September 1984

RADio COMmunication

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Peter Hart's review of the YAESU MUSEN FT980 HF TRANSCEIVER

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Journal of the Radio Society of Great Britain

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Technical articles on subjects of amateur interest are always welcome and should be sent to: The Editor, *Radio Communication,* 88 Broomfield Road, Chelmsford, Essex CM1 1SS.

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.
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London Lowe Electronics Ltd.
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Kent Thanet Electronics Ltd.
143 Reculver Road, Herne Bay, Kent.
Tel: 02273 63859/63850

TW4000A £488.70 inc VAT.

The TW4000A is the latest step forward in Trio's programme of providing today's radio amateur with the very best in equipment. Following the success story of the Trio TS780 dual band base station transceiver, the TW4000A gives the mobile operator a superb FM transceiver for both 70 centimetres and the 2 metre band. Not only for mobile operation is the TW4000A perfect but also for shack use where the rig with its scanning and dual band facilities enable the enthusiastic amateur to keep in touch with the local scene.

* The TW4000A covers in one compact transceiver both the 2 metre band (144.000 to 146.000 MHz) and also the full 10 MHz of the 70 centimetre band (430.000 to 440.000 MHz). Measuring 60mm high, 161mm wide, 217mm deep and weighing only slightly more than 2.0 kg, the TW4000A is smaller than most current 2 metre transceivers.
* Added to the exceptional receive performance, now a Trio standard by which others are judged, is the TW4000A's 25 watt capability on both 2 metres and 70 centimetres.
* A green backlit liquid crystal display gives frequency, memory channel, repeater offset, VFO A or B, scan function, channel occupied and "ON AIR" information.
* Ten memory channels are provided which store frequency, band and repeater offset (on 2 metres minus 600 KHz shift, on 70 centimetres plus 1.6 MHz shift). Memory 1 is used for priority watch, memories 8 and 9 for instant recall and memory 0 for split channel use (cross band operation).
* Frequency scan is extremely versatile in that the rig can be programmed to scan either all memory channels or those holding either 2 metre or 70 centimetre frequencies. The rig can also be programmed to skip those channels which the operator does not wish to monitor. The scan direction can also be changed by using the UP/DOWN switch on the microphone. In order that an important contact is not missed, when in priority watch mode, the rig switches back from the frequency in use to memory channel 1 for one second out of ten. The two most used frequencies can be placed in memories 8 and 9 respectively, common channel scan checking each alternatively for approximately 5 seconds.
* The use of GaAs FET's in the RF amplifiers on both 2 metres and 70 centimetres, as well as the use of high performance MCF's in the 1st IF section, provides a high receive sensitivity and an excellent dynamic range.
* Two VFO's are provided tuning in either 5 or 25 KHz steps, the UP/DOWN shift switch on the microphone providing control.
* Full repeater facilities are included giving the correct frequency shift, 1750 Hz access tone, and of course the essential repeater shift.
* The use of advanced diecasting techniques in the fabrication of the combined chassis/heat sink, as well as in the RF shielding results in greatly improved mechanical strength, plus a higher immunity to RF interference.

Optional Accessories
PS430 matching power supply.
VS1 voice synthesizer unit.
SP40 compact mobile speaker.
MA4000 dual band antenna with duplexer.
SW100B mobile SWR and power meter.
SW200B base station SWR and power meter.
PG3 noise filter for mobile use.

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 . . . **£458.72** 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 . . . **£850.00** 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 . . . **£323.30** 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 . . . **£436.75** 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 . . . **£1195.00** 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 . . . **£246.36** inc VAT.

TR3500 . . . **£265.85** inc VAT.

TS530SP 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 TS530SP now with notch filter.

TS530SP . . . **£669.61** 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. More details on opposite page and colour leaflet available. . . . **£488.70** inc VAT.

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There is more to a bench power supply than a transformer and rectifier, and we are once again proud to announce a top quality range from DAIWA. True to the DAIWA tradition of good engineering, this range of regulated supplies will satisfy professional and amateur users alike.

Each of the units is well constructed, conservatively rated, and cool running. Accurate metering of voltage and current is provided, with electronic fold back current limiting which gives fast, safe protection to both power supply and external equipment. Our demonstration trick is to drop a spanner across the output terminals of the 30 amp supply which promptly shuts down. Remove the spanner and the supply restores itself to the set voltage and carries on happily.

Output voltage is smoothly variable over a sensible range, and is stable to 1% and ripple voltage is less than 1mV, both values quoted at full rated output.

Output connection is by heavy duty terminals on the front panels, and in the case of the PS300, four sets of terminals are provided, for simultaneous connection of several pieces of equipment.

To sum up, the DAIWA power supplies are carefully designed, conservatively rated, well engineered, and totally satisfactory in use.

The price range represents extremely good value, and the units are normally available from stock. For further details contact us at any time.

FREE **RADSOFT** RTTY receive/transmit package with each 32K COLOUR GENIE!

Many radio amateurs, very wisely, have not yet **added a computer** to their shack. Apart from the difficulty of which computer to choose, they consider it **over expensive** to purchase the necessary additional soft and hardware to transmit and receive RTTY, create logging facilities or compute distances between themselves and other radio amateurs. **Things have now changed.** LOWE ELECTRONICS have put together a substantial package which includes **FREE OF CHARGE** with every COLOUR GENIE sold from Matlock, the following:

RADSOFT RTTY FULL RECEIVE/TRANSMIT SYSTEM (afsk) with the following features . . .

Split screen . . . enables incoming message to be displayed whilst you "type ahead" your reply.

Memory . . . The facility exists to pre-write information for later transmission. The information can be saved to cassette for future use.

Incorporated into the program are a selection of messages often used by a RTTY operator, eg: **RYRYRYRYRYRYR . . ., THE QUICK BROWN FOX . . ., QRZ DE** (your call sign), **DE** (your call sign).

Connections could not be easier . . . a cassette lead is used between the computer and the 3·5mm socket of the supplied terminal unit (hardware). To input an RTTY signal from the receiver requires a lead from the audio output of the rig to the 3·5mm socket of the terminal unit (one 3·5mm jack plug is supplied). Transmit audio is generated inside the COLOUR GENIE, a lead from the computer audio out to the microphone input of your transceiver completes the connections.
The **List price** of the RADSOFT package is **£56.00** inc VAT. With the LOWE ELECTRONICS computer the system is **FREE!**

In addition, purchases of the **COLOUR GENIE** will receive two other programs also **FREE OF CHARGE.** One is a log system enabling up to 700 stations together with their signal report and QRA locator to be stored, ideal for a contest. The second can be used to quickly tell you the distance between yourself and the station you are working. A map of the UK or, for the DX-er, Europe appears on the screen with flashing dots locating yourself and the other station.

Don't be carried away in your enthusiasm for RTTY, **don't forget,** you will own a COLOUR GENIE, a proven 32K home computer. This is a considerable advantage over the dedicated RTTY system. The COLOUR GENIE has a **"proper"** keyboard just like today's electronic typewriters, not indefinite touch pads. It is not a games plaything but is capable of introducing the family to computing. **That's if you'll ever let it out of the shack.**

complete package £168

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EMPORIUM NEWS

Good morning.

As I write this edition of Emporium News I am surrounded by **glossy photographs** which have just arrived from **TRIO** on the **new models.**

Last month I told you about the new 2 metre base station that I was using; **the TRIO TS711E.** It's still in my shack and using it during the sporadic conditions of late, I worked three **Portuguese stations** that were **well off** my QRA locator map – (**dashed annoying,** how can one brag about three pins in the corner of the map when you have really worked some considerable distance?). **The rig is perfection.** The more I use it, the more convinced I become. Of course TRIO are producing a **70 centimetre version** of the rig which will be called the **TS811E.** As a pair both in the shack what a combination!

TH21E £189.00 inc VAT
TH41E £198.00 inc VAT

As yet I have not seen the CD10 call sign display. (The TS711E and TS811E as well as having digital code squelch, can send, at the beginning and end of a transmission, **your Call Sign,** the information being in 6 digit ASCII Code). The TRIO CD10 uses this information and on an LCD reads out the Call Sign of the calling station. Not only that, the unit will store **up to 20 Call Signs** so you will know who has called you during your absence.

I have not included the 70 centimetre TS811E picture as it has an identical front panel to that of the TS711E.

The 2 metre **FM TH21E** and its 70 centimetre companion rig, the **TH41E,** are a **breakthrough** in amateur radio equipment design. It is impossible to convey by words the size of the new rigs or for that matter the **unbelievable** feel of the transceiver in the palm of your hand. I have in the past used the phrase "vest pocket" when describing the small AR22 VHF receiver – the **TRIO TH21E** and **TH41E** are **"vest pocket" transceivers!** 1 Watt or 150 mW output and for those of you who have

TM-211E £360.00 inc VAT
TM-411E £410.00 inc VAT

a ruler handy, **here are the dimensions and weight:** 57 (2·24) wide × 120 (4·72) high × 28 (1·1) deep, weighing only 260 grams (0·57 lbs) including batteries. Performance is **"typically TRIO".** Again I only show the 2 metre **TH21E** as externally, apart from their antennae, the transceivers are identical.

The remaining four new models, **the hand-held 2 metre** and **70 centimetre TR3500E** and **TR3600E** plus the mobile **TM211E** and **TM411E** are recognizable as being alternative versions of the current TR2500, TR3500, TM201A and TM401A. I use the word **alternative** as the existing hand-held and mobile version will run concurrently with the new models. The four new rigs have **"Digital Code Squelch"** and the **"Automatic Station Identification System"** built in and as described for the TS711E and TS811E base station transceivers.

I am sure we are entering a new phase of operating technique and I can certainly see the advantages of such a system. Indeed, our local 70 cm Matlock net would find the call alarm (an unattended rig will signify quietly that you have been called) most useful. It will probably mean that **smoke signals,** waving frantically out of windows, **flashing lights,** the **CQ call** expertly tapped out at **12 words a minute** on a **car horn** after **11 pm** and **distress flags run up the tower,** to say nothing of resorting to a telephone call, will become a thing of the past. My reasoning being that amateurs currently dislike monitoring a channel that undoubtedly will be used by some other station. **I remember** not so long ago monitoring a specific channel and as 2 metre activity was sparse the chances of another unknown station using that frequency in your area was slim. That is not

TS-711E £785.00 inc VAT
TS-811E £878.00 inc VAT

the case today. So the **"Digital Code Squelch"** will take us back to those **halcyon days.** What if your particular channel is in use when you want it? No problem! Wait for a break and politely call your friend. He will be monitoring the channel unaffected by the stations already using it. Your code will activate his rig and you can QSY to another clear channel. Simple – and how convenient.

In addition to **Digital Code Squelch** and **Automatic Station Identification,** the **TM211E** and **TM411E** have redesigned front panels which tilt up and down independently of the rig. So the transceiver which because of its size can be easily mounted in a car now has even more flexibility. **Flexibility of operation** using the code calling system and also of installation . . . **"typically TRIO"!**

Don't forget to read carefully the special offer on the **Colour Genie.** The **RADSOFT** package has been developed by a group of amateurs who are RTTY **addicts.** Every conceivable feature to aid operating for we two-finger typists has been incorporated. Next time you're on the band take a listen to the RTTY channels – wouldn't it be nice to read what was being sent and the amateur bands are not all that's available. Take a general listen on the short waves at any time of the day and you will find many RTTY signals. I have spent hours in front of a 12" green monitor, watching lists of . . . . . passing before my eyes. And when you have got the system together don't forget, at its heart is a home computer that you and the family can use for many other purposes – not a toy!

TR2600E £260.00 inc VAT
TR3600E £289.00 inc VAT

Just a word on the expertise of the workshop staff. On Saturday, just prior to the start of VHF Field Day, received a 'phone call from a guy whose TS430S would not go to transmit. As this was the driver for the VHF/UHF stations to me it seemed important. The chap couldn't get hold of the shop from where he bought it (an approved dealer). **Armed with the Service Manual,** David, one of our technicians, talked the amateur through the problem. Received a telex this morning "Fault found, thanks for your Guidance". **Part of the Lowe Service!**

Anyway, that's it for now. I must go and check whose called me on the TS711E/CD10 whilst I have been putting this together.

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

David G8GIY

ICOM

FOR THE SWL...

IC-R70, £565.

The R70 covers all modes (when the FM option is included), and uses 2CPU-driven VFOs for split frequency working, and has 3 IF frequencies. 70MHz, 9MHz and 455KHz, and a 100dB dynamic range. It has a built-in mains supply. Other features include input switchability through a pre-amplifier, direct or via an attenuator, selectable tuning steps of 1KHz, 100Hz or 10Hz, adjustable IF bandwidth in 3 steps (455KHz). Noise limiter, switchable AGC, tunable notch filter, squelch on all modes, RIT, tone control. Tuning LED for FM (discriminator centre indicator). Recorder output, dimmer control.

The R-70 also has separate antenna sockets for LW-MW with automatic switching, and a large, front-mounted loudspeaker with 5.8W output. The frequency stability for the 1st hour is ± 50Hz, sensitivity – SSB/CW/RTTY better than 0.32 uv for 12dB (S + N) ÷ N, Am – 0.5 uv. FM better than 0.32 for 12dB Sinad. DC is optional.

Ever since its introduction the IC-R70 has proved to be a popular and reliable HF receiver making your listening hours a pleasure. Please contact us for further details on this excellent set.

IC-R71E, £649.

For those who like the easy life, the R71E has the option of an infra-red remote control unit, making it a very sophisticated rig indeed, here are some details.

100 KHz – 30 MHz all mode (with FM option). Quadruple conversion superhet. IF frequencies 70MHz, 9MHz and 455KHz with continuous bandpass tuning and notch filter. Virtually immune from adjacent channel interference with 100db dynamic range. Adjustable AGC, noise blanker and switchable pre-amplifier. Direct keyboard into twin VFO's with 32 programmable memories. 5 year lithium memory backup cell. Memory and band scan with auto-stop. Tuning rates 10Hz, 50Hz and 1 KHz with 6 digit readout. AC mains operation. Auto squelch tape record function.

OPTIONS:- Synthesized voice readout, infra-red remote controller, 12 V DC kit, mobile mounting bracket, two CW filters 500 and 250 Hz, FM unit, computer interface, headphones.

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

ICOM

FOR THE DX'er...

IC-751, £1099.

The IC-751 could be called the flagship of the ICOM range as it features 32 memory channels, full HF receive capability, digital speech synthesizer, computer control and power-supply options. The 751 is fully compatible with ICOM auto units such as the AT-500 and IC-2KL. The IC-751 now has a remote push-button frequency selector pad

Standard features include: a speech processor, switchable choice of J-FET pre-amp or 20dB pin diode attenuator and two VFO's, marker, 4 variable tuning rates, pass band tuning, notch, variable noise blanker, monitor switch, 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. The transmitter features high reliability 2SC2904 transistors in a low IMD (-32dB@100W) full 100% duty cycle. For more detailed information on this excellent set, please get in touch with us.

IC-271H, £819.

The IC-271H is the most advanced 2 meter transceiver available today, it covers the spectrum from 144-146 MHz with FM, SSB, or CW using the most advanced 10Hz PLL system. The IC-271H is suitable for simplex, repeater operation, moonbouce or satellite work, and has features found on no other transceiver.

Some standard features include 32 tunable memories, a high visibility fluorescent display, RIT readout, scanning, 12V DC operation with optional AC power supply.

The 271H has a speech synthesizer that announces the displayed frequency, ideal for blind operators, this is an optional extra along with the SM6 desk microphone and 22 channel memory extension with scan facilities.

As you can see from this brief description the IC-271H, (and its 430-440MHz brother the IC-471H) are very versatile sets indeed. More detailed literature can be easily obtained from Thanet Electronics Limited.

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

ICOM

ON THE MOVE...

IC-27E, £319.

This must be the smallest, 2M, FM mobile available today, measuring only 38mm H x 144mm W x 177mm D. It has all the features that you probably require included in this microprocessor controlled unit. In addition, if you feel lonely and can't find anybody on the band, just press "speech" and the optional built in speech synthesizer will tell you the frequency you are tuned to. This is a boon to the blind operator or to those that tuck their rigs out of sight.

Brief features:- 25/1 Watt output, green LED readout, scanning (memories and programmable limit band scan), priority scan, programmable duplex splits, 25 and 5Khz tuning steps, 10 memory channels with lithium back up cell, normal and reverse repeater switch, dual VFO, internal speaker and optional speech synthesizer. Just ask for a leaflet and we'll be glad to send you one. Price £319 and £25 for the optional speech synthesizer.

IC-02E, £239.

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 and 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 LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions. New HS-10 Headset, with earphone and boom microphone, which operates with either of the following:- HS 10-SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS 10-SA Voice operated switch box, with pre-amplifier, mic gain, vox gain and delay. The IC-2E continues to be available.

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ICOM FOR COMPUTERS

Tono 5000E, £799.

From the famous TONO stable comes the new THETA – 5000E now ready to send and receive AMTOR as well as CW, RTTY, and ASCII.

Features include:- 5" high resolution monitor displaying 400chr. x 16 lines x 2 pages, ARQ/FEC, time clock, Selcal (Selective calling), high speed RTTY demodulator – up to 300 bauds (600 baud using TTL level); 3 shifts (170,425 and 850 Hz) and two tones (2125 and 1275 Hz); manual or automatic Tx/Rx; Battery back-up memory (72 chars x 7 channels and 24 chars x 5 channels); type ahead correctable buffer memory; Morse code 5 – 100 wpm (variable weights) + autotrack on receive; CW practice feature with random generator; Automatic CR/LF with wrap around display; Automatic letters code insertion; Printer interface; Bargraph LED meter for tuning; TOR A, B and L – the list goes on and on..... Power requirements by the way are AC mains or 13.8v DC.

Tono 9100E, £699.

The famous TONO THETA 9000E has had AMTOR modes A, B and L added to its functions providing transmit and receive facilities with selective calling on AMTOR, RTTY (with 3 selective shifts and 2 tone pairs), CW with built in practice function and random generator, and ASCII with full Duplex facility. The 9000E requires an external VDU. The battery backed memory covers 256 characters x 7 channels with Channel 6 which is divided into 16 subsections of 16 characters each and Channel 7 into 8 subsections of 32 characters. Any of the subsections may be used individually and messages can be repeated 1 – 9 times from a keyboard command.

Please note that we now have a new retail branch at 95, Mortimer Street, Herne Bay, Kent. Give it a visit; BCNU.

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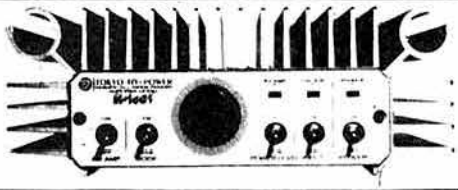


HL-160V VHF 160W linear £244·52 inc.

FEATURE: 160W output achieved with a pair of rugged MRF247 transistors. Drive requirement as low as 10W or 3W from hand-held. Selectable hi/lo output. Newly designed effective heat sink and high reliability one board construction.

SPECIFICATION: **Freq. Band:** 144-148MHZ (or 150-160MHZ), **Mode:** FM·SSB·CW, Supply **Voltage:** DC 13.8V neg. ground, 12-23A, **Output:** 160W, **RF Input:** 1-15W(or 0.5-3W), **Receive Pre-amp:** 12 dB gain with low-noise 2SK125 JFET, **In/Out Connectors:** SO-239 (50 ohm), **Built-in Circuitry:** COX, remote-control terminal, hi/lo output select, output power meter, reverse polarity protection, **Dimension:** 218W x82H x 299D(m/m), **Weight:** 3.5 kgs.

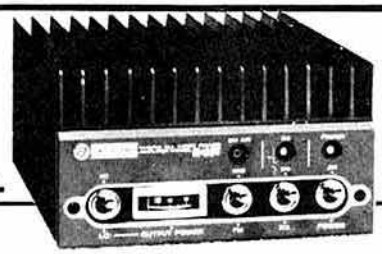
HL-82V VHF 85W linear

FEATURE: A compact 144MHZ band (or 154MHZ for commercial use) amp. with receive preamp and power output meter.

SPECIFICATION: **Freq. Band:** 144-148MHZ(or 150-160MHZ), **Mode:** FM·SSB·CW, **Supply Voltage:** DC 13.8V neg. ground, 13A max., **Output:** 35-85W, **RF Input:** 2-12W, **In/Out Connectors:** SO-239 (50 ohm), **Built-in Circuitry:** COX, remote control terminal, receive preamp (MOS FET 12dB gain), output power meter, output select (hi/lo), reverse polarity protection, **Dimension:** 152W x 92H x 217D (m/m), **Weight:** 1.8 kgs.

£144·50 inc.

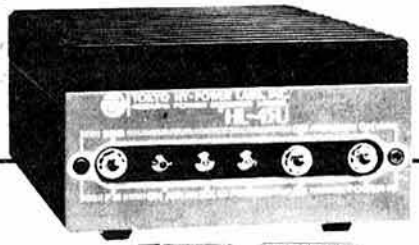
HL-160V25 25W input New model now in stock £209·73 inc.



HL-90U UHF 90W linear £263·59 inc.

FEATURE: 80W output achieved with a pair of rugged 2SC2783 transistors. Drive requirement as low as 10W. Selectable hi/lo output. Newly designed effective heat sink, and state of the art low-noise GaAs FET (3SK97) RX preamp.

SPECIFICATION: **Freq. Band:** 430-440MHZ, **Mode:** FM·SSB·CW, **Supply Voltage:** DC 13.8V neg. ground, 5-17A, **Output:** 80W, **RF Input:** 10W, **Receive Preamp:** 18 dB gain with low-noise 3SK 97 FET, **In/Out Connectors:** type N (50 ohm), **Built-in Circuitry:** COX, remote-control terminal, hi/lo output select, output power meter, reverse polarity protection, **Dimension:** 218W x 82H x 299D (m/m), **Weight:** 3.5 kgs.



HL-45U UHF 45W linear £152·77 inc.

FEATURE: A compact 430MHZ band linear amp with low-noise MOS FET receive preamp.

SPECIFICATION: **Freq. Band:** 430-440MHZ (or 450-465MHZ), **Mode:** FM·SSB·CW, **Supply Voltage:** DC 13.8V neg. ground, 5-7A, **Output:** 10-45W, **RF input:** 2-15W, **In/Out Connectors:** SO 239 (50 ohm), **Built-in Circuitry:** COX, receive preamp (12dB gain min.) reverse polarity protection, **Dimension:** 124W x 68H x 170D (m/m), **Weight:** 1.25 kgs.

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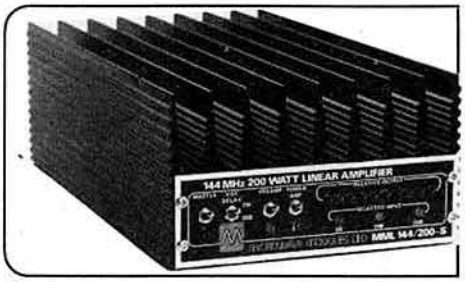

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FT203R	c/w FNB3, CSC6 etc	£175.00
FT203R	c/w FNB4, CSC7 etc	£185.00
FBA5	7.2/9V Cell case only (6 × 'AA')	£6.85
FNB3	10.8V NiCad Pack (425mAH)	£33.50
FNB4	12.0V NiCad Pack (500mAH)	£38.25
CSC6	Soft case (FBA5 or FNB3 fitting)	£6.00
CSC7	Soft case (FNB4 fitting)	£6.85
YH2	Headphone/Microphone option	£14.50
MH-12A 2b	Speaker/Microphone option	£17.69
MMB21	Mobile mounting bracket	£8.00
SMC8.9AA	Charger (slow) 13A style	£8.05
NC15	Charger (quick) and Power Unit	£49.95

NEW FT209R HANDHELD—TWIN CPU's

KEYBOARD ENTRY—SCANNING COMPREHENSIVE LCD DISPLAY

Two 4 bit CPU's: 10 memories (independent Tx & Rx), reverse/simplex (either) by single key touch, scanning; manual-auto band (full or partial)—memory, clear-busy, skip-select, programmable power save system (10 selectable dwell times). Large LCD ½" Digits + 10 special functions, "any angle". meter; S/battery condition, VOX. 65 × 34 × 169mm.

FT209R (1.8W)	c/w FBA5, YHA14A etc. FREE CSC10	£229.00
FT209R (2.7W)	c/w FNB3, YHA14 etc. FREE CSC10	£239.00
FT209R (3.7W)	c/w FNB4, YHA14 etc. FREE CSC11	£249.00
FT209RH (2.3W)	c/w FBA5, YHA14 etc. FREE CSC10	£235.00
FT209RH (3.7W)	c/w FNB3, YHA14 etc. FREE CSC10	£249.00
FT209RH (5.0W)	c/w FNB4, YHA14 etc. FREE CSC11	£259.00
CSC10	Soft case (FBA5, FNB3 fitting)	TBA
CSC11	Soft case (FNB4 fitting)	TBA

For general accessories see FT203R list.
FNB5, FNB3, FNB4, YH2, MH12A2b, SMC8.9AA, NC15, MMB21

SIX METRE EQUIPMENT

FT726R	Main frame unit less modules	£619.00 inc.
50/726	6M module for 726R	£195.00 inc.
FT680R	6M mobile 10W O/P	£359.00 inc.
FT690R	6M transportable 2.5W O/P	£259.00 inc.
FL6010	Matching 10W amplifier for 690R	£49.00 inc.
50TV	6M module for FTV transvertors	£89.00 inc.
MMC50/28S	6M down to 10M converter	£34.90 inc.
MMA50V	6M switched pre-amp	£34.90 inc.
SLNA50S	50 MHz switched pre-amp	£44.90 inc.

STOCK CARRYING AGENTS WITH DEMONSTRATION FACILITIES

Stourbridge Andrew G4BJY (0384) 390916 — SMC Northern Ireland — **Neath** John GW4FOI (0639) 52374 Day, (0639) 2942 Eve

SMC SERVICE
Free Securicor delivery on major equipment.
Access Barclaycard over the phone.
Biggest branch agent and dealer network.
Securicor 'B' Service contract at £5.00.
Biggest stockist of amateur equipment.
Same day despatch whenever possible.

FREE FINANCE
*On many regular priced items SMC offers.
Free Finance (on invoice balances over £120)
20% down and the balance over 6 months or
50% down and the balance over a year.
You pay no more than the cash price!
Further details on eligible items on request.

GUARANTEE
Importer warranty on Yaesu Musen products.
Ably staffed and equipped Service Department.
Daily contact with the Yaesu Musen factory.
Tens of thousands of spares and test equipment.
Twenty five years of professional experience.
• 2 years warranty on regular priced Yaesu products.

Communications Ltd.

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TEE—MAIN DISTRIBUTOR FACTORY BACKED

BUCKLEY, STOKE, GRIMSBY, JERSEY, EDINBURGH, N. IRELAND

'SMC' YOUR ULTIMATE CHOICE FOR SERVICE

FT980 "COMPUTER COMPATIBLE"

FT980	Transceiver General Coverage Rx	£1329.00
SP980	Ext. speaker with audio filter	£61.55
XF455.8MCN	300Hz CW filter (455KHz 8 pole)	£49.00
XF8.9HC	600Hz CW filter	£29.50
XF8.9GA	6kHz AM filter	£29.50
FIF**	Computer interface (see FT757GX units)	
D410004	Interconnect lead FT980-FC757AT	£26.99
TST980	Technical Supplement FT980	£8.50

FT757GX THE BIGGEST SELLER

Every item normally sold as an extra is provided as standard, including AM and FM modes, a 600Hz narrow CW filter, iambic keyer with dot-dash memory, 25KHz marker generator, IF shift and width filters, effective noise blanker and AF speech processor . . . . all at no extra charge.

FT757GX	Transceiver General Coverage Rx	£719.00
FC757AT	Automatic antenna tuner	£254.00
FP757GX	Switch mode PSU (50pc duty)	£145.00
FP757HD	Heavy duty PSU (100pc duty)	£179.00
FIF80	Computer interface for PC8001 NEC	£105.00
FIF65	Computer interface for Apple II	£54.00
FIF232C	Computer interface RS232C	£59.00

FT77 THE IDEAL MOBILE

100W PEP
8 Band HF
SSB/CW/FM AM
£479!

FT77	8 Band Rx/Tx 100W output	£479.00
FT77S	8 Band Rx/Tx 10W output	£449.00
FP700	Matching AC PSU	£145.00
FC700	Matching antenna tuner	£103.85
FV700DM	Digital VFO unit	£209.00
MKT77	Marker unit	£10.85
FMUT77	FM unit	£28.55
AMUT77	AM unit	£24..00

FT-ONE 'THE ULTIMATE'

FT ONE	Transceiver HF All Mode	£1569.00
KEYT901	Curtis Keyer	£28.50
DCT1	DC Power Cable	£10.85
RAMT1	Non volatile memory	£14.49
FMUT1	FM unit	£44.99

XF8·9K* Filter 300Hz or 600Hz or 6kHz. Each **£19.35**

FRG7700 COMMUNICATIONS RX

FRG7700	Receiver 0.15-30MHz AM/CW/SSB/FM	£385.00
FRG7700M	Receiver c/w 12 channel memory	£455.00
MEMG7700	Memory option	£75.00
FRT7700	Antenna tuner/switch	£48.25
FRA7700	Active antenna	£43.95
FF5	Low pass filter 500kHz	£11.25
FRV7700	VHF Convertors, 8 models, each 3 bands	From £85-£95 each

KDK 2033 FM MOBILE, 144MHz

NEW £239

144 MHz, 12VDC FM Transceiver.
25W/5W Hi/Lo (both adjustable).
Compact $2^{5}/_{16} \times 6\frac{3}{4} \times 7^{3}/_{16}$".
12½KHz steps (100KHz fast QSY).
Amber LCD'Sunlight View'. Side Lit Display. 100's of Hz + channel number.
Sensitivity <0.2μV for 12dB SINAD.
Single knob frequency control "Dual".
Endless or non endless dial options.
RIT; 1KHz steps. V.F.O. + memory.
Two 5 slot memories A, B, A+B, A×B.
11th memory instant "call" channel.
Memory simplex or duplex channels.
Band scanning, programmable limits.
Scan halts squelch + centre zero.
Pause on scan halt for 3 seconds.
Scan/tune/RIT from microphone
±600KHz split, plus cross memory.
Repeater input listen—press "diall".
Setable, steps, tone, splits, limits.
Simple controls for safe mobile.
CW mobile mount, mic, handbook.

Head office
Mail orders
Service & Spares

S. M. HOUSE, RUMBRIDGE STREET, TOTTON, SOUTHAMPTON SO4 4DP, ENGLAND
Tel: Totton (0703) 867333, Telex: 477351 SMCOMM G, Telegram: "Aerial" Southampton
See preceding pages for complete addresses and phone numbers of branches

SOUTHAMPTON
SMC Ltd
36/38 Rumbridge Street,
Totton, Southampton
Southampton (0703) 867333
8-5.30 Mon-Sat

GRIMSBY
SMC (Humberside)
247A Freeman Street,
Grimsby, Lincolnshire
Grimsby (0472) 59388
9.30-5.30 Mon-Sat

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

LEEDS
SMC (Leeds)
257 Otley Road,
Leeds 16, Yorkshire.
Leeds (0532) 782326
9-5.30 Mon-Sat

CHESTERFIELD
SMC (Jack Tweedy) Ltd
102 High Street,
New Whittington, Chesterfield
Chesterfield (0246) 453340
9-5.30 Tue-Sat

BUCKLEY
SMC (T.M.P.)
Unit 27 Pinfold Workshops
Pinfold Lane, Buckley.
Buckley (0244) 549563
10-5 Tue-Fri 10-4 Sat

JERSEY
SMC (Jersey)
1 Belmont Gardens
St Helier, Jersey
Jersey (0534) 77067
10.00-7.00 Mon-Sat

EDINBURGH
SMC (Scotcomm)
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.

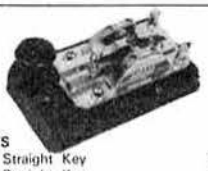
SPECIFICATIONS

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 VMF (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) × 250(D) × 85(H) mm
Weight:	1.7kg

£249.00 inc.

Price includes free carriage

MORSE EQUIPMENT



MORSE KEYS			p.p.
HK703	Straight Key	£29.35	£1.20
HK704	Straight Key	£19.95	£1.20
HK706	Straight Key	£16.65	£1.00
HK707	Straight Key	£15.50	£1.00
HK710	Straight Key	£39.95	£1.75
HK808	Straight Key	£49.95	£1.75
HK711	Key Mounting	£32.75	£1.50
BK100	Mechanical Bug	£24.95	£1.75
MK701	Single Lever Paddle	£28.50	£1.60
MK702	Single Lever Paddle	£29.75	£1.60
MK703	Squeeze Key	£28.95	£1.75
MK705	Squeeze Key	£25.65	£1.75
MK706	Squeeze Key	£23.50	£1.75
IKP60	Iambic	£9.95	FOC
HK802	de Luxe Brass Key	£85.85	£2.00
HK803	de Luxe Brass Key	£79.95	£2.00
HK804	de Luxe Brass Key	£79.95	£2.00
MHK831	Super de Luxe squeeze & straight key	£189.00	£3.50
MORSE EQUIPMENT			
KP100	Squeeze 230/13·8V	£79.50	£2.00
KP200	Memory 4096 Multi Ch Mem Back Up 230/13·8V	£169.50	£2.50
D70	Morse Tutor (Datong)	£56.35	FOC
MMS1	Morse Tutor (M/M)	£115.00	FOC
MMS2	Morse Tutor Advanced	£169.00	FOC
MICROWAVE MODULES—RRTY EQUIPMENT			
MM2001	RTTY to Video	£189.00	FOC
MM4001	RTTY Transceiver	£269.00	FOC
MM4001KB	RTTY Tx/Rx keybd	£299.00	FOC
MM1001KB	Morse Keyboard	£135.00	FOC
MM1000KB	ASCII CW conv c/w keybd	£135.00	FOC

PRICES INCLUDE VAT at 15%
Carriage as shown

JAY BEAM

			p/p
4 METRES			
4Y/4M	Yagi 4 element	7dBd **£32.78**	£2.65
PMH2/4M	Phasing harness 2 way	**£17.82**	£1.65
2 METRES			
H0/2M	Halo head only	0dBd **£6.53**	£1.50
HM/2M	Halo with 24" mast	0dBd **£7.48**	£1.65
C5/2M	Colinear omni vert	4·8dBd **£86.25**	£2.65
LW5/2M	Yagi 5 element	7·8dBd **£15.53**	£2.65
LW8/2M	Yagi 8 element	9·5dBd **£19.55**	£2.65
LW10/2M	Yagi 10 element	10·5dBd **£25.30**	£2.65
LW16/2M	Yagi 16 element	13·4dBd **£37.95**	£3.65
PBM10/2M	10 ele Parabeam	11·7dBd **£49.45**	£3.65
PBM14/2M	14 ele Parabeam	13·7dBd **£60.95**	£3.65
Q4/2M	Quad 4 element	9·4dBd **£31.63**	£2.65
Q6/2M	Quad 6 element	10·9dBd **£41.40**	£2.65
Q8/2M	Quad 8 element	11·9dBd **£51.75**	£2.65
D5/2M	Yagi 5 over 5 slot	10dBd **£27.60**	£2.65
D8/2M	Yagi 8 over 8 slot	11·1dBd **£37.95**	£2.65
5XY/2M	Yagi 5 ele crossed	7·8dBd **£29.50**	£2.65
8XY/2M	Yagi 8 ele crossed	9·5dBd **£38.53**	£2.65
10XY/2M	Yagi 10 ele crossed	10·8dBd **£43.80**	£2.65
PMH2/C	Harness cir polarisation	**£11.50**	£1.65
PMH2/2M	Harness 2 way 144MHz	**£12.65**	£1.65
PMH4/2M	Harness 4 way 144MHz	**£31.62**	£1.65
70 CM			
C8/70	Colinear Vertical	6·1dBd **£92.00**	£2.65
D8/70	Yagi 8 over 8 slot	12·3dBd **£28.18**	£2.65
PBM18/70	18 ele Parabeam	13·5dBd **£34.50**	£2.65
PBM24/70	24 ele Parabeam	15·1dBd **£46.00**	£2.65
LW24/70	Yagi 24 element	14·8dBd **£31.05**	£2.65
MBM28/70	28 ele Multibeam	11·5dBd **£23.00**	£2.65
MBM48/70	48 ele Multibeam	14·0dBd **£37.95**	£2.65
MBM88/70	88 ele Multibeam	16·3dBd **£51.75**	£2.65
8XY/70	Yagi 8 ele crossed	10dBd **£44.85**	£2.65
12XY/70	Yagi 12 ele crossed	12dBd **£55.20**	£2.65
PMH2/70	Harness 2 way	**£12.07**	£1.85
PMH4/70	Harness 4 way	**£25.78**	£1.85
23cm			
CR2/23CM	Corner reflector	13·5dBd **£43.13**	£2.65
PMH2/23CM	Harness 2 way	**£32.78**	£1.65

NB: PRICES INCLUDE VAT AT 15%
Carriage extra, mainland rate 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 panel Hi/Low power switch), so from the car or at home you can enjoy 10M FM without having to pay £500 for an HP transceiver.

OSCAR 2 10M FM **£49.00 inc**

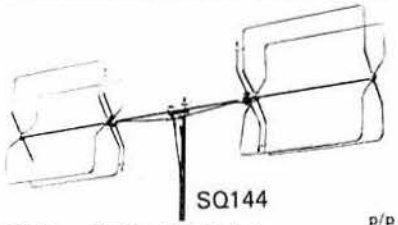
ACCESSORIES		INC	P/P
SMCGP27	¼ Wave vertical with radials	£25.75	£2.65
SMCVA27	¼ Wave vertical no radials	£25.75	£2.65
SMC11V11S	Glass fibre shortened ground plane	£32.95	£2.65
SMC10SE	10M Mobile whip	£15.95	£2.00
RSL-28b	Yaesu 10M mobile whip	£10.65	£2.00
SMCGCCA	Gutter mount and cable	£10.95	£2.00
SMCSOCA	4M cable assembly for 10SE	£5.65	£1.50
FLEXI 10	G. Whip mobile 10-80M	£52.33	£2.35
MULTI-MOBILE	G. Whip mobile 10, 15, 20M	£33.92	£1.85
FLEXIWHIP	G. Whip 10M mobile	£19.21	£1.85
GW BASE	Base for all G. Whip antennas	£6.90	£1.00
SMCT3170L	Twin meter SWR bridge	£16.95	FOC
SMC100LP30	Low pass filter	£6.30	FOC
SMCRU12 04·06	4 Amp DC power unit	£14.95	£2.35
SP55	Extension L/S	£16.50	FOC

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.



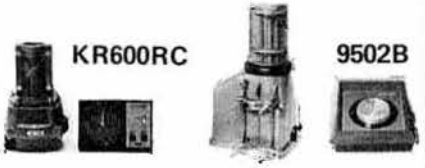
SQ144

			p/p
SQ144	2M Swiss Quad Vertical Mounting	£67.95	£2.65
GP2M	2M¾ c/w ground plane 3·4dB ↓	£21.50	£2.65
GP144W	2M 2 × ¾ colinear 6·5dB ↓	£31.95	£2.65
GP23	2M 3 × ¾ colinear 7·8dB ↓	£44.95	£2.65
GP432	70cm 3 × ¾ colinear 6·8dB ↓	£33.95	£2.65
70N2V	2M/70cm colinear 2·8dB ↓/5·7dB ↓	£32.95	£2.65
HS770	2M/70cm Duplexer 50W 30dB isolation	£17.65	£1.85
VHFL	65-520MHz Discone Rx only	£18.35	£2.65
GDX1	80-480MHz Discone 3dB ↓	£44.95	£2.65
GDX2	50-480MHz Discone 3dB ↓	£55.85	£2.65
GDXA	100-480MHz Discone 3dB ↓	£39.25	£2.65
LT606	50-500MHz Log Periodic 7-8dB	£132.25	£2.65
HF5V	Trapped Vertical 10-80M 5 bands	£65.00	£2.65
HF5R	Loaded Radial Kit	£39.85	£2.65
3Y1015D20	3 ele 10, 15M Dipole 20M	£179.00	£5.95

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

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.



KR600RC 9502B

FU200	Thro'	3 Core	Light Duty	£49.95
KR250	Bell	6 Core	Lighter Duty	£55.50
9502B	Offset	3 Core	Lighter Duty	£59.50
AR40	Bell	5 Core	Medium Duty	£105.00
KR400	Bell	6 Core	Matches KR500	£101.50
KR500	Thro	6 Core	Elevation	£131.85
AR50	Bell	5 Core	5 Position (AR40)	£113.85
KR400RC	Bell	6 Core	Medium Duty	£121.50
CD45	Bell	8 Core	Heavy Duty	£149.50
KR600RC	Bell	8 Core	Heavy Duty	£173.50
HAM IV	Bell	8 Core	Heavier Duty	£264.50
KR2000RC	Bell	8 Core	Heavier Duty	£346.50
T2X	Bell	8 Core	Very Heavy Duty	£332.35
H300	Bell	8 Core	Digital Readout	£546.25

Control Cable

RC5W	5 Way 40p/mtr	Carriage £1.90
RC6W	6 Way 55p/mtr	Carriage £1.90
RC8W	8 Way 59p/mtr	Carriage £1.90
9523	Support Bearing **£18.22** 9502b F4200	Carriage £2.50
KC038	Lower Mast Clamp **£12.65** KR400 600 etc	Carriage £2.50

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

Head office
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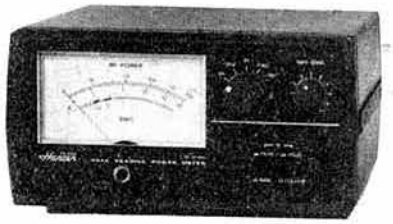
Service & Spares

S. M. HOUSE, RUMBRIDGE STREET, TOTTON, SOUTHAMPTON SO4 4DP, ENGLAND
Tel: Totton (0703) 867333, Telex: 477351 SMCOMM G, Telegram: "Aerial" Southampton
See preceding pages for complete addresses and phone numbers of branches

POWER METERS

IN LINE POWER/SWR BRIDGES P.E.P., AVERAGE 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 Auto SWR	102.95
FS710V	50-150 MHz	15/150W	PEP Auto SWR	102.95
FS50HP	1.8-60 MHz	20/200/2000W	Interval PEP/SWR	99.95
FS50VP	50-150 MHz	20/200W	Interval PEP/SWR	99.95
FS500H	1.8-60 MHz	20/200/2000W	PEP	79.95
FS500V	50-150 MHz	20/200W	PEP	79.95
FS300H	1.8-60 MHz	20/200/1000W		53.50
FS300V	50-150 MHz	20/200W		53.50
FS200	1.8-150 MHz	20/200W	PEP/SWR Interni Battery	57.95
FS601M	1.8-30 MHz	20/200W	PEP	58.95
FS601MH	1.8-30 MHz	200/2000W	PEP	58.95
FS602M	50-150 MHz	20/200W	PEP	58.95
FS603M	430-440 MHz	5/20W	PEP	58.95
FS210	1.8-150 MHz	20/200W	Auto SWR/ Power Meter	63.50
FS301M	2-30 MHz	20/200W		41.00
FS301MH	2-30 MHz	200/2000W		41.00
FS302M	50-150 MHz	20/200W		41.00
FS711H	2-30 MHz	20/200W	Head/ Display	42.35
FS711V	50-150 MHz	20/200W	Head/ Display	42.35
FS711U	430-440 MHz	5/20W	Head/ Display	42.35
W720S	130-430 MHz	20/200W	Head/ Display	41.50
FS7	145&1432 MHz)	5/20/(200)	(200W on 144 only)	46.97
FS5E	3.5-150 MHz	20/200/1000W (1KW HF only)		42.75
FS5S	1.8-150 MHz	20/200/1000W (1KW HF only)		43.75
SWR3E	3.5-150 MHz	20/200/1000W (1KW HF only)		28.75
SWR3S	3.5-150 MHz	F/S Meter ant. switch 20/200W		30.50
SWR50B	3.5-150 MHz	Twin Meter		30.50
FS20DL	3-150 MHz	1/10W Dummy/SWR/Power		43.65
FS20D	3-150 MHz	5/20W Dummy/SWR/Power		43.65
FS800	1.8-150 MHz	6/30/150W Dummy/SWR/ Power		125.35
W720S	930 MHz	7.5/15W Head/Display		46.00
		JD		
JD110	1.5-150 MHz	10/100W		15.85
		MIRAGE		
MP2	50-150 MHz	50/500/1500W	PEP	P.O.A.
		SMC		
S3-30L	Mini (CB Style)			8.80
T3-170L	3.5-170 MHz	Relative	Twin Meter	16.95
		WELZ		
SP300	1.8-500MHz	20/200/1KW	SWR/ Power	115.00

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 ¼λ	5.75	0.85
SMCT144h	Telescopic 2M ½ wave BNC	9.95	0.85
SMC6P2T/BNC	Telescopic 2M BNC fitting ¼λ	6.00	0.85
SMC2H/PL	Helical 2M PL259 fitting	5.75	0.85
SMC2H/BNC	Helical 2M BNC fitting	6.00	0.85
SMCHS430S	70cm ½ wave BNC fitting 2.5dB¼	7.95	0.65
SMC2QW	2M ¼ wave 0dB¼ 1.6'	2.70	1.85
SMC2NE	2M ⅝ wave fold 3.0dB¼ 4.3'	7.95	2.00
SMC2VF	2M ⅝ wave fold 3.0dB¼ 3.5'	13.65	2.00
SMC78F	2M ⅝ wave fold 4.5dB¼ 5.7'	15.95	2.50
SMC78B	2M ⅝ wave ball 4.5dB¼ 5.6'	15.95	2.59
SMC78SF	2M ⅝ wave short 4.7'	15.95	2.50
SMC88F	2M 5/8 wave 5.2dB¼ 6.5'	21.95	2.50
SMC118M	Colinear 2M 11/8 7dB¼ 9.7'	33.35	2.65
SMC258	70cm 2 × ⅝ fold 5.5dB¼ 3.1'	15.60	2.00
SMC268C	70cm 2 section colinear 6dB¼	25.95	2.00
SMC358	70cm 3 × ⅝ 6.3dB¼ 4.7'	19.65	2.00
SMC70N2M	Dual band 2M 2.7dB¼ 70cm 5.1dB¼ (½λ & 2½λ)	19.65	2.00
SMCHS770	144/432 Duplexer 50W	17.85	1.85
SMC20SE	20M 1.72M 100W PEP	19.95	2.50
SMC15SE	15M 1.72M 130W PEP	16.75	2.50
SMC10SE	10M 1.72M 200W PEP	15.95	2.50
SMC17SE	17M 1.915M 200W PEP	17.95	2.50
SMC12SE	12M 1.915M 200W PEP	16.75	2.50
RSL-28b	Yaesu 10M mobile whip	10.65	2.00
SMCGCCA	Gutter clip 4 mtrs cable	10.95	2.00
SMCSOCA	Cable assembly 4M	5.65	1.50
SMCSOCAL	Cable assembly 6M	5.95	1.50
SMC50CALLR	Cable assembly c/w 5M cable/ PL259	6.50	1.50
SMCROL	Rollet, 10mm thick (for SMC50CALLR)	1.15	0.50
SMCTMCAS	Trunk mount c/w 6M cable	9.95	2.00
HDTMCA	HD trunk mount c/w 5M cable	15.40	2.00
SMCSOMM	Magnetic base c/w 4M cable	10.95	2.00
SMCSOWM	Adjustable wing mount base	4.85	0.90
SMCGCD	Gutter clip deluxe	5.30	1.50
SMCBSD	Bumper strap deluxe	10.95	1.50
HS88BK	Bumper mounted extension for 144 MHz antennae	23.35	2.00

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	£335.00	£5.95
TH3JNR	3 Ele 10-20m	£212.00	£3.50
TH5DXX	5 Ele 10-20m	£419.00	£6.70
TH7DXX	7 Ele 10-20m	£545.00	£8.75
TB3	3 Ele 10-20 Jaybeam	£189.75	£5.90
HQ1	Mini Quad 10-20	£169.00	£4.00
G4MH	Mini Beam 1-20	£88.50	£4.50
TA33JNR	3 Ele 10-20 Moseley	£177.10	£6.00
Mustang 2	2 Ele 10-20 Moseley	£177.10	£6.90
Mustang 3	3 Ele 10-20 Moseley	£220.80	£6.90
GQ2E	2 Ele 10-20 Quad	£279.00	£5.40
GQ3E	3 Ele 10-20 Quad	£439.00	£9.20
GQ4E	4 Ele 10-20 Quad	£605.00	£10.00
Hyquad	2 Ele 10-15M dipole 20M	£339.00	£6.00
LP1007	Log Periodic 13-20 MHz	£2065.00	DIST
3Y1015D20	3 Ele 10/15M Dipole 20M	£179.00	£5.95
DB10/15A	3 Ele 10-15m	£209.00	£4.80

TB3

MONO BAND BEAMS			
103BA	3 Ele Yagi 10m	£75.00	£3.50
105BA	5 Ele Yagi 10m	£159.00	£3.95
153BA	3 Eli Yagi 15m	£105.00	£3.50
155BA	5 Ele Yagi 15m	£239.00	£5.90
203BA	3 Ele Yagi 20m	£189.00	£4.90
204BA	4 Ele Yagi 20m	£299.00	£7.30
205BA	5 Ele Yagi 20m	£399.00	£9.40
402BA	2 Ele Yagi 40m	£259.00	£6.50
18TD	Dipole Tape 10-80m		

HF5V

HF5R

VERTICALS			
12AVQ	Vertical 10-20m	£54.00	£2.75
14AVQ	Vertical 10-40m	£73.00	£2.75
18AVT/WB	Vertical 10-80m	£119.00	£2.75
18V	Vertical 10-80m taped	£38.50	£2.75
C4	Vertical 10-20m	£59.00	£2.65
SMCHF5V	Vertical 10-80m	£65.00	£2.65
SMCHF5R	Radial Kit for above	£39.85	£2.65
TRAP DIPOLE			
SMCTD/HP	High Power 10-80m	£47.50	£2.65
SMC TD/P	Portable inc coax	£67.50	£2.65
MOBILE			
Tribander	10-20m Slide sw.	£29.33	£1.65
Multimobile	10-20m	£33.92	£1.85
Flexiwhip	10m only	£19.21	£1.85
Extra coils	For above to 160m	£7.25	£1.00
Flexiten	2, 10, 12, 17, 15, 20, 30, 40, 80M	£52.33	£2.35
Bases	For above	£6.90	£1.00

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

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RADIO SOCIETY OF GREAT BRITAIN

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.

Headquarters and registered office: **Alma House, Cranborne Road, Potters Bar, Herts EN6 3JW**
Telephone (Dialling code 77 from London, 0707 from outside London) 59015. Telex 25280 (RSGBHQ G)
Secretary and general manager: D. A. Evans, G3OUF

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Corporate member: UK and overseas *(Radio Communication* by surface mail): **£16.50 UK associate member under 18: £6.20 Family member: £6.60**
UK students over 18 and under 25: £9.30 (Applications should give applicant's age at last renewal date and include evidence of student status)
Affiliated club or society/registered group (UK): £16.50 (including *Radio Communication*); **£9.90** (excluding *Radio Communication*)
(Subscriptions include VAT)

RSGB QSL BUREAU

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 was published in January issue of *Radio Communication*, and amendments will be published under "Amateur Radio News".

RSGB NEWS SERVICES

Headline News
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 July 1984 *RSGB News Bulletin*.

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

PACKET RADIO

Packet radio is a special form of radio teletype. It gets its name from the way in which information is sent in short "packets" of data, typically the length of a line of text. However, it differs from conventional radio teletype in a number of ways. First, each information packet is sent at high speed (typically 1,200 bauds) so that its transmission time is about half-a-second, compared with the tens of seconds that it might take for a slow typist to send the same information directly at 45 or 50 bauds. Thus, because a packet radio transmitter is on only while the packet is being sent, each transmitting channel can, in principle, be shared by perhaps dozens of stations at a time.

A second feature is that packet radio, like Amtor, is essentially an error-free means of communication: only when the receiving station has automatically acknowledged the reception of an error-free packet via its associated transmitter does the sending station transmit the next information packet.

A third feature is that it is possible to think of reliable extended coverage by this means. Such a system could develop from direct amateur-to-amateur links to communication via a relatively simple packet radio repeater in which messages may be stored until asked for by the amateur for whom they were intended. There is no reason, in theory why these repeaters should not be linked to give a nationwide coverage or, indeed, why individual amateur stations should not act as the relay, although both would require changes to the present UK licence.

There is also no reason why this type of communication should not be made international; for example, by amateurs connecting directly into the network in another country, or perhaps indirectly via their own national networks linked via hf or satellites. AMSAT is already developing a special packet radio satellite, "PACSAT", which is tentatively scheduled for launch in August 1986, which will do just that.

Packet radio would clearly represent a new area of amateur radio, although it was invented some 20 years ago, actually in the UK. It obviously differs from what many would regard as "traditional" amateur radio: its application would involve significant changes to our licensing conditions—such as permitting repeaters to talk to repeaters, and amateurs to handle third-party (albeit amateur third-party) messages—and there would inevitably be problems in finding additional frequencies for repeaters. Before making any decisions, there is a large number of problems to be debated and solved; some of these have already been highlighted by a recently commissioned working party of the Society's Technical & Publications Committee.

To date, the American national society, ARRL, has taken the lead on packet radio. However, on an international scale, there are clearly major decisions to be made about the development of the technique, especially with respect to standards. Surely this is a case where the International Amateur Radio Union, if it is to be worthy of its name, should be taking the initiative?

It seems that, hitherto, IARU has generally failed to provide leadership in technical matters—packet radio could be a major success in this direction. To make things easy, the ARRL HQ also houses the IARU international secretariat.

David Evans, G3OUF

Amateur Radio News

Telecommunications Act update

The provisions relating to wireless telegraphy in the Telecommunications Act 1984, which received the Royal Assent on 12 April, came into force on 16 July. These provisions are in Part 6 and Schedule 3 of the Act, and they include the following:

—powers for the police or persons authorized by the Secretary of State (i.e. members of the Radio Interference Service, which will become known as the Radio Investigation Service) to seize apparatus or other things used in connection with alleged offences for the purpose of legal proceedings;
—power for courts to order the forfeiture of certain apparatus without initiating criminal proceedings;
—a limited power of arrest without warrant for the police in cases involving the illegal use of radio transmitters where a question of identity arises.
—power for the Secretary of State to restrict the sale and possession of specified wireless telegraphy equipment and related apparatus.
—powers for the Secretary of State to carry out approval of equipment and to require marking of apparatus, and the provision of specified information in advertisements.

Part 6 of the Telecommunications Act 1984 is essentially concerned with the amendment and enforcement of the Wireless Telegraphy Acts. A summary of the sections which are relevant to amateur radio is given below.

Section 75 and **Schedule 3** update the penalty provisions for wireless telegraphy offences contained in Section 14 of the Wireless Telegraphy Act 1949 in order to take account of changes introduced by the Criminal Justice Act 1982. The only increased penalties are for the two most serious offences under Section 14 of the 1949 Act—these are sending false or misleading messages likely to prejudice the efficiency of the emergency services and causing deliberate interference to radio. Both of these offences are only triable summarily at present, but they are also made triable on indictment as well by Section 75. Summary penalties are increased to a maximum of six months' imprisonment, or a fine not exceeding the statutory maximum, or both. The penalties for conviction on indictment are set at a maximum of two years' imprisonment, or an unlimited fine, or both.

Section 76 creates a new police power of arrest without warrant for certain offences involving the installation or use of a radio transmitter where a constable cannot obtain the suspected offender's name and address, or where there are grounds for doubting that it is his/her real name and address, or where it is doubted that the person concerned will remain at the address given long enough for a summons to be served.

Section 77 substitutes a new section for Section 7 of the Wireless Telegraphy Act 1967. It extends the Secretary of State's existing powers to restrict the manufacture and importation of specified wireless telegraphy equipment to include the sale, advertising and possession of such equipment and also of apparatus designed or adapted for use in connection with wireless telegraphy apparatus.

Section 78 inserts a new section, 12A, into the 1949 Act which empowers the Secretary of State to make regulations imposing requirements on wireless telegraphy and related apparatus with respect to their ability to resist interference by rejecting unwanted signals. Sale of non-complying equipment will be an offence.

Section 79 extends the potential scope for search warrants issued under Section 15 (i) of the 1949 Act to include powers to seize for the purpose of legal proceedings any radio apparatus or other things which appear to have been used in connection with, or to be evidence of the commission of, certain wireless telegraphy offences involving the installation or use of radio transmitters or contravention of the new Section 7 of the 1967 Act in respect of any apparatus. The Section also provides for seizure of apparatus by a constable or person authorized by the Secretary of State without a warrant in similar circumstances.

Section 80 (which does not apply to Scotland) provides for a new procedure whereby magistrates' courts can be asked to order forfeiture of apparatus which has been lawfully seized and of which the possession is restricted by an order made under the new Section 7 of the 1967 Act. Before an order of forfeiture is made, any person having an interest in the seized apparatus will be able to appear before the court to show cause why it should not be forfeited. This section also provides for a right of appeal to the Crown Court. **Section 81** makes similar provisions for Scotland.

Section 82 consolidates and amends the provisions in both Wireless Telegraphy Acts relating to forfeiture of apparatus used in the commission of certain offences under the Acts. In particular, the section provides that where a person is convicted of an offence under the new Section 7 of the 1967 Act involving apparatus of which the possession is restricted, the court must order forfeiture of the apparatus unless cause to the contrary can be shown.

Section 85 gives the Secretary of State the power by Order to require apparatus to be marked with, or to be accompanied by, information or instructions relating to the apparatus or its installation or use. It also confers power to regulate or prohibit the supply of unmarked apparatus. Sale of apparatus in contravention of an Order would be a summary offence.

Section 86 empowers the Secretary of State to make Orders relating to the information to be conveyed by advertisements (including catalogues, circulars and price lists) for wireless telegraphy and related apparatus. The intention is that advertisements show in a clear and unambiguous manner whether the equipment to which they relate is approved for use in the UK—eg whether it complies with relevant regulations on interference. Contravention of the Order would be a summary offence.

Finally, **Section 90** authorizes the payment, out of money provided by Parliament, of any expenses incurred by the Secretary of State in providing a radio interference service. The definition of this service is included in this section.

CB operators killed

Two cb operators were electrocuted on 24 June 1984 while apparently erecting a mast for a portable antenna. According to newspaper reports the 30ft mast being erected at Hangman's Hill near Hungerford, Berkshire, contacted overhead power cables. Three other people present at the scene were treated for shock.

Several newspaper reports referred to "radio hams" being involved, and this caused some anxiety among the amateur community. Many telephone calls were received at RSGB headquarters enquiring as to the circumstances of the case, and it is to be regretted that despite the Society's best efforts the media persist in identifying almost every private individual using radio in a social connection as a "radio ham". This is precisely the point made in various replies to letters published in "Members' Mailbag", and which is often overlooked by writers and magazine columnists.

Quite apart from the semantic aspects of this sad incident, it is worth highlighting once again the obvious dangers of erecting any form of antenna near power lines—or, for that matter, any other overhead cables. A commonly-applied safety factor used in industry is "5kV/ft": in other words, a conducting structure of any kind should, as a bare minimum, be kept in excess of 2ft from an 11kV line. Since the voltage of overhead power lines will rarely, if ever, be known by visitors to an outdoor site, it would seem wise to aim to keep antennas as far away as practicable from them. Some overhead lines forming the "supergrid" system in the UK carry 400kV, and 275kV lines are also quite common. A spokesman for the Central Electricity Generating Board said that cases of electrocution from inadvertent contact with overhead power lines have become more common in recent years, and some area boards are apparently considering ways of educating cb users in the possible dangers of erecting illicit portable antennas near power lines.

Members may be interested to know that the "safety working limits" for flashover have been recently re-defined by the CEGB and area boards, and they are now as follows: 10ft for 400kV, 8ft for 275kV, 5ft for 132kV, 3·5ft for 66kV and 3ft for 33kV. Personnel are not permitted to work closer than these distances to "live lines". It should be stressed that these distances relate to flashover and they do **not** mean that an antenna can be safely mounted at the quoted distances from power lines. The dangers involved in the erection of an antenna, and also the possibility—however apparently remote—of its falling on to a live power line, must always be carefully considered before any form of operation in the vicinity of overhead cables.

As we went to press, it was understood that in a similar incident some days later, two men from an ILR radio station in the West Country were electrocuted when they erected a mast on a hill in connection with an outside broadcast link.

Safety at home

A recent report from the Consumer Safety Unit of the Department of Trade & Industry has given details of fatal accidents directly and indirectly involving electrical equipment in and around the home in the UK between 1977 and 1980. Taken overall, there has been a steady average number of deaths from electrocution of about 35 per annum, but there has been a steady fall in what the report refers to as "non-electrocution deaths involving electrical equipment". Twenty three per cent of cases were attributed to "falls and errors of judgment"; misuse and abuse of appliances were responsible for 26 per cent and do-it-yourself work accounted for another 23 per cent. In only nine per cent of cases was age given as a factor.

Leaving aside the more morbid details, some interesting technical points were made in the report. The total number of accidents attributed, at least in part, to inadequate earth continuity was given as 14

Election of regional representatives for the period July 1984–June 1987

The results of the elections held in Regions 1, 9, 16 and 20 are as follows:

	Votes
Region 1	
B. Donn G3XSN	50 (elected)
J. R. Fogg, G8UZZ	34
Invalid votes	4
Region 9	
A. H. Hammett, G3VWK	21
R. W. Jones, G3YMK	39 (elected)
Invalid votes	2
Region 16	
I. T. Coleman, G4GBT	48
T. D. Howe, G3PLF	37
M. J. Musgrave, G4NVT	41
A. Owen, G4HMF	150 (elected)
L. V. G. Turner, G4CUT	25
Invalid votes	7
Region 20	
B. L. Goddard, G4FRG	22
N. F. O'Brien, G3LP	56 (elected)

No invalid votes were received

The following appointments have also been made:
Region 3. G. Ross, G8MWR.
Region 13. A. Givens, GM3YOR.
Region 19. R. J. C. Broadbent, G3AAJ.

Mr P. Barker, G4HPS, is unable to take up the position of representative for Region 18, and an election will therefore be necessary to fill the vacancy.

Any five corporate members resident in Region 18 (Cleveland, Durham, Northumberland, Tyne & Wear) may nominate any other qualified corporate member resident in Region 18 to the office of Region 18 representative. Each nominator may not nominate more than one person to fill the vacancy.

All nominations must be made in writing and be delivered, together with the written consent of the nominee to accept office if elected, to: Mr D. A. Evans, Secretary/General Manager, RSGB, Alma House, Cranborne Road, Potters Bar, Herts EN6 3JW, on or before Monday 8 October 1984.

In the event of more than one person being nominated, a ballot will be held, details of which will be published in the December 1984 issue of *Radio Communication*.

per cent of the number of accidents. The DTI feels that "Although . . . the incidence was relatively low, it is felt that this figure could have been significantly reduced if there had been a greater awareness on the part of users of the dangers arising from inadequate earth continuity, and if this awareness had in turn led to better installation and maintenance of all forms of wiring and appliances." The report continues:

"Current safety legislation and practice require adequate conductor insulation and parts likely to become live, such as the housings and exposed metal components of domestic equipment, to be earthed. Earthing, however, cannot be effective if wiring is incorrect, or if, for example, the earth conductor is discontinuous. This can occur in an installation, a faulty or poorly-wired plug, socket of adapter, an appliance flex or, as is commonly the case, an extension lead. Such faults . . . can all lead to exposed parts of an appliance becoming live."

Another interesting section of the report mentions the residual current-operated circuit breaker (rccb)—sometimes also referred to as an elcb, standing for earth leakage circuit breaker. The report says:

"An rccb relies on the principle that in a fault-free system there are no leakages to earth and all the current leaving the rccb through one live conductor returns to it by the other. In the event of a leakage to earth, some of the current bypasses the neutral conductor and returns to the supply source through any earth continuity which may be present. An rccb used for protection against electric shock is set so that any leakage, known as a residual current, exceeding some 30mA, will cause the circuit to trip within a few milliseconds, sufficiently quickly to prevent a shock. Although the case for using these devices more widely is a good one, there are some drawbacks involved in their use:

(*a*) If used to protect a complete household, there is a possibility that a small leakage in the permanent wiring or in a large household appliance such as a cooker or an immersion heater (which is not likely to cause any danger) might cause a house to be unexpectedly plunged into darkness. Loss of lighting might prove particularly dangerous if an earth leakage fault was caused by a fire, from which occupants were attempting to escape. In practice, as a result of these problems, rccbs installed at the main fuse box to prevent excessive residual currents are not usually sufficiently sensitive to give any protection against electric shock, although they may give some warning of the presence of a faulty appliance.

(*b*) Some devices have been known to become slow if left unoperated for long periods, as is likely to be the case for a single central unit.

(*c*) The devices are fairly expensive and it is unlikely that users will wish to go to the length of permanently equipping all critical sub-circuits with sensitive rccbs.

(*d*) A user may become careless about the danger of electric shock because he believes he is protected by an rccb. It could be a mistake to depend for protection on an rccb or its correct operation. In addition to the possibility of error or failure, situations can exist, usually inside electrical equipment following an isolating transformer, where high-voltage circuits exist from which leakage to earth will not cause an rccb to operate.

"In spite of these difficulties it is considered that the more general use of rccbs would be beneficial, particularly in the light of the number of electrocution accidents and their distribution, in conjunction with caravans, power tools and garden equipment. It should be noted that for garden equipment and caravans, it is already a requirement of the Institution of Electrical Engineers' Wiring Regulations that socket outlets be protected by an rccb having a rated residual operating current not exceeding 30mA."

It would seem that a 30mA rccb in the main feed to the shack would be a wise precaution, especially for the avid homebrewer!

Packet radio

An informal meeting took place on Saturday 7 July, under the auspices of the Society's Technical & Publications Committee, to discuss packet radio. This is the subject of a good deal of experimentation in the USA, and some amateurs in the UK have already begun experiments with the system. Packet radio is a digital system wherein very short bursts of data are sent from one station to another. Each data burst contains the callsign of the originating station, the callsign of the station for whom the message is intended, other check digits and control codes and, of course, the message itself. An amateur version of the professional protocol known as "X25" is used, not surprisingly dubbed AX25 (ie Amateur X25), in conjunction with standard Bell 202 or CCITT V21 or 23 tone shifts. Packet radio could be regarded as a relation of the Amtor type of rtty operation, and possesses certain error-correcting properties; it is, however, less suitable for hf operation because of the error rates expected over typical hf paths. Packet repeaters are already operational in the USA, and packet satellites with "store-and-forward" modes of operation are being envisaged. In principle it would be possible for a modestly-sited vhf/uhf operator in London to communicate with the other side of the world quite easily via linked repeaters, satellites and, possibly, hf links.

There are many implications, both for amateur radio itself and for such matters as licensing. The Society is currently considering packet radio in some depth, and further information will be published in future issues of *Radio Communication*.

AN OPEN MEETING FOR RSGB MEMBERS IN REGION 20

will be held in the

Lecture Theatre,
Queens Building,
University of Bristol,
University Walk,
Clifton, Bristol

on Saturday, 13 October, 1984

commencing at 2.30pm

The RSGB President, members of the Membership & Representation Committee, and other Society officials will be present.

Your questions on amateur radio and the RSGB will be welcomed.

Raised in the House

On 29 June 1984 Mr Wood, the MP for Stevenage, asked the Secretary of State for Trade & Industry what progress had been made in the discussions between officials, British Telecom and the trade unions concerning the details of the transfer of the Radio Interference Service from British Telecom to his department. In reply Mr Kenneth Baker said that he was pleased to announce that discussions had reached an advanced stage and that proposals concerning terms of employment had been put to the staff. To ensure a smooth transition and to maintain an effective service, arrangements were being made for those staff who wished to continue to pursue a career within British Telecom to continue working in the radio interference service for a short period following the transfer. The Government had also decided that, following the transfer, the service would become the Radio Investigation Service.

Shuttle news

NASA astronaut Tony England, W0ORE, will be guest speaker at the Welsh Amateur Radio Convention on 30 September 1984; admission to his lecture will be by ticket only (see panel on the next page). It is hoped that he will visit RSGB headquarters on the following day. Tony England is scheduled to fly on Mission 51F, due for lift-off in March 1985; operating details have yet to be finalised.

Dr Owen Garriott, W5LFL, is due to be a member of the crew for Mission 51H which

WELSH AMATEUR RADIO CONVENTION

Oakdale Community College, Blackwood, Gwent

10am–5.30pm, 30 September 1984

Trade exhibits : Convention station : RSGB stand : Bring-and-buy stand : Raffle Refreshments

GUEST SPEAKER

Dr Anthony W. England, PhD, W0ORE

(Mission specialist on space shuttle flight 51F)

Admission to Dr England's illustrated talk will be by ticket only purchased in advance—see *Radio Communication* August. This ticket will permit admission to talk only.

PLUS

Tape-slide presentation on county hunting
ARRL video film of Dr Owen Garriott's (W5LFL) space shuttle flight
ARRL film *Ham's Wide World*

Talk-in from 9am on S22. Take exit 27 off M4

Admission £1, at door

Full information from: B. Davies, GW3KYA, 16 Vancouver Drive, Penmain, Blackwood, Gwent NP2 0UQ. Tel 0495 225825

is scheduled for launch in November 1985; the payload for this flight will be "Earth Observation Mission 1", which is mainly a re-flight of the nine Spacelab 1 experiments, and the mission is expected to use a new orbital vehicle named *Atlantis*. A new addition to NASA's team of astronauts is Dr Ron Parise, WA4SIR, who has said that he hopes to take part in amateur radio operations from space.

Still in space, the orbiting infra-red telescope IRAS has now observed more than 20,000 galaxies, and has also identified some 40 stars which may well be orbited by planets. The Society has a small link with IRAS, insofar as a director of the ARRL is involved with the project, and RSGB headquarters staff visited the ground receiving site near Oxford two years ago.

Jamboree-on-the-Air

Jamboree-on-the-Air this year falls on the weekend of 20/21 October. Over 400 applications for special event callsigns were received last year, and the Society expects to receive at least that amount for the 1984 event. A number of applications and requests for information have, in fact, already been received.

The closing date for receipt of completed application forms is Monday 24 September. **No** applications can be considered after that date, and applications **must** be made on the correct form which is available from the membership services department at RSGB headquarters. It is advisable to apply as early as possible in order to be issued with the callsign of your choice. Please do not forget that a special event callsign is issued for use at one specified location only, and that the station may **not** be operated from any other location. Simultaneous operation on all bands for which the licence is valid is permitted, which means that the callsign may be used on hf and vhf bands at the same time—it is not always necessary to hold both a Class A and a Class B callsign.

As in previous years, lists of JOTA stations will be obtainable, and they will be available this year after Monday 1 October. A stamped and self-addressed envelope marked "JOTA LIST" and sent to the membership services department is required.

RSGB at the rallies

For many years now the Society has attended mobile rallies organized by affiliated clubs and societies. Attendance takes the form of a display stand and RSGB bookstall, and one member of headquarters staff is usually available. The intention is both to make publications available to members and others without the necessity of paying postage, and also to receive comments and feedback from local areas and to answer any queries or solve any problems which members may have "on the spot". Contrary to the apparent belief of some clubs and groups, the Society makes no charge for attendance.

Many clubs, groups and societies have taken advantage of the RSGB's offer to attend their events during 1984, and have supplied stand space free of charge; the Society's stands have been well received by visitors and have proved to be an attraction in themselves. Membership services staff and local volunteer officers of the Society have been pleased to discuss members' problems and to give help and advice.

Any member organizing a rally in 1985 who would like the Society to attend is invited to write to David Gough, G6EFQ, membership services officer, at RSGB headquarters, for an application form, which should be returned not later than 30 September 1984. The Society will make every effort to attend, although obviously it cannot be present at every event in the British Isles, and it may be necessary to compromise in some cases by attending a rally or other event which is at least reasonably close to a given area. The Society will usually offer raffle prizes to clubs giving stand space at events in 1985 and, as was the case in 1984, publicity will be given in *Radio Communication* and elsewhere.

Check your rally date with RSGB HQ

It is worth noting that the Society keeps records on its computer database of all events taking place, and it is advisable to check with headquarters before deciding on the date of a rally so as to avoid a potential clash of dates in a particular part of the country. The "Diary of events" already has details of a number of events taking place in 1985, and rally organizers who have decided on dates are asked to communicate them to the Society as soon as possible so that they can be included. The data is used by many traders to obtain the dates and location of rallies.

If an affiliated club chooses not to invite the Society to attend a particular event, it may obtain books on a sale-or-return basis for sale at the event, but the club will be responsible for the transport costs of the order. Please note that it is not legitimate to advertise an "RSGB bookstall" at an event if the bookstall is not being run by the RSGB!

Trapped dipole—W3DZZ or G8KW?

A mild controversy concerning the inventor of the "trap" or "trapped" dipole has arisen as a result of references in *Radio Communication* to the "W3DZZ" trap dipole. Mr R. G. Shears, G8KW, the managing director of KW Communications Ltd, has written to the Society pointing out that a similar antenna known as the "G8KW multiband trapped dipole", developed by himself, was the subject of a provisional patent application in July 1957. The development of this type of antenna was commenced by Mr Shears in 1942/4 during the course of duty with the Royal Signals. He says:

"To my certain knowledge at that time, the use of traps in aerials was quite unique . . . a pair of traps was used in a dipole design for 'day and night' frequencies, eg 3 and 7MHz".

"After serving abroad until 1950, further development of trapped dipole aerials was undertaken at my QTH near Dartford, Kent, and by 1954 the multiband trap dipole for 10, 15, 20, 40 and 80m, as we know it today, was being used with excellent results. In 1956, KW Electronics Ltd was formed, and a year later the company entered the amateur radio market. One of the products was to be the unique multiband trap dipole, and an application for a patent was made. Since then many thousands of aerials and kits have been sold covering the "G8KW multiband trap dipole" design and commercial 2, 3 and 4-frequency trapped dipoles. Literature and dimensions were freely available from the company, including polar diagrams. The latter is something that most published articles have not mentioned.

"Although many references have been made to the G8KW trap dipole in *Radio Communication*, it is apparent that the writers of a number of articles on (the subject) have used the ARRL *Antenna Handbook* as a reference and this mentions only the W3DZZ design or variations thereof."

It would appear that radio amateurs over

the years should have been referring to the "G8KW trap dipole" instead of the "W3DZZ trap dipole". If this is indeed the case, the Society is pleased to make the correction as a tribute to one who has achieved a great deal for amateur radio for many years and whose products are world famous.

Raynet zonal representation

It is now three years since the setting up of the Raynet zonal representation scheme and, as a result, those representatives who were appointed in January 1982 are now coming to the end of their term of office. Consequently, Raynet members now have an opportunity to consider whom they wish to represent them for the three-year period commencing January 1985

The representatives in zones 5 and 10, comprising Greater London, Cheshire, Merseyside, Greater Manchester, Lancashire and Cumbria, were elected during 1984, and members in these zones should disregard this notice. Members of Raynet who are resident in zones 1, 2, 3, 4, 6, 7, 8, 9, 11 or 12, may forward nominations for the post to the RSGB Secretary (Raynet), RSGB HQ. Nominations should be supported by five registered members who are resident within the respective zone, and they must be received no later than 31 October 1984.

They should be accompanied by a declaration that the nominee is a registered Raynet member, a member of RSGB, and is willing to serve. The period of appointment is normally three years. Retiring representatives are eligible for re-election.

Where more than one valid nomination is received by the due date, an election will be held during the month of December 1984, and members will be notified of the arrangements as soon as possible.

QSL Bureau news

The QSL Bureau will be closed from 8 to 23 September while the manager, G3DRN, is on holiday. He asks members not to send QSL cards to him to arrive during that period.

The sub-manager for callsign series G3LAA-NZZ is now Mr J. G. Holland, G3GHS, "Tanglewood", off Portheast Way, Gorran Haven, Cornwall PL26 6JA.

Amateur fined

Mr Paul Thomas Russell, previously licensed as G4BWQ, was fined £100 with £50 costs in Brighton Magistrates' Court on 21 June 1984 for failing to keep a proper log as required by the terms of the licence, failing to notify a change of address to the licensing authority, and two offences of failing to use a proper callsign.

GB2RS frequencies

There have been some instances recently of stations operating on frequencies in the 144MHz band that are used for the Sunday morning GB2RS broadcasts and refusing to move when politely asked to QSY before the beginning of a broadcast. While accepting that no one user has specific rights to any frequency, the GB2RS news broadcast service is well established and widely listened to by a large number of licensed radio amateurs and short-wave listeners who rely on it for the most-up-to-date amateur radio news, and it would be greatly appreciated if 144·250 and 145·550MHz (channel S22) could be kept clear for the duration of the broadcasts. The July issue of the *RSGB News Bulletin* carried the latest GB2RS schedule.

QRP CONVENTION

(Organized by the Yeovil ARC)

Preston School (Preston Centre), Monks Dale, Yeovil

(Arrive via Preston Road and Larkhill Road)
(Talk-in on S22 using G8YEO/A)

Sunday, 14 October 1984

Admission: 50p, including free programme with lucky-draw number

PROGRAMME

0930 Convention opens
1000 "Ionospheric propagation of low-power signals"—G3MYM
1100 "Antenna design for low-power operation"—G3GC
1200 Lunch break
1400 "A very-low-power transmitter"—G3MYM
1500 "Low power propagation at vhf"—G3GC
1600 Discussion on low power topics; chairman G4WMV
1700 Convention ends

The YARC stations G3CMH and G8YEO will be on the air
Light refreshments will be available before and after the event and during the lunch break
Further information from G3GC, QTHR, tel 0935 75533

In-car rfi

Following on from an item in *Radio Communication* June 1984 concerning interference to microprocessors used in automotive applications, a member has informed the Society that a problem may exist with the British Leyland "Maestro" when 144 and/or 430MHz fm is used. Apparently there was a considerable power loss during medium-speed accelerating manoeuvres when transmissions were taking place, and it is understood that British Leyland recommended the replacement of a microprocessor used in conjunction with the metering of the fuel supply. The Society has asked British Leyland for their comments and is awaiting a reply.

Amateur at professional workshop

Mr Ray Flavell, G3LTP, chairman of the Society's Propagation Studies Committee, is presenting a paper entitled "Practical aids to long-term studies of events linked to the solar rotation period" at a Forecasting Workshop taking place at the Meudon Observatory later this year. The paper is a spin-off from his work on solar rotation base maps, which are available to members from the membership services department at RSGB headquarters on receipt of an sae.

RSGB goes Prestel

The Society is now on Prestel/Micronet and our mailbox number is "070759015". The mailbox is currently emptied once per week.

More amateurs in Taiwan

The Taiwanese Ministry of Communications has agreed to make amateur radio licences available to Taiwanese citizens. An officer of the Ministry of Communications has said that amateur radio is an international activity and that it is desirable that Taiwanese citizens be given access to it.

Licences will be issued by the Ministry of Communications to those passing technical examinations. Communication with any domestic or overseas amateurs will be permitted.

National Wireless Museum news

At a meeting held on 4 July 1984, it was decided that the National Wireless Museum, which is currently housed at Arreton Manor on the Isle of Wight, will in future be known as the National Wireless & Communication Museum. The meeting also decided that the museum should apply for charitable status. Trustees appointed at the meeting were Dr Graham Winbolt, Mr Bruce Jenkins (managing director, Victory Radio), or Tony Howarth (Director of Portsmouth City Museums) and Mr Douglas Byrne, G3KPO (curator). A new organizing committee was also elected.

The museum exhibition on the Isle of Wight is open to the public on weekdays from 10am to 6pm, and on Sundays from 2pm to 6pm. GB3WM is also active on the 3·5 and 7MHz bands.

Stolen equipment

Icom IC22A and Pye speaker, together with the official licence document for G4AXS, and a number of blank QSL cards for G4AXS. Any information to G4AXS, QTHR.

Nasty capacitors

A recent Airworthiness Notice from the Civil Aviation Authority has drawn attention to continuing problems with silver-tantalum capacitors. To quote from the notice: "There exists well-documented

RMG OPEN MEETING

The Repeater Management Group

will hold an open meeting at the

Crest Hotel, Ferriby High Road, North Ferriby, Hull

commencing at

1.30pm, 6 October 1984

Talk-in on GB3HS (R2) and on S22

A buffet at an approximate cost of £3 per head will be available

Further details from G4AFJ, QTHR

evidence that non-solid electrolyte silver-tantalum capacitors can, with age or under adverse electrical operating conditions, suffer from active failure modes which can involve explosion, electrical short-circuit or electrolyte seepage. Because the electrolyte in such capacitors is highly corrosive, consequential damage to equipment is usually caused, and a hazard to personnel may also exist . . . the use of capacitor types produced to BS9000 of CECC specifications is desirable."

This may seem rather remote from amateur radio, but some surplus or "flea-market" equipment may possibly contain capacitors of this type. The common "tantalum bead" type of capacitor uses a solid construction, as opposed to the "gelled" construction of the silver-tantalum variety, and the CAA's comments do not apply to these components. However, it is worth noting that solid tantalum capacitors are polarized and often quickly fail short-circuit if reverse voltage is applied to them.

Sidebands

Two callsigns often heard on the vhf and uhf bands seem to have attracted pirates. The Parallel Lines Contest Group, G4LIP, has received a number of QSL cards for alleged contacts on 14MHz with a gentleman calling himself Chris, but the Parallel Lines Contest Group has never been, and has no intention of being, active on any band below 30MHz! Also G4FRX, a member of RSGB headquarters staff who currently chases dx exclusively on 144 and 430MHz cw and ssb, has received cards for supposed "GI4FRX" operations on 7MHz cw by courtesy of someone calling himself James. Please ignore pirate hf versions of both callsigns.

Messrs R. L. Drake have acquired an extra 45,000ft² of new manufacturing space at its Miamisburg, Ohio, location. Alas for Drake *aficionados*, we understand that the new facility is intended for production of the ESR240 satellite receiver. Drake is now reported to be one of the world's largest producers of satellite television receiving equipment for the consumer market.

According to the communist youth newspaper *Komsomolskaya Pravda*, a Soviet amateur radio enthusiast who "broke into official frequencies" was gaoled for six years by a Russian court on 13 June 1984. Can there be a new Telecommunicationski Act in the USSR?

50 YEARS OF AMATEUR RADIO

As is the Society's normal practice, a special gilt RSGB lapel badge was recently presented to Mr George Neale, G8NN, on completion of 50 years' uninterrupted membership of the Society. In reply to a letter from the secretary, Mr Neale wrote:

With the early morning post there was a small packet from the RSGB. Over the first "cuppa" of the day I tried to bring to mind what I had ordered and, finally deciding that it would be easier to open the packet, settled down to a surprise. One gets like that with advancing years!

Indeed a surprise it was. A letter from the secretary enclosing a gilt RSGB badge in recognition of 50 years' membership! Delightful and congratulatory as that may be, the real surprise was the realization that I had completed over 50 years of amateur radio: what had I achieved in all that time? How did it start anyway? I must confess that a touch of nostalgia began to creep up on me.

I suppose my first exposure to the disease occurred when I was barely three years old when, as I learned some years later, I flatly refused to go to sleep at night unless I had a pair of headphones on and my father had adjusted the cat's whisker on the crystal set. Whether I heard anything or not is not known, although about 100 yards down the road the late Harry Beckett, G5HK, transmitted a pianola recital on 400m almost every evening!

As a matter of interest to vintage radio enthusiasts, in the early 'twenties my father started a small electrical goods factoring business trading under the name of Britishers (Sheffield) Ltd. A crystal receiver soon appeared on its list, being assembled by my father and sold under the trade name "The Britisher". I still have the original agreement, signed by John Reith, whereby the British Broadcasting Company agreed to transmit programmes, and Britishers (Sheffield) paid one shilling for every set sold as a contribution towards the transmitting licence!

It was not until I was about 12 years' old, while on a family holiday with relatives living in Hampstead, that I was again introduced to the world of amateur radio by my cousin Tom Cocking, BRS404 and later 2BHT, and still active as G2CV. I continued to spend part of my annual school holidays there for a number of years, and finally succumbed after a trip to Radiolympia, where we drooled over Eddystone components and Osram valves and, at the Schoolboy's Exhibition, saw each other on the early 30-line disc television. I bought my first copy of *A Guide to Amateur Radio* at Olympia, and scoured Kilburn Road for cheap components (Lisle Street was "out of bounds" on my own!). We saw the *Graf Zeppelin* pass over north London, and I remember Tom dashing up the stairs three at a time to have a contact with it.

As one might imagine, all this charged me with enthusiasm and the desire to get my ticket. Excellent advice from Tom was: first join the RSGB, apply for an artificial aerial licence, and after a year apply for a full ticket. In 1934, at the age of 16, I became BRS1409 and soon acquired 2BGN. After about 12 months my reasons for requiring a radiating aerial were accepted by the GPO and, subject to having a morse test at Sheffield Head Post Office, a licence would be granted.

Shortly after joining the RSGB I read in the new members list in the *Bull* that a friend living a short distance from me had been allocated BRS1600: this was Ronald Strickland, later 2BCQ, and still active as G8KB. I slipped a QSL through his letter box, and we have since continued to share our hobby in many ways—including the original Low Power Field Day which, I am sure, was started largely as a result of a suggestion from G8KB. However, going back to my morse test, I was greeted by G8KB's father, who was an inspector there. He ushered me into what might be termed a telegraph room, sat me down with pencil and paper and proceeded to key a buzzer at about 30wpm. After about 2 min he said "If you haven't got all that your're no good!". As he left the room he turned round and said "Someone will be coming along soon for the test". Fortunately I was well acquainted with Mr Strickland's sense of humour and I knew he was pulling my leg, but the morse test was a piece of cake after that practice run!

When I read letters from people complaining about the state of amateur radio, my thoughts go back to pre-war days when meetings were held in a temperance hotel in Sheffield (which illustrates respect towards young members), and we would discuss the various things we were making: coils, condensers, transformers, grinding crystals and making loudspeakers! The highlight of the year was National Field Day—you didn't have to be anything special to join in. I can remember being the generator operator, switching on and off at a nod from the chief operator, and what a thrill when you were trusted to fill in the log as second operator and allowed to send "test nfd de G----" now and again, contrary to GPO regulations. NFD really was a training ground, and I shall never forget the patience, help, encouragement and friendship that existed in those early days.

I think two of my most exciting experiences were, first, a QSO with my cousin G2CV on 7MHz one Sunday morning, which I looked upon as a climax to all the help he had given to me from the very beginning. Second, my first dx contact, on 14MHz, with VK3NO, after listening for about two hours without any joy and then calling "test dx" for about 3 min. Bear in mind that the input in both cases was about 6W and the frequency was crystal controlled: no vfos then!

Some say it's not wise to reflect too much on the past, but one has to look back to try to find an answer to those letters about the state of amateur radio. The only achievements I can claim are personal satisfaction from being involved in a great science and to be able to pass an experience, be it success or failure, to other people. I cannot pretend to be responsible for any outstanding technical achievement and, like many others whose interests may lie anywhere between bench-work and band occupancy, have simply kept amateur radio alive. In the early days nothing was technically taken for granted. There was immense scope for experiment. Amateurs of that period were close enough to the beginning to class themselves as pioneers but, with the present-day rapid progress made by professional teamwork, there is little pioneering left for the amateur. I find the revival of early ideas and circuits immensely interesting, however, and believe there is still plenty of scope for the experimenter: nevertheless, each to his own. The important thing is to keep the spirit alive.

Just a word to those who write about abolishing the RAE and the morse test. There was a time when one couldn't buy equipment off the shelf, and professional tuition in radio and electronics was not easily obtainable. Passing the morse test was not a necessary evil, it was an exciting achievement, and self-teaching to the stage where one could design and build one's own equipment was proof itself of the amateur's credibility and sense of responsibility. The ease with which transmitting equipment can now be acquired necessitates some other form of proof to satisfy the international regulations.

I can't sign off without saying something about cb radio. It is my belief that people should be able to communicate with each other by any means at their disposal provided that they do not interfere with others. Mass radio communication is inevitable and I am surprised that cb didn't come upon us earlier. It is a pity that British manufacturers didn't foresee it and step in before the importation of rogue equipment. However, we have to live alongside cb (literally in some cases) and we should do all we can to foster good relations. There are a few idiots, but generally cbers are a good crowd and—let's face it—there are exceptions in the amateur fraternity! QRU.

George Neale, G8NN

RAE Courses 1984–5

(See also *Rad Com* July, p560, and August p655)

Abergavenny. Nevill Hall Hospital, Abergavenny. Classes Tuesdays, 7.30pm, commencing 11 September. Candidates may sit the exam at the hospital. Registration for the December exam will be taken in September and October. Details from D. Jones, GW3SSY, 80 Croesonen Parc, Abergavenny, Gwent NP7 6PE, tel 0873 78674.

Bakewell. Bakewell Centre, Lady Manners School, Bakewell, Derbys. Details from Further Education Organizer, Mr K. R. Johnson, at the centre.

Balham. Clapham & Battersea AEI, Balham branch, Chestnut Grove SW12. Thursdays at 7.15pm, commencing 27 September. Enrolment 17–20 September. Details from branch, tel 01-673 2613, or from course tutor Bob Crane, G4PHS, tel 01-977 4157.

Borehamwood. De Havilland College, Elstree Way, Borehamwood. Enrolment 10–11 September, 2–8pm. Classes Tuesdays, 7–9pm, commencing 18 September. Lecturer G. L. Benbow, G3HB. Details from the college.

Bradford. Bradford & Ilkley Community College. School of Science & Technology, Dept of Electrical and Electronic Engineering, Great Horton Road, Bradford. Enrolment 11 September. Details from course tutor, P. Nurse, c/o the college.

Bristol. Brunel Technical College. Monday evenings, RA theory, Tuesday evenings, RA morse. Enrolment 3–4 September. Courses commence 17–18 September. Tutor Phil Brouder, G3ZJH. Further details from Department of Aerospace & Radiocommunications Engineering, tel 0272 41241, ext 64.

Bristol. YMCA, Park Road, Kingswood, Bristol. Classes commence on 18 September at 7.30pm. Details from G8GFZ or G3ZKI.

Crawley. Ifield School, Lady Margaret Road, Crawley RH11 0DB. Monday evenings, commencing 17 September. Enrolment 10 or 12 September, 7–9pm. Course fee £40. Details from course tutor Steve Webb, G4GHO, tel Crawley (0293) 25742.

Durham. Details of classes to commence on 12 October, from G3ZJY, QTHR. tel 0385 66773. Please write as soon as possible.

Gosforth. Gosforth Secondary School, Gosforth, Newcastle upon Tyne. Classes Tuesdays, 7–9pm. Candidates may sit the RAE at the school. Details from the Principal, Gosforth Adult Association, Gosforth Secondary School, or tel Newcastle upon Tyne 668439.

Halifax. Calderdale Metropolitan Borough Council, Whitley Adult Education Centre, Holdsworth Road, Holmfield, Halifax. Classes Thursdays, commencing 20 September, 7pm. Tutor Rev H. Makin, G3FDC. Details from the college.

Heckmondwike. Heckmondwike Grammar School, Yorkshire. Classes Mondays, 7pm, commencing 17 September. Enrolment previous week. Course tutor F. Stock, G3TEE. Details from the school.

Leamington Spa. Mid-Warwickshire College of Further Education, Warwick New Road, Leamington Spa. Enrolment 6–7 September. Further details from C. Evans, tel Leamington Spa 311711, ext 258.

Manchester. North Manchester College, Abraham Moss Centre, Crescent Road, Crumpsall M8 6UF. Classes Tuesdays, 7pm, commencing 12 September. Details from Graham Jones, at the college, tel 061-740 1491, ext 203.

Manchester. North Trafford College of Further Education, Talbot Road, Stretford. Classes Monday or Thursday evenings, or Wednesday afternoons. Enrolment 10, 11 12 September. Details from lecturer J. T. Beaumont, c/o the college.

Manchester. Pendlebury High School, Cromwell Road, Swinton. Classes Mondays, 7.30pm, commencing end of September. Instructor, P. Whatmough, G4HYE. Details from G4HYE, tel 061-794 3706 or from Swinton Adult Education Centre, tel 061-794 5798.

Market Harborough. Welland Park Community College, Market Harborough, Leicestershire. Classes Wednesdays, starting in September. Tutor, Alan Faint, G4TZY. Details from Mike Lee, at the college, tel 0858 63645, or Alan Faint, tel 0858 62827.

Nottingham. Arnold & Carlton College of Further Education, Digby Avenue, Mapperley, Nottingham NG3 6DR. a) Full course Wednesdays, 7pm, commencing 19 September, for May 1985 examination. b) Crash course, Thursdays, 6.30pm, commencing 20 September, for December 1984 examination. There will also be a course commencing in January for the May examination. Enrolment 11, 12 September, 2–8pm. Details from the college.

Sandwell. Warley College of Technology, Crocketts Lane, Smethwick, Warley, Sandwell, West Midlands B66 3BU. Prospective students should contact Mr D. Wilson, at the college, tel 021-558 4121, ext 221, as soon as possible for details.

Shirley. Light Hall School, Shirley, Solihull, starting September. Practical, theory and morse. Details from tutor, Gil Cleeton, G3LBS. Tel 0564 826072.

Sleaford. St Georges School, Sleaford, Lincs. Classes Mondays, 7-9pm, commencing 24 September. Enrolment by post from 7 September onwards. Course fee £16.24. Details from Adult Education Office, Westholme, Leicester Street, Sleaford, tel 0529 305211, mornings only from 5 September.

Stevenage. Stevenage College, Monkswood Way, Stevenage. Classes commence September 1984. For further details tel Cliff Barber, G4BGP, Baldock 893736.

Stockport. Reddish Vale Evening Centre, Reddish Vale Road, Reddish, Stockport. Classes 7–9pm, starting on 24 September. Enrolment 17, 18 and 20 September, between 7 and 9pm. Details from Dave Wood, tel 061-477 3544, ext 10, between 9am and 4pm.

Surbiton. Surbiton Hill Adult Education Centre, Surbiton Hill Road. Classes Tuesdays, 7.15–9.15pm, commencing 25 September. Enrolment asap. Course fee £37.90. Details from the college, tel 01-546 2121, ext 2615/6.

Welwyn Garden City. De Havilland College, Applecroft Road, Welwyn Garden City. Enrolment 10–11 September, 2–8pm, at the college, tel 26318/31344. Classes Thursdays, 7–9pm, commencing 20 September. Details from the college.

Weston-super-Mare. Weston-super-Mare Technical College. Classes Tuesdays, 7pm, for three terms, starting 11 September in Room 613. Enrolment 3–4 September. Contact Mr Harris, G3XGY, QTHR, tel 0934 514674 for further information.

Weybridge. Brooklands Technical College, Heath Road, Weybridge. Classes Wednesdays, 6.30–8pm, commencing 19 September. Lecturer, Chris Roberts, G4EVA. No previous knowledge is assumed. Enrolment 10, 11 and 12 September, between 6pm and 8pm. For further information contact the Department of Technology, Brooklands Technical College, Heath Road, Weybridge, Surrey, tel Weybridge 53300, ext 246.

Other Courses

(See also *Rad Com* August, p655)

Abergavenny. Club Room, Pen-y-Fal Hospital. Morse classes Thursdays throughout the year. Details from D. Jones, GW3SSY, 80 Croesonen Parc, Abergavenny, Gwent NP7 6PE, tel 0873 78674.

Heckmondwike. Heckmondwike Grammar School, Yorks. Morse classes Thursdays, 7pm, commencing 20 September. Enrolment previous week. Course tutor F. Stork, G3TEE. Details from the school.

London, Chingford Community & Adult Education Centre, Friday Hill House, Simmons Lane, Chingford E4. Morse classes Mondays, 7.30pm, commencing 10 September. Enrolment on the first night. Details from tutor Tom Langley, tel Lea Valley 715168.

Manchester. North Manchester College, Abraham Moss Centre, Crescent Road, Crumpsall. Morse classes Thursdays, 7pm. Details from Graham Jones, at the college, tel 061-740 1491, ext 203.

Manchester. North Trafford College of Further Education, Talbot Road, Stretford. Morse code classes Tuesday evenings or Wednesday mornings. Enrolment 10, 11, 12 September. Details from course tutor J. T. Beaumont, at the college, tel 061-872 3731.

Manchester. Pendlebury High School, Cromwell Road, Swinton. Morse classes Tuesdays, 7.30pm. Instructor W. Stevenson, G4KKI. If there is sufficient demand Mr Stevenson may also take a construction class. Details from G4HYE, tel 061-794 3706 or from the Swinton Adult Education Centre, tel 061-794 5798.

Nottingham. Arnold & Carlton College of Further Education, Digby Avenue, Mapperley, Nottingham NG3 6DR. 1) Construction classes, eight sessions for the beginner, Tuesdays, 7pm, commencing 18 September. 2) After the RAE. Wednesdays, 7pm, commencing May 1985, for those who have just taken the RAE. 3) Introduction to amateur radio, Wednesdays, 7pm, commencing 5 June 1985. Details from the college.

Stockport. Reddish Vale Evening Centre, Reddish Vale Road. Morse classes Thursdays, 7–9pm, commencing 27 September. Enrolment 17, 18 and 20 September, 7–9pm. Details from Dave Wood, tel 061-477 3544, ext 10, between 9am and 4pm.

Special Event Stations

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

1–2 September, GB2FI
Barry College of Further Education RS will be operational on the hf, vhf and uhf bands from Flat Holm Island in the Bristol Channel. Special QSL cards will be available. WAB square ST26. Details from Glyn Jones, GW6PDG, QTHR.

9 September, GB2SMW
A station will be set up by Swindon & DARC at the Science Museum Open Day at Wroughton, Wilts. The museum has exhibits of commercial aircraft and vehicles, space rockets, railway equipment, vintage machinery, hovercraft etc. Details from Ken, G8SFM, QTHR, tel 066689 307.

15 September, GB2AB and GB4RAF
The Oxfordshire members of RAFARS will be running the stations at RAF Abingdon for the Battle of Britain "At Home" Day. Operation will be on all bands 3·5 to 28MHz, mostly ssb, according to conditions, plus 144MHz, from 9.30am to 6.30pm. Details from Eric Palmer, G3FVC, QTHR.

15 September, GB0ATC
This station will be run at 384 Squadron (Mansfield) Air Training Corps to commemorate the Battle of Britain Day. Operation will be on hf, vhf and uhf, using ssb, fm, and for a special two hours, starting at about 1pm, using cw on 3·5 and 7MHz. QSL cards should go via the bureau, or with an sae to G4TGB and G3JUY, QTHR. SWLs' cards most welcome.

16 September, GB4NSY and GB8NSY
New Scotland Yard will be using their special callsigns to mark the third anniversary of amateur radio operation from the Metropolitan Police Headquarters, London. Activity will be on 7, 14, 21, 28, 144 and 432MHz, using cw, ssb, fm, and possibly rtty. The club station is *not* open to the public but QSL cards will be available. Further information from G4NSY, QTHR.

20-21 September, GB4MDH
This station will be operated from 1000-1600h, as part of the centenary celebrations of the Manchester Dental Hospital. Operation will be on hf and vhf. A unique QSL card will be available via the bureau for all contacts and swl reports. Contacts are especially welcome from dental students, dental surgeons and ancillary dental personnel. Details from Paul Leach, G4AMZ, QTHR, tel Wilmslow 533857; or Nicholas Chandler, tel 061-273 5252, ext Conservation Dept.

23 September, GB0RAF
The station will operate at the Lincolnshire Hamfest, and will be manned by members of RAFARS. It will operate on hf only. There will be one station operating on the RAFARS net frequency, 3·710MHz, continually during the day, and a second station operating on 28, 21, 14 and 7MHz, depending on propagation. All contacts will be sent QSL cards, as will all shortwave listeners who send cards to GB0RAF. QSL information via QSL bureau to GB0RAF, or to G4NVD, via the QSL Bureau. Details from G4NVD, QTHR.

29 September, GB2MN
The station will be operated by Horndean Radio Club at the College of Nautical Studies, Warsash, Southampton, Open Day. There will be a talk-in station on 144MHz, and there will also be operation on 3·5 or 7MHz according to conditions. Details of the station and the open day from D. Hotchkiss, G4BEQ, c/o the college.

30 September-5 October, GBZMU
Manchester University ARS will operate the station during Freshers' Week. Operation will be on all bands, 1·8-432MHz, in as many modes as possible. There will also be an exhibition of society activities. Details from the society, c/o Students Union Building, Manchester University, Oxford Road, Manchester.

Other Events

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

7-9 September—WACRAL Annual Conference. London Bible College, Northwood, Middx. Details from G3AGX or G4NPM, both QTHR.

8 September—Scottish Amateur Radio Convention, organized by West of Scotland ARS, Cardonald College, Glasgow.

30 September—Welsh Amateur Radio Convention, Oakdale Community College, Blackwood, Gwent. Details from R. B. Davies, GW3KYA, QTHR.

13 October—Midlands VHF Convention. British Telecom Training School, Stone, Staffs.

13 October—Open meeting for RSGB members in Region 20. Lecture Theatre, Queens Building, University of Bristol, commencing 2.30pm.

14 October—QRP Convention, Preston School, Monks Dale, Yeovil, Soms. Details from G3GC, QTHR.

20-21 October—27th Jamboree on the Air.

8 December—RSGB AGM, IEE, Savoy Place, London.

1985
23 March—RSGB National VHF Convention, Sandown Park Racecourse.

13-14 April—RSGB National Convention, National Exhibition Centre, Birmingham.

Mobile Rallies Calendar

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

9 September—Telford Mobile Rally. Telford Shopping Centre, Telford, Shropshire. Open 11am (disabled from 10.30am). M54 now open all the way (junction 10A off the M6), or use A442 from N or S. Free admission, and parking. Town park adjacent to site for the family. Over 80 stands, plus club exhibits in fully enclosed venue. Restaurants and take-aways, plus the "Ironmaster" pub, all on site. Details from G8DIR, tel Shrewsbury 64273, G8UGL, tel Telford 584173, or G3UKV, tel Telford 55416, all QTHR.

16 September—Vange Mobile Rally. St Nicholas School, Nicholas Lane, Basildon, Essex. Open 10am to 5pm. Talk-in on 144MHz by GB4VMR. Details from G4IFD, QTHR.

16 September—Peterborough R&ES Mobile Rally. Wirrina Sports Stadium, Bishops Road, Peterborough. Open 10.30am until 5pm. Situated on the river embankment, good car parking, free on Sundays, caravans by arrangement. Food and bar meals in adjacent Gildenburgh Rooms, bar until 3pm. Details from D. T. Wilson, 4 Conway Avenue, Peterborough, tel Peterborough 76238.

22 September—Ballymena & DARC Annual Mobile Rally. Ballee High School. Open 12 noon-5pm. Talk-in on S22. Trade stands, bring & buy, RSGB bookstall, QSL Bureau, refreshments, raffle, free car parking. Further details from Jeffrey Clarke, club sec, GI4HCN, QTHR.

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.

30 September—Harlow & DARS Annual Mobile Rally. Harlow Sports Centre, Hammarskjold Road. Open 10am. Talk-in on 144MHz (S22). Ample car parking. Refreshments and licensed bar. Bring & buy and usual features. Details from G4TLU and G6STB, c/o Harlow & DARS, The Barn, First Avenue, Harlow, Essex.

7 October—Great Lumley ARES Rally. Community Centre, Great Lumley, nr Chester-le-Street, Co Durham. Open 11am. Talk-in on S22. Usual attractions including bring & buy. Further information from Ian Blackman, G4OCQ, QTHR, tel 0385 40827.

3 November—Street & DARS/Lions Club of Glastonbury and Street Rally (proceeds to charity). Crispin Hall, Street, Somerset. Open 11am-4pm. Admission 50p, under 14 years free if accompanied by an adult. Talk-in on 144MHz (S22). Details from Bill Scriven, tel Street 42277.

18 November—Carmarthen ARS Rally. The West Wales Hospital Club, The Quay, Carmarthen. Open 11am to 5pm. Admission 50p. Trade stands, bookstall, bring & buy, craft and bric-a-brac, licensed bar, full catering. Ample space for visitors. Talk-in on S22. Free car parking. Details from M. Meredith, 50 Caecoed, Llandybie, Ammanford, Dyfed, tel 0269 850803.

30 June 1985—Buxton Mobile Rally. Pavilion Gardens, Buxton. This will now be an annual event, due to the overwhelming success of the 1984 event. Details from Dave Cooper, G6MIF, QTHR, tel 0298 6174.

OBITUARIES

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

Mr S. Cook, G3RNU
Stan Cook died on 30 June. He had built and experimented with receivers in the 'twenties, joined the RSGB, passed the RAE and became licensed in 1962. At first he was very active on 1·8MHz am. phone, but more recently worked ssb on 14 and 21MHz. He enjoyed local radio events and mobile rallies. He had many friends in the Gloucester ARS.

Mr A. P. Kerford-Byrnes, G6AB
Arthur Kerford-Byrnes died on 13 June, aged 79. A keen cw operator and author of numerous constructional articles, he was well known on the lower frequency bands for his help and kindness, especially to the disabled. He was an electrical engineer by profession and joined the Royal Naval Volunteer Wireless Reserve prior to the last war, serving mainly as a communications officer on North Atlantic convoys, for which he was mentioned in Despatches. He was a member of RNARS and RAIBC.

Mr J. E. Rand, G2FOX
Jim Rand died on 1 July, aged 64. He was licensed as 2FOX before the war and he served as a radio mechanic with the RAF during it. He became licensed as G2FOX after 1945. After three years he dropped his licence due to personal pressures, and only two years ago sat the RAE and passed the morse exam to become active again on 21 and 28MHz.

Also:

Mr R. A. Crawford, G3HFV;
Mr J. N. C. Eglen, G6LFH, on 20 July 1983;
Mr C. Marks, GW6VJJ;
Mr C. R. Pendred, G8IHV, on 26 April;
Mr A. G. Smith, G8WP, in May 1983;
Mr R. G. Suckling, G6GHZ, on 30 May;
Mr C. C. Warner, RS48334, on 12 November 1983;
Mr C. Weetman, G8UWV;
Mr D. Wills, G4FOG, on 6 April; and
Mr H. R. Worrall, RS51655.

Members' Mailbag

FORMULA PROBLEMS

Sir—Reference G8UYZ's formula problems (June issue). He is quite correct that there are a number of errors associated with the third edition *VHF/UHF Manual*, transmission line impedances; pp3.5—I haven't viewed the fourth edition. The following note may help the quest for the truth.

Of interest here is that the expressions discussed are effectively low-frequency ones in which none of the high-frequency effects such as skin-effect, radiation loss etc have been taken into account. However, for amateur purposes these effects, for the most part, can be considered small, often well into the low microwave region.

First then, the expression for "wire in a rectangular trough" is correct if the hyperbolic tangent function is used. Thus the formula (5) should read:

$$Z_o \simeq 138 \log_{10}\left(\frac{4W \tan h\left(\frac{\pi h}{w}\right)}{\pi d}\right)$$

Second, the expression for "square coaxial", as Mr Coombers says, has been transposed where the number 1·178 should be a co-efficient which relates this square geometry to the more familiar circular coaxial cross-section.

Thus the formula (7) should read:

$$Z_o \simeq 138\,(1{\cdot}178) \log_{10}\left(\frac{D}{d}\right)$$

Third, there is a rather more obvious mistake for the "wire parallel to an infinite plane" which shows the relation for a "circular coaxial" cross-section.

The correct formula for (e) should be:

$$Z_o \simeq 138 \log_{10}\left(\frac{4D}{d}\right)$$

A couple of additional comments on the use of these expressions in computer programs. A lot of microcomputer interpreters do not support hyperbolic functions, but if procedure or function definitions are available one could simply set up the relation:

$$\tan h\,(X) \times \frac{\sin h}{\cos h} = \frac{e^{(X)} - e^{(-X)}}{e^{(X)} + e^{(-X)}}$$

Also, I note that Mr Coomber's computer, as many do, only provides for natural logarithms and so needs to convert the base by the division of natural log (10). This factor is, of course, a constant and it will be of interest that the numbers 138 and 276 are already adjusted coefficients to allow the original expressions, using natural logs, to be calculated using logs base 10. These very numbers themselves are not, in fact, accurate, being 138·1551 and 276·3102 respectively. These differences only induce small errors, but if in any of the published or corrected formulas these numbers are replaced by 60 and 120 respectively and the natural log functions used, the division of the calculated constant need not be done and a source of numerical error is removed.

Anthea Cobb, G4FUN

VANGUARD MEMORIES

Sir—I must disagree with G8KW in his assertion in the June issue that the Viceroy was the first amateur sideband transmitter to be commercially made using a crystal filter. I am not even sure that by the time this transmitter was produced the expression "pioneering days" could be correct. After all American manufacturers, including the well-remembered Central Electronics, were producing sideband transmitters in the early 'fifties, although in that firm's case of the phasing type. In addition, there were those pioneers of excellence the Collins Radio Company (yes, I am biased) who introduced a range of equipment utilizing their mechanical filters, ie the KWS-1, 1kW transmitter of 1955 and the KWM-1 transceiver of 1957. Now I do realise that G8KW referred to crystal filters, and the equipment mentioned did not use this method, but does he remember the Hallicrafters HT32 of 1957? This transmitter was a portent of things to come, in that it used a 5MHz crystal filter and not just the 435kHz arrangement utilized in the Viceroy. American and expensive yes, but certainly pre-dating the Viceroy by at least three years. Incidentally, I believe the exciter circuitry of the Viceroy was based on a design published in *Short Wave Magazine* sometime around the mid-fifties, but have been unable to trace the article.

I found the reference to Japanese copying amusing, as of course there is nothing new under the sun. Some of the early models from the Far East had a marked resemblance to Heathkit among others. There is an interesting similarity between the circuitry of an 1959 Collins KWM2 transceiver and that of the KW2000 of 1963. Of course, I expect this is pure coincidence, and that accounts for the identical crystal i.f. and vfo frequencies together with the similar layout and circuitry. Having owned both I could never understand why the KW just did not work as well as the Collins, but I suppose you get what you pay for.

Jonathan Butler, G4JOW

PACKET RADIO—FIRST UK TRANSMISSIONS?

Sir—What is thought to be the first packet radio QSO using AX25 protocols between two licensed UK amateurs, took place on 10 and 11 June, on 145·300MHz fm. The two stations concerned were G3VPF of Chickerell, near Weymouth, and G4VBY of Broadmayne, near Dorchester, Dorset. Several frames of information were exchanged using AX25 protocols, both stations receiving good copy once the link was established. The stations used a terminal node controller which is produced in kit form by the Tucson Amateur Packet Radio Group in the USA. Both kits were assembled and commissioned by G3VPF.

Perhaps anyone who is interested in setting up, or has already set up, a packet terminal would like to contact me (Tel 0305 853408 or QTHR) with a view to a bulk purchase of parts, thus reducing the initial cash outlay and/or an exchange of ideas. It is known that other groups are already formed, so it would be of benefit to all if the amount of interest in this fascinating mode of communication could be estimated.

A. W. Dickson-Smith, G4VBY

See also "Amateur Radio News" *and the editorial this month. Standards and protocols for amateur packet radio are still being developed, and indeed the Society has its own packet radio working group which has met to co-ordinate the many elements in this new type of activity. While our correspondent has undoubtedly been quick off the mark, we rather suspect that this was not, in fact, the first packet radio contact in the UK—any prior claims?*

RECIPROCAL LICENSING

Sir—I read with considerable interest the letter by Mr. W. Farrar, G3ESP, and the RSGB's reply, in your May issue on the subject of operating in Europe.

Many radio amateurs travel throughout the world these days, and, as I do, often carry along a 144MHz handheld fm radio. I cannot plan my foreign travel far enough in advance to include time for foreign licensing, nor can I carry along frequency counters etc, as required by some governments.

I believe that national amateur radio societies, and the IARU, should encourage their respective governments (and the ITU) to "deregulate" reciprocal licensing regulations, as was done between the USA and Canada. At the very least, consideration should be given to liberalizing amateur operations above 144MHz.

I agree these issues are very complex; however, we live in a very mobile world and we are rapidly becoming one international community. Radio regulations developed 30 to 40 years ago are the root of this problem. It is time to consider the advances of technology which have created worldwide compatibility and the need to encourage the goodwill which is created by amateur radio operations.

William J. Deegan, WA4QLZ

Mr Deegan's point is well taken. The Society continues to discuss the matter with the DTI although progress is slow because of DTI staffing levels.

WHAT'S IN A NAME?

Sir—Some 30-odd years ago I supported, very unenthusiastically, a campaign to abolish the name "Sparks". I don't know whether it was ever successful, I rather hope it wasn't. I have been called lots of worse things.

I would, however, wholeheartedly support any campaign to suppress the word "Ham". It may be all right over the air or between consenting amateurs, but when used by the media or people outside the hobby it makes me cringe. When referred to as a "Radio Ham", I am tempted to deny all knowledge of the hobby.

The tendency to confuse "Hams" with cbers and illegal broadcasters does not lessen, and is unlikely to do so as long as amateurs persist in using the expression themselves. A hobby that requires considerable technical qualification deserves more dignity.

R. M. W. Rash, G3MQU

Council and headquarters staff agree with these sentiments. Mr Rash's last paragraph encapsulates the point which the Society has made many times before and which is, as it happens, made again in the item concerning the deaths of two cb operators in this month's Amateur Radio News. *However, it is only fair to mention that one of our esteemed columnists seems to disagree with this point of view—see* Technical Topics, Rad Com *July 1984.*

THE "ALLIGATOR" PROBLEM

Sir—I heard with interest the GB2RS news broadcast on 10 June 1984 concerning Oscar 10 and the QRO men. I have complained to the G8 . . . and G4 . . ., but it has no effect at all. They say it will not affect the QRP stations on Oscar 10. They don't seem to realize that there is only a certain amount of power available in the passband which is shared according to your i/p signal on 435MHz. Possibly these stations should re-sit the RAE, as they seem to lack a basic fundamental knowledge of satellite operation.

Reg Woolley, GW8VHI

The mentality of the "alligator" is certainly baffling. All we can do is to reiterate Mr Woolley's last point: only a certain amount of power output from the satellite is available over its output passband and this has to be shared according to the number of stations active and the effective radiated power which they are using. Part and parcel of good satellite operating is to use the minimum of power consistent with making contacts, and we suspect that a good deal of the "alligator" problem is due to downlink receivers whose sensitivity is not adequate for the job.

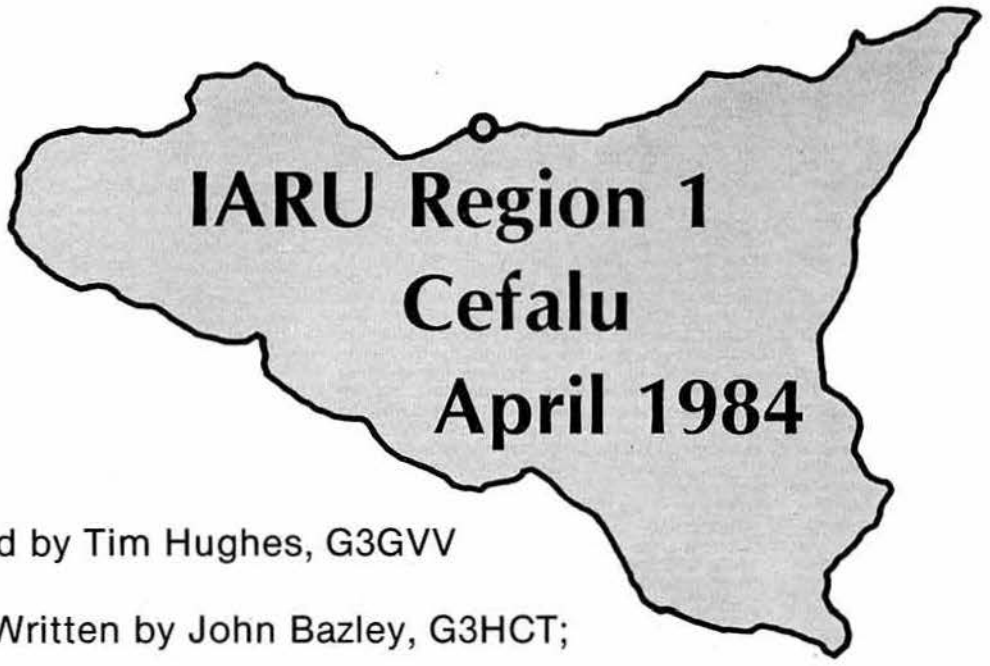
CALLSIGN ERROR

Sir—In response to recent letters in "Members' Mailbag" regarding the issue of incorrect callsigns, may I apologise to all stations whom I contacted using the callsign GM1BUD, and also to the owner of the callsign.

I have now found out, since obtaining the current *RSGB Amateur Radio Call Book*, and have had this confirmed by Chesterfield, that my correct callsign is GM1BVD. This error was due to the handwriting on the licence and I have now been speedily issued with a replacement licence. I feel compelled to state that in spite of the original error, the licence records head office at Chesterfield dealt with the matter immediately over the telephone and were most apologetic. The problem was solved and apologies given to me in 2min flat, due to at least one highly efficient person.

Colin Roberts, GM1BVD

CONFERENCE REPORT



Compiled by Tim Hughes, G3GVV

Written by John Bazley, G3HCT;

Ron Glaisher, G6LX; John Morris, GM4ANB, and G3GVV

Introduction

The Italian society, ARI, hosted the 1984 IARU Region 1 Conference at Cefalu on the north coast of Sicily. It was attended by delegates representing nearly 40 countries in the region, ie Africa, the Middle East, Europe and the USSR. Additionally, there were also present the president of IARU, Dick Baldwin, W1RU; the vice-president of IARU and president of ARRL, Larry Price, W4RA; the secretary of Region 2 (Asia and Australasia), Masayoshi Fujioka, JM1UXU; the secretary of Region 3 (North and South America), Alberto Shaio, HK3DEU; and the president of JARL, Shozo Hara, JA1AN.

Before the proceedings started, the meeting stood in silence in memory of Roy Stevens, G2BVN, secretary of Region 1 for many years. Delegates were welcomed by the chairman of Region 1, PA0LOU; the mayor of Cefalu; the president of ARI, Mr Rosario Vollero, I8KRV; and the president of the Sicilian region.

The conference was opened officially by On Antonio Gaera, I8XNG, Minister of Posts & Telecommunications of Italy. He spoke of the high esteem in which ARI is held by his department, of the support which would continue to be given to amateur radio, and of the establishment of the Emergency Radio Amateur Corps.

LA6A presented a Region 1 flag on behalf of NRRL to the chairman. The work of the conference followed the traditional pattern, being divided between three committees: Committee A dealt with administration and hf topics; Committee B with vhf and microwave topics—both meeting throughout the conference; and Committee C (finance and credentials) which met at the commencement of the conference.

The RSGB delegation consisted of: Tim Hughes, G3GVV, delegation leader, John Bazley, G3HCT, and Ron Glaisher, G6LX—all on Committee A; and Malcolm Appleby, G3ZNU, Dain Evans, G3RPE, Keith Fisher, G3WSN, and Petra Suckling, G4KGC—all on Committee B.

The following RSGB members attended in an IARU capacity: John Allaway, G3FKM, Region 1 hf manager; Ron Broadbent, G3AAJ, secretary, Satellite Co-ordinating Group; Eric Godsmark, G5CO, Region 1 secretary; John Morris, GM4ANB, secretary, Committee B; and Alan Taylor, G3DME, international beacon co-ordinator.

As an official observer on behalf of the British Amateur Television Club, Graham Shirville, G3VZU, was also present.

Committee A

International Beacon Project

G3DME reported on the progress of the project during the past three years. The present 2·5kHz spacing would be retained, and the beacon sub-band (on 28MHz) would remain 100kHz; for the future this may imply channel sharing, with or without time sharing. New beacons include 9L1FTN (Freetown) and VK6RWA (Western Australia); 3B8MS (Mauritius) is operational again, and H44SI (Solomon Islands) is under construction.

IARU Monitoring System

Under the chairmanship of G3GVV, a working group attended by W2RU and W4RA of IARU HQ, the secretaries of Regions 2 and 3, the chairman of Region 1, and representatives of DARC, SSA, UBA, VERON, OVSV, SRAL, IRTS, EDR, FRA and IRA recommended that:

1. The IARU Region 1 Monitoring System should continue: its need was reaffirmed.
2. Decisions of previous conferences be endorsed.
3. Efforts be redoubled to find a suitable Region 1 co-ordinator.
4. Guidelines or specifications of the requirements and aims of the Monitoring System and the regional co-ordinator be produced.
5. An international study group, organized by the IARU Administrative Council, be formed to examine the current state of the Intruder Watch throughout the world, to examine how its goals and obligations may be best accomplished, and to recommend to the three regions a general procedure for revitalizing the IARU IW.
6. That all member societies continue to encourage the operation of their own IW.
7. That the very carefully documented recommendation concerning intruders on 7MHz, drafted by DARC, be circulated to all delegates for submission to their administrations.

EMC

The EMC Working Group, chaired by SP9ZD recommended that:

1. National societies be invited to confirm whether they wish to continue to contribute actively to the work of the working group.
2. Societies of Region 1 are asked to seek co-operation with their respective CISPR bodies, and other authorities on a national level.

3. Member societies are encouraged to support EMC symposia by submitting papers.
4. The EMC Working Group will circulate papers dealing with amateur radio from these symposia to all societies.

Common Licence Group
The chairman, I1RYS, reported that information concerning licensing arrangements in their own countries had been supplied by ARI, DARC, NRRL, RSGB, URE, USKA and VERON. At a meeting attended by representatives of VERON, RSGB, DARC, MARL, NRRL, USKA, UBA, SSA and URE, together with the secretaries of Regions 2 and 3, and observers from IRA, IRST and USKA, it was agreed that the life of the working group be extended for a further three years, and that a publication be produced concerning the procedures for obtaining a temporary licence in other Region 1 countries.

Assistance by developed countries in advancing amateur radio
It was reported that several societies, including RSGB, had contributed books, training material and kits. It was recommended that the principle of sister clubs be agreed, and societies within Region 1 should make a co-ordinated approach to radio amateur societies of developing countries through the PADC working group.

Special callsign prefixes
It was agreed to keep the number of special callsign prefix applications to the telecommunication administrations of each society as low as possible, and in line with the Radio Regulations.

QSL cards
It was agreed that QSL cards exchanged through QSL bureaux should preferably have a size of 9 by 14cm.

Propagation studies
G3DME introduced a proposal for a Propagation Working Group. The conference supported unanimously the offer of RSGB to act as the co-ordinating society between interested Region 1 societies, and that the experiment continue for one year from 30 April 1984. Exchange of information will be by the postal service.

Amateur satellite service
It was agreed that support should be given by Region 1 for development in the amateur satellite service. Dr A. Gschwindt, HA5WH, will be Region 1 satellite co-ordinator for the next three years.

Administration
1. The significance, implications and interpretation of the proposed new constitution of the IARU (worldwide) was discussed at length. Its virtues were extolled by PA0LOU, chairman, Region 1; HK3DEU, secretary, Region 2; and JM1UXU, secretary, Region 3. W1RU and W4RA of IARU headquarters both spoke strongly in its favour.
(*Note.* This has subsequently been supported by RSGB.)
2. The constitution of Region 1, its structure, rules, and byelaws are to be revised. An informed and carefully prepared paper by SP5FM (vice-chairman, Region 1) provided guidance on this; further views are to be submitted to the Executive Committee by member societies.
3. The IARU Region 1 Medal is awarded to those who have given distinguished service to the amateur radio service and to the IARU Region 1 division. Medals were awarded to the following distinguished amateurs as the result of decisions taken at Cefalu.
Nikolaj Kazanskij, UA3AF, who through his personal efforts, played a vital role in ensuring that the Radio Sports Federation of the USSR became a member of Region 1. He first became a member of the RSF delegation in 1962, and later the leader, and he attended every Region 1 conference from that time until 1981, using his knowledge and wisdom to promote good relations with other member societies.
Eric Godsmark, G5CO, in appreciation of the way in which he took over the secretaryship of Region 1 during the very difficult period following the death of Roy Stevens; for the work he did at WARC 1979 and at AC meetings, and as a token of the gratitude felt by the Executive Committee for all the work done between 1979 and 1984.
4. Elections for the Executive Committee are held towards the end of each conference, and are supervised by a committee consisting of representatives of three different societies (on this occasion by G3GVV, chairman; PA0AD and UA3BW).

The Executive Committee for the next three years will be: L.V.d. Nadorv, PA0LOU, chairman; W. Nietyksza, SP5FM, vice-chairman; John Allaway, G3FKM, secretary; S.R. Barlaug, LA4ND, treasurer; M. Madrino, YU7NQM, member; Mrs Rossella Strom, I1RYS, member; and H. Walcott-Benjamin, EL2BA, member.
5. The venue for the next conference is decided by voting for those societies which have offered their hospitality. In 1987, the Region 1 Conference will be held in the Netherlands, at the invitation of VERON.

HF matters *(by John Bazley, G3HCT)*
Following the 1981 Region 1 Conference, an HF Working Group was formed under the chairmanship of John Allaway, G3FKM. It met at Cefalu to deal with papers on hf topics and hf contests.

RTTY band plans. It was resolved to refer this to the next meeting of the IARU HF Working Group. The conference did recommend that wide- and narrow-band modes should not be mixed. It was stressed that operators should, in the meantime, follow the existing band plan.

QRP frequencies. While the conference acknowledged the internationally accepted QRP frequencies, it did not think that they should form part of the formal band plan. It was agreed that there will be an annual QRP day (17 June), when all amateurs will be encouraged to use low power.

Amendments to the 7 and 10MHz band plan. It was agreed that no exceptions could be made to the band plan within Region 1.

SSTV and rtty on 18 and 24MHz. It was agreed to discuss this at the next conference.

Intercontinental dx on 3·5MHz. The conference agreed to amend the footnote so that the segment be increased from 3,790–3,800kHz to 3,775–3,800kHz.

29MHz repeaters. By a narrow majority the conference rejected the proposal for channellized repeaters on 29MHz. It was agreed that the segment 29·30 to 29·55MHz should be reserved for satellite downlinks.

Hans Berg, DJ6TJ, was elected chairman of the HF Working Group, to take over from John Allaway, G3FKM; the latter is now IARU Region 1 secretary.

HF contest matters *(by Ron Glaisher, G6LX)*
The main discussions took place within the HF Working Group of Committee A under the chairmanship of G3FKM. Many of the delegates who attended the two separate sessions of the HFWG were not contest orientated and this resulted in some unexpected decisions.

Rationalization of contests
This covered the matters already agreed by the HFWG at their 1983 meeting, viz:
(*a*) The recommended classification of contests into five groups: worldwide, continental, country-orientated, national and special interest.
(*b*) That all contests be reduced from 48h to a maximum of 24h (or less).
(*c*) That the phone and cw sections of a contest be limited to a single weekend.
(*d*) That efforts should be made to combine smaller events presently organized by member societies with like events organized by another member society so as to provide a larger single event.
(*e*) To reduce the overall number of events in Region 1 to not more than one Class 1 or Class 2 contest so that there is only one event per four-week period.

There were attempts to obtain some modifications, including a proposal from the Region 1 contest co-ordinator, LA5QK, to extend the contest period for Class 1 and Class 2 contests to 48h. The chairman ruled that as the revised proposals had not been circulated in time for proper consideration, and that as the original proposals had already been accepted by the HFWG, no changes could be made.

It is now up to the Region 1 societies to introduce these changes as soon as is convenient.

Field days
A paper of considerable importance was the proposal by VERON for the three separate field days: HF CW (June); VHF (July), and SSB (September), to be combined into one event to be held during the first weekend of June.

The Region 1 contest co-ordinator, LA5QK, took the view that a combined event would be a suitable way to reduce the overall number of contests, and he asked for the HFWG to support this paper. RSGB stressed that such a combined contest would be difficult to organize, as mainly the same operators were involved in both the hf events. This was supported by DARC. This was not supported by other societies and a vote in favour of the VERON proposal was carried by a large majority.

The UK delegation at the opening plenary meeting: (l to r) G4KGC, G3HCT, G3GVV, G3WSN, G6LX, G3ZNU and G3RPE

The HFWG also accepted by a large majority the other proposal by VERON that a multi-operator/multi-transmitter class should be included in the IARU Field Day.

The HFWG will now discuss these proposals at their next meeting (in 1985) so that a set of rules can be drafted (to cover all bands and all modes). In view of this decision other papers relating to SSB FD were either withdrawn or referred to the next meeting of the HFWG.

We had the chance to raise this matter again during the final session of Committee A when the HFWG proposals came before the committee for approval. We asked the committee to vote against the acceptance of this recommendation as the June NFD was not an IARU Region 1 event, but was a set of separate national contests run by RSGB, DARC and USKA. This was accepted by the chairman, but immediately LA5QK proposed that because of the wider support for the combined field day within Region 1 as shown by the vote, it should be an IARU contest. This proposal was carried by a large majority.

We made a further attempt to have this recommendation quashed during the final plenary session, when we pointed out that neither the VHFWG or Committee B had discussed or agreed the merging of VHF NFD with the hf event(s). The conference chairman agreed that the vhf event could not be included in the new combined field day contest, but as the new event would be further discussed at the next meeting of the HFWG he was unable to accept any other alteration.

It may well be that the RSGB membership are in favour of a combined hf field day, but the HF Contests Committee should confirm this by asking HF NFD and SSB FD entrants. DARC propose to do this with their entrants in the forthcoming contests. If it is clear that there is a majority in favour of the *status quo*, then we should make a further effort to influence the HFWG to take no action without further consultation with the interested societies: RSGB, DARC and USKA. If our membership is in favour of the change, then we will wish to have a part in framing the rules for the combined event. *(See the article on this subject on page 753—Ed)*

Contest-preferred segments

The proposal made by the HFWG for contest preferred segments was accepted in regard to the 14 and 3·5MHz bands. These are: major contests —3,500-3,560kHz cw, 3,600-3,650kHz and 3,700-3,800kHz phone, 14,000-14,060kHz cw, 14,125-14,300kHz phone.

Where no dx traffic is involved the contest preferred segments should not include 3,500-3,510kHz or 3,790-3,800kHz.

It was also agreed that member societies may fix their own limits for internal and national contests.

The proposal by DARC for contest preferred segments of 21MHz was not accepted and this paper was referred to a future meeting of the HFWG for further discussion. It is expected that the HFWG will make further recommendations for contest preferred segments on the other bands in the future.

QRP categories in hf contests

The HFWG decided to adopt uniform power limits for Region 1 QRP contests. Member societies are asked to include two categories in their contest rules: QRP, 10W; QRPP, 1W.

The proposals for frequency segment(s) for QRP use were not accepted.

IARU Region 1 HF Championship

There was general support for this previously-agreed event. however, there were a number of questions as to how it could be organized and which contests should be included. It was decided to defer any decision to the next meeting of the HFWG.

RSGB papers on receiving contests and ROPOCO

These were accepted and noted as information papers.

There were a number of papers in relation to amateur direction finding contests. While these were of considerable interest to a number of societies, the rules for ardf as currently practised in Europe do not allow for UK participation, as unmanned transmitters are a key feature. Such transmitters are not permitted under UK licence conditions. Arrangements have been made with SP5HS (Region 1 ardf convenor) for a full set of rules (in English) to be sent to the HFCC for reference.

Committee B *(by John Morris, GM4ANB)*

This committee considered matters affecting frequencies above 30MHz, with C. van Dijk, PA0QC, providing his usual expert chairmanship. GM4ANB acted as minutes secretary.

According to the conference programme Committee B sat for a total of 21 hours during the three days from 9 to 11 April, but the official timetable tells only part of the story. Early in the first session, working groups and sub-committees were hatched to consider meteor scatter procedures, contest rules and dates, 432MHz repeater systems, and frequency allocations to the amateur service. Meetings of these groups often lasted until the small hours. In addition, meal times provided strategic opportunities for a few off-the-record discussions, although it must be admitted that delving into the fine print of the Radio Regulations at breakfast is not the best imaginable way of starting a long and busy day.

Throughout these meetings the RSGB was ably represented by G3WSN (vhf manager), G3ZNU (VHF Committee chairman), G3RPE (microwave manager) and G4KGC (Microwave Committee). Also present as observers were G3VZU on behalf of BATC, and G3AAJ as secretary of the Satellite Co-ordinating Group.

What follows is a summary—in no particular order—of the main decisions made by Committee B, including the few amendments made at the final plenary meeting.

Amateur allocations

The theme running through much of Committee B's discussion was that of allocations to the amateur service. In recent years professional radio circles have been becoming more and more appreciative of just what can be done on vhf and above, and the formerly wide-open spaces are becoming increasingly squeezed from all directions. As spectrum becomes ever more precious, amateur allocations gradually get eaten away—although it should be said that most administrations are in favour of amateur radio, and rarely nibble allocations completely down to nothing.

Losing any part of a band is bad enough by itself, but it is of particular concern that many (but not all) countries' administrations see uhf and microwaves as being essentially for short-range communications. They may not realize that amateurs can, and regularly do, communicate not only

Table 1. Provisional Region 1 1·3GHz band plan and usage

	1,240·000	
ATV		
	1,256·000	
All modes		
	1,260·000	
Satellite sub-band		
	1,270·000	
ATV		
	1,286·000	
All modes		
	1,291·000	
Repeater input		1291·000 RM0 1291·025 RM1 1291·450 RM18 1291·475 RM19
	1,291·500	
All modes		
	1,296·000	
Narrowband dx segment		1,296·000–1,296·025 EME 1,296·200 Narrowband centre of activity 1,296·500–1,296·600 Linear transponder input 1,296·600–1,296·700 Linear transponder output
	1,296·800	
Beacon band exclusive		
	1,296·990	
Repeater output		1,297·000 RM0 1297·025 RM1 1,297·450 RM18 1,297·475 RM19
	1,297·500	
FM simplex		1,297·500 SM20 FM calling 1,297·525 SM21 1,297·975 SM39 1,298·000 SM40
	1,298·000	
All modes		
	1,300·000	

between countries but even between continents on these bands. The result of this lack of appreciation is that when a country decides to reduce the width of some uhf or microwave amateur band it tends to do so on a purely national basis, without regard to what is going on elsewhere. What we can end up with is a situation where all countries have some allocation, but where there is no common band of frequencies that can be used for international communication.

To try to stop this happening, all the countries of IARU Region 1 (and, indeed, Regions 2 and 3) must work together, and talk to their administrations with one voice. They must also try to encourage discussions in international bodies, such as CEPT. This policy worked very well in 1979 for the World Administrative Radio Conference, and there is no reason to believe that the principle of "united we stand" should be any less effective now than it was then.

This is one of the most important functions of the IARU organization, and indeed one of the main reasons for its very existence. The committee agreed that work should begin at once. Therefore a small group has been set up to look at amateur allocations above 30MHz in all the countries in Region 1, and to come up with suggestions for policies for all national societies to follow when talking with the "powers that be".

One particular problem already causing great difficulties to stations in countries around the North Sea is Syledis, which wipes out most of the interesting bits of 432MHz for many amateurs. On the recommendation of IARU, societies in countries bordering the North Sea will soon be approaching their authorities with, in the words of the IARU recommendation, "an urgent request to reconsider, both nationally and in the appropriate international co-operative bodies, the frequency allocation for the Syledis system in view of its incompatibility with the long-established amateur activity in this band".

This is planned to be a concerted effort. Documentation will be produced giving the arguments on the basis of the Radio Regulations, and "setting out clearly the impossible situation for the amateur service in the countries concerned, where the Syledis interference practically prohibits amateurs from participating in international and worldwide activities on this band".

Table 2. Provisional outline Region 1 50MHz band plan

	50·00	
CW and beacons		
	50·08	
CW only		
	50·10	
All "narrowband" modes (cw, ssb, a.m., rtty, sstv, etc)		50·200 ssb calling 50·600 rtty calling
	51·00	
Pacific "dx window" (narrowband only)		
	51·10	
All modes, including fm (and repeaters)		
	52·00	
Pacific "dx window" (narrowband only)		
	52·10	
All modes, including fm (and repeaters)		
	54·00	

Band plans

The band plans for 144 and 432MHz have been subjected to a few clarifications and minor alterations, but their basic outlines remain largely unchanged. When discussing a band plan it is important to distinguish between the "left-hand side", which specifies segments for completely incompatible types of activity, such as cw, repeaters, beacons and so on; and the "right-hand side", which is designed only to act as a guide as to the frequencies used for specific activities.

In other words, a band plan itself (the "left-hand side") consists of a set of self-imposed rules which all amateurs should follow to let everyone get the most enjoyment out of amateur radio. The beacon sub-bands, for example, are strictly out of bounds for transmitting—they may sound empty to a cursory listen, but they are actually brimming with weak signals of great interest to many operators.

The right-hand side, on the other hand, is an indication of what amateurs actually do on specific frequencies. Up till now this information has been labelled "recommended usage", but in recognition of the fact that it is meant to reflect activity, it will henceforth be labelled simply "usage".

Quite a few "usage" points were noted, mostly on 432MHz, but also a few for 144MHz and 1·3GHz.

It was noted that the following frequencies within the exclusive cw sections of the respective bands are used for cw eme: 144·000 to 144·025MHz, 432·000 to 432·025MHz; and 1,296·000 to 1,296·025MHz.

Linear inter-band transponders (which are only allowed on 432MHz and above) will use the following frequencies: inputs between 500 and 600kHz above the lower end of the weak-signal part of the band (432·000, 1,296·000MHz etc); outputs between 600 and 700kHz above the lower end of the weak-signal part of the band.

433·500MHz (SU20) is now officially called "fm calling", a status which it has in practice had for some years. The random meteor scatter frequencies have been dropped from the 432MHz band plan, the reasoning being that there is not yet sufficient activity to justify their inclusion.

There was some discussion about the nature of calling frequencies, and how they should be used. It was RSGB policy that, once contact had been established on a calling frequency, the stations involved should move to another frequency to complete the contact. This can cause problems on 432MHz and above, especially with weak stations, as it is all too possible to lose the contact on the way. It is now IARU policy that on the 432MHz band and above it is quite acceptable to work on the calling frequency. To reflect this they are not called "calling frequencies" any longer, but "centres of activity". Note that this does not apply to 144MHz.

The 432MHz microwave talkback centre of activity was set at 432·350MHz. For quite a few years 432·300MHz has been the official ssb calling frequency, but most amateurs happily carried on using 432·200MHz. There will be no doubt one or two small cheers from uhf operators for the news that 432·200MHz is now officially recognized as the ssb centre of activity.

In the band plans themselves, as opposed to the usage sections, a few "paper" changes were made. For example, the band 145·250 to 145·475 (S10 to S19) has until now been officially known as "all mode". Its designation is now "fm local".

Repeater channels R8 and R9 (which have never been used in the UK) have been "temporarily" removed from the 144MHz band plan for the last six years, to keep the satellite sub-band, 145·800 to 146·000MHz, clear. Given the expected lifetimes of current and expected satellites, they have now been completely dropped. In addition, no fm repeaters with inputs or outputs between 144 and 145MHz will be allowed in Europe.

On 432MHz the beacon sub-band had previously been specified only loosely by a centre frequency, and a more precise definition was needed. Accordingly the exclusive 432MHz beacon sub-band is now defined as 432·800 to 432·990MHz. A proposal by RSGB that the lower limit of the 144MHz beacon band be raised slightly was defeated, so that remains at 144·845 to 144·990MHz.

There was quite a lot of discussion about the 1·3GHz band plan, and many minor points were made. In the end it was decided to give it a complete dust down, and yet another sub-committee was formed to set about doing this. The resulting provisional IARU Region 1 1·3GHz band plan is shown in Table 1.

Turning to lower frequencies, the gradual disappearance of Band I television means that the future for an amateur allocation around 50MHz looks brighter than it has done for some time. All national societies will be approaching their administrations in the near future with the aim of obtaining such an allocation. As you will know, the RSGB has already managed to gain 100 experimental permits for 50MHz research.

If all of Region 1 ever gets a 50MHz band then we are going to need a 50MHz band plan. The nature of 50MHz, with its possibilities for very-long-distance communication, means that such a band plan has to be made in consultation with the rest of the world. For the moment the outline band plan shown in Table 2 is to be used as an initial basis for operation.

QTH Locator

The new QTH locator system, known variously as the "Modified G4ANB" or "Maidenhead" system, will be adopted as from 1 January 1985.

On cw the recommended abbreviation for locator is "LOC". Regions 2 and 3 of IARU (in other words, the rest of the world) have already indicated their acceptance of the system.

The new system was described in the November 1980 issue of *Radio Communication*, and articles have since appeared in other magazines. For those whose archives do not extend back to 1980, articles describing the system, how it is used, how to calculate distances, and so on, are already being prepared for publication in *Radio Communication*.

This decision represents the climax of a saga that started about eight years ago. Now, after a lot of work by a lot of people in all three regions of IARU, there is a common locator system throughout the world.

It is largely through the tireless efforts of Folke Rasvall, SM5AGM, that the system has now gained worldwide acceptance. A vote of thanks was recorded to SM5AGM for his enthusiastic promotional work during recent years, and to GM4ANB for designing the system.

Contests

There have been no changes to the IARU contest rules or dates, and the 1400 to 1400 timing has been retained.

The time it takes IARU contest results to appear is notorious among participants. In the last few years the results have on occasion not appeared until after the following year's contest!

The way these contests are organized is that entrants first send their logs to their own national society, which has the job of checking them. Then they are forwarded to the society organizing the contest, to be collated with the logs from all other countries. The massive job of organization is done by a different country each year.

The tardiness of IARU contests results was investigated by a sub-committee. It concluded that the fault lies with individual national societies, not all of whom go through the proper checking of logs before sending them in to the organizing society, and don't always get them in on time.

This problem, together with any necessary updates to the rules, will be discussed by a group made up of representatives from West Germany, UK, Spain, Czechoslovakia and Sweden, with the aim of finding a way of speeding things up.

Of course, one change to contests that will happen from next year is that the new locator system will be used. It was agreed that during contests the full, six-character locator code should be exchanged.

Meteor scatter

The more popular meteor scatter becomes, the more QRM there is around the random calling frequencies, 144·100 and 144·400MHz, especially during showers. For the last three years there has been an official system in force whose aim is to spread stations out in frequency, but, to be frank, it just does not seem to have been taken up. Everyone still piles up on 144·100 or 144·400MHz.

The difficulty seems to be that not enough people know about the system, which is based on the idea of selecting a frequency according to the last letter of your callsign. Therefore the system is to be given greater publicity throughout Europe.

The rest of the standard meteor scatter procedure—reporting, requirements for a QSO etc—seems quite satisfactory and no changes have been made.

The procedures may be reconsidered at future meetings in the light of experience.

432MHz repeaters

The UK 432MHz repeater system is out of step with that used by most European countries. The official IARU system uses the RU channels, whereas in the UK 432MHz repeaters are all on RB channels. The two systems, RU and RB, use the same frequencies, but with their inputs and outputs the opposite way round. An obvious result is that when conditions are good and repeaters on corresponding RB and RU channels can hear each other, massive "howl-around" occurs. A special meeting of repeater experts from the UK, Belgium, the Netherlands and Denmark will be held in the near future to try to find a mutually acceptable solution.

The number of channels in the IARU RU system has been increased. Until now only RU0 to RU9 have existed. The list has now been extended by the addition of RU10 to RU15.

The French 432MHz repeater system has inputs spaced 25kHz apart from 431·625MHz to 431·975MHz, and outputs 1·6MHz lower. The channels are called "FRU1" to "FRU15". The use of this system in France was accepted as a useful measure to fill an otherwise little-used part of the band.

EME

The recommended polarization for eme on 2·3GHz has been changed from left-hand circular to right-hand circular. Right-hand circular means that a wave travelling away from the observer should rotate in a clockwise direction.

This brings 2·3GHz eme into line with that on all the other microwave bands. The reason for it being the odd one out in the first place was because of a useful beacon left on the moon by the Apollo program. This beacon has now stopped operating, so there is no longer any reason to have a different standard on 2·3GHz.

A proposal that eme timing should be made the same on all bands was not accepted. Indeed, there is no way that IARU Region 1 could sensibly change this unilaterally, as it affects not only Europe and Africa, but the whole world.

An active moonbouncer, DL7YC, will be canvassing opinion among eme operators in all parts of the world to see if it is desirable to adopt the same timing for all bands, and if so to come up with a recommendation as to what it should be.

Propagation research

Much interest is being shown in fai (field aligned irregularities) propagation. Unfortunately, it seems that we in the UK are rather too far north to take advantage of this propagation mode. It is characterized by quite weak signals, usually coming from a high elevation (10° or so), and on a bearing well away from the great circle path.

As well as this new propagation mode, the old familiar ones are still far from being fully understood. Sporadic-E, in particular, still has many questions surrounding it, and a joint study between amateurs and CCIR, the professional body, has recently been started. For this study to succeed it is vital that reports of sporadic-E contacts be submitted. Reporting forms are available from RSGB for this purpose, and the Propagation Studies Committee will welcome all input. The data collected will be collated and summarized, and a report sent to CCIR.

Committee B thanked F8SH, the sporadic-E co-ordinator; the RSGB Propagation Studies Committee; and MRASZ, the Hungarian national society, for their work.

Miscellany

SM5AGM keeps the table of vhf/uhf/shf distance records in Region 1, but he is hampered by people not always telling him when they break records. So if you think you have broken a record then do send the information to the vhf manager, or to any member of the VHF Committee, who will make sure it gets to SM5AGM, and perhaps get your callsign into the record books. The latest version of the record table will be published as soon as it becomes available.

Another list that can be suspect because of lack of information is that of

vhf/uhf/shf beacons. This is kept by the RSGB, but not all countries have always been as conscientious as they should in keeping the Society up to date with the comings and goings of their beacons. It was agreed that this was not satisfactory, and a streamlined beacon reporting method has been set up to try to improve things.

A provisional standard has been adopted for "Delta modulation" on the microwave bands. The standard is for "CVSD", with the following parameters: Three-bit adaptive algorithm; bit rate of 16kbit/s plus or minus 50ppm; primary integrator time constant 1ms; syllabic integrator time constant 4ms. The standard can be handled by several readily-available integrated circuits (FX309, HC55516, MC3417). Modulation is by fsk with a shift of about 10kHz each side of the centre frequency.

If anybody would like a real challenge, then a proposal from Iceland offers some intriguing possibilities. It suggests that amateurs should take part in the search for extraterrestrial intelligence. According to current theories, the best amateur stations are too deaf by about 80dB to hear any artificial signals over interstellar distances.

Conclusion

Audrey Jefcoate once again did an immense amount of work in organising and running the Conference Office. Her indefatigable and unflappable presence ensured that thousands and thousands of documents appeared at the right place at the right time.

Tribute must be paid to Heather Norman, and John Morris, GM4ANB, who, as secretaries of Committees A and B respectively, tirelessly produced admirable minutes.

The overall planning and arrangements for the conference were masterminded by ARI. For all that ARI did, and for their excellence as hosts, visiting societies were unanimous in their praise. At the final plenary, Tim Hughes, G3GVV, made a formal expression of thanks to ARI president Rosario Vollero, I8KRV, presenting him (on behalf of RSGB) with a silver salver.

The task of the RSGB's IARU Committee for the coming year is the consideration and, where appropriate, the implementation of the recommendations of Cefalu. □

FIELD DAY CONTESTS

by R. L. Glaisher, G6LX (Chairman, HF Contests Committee)

Introduction

The report on the IARU Region 1 Conference held in Sicily in April includes recommendations for the future nature of field day contests within the region. As these recommendations conflict with the established pattern of RSGB portable contests, and are counter to the wishes of many clubs and groups in the UK, it is hoped that these notes will explain the background and will allay the fears of the many groups that are concerned about the future pattern of HF NFD and SSB FD.

Field day background

The RSGB currently runs four field day events, of which three are on the hf bands and the other on the vhf and uhf bands. Additionally, there are other hf and vhf contests which allow both portable and fixed station operation. The main cw event is the 24h duration HF NFD which is held in early June. VHF NFD is held in early July, and is a multimode 24h event on the 70, 144, 430 and 1,290MHz bands. The main phone hf bands event is the 24h SSB FD which takes place on the first weekend of September. There is also a low-power cw field day contest, which is of a shorter duration. HF NFD and the LPFD are "national" events, but VHF NFD and SSB FD are run in conjunction with Region 1 IARU.

The RSGB pioneered field day contests in Europe, by introducing the first portable cw contest in June 1933, and the first phone portable hf contest in July 1952. The 1933 event was limited to groups of stations from each of the RSGB regions. Apart from the war years, HF NFD has been held every June since 1933, and while many of the old-timers who supported the earlier events are now "silent-keys", the traditions of friendly inter-group rivalry that they established are still in evidence today. Apart from minor changes in the rules to permit wider participation and the use of modern equipment, HF NFD in the 'eighties is very similar in concept to the 1933 event.

For many years HF NFD was entirely a British affair, but over the past 20 years or so, other European societies have organized their own cw field days on the same weekend. There have been several attempts to harmonize the rules between the RSGB, USKA (Swiss) and the DARC (W Germany), but for various reasons this has not been possible and the concept of "national" contests has been retained. The Belgians (UBA) also use the same weekend for a multimode multiband (including vhf) field day. There is also minimal representation from groups in other European countries.

The first RSGB phone field day was not very well supported and was discontinued for a few years. With the worldwide acceptance of single-sideband, the RSGB HF Contests Committee decided to revive the event during the early 'seventies, and it is now well supported with a substantial following. At first, the SSB FD was held in July, but following representations from the VHF Contests Committee who wished to change the dates of VHF NFD to correspond with the Continental vhf portable events, the two contests were interchanged, with SSB FD moving to September and the VHF NFD to July. This opened the way for more IARU societies to participate, and eventually the contest developed into the present IARU Region 1 SSB FD. There is still a conflict of dates as there is a vhf "open" contest on the same date, and many groups in the UK and in Europe treat this as a portable contest. The VHF NFD event has also become an IARU Region 1 event and has wide participation within the UK and Europe.

IARU Region 1 Conference discussions

It was probably this conflict of dates, combined with a misunderstanding of the nature of the field day events that prompted these discussions. At the conference, the Dutch society (VERON) presented several papers relating to field day events, and it was these proposals that triggered-off the present situation. The VERON papers proposed that the June (cw) field day, and the September SSB FD should be combined into a single multimode, multiband event, with provision for a wide range of entry sections.

These papers were received by the RSGB only a short time before the departure of the delegation, making it impossible to consult the membership fully to obtain their views. The paper was discussed by the HF Contests Committee, and a straw poll was taken at a number of clubs who normally enter HF NFD, the SSB FD (or both). The information obtained showed that there were likely to be strong objections to any form of merged event, and that the RSGB should vote against the proposal.

HF matters within Region 1 are discussed by the HF Working Group, which comprises representatives nominated by member societies. In conference year, the membership of the HFWG is enlarged to enable any delegation at the conference to nominate a representative to take part in the discussions and vote on the proposals, which are then passed as recommendations to the conference HF Committee for approval. The VERON proposal was duly discussed by the HFWG, but despite very strong objections from the RSGB and DARC, a multimode multiband field day was favoured by a large majority. At this time, many of the delegates were under the impression that the proposal was limited to the hf bands and that vhf and uhf were not included. The VERON paper was unclear on this point, but it later transpired that their proposal was to merge the three events, including VHF NFD. Had this been appreciated, it is possible that the proposal would not have been accepted.

Many of the delegates were unaware of the differences between the two hf events, or that over 90 per cent of the total portable activity in HF NFD came from the UK, West Germany and Switzerland. There was also a misunderstanding about the organization of HF NFD, and some delegations (including VERON) thought that this was an IARU-sponsored contest. The differences were made clear to the HFWG, but because of the overwhelming opinion in favour of a joint event, the proposal was put forward as a recommendation.

The HFWG recommendation came up for further discussion in the conference HF Committee, and again the RSGB, with the support of DARC, strived to overturn it. Some progress was made, as it was agreed that because of the previous difficulties of finding acceptable common rules, the matter should be referred to the next meeting of the HFWG (in Germany in 1985). The Region 1 IARU contest co-ordinator, LA5QK, supported the proposal, as he felt that a combined field day would cause less interference to non-contest operators than two separate events. The RSGB and the HF Contests Committee receive a number of complaints each year about the interference caused by multiband multimode contests (not RSGB events!), and it is clear that this type of contest causes more annoyance than a single-mode event.

To the surprise of many delegates, it became clear that the VERON recommendation included the vhf and uhf bands. The addition of VHF NFD to the proposal was outside the terms of reference of the conference HF Committee and was clearly a matter for joint discussion with the conference VHF Committee. This discussion did not take place because of lack of time, and the proposal went forward to the final plenary session of the conference as a recommendation.

As this decision was clearly unconstitutional, the RSGB objected, and the conference chairman ruled that the VHF NFD could not be included and must remain a separate event. He also accepted that because of the RSGB objections, there must be further consultation about merging HF NFD and SSB FD, and it was agreed that this should be referred back to the HFWG for further discussion at its next meeting in Germany in 1985.

The aftermath

It is hoped that good sense will prevail and that the HFWG will reverse the conference decisions. The RSGB has a representative on the HFWG, and in order to provide a clear working brief, the HF Contests Committee sent out questionnaires to over 150 clubs and groups who support HF NFD and SSB FD. It is possible that not every group received a questionnaire, so arrangements have been made with Mrs H. Norman at RSGB HQ for a further supply of forms to be available on receipt of a request from a club or group secretary/chairman.

Most of the original questionnaire forms have now been returned and, apart from two groups, there was an overwhelming vote against any change, except to move the SSB FD dates to another weekend. One of the groups which voted for the change felt that a combined cw and ssb event would help the smaller groups who had a minimum of cw operators, while the other was of the opinion that it should be up to the members of a group to decide if they wanted to operate cw or phone.

As the groups returning a "no" vote represent well over 2,000 RSGB members, it would seem that there is a clear mandate for the RSGB to continue opposition and, if necessary, to keep HF NFD and SSB FD as separate "national" events. However, before taking a final decision it will be necessary to wait until the HFWG of IARU Region 1 has met to discuss the conference decisions. The HF Contests Committee will also take note of any further comments received from any HF NFD or SSB FD group. If it is found necessary to organize separate portable contests, then the present clash of dates between the September SSB FD and the IARU VHF contest, which causes problems for many groups, can be overcome and this could be a bonus. A selection of comments from the many letters received by the HF Contests Committee shows the depth of feeling that has resulted from the VERON proposals.

Comments

We fail to see why the IARU should influence the RSGB, and whether the decision to run a combined field day on the Continent is taken or not, it does not mean the RSGB has to follow suit—Gloucester.

We do not believe a combined field day would be manageable, and it in no way provides for the interests of our members. HF NFD is an event which should be retained as a British contest—Sutton & Cheam.

We have all heard of complaints about contests taking up the whole of the band. A combined field day would do just this and give the anti-contest brigade a lot of free ammunition and would not be acceptable. Our group were unanimously against the proposal—Medway.

Every year there are allegations of groups using amplifiers in HF NFD. If the events were joined it would become a complete rat-race. Many operators live for NFD and this is their only contest until next year. Sharing modes would result in much higher QRM levels to non-competition stations and we can hear the cries of outrage. Please do not change the June NFD—Plymouth.

A combined field day will result in a lowering of standards, and the presence of a QRO amplifier as used in SSB FD would tempt clubs to "go over the top". Our group is unanimous in wishing to keep HF NFD separate and in June—Clifton.

A combined field day is an open invitation to run high power, as the phone rules permit this. While we mainly support SSB FD we also "dabble" in the cw contest and would hate to lose our excuse for a weekend out with the "boys"—JUARS.

Overwhelming majority against any change. We get a lot of support for both field days, but if it came to the crunch we would opt for cw—West of Scotland "B".

Our 131 members say "no thank you"—SRCC.

NFD has a tradition and history going back over 50 years, something which is often overlooked. The present sorry situation stems from failure of EU societies to agree a common set of rules for HF NFD. No merger would be acceptable—Guernsey.

As supporters of SSB FD our club unanimously favours separate events. A combined field day would not be workable and would break with tradition. The extra activity would block the use of both ends of the band to the detriment of non-contest stations—BSARS.

If Europe wants a joint event then this clearly gives the RSGB the right to "go it alone". We normally enter SSB FD, but many of our 40 members support other local clubs in HF NFD so there would be a clash of interests resulting in a shortage of operators and equipment. A very definite "No"—BARC.

Please retain present separate HF NFD and SSB FD—Lincoln.

Our small group of 16 members is not able or willing to support a combined event. SSB FD is our main interest, but we lend our operators to a nearby club for HF NFD—TAG.

Although we merge with another club for HF NFD, we still retain a separate activity in SSB FD. If it came to a decision we would have to go cw. We think the IARU proposal to be wrong and could not support it. RSGB should keep separate contests—CFDG.

Our small group not happy with proposal for many reasons. Please reject—Croydon.

Not a difficult decision for us to make, "no thank you"—Quantock.

*Our members agreed that a substantial reduction in the number of contests should be made and a merger would serve to do this. Members also feel that the choice of cw or ssb should be made by the club members.*Dynamics Hatfield.

We are not in favour of mixed-mode contests and our group of 30 are 100 per cent against such a change—RAGCG.

No mixed-mode events should be held on the same weekend, as this increases the QRM to non-contest operators, IARU is wrong to even try—LDARS.

I am sorry if the tone of this letter appears rather hostile and negative, but we are strongly opposed to any proposal to combine the two events, as is clear from our comments—Addiscombe.

Our group is totally in favour of retaining cw as an element for field-day contests—Leicester Poly.

We wish the HF Contests Committee to strive for the retention of separate cw and ssb field days. The popularity of the two events makes it difficult to see any justification for abolishing them and establishing a new concept which may not obtain any sustained support etc—Stockport.

We are totally against any move to introduce a combined cw/ssb field day. Other than possibly West Germany, the UK puts more stations in the field than all the other IARU Region 1 countries together, and the RSGB could easily sustain a national contest, though we hope it will not come to that. Should it happen, though, it will permit a more sensible scoring system to be adopted to put dx working at a greater premium than working near-Europeans—Lichfield.

Quite frankly we were appalled at the suggestion to combine cw and ssb field days. Please assure us that the matter has not been resolved and we have not, in fact, been presented with a "fait accompli"—Crawley.

Many of our club members find themselves out of their depth with the speed of the cw and refuse to try. We favour combining the two field days over one weekend but making them separate 12h contests—Southdown.

We prefer ssb as only have a few cw operators, but live and let live, so our vote is to keep the status quo—SLCG.

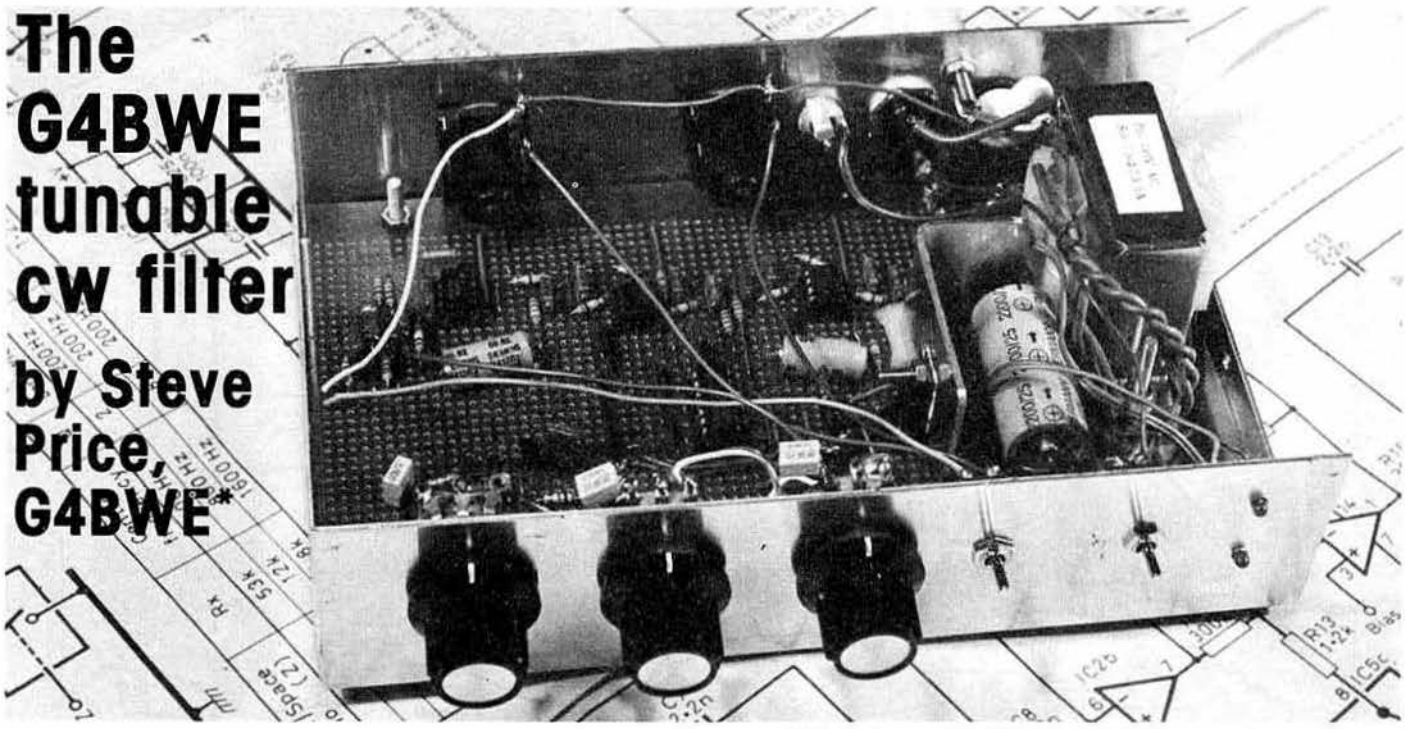
Our group hopes that the RSGB will take note of its members' demands and NOT that of members of foreign societies. We are totally against any change—Liverpool.

Who do the IARU Region 1 people think they are. Interfering with our HF NFD and SSB FD is just not on. If the RSGB gives way to these demands, it will lose a lot of members, our group included! These contests give us a wonderful excuse to spend two whole weekends away from our wives. Joking apart, it's a stupid suggestion—GARC & WGC.

The above are typical and represent a fair cross-section of the comments and letters received by the RSGB and the HF Contests Committee since the conference.

The G4BWE tunable cw filter

by Steve Price, G4BWE*



The author's prototype with top cover removed. The controls, l to r, are centre frequency (RV3), background level (RV2), gain (RV1), by-pass (S1) and on-off (S2). LED1 and LED2 are positioned at the extreme right of the front panel. Coupling capacitors C16 and C17 may be seen soldered directly to RV1 and RV2. There is no particular reason for this, however, and constructors will no doubt wish to mount these components on the Veroboard. ***Photo:*** **G3YHV**

DESPITE THE ADOPTION of some very sophisticated design techniques by manufacturers of contemporary amateur radio equipment, the readability of weak cw transmissions may nevertheless be enhanced quite considerably by feeding the loudspeaker output of a commercial transceiver through a high performance audio filter. The design to be described exploits an advanced control method that provides a facility to tune the filter over a two-octave range, from 400 to 1,600Hz.

A four-stage active bandpass filter forms the heart of the system, and use of the latest bi-fet op-amps ensures low distortion with high signal-to-noise ratio.

Design background

Active filter technology presents to the designer a highly versatile set of electronic "building blocks", which make possible the synthesis of any response shape, whether lowpass, highpass or bandpass. Furthermore, as mere resistors and capacitors constitute the controlling elements in active filter systems, it is possible to vary the filter parameters by adjusting the value of either R or C in a particular circuit. Generally speaking the incorporation of variable resistors, rather than variable capacitors, is by far the most practical alternative.

Problems are encountered, however, in the control of complex, multi-stage filters, because in order to vary any one parameter (eg centre frequency) it becomes necessary to employ a number of variable resistors acting in unison. At first sight the readily available twin-gang, carbon-track potentiometer, as employed in stereo amplifiers, appears to offer a perfect solution. Unfortunately, however, two variable resistors can only be expected to control, at most, a four-pole filter. Both experience, and also the relevant theory, dictates that a minimum of six, and preferably eight poles of filtering are required to achieve an acceptable level of performance in a narrow-bandwidth cw filter. Also, it is important that all sections, or "gangs", of the variable resistor track near-perfectly; a specification not likely to be met by many "off-the-shelf" carbon-track potentiometers. Clearly then, a fundamentally different type of multi-gang variable resistor must be considered.

The CD4066 quad bilateral switch

One of the most intriguing CD4000 series digital integrated circuits is the type CD4066. This 14-dil device contains four entirely-separate analogue gates, or switches, each switch being connected to an external control pin. When a voltage equal to that of the device supply rail (V_{DD}, or "logic 1") is presented to any one of these control pins, the respective switch is held closed and only a very low ON resistance appears across it. An analogue signal (ie an audio waveform) may now be made to travel through the closed switch by making suitable connections to the relevant IN and OUT pins, which constitute, in effect, the switch contacts. Conversely, when the control pin is connected to ground (Vss, or "logic 0") the switch is held open and an extremely high resistance now exists between the two switch "contacts", thus preventing the passage of signals through the switch.

It will not be immediately obvious from the above description how the function of a multi-gang variable resistor may be synthesized using the analogue switches contained within the CD4066. In order to explain how the humble CD4066 is forced to undergo such a metamorphosis, let us examine an elementary CR network and see how a single logic-controlled switch may be employed as the controlling element. Fig 1 shows a circuit in which capacitor C will charge at a rate determined by the value of resistor R. As curve 1 of the associated graph clearly indicates, closing the switch in order to connect the battery causes the voltage across C to rise gradually towards the voltage of the battery itself. Taking things a step further, curve 2 illustrates what will happen if the switch control pin is driven from an oscillator producing a square wave output which toggles between Vss and V_{DD}. As can be seen, the capacitor receives charge only during periods when the switch is held closed, and as the switch is closed for a period equal to exactly 50 per cent, or half, of each oscillator cycle, the time averaged effect will be to produce a charging rate one half the magnitude of that observed previously. This reduction in the charging rate is the same as that which might otherwise have been obtained by doubling the value of R.

Fortunately we are not restricted to driving the switch with pulse trains of 50 per cent duty (1:1 mark space ratio), and it is a simple matter to construct an oscillator featuring continuously-variable mark space ratio output with which we may drive the CD4066. Curve 3 shows that driving the switch with a waveform of 20 per cent duty (1:4 mark space ratio) is equivalent to multiplying the value of R by a factor of five.

As the active filter is merely a collection of rudimentary CR networks working in conjunction with an operational amplifier, the special form of variable resistor analysed above may be applied directly as a controlling element in such systems. The only precaution that need be taken is to ensure that the fundamental frequency of the CD4066 switching waveform is considerably higher than the highest frequency with which the filter is likely to be presented. An audio cw filter used in conjunction with a transceiver having a 2·7kHz i.f. filter will never "see" frequencies higher than about

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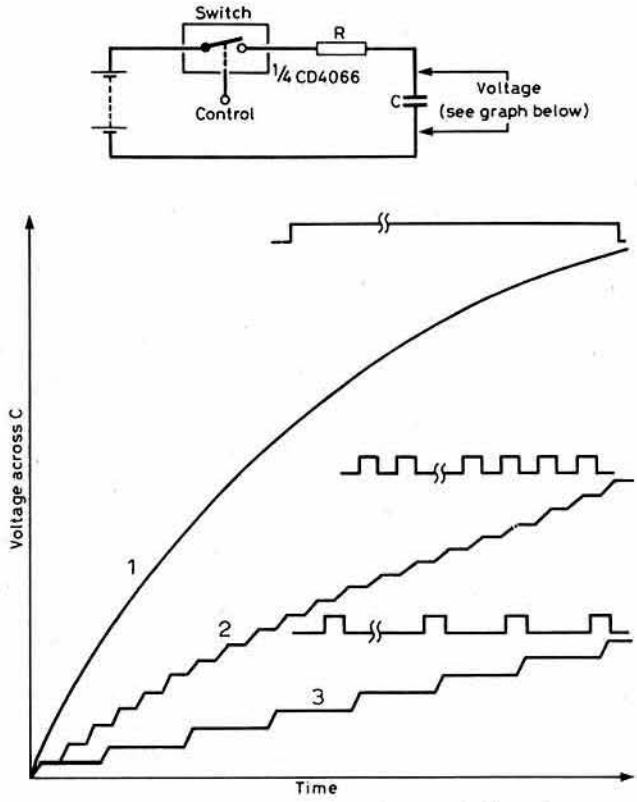
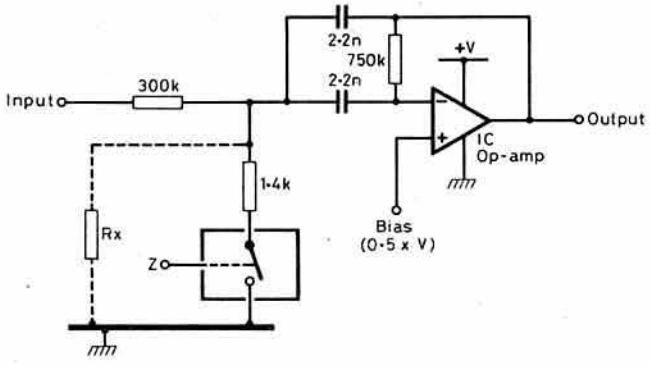


Fig 1. Using the electronic switch as a variable resistor

4kHz at any significant amplitude. This dictates that the lowest practicable switching frequency is around 10kHz. The filter's output will possess an amplitude ripple at the switching frequency (this ripple is well illustrated by the stepped nature of curves 2 and 3 in Fig 1) and so in order to restore the signal to its original form, it is necessary to remove the ripple using an effective lowpass filter.

In practice, the performance specification of the lowpass filter may be relaxed considerably if the switching frequency is raised above the limit of audibility. Therefore the lowest switching frequency employed in the author's design is approximately 27kHz, and any residual output ripple has no effect whatsoever on the subjective performance of the cw filter.

If the control pins of all four switches contained within a single CD4066 are driven in synchronization from the same oscillator, and if fixed resistors of identical value are placed in series with each switch, we produce a precision four-gang variable resistor which exhibits excellent tracking characteristics. The effective resistance of the four sections is determined by the "duty", or mark space ratio, of the driving oscillator, and it is quite feasible to vary this parameter using a single-track potentiometer which forms part of the oscillator circuitry.



Mark/Space ratio (Z)	Rx	Centre frequency	Q	−3dB bandwidth	Voltage gain
1 : 38	53k	400 Hz	2	200 Hz	1·2
1 : 8	12k	800 Hz	4	200 Hz	1·2
1 : 1	2·8k	1600 Hz	8	200 Hz	1·2

Fig 2. A single-stage variable-frequency bandpass filter

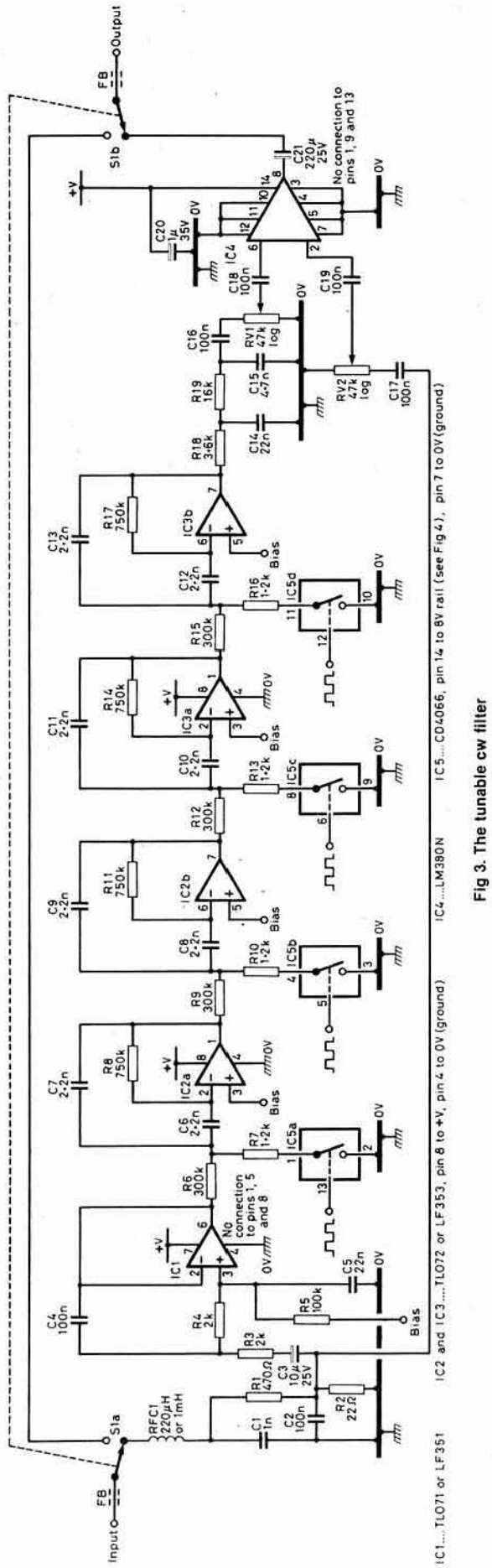


Fig 3. The tunable cw filter

Components list

R1	470Ω	**R8, 11, 14, 17**	750kΩ
R2	22Ω	**R18**	3·6kΩ
R3, 4, 20, 21	2kΩ	**R19**	16kΩ
R5	100kΩ	**R22**	270kΩ
R6, 9, 12, 15	300kΩ	**R24, 25**	10kΩ
R7, 10, 13, 16, 23, 26	1·2kΩ		
All resistors are 0·33W, 5% tolerance, carbon or metal film types.			
RV1, 2	47kΩ log		
RV3	100kΩ linear		
C1, 22	1nF polyester or polystyrene		
C2, 16, 17, 18, 19, 23, 24, 25, 26, 28, 31, 32	100nF ceramic		
C3	10μF electrolytic 25V		
C4	100nF polyester		
C5, 14	22nF polyester		
C6, 7, 8, 9, 10, 11, 12, 13	2·2nF polyester 5 or 10% (see text)		
C15	4·7nF polyester		
C20	1μF tantalum electrolytic 35V		
C21	220μF electrolytic 25V		
C27	2,200μF electrolytic 25V		
C29, 30	100μF electrolytic 25V		
IC1	TL071 or LF351	**IC6**	NE555
IC2, 3	TL072 or LF353	**IC7**	78L08
IC4	LM380N	**IC8**	7815
IC5	CD4066		
BR1	50 piv 1A silicon bridge rectifier		
D1	1N4148 or 1N914		
D2, 3	1N5402		
LED1, 2	TIL209		
FB	Ferrite bead		
RFC1	220μH or 1mH		
S1	Toggle DPDT		
S2	Mains DPST		
FS1	500mA anti-surge		
T1	240V primary 15V secondary 500mA minimum		

Suppliers: Capacitors and resistors obtainable from Electrovalue Ltd, 28 St Judes Road, Englefield Green, Egham, Surrey TW20 0HB. Semiconductors obtainable from Technomatic Ltd, 17 Burnley Road, London NW10 1ED.

The filter block

The G4BWE tunable cw filter employs four cascaded bandpass sections, and in this respect is similar to an earlier fixed frequency design presented by the author [1].

Fig 2 shows one of the four filter stages in skeleton form, the other three being identical in every respect. It is the 1·4kΩ resistor which dictates the filter's centre frequency, and the electronic switch shown in series with this component enables us to tune the filter using the technique described previously. A tuning range of two octaves (4:1) is provided, and this allows the centre frequency to be positioned up to, approximately, one octave either side of the cw offset frequency, which is normally chosen to lie between 750 and 800Hz.

As the table shows, Q varies proportionately with centre frequency, thus keeping the filter's bandwidth constant. In order to tune the filter from 400 to 1,600Hz the tuning resistor must be varied by a ratio of very nearly 19:1, not 4:1 as common sense might suggest and, indeed, is the case with many other types of active filter. A mark space range of 1:1 to 1:38 achieves this variation, and the generation of such is well within the capabilities of a suitably-adapted astable multivibrator built around the familiar NE555 ic.

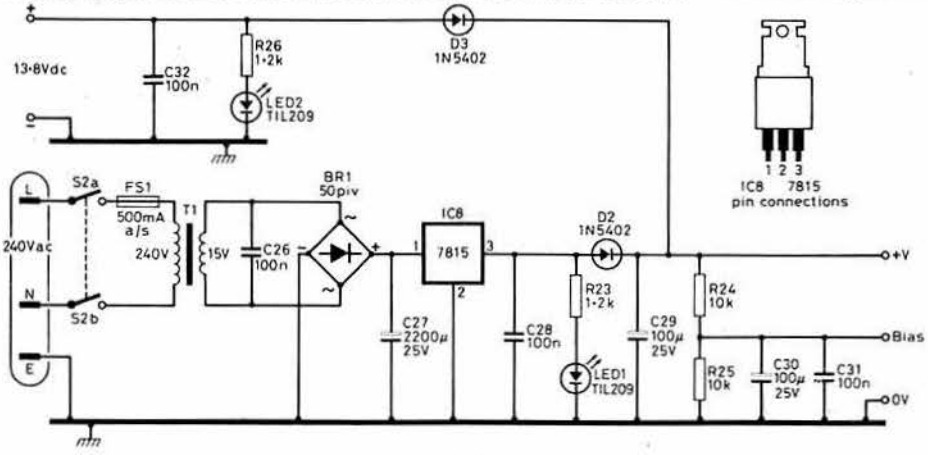


Fig 5. The filter power supply

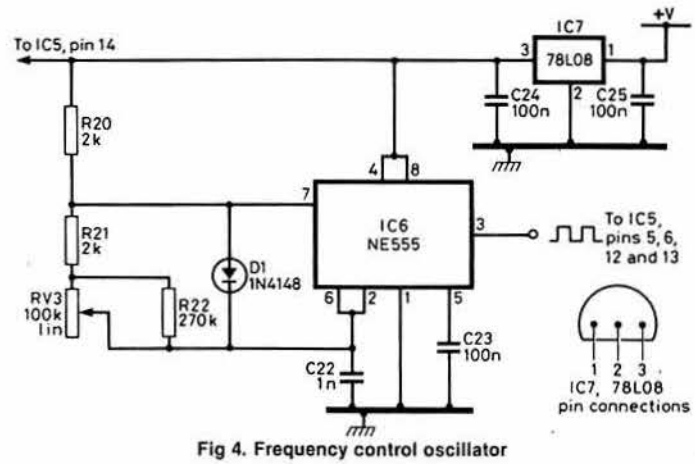


Fig 4. Frequency control oscillator

The complete design

Fig 3 shows the filter circuitry, and Figs 4 and 5 feature the frequency control oscillator and power supply respectively. These circuits should be studied in conjunction with the block diagram of Fig 6. Input signals are routed via the bypass switch (S1a), and RFC1, to an attenuator composed of R1 and R2. The attenuator is incorporated to ensure that the main part of the filter will never be overloaded, even in circumstances where the transceiver's volume control has been advanced to a point which causes the rig's own output stage to be driven into distortion.

IC1 functions as a buffer and active lowpass filter with a fixed cut-off frequency of 2kHz. This serves to strip the input signal of any high frequency components which might otherwise interact with the CD4066 switching waveform. The four bandpass filter stages are built around two dual op-amps, IC2 and IC3. Although four single op-amps of type TL071 or LF351 may be utilized here, the dual devices, which come in small eight-dil packages, make for a more compact layout. Each filter stage differs in one slight respect from the skeleton circuit shown in Fig 2. The resistor which appears in series with the CD4066 switch has been reduced in value to 1·2kΩ. This change is necessary to compensate for a minor deficiency inherent in electronic switches of the type contained within the CD4066. Ideally, the resistance across the switch should be maintained at infinity in the OFF state and zero in the ON state. This theoretically-perfect switch characteristic is assumed for the circuit at Fig 2. In practice, however, the CD4066 switches exhibit a residual ON resistance of between 120 and 300Ω when operating in the author's design. Therefore, the values of R7, R10, R13 and R16 have been reduced to 1·2kΩ as a means of compensating for this effect.

It must be emphasized that the switch ON resistance will have practically no effect on the tracking alignment of the electronic four-gang variable resistor, for although the precise value of ON resistance will vary depending on the sample of CD4066 used, the maximum variation between the ON resistance of any two switches contained within a particular CD4066 is only 10Ω.

A passive lowpass filter comprising R18, R19, C14 and C15 serves to significantly attenuate the switching ripple present at the output of IC3b. RV1 is the gain, or "volume", control which regulates the input voltage to IC4, an LM380 audio power amplifier chip. IC4's output feeds the second half of the bypass switch, S1b via C21, a dc blocking capacitor. IC4 will

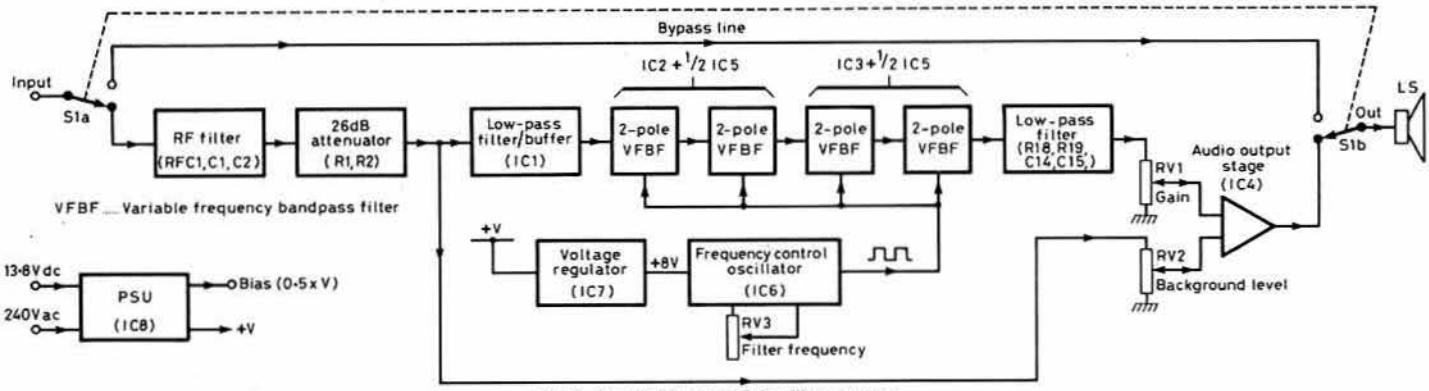


Fig 6. Block diagram of the filter system

provide a maximum undistorted output of approximately 1W into an external 8Ω loudspeaker.

Rejection of signals which fall well outside the passband of the four cascaded filter sections is extremely high. Indeed, the filter's true skirt response is difficult to measure using workshop-grade test-gear, and is certainly in excess of −60dB. Such a high rejection ratio can sometimes be disadvantageous because it prevents the operator from hearing signals only a few hundred hertz either side of the transmission to which the filter is tuned. This degree of isolation makes the filter harder to tune to a wanted signal in the first place, and can also frustrate attempts to monitor a split frequency QSO where the two stations of interest are operating a few hundred hertz apart. In order to solve this problem, a facility is provided whereby a proportion of the unfiltered input can be mixed with the filter's output. This is achieved by inclusion of RV2, which operates as a "background control' (author's term), allowing some of the input voltage to be presented to the LM380's second input pin (pin 2). When RV2 is set at minimum the filter's performance is totally unaffected, but as the background control is advanced towards maximum the stop-band rejection progressively drops.

RV1 and RV2 operate almost entirely independently because each control feeds a separate input pin on IC4. Any minor interaction that does occur will be due to cancellation effects caused, first, by phase shifts generated within the filter stages, and second, by the use of both the inverting and non-inverting inputs of the LM380 simultaneously.

The variable mark space ratio oscillator which drives the four control pins of IC5 (see Fig 4) is built around a single NE555 (IC6). The timing network comprises R20, R21, R22, RV3 and C22. D1 modifies the normal '555 astable function by allowing C22 to charge directly through R20. This arrangement enables RV3 to control the repetition rate of a positive going 1μs pulse, producing a variation of mark space ratio over the range 1:1 to 1:38. The very simple method by which mark space control is achieved results in a shifting of the fundamental frequency generated by the oscillator. At the lower extreme (1:38) this frequency is approximately 27kHz, and rises to around 500kHz for 1:1 mark space. However, the oscillator frequency is unimportant as only the mark space ratio dictates the tuning of the four filter stages.

While RV3 is being adjusted, low level "scraping" noises may sometimes be generated. These noises do not present an operational drawback but the effect is mentioned to reassure constructors that they do not necessarily imply poor wiper contact in RV3.

Power is supplied to both IC5 and IC6 via IC7, a type 78LO8, 8V regulator. This measure ensures stability and also provides "active decoupling" of IC6 from the rest of the system. Fig 5 shows the power supply circuitry. The filter may be powered from ac mains or, alternatively, fed from a standard 13·8V psu or equivalent battery. The arrangement featured in Fig 5 is exceptional in that it allows for either of the above options, and provides visual indication of which power source is in use through the incorporation of LED1 and LED2. D3 provides reverse polarity protection for the 13·8V input, and also acts as a steering diode in conjunction with D2, thereby preventing interaction between the two sections of the psu. IC8, a 15V, 1A regulator type 7815 forms the heart of the mains section, and the cooling tab of this device should be bolted to a small heatsink.

The potential divider formed by R24 and R25 develops a bias voltage equal to half that of the main supply rail. C30 and C31 serve to decouple the bias supply over a very wide range of frequencies. If the 13·8V option is not required, components R26, C32, D2, D3 and LED 2 may be omitted. Conversely, if operation of the filter from ac mains is not contemplated, remove R23, C26, C27, C28, D2, LED1, BR1, T1, FS1, S2 and IC8.

Construction

In the author's prototype the majority of the filter, frequency control oscillator and power supply components are mounted on a single piece of 0·1in matrix Veroboard measuring approximately 4·5 by 5·75in. Some constructors may feel that the relative complexity of the design justifies production of a pcb for the filter. This is indeed a possibility and might well form the basis of a worthwhile club project. The author has absolutely no objection to such a venture and would be pleased to hear from any successful group(s).

All resistors should be of five per cent tolerance and the various E24 range values may be obtained direct from a number of the larger suppliers. The filter stage capacitors C6 to C13 may be Siemens B32560 polyester. The stated tolerance of the B32560 is only 10 per cent for the 2·2nF value, but no problems were experienced with these components in the prototype.

IC1, IC2, IC3, IC5 and IC6 may be mounted in sockets, but IC4, the audio output chip, must be soldered in place as heat is conducted away from this device through pins 3, 4, 5, 10, 11 and 12. In order to avoid instability, C20 should be mounted very close to IC4.

S1, S2, RV1, RV2 and RV3, LED1 and LED2 are front-panel mounted. It is important to house the filter in a screened case. This measure considerably reduces the filter's sensitivity to transmitter radiation, and also prevents low level radiation from the frequency control oscillator (IC6) interfering with the station receiver.

Sockets should be provided at the rear of the filter for input and output. It is not essential to employ screened cable for "off the board" signal wiring but this may reduce susceptibility to mains hum etc.

The cable which couples the rig's external loudspeaker socket to the filter's input should, however, be a screened type. It is also wise to employ screened cable between the filter's output and the loudspeaker.

The filter input impedance is approximately 500Ω, and largely resistive at audio frequencies. Constructors may wish, therefore, to connect a fixed resistor of between 4·7Ω and 10Ω (1W rating) from the junction of S1a, RFC1 to ground. This measure will ensure that the rig's audio output stage "sees" an impedance roughly equivalent to that of a moving coil loudspeaker. The inclusion of such a resistor is particularly advisable where the rig has a valve audio output stage.

Conclusion

The measured tuning range of the prototype is 490 to 1,650Hz, which equates well with the mathematically-predicted range of 400 to 1,600Hz. The filter −6dB bandwidth is a constant 130Hz, irrespective of centre frequency. At first sight this figure may seem too narrow for general use, but it must be considered in the context of the facility to precisely tune the filter on to the wanted signal. Assuming a standard potentiometer rotation of 270°, the effective tuning rate of the filter is 1·6kHz per revolution. In consequence, weak signals are easily captured by careful adjustment of RV3, and the filters narrow bandwidth can be fully exploited to reject adjacent transmissions and noise.

Although the G4BWE tunable cw filter does not represent the ultimate in active filter technology, the performance and versatility of this straightforward design is hard to beat. It is certainly a most cost effective alternative to any commercial equivalent.

References

[1] "The G4BWE CW Filter", *Rad Com*, March 1983, pp226-9.
[2] *CMOS Databook*, published by National Semiconductor Corporation [CD4066 Data Sheet].

Follow-up to the low-budget hf linear amplifier

by E. J. Hatch, CEng, FIEE, G3ISD*

E. J. (Ted) Hatch is a chartered electrical engineer without professional connections in electronics or telecommunications. He spent the greater part of his working life in the papermaking and petro-chemical design industries, retiring in 1982. His interest in radio dates from boyhood, and he obtained the callsign G3ISD in 1953. His amateur radio interests are varied, but he finds constructional work particularly enjoyable and satisfying.

THIS ARTICLE gives details of recent modifications to the hf linear amplifier described in [1], in the hope that they may be of interest to others.

Input matching network

The original article contained the prophetic statement "If an exciter with a solidstate pa is used, a suitable matching network would no doubt be essential", and this has proved to be the case.

As originally constructed, the amplifier input was untuned, and an FT101ZD with its valve final amplifier drove it without any problems. Since then, an all-solidstate transceiver has been acquired, as a result of which the simplicity of the untuned linear input has had to be abandoned, and an input matching network installed. The reason is that the solidstate transceiver output must "see" something very close to 50Ω, whereas the input impedance of the linear is probably something of the order of 200Ω [2]. In any case, it is outside the range of the transceiver built-in automatic antenna tuner, which has a nominal upper matching limit of 150Ω. See Fig 1 for circuit diagram and component values of the pi-matching network.

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Preliminary calculations were carried out, but it must be admitted that the final component values are mainly the result of trial and error. The low estimated Q of between 1 and 2 gives a flatly-tuned circuit presenting to the exciter an swr better than 1·2:1 over the whole of each band without retuning.

The tuning and switching arrangements of the network are a matter for individual preference, and it is evident that the simplest and most flexible arrangement would be to use two variable capacitors, Fig 2. However, the arrangement used here was determined by the availability of components and the space available to accommodate them. The coil was a lucky find, being already wound (except for 28MHz) on a ceramic former, and only needed the addition of taps for 14 and 21MHz. The compression trimmers and two-gang capacitor were liberated from an old broadcast receiver which had already been cannibalized, and the use of silver mica capacitors was dictated by the fact that they appear to be the only type readily available of appropriate capacitance values combined with reasonable voltage rating (350–500V dc).

Adjustment and operation

Setting-up simply consists of alternately adjusting the pi input and output capacitors for lowest swr, and it will probably be found necessary to adjust the 28MHz coil by pulling out or squeezing together its turns. After the preset capacitors have been correctly adjusted, it will be found that a single setting of C6 will suffice for each band.

It is advisable to have a selection of values of fixed capacitors to hand, as a fair amount of experimentation was required, and in accordance with the principles established by Murphy, it is unlikely that exact duplication will be achieved. Note that C3 (but not C8) is to be removed from the original circuit.

My practice is to load the exciter into the antenna using its automatic atu, switch the atu out and the linear in, adjust the linear input circuit, and load the linear into the antenna. In this way the exciter is already matched to the antenna if and when the linear is switched out of circuit. There is another atu available between the linear and the antenna, but this is rarely used and is retained mainly for the forward power and swr meters incorporated, as well as a multi-way antenna switch.

The hf antennas are an inverted V trap dipole for 3·5 and 7MHz, and a three-element trapped beam for 14, 21 and 28MHz. Any multiband antenna is essentially a compromise, and I have always felt that the trapped antenna afforded the best compromise, for the reason that if all is well, an antenna tuning unit is unnecessary, at least when using a valve pa.

Although trapped beams and verticals seem to be generally accepted without comment, mention of a trap dipole often results in references to "trap losses", the speaker apparently overlooking losses in the obligatory atu used with alternative multiband antennas, and which has to be adjusted when changing frequency.

Linear control circuits

In order to provide a contact for bias switching (see below), it became necessary to introduce an additional relay into the linear amplifier, and Fig 3 shows the circuit. The additional relay RLB is a miniature double-pole type which plugs into a 16-pin dil holder mounted on Veroboard. Switch S1 has also been added to increase operating convenience; it enables the amplifier to be switched in and out of circuit without switching off the mains, as was previously the case.

Grid bias and heat reduction

For some time I had thought about the desirability of reducing the heat generated in the amplifier, particularly during "receive" periods. One has little choice but to tolerate the heat from 100W of filament power, as it is

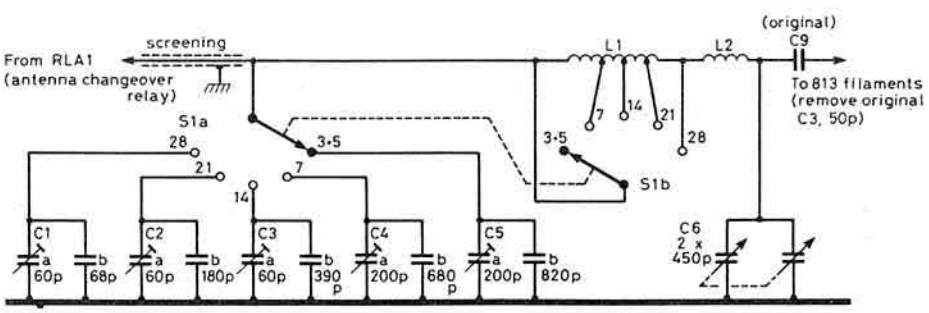
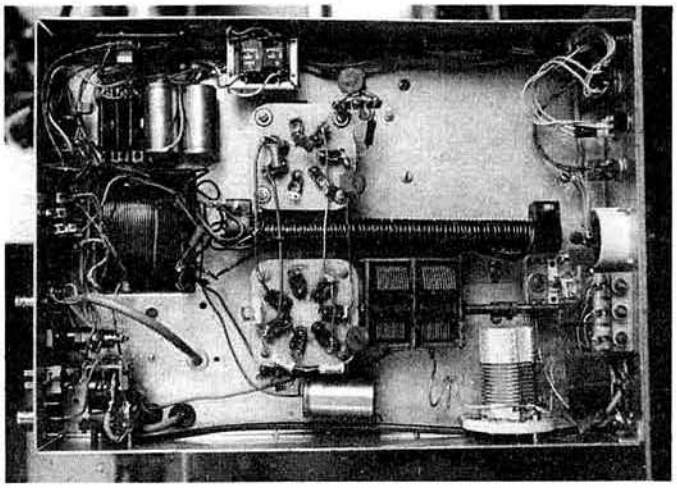


Fig 1. Matching network circuit diagram. S1a/S1b: two-pole five-way. L1: former dia 1·375in, 11t, 10t/in, 22swg, tapped 1t for 21MHz (from 28MHz coil), 2·25t for 14MHz, 5·5t for 7MHz. L2: 2·5t, 16swg, 0·75in dia, 0·75in long. C1a, 2a, 3a: 60pF mica compression. C4a, 5a: 200pF mica compression. C1b, 68pF; C2b, 180pF; C3b, 390pF; C4b, 680pF; C5b, 820pF—all 350/500V silver mica. C6: two-gang 450pF



Under-chassis view taken after modifications. The input matching and bias networks are visible in opposite corners. *Photo:* G6TXB

inadvisable to switch the filaments on and off unnecessarily frequently. However, the 150W or so of anode dissipation during receive periods can be completely eliminated by the application of sufficient negative grid bias to cut off all anode current. Also, with a bias supply available, it is an easy matter to add a few volts of bias on "transmit", one effect of which is a reduction of dissipation (and therefore heat) during transmission.

In addition, [2] tells us that: "The use of fixed bias on the control grid in the GL-813 amplifier tends to limit the control grid current, and keep grid dissipation within ratings". Furthermore, the application of cut-off bias would also eliminate any "diode hash" generated in the 813s when receiving. Although this has never been a problem with the original amplifier, it is possible that some constructors may experience the effect. Fig 4 shows the bias circuit. The voltage doubler supplies about 140V of negative bias which cuts off the 813s completely during the periods of receive. When the relay contact RLB2 closes on transmit, the grid bias falls to 5·6V as determined by the zener diode.

On transmit, the standing anode current has been reduced from an indicated 60–70mA to 40mA, and although these readings at the lower end of a 500mA scale cannot be relied upon, it is evident that at 2,000V, there must be a worthwhile reduction in dissipation and, therefore, heat.

Miscellany

As stated in the original article, the filament choke is not critical and inspection of a number of published designs shows that ferrite rods of varying lengths and diameters are usable. Since 6 by 0·375in rods seem to be very commonly available, it is suggested that two of these be used if necessary, taped together, and wound with about 20–25 spaced bifilar turns.

It has been suggested that the filament transformer should have an earthed centre tap instead of being earthed at one end. As far as one can see, the only consequence of this departure from ideal is less than one per cent of 50Hz modulation (with 2,000V ht and 10V filament). Perhaps not *completely* negligible, but unlikely to reach the ear. An artificial centre tap could be derived by using, say, two 20Ω 10W, wire-wound resistors in series across the filament transformer secondary, but it hardly seems worth the trouble. Note that changes in this area may affect relay supply circuits.

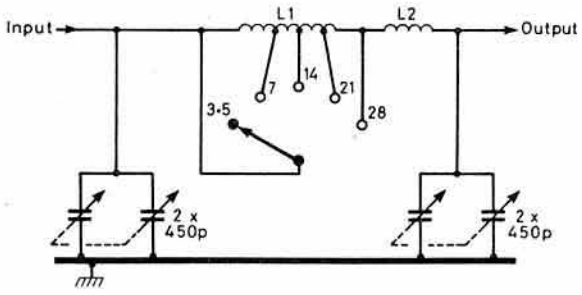


Fig 2. Versatile matching network (L1, L2, as Fig 1)

In the original article the polarity of the anode current meter was incorrectly shown in Fig 2; ie the negative, not the positive, side of the meter should be earthed.

Making room for the matching network entailed the substitution of a mains neon for the original oversize 6V indicator. I have found that neons purchased at rallies, even when described as 240V, often are 110V devices. The neon lamps themselves are identical, but for 110V the series resistor should be 100kΩ, and for 240V, 220kΩ.

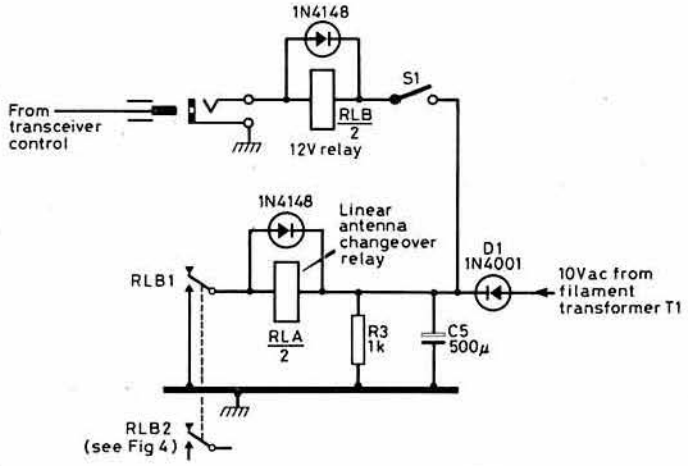


Fig 3. Addition of interposing relay $\frac{RLB}{2}$ and S1

VK5QG has suggested that the large insulated anode connectors originally used be discarded and the parasitic suppressors be connected as closely as possible to the valve anode caps. This is a sound suggestion which would probably increase the effectiveness of the parasitic suppressors.

Prospective constructors may care to know that a recent article on "low cost linear design and construction" [3], considered a number of alternative valves and came down in favour of the 813. It would be easy to be put off by the very high prices at which these valves appear in some advertisements, and one wonders whether they ever result in any sales. They *can* be found at moderate prices, ie less than £20, but the search could conveniently begin among friends and fellow club members.

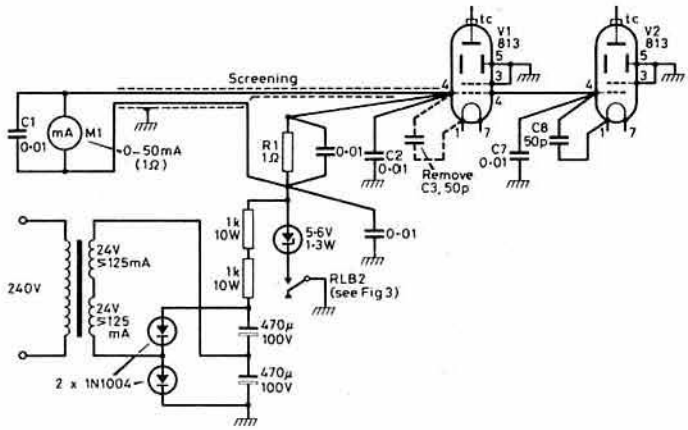


Fig 4. Grid bias circuit. Numbered components as per original article. Ensure that 0·01µF capacitors have adequate voltage rating (150V dc minimum)

A problem which may be encountered is the acquisition of valveholders, but this could be overcome with some ingenuity if necessary. The possession of even modest facilities should enable a means, perhaps unorthodox, to be found of holding or mounting the valves, and making the necessary connections to them. (A box full of new valveholders at £1 each was seen at the Brighton rally last year.)

Finally, the top of the screening has now been enclosed, both as a safety precaution and to confine, as far as possible, all rf energy. This has necessitated the addition of a small extractor fan on the rear of the screening above the filament transformer.

(Continued on p765)

Equipment Review

The Yaesu Musen FT980 hf transceiver

by Peter Hart, G3SJX*

Introduction

The FT980 was introduced early in 1983 and is currently Yaesu's most versatile transceiver. It is a mains-operated all-mode base station similar in style and concept to the FT-ONE [1] but out-classing even that transceiver in terms of built-in facilities.

The unit incorporates a general coverage receiver and amateur bands transceiver with comprehensive frequency selection facilities using frequency synthesis and multiple memories. Extensive interfacing is provided for transverters; linears and a computer.

The item reviewed comprised FT980 with built-in keyer, extra cw filter and external RS232 computer interface.

Principal features

The FT980 uses fully-solidstate broadband circuitry and is intended for ac mains operation only. In amateur bands mode the bands are covered in 500kHz segments, and in general coverage mode continuous tuning from 150kHz to 29·99999MHz. Separate vfos are used in the two modes. The frequency may be set in a variety of ways:

(1) Rotary knob tuning in steps of 10Hz at 10kHz per revolution.

(2) Single or repeated band select buttons shifting 500kHz in general coverage mode or amateur bands in HAM mode.

(3) Single or repeated steps of 5kHz.

(4) Scanning at rates of 300Hz or 30kHz per second from the front panel or from a suitable microphone.

(5) Keyboard entry of frequency to a resolution of 10Hz.

(6) Frequency selection from one of 12 memories.

The memories store mode as well as frequency, and may be backed up by using two AA-sized batteries to prevent loss of data when the power is removed. Push-button facilities allow preview of memory contents, vfo from memory frequency, split-frequency transceive operation, set frequency between limits (TABs), and receive and/or transmit clarifier (irt) giving an offset to ± 10kHz in 10Hz steps.

Two blue fluorescent displays are provided. The main display is seven digit giving 10Hz resolution. A second display attempts to simulate an analogue film scale (Racal RA17 for example) by sideways scrolling a three-digit display with a cursor. This second display is rather confusing. USB, lsb, cw, a.m., fsk and fm modes are provided with two selectable bandwidth settings for cw and a.m.

Receiver functions include i.f. shift and width controls, adjustable noise blanker, three-position rf attenuator, fast/slow agc, audio peak filter and i.f. notch.

Transmitter functions include speech processor, vox, transmission monitor, microphone squelch, full break-in on cw also useful for Amtor, comprehensive metering of current, compression level, power output and vswr, and a thermostatically-controlled fan. The fan is somewhat noisy in operation.

The rear panel carries an amazing array of connectors and switches, as can be seen from the photograph. These include antenna, separate receiver antenna, antenna output to separate receiver, inputs for straight and automatic keys, fsk, ptt and audio, outputs for low level rf, rx i.f., rx af and external speaker. Switches select normal/QSK linear, keyboard "beep" tone on/off, 25kHz marker on/off, selectable fsk shift and selectable cw pitch frequency. Interfacing is provided for control of linear (including full break-in linears), transverters and controlling computer.

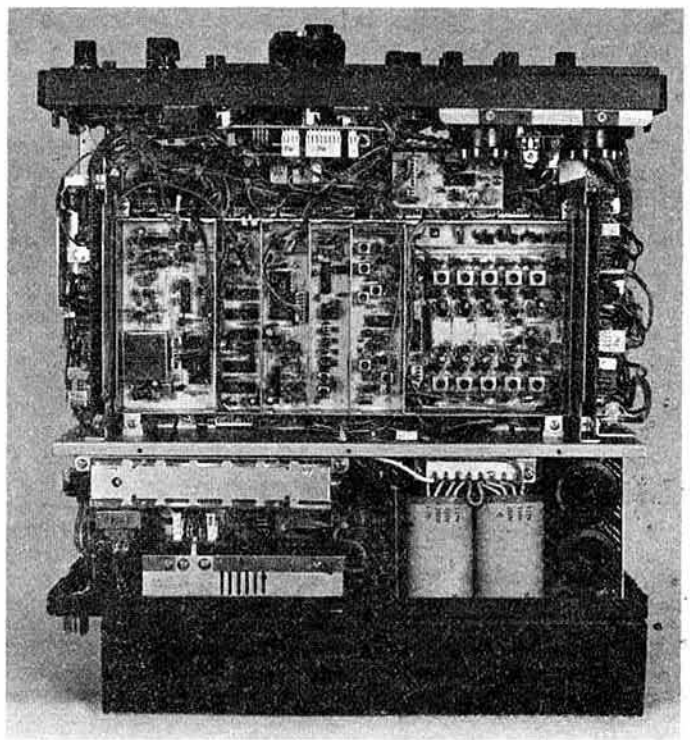
Extra i.f. filters for cw bandwidths of 300 and 600Hz and a.m. bandwidth of 5kHz are available as options. A built-in keyer unit is also an option. Matching accessories include SP980 external loudspeaker and computer interfaces for RS232, Apple 2 and NEC PC8001 computers. The FC757AT automatic atu is also fully compatible with the FT980.

The transceiver is provided with a 36-page instruction manual which covers, in detail, operation and installation of the equipment. Block and circuit diagrams are given, but no technical descriptions or service information. A 125-page technical supplement is available which gives full service details.

Description

The FT980 falls in the large category measuring 38 (w) by 16·5 (h) by 42·5cm (d) and weighing 17kg. Many of the controls are push-button or keypad operated, and most of the rotary controls are of the dual-concentric variety. The transceiver is sturdily constructed with a steel chassis and diecast front panel. The circuit boards are mounted on both sides of the chassis and interconnected with the usual cable harness and multiway plug and sockets. This is a cheaper form of construction than the FT-ONE, which uses fully screened, vertically mounted plug-in boards. The memory back-up batteries are mounted underneath, and a 9cm diameter speaker is mounted in the top of the case.

The overall equipment is highly complex, using—according to the technical manual—nearly 800 semiconductor devices. A simplified block



Top view of the FT980 with covers removed

*42 Gravel Hill, Addington, Croydon, Surrey.

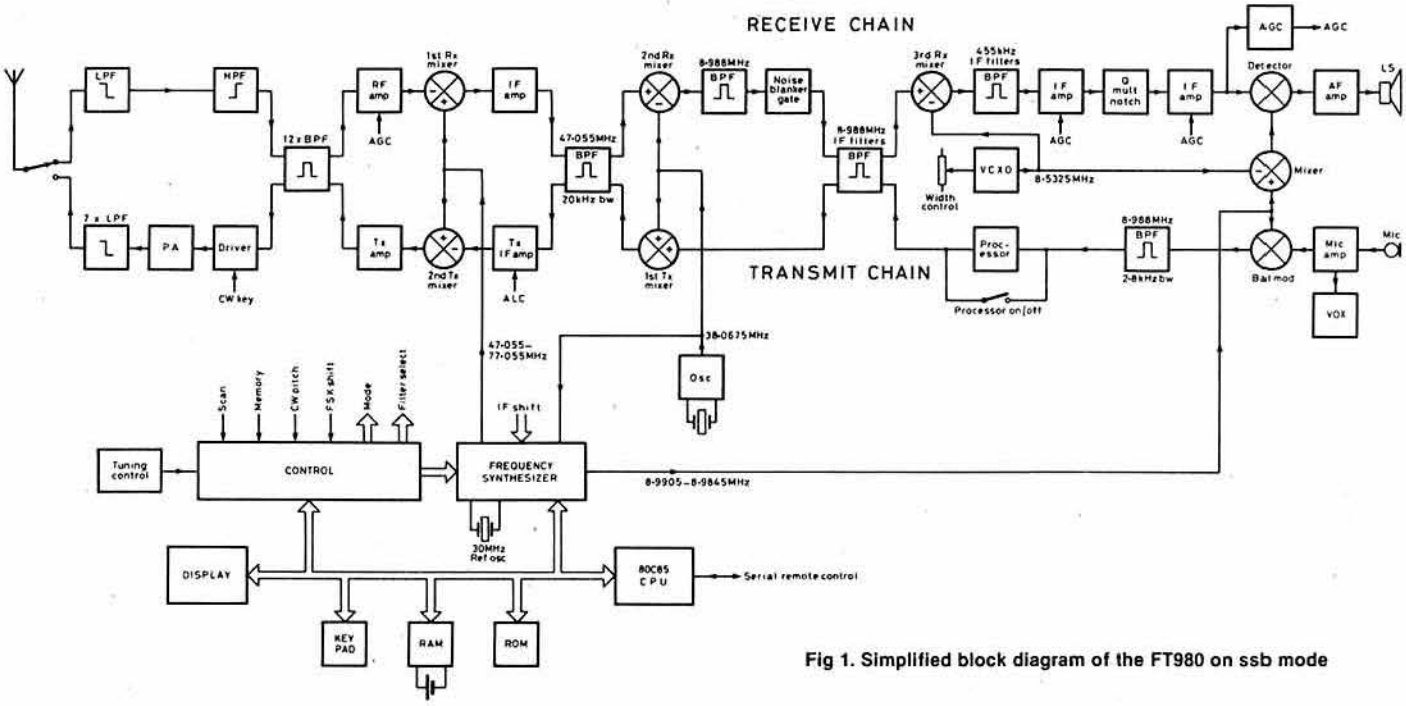
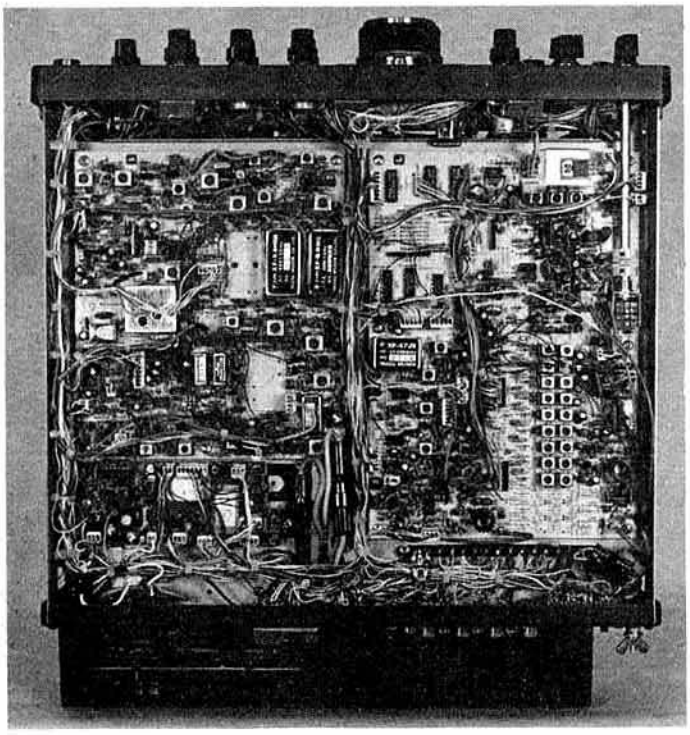


Fig 1. Simplified block diagram of the FT980 on ssb mode

diagram on ssb mode is shown in Fig 1. Separate receiver front-ends are used in general coverage and amateur band modes. In amateur band mode separate bandpass input filters are used for each band, and these are also used on transmit. The receiver rf amplifier comprises a cascode pair of jfets, and the mixer a push-pull pair of jfets. Most of the signal circuitry uses discrete transistors and fets. The transmitter pa operates from a 24V supply, with the remainder of the non-digital circuitry operating from 13·5V.

The frequency synthesizer uses three phase-locked loops to generate the local oscillator frequency 47·055–77·055MHz in 10Hz steps. One of 10 final vcos is used to limit the tuning range of each vco to 3MHz and hence improve noise performance. An eight-bit 80C85 microprocessor is used to perform all control functions. These functions include frequency selection and control, filter and mode selection, display, memory, clarifier, fsk shift, cw pitch and i.f. shift. The i.f. shift control comprises a five-bit binary coded switch (hence 32 positions) which provides data for the frequency synthesizer. The main rotary tuning control drives a slotted disc and photochopper giving 1,000 steps/revolution of the knob. This degree of resolution is a great improvement on earlier systems.



Bottom view of the FT980 with covers removed

Measurement technique

The measurement technique was similar to that used in previous reviews [2], [3] and [4]. All signal input voltages are given as pd across the antenna terminal, and two-tone intermodulation products are quoted with respect to either originating tone. Unless stated otherwise, all measurements were made on ssb.

Receiver measurements

Sensitivity

Table 1 shows the sensitivity figures on ssb. These indicate a noise floor of −133 to −136dBm, or a noise figure of about 5 to 8dB. On 28MHz the fm sensitivity was 0·28μV for 12dB s+n:n for 3kHz peak deviation of a 1kHz modulating tone. The step attenuator was within 1dB.

Table 1. Receiver measurements

Frequency	Sensitivity on ssb for 10dB s+n:n	Input for S9	Image rejection	47·055MHz i.f. rejection
1·8MHz	0·13μV (−125dBm)	70μV	94dB	69dB
3·5MHz	0·14μV (−124dBm)	80μV	95dB	72dB
7MHz	0·14μV (−124dBm)	90μV	92dB	73dB
10MHz	0·13μV (−125dBm)	80μV	101dB	88dB
14MHz	0·11μV (−126dBm)	56μV	108dB	93dB
18MHz	0·14μV (−124dBm)	63μV	96dB	82dB
21MHz	0·16μV (−123dBm)	70μV	88dB	81dB
24MHz	0·14μV (−124dBm)	63μV	87dB	82dB
28MHz	0·14μV (−124dBm)	70μV	86dB	80dB

S-meter calibration

The input signal level required to give an S9 meter reading is shown in Table 1, and on 14MHz the calibration was as follows:

S-reading	Input signal	Relative increase
S1	0·8μV	
		10dB
S3	2·5μV	
		9dB
S5	7μV	
		9dB
S7	20μV	
		9dB
S9	56μV	
		20dB
S9+20	560μV	
		18dB
S9+40	7mV	

The linearity is excellent.

Spurious responses

Table 1 shows the rejection of the primary image frequency which occurs 94·11MHz above the frequency to which the receiver is tuned, and also the rejection of the first i.f. on 47·055MHz. Half i.f. rejection of 23·5275MHz was better than 110dB, except on 24 and 28MHz where the figures were 84 and 97dB respectively. Rejection of the 8·9875MHz i.f. was better than 115dB.

With the antenna terminated in 50Ω only one spurious signal of any note was found, on 28·854MHz, and that was not strong enough to move the S-meter. Other spurious signals were about equivalent to the noise floor.

Other spurious responses, checked as in [3], greater than 100kHz off-tune were:

Frequency	Worst response	Other responses
1·8MHz	None up to 200mV	
3·5MHz	140mV	None up to 200mV
7MHz	100mV	None up to 200mV
10MHz	3mV	None up to 200mV
14MHz	None up to 200mV	
18MHz	60mV	None up to 200mV
21MHz	100mV	None up to 200mV
24MHz	30mV	One at 45mV
28MHz	40mV	Two at 50mV

This result is excellent. In addition, a number of close-in (within 100kHz) responses were obtained at around 100mV.

AGC performance

The age threshold was measured as 0·8μV. A 120dB increase in the signal level above the threshold resulted in a 2dB increase in audio output. The attack time was about 2ms, and the decay time 0·5–1s in the fast position, or 1·5–3·5s in the slow position depending on signal level.

Selectivity

I.F. selectivity measurements were made with the width control at maximum. Reciprocal mixing limited measurements to about 55dB down the filter skirts. Results for the various modes were as follows:

	BANDWIDTH			
Response	SSB	CW(W)	A.M.(W) or fm	A.M.(N)
−6dB	2·25kHz	630Hz	6·0kHz	3·61kHz
−50dB	3·93kHz	4·47kHz	11·8kHz	5·66kHz

The cw filter exhibited a reasonable skirt response down to −40dB but then broadened dramatically. This may be due to leakage around the filter or to a faulty filter.

Reciprocal mixing

Measurements made at 21·4MHz on ssb were:

Frequency offset	Input level	Level with respect to noise floor
3kHz	−67dBm	66dB
5kHz	−64dBm	69dB
10kHz	−56dBm	77dB
20kHz	−45dBm	88dB
30kHz	−39dBm	94dB
50kHz	−30dBm	103dB
100kHz	−19dBm	114dB
150kHz	−12dBm	121dB
200kHz	−7dBm	126dB
300kHz	+1dBm	134dB

These figures indicate an oscillator noise sideband performance of −110dBC/Hz at 10kHz off-tune. This is a rather poor result. The close-in noise sideband levels of the FT980 local oscillator are at a relatively high level, similar to the FT-ONE [1], and very much higher than the Icom IC740 [5] or the non-synthesized FT102 [3]. However, at spacings greater than 20kHz from the carrier, the FT980 is substantially better than the FT-ONE, and at greater than 150kHz the FT980 is better than both the IC740 and FT102.

Blocking

Front-end blocking occurred at input levels of −4dBm (140mV) with on-tune signal levels up to S9. Within 15kHz of the on-tune frequency this figure degraded by up to 16dB by signals passing through the 47MHz roofing filter and blocking the second mixer. However, reciprocal mixing predominates at these offsets, as can be seen in Fig 2.

Third-order intermodulation

A signal spacing of 50kHz was used to avoid the effects of reciprocal mixing. A third-order intercept of +10dBm was measured, giving a two-tone spurious-free dynamic range of 96dB in ssb bandwidths.

I.F. inband linearity was assessed with 200Hz signal spacings [3]. The level of intermodulation products generated was fairly constant at −30dB for input signals up to 70mV.

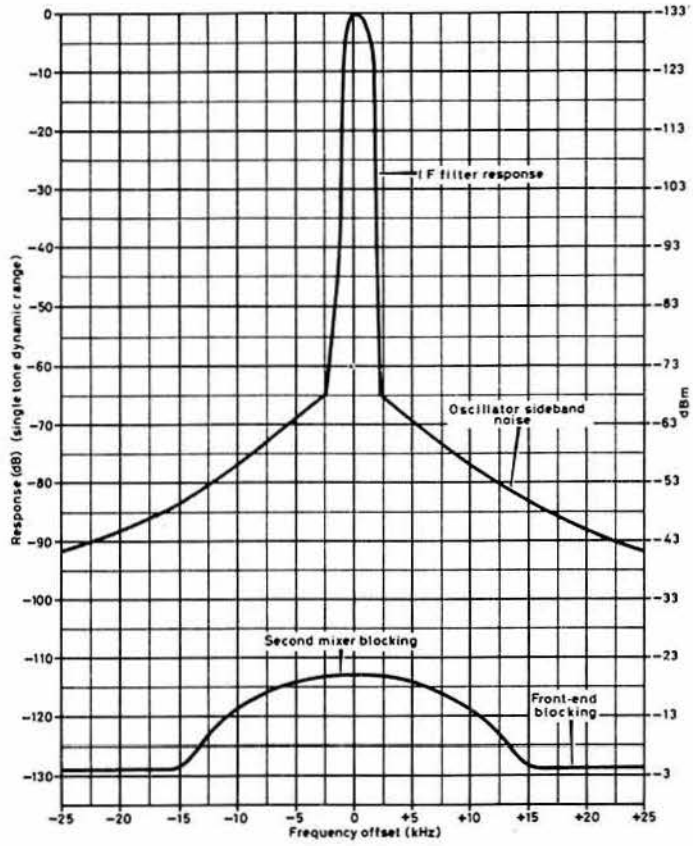


Fig 2. FT980 effective selectivity curve on usb

Audio

The maximum audio power output before the onset of clipping was 1·3W into an 8Ω load, or 2W into a 4Ω load. Up to this level the distortion was constant at about three per cent. Maximum audio output could be achieved with 0·8μV input signal.

Transmitter measurements

CW power output, harmonics and spurii

Setting the drive according to the manual, the maximum cw power output together with the harmonics and other spurii were:

Frequency	Power output	Harmonics	Other spurii
1·8MHz	101W	−60dB	Less than −85dB
3·5MHz	96W	−59dB	Less than −85dB
7MHz	90W	−55dB	−78dB, −82dB
10MHz	90W	−54dB	−74dB, −82dB
14MHz	93W	−57dB	−75dB, −78dB
18MHz	97W	−55dB	−72dB, −79dB
21MHz	100W	−55dB	Four −74 to −80dB
24MHz	105W	−54dB	Four −65 to −80dB
28MHz	94W	−54dB	Five −62 to −80dB

In addition to the spurii noted above, a number of close-in spurii were observed up to ±20kHz, and in particular at ±17kHz, at levels of −60 to −70dB on all bands.

Fig 3 shows the cw keying envelope when keying at 40wpm. The rise and fall times are a little sharp and there is noticeable shortening of the character.

SSB power output and distortion

With maximum two-tone audio drive according to the manual, the following results were obtained with the processor off:

Frequency	Power output (P.E.P.)	Third-order ips	Fifth-order ips
1·8MHz	108W	−34dB	−45dB
3·5MHz	103W	−34dB	−38dB
7MHz	94W	−34dB	−38dB
10MHz	95W	−29dB	−38dB
14MHz	99W	−34dB	−34dB
18MHz	102W	−34dB	−34dB
21MHz	106W	−30dB	−34dB
24MHz	109W	−25dB	−32dB
28MHz	99W	−24dB	−31dB

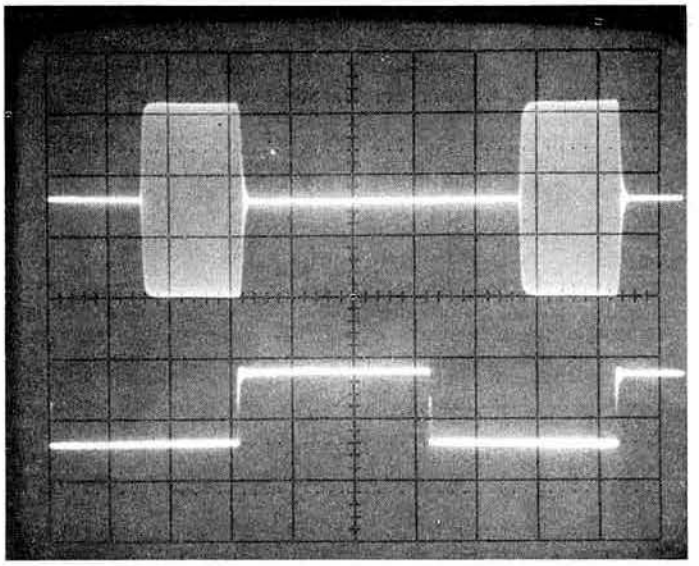


Fig 3. CW keying waveform (bottom) and rf envelope (top) at 40wpm. Horizontal scale 10ms/div

The intermodulation product level at ±10kHz was around −60dB, and at ±20kHz was −70 to −80dB.

With the processor in circuit and 10dB speech compression, inband intermodulation products were degraded but the wideband products were the same. See Figs 4 and 5.

The carrier suppression was −60dB, and sideband suppression unmeasurable at better than −70dB.

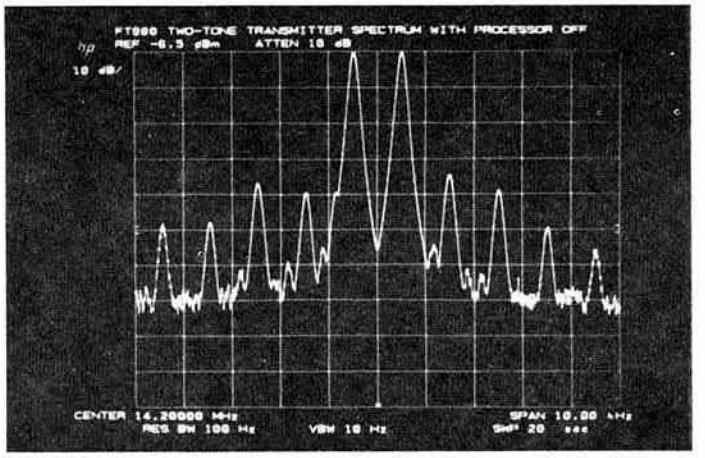


Fig 4. Two-tone transmitter spectrum with processor off. Vertical scale 10dB/div. Horizontal scale 1kHz/div

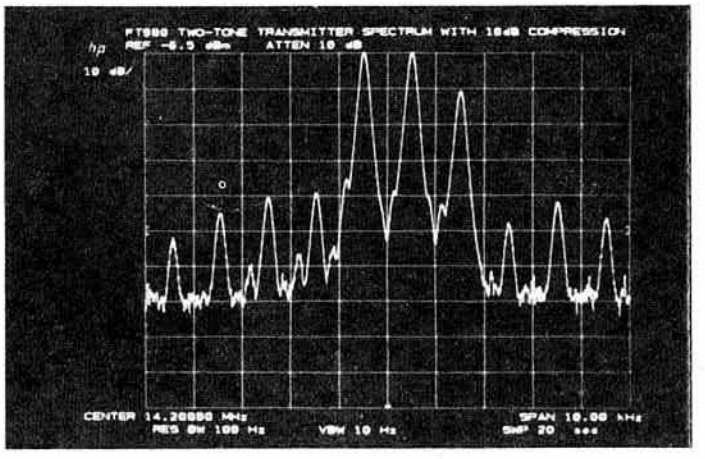


Fig 5. Two-tone transmitter spectrum with processor on. Vertical scale 10dB/div. Horizontal scale 1kHz/div

Audio

The audio bandwidth was measured as 210Hz–2·7kHz at the −6dB points, and both lsb and usb gave the same result. Full output could be achieved with 1·7mV af input at the microphone and audio distortion was less than 0·3 per cent.

Transmitter noise output

Noise measurements at full output on cw at 21·4MHz (see [3]) were:

Frequency offset	Noise output	Noise output with respect to carrier in a 2·5kHz bandwidth
5kHz	−50dBm/Hz	−66dB
10kHz	−56dBm/Hz	−72dB
20kHz	−68dBm/Hz	−84dB
50kHz	−82dBm/Hz	−98dB

These figures agree fairly well with the receiver reciprocal mixing figures.

Operation into mismatched loads

This measurement was fully described in [4]. On 28MHz, with full cw power output, the transmitter delivered between 75 and 81W into a 2:1 load vswr, and between 53 and 66W into a 3:1 vswr.

Frequency stability

Frequency drift on 28MHz amounted to 40Hz during the first hour from switch-on, and a further 14Hz during the second hour.

Low power (transverter) output

The manual does not describe how to operate the transceiver in transverter mode. Grounding pin 1 of the 28-pin accessory connector ACC-1 will disable the pa. Also, grounding pin 9 will cause the MHz display to read 144 when the band-up button is operated beyond 28MHz. Further stepping of the band-up button will cause the display to advance in 0·5MHz steps up to 148MHz. The actual rf output or receive input will lie in the range 28–30MHz for 144–146MHz and repeat for 146–148MHz. As an alternative to grounding pin 9, grounding pin 7 will cause the display to read 50–54MHz, pin 8, 70–74MHz; pin 10, 220–226MHz; and pin 11, 430–440MHz. The actual i.f. in each case is 28–30MHz repeating as many times as necessary to cover each respective band. This is a very elegant system.

Measurements of the low-level rf output show that the spurious outputs can be excessively high if the drive control is advanced by more than one third. At this level −3dBm output power is available on all bands. High Q filtering should be used to limit the level of harmonics, spurii and local oscillator feedthrough. Fig 6 shows the output spectrum on 28MHz.

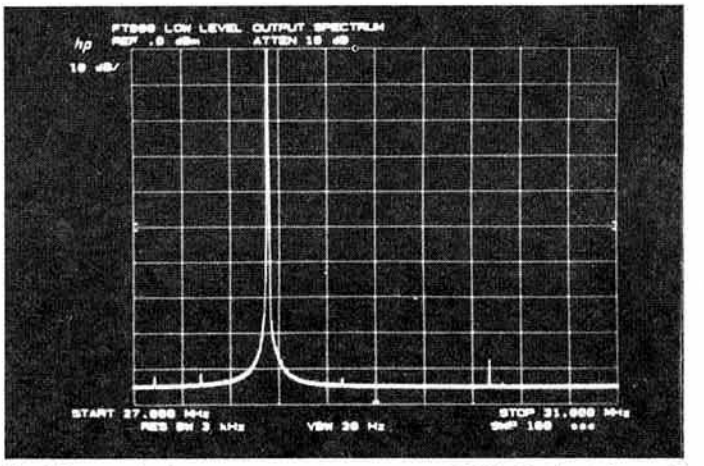


Fig 6. Transverter low-power output spectrum on 28MHz. Horizontal span 27 to 31MHz. Vertical scale 10dB/div

On-the-air performance

The initial confrontation with an FT980 front panel can be a rather daunting experience. However, it is not as complicated as at first sight, and after a thorough reading of the manual is capable of very flexible operation.

The electrical performance of the transceiver was very good. The receiver sounded clean and coped well with strong and weak signals. Full break-in on cw was effective but the cw filter noticeably lacked skirt selectivity. Dynamic reciprocal mixing or clicks when tuning close to a strong signal was much better than most other synthesized equipment. The memories are easy to use but there is no transfer of memory frequency to vfo. The memory shift facility leaves some of the front panel controls disabled.

On transmit, audio quality reports were very complimentary using the MH-1B8 handheld microphone. On cw, key clicks were reported by local stations up to 5kHz off frequency. The keying characteristic really needs some attention. The fan was noticeably noisy.

The review transceiver proved to be somewhat unreliable, having to be returned three times for repair with different faults on each occasion. Other owners do not seem to have had these problems.

Computer control

The FT980 provides facilities to control a number of functions from an external microcomputer. These include all frequency setting functions, i.f. shift and width, fsk shift, clarifier, mode and memory control.

The 80C85 microprocessor used in the FT980 incorporates a primitive serial input/output capability. These two cpu pins (SID and SOD) are routed to the external control five-pin DIN connector on the rear together with the agc and ptt lines.

Three external interface units are available, the FIF80 to connect to an NEC PC8001 computer, the FIF65 for an Apple 2, and the FIF232C to connect to any computer with RS232 compatible interface. The review FT980 was used in conjunction with the FIF232C and a BBC model B microcomputer. Data is input to or output from the FT980 at 5V logic levels as asynchronous Ascii characters (start bit, eight data bits, two stop bits) at a data rate of 4,800baud. The FIF232C comprises a dual opto-isolator, level shifting circuitry and mains psu. Only the data lines of the RS232 standard are used, the control lines are not implemented. For the BBC computer, connect CTS to +5V, leave RTS open circuit, connect computer data out to FIF232C data in and computer data in to FIF232C data out.

Data transfer must follow the following format:

(1) Computer sends five-byte command to the FT980. This five-byte code comprises one byte instruction (eg set frequency) and four bytes data (eg the frequency to be set).

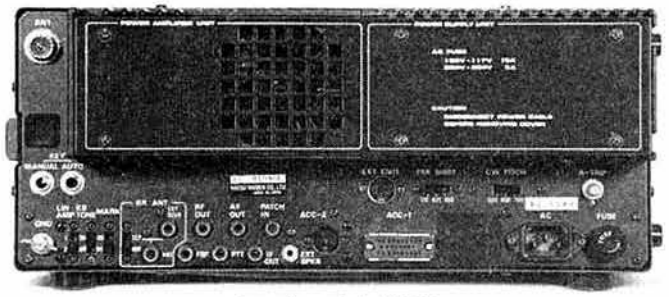
(2) FT980 echoes back the five byte command.

(3) Computer compares the echoed back command with the outgoing command and if correct sends a five-byte acknowledgement. If incorrect, step **(1)** is repeated.

(4) FT980 responds with status information which can be from 1 to 147 bytes long.

The controlling computer must be programmed by the user to perform this data exchange. In general, this is likely to be a machine-code routine. However, if the controlling computer has sufficient RS232 buffer storage, as with the BBC computer, Basic might also be used. The agc line and ptt may be used for external processing of signal level and transmit/receive (via the analogue and user ports on a BBC microcomputer, for example).

A fair amount of software is required to perform relatively simple routines. It is difficult to envisage a particularly useful application, but



Rear view of the FT980

possibilities exist for a large increase of memory channels stored on computer, scanning of beacons and plotting amplitude against time to forecast vhf openings, automatic search for rtty or cw "CQ" calls, automated Amtor etc.

Conclusions

The FT980 is a highly-versatile base station transceiver with an excellent performance. Every conceivable facility is provided. About the only shortcoming in its performance is a high level of close-in oscillator sideband noise. This seems to be a common failing of Yaesu transceivers.

The price, including VAT, is £1,329, the SP980 external speaker is £61.55, and FIF232C computer interface is £59.00.

Acknowledgements

The reviewer would like to thank G3UFY and G3RQZ for critical comments on the transmission, and South Midlands Communications Ltd for the loan of the equipment.

References

[1] "The Yaesu Musen FT-ONE hf transceiver", P. J. Hart, G3SJX. *Rad Com* October 1982, pp854-8.

[2] "The Icom IC720A hf transceiver", P. J. Hart, G3SJX. *Rad Com* February 1982, pp129-33.

[3] "The Yaesu Musen FT102 hf transceiver", P. J. Hart, G3SJX. *Rad Com* January 1983, pp32-6.

[4] "The Yaesu Musen FT77 hf transceiver", P. J. Hart, G3SJX. *Rad Com* June 1984, pp482-6.

[5] "The Icom IC740 hf transceiver", P. J. Hart, G3SJX. *Rad Com* November 1983, pp985-9.

Follow-up to the low-budget hf linear amplifier

(Continued from p760)

Conclusion

In my opinion, it is a pity that the utter simplicity of the original circuit has had to be sacrificed by the addition of the tuned input, but on balance the advantage lies with the solidstate transceiver with single knob tuning. Comfort may be drawn from the following quotation from an article which appeared as long ago as 1961, and which included the well-known and highly-respected Bill Orr among its authors: "The use of the tuned cathode circuit in a grounded-grid linear amplifier stage improves linearity, increases the power output, makes the stage easier to drive, and reduces the burden placed on the sideband exciter" [4].

What more could one ask?

References

[1] "A low-budget hf linear amplifier", E. J. Hatch, G3ISD. *Rad Com* May 1982.

[2] "Kilowatt grounded-grid linear amplifier with paralleled GL-813s". *G. E. Ham News, Sideband Handbook*, 1st edn 1961 (USA).

[3] "Low-cost linear design and construction", R. P. Haviland, W4MB. *Ham Radio* December 1982 (USA).

[4] "The grounded-grid linear amplifier", William I. Orr, W6SAI, Raymond F. Rinaudo, W6KEV and Robert I. Sutherland, W6UOV. *QST* August 1961 and many editions of *Single Sideband for the Radio Amateur* ARRL (USA).

Damn! I forgot to ask him to QSL

A TRANSCEIVER FOR THE HF BANDS

by Lorin Knight, MIEE, G2DXK*

Part Four

THIS MONTH an outline is given of the recommended procedure for commissioning and testing the basic receiver section of the transceiver.

Test equipment

In order to test and align the receiver (and the remaining sections of the transceiver) certain vital pieces of basic test equipment will be needed. These are:

(a) A dc test meter.

(b) A simple homemade rf voltmeter, such as is shown in Fig 47. The 100μA movement can be that eventually destined for the S-meter. By adding a 100μF capacitor as shown, the meter can be converted to read af.

(c) Some method of measuring frequency. It is possible to use a general coverage sw receiver for the initial testing and commissioning, but something a little better will be required for the final calibration before one goes on the air—not only for one's own self-satisfaction but in order to meet the requirements of the transmitting licence.

(d) A signal generator covering approximately 4,429 to 4,437kHz for commissioning the 4,433kHz filter. Such a generator can be made quite easily by temporarily putting a special pcb into the vfo box instead of PCB2. Details of this test oscillator board (PCB17) are given in Figs 48, 49 and 50.

A 12V supply will also be required. If this is capable of supplying up to about 500mA it will be adequate for operating the transceiver on TRANSMIT.

A suitable power supply can be improvized from a 4A car battery charger, as shown in Fig 51. The voltage stabilizer ic can be used later for a self-contained power supply.

*177 Baldock Road, Letchworth, Herts SG6 2EJ.

Preliminary steps

Before installing any of the pcbs, it is recommended that all the following be done:

(a) Fit the boxes for the bfo, the 4,433kHz filter and the vfo.

(b) Fit the vfo tuning capacitor, the drive and the dial.

(c) Fit and connect up relay RLA and the capacitor C1101.

(d) Fit the other front panel controls and the l.e.ds.

(e) Fit all the various sockets to the cabinet.

(f) Make sure that the S-meter fits into the holes provided. (It is not necessary to fit the meter at this stage if it is required for the rf voltmeter).

Test oscillator

The recommended next step is to install the test oscillator board (PCB17) and the vfo amplifier board (PCB2A). Connect the vfo amplifier to +12V and its input to the input pin of the test oscillator. Connect the +9V pin on the oscillator board to the rear feedthrough capacitor, taking the other end of this capacitor for the moment via a 330Ω resistor to +12V. If there is no degree scale on the vfo tuning drive, fit a temporary one and set it so that 0° corresponds to maximum capacitance (ie lowest frequency). Switch to Sector B so that relay RLA is not energized.

Switch on the power and adjust R1203 to bring the rf output from the vfo amplifier to about 0·3V. Adjust L1201 so that the mid-scale frequency is somewhere around 4,430kHz. Now take one of the 4,433kHz crystals and connect up as in Fig 52. Tune the oscillator until a peak is seen in the meter reading, indicating the series resonance of the crystal. It may be necessary to adjust L1201 and C1203 to find this resonance. Having done so, adjust C1203 to bring the resonance point to about midway on the tuning scale (with the lid in place on the vfo box). At this stage it is advisable to cement the core of L1201 into position, using polystyrene cement, so that it does not move.

Now the series resonant frequencies of all the 4,433kHz crystals can be measured, using the arbitrary degree scale, and each crystal can be allocated its position in accordance with Table 2.

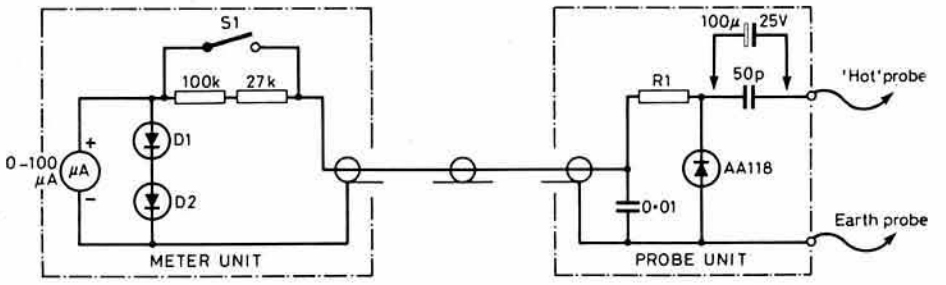


Fig 47. Circuit of simple rf meter

The probe unit is assembled on a small piece of Veroboard and has two flexible 3in leads which are terminated in small insulated crocodile clips. The meter unit is mounted in a small plastic box (eg a margarine tub) and is linked to the probe unit with a length of screened lead
R1 has a value of 14,140Ω minus the meter resistance. D1 and D2 are small germanium diodes to protect the meter against excessive overloads—but check that they do not have any significant effect on the meter reading at full scale deflection. With a low resistance meter only one diode may be needed
The switch, S1, provides two ranges, namely, 1V and 10V rms full scale
NB. Later, for the transmitter modulator, a pair of matched AA118 diodes will be required. It might be advisable to purchase several of these, to put aside the pair whose forward and reverse resistances are most alike, and to use one of the odd ones for the rf voltmeter

Components list for the test oscillator board (PCB17)

C1201	180pF silvered mica*
C1202	1,200pF polystyrene*
C1203	20pF air-spaced trimmer; if not available use 2-22pF Mullard miniature film dielectric trimmer (Maplin Electronic Supplies, Electrovalue)
C1204	20pF miniature ceramic plate
C1205	100pF miniature ceramic plate
C1206, 1207, 1209	10nF mylar
C1208	1,000pF polystyrene
R1201	100kΩ 0·25W
R1202	100Ω 0·25W
R1203	1kΩ subminiature preset (horizontal)
R1204	330Ω 0·25W
R1205	4·7kΩ 0·25W
TR1201	2N3819
D1201	6·8V 400mW zener
L1201	29t 28swg enam wire on 0·25in diameter former with 6mm core (eg former type 351 from Maplin Electronic Supplies)
RFC1201	1mH

*Assuming 75pF tuning capacitor.
For 50pF tuning capacitor, C1201 = 180pF, C1202 = 1,000pF
For 25pF tuning capacitor, C1201 = 220pF, C1202 = 680pF

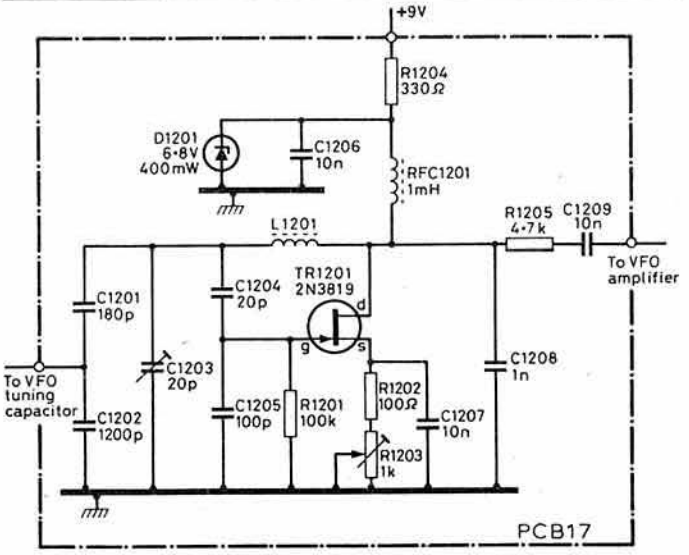


Fig 48. Circuit of the test oscillator board (PCB17)

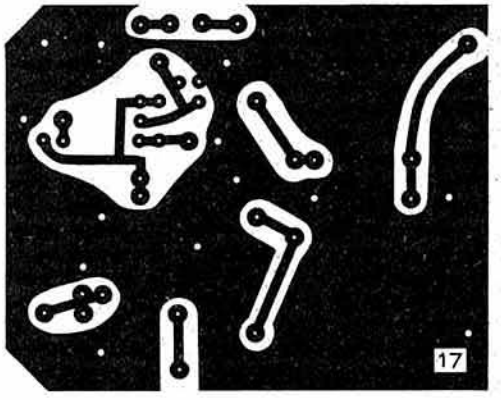


Fig 49. Etching pattern for the test oscillator board

The i.f. and af stages

The next step is to install the i.f. amplifier, af amplifier and af output modules (PCB6, PCB7, PCB8). Fig 14 shows how these pcbs are positioned physically, and Fig 11 shows the interconnections between them. For the time being take the +12V(R) terminals direct to the +12V line and leave the +12V(T) terminal unconnected. Connect to a loudspeaker and switch on.

On the af amplifier board (PCB7) check that the collectors of TR801 and TR802 lie somewhere between +4V and +8V, and that the collector of TR804 is at +5·6V. Make a preliminary test of the af stages by touching a small screwdriver onto the input pin of PCB7; this should produce a buzz in the loudspeaker.

Next check that the i.f. amplifier is working. Immobilise the agc by

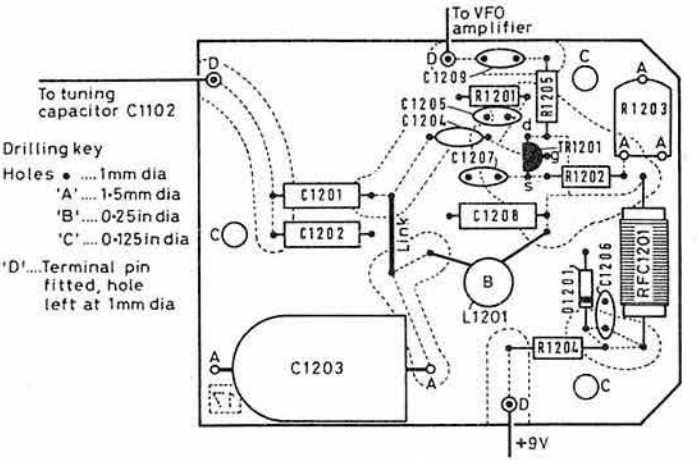


Fig 50. Component layout of the test oscillator board

turning R805 on PCB7 fully clockwise and turn down the RF GAIN control. Solder a temporary lead from the output pin of the vfo amplifier to the input of the i.f. amplifier board (PCB6). Put the rf voltmeter to the 1V position and connect to the junction of R705 and C713 on PCB6. When the RF GAIN control is turned up, the meter should indicate some output from the i.f. amplifier. Tune the i.f. coils, L701, L702, L703 on PCB6 for maximum meter reading.

Care must be taken not to damage the cores of these coils. A suitable trimming tool can be made by grinding the tip of a small screwdriver so that it is a good fit with the slot in the core and does not have any burrs or rough edges. When using the trimming tool always hold it perpendicular to the pcb and turn it gently.

The agc circuitry can be given a first check now. With the test oscillator still feeding into the i.f. amplifier, and the RF GAIN control turned up, turn R805 on the af amplifier board (PCB7) fully anti-clockwise. This should cause the voltage across the RF GAIN potentiometer to fall from 5·6V to around 2V.

BFO

It is recommended that the bfo be tested next. Install PCB9 and connect up as shown in Fig 11. At this stage, as a temporary measure, it will be necessary to connect an rf choke of the order of 1mH across the points (I) and (J). The +12V(cw) and +12V(ssb) outputs from the bfo box should not be connected to anything for the time being. Set each of the two trimmer capacitors to a midway position and check that the bfo works in both positions. The rf voltmeter should indicate around 4V at point (I).

If the test oscillator is now tuned, an audible beat should be heard from the loudspeaker as the test oscillator passes through the bfo frequency.

If the constructor does not have any other means for precise calibration of the test oscillator, an approximate calibration can now be done using the af stages, whose frequency response is fairly closely defined by the component values used. The method is as follows. Replace the loudspeaker by an 8·2Ω (or 10Ω) 0·5W resistor to eliminate the influence of the speaker on the measured response. Across this resistor connect the rf voltmeter, converted to read af volts as shown in Fig 47. Make sure that the agc is immobilized, ie that R805 on the af amplifier board (PCB7) is turned fully clockwise. With the AF GAIN at maximum, tune the oscillator for maximum meter reading, adjusting the RF GAIN control to bring the maximum meter reading to precisely 1V. Then off-tune the test oscillator in each direction until the meter reading drops to 0·2V. These two points will correspond to af outputs of approximately 180 and 3,400Hz respectively. This means that

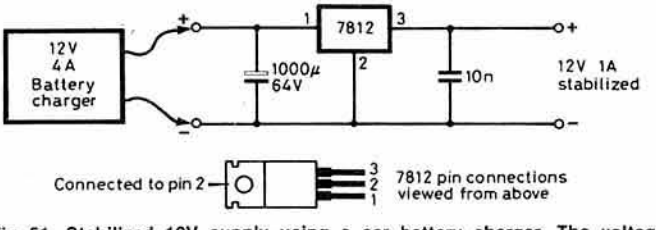


Fig 51. Stabilized 12V supply using a car battery charger. The voltage regulator ic should be mounted on a small aluminium plate or box to provide some heat-sinking

the two points are approximately 3,220kHz apart and thus one can calculate the number of scale divisions/kHz. Since the scale shape will be essentially linear, this relationship can be safely assumed to exist over the whole tuning scale.

This will allow filter bandwidth measurements to be made with an accuracy of about ± 10 per cent. Provided that the test oscillator has been carefully made, and the lid of the diecast box is firmly screwed down, the frequency drift of the test oscillator should not be more than about 30Hz in any 15min period—once it has had 20min or so to settle down. Thus any frequency drift of this oscillator should not have any very significant effect on filter bandwidth measurements provided that these are done reasonably quickly.

4,433kHz filter

The 4,433kHz filter can now be checked. Connect the magnet coil between earth and the +12V(CW) output from the bfo. Install the filter pcb with the coil, L101, towards the front, ensuring that the reed switches are clear of the bottom of the box. Switch to CW and check with an ohmmeter that all the reed switches close. In order to ensure that there is a reasonable safety margin it is advisable to check that they close with something a little less than 12V.

Connect the rear 1200Ω port of the filter to the input of the i.f. amplifier, and connect the vfo amplifier to the front 1,200Ω port, as shown in Fig 53. Reconnect the rf voltmeter (in the 1V position and restored to reading rf) to the junction of R715 and C713 on PCB6. Switch to ssb to de-energize the magnet and temporarily disconnect the wire from the slider of S1103b to the bfo pcb, in order to make the bfo inoperative. Tune the test oscillator for maximum meter reading, readjusting the tuning of the i.f. coils (L701, L702, L703 on PCB6) as necessary, and setting the meter reading to 1V. Throughout this operation, in order to prevent overloading the i.f. amplifier, the RF GAIN control should be kept at maximum and the level of the meter reading controlled by the 100Ω preset resistor.

The test oscillator can now be tuned to look at the passband. Fig 54(a) shows what to expect. At the first attempt the ripple might well be worse than 3dB but, by experimenting with different settings of R101 on the filter pcb and with slight adjustments to the tuning of L101 on the i.f. amplifier pcb, it should be possible to reduce the ripple to something lower than 3dB. The bandwidth at −6dB should be of the order of 2,400kHz.

The response in the cw position can be examined next. The meter reading at the frequency of maximum response will be something lower than in the ssb position but it should be at least 0·5V. The 6dB bandwidth can be checked by adjusting the maximum output to 1V, and should be around 300 to 400Hz. The passband may contain one or more ripples, as shown in Fig 54(b), or it may have a single rounded peak. It might be found that the setting of L801 on the i.f. amplifier pcb which gives the best response curve in the ssb position is slightly different from that which gives the best curve in the cw position, in which case a compromise setting will be necessary.

Fig 54 also indicates the recommended method for determining the required bfo frequencies. Before going on to set up the bfo, however, it is worth looking at the response curves in more detail. Using the test oscillator, it will be possible to check the response down to around −50 or −60dB. The use of the following approximations will make the plotting task very simple:

1·0V	=	0dB
0·9V	=	−1dB
0·8V	=	−2dB
0·7V	=	−3dB
0·5V	=	−6dB
0·32V	=	−10dB
0·10V	=	−20dB

Each time one gets to −10dB, the input to the filter should be turned up to bring the meter back to 0dB again. The RF GAIN control may be used as a fine control of the meter reading, but it should always be near its maximum setting. Some adjustment to the low-frequency side of the response curve in the ssb position can be obtained by adjusting L101 on the filter pcb, but it is unlikely that much advantage will be obtained by deviating from the as-received inductance.

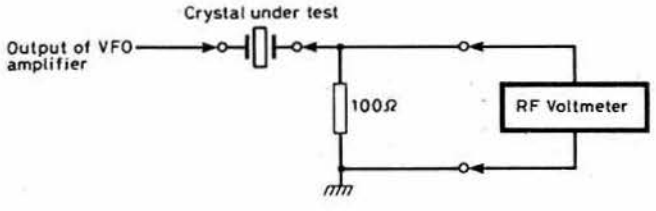


Fig 52. Circuit for checking the series resonant frequencies of the 4,433kHz crystals

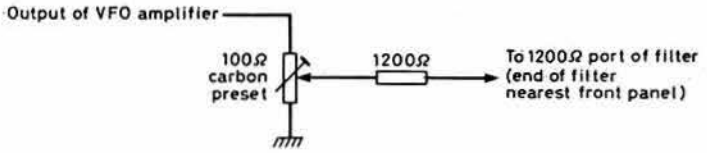


Fig 53. Method of feeding the test oscillator into the 4,433kHz filter when measuring the frequency response of the filter

When checking the skirts of the filter response, and when using the transceiver, it is advisable to keep the lid on the filter box. It is not essential to screw it on; if the flanges are squeezed in slightly a satisfactory push fit can be obtained.

Having satisfied oneself that the filter response is satisfactory, one can proceed with setting the bfo frequencies against the test oscillator. After having replaced the connection to S1103b to make the bfo operative again, switch the MODE switch to each position in turn, setting the test oscillator to the required frequency (see Fig 54) and adjusting the appropriate bfo trimmer to get as close as possible to a zero-frequency beat note from the loudspeaker. Remember that too much time should not be taken over this operation in order to avoid any possible inaccuracies which might result from frequency drift in the test oscillator.

VFO

The test oscillator board can now be removed and the vfo board (PCB2) put in its place. The incremental tuning pin on the pcb should be connected to the front-most feedthrough capacitor, and the other end of this capacitor connected to the slider of the FINE TUNE control, as shown in Fig 6. The other two terminals of this control will eventually be connected to the t/r switching module. For the moment (A) can be taken via 39kΩ to +12V and (B) taken via 22kΩ to earth. All the trimmers on the vfo board should be set to their midway positions and R203 turned fully anticlockwise.

The rf voltmeter should indicate something like 2V at the output pin of the vfo amplifier, and this reading should be reduced to 1V by adjusting R203 on the vfo board. Adjust the vfo coil, L201, so that the frequency at the bottom end of Sector A is approximately 9,560kHz (ie close to Radio Switzerland International if one is calibrating against a short-wave receiver). Check that there is an overlap between Sectors A and B, and check that the frequency is around 9,975kHz at the top of Sector B (or that the vfo tunes to the top of the 9·5MHz band about three-quarters of the way up Sector B). Check also that the FINE TUNE control is working; it should give a total frequency variation of about 5kHz, the highest frequency occurring with the control turned fully clockwise.

One can look next at the frequency stability. Starting from cold, observe what happens to the frequency of the vfo as it warms up. (If one hasn't a suitable frequency meter one can set the vfo to zero beat with a broadcast station in the 9·5MHz band). If the frequency drifts upwards, ie the FINE TUNE control has to be turned anticlockwise to correct it, this indicates that the overall temperature coefficient of the circuit is negative, and vice versa. It should be possible to correct the temperature coefficient by suitably adjusting C204 and C205. To make the temperature coefficient more positive, the value of C205 must be reduced and C204 then adjusted to bring the frequency back to its original value. Should it not prove possible to correct a negative temperature coefficient using C204 and C205, it will be necessary to replace part or all of C210 with a silvered mica capacitor. Should it not prove possible to correct a positive temperature coefficient with C204 and C205, it will be necessary to replace some or all of C201 with a polystyrene capacitor.

Having assured oneself that the frequency coverage is about right and that the frequency drift has been minimized, one can now set about the final alignment and calibration of the vfo. (Alternatively one can wait until the transmitter is operational and, instead of calibrating against the vfo frequency, one can calibrate against the actual output frequency on, say, the 14MHz band). With the lid screwed onto the vfo box, adjust C203 and C204 to get the required frequency coverage. The scale can then be calibrated against whatever frequency meter one is using, and the tuning scale marked up accordingly (See Table 4).

VFO converters

Details are given here for the commissioning procedures for all the vfo converters. Initially it is assumed that the constructor will only be fitting one of these, probably that for 14MHz, and that it will be wired up without any bandswitching as suggested in Part 3.

Table 4. Calibration of vfo

VFO frequency*											
Scale reading		0	50	100	150	200	250	300	350	400	
Signal frequency	1·8MHz					1,800	1,850	1,900	1,950	2,000	
	3·5MHz	3,500	3,550	3,600	3,650	3,700	3,750	3,800			
	7MHz	7,000	7,050	7,100							
	10MHz			10,100	10,150						
	14MHz	14,000	14,050	14,100	14,150	14,200	14,250	14,300	14,350		
	18MHz		18,050	18,100	18,150	18,200					
	21MHz	21,000	21,050	21,100	21,150	21,200	21,250	21,300	21,350	21,400	
	24MHz				24,850	24,900	24,950	25,000			
	28MHz (a)	28,000	28,050	28,100	28,150	28,200	28,250	28,300	28,350	28,400	(Sectors A & B)
		28,400	28,450	28,500	28,550	28,600	28,650	28,700	28,750	28,800	(Sectors C & D)
	28MHz (b)	28,800	28,850	28,900	28,950	29,000	29,050	29,100	29,150	29,200	(Sectors A & B)
		29,200	29,250	29,300	29,350	29,400	29,450	29,500	29,550	29,600	(Sectors C & D)

*For precise calibration the vfo frequency will need to be approximately 0·5kHz higher.

The standard converter

Set C301 on the converter pcb to a midway position and check that the crystal oscillator is functioning. There should be approximately 0·5V at the emitter of TR301 and approximately 0·1V at gate 1 of TR302. These readings will vary somewhat depending on the particular band and on the setting of C301. On the vfo converter for the 3·5MHz band the rf input to gate 1 of TR302 is deliberately low (around 0·02V) in order to prevent any significant fifth harmonic at the drain of the mixer. (On this converter the fifth harmonic of the crystal frequency is 8,175kHz, which is in the passband of T301 and T302).

With the vfo frequency set to the centre of the particular band concerned, connect the rf voltmeter to the collector of TR304 (it is connected to the can) and tune T301 and T302 for maximum reading, which should be around 2 to 4V. Then transfer the rf voltmeter to the output pin on the board and adjust L301 for maximum output (around 0·2 to 0·4V). Check that the output is at the expected frequency, ie that T301 and T302 have not been tuned to some unwanted mixer product. This is particularly important with the converter for the 24MHz band. If necessary, make some final readjustments to T301, T302 and L301, to improve the output at the band edges.

14MHz converter

With this converter it is merely necessary to adjust L401 for maximum output at band centre.

28MHz converter

Points (X) and (Y) need to be connected to the SECTOR switch (see Fig 6). Set the trimmers C501 and C502 to a midway position. Check that the SECTOR switch, when turned from B to C, changes the oscillator frequency, and check that in each position the oscillator frequency is correct. Then proceed as for the standard converter.

General

Eventually one will want to adjust the trimmer capacitors to set the oscillators to the precise frequencies required, but this can be left until later.

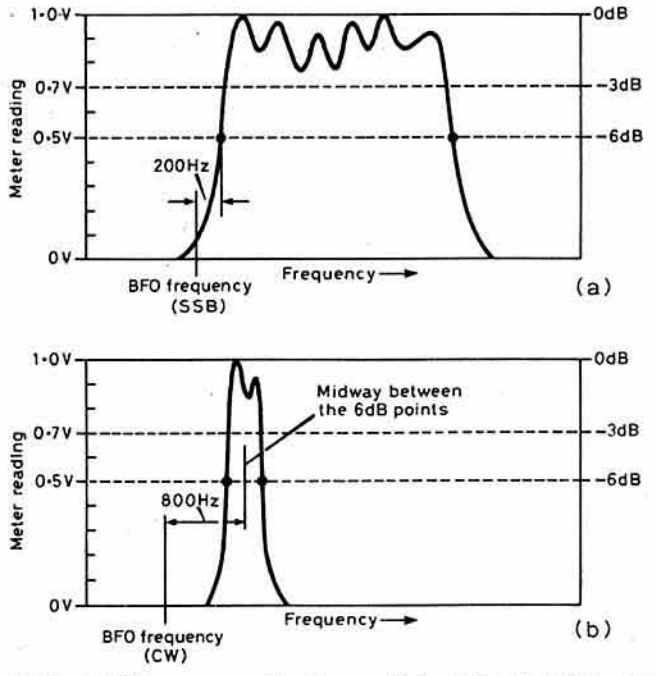


Fig 54. Typical filter response. The diagrams indicate the kind of frequency response which will be observed and show the recommended way of determining the required bfo frequencies: (a) ssb position, (b) cw position

Bandpass filters

Initially it is assumed that only one bandpass filter will be fitted, and that it will be wired up without any bandswitching as outlined in Section 3.

Connect an antenna to the coaxial socket. The antenna should preferably have a 50Ω impedance at the frequency concerned, or be applied through a tuner which will make it look like 50Ω to the receiver. Tune the vfo to find a signal and, with the agc immobilized, tune the two coils on the bandpass filter for maximum output. The RF GAIN control should set as low as possible while this is being done to avoid any possible overloading. This gives a rough first tuning of the bandpass circuits. Later, when the transmitting part is operative, the output of the transmitter preamplifier can be used to align these circuits more precisely and to check their frequency response.

Finally, bring the agc into operation by turning R805 on PCB7 anticlockwise. A dc voltmeter connected across the RF GAIN control will serve as a temporary S-meter and R805 should be set so that the agc is not quite operating with the weakest signals.

Time for a pause

The constructor now has the basic receiver working on one band. He will probably want to pause a little at this point, to take a rest and to spend a little time twiddling the knobs. His next step may be to add one or two more bands. Or he may want to press on with getting the transmitting side working. Part 5, next month, will look at the modules required to complete the basic transceiver.

Technical Topics

by Pat Hawker, G3VA

THE LINKS between amateur radio experimenters and academic and professional research into the radio sciences are not particularly strong, despite the fact that a number of those engaged in such research are, or have been, radio amateurs. The result is that there is often a lack of knowledge on each side of this barrier. Perhaps one reason for this is that both sides tend to regard anomalous propagation from diametrically-opposed viewpoints. To the amateur, anything that dramatically extends his range and brings in "rare" dx is a *good thing*, eagerly awaited no matter how infrequently or briefly such conditions may exist. On the other hand, to the professional communicator extended range that cannot be accurately predicted implies increased *interference*. To the radio physicist, an anomaly that cannot be contained in a "model", in the form of a precise mathematical expression, is a challenge that has too often proved intractable. Few of the CCIR formulas survive unscathed for long.

THIS MONTH

Radio science
Ultimate versus spc transmatch
More optimum-shaped elements
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Phasing stacked arrays
Short helical circularly-polarized antennas
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Moulded-on plugs and safety
Sparks flying at Riyadh
High-power transmitters and emc
G8ZDU's crystal oscillator
Nostalgia corner

Radio science

It is thus largely on the basis of predicting possible interference that most of the current research at the Rutherford Appleton Laboratory (RAL) and by the various university teams is being carried out. Yet it was clear at a recent two-day URSI (International Union of Radio Science) colloquium at Leeds University, organized by the British National Committee for Radio Science, that a number of major investigations are currently being made into tropospheric propagation at vhf, uhf and shf, sporadic-E at vhf, auroral propagation at hf, vhf and uhf, rain scatter above 10GHz, attenuation due to water vapour of signals up to 100GHz etc—all subjects of great or potential interest to radio amateurs. On the equipment side there are current projects aimed at a single-sideband mode for fm broadcasting, much interest in spread-spectrum and packet and other digital data systems, as well as studies that have confirmed that even relatively short-distance hf signals arrive on bearings that can vary by several degrees from the true great circle path, checked using highly-accurate Wullenweber ring df systems.

Then again, Dr R. C. V. Macario at Swansea University, following many years of research into improved ssb demodulation techniques, is currently investigating exalted-carrier demodulation for broadcast reception: a technique that has been known for 60 years but seldom exploited on a large scale, although often shown to have great potential in hf communications.

British Telecom Research at Martlesham are studying 60GHz propagation for use with cordless communications systems within buildings; 29GHz for point-to-multipoint links; 19GHz for use on spur routes, satellite communications etc; and 900MHz for cellular mobile radio systems.

Many of these projects are using major facilities, such as RAL's dual-polarization radar and 25m-diameter dish reflector at Chilbolton which is particularly effective in examining back-scatter; RAL is also engaged in auroral research using an installation at Wick, Scotland, in conjunction with the Swedish installation at Uppsala.

Many of these projects require facilities completely out of reach of the radio amateur. Yet there remain strong reasons why each side should be aware of what the other is doing and the results they are achieving. Amateur radio has one special advantage not possessed by the professionals—it can draw on large numbers of enthusiastic observers spread over a very large area; on the other hand the professionals tend to have more complex installations, more effective measurement techniques and automatic recording of large amounts of data for subsequent processing on mainframe computers.

Many amateurs remain fascinated with the curious puzzles of radio propagation. It would be a pity if, in the end, this knowledge is used only to work a few more "squares" as a "sport" and not as a "science". Pure science is seldom as exciting as chasing dx, and I am not suggesting we have anything to be ashamed of: but we should bear in mind that there are still many unsolved mysteries of radio propagation that we might be able to help solve.

Ultimate versus spc transmatch

A note from Alan Williams, G3KSU, points out that he still sees frequent advocacy of, and designs for, the "ultimate transmatch" form of atu in various amateur radio books and journals, including very recently in *Amateur Radio* (UK) and *Practical Wireless*. Few of the authors make any reference to the short-comings of this particular circuit as discussed, in considerable detail, in the technical correspondence columns of *QST* July 1980, March 1981 and August 1981, including careful analyses of the circuit by Doug De Maw, W1FB, and Walter Maxwell, W2DU.

The debate centres around the fact that while the original "ultimate transmatch" configuration (Fig 1(a)) undoubtedly provides an effective way of matching a transmission line to a transmitter, it is essentially a simple T-network of *high-pass* configuration and hence provides limited harmonic attenuation. It also includes an extra shunt-arm capacitor, C2, across the input. W2DU shows that "C2 is not only useless in the impedance-matching function, but actually causes a slight degradation in efficiency".

The drawback to the "ultimate transmatch" was overcome in a later "spc

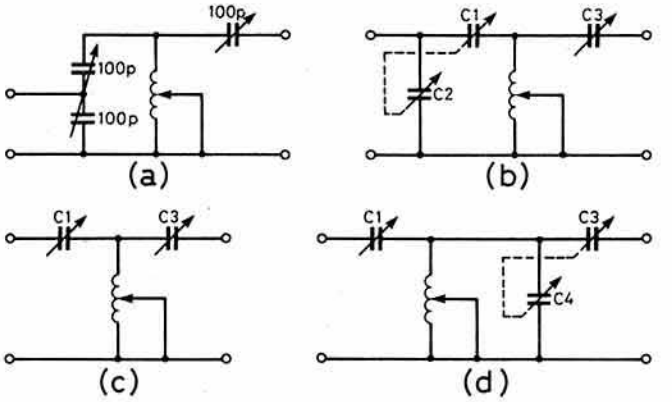

Fig 1. (a) The original "ultimate transmatch" atu circuit. (b) Circuit redrawn to emphasise that it is basically a T-network with a shunt input capacitor. (c) Removal of the ineffective C2 makes clearer the high-pass network with little harmonic suppression capabilities. (d) The derived spc transmatch originally proposed by Doug De Maw and offering significantly greater harmonic attenuation without requiring any additional components

transmatch" devised by Doug De Maw, W1FB (Fig 1(d)); spc stands for series/parallel capacitance, with C4, a ganged section, substantially improving the harmonic rejection of the network. The improvement, as W2DU notes, is obtained because the shunt capacitance of C4 in the spc circuit follows the series-arm reactance of C1, thus providing a voltage drop for the unwanted frequencies.

W2DU admits that although the basic configuration of the "ultimate transmatch" is a high-pass configuration, it does in practice provide some harmonic attenuation, since the network provides a complementary mismatch (or conjugate match) at only the fundamental frequency; ie the harmonic energy is not matched to the transmission line. In the spc network the harmonic mismatch is substantially increased by the effect of C4, because the shunt-arm reactance of C4 decreases as the frequency increases. W2DU added: "In addition, C4 affords a greater shunt attenuation by following the series attenuating reactance of C1 than if an equivalent C2 were directly in shunt with the 50Ω source line as in the original arrangement". A detailed analysis by W2DU is in *QST* August 1981, pp42-3, but for many readers I suspect that the only really important point to remember is that the spc form of transmatch is the improved version, and should provide more harmonic attenuation. It is perhaps a pity that the original configuration has become so well-established that its effectiveness is taken for granted.

In brief, there do seem to be solid technical grounds for burying the original "ultimate transmatch" despite its acceptance by many amateurs and manufacturers over a number of years. The spc arrangement, although deceptively similar except for the connection of the split-stator capacitor, offers the significant advantage of improved harmonic attenuation, and is therefore much to be preferred.

More optimum-shaped elements

TT December 1982, pp1054-5, and June 1983, pp513-4, discussed the possibilities offered by the Landstorfer concept of curved 3λ/2 dipole elements that provide gain and directivity, including a modest front-to-back ratio with a single element not resistively terminated; it was also indicated that such elements can be used to form high-performance vhf arrays. In the June notes, Les Moxon, G6XN, came up with a novel version of this idea based on the use of five straight segments that he felt would be much simpler to implement on hf than the curved Landstorfer shapes.

A similar concept, but using six straight segments, is published in *Electronics Letters* 24 May 1984, pp468-9) stemming from Du Jia-Cong and Zhang Zhong-Pei of the Guilin Institute of Electronic Technology, China. Their "tribroken-line dipole" element is a closer approximation to the shapes proposed for curved optimum-shaped elements, though one suspects that their shape would not be as simple to implement on hf as that of G6XN. Directivity of the 3λ/2 tribroken shape is about 6·6dB (this is presumably directivity gain in dBi *not* dBd). An experimental antenna for 203MHz is reported to have achieved 6·6dB with half-power bandwidths in the E-plane and H-plane about 37·5° and 110° respectively; input impedance is given as 118·64 + j15·7Ω. The various shapes are outlined in Fig 2.

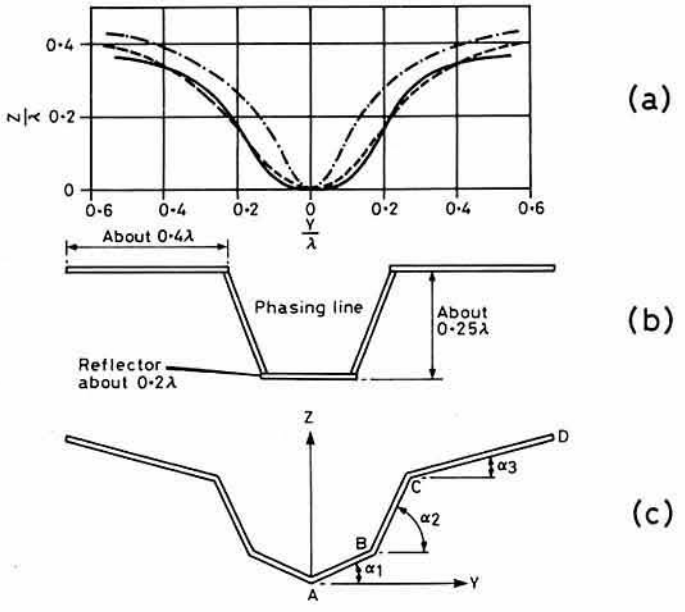

Fig 2. Optimum-shaped 3λ/2 dipole wire antennas with maximum directivity. (a) some suggested curves mathematically described as (1) Piecewise parabolic model; (2) Gaussian lineshape model; and (3) Witch of Agnesi model. (b) The simplified shape suggested by G6XN; and (c) Chinese tribroken-line dipole shape

The Chinese engineers conclude: "This type of dipole with higher gain and simpler construction, which can even be folded up, is being used as a receiving antenna for uhf and vhf television channels."

The λ/4 sloper again

Vincent C. Lear, G3TKN, writes in praise of the λ/4 sloper antenna but points out that it is possible to encounter unexpected problems. He writes:

"A brief note on λ/4 sloper antenna, including a diagram (Fig 8) appeared recently in *TT* (October 1983) but this antenna does not appear to have enjoyed the same popularity in this country as in the USA, and very little has been written about it in British journals.

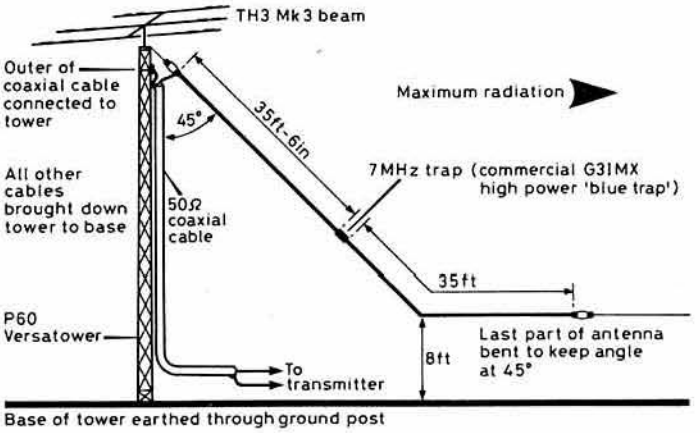

Fig 3. Dual-band λ/4 sloper antenna for 3·5 and 7MHz as used by G3TKN

"I have recently been experimenting with the system and have found it a very effective dx antenna for 7 and 3·5MHz: Fig 3. There are, however, some points that need to be considered when using one.

"My original 7MHz sloper was fed off the top of a 45ft tower, which also carries a Hygain TH3 Mk3 beam. The wire sloped at 45°. I found the length had to be increased to 35ft 6in to obtain resonance, and other users have confirmed the need to increase the length slightly compared with a conventional λ/4 element.

"I found, moreover, that when I removed the beam from the top of the tower the antenna would no longer resonate at 7MHz. This result is consistent with the findings of Doug De Maw, W1FB (*QST* October 1981) when he modelled his sloper and tower/beam combination at 144MHz. VE2CV (*QST* May 1980) modelled a sloper at 200MHz, but without having a scaled-down beam on the top of the structure supporting the sloper. His tests revealed that it was not possible to resonate the antenna despite adjustments of tower height and wire length.

"From all this, it does appear that for a λ/4 sloper to work correctly, it must be fed off a mask/tower that also carries an hf beam or similar amount of metalwork. It would appear that the array acts as a form of "inverted ground", raised groundplane or counterpoise.

"My tower is earthed automatically via its ground post, but the addition of a large number of radials at this level did not appear to improve the performance. However, some amateurs to whom I have spoken have reported improvement when extra radials were connected to the tower.

"In a series of tests on 7MHz both on ground wave and on contacts with VK/ZL via long path, the antenna showed a front-to-back ratio of approximately 10dB, which agrees with W1FB's 144MHz scale model. At high radiation angles, the antenna does not appear to show any directivity and, on average, signals from it are about +6dB compared to a horizontal dipole for UK and European contacts.

"As shown in Fig 3, I have trapped the sloper for operation on both 7 and 3·5MHz. However, I found the tower height had to be increased to 60ft to obtain a reasonable match on 3·5MHz. Results on this band have been very good, including contacts with VK2 and VK7 on short path with the antenna element sloping north-east. With the antenna sloping south-west I have received good reports from ZL, PY, LU and FM7."

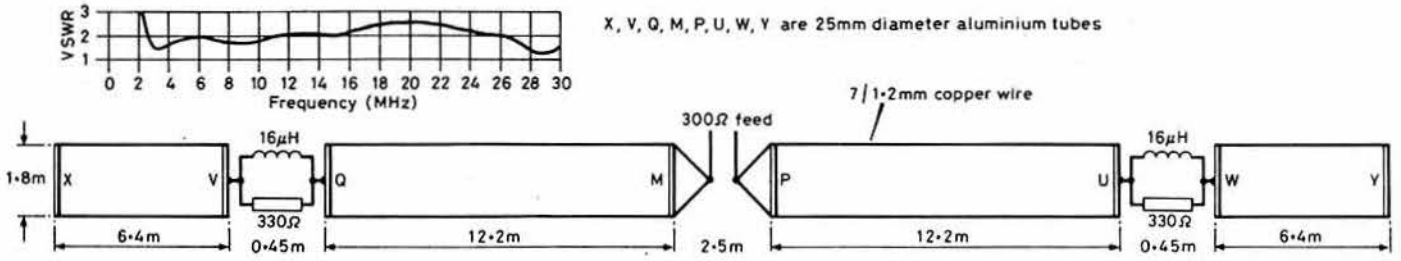

Fig 4. The original Australian broadband travelling-wave dipole as developed by R.J.F. Guertier and G.E. Collyer, showing magnitude of vswr over the range 2·3 to 30MHz. Later versions have used wire cages. (*TT* June 1974)

Australian broadband sloper

A special form of broadband cage-dipole incorporating matching networks that covers much of the hf spectrum without matching adjustments has become known as the "Australian dipole". The original version, using just two wires, was described many years ago in *TT* (June 1974, p379): Fig 4.

Bill Orr, W6SAI (*Ham Radio* April 1984), reports that VK6IM and VK6YX have found that a grounded version of half this element functions effectively as a vertical monopole or sloper antenna over the range 1·8 to 14·34MHz with a measured swr on the feedline of only about 1·2 throughout the frequency range, and a feed impedance that remains roughly 154Ω: Fig 5.

Basically the VK6 version is a fat half-element about 75ft long with an impedance matching network placed about one-third in from the free end (ie high end of a vertical, low-end of a sloper). The antenna is fed against counterpoise earth (presumably attached at the top of the tower) through a simple broadband matching transformer (Fig 6 (b)). The element is 75ft long and requires a pretty high support, but presumably it might be possible to devise a scaled-down version where 1·8MHz operation is not essential.

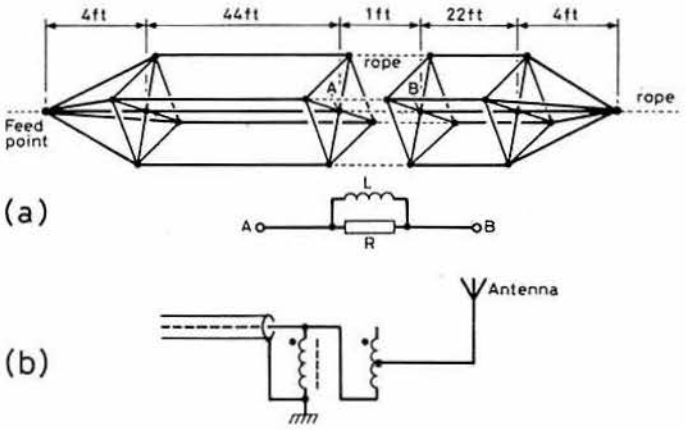

Fig 5. VK6 broadband cage antenna element used as a sloper or a vertical monopole. Spreaders are 6ft long. All five wires are bonded together at each spreader as shown. Connecting ropes join the antenna sections. The matching network is placed between points A and B of the cages. The antenna is fed at the left side using the matching transformer shown in (b) wound on an Amidon T200T powdered iron core. 24 bifilar turns are used. One winding is tapped for the antenna connection 18 turns from ground. Note that the tap is on the winding, not connected to the coaxial line

Circular-polarized antennas

For over a decade, the trend in vhf/fm/stereo broadcasting on Band 2 (gradually being extended in Europe up to 108MHz) has been firmly towards the use of circular (ie mixed) polarization. The prime reason for this has been the wish to improve reception on car radios, which usually have a vertical whip antenna, and also on portable receivers operated out of doors with telescopic whip antennas, while at the same time retaining the ability to provide good reception on horizontally-polarized dipoles or arrays usually favoured for domestic receivers.

Circular polarization is not without its problems. Because of the proximity of the metal tower or mast it is virtually impossible to obtain perfect circularity in all directions, which is why the term "mixed" polarization is preferred. Imbalance between the vertical and horizontal components can also arise from the receiving environment, including the effects of wooded areas, tall buildings, etc. For the broadcaster there is also the disadvantage that the vertical component is more subject to multipath reflections, at least in some environments, than a horizontally-polarized signal, resulting in more multipath distortion that can be very disturbing to those seeking really high-quality reception. Since power is shared between the vertical and horizontal components it also means that for a fixed transmitter output, a plane-polarized receiving antenna suffers a 3dB loss.

Nevertheless it is generally held that the advantages significantly outweigh the disadvantages, and the BBC is currently in the process of introducing mixed polarization on its high-power national networks; the IBA's independent local radio transmitters have used mixed (circular) polarization from the outset in 1973.

Stack of six circularly-polarized Band 2 elements forming the broadcasting antenna used by the IBA at Croydon for Capital Radio and LBC

It could well be argued that vhf and uhf repeater stations should radiate signals of mixed polarity, permitting the users to have either horizontally or vertically-polarized antennas. Circular-polarized receiving antennas are virtually essential for many satellite applications.

B. Sykes, G2HCG, reports finding a solution to some long-standing problems affecting the use of circular polarization, including the development of a new phasing device he calls a "Polaplex". Since he hopes to market this device he is not prepared to release constructional details at this stage. For reception only, one could imagine the use, with crossed arrays, of the type of null-steering phasing techniques that have been developed for electronic-counter-counter-measures (*TT* August 1982).

G2HCG writes: "Operation through Oscar 10 on 144MHz has highlighted the need for a means of varying the antenna polarization to optimize signals. Helicals produce circular polarization but cannot be switched to the optimum direction of rotation which is dependent on the attitude of the 'bird' and whether it is coming or going. Crossed Yagis can be switched to any type of polarization but with some difficulty, involving much cutting and trying of coaxial cable to equalize the feeder lengths and to provide the appropriate phasing lengths. Also, when conventionally mounted, the vertical-element performance is invariably inhibited by the presence of the mast and feeders, resulting in elliptical polarization. This mast effect problem was of course fundamental to my 'Jaybeam' outlook resulting in the 'end-fed' systems.

"Now if a crossed Yagi is mounted with the elements at 45° to the mast, its detrimental effect is minimized or eliminated and there is no loss of circularity. At first sight there is no vertical or horizontal polarization, but these can be generated electrically by suitable phasing of the feeders, although, as noted above, this is a difficult and tedious task.

"I have at last produced a device, christened a 'Polaplex', which matches two feeders and gives variation of the phasing over 360°. Obviously with this available individual feeder length becomes irrelevant; horizontal,

vertical, circular clockwise, circular anticlockwise, together with any elliptical modes in between, are all obtainable by the turn of a knob in the shack, even while transmitting high power.

"Other uses of the device have shown up while in operation; one in particular being the ability to take advantage of the seldom-appreciated fact that the designed polarization of an antenna applies only in the main beam. Thus with the Polaplex an interfering station, even of the same polarization, can be phased out provided that the signals are not arriving from the same direction. Further uses come to mind which have not yet been tried in practice, such as the electrical rotation of the radiation from crossed dipoles or turnstiles. Swinging the radiation up and down from a pair of stacked dipoles is also an interesting thought. Taking this to its logical conclusion, it should be possible to produce a satellite antenna with no moving parts; both bearing and elevation being controlled electrically from the shack. The Polaplex technique will cost a lot less than one rotator, let alone two.

"So far I have confined my attention to 144MHz, but 430MHz should not be impossible, though obviously needing careful attention to impedance discontinuities, and could prove costly."

Phasing stacked arrays

A brief note and diagram (Fig 9) in the June *TT* drew attention to VK2ZAB's finding that the front-to-back ratio of a pair of stacked-Yagi arrays can be much improved by advancing the lower array by $\lambda/4$ in front of the upper array and adding an extra $\lambda/4$ (electrical) to the phasing line.

This item brought a phone call from Ian Suart, GM4AUP, who confirmed that this technique was used very successfully in 1981 in connection with the receiving antenna at the IBA's small vhf/fm relay for the "West Sound" service at Girvan. As GM4AUP puts it: "I can certainly confirm that this cancellation technique really works." The Girvan antenna picks up signals from the Darvel transmitter and these are then rebroadcast on the local frequency.

Short helical circularly-polarized antennas

It has been shown in the past that axial-mode helical antennas for vhf omni-directional radiation should have only about one turn if they are to provide a broad radiation beam. Recent work by three Japanese engineers—H. Nakano, N. Asaka and J. Yamauchi—has shown that a two-turn helix fed at its periphery exceptionally radiates a circularly-polarized wave in spite of its short axial length. More recently (see *Electronics Letters* 1 March 1984, pp202-3) they have reported that circular polarization is also possible with a 1·5-turn short helix in which the feedpoint is located on the helical axis. Fig 6 shows the balanced and "monopole" versions of their configuration. The circumference of the helical cylinder C and the pitch angle are chosen to be, respectively, $C = 1\lambda$ (λ = free space wavelength) and $\alpha = 12{\cdot}5°$ which are common in a conventional axial-mode helical antenna. The wire radius is taken to be $0{\cdot}005\lambda$. The feedpoint is located on the helical axis, and a short wire inserted between the feedpoint and the beginning of the helix proper. This allows the rotation of the helix about the helical axis, with the feedpoint being fixed.

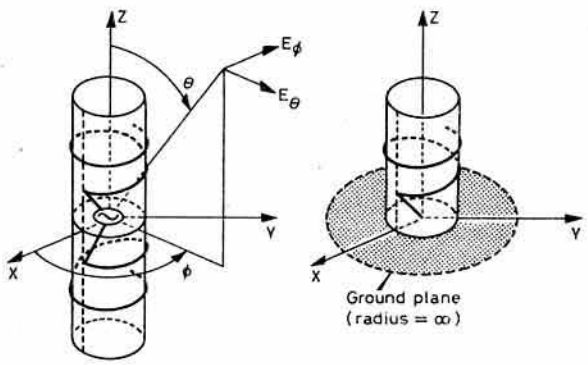

Fig 6. Configuration and co-ordinate system of circularly polarized 1·5 turn axial-mode helical antenna

They also show that a pair of identical 1·5-turn helixes wound in the same sense can form an array in which the mutual coupling can be reduced by rotating one helix with respect to the other; minimum coupling is when the rotation angle is about 180°.

Steer clear of power lines

Two tragic incidents only a few weeks apart, involving the loss of four lives, have once again drawn attention to what is undoubtedly the single greatest potential hazard in field operation and antenna erection: the risk of an antenna or metal pole coming into contact with high-voltage power lines. Neither of these particular accidents related to amateur radio operation, yet so easily could have done. Paradoxically, the one involving an outside-broadcast vehicle of Severn Sound, with its permanently-mounted telescopic mast and communications antenna, apparently occurred *after* the danger had been spotted and the decision taken to move the antenna further away from the overhead power lines. In such a situation it takes only one touch of the lines to do the damage; there is seldom a second chance.

It may seem to be stating the obvious in suggesting that it is *essential* to look out for and assess any such hazards *before* attempting to put up an antenna. And then to take into account the worst-possible situation in judging how far it is necessary to keep away from power lines. Never take the risk of a mast or pole getting out of control, swaying or bending and so momentarily coming into contact with power lines that at first sight had seemed well clear of where your antenna was intended to go.

Moulded-on plugs and safety

In the UK, for many years we have been used to rewirable plugs and sockets for domestic appliances, radio equipment etc, gradually progressing towards universal 13A ring main systems, although with many round-pin plugs, sockets and adapters still in use. However, in mainland Europe, the USA, and many other parts of the world, virtually all domestic appliances have for a considerable time used "moulded-on plugs" that can only be cut away from a lead, and with no facilities for reconnecting them. Several attempts to popularize moulded-on plugs in the UK have come to grief, including some instances where a particular moulded-on plug has been shown to be a potential safety hazard. Yet it is the claim in other countries that moulded-on plugs are *inherently safer*, partly because of the many instances of d-i-y errors in wiring three-pin plugs and sockets (Fig 7). (There are, it must be said, very many homes where three-pin *sockets* have been incorrectly wired by working electricians!)

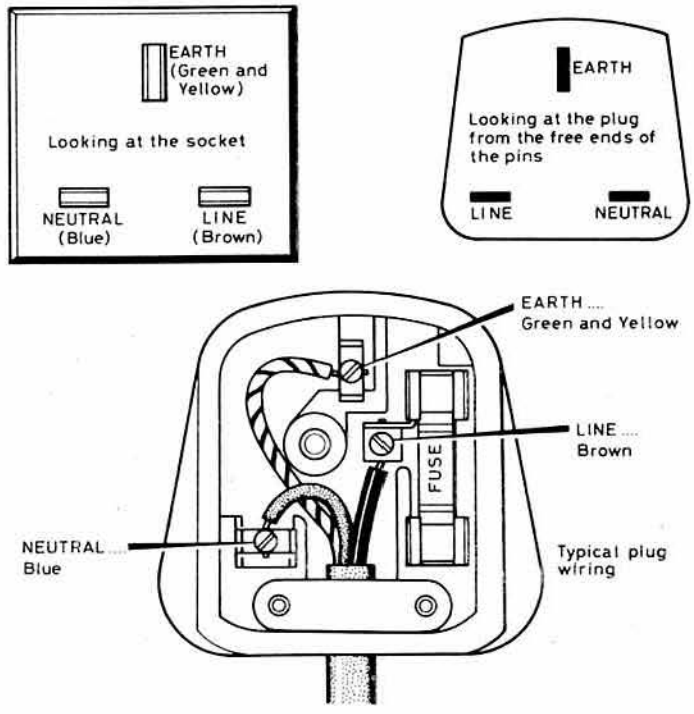

Fig 7. The correct wiring in the UK for three-pin plugs and sockets. To test that *your* socket is correctly wired (they are frequently wired incorrectly) a lamp should light if connected between "L" and "N" or "L" and "E". A neon bulb should glow when touched against "L" but not with any other pin

When dealing with any equipment it is *always* advisable to test for "line" ("live") potentials with a neon bulb both at the socket and at the equipment, repeating this quite often, particularly if the equipment is not effectively earthed and fused. On at least two occasions I have found operational metal cabinets dangerously "live" as a result of failed or leaky

NOT ALL IT SEEMS

Things are not always what they seem to be—at least not in the strange world of broadcast television. Take for example this lavishly-equipped shack complete with QSL cards and RSGB poster and the associated antenna rising above the roof tops of a quiet suburban road. The "amateur" is actor Michael Elphick; the "shack" is a studio set in Limehouse studios; the bijou residences are a model built by Richard Henry, former BBC designer who now concentrates on model making. It all adds up to a Limehouse production for Channel 4 of a new television play "CQ" by Paula Milne. Briefly, the play tells the story of "Norman", an insurance loss adjuster and amateur radio enthusiast, who becomes the "voice" of a round-the-world lone yachtsman and wins local radio and television fame with his daily bulletins of the lone sailor's progress—until a sudden loss of radio contact threatens his "celebrity" status. Peter Marcham, G3YXZ, was technical adviser, and—according to the advance publicity—ensured authenticity in the radio conversations, and advised on correct equipment. All callsigns are claimed to be "genuine, although currently unused".

"CQ" is likely to be seen on Channel 4 this autumn. Apart from starring Michael Elphick as the radio amateur whose activities earn him the respect of family and friends, the play also features Marjorie Yates as his wife, Michael Graham-Cox as the lone yachtsman, and newscaster Gordon Honeycombe as a television presenter. The producer was Susi Hush, and Moira Armstrong directed. The theme sounds familiar, but in striving for so much authenticity it may possibly turn out less humorous than Tony Hancock's classic version!

insulation on the primary of mains transformers. Personally, since manufacturers tend to supply ridiculously short connecting leads on appliances, I would greatly miss the re-wirable plug. But the signs are that moulded-on plugs, once they live down the "glitches" that have occurred, will become established in the UK as they have elsewhere.

Sparks flying in Riyadh

The list of RSGB mobile safety recommendations published in the July *TT* (page 579) included a firm warning that "All equipment must be switched off when (a) fuelling, (b) in close proximity to petrol tanks, and (c) near quarries where charges are detonated electrically." The reason for this safeguard is, of course, that metal work or wires can act as a resonant antenna and pick up sufficient rf to generate small but possibly deadly sparks that could trigger off an explosion or ignite flammable substances.

It needs to be recognized that ignition hazards can exist at lower transmitter power levels than the more-often discussed biological radiation hazards. A few years ago, *TT* drew attention to work at the Postgraduate School of Electrical & Electronic Engineering, University of Bradford, that resulted in a paper "The ignition hazard due to radiation from radio transmitters" by G. H. Butcher, P. S. Excell and D. P. Howson (IEE Conference Publication No 134 *Electrical Safety in Hazardous Environments*, pp 143–7). This discussed the mechanics of spark ignition at radio frequencies, the type of structures that might act as receiving antennas, and the degree of hazard arising from low-power transmitters.

The final section of this paper saw little hazard from low-power fixed transmitters where the antennas are well above ground and the power flux density low enough to be harmless at any reasonably approachable point. However, it added: "Mobile transmitters raise special problems owing to their unpredictable location. In general, commercial mobile transmitters (25W maximum permitted radiated power in the UK pmr service) create no more hazard than the ignition system of the vehicle. Hand-portable transmitters usually do not radiate more than 1W and present no hazard (although we recommend that the antenna be insulated as a precaution against direct arcing); higher-powered manpack sets should be regarded with circumspection in any hazardous environment. Amateurs are permitted to operate transmitters radiating up to 400W peak and these may be fixed or vehicle-mounted. Although the hazard represented is probably small, we do feel that *proximity to explosion-hazarded installations should be taken into account when granting licences for fixed amateur stations, and that a lower maximum power should be stipulated for vehicle-borne amateur transmitters* (my italics).

"An additional hazard with mobile transmitters which we have discovered in practical tests concerns the fuelling of a vehicle containing an operating transmitter, or parked close to another vehicle containing one. With hf mobile transmitters there is a substantial ground return current which is coupled normally through the vehicle-ground capacitance. If, however, a metallic route for this is provided (and all petrol pump nozzles are required to be bonded to ground to eliminate electrostatic hazards) a spark can be drawn, the probability being that this will occur at the most hazardous point, *viz* between the fuel nozzle and the tank inlet."

It is perhaps worth pointing out that during 1983 the IBA moved its entire mf transmitting installation (emrp of only about 2·2kW) for the Radio Forth ILR service at Edinburgh to a new site. This was because of local fears arising from the original site being reasonably close to a large oil refinery that had been built after the original ILR site had been chosen and planning permission granted!

Two members, John Stebbing, G4BTV, and Steve Ortmayer, G4RAW, have drawn attention to an article in the *New Civil Engineer* (21 June 1984, pp32–3) headed "Saudi Stadium set for shocks". This is a report on the site work at a major new international sports stadium being built outside Riyadh in Saudi Arabia. The interesting passage is as follows:

"Workers on site have been finding themselves exposed to high-voltage sparking from virtually every piece of plant and equipment. While not being lethal, the electrical discharges have been frightening and potentially hazardous to operatives working in high places. Fortunately no accidents have taken place but the sparks are enough to raise small blisters on hands. 'No one ever believes this story but we brought in experts to examine the problem. At night one of them walked up to our main tower crane hook with a fluorescent tube in his hand. It glowed brightly and continued to do so even when he walked away from the crane! Voltage was measured at 5,000V.' . . ."

The article explains that the source of the rf voltages proved to be the 1·2*megawatt* "Voice of Islam" radio transmitter *just 2km from the site*. The "Voice of Islam" presumably uses directional antennas so that the emrp in the main beams could be many, possibly hundreds, of megawatts. This is vastly more power than any amateur transmitter is ever likely to use, but one has to take into account the inverse square law. An amateur transmitter may be a lot less than 2km from a hazardous environment!

High-power transmitters and emc

The Riyadh stadium also faces the potential problem of emc affecting its elaborate electronic scoreboards, television and radio equipment etc. There is also a complex computerized security system with electronic locks, and this is now all having to be fitted with special screening, screened cable ducts etc. One can understand why the public is increasingly hostile towards the presence of radio transmitters in residential areas.

In the UK there has been a battle lasting many months over the proposed installation of hf broadcast transmitters at the former Post Office receiving station at Bearsley, near Stratford-on-Avon. Much of the opposition has come from the Royal Shakespeare Memorial Theatre which fears emc problems with its electronic equipment, including the computerized lighting system. Yet the Bearsley site is at a distance of several miles!

In 1979 the BBC similarly applied, on behalf of the Foreign & Commonwealth Office, for the use of the old Henstridge airfield between Gillingham and Sherborne, Dorset. In the outcome, planning permission was refused. Local authorities have rejected a number of planning applications for broadcast radio and television installations, usually on environmental grounds, although there is little doubt that some of the local residents have been more concerned with emc and radiation hazards.

There is thus a real and increasing danger to amateur radio in the public dislike, for whatever real or imaginary reasons, of living close to radio transmitters, even at distances where there could be no possible biological effects from the non-ionized radiation. There have already been attempts in some parts of the USA to ban all radio transmissions, including those of amateur radio, in residential areas. The major problem is emc and not rf sparks, but the public is beginning to use every argument it can muster. It perhaps weakens the amateurs' case that the present UK licence places no power limit on the transmitter, but only on the power actually delivered to the antenna element. Who, only a few years ago, would have expected an official change of heart that can make the old 150W dc input look like QRP compared with some rigs being used today in the UK!

G8ZDU's crystal oscillator

Roger C. Arnold, G8ZDU, has developed an unusual vhf crystal oscillator that is based on a free-running Hartley oscillator: Fig 8. He claims this works well with crystals from fundamental right up to times-seven or times-nine overtone or harmonic frequencies, providing sufficient output of both odd and even harmonics to drive directly a digital frequency meter at frequencies extending possibly into the microwave region.

He feels that his circuit may be an "original", although I suspect that some old-timers will spot a certain likeness to some of the very early "Goyder lock" arrangements that were popular in the late 'twenties. In G8ZDU's arrangement, an eco-type of Hartley free-running oscillator is "locked" by the crystal, if I have understood his system correctly. This does imply, of course, that if the crystal is removed, or for any other reason fails to lock the Hartley oscillator, this will continue to function with much degraded stability.

This is not a criticism of his system; the Goyder lock was an effective arrangement *provided that* care was taken when using it in transmitters to make sure that it really did achieve lock, since otherwise with the crude free-running oscillators of that era one could, so I am told, end up with a pretty foul note. But when it worked, it worked very well and provided an early form of vxo.

G8ZDU writes: "As coils for 78 to 122MHz are of seven turns, it seems possible for 144MHz fundamentals to be generated in the crystal harmonic oscillator with reduced coil turns, say five or six turns, but as my digital frequency meter has limitations above 122MHz, I have not been able to establish the usage up to 150MHz . . . . The set-up procedure is as normal, with the 12V supply providing 6 to 10mA and tuning for a dip to 1·5 or 2mA which denotes locking oscillation of the crystal. Small dips indicate inactive crystals, random harmonics, or the tap on the coil is not optimum. For frequencies above 50MHz the coils should be air cored and not less than 16swg and 0·38in (10mm) diameter spaced half-diameter of wire between turns (seven turns for 78MHz)."

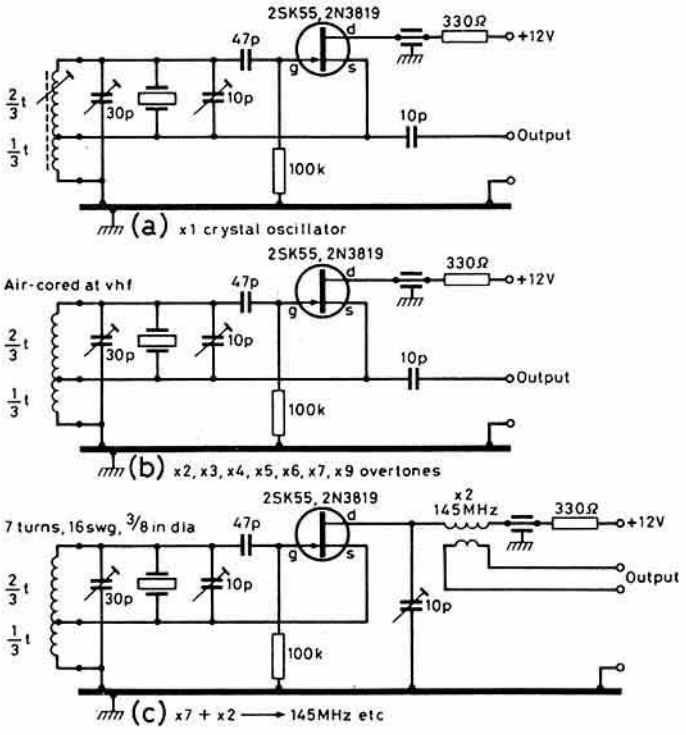

Fig 8. G8ZDU's crystal oscillator with its overtones of the old Goyder Lock system. (a) As a fundamental frequency arrangement. It can use a slug-tuned coil (preferably not a ferrite core) below 30MHz. (b) Harmonic locking oscillator with air-cored coil above 50MHz for use with overtone crystals and providing high output. (c) Harmonic locking oscillator with air-cored coil for use with overtone crystals up to 72MHz, with 145MHz harmonic tuned circuit in the drain circuit

Nostalgia corner

In the June *TT* it was suggested that the once-popular American expression "fubar" could be roughly translated as "fouled up beyond any repair". Peter Brooks, G4UMI, however, begs to differ. As a schoolboy in Southport, where there was once a large USAAF rest camp, he was initiated into many of the ways of those "strange beings" (as they then appeared to the natives), the American servicemen. He mentions Hershey bars and the time he was reprimanded at school for using "sidewalks" for pavements. But both then, and later as a wireless operator on a Sunderland flying boat during the Korean war, he always recognized fubar as meaning "fouled up beyond all recognition".

At first, of course, our American cousins were written-off by disgruntled British servicemen on the grounds that they were "over-paid, over-sexed and over-here", though certainly some of us later came to appreciate American service rations, including the famous K-packs, and enjoyed, if only briefly, the facilities of the American Red Cross centre in Paris (until somebody discovered that the constitution of this organization, unlike the British WVS canteens, strictly limited customers to American servicemen!).

A number of British old-timers attended the Anglo-American hamfests held in wartime London and Cairo, though these escaped me. I admit, however, to some association with the "oh, so, society" types in OSS whose radio expertise seemed strangely lacking for a nation that had produced such excellent hf equipment as the SCR299 signals vehicle with its BC610 (Hallicrafters HT4) transmitter.

There are probably now few readers who recall the USA West Coast amateur magazine *Radio* that flourished in the 'thirties and from which sprang the *Radio Handbook* that is still going strong. I still have one of the annual extended issues of *Radio*, notable for containing not only the very first design of a rotary close-spaced two-element Yagi array but also an article on 112MHz receivers (a period when the 28, 56 and 112MHz bands were all in convenient harmonic relationship) by Grote Reber, W9GFZ, who has since achieved immortal fame as the very first person ever to build a steerable radio telescope.

The original editor of *Radio* was Clayton F. Bane, now W6WB, responsible for many of the technical scoops of that magazine, and himself author of many hundreds of articles on amateur radio. Recently, I was interested to have correspondence with "Bud" Bane of Bane Advertising, San Francisco, and still as anxious as ever to ensure that due credit is given to the work of those who contributed to *Radio*.

Broadcast radio receivers are getting smaller and smaller—though not necessarily performing any better, if as well. Panasonic (Mitsushita) is planning to market in the UK in a few months' time, a radio about the size of a plastic credit card (0·15in deep, 3·5in high and 2·1in wide). The interesting feature is that it uses a miniature rechargeable nicad battery. The "card" receiver is plugged into its associated charger and, if left for 5h, will then play for about the same time before recharging. It weighs in at about 1·3oz—a far cry from the large wooden or Bakelite table radios with which many of us gained our introduction to radio before progressing to our own home-built crystal sets. □

4-2-70

*by Ken Willis, G8VR**

AS THE SUMMER PROGRESSED, conditions improved somewhat with some interesting sporadic-E, and a very unusual tropo opening on 144 and 432MHz over a seapath exceeding 2,000km. Having diligently monitored 2m for Es since the end of May without conspicuous success, G8VR with a great sense of timing, decided to take a holiday in EA7, and arrived there on the evening of Saturday 30 June to note several 2m Tonnas atop apartment blocks all pointing towards the UK. There was a major Es event in full swing between southern Spain and the UK! Incidentally, many Spanish amateur vhf arrays seem to be vertically polarized (for fm?), yet *4-2-70* does not hear very much from fm operators who have worked real dx during these openings. If you think you have tvi or neighbour problems, pay a visit to Spain and see a typical rooftop covered by dozens of vhf broadcast, tv and amateur hf/vhf beams, all cheek by jowl with only inches between them. One consolation though; they don't seem to suffer the same planning problems which beset us here, since lattice masts carrying triband hf beams plus vhf arrays on top of an apartment block are commonplace.

It goes without saying that since I arrived back in the UK, conditions have been totally flat. Now for the news . . .

Sporadic E

The big event of 8 June which was reported last month was even more widespread than at first appeared. Reports seem to indicate that while it went as far north as southern Scotland, stations there were hearing less from the USSR and more from Poland and Czechoslovakia. However, a report just in from Peter Weller, GM3XOQ (Shetland), tends to dispel this view. He said that all day on 8 June tropo was good into PA, DL and ON, and Jon, OY9JD, worked into PA via this mode. Then when the big Es event started, Pete heard stations in Hungary, Czechoslovakia, Poland and Romania as well as the USSR, and his best contacts were with UT5DAA (LI22f) and UT5DL (LI23g). Other squares worked were KH, JJ, JH, JI and KG. OY9JD experienced similar Es conditions and had similar contacts. OY9JD to UT5 is just short of 2,800km, and even if no records were broken it must be rare for an OY to work a UT5 on 144MHz, and quite likely a "first" for the record books unless OY5NS beat him to it in the past. John, G3IMV, during a chat on 2m, made the point that the 8 June date, or one very close to it, had produced good Es for several successive years, and since there was a good deal of meteor activity at that time from both the Arietids and the Zeta Perseids, he wondered whether there was a link. The facts are that we still know very little about the causes of sporadic-E propagation, but let's hope it never goes away. Other Shetland stations which had successful Es dx contacts were GM4LER and GM4SSA.

A little further to the south, GM6JFP (YS33a) took advantage of the good tropo earlier on 8 June to work numerous ON, D and PA stations in a great pile-up, and later when the Es appeared, worked YO6AFP (MG), SP6LZW (JK), OK3AU (KI), UB5DAA (LI) and UT5DL (LI), not a bad haul for all-ssb contacts. He commented that GM6LXN, his neighbour some 10 miles distant, could at times copy dx at S9 which was inaudible to GM6JFP, but this is a feature of this mode of propagation which we have come to expect.

Dave, G6DOX (Cumbria), worked Polish stations SP5EPT and SP5IWV in KM square, and GM6KWF worked SP7CNL, so most stations who could be active added some very nice new squares to their scores.

The QRP Field Day on 17 June coincided with a brief Es opening to Italy and Malta between 1400 and 1420gmt. It was a little more widespread than at first it appeared. G6DOX worked I1MXI (EE), I5WHC (FD) and I2FHW (EE) with 25W to a 10-element. Martin Stokes, G3ZXZ (W Yorks), worked two of these, plus I1DMP (DF), I5JUX (FD), I1KTC (EF) and I5WBE (FD), and heard I4BXN. Further north, GM6LNM (Glasgow) worked I1MXI, and he heard that three Italian stations were worked from his area, so the event extended quite far north. In fact it was not so good in the south, where Jim Rabbitts, G8LFB (London), copied 9H1BT, I6DRZ, IK8DYD and IW7ABE, but was not able to manage a QSO with any of them, experienced Es operator though he undoubtedly is.

The next Es event of any significance occurred on 30 June between approximately 1700 and 1900gmt, though there was a short precursor to this event around 1400 when G3IMV heard two EA7 stations very briefly but was unable to make contact. The main event embraced Portugal and southern Spain at one end, and most of the UK at the other, though Dutch stations were also getting into the act. G3IMV worked CT1AEX (VB), CT1COU (VZ), CT1BZT (VY), CT4ER (WY), EA5NY/7 (XX), EA4AAW (WZ), EA1BPO (XA), EA7AHS (WX) and EA1KV (VC), nine different squares in as many contacts, plus EA7PZ, EA7CR, EA7ERS and EA7DGS, all in WX. However, with John's mammoth score totals, only two of the squares were new ones for him. G3ZXZ caught EA7PZ, EA5NY/7, CT1BZT, CT1AWO (VZ), CT1WW (WB), CT1QP (VY) and CT1AWS (WA), and heard many more. Martin and several others commented on the terrific QRM and pile-ups, since most of the action seemed confined to 30kHz either side of the calling channel for ssb. Little or no cw activity appears to have been present.

The scope of this event can be gauged from the fact that James O'Hare, EI8EV (County Mayo), said that he had "at last" worked some dx on 2m, his "bag" was about 10 EA stations—the best being EA3LL, EA3EH, EA5HM, EA5DFY and EA5DHM—using only 10W to a six-element quad. Not so far away, Richard, GD3YEO (XO) worked EA7CPW (YX), EA1MO (XB), EA7AJX (YX), EA4QR (YA), EA7CGH (YY), SM5DIC/EA4 (YA), EA4APX (YZ), EA7PZ (WX), EA7CEC (XX) and EA1BMZ (ZB?). He worked every dx station that he heard.

In Lincolnshire, Dave, G4DHF, worked CT1WB (VB), CT1COU, CT1ASM/M (WB!), CT1AWO, CT1BZT, CT4PI (VZ), CT1AEX, plus EA4AAW, EA7AHS, EA7ERS (WX), EA7DGS (WX), EA1CME (XA), EA7CR, EA1BPO (XA) and EA1KV. Dave says that the CTs were the best with him, and the EAs the "exception". Some quite nice exceptions I would say! G4ASR (Hereford) heard an unidentified EA9 in XV square at 1755gmt. G1EZF is reported to have heard EA8AAE (RO), but whether this was in this event or in the tropo on 4/5 July is not known. It was felt to be useful to print this long list of calls worked since it tells us much about the nature of this event. First, the spread is interesting, with CTs not so prolific as one goes further north and west, but the event being seen to embrace an area between EI to the west and PA to the east. In the southwest G4NDG (Devon), heard EA7 and CT but did not manage to work them. GM6LNM called it a "great opening" giving him five new squares, the best being to XX, so the event extended well to the north, while in the south, Mel, G4XKZ (Kent), worked CT1AYC and CT1WW for new squares and a new country, so again the CTs seemed to favour the more southern regions, generally speaking. The long list of callsigns also indicates how vhf activity has grown in Spain and Portugal, in fact all over Europe, which augurs well for future openings of all types if you can put up with the inevitable QRM which this increased band occupancy brings in its wake. Several others in the Home Counties sent in lists of stations worked, too many to reproduce here unfortunately, but we have a general picture of a very satisfying opening which, added to the USSR event of 8 June, must have swelled the scores of many stations and added some most exotic calls to the log. Long may it continue!

50 and 70MHz

Good sporadic-E conditions in June led to some interesting 50MHz contacts on 24 June, reported by Brian Bower, G3COJ. At 2308gmt he worked W6JKV/OX (Greenland) two-way on the band, and was then followed by G5KW, GW3MHW, G3NOX, G4CUT and GW3LDH. The Greenland station closed down at 2340gmt and was not heard again. At peak he was 57 on ssb when he turned his beam away from the USA and towards Europe. He also worked cw, his equipment being 100W to a seven-element Yagi, though he has 1kW available. The antenna bearing from G3COJ to Greenland is theoretically 340°, but Brian received W6JKV/OX best when he beamed 300°. Unfortunately the stay in OX for the American operator was very short-lived, but this is another indication of how useful the 50MHz band would be for dx working were it more generally available.

The most significant 50MHz event for a very long time came overnight on 30 June/1 July when GJ3YHU in St Lawrence, Jersey, CI, caught the

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tail-end of a "CQ" call on the band from "Lefty", K1TOL, in Maine, USA; worked him, getting a 519 report, and then went on to contact a further 46 stations in New Hampshire, Maine, Connecticut, Massachusetts, Vermont, New Jersey, Rhode Island and Nova Scotia. In all he had 56 contacts between 2234 and 0057gmt, some stations being worked more than once to check propagation which was, presumably, by sporadic-E. The USA stations had heard the Gibraltar beacon ZB2VHF earlier in the evening, but not GB3SIX. GJ3YHU was the only UK station worked despite many "CQ-Europe" calls by the North American stations. GJ3YHU said that the band sounded like 20m during a CQWW contest! At the time he had his beam pointing northwest, hoping to hear something from the EI0RTS expedition. The USA stations told GJ3YHU that they monitored the 6m band for UK signals every night but had no success until this occasion which says much for the dedication of these operators.

G3PBV (Devon) heard some of the USA stations, while GW4HBK heard the GJ but could not hear the USA signals.

On the same day, G8VN (Derby) heard ZB2VHF early in the day, and later, at 1625gmt, heard ZB2BL on 50·035MHz working crossband to G4IOQ on 28MHz. They made a QSY to 70MHz when several G stations proceeded to work Jimmy; one of them, G4ARI, using only 4W to an indoor dipole on ssb. ZB2BL transmitted simultaneously on 50 and 70MHz.

Via GJ3YHU, WA1OUB advises UK stations to use 50·100MHz as a calling channel, since the usual frequency (50·110MHz) is usually very busy on the other side of the Atlantic. This Es on 50MHz is very significant for students of propagation. Peter Blair, G3LTF, had written earlier to say that he was culling statistics from 10 years of records in an attempt to learn more about the mechanism of sporadic-E. He made the point that last year's USA-G contacts might not have been double-hop Es after all, and he hoped for some data this year which he now undoubtedly has! We hope that Peter will tell us more of his researches when he has analysed his records, but he makes a point not perhaps obvious to newcomers that if there is transatlantic dx on 50MHz via Es, then there will almost certainly be similar paths open on 28MHz, so monitoring that band late at night can be very useful.

David Reid, GM6JLQ (Dunbartonshire), is now listening on 50MHz using a specially-built Microwave Modules 6-to-2 converter into a FDK M750E. He has a homebrew four-element beam at 28ft, and hears GB3SIX at 419–529 regularly. His usual operating hours are between 11.30pm and 1.30am and 7.30am and 8.20am. David will send reception reports to any station he can copy, including cw, his speed being 8–9wpm at present.

Via GM6LNM comes a report that GM3DOD was hearing 50MHz signals via aurora on 1 July at 2200gmt, so don't neglect monitoring for signs of these events late at night.

Back on 29 May, Jeremy, G3IMW, had an ms ssb contact with GM3WOJ in which Chris transmitted simultaneously on 50 and 70MHz, with Jeremy using two receivers. Some bursts occurred simultaneously on both bands, while others were quite separate, some reflections seeming to move from one receiver to the other. They repeated the test on 5 June, when G3IMW used short agc time-constants. Jeremy uses an antenna system mentioned before in *4–2–70*; a 50/70MHz dual-beam with elements interlaced, which clearly works well since he copied GM3ZBE via tropo on 15, 16, 17 and 18 June. Much of the path between these stations is over the sea, possibly significant since no other GM stations were heard on these days.

Aurora

There is not as much to report on auroral activity as there was a year or so ago, but for those who like to maintain records here are some details of auroras since the last reported in *4–2–70*, which was an event on 25/26 April. There may have been others, but the following were reported by either Stuart, GM4OGM, or GM6LNM.

2 May Scottish type between 1400 and 1500 with GI and GM only heard at GM6LNM. GB3LER 51A.
5 May Weak, northerly event at GM6LNM. GB3LER 53A at peak, DL0PR 51A and GI, GM worked on ssb. A few Continentals heard on cw. Duration 1515 to 1745gmt.
18 May Aurora reported on 6m in late afternoon.
20 May GM6LNM copied GB3LER at 51A bearing 25°. This must have been a first phase, since GM4OGM reported: . . .
21 May 0042 to approximately 0200gmt. GM4OGM worked G3UTS who appeared to be the only station QRV. He varied his beam heading and found the best direction (from GM4OGM) to be 35°, with signal disappearing some 35° either side of this direction.
22 May GM4OGM worked GI4OMK (XO), G4XUM (YN), G6GN (YL), and G4KUX (ZO) in an event between 1716 and 1743gmt, all on cw. GM6LNM heard GB3LER at 1651gmt, very weakly, and only worked GM6LXN, and the beacon disappeared at 1800gmt. This is strange in view of what was being heard and worked by GM4OGM at this time, since they are not all that far apart (GM4OGM Edinburgh, GM6LNM Port Glasgow).
23 May 0030gmt, an apparent second phase of the previous event when GM4OGM worked OY9JD (WV) with no other stations heard. GB3LER was auroral during the same afternoon.
24 May GB3LER again auroral at GM6LNM 1512 to 1645gmt.

Auroral events are clearly diminishing compared with those of 1981–2 which are now pleasant memories. There was an event which reached the south on 18 June however, when GM and LA were worked from the London area. G4XKZ used his recently-acquired G4 licence to have his first Au cw contact with a GM during this event. In this aurora, GM6JFP worked several G stations and some PAs and comments that GB3LER was only weakly auroral with him for about 15–20min during the event, which he thinks was almost overhead at his QTH.

It was heard on the vhf net that LA6QBA participated in a major aurora overnight on 4/5 May in the period 2100 to 0400gmt. From his location in GV square he is reported to have worked UA1, UA3, OH7, SM2 and G as far south as AM square. This sent me rushing for my log and notes, but I can find no reports of any kind from UK stations who might have taken part in this event, and the reports from our GM friends indicate only minor events around that time. Does anyone have more information?

Tropo to the Canary Islands

Although for most of us the tropo conditions on both 144 and 432MHz have been somewhat poor of late, an unusual seapath opened up late on 4 July between the UK and the Canary Islands when a lucky few who were situated in the right places had contacts with Salva, EA8XS, in Las Palmas, Canary Islands (SO73d). This is equivalent to working from the UK down to the far side of the Black Sea, and the fact that it was accomplished on ssb on both 2m and 70cm, as well as on 2m fm, with some contacts lasting for 45min, shows how stable this path was, yet it appeared to be very localized. The event (or events, since contacts bridged two days) can best be summed up by a report from Dave Last, G6LEU, of Truro, Cornwall, who writes: "On 4 July, following *several* contacts close to the calling-channel with EA1 stations in VD square, a "CQ" call to EA/CT made at 1840gmt was answered by EA8XS at 59 plus 20dB (both ways). After QSY to 144·275MHz, Salva said that this was his first UK contact this year. I mentioned that a local amateur, G8ZDS, was QRV on 70cm, and by coincidence he was listening to the QSO and joined in to arrange a successful QSO on the higher frequency band with reports of 51."

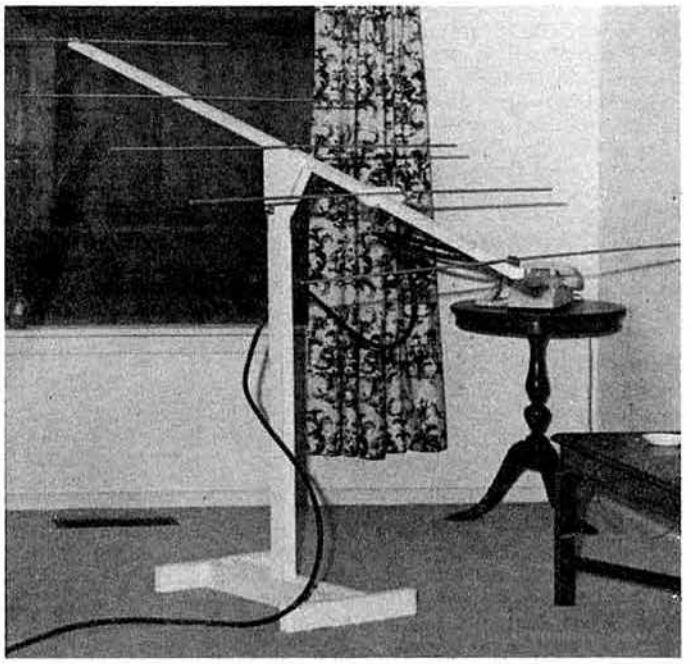
Dave goes on to say: "The following evening at 2140gmt I was again the first to pick up EA8XS on 2m, and after our QSO, Salva worked several other UK stations on both 144 and 432MHz, including contacts with GW. At 2245gmt I heard him calling and getting no answers, so we then had another excellent QSO lasting 45min at 59 plus both ways. This time we both asked repeatedly for callers to break in, but several whom I passed on to Salva were not audible at his end. At 2300gmt we changed to fm simplex mode and again exchanged 59 reports. I gave all the help I could to G, GW and F stations calling Salva but with no result. We closed our contact at 2339gmt and Salva continued to work Spanish stations . . . "

G6LEU uses a FT290R and a kit-built 25W linear into an eight-element quagi, and reports that EA8XS was using 25W to a 17-element Tonna. G3IMV and G4DHF both report having heard that OK2BFH (JJ) worked EA8XS and possibly other EA8's during this period, which if correct is remarkable, since the path between them is mainly over land and quite out of line with the apparently well-defined duct (?) which appeared to limit the number of UK stations who could hear EA8XS. There may be some confusion here, inasmuch as it is not clear whether OK2BFH was QRV during this tropo opening or in the Spanish Es event on 30 June, so we must await further details.

Indoor antennas for vhf

It must be very unpleasant to read about super dx on the vhf/uhf bands when all you can use is an indoor antenna, and there are very many in this category though we do not often hear from them in *4–2–70*. Whereas one can get by on the hf bands with wire dipoles and such like in the attic, operation at vhf using simple indoor antennas imposes a number of restrictions which are not easily overcome. A 144MHz beam is usually too large to rotate in an attic, though many manage to do this, while to go to higher frequency bands in order to reduce antenna size only invites problems due to absorption effects of roof structures, plumbing, general attic "junk" etc. So it is not surprising that when faced with these problems many operators opt for a simple antenna which will permit them to access their local repeater, such as the "Slim Jim" or vertical quarter-wave. Writing in *Central Scotland and Borders FM News*, Mike Dennison, chairman of the Repeater Management Group, urges users of this type of antenna to try for something more elaborate, despite the difficulties which this might entail, simply to broaden the horizons of those who cannot put up an outside array by endeavouring to work something other than the local "machine".

On several occasions in my amateur career I was limited to indoor antennas on vhf and, though it is not easy, much dx was worked with a great deal of patience. Horizontal polarization is a great help, of course, since



Indoor 2m beam with elevation for satellite working (G8VR/W1)

many stations who install something simple tend to use a vertical antenna which limits still further their ability to work ssb and cw on the vhf bands. The photograph shows a "living-room Yagi" using five elements which I used regularly in Connecticut, USA, where I could not have an antenna outside. I worked through Oscar 6 and 7 satellites across to Europe on most days, particularly with G6RH (Bexleyheath) who, it seemed, could always hear me, and it was a good enough antenna to work some ssb and cw, including two auroral contacts on *sideband* with stations (admittedly big ones) some 250 miles distant. If any reader has had good results from indoor antennas of a particular type, then any input on this subject would be much appreciated by those who can only read about the dx and not get among it for lack of an efficient antenna system.

How's your front-end?

Correspondence has shown that many operators wonder whether their receivers are good enough to copy really weak vhf signals. It is, of course, the first stage or front-end of the receiver which to a large extent governs this, and specifically the noise figure (nf) which gives a guide to weak signal performance.

Receiver measurements at this year's VHF Convention and other rallies showed very clearly that although they may sound lively, many commercial transceivers have extremely poor receiver noise figures, typically 5–7dB, and in some cases as high as 20dB. Without delving too deeply into the theory of receiver design, it can be assumed that a receiver nf of about 2dB is adequate for general vhf purposes up to 432MHz, and to strive for anything better is probably a waste of time, except for eme work, since terrestrial noise has to be taken into account.

The nf of the receiver itself is only part of the story, however. Any losses ahead of the first stage of the receiver will add directly to the nf of the system as a whole, while losses following the first stage contribute to second stage nf and are less important if the front-end is properly designed and set up. To take an example, if a receiver has an nf of 5dB, and is connected to an antenna through a coaxial feeder with a loss of 2dB at the frequency to which the receiver is tuned, then the overall system nf will be 5 + 2, or 7dB. This is not a very good system figure, so what might be done to improve it? One solution would be to install a preamplifier—such as is commercially available—with, say, a gain of 15dB and an nf of 2dB. However, if this preamp is positioned close to the main receiver and connected to it through a short length of coaxial cable, then the overall nf will not be the 2dB of the preamp but more like 4·2dB, because we still have to consider the noise contribution of the feeder loss as well as the effects, though now smaller, of the receiver input stage (which now serves as the system *second* stage).

The effects of feeder loss can be minimized if the preamp is moved to the top of the mast. A relay or relays will now be required to cater for send/receive switching with a preamp in this position, but if they are good ones any losses they introduce should be small, of the order 0·2dB, but nevertheless important since this is a loss *ahead* of the first stage where its effect is most felt. If the original 2dB feeder is still connected between the preamp and the main receiver, then the overall nf of the system will be reduced to about 2·3dB, a distinct improvement. Having now put the preamp up the mast, any losses which follow it become much less significant. If a separate feeder line is used for "receive", this can be quite "lossy" since theory indicates that if, say, 6dB loss existed between masthead preamp and the main receiver, the system nf would be about 2·9dB in this case. In other words, increasing the feeder loss on receive by another 4dB has only degraded the system nf by about 0·6dB. There is a relationship between the gain needed from a preamp and the nf of the following stage, and some manufacturers specify an attenuator pad between the units to adjust for this. Since some of this attenuation can be made up of feeder loss, simple fm broadcast or tv feeder is usually quite good enough as a "receive-only" feedline from a masthead preamp.

Those readers with microcomputers who would like to explore these matters further are recommended to read a series of articles on eme by Charles Suckling, G3WDG, in *Ham Radio Today*, May, June, July 1984. In the June issue, Charlie published a computer program in Basic which investigates the use of not one but *two* preamplifiers to achieve the very low nf required for eme. By assigning to one preamp a gain and nf of zero, however, the program is equally applicable to the single preamp case which most of us use. It is fascinating to insert into this program various figures for feeder loss, preamp gain and nf, and to see the result on the overall noise performance of the imaginary system. It certainly makes one want to do something to improve the receive side of the equipment, since the old adage "You can't work them if you can't hear them" is as true today as it ever was! And there are sure to be some perfectionists who want to try two preamps in an attempt to hear those elusive YOs and LZs on tropo!

Here and there

Edmund Ramm, DK3UZ, has written to remind readers that the Activity Group CW in Germany (AGCW-DL) sponsors annual vhf/uhf cw contests on the third Saturday in March, the fourth Saturday in June and the fourth Saturday in September, so there will be one at the end of this month. Times are 1900–2300gmt for single-operator stations in the band 144·010 to 144·150MHz (the March contest is on 432MHz). There are three classes, A for less than 3·5W output, B for less than 25W and C for powers greater than 25W. The exchange should be RST, serial number, class and QTH locator.

Trevor, G8KMV, QTHR, can supply details of a low-cost controller for packet radio requiring only a 12V 200mA power supply, plus a suitable micro of course. For a readable description of packet radio, the spring 1984 issue of *Datacom*, the journal of the BARTG, contains a "tutorial" by Ian Wade, G3NRW, which puts this least-understood mode into perspective.

Some of the callsigns heard on the bands these days which have been issued to overseas amateurs operating in this country are very unwieldy. Take for example G4VK4IAZ which Doug Friend, VK4IAZ has to use. Try getting that across in a contest or a big sporadic-E opening! It seems to me that we could do better than that for our overseas colleagues. When I was operating in the USA I was simply G8VR/W1, which at least had the merit of getting my main callsign over before embarking on the suffix. A glimpse at the 1984 *RSGB Call Book* shows many more, like G4WD6GZC and G4WA2JRV for example. What about a small prize for the longest call worked on vhf?

David Reid, GM6JLQ, QTHR, has a full set of plans for a 6m transceiver which appeared originally in *Radio-Tv Experimenter* in 1959, and offers to send copies to anyone who sends a largish sae, plus a first-class stamp to cover photocopying costs.

GM6LJE (Dumfriesshire) is active from YP square using 35W to a 17-element Tonna, mainly in the evenings and at weekends. He makes a plea for more stations to use their QTH locators when calling.

During the first weekend in September, in the IARU contest, PA3CAC will be QRV from DO70d (JO34JM) on 144·375MHz, using 25W into 4 × 9-element Tonnas. He will be looking mainly towards the UK.

The vhf awards manager, G5UM, reports having issued three awards to YL operators all within one week. They went to Susan Beech, GM4SGB; Tina Keil, EI6BLB/P (who submitted a double claim for a Standard and a 40/10 squares certificate); and Yvonne Taylor, G4RTD (who received a sticker for 60 squares/15 countries to top up her previous 40/10 award). Jack says that when applying for a sticker, only the extra cards to boost the original claim need be sent, not the entire batch. Also he will accept photocopies of cards from those who do not want to risk their precious QSLs in the mail, but makes the point that both sides of cards must be copied if relevant information appears on each side of the card. □

Microwaves

*by Mike Dixon, G3PFR**

Operating news

Further to my comments concerning the G3NKL/G3FNQ 10GHz link, both stations are understood to be now using Microwave Associates Gunnplexers for the link. Dennis, G3FNQ, has received G3NKL's end of the link on Great Orme's Head at Llandudno, which augurs well for the possible participation of a station along the North Wales coast, and Ray, G3NKL, similarly reports receiving Dennis' signals from Pendle Hill, thus extending the potential of the link well beyond its present boundaries. I have heard Dennis' signals from Winter Hill, well off the nominal beam bearing.

Jack Hum, G5UM (vhf, uhf and microwave awards manager, QTHR) must have been psychic when he commented on the 1·3GHz Senior Four Metres and Down Awards (July *Microwaves*), for, no sooner having observed that only eight such awards had been made since 1976, than a valid claim arrived from Frank Jackson, G3GIM, of South London. Frank was able to turn in four more countries than required, and his cards included such rarities as LX and OE. This claim brings Senior Award No 9 less than a year after earning the Standard Award which in its turn had earned him the Supreme—well done!

An equally remarkable claim on 2·3GHz came from Charlie, G3WDG —five squares on this band, two of which were for Charlie's recent notable UK "firsts" on 2·3GHz eme (sticker No 7). For the record, the first such award went to John Tye, G4BYV, in January 1980, and John is still the only holder of the Ten Squares Award on the next band up (3·4GHz), achieved last January.

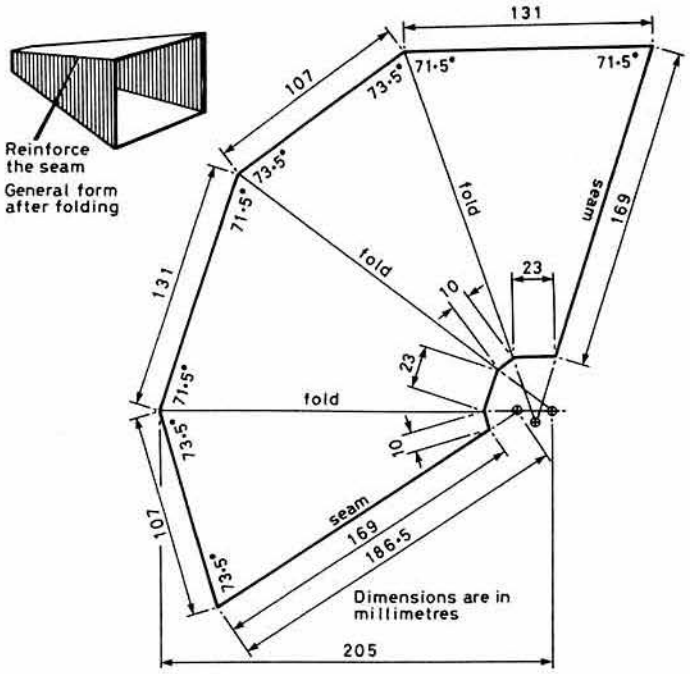
Charlie sends news of what is probably a new world record for a 1·3GHz terrestrial contact which took place very recently between N6CA (Torrance, California) and KH6HME (Mauna Loa, Hawaii). This path, in excess of 4,000km, was first worked on 144MHz on 8 July 1957 by W6NLZ and KH6UK, and it is perhaps significant that N6CA's QTH is close to that from which the earlier vhf contact took place. On this occasion the participating stations *just* made contact on 144MHz, 432MHz did not work at all, and 1·3GHz was open for just 10min in a period of several hours' operation. N6CA used 100W to four quad-loop Yagis, and reported storm fronts crossing the California coast at the time of the contact: this phenomenon has previously been noted for the other vhf and uhf contacts on this very long path. Congratulations to both stations—just reward for patience and perseverence!

Dave Robinson, G4FRE, writes to say that he and G8HPU took 3·4GHz gear to the site (AL07a) on Felixstowe golf course primarily to allow G3ZEZ to test new equipment. Not only was this achieved, but Dave's signals (1·5W to a 2ft dish) were heard by Simon, G3LQR, at 539 over an obstructed path. Moving the equipment by 200m improved reports to 599 both ways. The highlight of the day was the detection of G4BYV's signal on the input stripline of the receive preamplifier, giving John, G4BYV, a new square on 3·4GHz! A rapid trip home to fetch 5·7GHz equipment resulted in a one-way 419 report on that band under rapidly deteriorating conditions. Dave noted that there was a visible over-sea inversion accompanied by drifting fog banks: the Dutch 10GHz beacon PA0DBQ was intermittently received, and Simon, G3LQR, was said to be much impressed by the 5mW ssb (58 report) signal on 5·7GHz produced by a JVL transverter driving the receive preamp in transmit mode!

Fundamentals (3)

While even small parabolic dishes provide very considerable gain at 10GHz and beyond, they can, depending on their profile, be quite difficult to feed effectively; moreover, for the newcomer they can be quite difficult to obtain at a "sensible" price. Fig 138 on page 9.65 of the *VHF/UHF Manual*, 4th edn, shows graphically the order of gain to be expected from parabolas of different diameters (assuming an illumination efficiency of 50 per cent) and from this it can be seen that, for instance, a 12in dish has a gain of approximately 27dB with a beamwidth of about 7° at 10GHz.

An acceptable substitute, at least for initial operation, is the pyramidal horn, design details for which are given in the *Manual*, p9·81 to p9·83 and particularly in Fig 172. If the reader does some calculations based on this data, it will be seen that there is a rapid "trade-off" of gain against increasing size (in particular, length) compared with a parabolic dish. The cut-off point is around 20 to 25dB if size, portability and beamwidth are considered important.



An approximately quarter-scale template of a 20dB horn for 10GHz

Bearing these factors in mind, the principal advantages of the horn are still those mentioned last month: predictability of gain, good match over a broad bandwidth, and ease of construction—with the added bonus of owning a good "reference" antenna from which comparisons can be made.

To quote the *Manual* "The geometry of a horn is not quite as simple as appears at first sight . . . for a superficially rectangular object, a horn contains few right-angles". When opened out into a flat shape and calculated for a nominal 20dB, the horn looks like Fig 1, a far-cry from a rectangular object! The constructor is strongly urged to draft a full-scale template in stiff card of about the same thickness as the sheet metal to be used. This will give the opportunity to correct errors in measurement before the transfer onto sheet metal and to prove to the constructor that, on folding, a pyramidal horn *is* formed!

As with iris plates, the sheet is best sawn (or guillotined) rather than cut with tin-snips so that the metal remains flat and undistorted. There is an advantage in using sheet metal of similar thickness to the waveguide walls, *viz* 1·25 to 1·3mm. If the constructor has difficulty in folding sheet metal, the horn can be made in two pieces rather than the one piece shown, although this will introduce a second soldered seam. Soldering is best carried out using a heavy-duty iron to "run" the solder progressively along the seam(s). When soldered, the seam(s) can be reinforced by means of an angle section soldered to the outside of the joint. Mounting to the waveguide can be accomplished by several means suggested in the *Manual*, and other means can, no doubt, be devised by the constructor. It is worth paying attention to the strength at the point of attachment, and also to the removal of any "lip" at the transition from waveguide to horn. No tuning or alignment is needed other than to check the mounting is "square" and that excess solder is removed from the inside of the seams. Weather protection can be provided by a coat of good-quality polyurethane or epoxide paint. As to materials of construction, I have successfully used brass, copper, tin-plate and double-clad glass-fibre pcb material. Although the latter requires all four seams to be soldered (and this presents its own alignment problems!) it has the advantage of being very light and cheap to use, together with the fact that a small soldering iron will make satisfactory joints. Such an antenna is, however, not very robust and is probably best suited to occasional use as a comparison antenna for gain measurement.

Diary dates

Three events of interest to microwave operators are as follows:

The next Martlesham round table is scheduled for 21 October and, as usual, is a ticket-only meeting. Tickets and further details can be received from Dave Robinson, G4FRE, QTHR.

(Continued on p780)

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

EPHEMERIS

Satellite news and views

*by R. O. Phillips, G4IQQ**

Oscar 10

The spacecraft is now well into its second year of operation and appears to be in very good health, particularly the Mode B transponder, which still carries the bulk of the traffic. It is difficult to conceive of a time when communication was limited to short periods requiring frantic changes of the antenna direction and retuning the receiver to counteract the effects of Doppler shift. Be that as it may, the number of amateurs using Oscar 10 is probably somewhat lower than one might have expected, and it is doubtful if there are as many operators using this satellite as there were on the earlier birds (not forgetting, of course that the RS series polar-orbiting satellites continue to function very well). One thing is certain, the initial fears of congestion in the transponder bandwidth were rather optimistic, and it is still quite possible to find that you are sharing the total satellite with only one or two others. It will be interesting to see the results of the Stoner Challenge Cup which ran for three months from 15 April. This should enable AMSAT to obtain a very good indication of the extent of use of the satellite, both in terms of number and location of operators as well as the equipment at their disposal.

A recent issue of *Amateur Satellite Report* carried details of what it called an important milestone, namely the first-ever QSO between operators using handheld transceivers. The link was established not by direct communication, which would indeed have been noteworthy, but by arrangement with other local amateurs who patched the signals through to their satellite equipment after translating the signal modulation from fm to ssb. Similar arrangements were made at either end of the link with the odd repeater thrown in for good measure. The application of this type of operation in normal amateur communications is difficult to contemplate, but it does demonstrate what could be done in disaster-relief situations, where use of handheld equipment for long-distance communications would be very attractive.

Uosat

Considerable progress has been made in stabilizing the attitude of Uosat 2 since my report last month. This is a particularly important task, as incorrect alignment with Earth affects not only the quality of the received telemetry signals but also the critical solar illumination which determines solar cell output and spacecraft temperature characteristics. During the latter part of June and early July, the on-board magnetorquers were activated for long periods of time in order to decrease the rate of spin of the spacecraft. After close alignment with Earth's magnetic field had been obtained by manual telecommand methods, a number of control algorithms were loaded into the spacecraft computer to further refine the accuracy. The results of the initial trials untler this mode of control have been very satisfactory, and further work will be carried out in the near future which should provide very useful data for subsequent use, either for Uosat 2 or any other satellite.

Some work has been carried out to assess the performance of the on-board clock after it was set to British Summer Time on 22 June. Again, initial indications are very encouraging, and when the clock was re-read some five days later it was found to have gained 12s. When full confidence has been gained in the operation of the clock it is likely to be used much more to contol on-board functions.

During the commissioning phase of the satellite it will not be possible to give any firm indication of an operating schedule. The main requirement during this period will be for a great deal of telemetry information, using either the complete frame or selected channels relevant to a particular activity. In some instances the telemetry system will be commanded to dwell on five selected channels so that each line of telemetry contains updated values. This facility provides very fast data acquisition for ground analysis and should enable the whole commissioning procedure to be achieved in the shortest possible time.

Last month I referred to the data sheets now available from the University of Surrey concerning various aspects of both its satellites. These have now been supplemented by a further data sheet which covers decoding of Uosat 2 telemetry using a BBC microcomputer. Using the assembly listing provided (which was written by Trevor Stockill, G4GPQ) it is only necessary to feed the received signals directly into the cassette port of the BBC and the decoded data will be displayed. If rfi problems are encountered from the micro into the receiver, it may be better to record the telemetry first, then carry out the decoding. A copy of this data sheet may be obtained from the University by sending a large self-addressed stamped envelope. A further development of this program which actually displays the telemetry parameters after conversion using the relevant algorithms is currently in use at the university.

A last-minute check on developments before writing this indicated that further evaluation of Uosat was continuing and the only areas for concern were the battery charge rate and the temperature. These two parameters were being closely monitored during the orbit manoeuvre phases to avoid conditions that might cause the 145MHz beacon to malfunction. It was similar conditions that were initially thought to have been the cause of the difficulties after launch.

During all this activity Uosat 1 continues its very active life, though its altitude has now decreased to around 500km. The operating schedule for the satellite is now well established, but it is worth repeating occasionally for the benefit of newcomers:

Friday	Load bulletin
Saturday	Bulletin/1,200 baud telemetry/Digitalker
Sunday	Bulletin/1,200 baud telemetry/Digitalker
Monday	Radiation data
Tuesday	Checksummed telemetry
Wednesday	CCD image
Thursday	Whole orbit telemetry data

The main telemetry frequency for Uosat 1 is the same as for Uosat 2, ie 145·825MHz. In addition to the above transmissions, the beacons on 21 and 2,304MHz are usually activated on alternate weekends.

Other news

Pat Gowen, G3IOR, wrote to say that the double satellite experiments, using Oscar 10 and RS6 carried out with Dave Rowan, G4CUO, were very well received in the USSR. Purely by coincidence their successful attempt occurred on their "Radio Day" which celebrates the demonstration of radio communications by Alexander Popov.

A four-week meeting of the International Consultative Committee for Radio (CCIR) took place in Geneva during June/July, the purpose of which was to prepare the groundwork for two World Administrative Radio Conferences concerning satellite services to be held in 1985 and 1988. The conferences are essentially concerned with satellite services which employ the geostationary orbit, and their function will be to determine which services and frequency bands, if any, should be planned. One of the major objectives for the participants of the conferences will be to arrive at a solution which ensures that requirements for new networks can be accommodated when the need arises. Fortunately the amateur satellite service is currently in a position where it is able to undertake its own frequency and orbit planning. Even when amateur satellites use the geostationary satellite orbit (Phase 4), it should be possible to retain independence in our planning, subject to the usual constraints of sharing with other radio services. □

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MICROWAVES

(Continued from p779)

The 1985 VHF Convention is being organized at the usual venue on 23 March 1985, and the RSGB Convention is scheduled for 13/14 April 1985 at the NEC, Birmingham.

From another publication

Dubus 2/84 contains several interesting microwave designs: an active 2·5 to 5GHz doubler using an MGF1402 GaAsfet is described for use as a local oscillator to a sub-harmonically driven 10GHz transverter; 18mW input at 2·556GHz produced a filtered output of 34mW at 5·112GHz. There is a design for a simple 5·7GHz cavity filter, a "three-band" (1 to 4GHz) GaAsfet preamplifier/low-power linear amplifier, a complete 10GHz ssb transceiver making use of MGF1402 GaAsfets as amplifiers in both transmit and receive chains, and a "stand-alone" 10GHz GaAsfet amplifier with microstrip filter. There are also no less than 14 pages of GaAsfet data! □

RAYNET

*by Geoff Griffiths, G3STG**

Chairman, Raynet Committee

Raynet reports

Raynet group controllers are like most other radio amateurs. They are usually very busy people with lots of energy and enthusiasm for communication. They enjoy working on training programmes for their groups, and talking to user services about Raynet support for all sorts of activities and events. It really is little wonder that they show a marked disinclination to spend a great deal of time on paperwork.

However, one chore that group controllers are asked to undertake is to complete a Raynet report form describing their group's activities on exercise, event or emergency. These forms are then despatched to headquarters and probably pass out of everyone's minds—or at least out of the group's mind. These reports do form a fascinating insight into the operation of the members in support of the community, and our zonal co-ordinator, Joan Heathershaw, G4CHH, has recently completed a study of the reports submitted to headquarters between March 1983 and February 1984. In analysing the sheets, many common experiences and lessons emerge, and also many rueful little comments which betray a panic on the day, or a thought to be stored away for the future.

A copy of the complete report can be yours for the price of a large stamped self-addressed envelope sent to me at the address at the foot of this column; but just as a taster, how many of the following comments seem familiar to you?

"On a number of occasions during the event, Raynet was praised for its clear communications and amazing coverage."

"By way of appreciation, and to bribe us to take part next year, the team was invited to a reception in the City Chambers."

"A special event station used 144·8MHz for most of the day, but fortunately two other Raynet channels were free to use instead."

"Of the five radios at Control, one failed when the phase-locked loop wouldn't."

"Initial problems with rtty due to generator instability."

"We overlooked the time to sort out adapters and sockets on borrowed feeders."

"Murphy's Law states that battery packs for portables are designed to run down when the operator is furthest from HQ."

"Raynet logged some 400 messages while StJAB treated 110 casualties. Mobility of some operators was frustrated or denied altogether by police officers—a matter to which Raynet might pay serious attention in the coming closed season."

"In setting up stations in ambulances and medical officers' cars, we had a problem with glass-fibre bodies and positive earths."

One which both Joan and I particularly liked was describing an exercise called "Festival", which was a poor choice of name for a simulated battle covering 600 acres, which reads:

"An estimated 1,500 messages were passed, including 15 immediates. Saturday proved a quiet day, our main problem being the inability to track down the various officials due to the vast area being covered. This was solved by providing portable radio 'shadows' for the more essential 'users'. Our magnetic map board was used to indicate to net control where the 'users' were, and this proved invaluable.

"Sunday: one word describes it—chaotic! Imagine some 2,000 soldiers carrying on a battle on soft ground. Suddenly the heavens opened! Result: soldiers and Raynet operators drenched through. Then the casualty reports came flooding in, and a high proportion required hospital treatment. The net closed at 1724 and we were exhausted. At 1834 we were asked to open up again as the 2,000 soldiers camping on the common were suffering from hypothermia. With local, and the cepo's, help the soldiers were eventually accommodated and fed, and the Raynet group stood down at 2245.

"On the third day the weather was superb, the crowds came out in force, and the battle was reconstructed on a better site. There were no further casualties, and a less arduous day was had by all—for which the Raynet group were well and truly thankful."

This account illustrates very well the point that what is originally set up as an innocuous exercise can all too often turn into a live emergency. This of course provides further justification for Raynet's presence at events like country shows, scrambles and marathons in the first place. Undoubtedly the inclusion of the user service event participation has greatly increased "live" activity, and it is a truism that, "there is no substitute for live conditions". Joan remarks that "it is amazing that a comparatively small organization can be so adaptable".

I can only summarise some of the reports quoted here, and I would urge all groups and controllers to ensure that they get sight of a copy of the report. It contains a volume of irreplaceable experience.

Mr Douglas Willies, G3HRK (third left), county controller for Raynet, receives equipment for the North Walsham police station flood control room from (l to r) Dr Tim Thirst, G4CTT, of Eastern Communications, deputy county controller for Raynet; Mr Paul Willies, G6TMU; and Mr Stephen Dorey, president of the Rotary Club of North Walsham. *Photo: Eastern Daily Press*

Support for the Norfolk Group

A presentation ceremony was held recently at the new showrooms of Eastern Communications, when two transceivers, a pa and power supply were handed over to the Norfolk Group to equip the flood control room at North Walsham Police Station. The equipment came from a variety of sources: a Yaesu FT290 from Eastern Communications, a Yaesu FT790 from the North Walsham Rotary Club, and a 430MHz linear and power supply from Paul Willies, G6TMU, a member of the group and son of G3HRK, who had raised the money by taking part in a local half-marathon. In addition, an anonymous donor sent £50 to help equip the flood control room.

Don't just sit there!

Raynet and the media

Two recent examples of the way in which the media deals with Raynet have come across my desk recently and, as is the way of these things, one case is good, the other not so good.

Let's start with the bad news first. A recent disaster in the county of Lancashire which hit the national headlines involved speedy and efficient reactions by Raynet members in the North Bowland, Central Lancashire and Cumbria groups. Unfortunately, an interview with a local newspaper reporter—well hardly an interview really—resulted in an article appearing which was super publicity for Raynet but did a great deal to harm the relationship with the user services which had taken many years to build up. Moral: when involved with a major emergency, refer the media to the user service press officer, no matter how innocuous the conversation appears to be.

On the other hand: the Grimsby & Cleethorpes Group was able to take part in the annual Immingham Town Gala, and as a result collected a good deal of positive publicity for Raynet in both local press and radio. In cases like this it is a very good idea to have a "Press handout" available so that the local reporters really have little excuse for inaccuracy of their facts. A word with your zonal representative or with RSGB headquarters before the event will usually result in the right sort of support for your event. Moral: be prepared.

Raynet Manual

By the time this column appears on your breakfast table, copies of the new edition of the *Raynet Manual* will have arrived through the letter-boxes of group controllers and should be available through the Society's publications sales department at headquarters.

This edition of the manual represents a considerable departure from previous versions. Members will observe that it is much more substantial, and this follows the determination by the Raynet Committee to make available a store of information for new controllers and controllers of newly-formed Raynet groups. This of course is no substitute for the experience of long-serving members and controllers, but at least it provides a useful point of reference for controllers and members alike. Much of the first section is an updated version of earlier editions, but the later chapters consist of new material which has been produced by members of the Raynet Committee over the last 12 months. Its purpose is to provide suggestions and stimulation for discussion. No doubt Raynet members will soon be letting zonal representatives and committee members know what they think of it! □

11 The Grove, Asfordby, Melton Mowbray, Leics LE14 3UF.

SWL News

*by Bob Treacher, BRS 32525**

Second HF Challenge

In view of the success of the HF Challenge held last September, I am repeating the idea to again coincide with ssb and cw legs of the CQ WW DX contests. The ssb leg will therefore take place from 0000 27 October to 2359 28 October, while the cw leg will be from 0000 24 November to 2359 25 November. The idea is still to log as many different countries as possible. Only one station from each DXCC country can be logged on each of the six bands—this caused some confusion last year. The full rules are as follows:

(1) Entries may be either single-band or multi-band.
(2) Each different country heard on each band will count for points:
  (a) countries in the swl's own continent will count one point on 28, 21 and 14MHz, two points on 7 and 3·5MHz, and three points on 1·8MHz;
  (b) countries outside the swl's own continent will count three points on 28, 21 and 14MHz, five points on 7 and 3·5MHz, and 10 points on 1·8MHz.
(3) The final score should be computed as follows:
  (a) **single-band entries.** The total points should be added together and multiplied by the number of DXCC countries heard (eg 120 points × 65 countries = 7,800);
  (b) **multi-band entries.** The total points gained on each band should be added together and multiplied by the total number of DXCC countries heard on each band.
(4) Entries must be accompanied by a multiplier check list.
(5) Entries, showing the full callsign, time, and signal strength of the stations heard, should be sent to me at the address at the foot of this page, to arrive no later than 19 November for ssb and 17 December for cw.
(6) Prizes may be available. So, good luck, and let's hope conditions are favourable.

SSTV swl

Not too many swls have sstv facilities, but Les Hobson, BRS84809, has spent many profitable hours monitoring the sstv channels. His exploits and details of sstv listening are interesting and, as they might tempt other swls to consider purchasing equipment to monitor the signals, the following might be of interest.

G4NJI first introduced Les to sstv, and he soon equipped the shack with a SC422 scan-converter and black-and-white monitor. Ordinary amateur equipment is used, and video information is contained between 1,200 and 2,300kHz. The display of operator, shack, family etc are transmitted during an ssb transmission, and the operators can also discuss the pictures. Pictorial CQs, test patterns, and cartoons test the operator's artistic design and most are unique. A picture can be viewed directly from the monitor screen, photographed, or recorded to be played back via the monitor. A complete picture takes either 8, 16, 24 or 32s to be produced. An sstv signal can be recognized by the continuous warbling tone which is made up of line sync pulses occurring 16·6 times/s mixed with variable tones according to the picture content. At the end of each 8, 16, 24 or 32s, a longer tone signifies the frame sync pulse, and the signal is tuned and can be displayed on the monitor.

The sstv channels are 3,740, 7,040, 14,230, 21,340 and 28,680kHz, while on 144MHz the frequency is 144·500MHz. To get equipped for sstv will cost around £200. For this you can buy a receive board and a secondhand black-and-white monitor. For those with a Sinclair Spectrum computer, an sstv interface board is available.

If as a result of this pen-picture of sstv swling, other listeners are interested, Les has offered to give more information or advice if they ring him on Rotherham (0709) 64569.

HF news

Les Hobson, BRS84809, monitored the ssb portions of the band in June and July, and commented on the Pacific and Far East dx heard, including KH6APS, VKs, JAs, DU1JMG, C21BD and S79MC.

Up to mid-July the 28MHz slps had failed to find any decent openings. Entries for the series are therefore likely to be minimal. Even the short-skip Es were few and far between (as on 144MHz) but 17-19 and 21 June provided northern, southern and eastern Europeans.

Cliff Adams, BRS10906, found 7MHz interesting, logging VK2AVA, VK6IR, VS6CT and ZL2BT in early July. On 3·5MHz VK6LD and ZD7CW were heard.

Robert Small, BRS8841, managed CE0ZIJ/CE0A on 3·5MHz for a new country on the band. The 7MHz band came up with KC6VP (East Carolines) on cw, and 14MHz produced T31AT, BV0JA, N7COV/YN and KS0C/KH2. BY1QH, BY8AA, KX6DS and DL6VY/9Q5 were added to Robert's 21MHz tally. QSLs received recently included T30AT, 3V0AA, J20WCY, K9MK/VP2A, ZL8BQD, YJ8GX, FW8AF, AH9AB and FB8WJ—a good haul indeed.

Paul Crankshaw, BRS48909, had been fairly inactive due to holidays, but mentioned TR8IG on 7MHz and a UG6 for a new country on that band.

Brad Bradbury, BRS1066, reported QSLs from CF0FCM/CE0Z, ZP5XDW (10MHz) and CT2BQ (1·8MHz). July produced SY1MA (via 13TZP) for country No 289 all-time, KX6QC on 21MHz, and on 1·8MHz DF5SM/IS0, HZ1AB, EA2ATL and UD6DEU to show that the band is still lively in mid-summer.

VHF news

The sporadic-E event on 30 June has been reported on by Martin Parry, BRS52543 (YN square), David Whitaker, BRS25429 (ZN square), and Joan, BRS62088, my xyl (AL square). Although the event commenced at around 1745 for all three, the lists of stations heard vary greatly. Martin logged EA1MO (XB27e), EA1TH (YC48b), EA4AAW (WZ49g), EA4DEM, EB4IM (XA67c), EA4QR (YA44h), EA4DK (YA42d), SM5DIC/EA4 (YA42d), EA7PZ (WX50e), EA7AJX (YX12a), EA5BY/7, EA7CPW (YX12f), EA7XD (XX78f), EA7CGH (YY72b), EA7ERS (WX55f) and EA7CR (WX65g).

In Yorkshire, David copied EA7APV, EA7CEC (XX73c), CT1DCT, CT1BZT (Lisbon), and CT4PI (VZ38j). In London '62088 logged CT1WW (WB63b), CT1BZT and CT1COU (VZ38j). In addition the om heard CT1AWO (VZ38j), CT1BLL, CT1CYU, CT1AYC (VY24g), CT1ALF, CT1BYJ, CT1QP and EA4AAW. The event seemed to end at around 1855, but G4HMF was heard calling CT2AP at 1913, without reply.

Martin, '52543, also commented on the 8 June Es to the USSR, mentioned last month. He could hear none of this, but he was rewarded with SP5EPT (KM65j), SP2DDV (IN80b), SP5IWV, and SP5BTN (KM66a). On 18 June he heard ZB2VHF on 70MHz at 2140, but ZB2BL was not heard.

All-time Countries List

(Entry score 750)

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS25429	279	311	334	253	231	88	1,496	ssb
BRS32525	267	304	317	253	253	72	1,466	ssb
BRS8841	254	291	314	222	205	56	1,342	ssb/cw
BRS48909	216	252	266	192	160	61	1,147	ssb
BRS52543	193	235	243	180	170	61	1,082	ssb
BRS1066	193	210	267	164	108	74	1,016	ssb/cw
BRS18529	155	210	263	176	139	50	993	ssb
BRS50134	174	210	229	163	152	54	982	ssb/cw
ORS45992/7Q7	209	247	259	105	94	10	924	ssb
BRS44395	168	219	235	138	78	59	897	cw
FE8957	202	197	232	75	98	33	837	ssb
ARS53844	127	180	165	128	116	45	761	ssb
Average	203	238	260	170	150	55	1,076	

1984 HF Countries Table

(Starting score 150)

Station	DXCC	28	21	14	7	3·5	1·8	Total
G listings								
BRS8841	235	83	176	202	137	134	40	772
BRS52543	219	99	142	175	131	131	46	724
BRS48909	216	84	148	175	130	120	46	703
BRS25429	209	102	133	163	111	127	53	689
BRS44395	—	92	143	126	92	60	45	558
BRS31879	172	100	112	120	86	67	36	521
BRS10906	193	69	132	149	73	86	11	520
BRS1066	159	65	117	113	80	53	51	479
BRS50134	149	4	8	13	106	103	36	270
BRS18529	—	1	56	46	57	88	14	262
ARS53844	—	—	—	—	88	96	30	214
BRS44984	—	23	36	65	42	40	0	206
RS49875	94	31	50	42	28	20	3	174
BRS44083	109	26	35	61	18	17	1	158
DX listings								
ORS45992	205	118	139	167	49	53	2	528

1984 UHF/VHF Table

Station	QTH loc	70MHz Squares	70MHz DXCC	144MHz Squares	144MHz DXCC	432MHz Squares	432MHz DXCC	Total via*
BRS52543	YN	16	5	43	13	11	5	93a, b, c
BRS32525	AL	—	—	38	16	18	5	77a, b
BRS25429	ZN	—	—	38	14	—	—	52a, b
BRS62088	AL	—	—	12	4	6	2	24a, b
RS49875	YN	—	—	13	5	2	2	22a
BRS18529	AL	—	—	9	3	—	—	12a
FE8957	BF	—	—	9	2	—	—	11a

* a = tropo; b = Es; c = Ar; d = ms.

*79 Granby Road, Eltham, London SE9 1EH.

Reports suggest that although the weather was influenced by a high pressure system and temperatures up to 28°C, VHF NFD promised much but produced little of great news value. Exceptions there most certainly were, but with average antenna systems nothing of especial interest was logged either in the south or the north of England. In YN, Martin Parry heard ms bursts from a station giving his QTH as ZD54j, but otherwise had to content himself with VO, VN, ZJ, XQ, BL and CL on 144MHz; on 432MHz WN and YK squares were logged, and on 70MHz VN, AN and ZP were three all-time new squares. In Yorkshire, Dave Whitaker fared little better, while, in AL, I thought conditions on 432MHz were better than on 144MHz, which was good for inter-G working. The higher band produced dx in CL, CM, ZH and YI. On 144MHz DM square was the most distant heard.

VHF awards

G5UM, the Society's vhf awards manager, considers that too few listener members are aware of the very extensive awards programme run by the Society to mark achievement on the uhf/vhf bands. County and country chasing is a well-known pastime on the lower frequency bands, especially 1·8MHz, but it is even more rewarding at uhf and vhf. Awards are available for 3 countries/30 counties at 70MHz, 9/40 at 144MHz, and 3/20 at 432MHz. Higher achievement awards are also available. QSL cards are required and must be sent to G5UM when claiming the award. The 4-2-70 Squares Award is also available for each band, and during any uhf/vhf contest sufficient stations will be heard to enable over half the claim to be substantiated. On 70MHz, 20 QTH squares and four countries are needed, on 144MHz 40/10, while on 432MHz all you need is 30/6. Again, higher achievement awards are available. G5UM, QTHR, looks forward to receiving claims or requests for claim forms. Any successful claims will be mentioned in this column, as it really gives a sense of achievement to do well at uhf/vhf. I have certainly noted that reports sent to stations at uhf/vhf are more warmly received than are QSLs sent to G stations on the lower frequency bands. Why not start checking through your confirmations now and get your claims off to G5UM quickly.

WZ-SWL Award

Michel Monteil, FE8957, has sent details of the swl's equivalent of WAZ. There are three classes: for 40, 30 and 20 zones confirmed. Endorsements are available for mode, band, and a new category—WAZ-YL—for hearing all yls. No QSLs need be sent, but a list of cards held, certified by two licensed stations, must be sent with the claim. The fee is 10 ircs, and there is no time limit. The 20 and 30 zones awards can be upgraded for one irc together with the number of your certificate. The awards manager is Pierre Fournier, FE1107, 3 Bis Rue Pasteur, 78000 Versailles, France.

To encourage amateurs to QSL swl reports, there is also an award for confirming swl reports from all 40 zones. I wonder how many of these have been claimed?

QSL

Not many months pass without mail about QSLing being received, whether it be about techniques or designs etc. This month's mail concerns both. Ted Allen, G3DRN, RSGB QSL Bureau manager, thought that it was time for him to add his views to others about QSL techniques, especially as he had had some disgruntled swl customers. As handler of all outgoing swl cards, he considers that the listener should become more selective in his choice of which station he should QSL, as he sees many cards destined for dx stations who were working the world with 59 reports being exchanged willy-nilly. The listener should confine his reports to being useful and passing on information of which the station was unaware. It is felt that the vast number of awards etc accounts for much of the QSL traffic both from swls and licensed members. As over one-third of the cards addressed to UK amateurs are not collected—the percentage is probably no different overseas, and many foreign bureaux do not forward cards to amateurs who are not members of the national society—the message from G3DRN is clear. Make your reports useful, restrict them to stations which you cannot hear very well, or to those which appear to be having difficulty in making contacts (refer also to March 1984 *SWL News*). Most amateurs will reply to reports, but if some trouble is taken to provide more than just a 59 report, returns will undoubtedly be improved.

Alex Dodd, BRS48178, has looked through his records and found that of 639 QSL cards sent to the bureau between 1 September 1981 and 31 August 1982, he had received 242 in return by 31 May 1984. An average of 37 per cent.

John Goodrick, BRS44395, received a QSL card from an EI8 which he considered to be of little value. Instead of QSLing John's report in the normal way, the usual six-box block contained the following: FT902DM, 300W, 3-el beam, 20m high, WP72b. This for a cw report on the hf bands! He also commented on the QSL card which won the recent competition, and considered the layout to be unusual. I should explain that Kevin, ex-BRS45466, used the reverse of the card to pass on sufficient additional information which the judges felt, of the cards they had considered, formed the most useful and comprehensive report of all.

The neat station of Marc Domen, ONL-6945, one of Belgium's leading swls

Newcomers

Alex Dodd, BRS48178, wrote from GM-land. A member for three years, he runs two homebrew receivers: a TRF for the lower frequency bands, and a double conversion superhet for 7, 10, 14, 18 and 21MHz. The TRF uses ancient directly-heated valves with 2V filaments and is intended for use with 120V ht; the valve line-up being APR12 (VP23), AR8 (HL23DD) and Pen 220A. The other receiver is a hybrid type with two valves (PCC84 and EF184) in the preselect front-end. The remainder is solidstate, but the circuitry is unusual as the first i.f. tunes 2-3MHz and the two stages in the second i.f. are at 380kHz. All three i.f. stages and the second mixer use cascode circuitry, with a fet as the bottom half and a bipolar transistor as the top half. The receiver was designed by Alex in this way as he wound his own i.f. transformers and did not have to tap them for impedance matching. He is very much a cw man and enjoys listening best during the wee small hours when the QRN level is at a minimum.

Here and there

HG5HR wrote following the mention of HG5A in May's *SWL News*. Perfectly feasible, seems to be the answer. HG5A is the callsign of the contest station of the Radio Club of Budapest.

E. S. Smith, BRS50718, is another reader who considers that the UK callbook should indicate whether the station QSLs swl reports. This is an interesting thought, but the idea is not feasible because of varying circumstances; for example, a G might not QSL a 7MHz swl report, but would QSL a report for a 432MHz QSO. How could such a problem be overcome?

Douglas Johnstone, BRS54163, recently made a rhombic square antenna. The first station heard on it was VK5BC on 7MHz ssb—proof enough that the antenna works. However, Douglas would like to raise the antenna to improve reception even more.

Congratulations to the UBA SWL Committee for their publicity on QSL managers who do not answer swl reports even when accompanied by ircs or US dollars. If any of them should read this I would be interested to hear their views. If one argument is that stations such as JT1AN do not QSL swl reports, I know of at least two G swls who have received a QSL direct from JT1AN.

Geoff Curtis, BRS20104, wrote regarding the early days of *DX News Sheet*. It seems that Geoff Watts (who did such a marvellous job for many years before G3XTT and G3ZAY took it on), G6XL, Bill Wilkinson and himself were the instigators of *DXNS* in 1959 when the four swopped dx news by letter, telegram and landline. Geoff Curtis is an ex-RAF aircrew w/op and would be pleased to hear from any listeners who were flying as w/ops and used the T1154/5. His address can be found in the June *SWL News*. On a different topic, he asked for a translation of "55s"; used mainly by the DLs, I believe a rough translation is "cheers" (as in beer!).

Finale

News, views and scores for the November issue should reach me by Tuesday 18 September, with late news items by Tuesday 25 September. □

The Month on The Air

*by John Allaway, G3FKM**

ONE OF THE important documents which came out of the Cefalu Conference is of great interest to those of us who have some interest in 7MHz work and realize just how useful the band would be if only it were free from intruders. This was called the Cefalu Resolution and it reads as follows:

Implementation of Resolution No 641 of the ITU Radio Regulations

The conference of the IARU Region 1 Division at Cefalu, April 1984 . . . .
considering
(a) that the frequency band 7,000—7,100kHz is allocated exclusively to the amateur service and the amateur satellite service on a worldwide basis with the exception of some minor footnote fixed service allocations;
(b) that this band is of utmost importance for worldwide radio communications within the amateur service and, in case of natural disasters according to Footnote 510 and Resolution 640 of the Radio Regulations of ITU, to other services;
recognizing
that nevertheless this band is used by a considerable number of stations of the broadcasting service without having due assignments causing harmful interference to the other authorized services;
recognizing in particular
that certain of these broadcasting stations are operating under the auspices of Reservation No 20 of the Final Protocol of the WARC Geneva 1979;
recognizing furthermore
that according to the intention and the wording of Resolution 641 "the broadcasting service shall be prohibited from the band 7,000—7,100kHz and the broadcasting stations operating on frequencies in this band shall cease such operation";
invites
all national telecommunications administrations to induce the ITU to initiate urgently the transfer of those broadcasting stations to other frequency bands;
and especially invites
the Administrative Council of the ITU to include Resolution 641 in the agenda of the second session of the WARC for the hf broadcasting service, as scheduled for 1986.

This resolution was initiated by DARC, and all societies are being asked to pass it to their administrations with a request that the action be set in motion. One of the problems at the present time is that China (referred to above in Protocol 20) has reserved the right to "continue to use those frequencies which it uses for broadcasting at present in the band 5,060-27,500kHz until the establishment and implementation of the proposed hf broadcasting plan".

Overseas news

G2BUJ visited Gibraltar earlier in the year and has forwarded a copy of *GARS Newsletter*. This contains a list of currently-active ZB2s which is as follows: AT, BL, BU, CF, CI, DG, EB, EO, FFG, FK, GK, GQ, GR, GU, GY, GZ, HB, HD, HG, HM, HP, HR, HT, HW, J, VHF and HX. A full list (of over 200 stations) is offered for £0.50 (Gibraltar), and would possibly be supplied to a UK applicant in exchange for a few ircs; GARS HQ is at Hargraves Ramp, PO Box 292, Gibraltar.

David Calderwood has submitted a full list of licensed members of MARTS. As mentioned in a previous *MOTA*, only QSLs for these are forwarded, and several hundred cards are returned to sender every month. Chief offenders are said to be 9M6BP, 9M6CR, and 9M2CK. Although not members, a few stations do get their cards—these include 9M8PW (QSL manager G4DXC), 9M8NL (via VK9NL), 9M8JS and 9M8NS (via VK9NS), 9M6BE (via VS6TX), 9M6WN (W9GW), and 9M2AX (via JA3BFT).

DX news

Dave Burke, VP8AQA, has recently returned home from Faraday Base and is dealing with the backlog of QSL cards sent to GM4TNF and to GM4GRC. He apologises for the delay and at the same time thanks everyone for the contacts and their patience.

The station using the callsign OR4RB/P and claiming to be in Antarctica appears to be a pirate. 4K1GAG is located in South Shetland and operates on 7MHz most days on cw and ssb around 2100.

VE7FXX is working in Uganda and has been on the air as 5X5GK. His equipment is said to be run off batteries charged by solar cells, and at the time of writing he had no licence. D68WB is an American surgeon who uses 14MHz and 21MHz ssb most days around 1500 or 1600. J28AZ is now F6GZA but will be moving to 5R8 from where he expects to visit a number of the French territories in the Indian Ocean.

Long Island DX Bulletin says that 6O84TI is located in Masaya, Somalia, and often to be found in the 14,020-14,030kHz area around 2000 as well as on 14,235kHz from 2100. The same source says that KA4SBE/SU and WD5AJE/SU, who work with the UN force in Lower Sinai, tend to appear between 2130 and 0330 on 21,280kHz or in the 14,180-14,250kHz area. 3X4EX has temporarily lost his callsign and has been on the air as LA2EX/3X4. 9X5WP frequents 21,275kHz at about 1900, and keeps schedules on Mondays and Wednesdays on 14,305kHz from 0430.

According to the *DX Bulletin* ZL1AMO says that he still has logs and QSLs for VR6HI, ZK1MB, ZK2EA, A35EA, 5W1CW, H44RW, VK4ANS/LH, YJ8RW, 3D2RW, ZK1CQ, ZL1AMO/C, ZK9RW, ZL8AMO and ZL7AMO.

G4XKR reports a QSO with VE8RCS who said that he is the most northerly station in the world—only 450 miles from the North Pole. He will be active daily between 1400 and 1600 on 14,165kHz until mid-September.

VK9ZA is on Willis Is and will be there until early in 1985. VR6KY keeps a schedule with QSL manager NE5C every Monday and Thursday at 2200 on 21,305kHz. KC6JA is to be found near 14,220kHz most days from 0700—the station is located in the East Carolines.

4U1UP is on the air from the outskirts of San Juan from what is described as the "University of Peace". It is unlikely to count for DXCC purposes as 4U1UN has recently been rejected by ARRL.

G4SXU has clarified the position with respect to VQ9GE. This is George Essig, WA7KSW, who is in Diego Garcia. His wife, WB7AWO, is acting as his QSL manager.

Baker and Howland Islands—a new country?

Shortly after last month's *MOTA* went to press, a dossier of information arrived from the Northern California DX Foundation Inc, concerning possible changes in the DXCC status of the present Baker, Howland, and American Phoenix Islands. In essence it says that rumours of change have some basis in fact. The situation has always been ludicrous, in that the dispute between the USA and Britain over ownership of the eight Phoenix Islands resulted in an agreement in 1979 which established joint administration of Enderbury and Canton Islands. This was extended to Hull Island in 1980, and the result was that it was possible to obtain a licence from either authority and operate as a VR1 or as a KB6 or KH1. This meant that an individual station could count for two DXCC countries during consecutive QSOs. In 1979 British Phoenix Islands became Central Kiribati, thereby leaving the dispute to be between the USA and Kiribati. Later that year the USA renounced all claims to the Phoenix Islands—the relevant treaty being ratified in the US Senate in June 1983. KH1 licences are no longer issued in the Phoenix Islands, and Baker, Howland and American Phoenix Islands therefore now consists of Baker and Howland Islands only. The NCDXF has petitioned the DX Advisory Committee and awaits an answer. Should this prove to be favourable, action to activate it will take place as soon as possible. (Stop press. It is understood that the DXAC is advising acceptance to the ARRL board).

Expeditions

The summer expedition by the Imperial College Radio Society, G5YC, to the Faeroe Is was very successful. However, there has been some delay in answering QSL requests due to the fact that most of the group have now left the college. However, all cards received for hf QSOs have been

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answered and should now have been delivered. Anyone still needing a card is invited to re-apply to G4SAY, who is hf QSL manager.

The *DX Bulletin* mentions possible Andaman Is activity this month by the members of the second group which went to the Laccadives last January.

In spite of suggestions that the recent DJ5CQ/SV/A operation may not have been fully authorized, *DX-NL* says that the licence and "legitimation to stay in Athos" are to hand and are being sent to ARRL.

Just before going to press a message arrived from VK9NS saying that his proposed multi-stop HIDXA Club Dxpedition had to be abandoned on 28 June due to bad weather and subsequent aircraft problems. It was intended to visit KH0, both KC6s, C2, FK and FW. He will be in Port Moresby as P29JS by now on a short-term contract with the Dept of Civil Aviation. The bank overdraft for the VK0 expedition has been cleared but some more cash is needed before Jim will feel happy to continue.

VHSC

This organization was formed on 1 May 1961 under the auspices of DARC and VERON and has the objective of gathering together amateurs who are able to transmit and copy very high speed telegraphy, and by doing so, encourage cw traffic in general and high-speed work in particular. To join it is necessary to have a contact with an existing member for at least 30min at a speed of 40wpm or more. No keyboards or decoders are allowed. The station worked will then send a recommendation, and when three more have been collected all four should be sent, plus 10ircs, to the secretary: D. J. Hoogma, PA0DIN, Schoustraat 15, 6525 XR Nijmegen, Netherlands. All applications must include a signed statement that the applicant did not use a keyboard or decoder during the four test QSOs.

Awards

Worked All Pacific

For confirmed contacts with at least 30 countries in Oceania since November 1945. It is also available to listeners on the same basis. Send a list of contacts certified by the awards manager of a national society—do not send the QSLs. Endorsements are available for various bands/modes. The fee is NZ$2 or 10 ircs, and applications should be sent to NZART, Postbox 1459, Christchurch, New Zealand. A five-band version is available.

WAZL Award

For confirmed contacts with 35 different branches of NZART since November 1945. This is also available to listeners. Special endorsement is made if all contacts were made in a period of 12 months. Apply as for WAP —fee is NZ$1.00 or five ircs.

New Zealand Award

Requires a total of 101 confirmed contacts, since 8 December 1945, with the following distribution: ZL1, 35; ZL2, 35; ZL3, 20; ZL4, 10; plus one from a ZL territory (ZL5–ZL9) or 20 extra ordinary ZLs. Apply as for WAZL.

5 × 5 Award

Issued by NZART to those who have proof of contact with five stations (located in different DXCC countries) each worked on five different bands. Endorsements are issued after another five, and then in steps of 10. QSOs since 1945 are valid, This is described by NZART as an outstanding certificate, and certified lists of QSOs should be sent to J. M. White, ZL2GX, 152 Lytton Rd, Gisborne, New Zealand. The fee is NZ$2 or 10 ircs, and this covers all endorsements. All NZART awards will be despatched by airmail if an additional NZ$1 is enclosed.

Contests

Scandinavian Activity Contest

1500 15 September to 1800 16 September (CW)
1500 22 September to 1800 23 September (Phone)

Single-operator multi-band and multi-band QRP (output up to 10W), plus multi-operator single-transmitter multi-band categories. In the last category a station must stay on a band for at least 10min after the first QSO following a band change. There is also a listener section—they should log Scandinavians, and record date, time, band, Scandinavian station heard, message sent, listener's own report, station being worked, if multiplier, points claimed. The contest covers 3·5 to 28MHz according to IARU band plans, and 3,560–3,600kHz, 3,650–3,700kHz, 14,060–14,125kHz and 14,300–14,350kHz should be kept clear of contest traffic except where this conflicts with national regulations (in which case split-frequency operation should be used). Exchange RS/T plus serial number from 001. Europeans score one point per QSO and the multipliers

All-time Countries Table

	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
G3KMA	91	**221**	**296**	330	**331**	**316**	1,584
G3GIQ	59	187	235	330	330	308	1,449
G3MCS	47	200	246	319	320	305	1,437
G3UML	21	196	211	332	295	254	1,309
G3XTT	97	175	210	271	274	246	1,273
G4DYO	48	130	195	306	301	283	1,263
G3HTA	58	161	213	306	280	242	1,260
G3ALI	2	204	212	312	276	234	1,240
G2DMR	42	147	155	295	302	256	1,197
G4FAM	50	149	213	265	264	242	1,183
G3RUV	6	142	161	285	285	234	1,113
GW4BLE	22	148	170	264	263	241	1,108
G3TXF	58	162	176	252	250	209	1,107
G3NOF	4	84	75	**341**	322	277	1,103
G3IGW	**98**	140	228	224	197	181	1,068
G3XQU	4	124	160	268	265	238	1,059
G3RUR	1	134	156	276	253	223	1,043
VK9NS	36	141	200	270	223	173	1,043
G3YMC	72	91	152	226	232	182	955
G3VJP	14	110	161	255	238	184	922
G4LJF	1	131	149	235	207	188	911
G4BWP	29	127	131	167	186	236	876
G3JFF	25	78	112	232	225	179	851
G4KPE	1	146	162	176	165	134	785
GM3PPE	41	117	140	181	167	138	784
GM3YOR	53	78	112	180	175	174	772(cw)
GW4OFQ	33	164	120	178	167	110	772
9K2BE	41	70	84	127	175	181	678
Average	38	141	173	257	249	220	1,077

The next table will be for **current countries only**—please state this clearly on your entry which should reach G3GIQ by no later than 15 October.

1984 28MHz Table

G3XQU	137	G3TXF	82(cw)	G4OBK	35(cw)
G4SKI	99	G4FEL	65	G3KSH	23(cw)
G4MUW	91(ssb)	G3WVG	58(cw)	G4FVK	22
G4TTR	91	G4DXW	56	G4SXK	20
G4VJK	91	5B4DN	50	GM3CHX	19
G3KDB	88(cw)	G3XTT	49	G4RWP	14
G4RAB	86(ssb)	GW4TEJ	48	G2FQR	8
G3SXW	82(cw)	G4NXG/M	45		

are the call-area numbers (0–9) on each band in each Scandinavian country. Portable stations without district number count for the 10th area (W4XXX/OZ counts as OZ0). Final score is total QSO points multiplied by the total of multipliers from all bands. Logs should show date and time, station worked, numbers sent and received, band, and if multiplier. Enclose signed declaration and summary sheet giving number of QSOs per band, number of duplicates, multipliers and QSO points per band and final score. A multiplier sheet must be enclosed for each band with more than 200 QSOs, together with a "dupe" sheet. Mail entries before 30 October to: SSA Contest Manager, Goran Granberg, SM6EWB, Rosengatan 76, S-434 00 Kungsbacka, Sweden.

(NB. Scandinavia is defined for the purposes of this contest as LA, JW, JX, OH, OH0, OJ0, OX, OY, OZ, SM and TF).

VK/ZL Oceania Contest

1000 6 October to 1000 7 October (Phone)
1000 13 October to 1000 14 October (CW)

Two points per QSO with VK/ZL/Oceania. The multiplier is the total of call areas worked on each band added together. Exchange RS/T plus serial QSO number. Logs should show date, time, station worked, numbers sent and received—and each new muliplier should be underlined. A separate log should be submitted for each band. A summary sheet should give name and callsign (in block letters), details of equipment used, and for each band QSO points and multiplier total. The usual signed declaration should be enclosed and the entry posted to reach NZART Contest Manager ZL2GX, 152 Lytton Rd, Gisborne, New Zealand, by 31 January 1985. There is a listener section, and in this case log date, time, callsign of VK/ZL/Oceania station heard, station being worked, RS/T of station heard and number being sent. Scoring is as for the transmitting section but the phone and cw sections are combined in this section. Note that Oceania call areas count as multipliers this year, and that Oceania stations are those which would qualify for that continent for the WAC Award.

International "50th Anniversary Province of Latina" Tournament

0400 22 September to 2400 7 October

3·5 to 28MHz. All modes. Work stations in Latina Province. QSOs on 3·5 and 7MHz count one point, on other bands three. "Jolly" stations will be active occasionally and will be worth double points. Stations may be worked once each day on each band. Log should show date, callsign, band, time, serial number given by Latina station, and should be accompanied by QSLs for stations worked, and $5. Send to Alfredo Dugo, I0DAO, PO Box 24, 04100 Latina, Italy.

QTH CORNER

A24SC	PO Box 416, Gaborone, Botswana.
EP2TA	Box 34-214 Teheran, Iran.
FO8s CX, DF, HI, HL, HO	via WB6GFJ (see below).
FO0FB	via WB6GFJ, R. Forbes, PO Box 1, Los Altos, Cal, 94022, USA.
FY9IS	via FY7AN, C.Loit, Box 746, 97305 Cayenne, French Guyana.
G4RWP	E. Perry, 7 Sudicamp Court, Ninefields, Waltham Abbey, Essex EN9 3HB.
ON5NT/HB0	via ON7FK, 39 Akkerwindestraat, B-2050 Antwerp, AN, Belgium.
KC6VP	PO Box 220, Truk, East Caroline Islands, 96942.
IK0CAK/OX	via I0JAJ, G. Caratozzolo, Via Val Maggia 28, I-00141 Rome, Italy.
N4DW	D. Wilson, 11434 Rex Baxter, El Paso, Tx, 79936, USA.
VK9LW, VK9LX	Box 146, Cambridge.
VK9ZA	via VK6YL, Mrs G. Weaver, 23 Corbel St, Shelley 6155, W Australia.
VP8AQA	M. Burke, 25 Duncan Rd, Glenrothes, Fife KY7 4HS.
VQ9GE	via WB7AWO, 2238 Aloha Rd, Medford, Ore, 97504, USA.
4U1UP	University for Peace, PO Box 199, 1250 Costa Rica.
6Y5FS	via GW3YDX, 5 Broadparks Close, Pinhoe, Exeter EX4 9HB.
9M2RT	via KB6UF, R. D. Jones, 12136 Lester Ct,Chino, Cal, 91710, USA.

Results of the **1983 WAEDC CW Contest** have been received. Special congratulations to **G3MXJ** who was fifth European in the single-operator class, and to **G4DAA** who came second in Europe in the multi-operator single-transmitter class and will receive a special trophy. Scores were as follows: (Single-operator) **G3MXJ**, 946,323 points; G3ESF, 191,150; G3TXF, 73,440; G2AJB, 6,240; and G3MWZ, 1,200. In the multi-operator class G4DAA scored 2,141,412 points.

In the **1983 WAEDC Phone Contest, G3XBY** came fifth European also with his 1,253,632 points. Other UK scores were: G4AMT, 230,256; G3XWZ, 73,620; **GW3NYY**, 73,346; **GM3BCL**, 37,926; and G6QQ, 1,782 points. G3CMH was the only multi-operator entrant from the UK, and scored 5,192 points.

Welcome

June produced a large number of recruits to the Society from outside the UK, and particularly from the USA—a most welcome trend. The list includes: AD7T, AK7M, K4EGZ, KA1DT, KA2CRU, KA2UVF, KA3LSE, KA4QVK, KA7RFO, KA9AAL, KA9FUG, KB4KEM, KB5VQ, KC5TU, KD0JL, KE8V, KG7T, KH6UA, KK3V, KL7EU, KS7D, N1BGG, N2BQ, N2BSJ, N3BQA, N6JRK, N9AEG, N0DLF, NM6L, W1BEL, W1DMD, W1HAD, W1RII, W2BIE, W2EJM, W2WVC, W5URP, W6BE, W6JEO, W7NEJ, W8POZ, W9GXR, W9KHN, W0IKT, WA1ZPG, WA2AHP and WA6MDT. From the rest of the world: EI6EW, EI8EQ, F6KNN, IV3MKG, P29ZRL, VE3ETQ, VE3OCX, YC0DOG, YC0DPO, ZS5NO and 5N9MBT. Listeners include A. Matheson (BFPO 53), T. Cahill (EI), S. Richardson (J8), T. Wright (A4), A. Luijten't (PA), and R. Wilson (BFPO 18).

Around the bands

Conditions have been disappointing and the level of activity low—however, one station has been reported on 18MHz! The top 28MHz table entrants have added just a few more countries, but will perhaps have to wait until autumn before very much else happens on that band.

Thanks are due to the following for sending in logs: G2HKU, G3s GIQ, GVV, IGW, KSH, YRM, G4s BLH, EHQ, GM4ELV, GW4KGR, GM4KHE, G4s UOL, UYR, and RS10906.

Stations listed in italics were using A1A.

1·8MHz. 0000 DL6YE/LX. 0200 *K1ZM, K2EK.* 0300 *I0KHP, KT3M, WA3EUL.* 2100 *UR2RJJ.*

3·5MHz. 0000 PT2KT. 0400 HK0HEU. 2200 VK6LD, ZD7CW. 2300 H5AWD.

7MHz. 0000 6Y5IC. 0400 YV3XL, ZL2BT. 0600 *CE3EEO/CE0A, CP6IM, HC2RG, TG9LX, VK3XB, VK9LX, YN2MRJ, 4U1UP.* 0700 *CT3DL.* 2000 VK2AVA. 2200 A92P, D44BS, *OZ5DL/OY,* S79SM, TR8IG, TZ6FIC, VK6IR, VS6CT, YB0AV, ZS4NL, *4S7NMR, 9H1ED.* 2300 CE3DNP, FM7WD, H5AWD, UJ8JO, 4K1s A, *AMO,* GAG.

10MHz. 0400 *VE6CMX, N5VV(N.M), W6-W7, ZS6DW.* 0500 *KH6CC.* 0600 *VK2BKH, VK3MR, ZL2AGY.* 0700 *C30BAV, KA5DXO.* 1800 *LX1YZ.* 1900 *ZC4EPI.* 2100 *JA6HW.* 2200 *HZ1HZ, J73D, SV0AH.* 2300 *HK1QQ, 3V8AL, 4X6DP.*

14MHz. 0500 KL7LF, VK, W6-W7. 0600 *D2CCC,* EL2BA, *FO0KI, JW5VAA, DJ5CQ/SV/A,* YI1BGD. 0700 KH6FKG, VR6TC, T31AT, ZK1CG, 3X4EX. 0800 C30LAC, FO8ET, KH6JEB/KH7, KL7FI, V2AZM, V85GF, VE8RCS. 1000 *HL1DC,* 4U1ITU. 1100 *UZ0BWC.* 1600 FB8WJ, JA, *VS6CT.* 1700 S79WHW, YB2DI. 1800 AH9AB, A35SA, S79SM, T30DB, T31AT, YB0TK, 1Z9B. 1900 KF6ME/DU2, TZ6FIC, 9M2CO. 2000 CQ0FSJ, FY7AN, J27RDD, P29AF, VP8MT, 7X2AK. 2100 W6-W7, 3X4EX, 9L1SL. 2200 A71AM, FH8CB, FP0HXG, OD5SH. 2300 HH2YR, KA4SBE/SU.

18MHz. 1800 *PA0MAR.*

21MHz. 1000 A24SC, TR8CR, XU1SS, 4K1A. 1300 FH8CR. 1400 FR7BT. 1500 FH8CB, *G3IAD/5N4.* 1600 J28DX, 3D6BP, 5H3QM, 7P6CI. 1700 6W1DY. 1800 C53EK, EL2BA, S79SM, ZD9CC, 5H3BH, 5Z4BF. 1900 JY1. 2000 HC, J88AB, LU, PY, VP2MLD. 2100 CE, ZP. 2200 KP2J, VP2MDG. 2300 W1-W5.

24MHz. No reports.

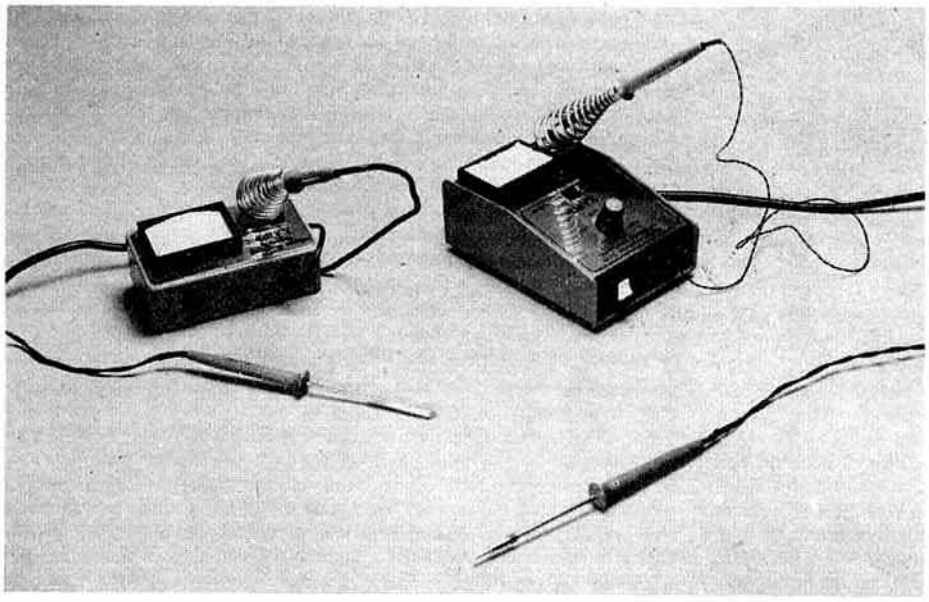
28MHz. 1400 EL2AY. 1800 CX4HS.

Acknowledgements to the following for information used: *Long Skip* (VE3GCO), *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), and the *Ex-G Radio Club Bulletin* (GI3OEN/W6).

Please send everything for the **November** issue to arrive by **27 September**—anything received later cannot be included! □

NEW PRODUCT

Miniature low-voltage soldering irons from Greenwood Electronics



A series of miniature low voltage soldering irons, the Oryx Micro Series, has been introduced by Greenwood Electronics, the Reading-based electronics production equipment specialists.

These professional irons, the smallest in the Greenwood "Oryx" range, have been designed for intricate circuit work. They provide maximum heat in a concentrated area and offer typical tip temperatures of around 320°C. Typical unit weight is only 4g. The Oryx Micro soldering iron range includes 5, 6, 9, 11, 12, 18 and 25W models and operating voltages include 6, 12, 24 and 50V.

A power supply station stand and cleaning facility, the Micro P66, offers 115/240V ac mains operation and delivers a safety isolated output for the 6V, 6W Micro iron. A more elaborate version, the Micro PT66 variable temperature unit is also available; with this unit the tip temperature of the iron can be controlled between 120°C and 400°C via a control knob on the base stand.

Further information can be obtained from: Greenwood Electronics, Portman Road, Reading, Berks RG3 1NE. Tel 0734 595844.

HF propagation predictions for September 1984

Using the table

The time is presented vertically at two-hour intervals 00(00)gmt to 22(00)gmt for each band, ie ⅛ = 0000, ¼ = 0200, ⅜ = 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						23	333	2		677	778	861	424	655	456	897	875	322	223	689	†42			3††
Malta						33	333	41	1	677	778	982	654	755	556	898	997	522	224	689	††5	2		3††
Gibraltar						12	111	2		177	767	871	431	676	556	897	997	643	233	689	†††	3		3††
Iceland										25	656	75	2	366	556	785	865	643	334	578	†††	3		24†
ASIA																								
Osaka						12	2			354	432	11		132	123	452		1	1	451				2
Hong Kong						134	331			244	445	64	1	22	123	683			1	474				4
Bangkok						234	442	1		134	456	751	2	1	123	686	2		1	476				43
Singapore		1				245	444	3		134	456	861	2	1	123	685	1		1	476				43
New Delhi		1				245	453		1	224	446	642	521	1	113	687	51		1	478	2			4†
Teheran	11	111				445	555	3	13	433	446	873	743	1	113	688	841		1	478	†2			4†
Colombo	11	111				345	555	2	1	123	446	873	42		113	688	51		1	478	2			4†
Bahrain	11	111				455	566	3	313	322	446	875	853	1	113	689	851		1	478	†2			4†
Cyprus	12	122	1			466	667	62	424	766	667	996	976	433	335	799	984	1	112	588	†5			25†
Aden	22	222	1			455	677	62	423	312	346	886	964		13	689	861		1	478	†3			4†
OCEANIA																								
Suva (S)						1	11			234	441	62	1	532	113	62		31	1	3				
Suva (L)				1	1			5	111	742	1	352	2	631	111	62		31	1	3				
Wellington (S)					1	1				454	331	12	1	532	122	53		31	1	41				
Wellington (L)								1	121	52		53	112	631		331		31		31				
Sydney (S)					234	21			1	564	444	22	1	332	123	552			1	44				
Sydney (L)									11	131		54	1	231		152		11		23				
Perth	11				355	31			11	354	444	41	3	21	113	663	1		1	474				42
Honolulu								1		112	13	52	1	432	113	3	2	31	1					
AFRICA																								
Seychelles	12	222	1		455	677	52		422	212	346	886	962		113	689	84		1	478	†			4†
Mauritius	22	233	1		456	677	72		422	322	346	896	963		113	689	84		1	478	†			4†
Nairobi	22	334	2		455	678	73		522	412	246	897	985	1	13	689	872		1	478	†5			45
Harare	22	345	3		356	678	84		532	522	246	897	985	2	13	689	884		1	478	††			45
Capetown	22	344	3		266	678	85		311	642	346	897	875	41	13	689	885	1	1	378	††2			4†
Lagos	22	355	51		165	668	96		541	742	225	897	896	51	2	689	787	2		378	5†4			4†
Ascension Is	22	124	51		76	557	97		44	163	223	797	895	43		489	887	31		268	5†4			3†
Dakar	12	233	51		66	567	87		341	463	223	697	897	63		489	887	31		168	5†4			35
Las Palmas	12	111	31		56	656	86		331	476	666	896	897	754	334	689	998	521	111	378	††5	2		4†
S AMERICA																								
South Shetland		233	31		2	678	75		321	134	345	676	886	531	113	346	687	31		114	3†4			
Falkland Is	1	223	51		5	667	86		341	335	344	566	897	632	111	247	887	31		14	5†4			
Rio de Janeiro	2	222	42		7	656	77		341	235	322	477	897	532		158	887	31		27	††4			4
Buenos Aires	2	212	42		6	656	76		341	215	332	366	897	532	1	137	887	31		14	††4			
Lima		1	21			544	551		331	33	432	235	786	432	1	14	687	31		1	4†4			
Bogota		1	11		1	533	451		321	14	421	136	886	332	1	14	787	31		2	4†4			
N AMERICA																								
Barbados	1	1	21		5	534	561		331	25	422	257	886	432	1	26	887	31		4	††4			
Jamaica			1			433	44		32	3	432	235	785	222	1	14	687	31		1	3†4			
Bermuda			1		1	433	44		32	4	432	356	875	222	1	26	787	31		3	4†4			
New York						222	33		21	3	442	355	773	12	11	25	687	31		2	3†4			
Mexico						22	32		21		342	223	563	121	11	2	277	31			44			
Montreal						222	23		21	3	443	455	763	112	11	125	687	31		2	3†4			
Denver						11	11		1		134	333	443	2	111	2	266	31			34			
Los Angeles						1	11		1		34	322	332	21	112	1	146	31			4			
Vancouver									1		13	332	222	211	113	111	136	31	1		3			
Fairbanks										111	122	431	112	432	113	322	13	31	1	1				

The provisional mean sunspot number for June 1984 issued by the Sunspot Index Data Centre, Brussels, was 46·2. The maximum daily sunspot number was 83 on 16 June, and the minimum was 23 on 6 June. The predicted smoothed sunspot numbers for September, October, November and December are, respectively: (classical method) 48, 47, 45 and 43; (SIDC adjusted values) 41, 46, 38 and 36.

Contest News

47th Commonwealth Contest 1984 results

Conditions proved to be better than last year, resulting in a 30 per cent increase in the entry; in fact it was the largest entry for 10 years or more, and there was a consequent increase in the scores achieved by most entrants. A total of 28 different Commonwealth call areas are represented in the results, with the VK stations taking the lion's share of the entry, almost 48 per cent. The number of UK stations submitting logs was 34 per cent up on last year, and the remainder of the entry, while similar to that of previous years, also included 5N6, VP8, VP2K, and a return of 9H1.

Well in excess of 18,000 QSOs were recorded in the logs, the greatest number taking place between overseas entrants. Around 6,000 QSOs were made with the UK during the 24h, with—as was to be expected—14MHz carrying most traffic. Use of the bands followed the pattern: 3·5MHz (6·5 per cent), 7MHz (14 per cent), 14MHz (44·5 per cent), 21MHz (28 per cent), 28MHz (7 per cent), and it is interesting to note that 3·5MHz represents a mere three per cent of the total QSOs made with UK stations.

Over 300 UK stations recorded in the logs indicate room for a substantial improvement in the UK entrants in future. An analysis shows that 43 call areas were active at one time or another, including J3, VP2M, VU, ZF, 3B8, 3D2, 4S, 7P and 8P. VE3 provided the greatest number of QSOs with the UK, closely followed by VK3, while overseas stations had a majority of contacts with the UK, followed by VK3, and then VK2.

Conditions on 28MHz made it possible for some UK stations to make transatlantic contacts, but the majority of UK activity was centred upon 9J2BO, Z23JO, VP8KF and KC7UU/5N6. The opening between VE6/7 and VK/ZL seemed remarkably good, with VE6OU and VE7UZ appearing in many of the overseas logs.

For the second year running the Senior Rose Bowl goes outside Canada despite some strong VE opposition. The winner by a clear margin is Nigel Hoyow, 6Y5HN, who, entering only his second Commonwealth Contest, made a total of 528 QSOs with 168 bonuses, notching up 5,903 points. Congratulations, Nigel.

The Canadians remain a strong force; the Junior Rose Bowl and second place goes to Jim Roberts, VE3IY, who totalled 470 QSOs with 168 bonuses to give 5,583 points. VK4XA took third place.

The top UK entrant for the twelfth time in succession is Al Slater, G3FXB, once again retaining the Col Thomas Rose Bowl, and proving that he is still the top operator from the UK in this event. G3UKS operating G3RRS pushed G3MXJ from his usual second UK position and made a creditable ninth position overall.

The Receiving Section attracted the same four entrants as last year, and despite careful checking, the positions remain the same as in 1983. The Receiving Rose Bowl goes to Eric Trebilcock, BCRS195, with "Brad" Bradbury again in second place.

No less than 20 entrants will find their final scores higher than those they claimed. Over 30 per cent of the logs required re-scoring, many upwards, and in almost all cases stations lost points through unmarked duplicate contacts, transcription errors or incorrect reception of data during a contact. There were a few logs which were of a very high standard, and one, which, even after thorough checking, failed to provide a look-in for the adjudicator's red pen! Only one entrant this year tried to claim for a non-Commonwealth call area, a big improvement over 1983. Some confusion arose over ZL0AEA, who was in ZL1, and ZL1AIZ who was in ZL2! Points were adjusted where mistakes in bonuses were made. The New Zealand amateur licence regulations have been subject to change recently, and it now appears that call areas are no longer restricted to zones in the country. The HF Contests Committee will be considering this issue in depth and will alter the 1985 Commonwealth Contest rules accordingly.

Could all entrants please include details of their station, as this provides useful data for the adjudicator. From the information available, the most popular single rig was the Yaesu FT101, closely followed by the TS830s and TS520s transceivers. In all, 34 different types of rig were used, including four home-made stations and one HRO. Dipoles proved to be the most-used lower frequency antennas, followed by long wires, with three entrants making use of large real estates and wire beams. The three element tri band Yagi was the most popular hf antenna, with a number of wire dipoles being used by those with limited space, and some TH6DXXs and quads for the lucky few! Three G5RVs were in use with 13 all-band trap verticals.

AWARD WINNERS

Senior Rose Bowl	N. Hoyow, 6Y5HN
Junior Rose Bowl	J. Roberts, VE3IY
Col Thomas Rose Bowl	A. Slater, G3FXB
Receiving Rose Bowl	E. W. Trebilcock, BCRS195

SINGLE-BAND LEADERS

3·5MHz overseas	VK3RJ	14MHz overseas	VK6AJK
14MHz home	GW3MPB	21MHz overseas	ZC4CW
21MHz home	G3OLU	28MHz overseas	VE2AEJ/3

HOW THE LEADERS MADE THEIR SCORES

Callsign	QSOs/bonuses 3·5	7	14	21	28	Equipment
6Y5HN	51/10	102/34	177/57	151/42	47/25	TS180s SB201 3-el tri-Yagi If dipoles
VE3IY	29/18	121/48	143/45	165/45	12/12	R4B/T4XB If dipoles 40m beam, hf Yagis
VK4XA	33/21	56/30	194/54	85/45	30/27	TS520s If dipoles 3-el tri-Yagi
G3FXB	25/22	60/44	111/55	69/48	10/10	T4XC/R4C If slopers 40m beam hf quad
ZL1AIZ	42/30	70/33	82/43	54/37	35/31	FT902DM wire antennas GP 3-el Yagi

Comments from entrants

Conditions . . . *very good*—VK3ZC; *vastly improved over 1983*—VE3IY; *40m late opening*—VE2WA/3; *excellent morning opening to VK/ZL on 40m*—G3FXB; *disappointed with activity on 80/40—worked all I could hear—all four of them!*—G3SWH.

Placings . . . *Will hazard a guess—from his last serial number 6Y5HN must be in the running for first place*—BRS52868; *so far as G stations are concerned, surely yet again G3FXB. What does one have to do to beat the man!*—G3PEK; *this is about double my previous score*—VK3AUQ.

Suggestions . . . *All G areas to count separate*—VK2BQQ; *replace bottom 30kHz with bottom half (due to novices)*—VK3SV; *omit serial number (an old one!)*—VK3KF; *what about a QRP section?*—G3CWL.

Miscellany . . . *super beaut contest*—VK2ZC; *distinct lack of activity from VE making the night on 80/40 extremely boring*—G4BUO; *operating was at the high level of skill and quality as one expects in this world-class contest*—VK2BPN; *outstanding activity from VK*—G3MXJ; *first entry, most enjoyable, will be back next year*—GM3YOR; *as a 70-year-old the 24h "fun and games" was just my distance*—VK5AGX; *my first contest, much learned, much enjoyed, and many thanks to all concerned*—VK4APZ; *missed VE7CC*—VK2AQF; *best contest going*—VE5BAF; *having let the side down last year (away in VK2) decided to see how the groundplane performed*—9H1CH.

The contest seems to be going from strength to strength, and in particular the HF Contests Committee would like to express their thanks to John Tutton, VK3ZC, and Eric Trebilcock, BCRS195, for their invaluable help in improving the entry from "down under". Almost all participants expressed their enjoyment in the contest and the committee hopes this will continue.

G4DJX

TRANSMIT SECTION

Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points
1	6Y5HN	5,903	29	P29PR	3,050	57	VK3VF	2,142	85	VO1AW	1,412
2	VE3IY	5,583	30	VK3KF	3,047	58	VK3KS	2,110	**86**	**G3VW**	**1,397**
3	VK4XA	5,391	**31**	**G2QT**	**2,997**	59	VK3AZW	2,085	**87**	**GW3JI**	**1,389**
4	**G3FXB**	**4,943**	**32**	**G3DYY**	**2,962**	60	VK3XU	2,058	88	ZB2CJ	1,380
5	ZL1AIZ	4,840	33	9V1TL	2,932	61	VK2DO	2,000	89	ZL3AGI	1,355
6	VE6OU	4,693	34	VK4APZ	2,883	62	VK4SF	1,984	90	VK2GT	1,339
7	VK2BQQ	4,644	35	VK6RZ	2,867	63	VK6AJK***	1,970	91	VK7GB	1,308
8	VK2BPN	4,206	36	VK3CM	2,782	**64**	**G3KSH**	**1,930**	92	VK7CH	1,305
9	**G3RRS (op G3UKS)**	**4,204**	37	VK5AGX	2,747	65	KC7UU/5N6	1,922	93	VK3YD	1,280
10	VK3AEW/1	4,197	38	VK2ZC	2,730		VS6BQ	1,922	94	VK5FG	1,277
11	VE2WA/3	4,067	39	VP8KF	2,695	67	VK2EL	1,905	95	VK5HO	1,225
12	**G3MXJ**	**4,051**	40	VE5BAF	2,558	**68**	**G3EBH**	**1,873**	96	VK6AUX	1,204
13	VK3MR	4,021	41	VS6JH	2,522	69	VK6FS	1,835	97	VK4BKM	1,180
14	ZL2VS	3,928	42	VK5BN	2,415	**70**	**G5MY**	**1,792**	**98**	**G3ESF**	**1,168**
15	VK2AYD	3,907	**43**	**GM3YOR**	**2,410**	71	VK1UD	1,739	**99**	**GW3MPB*** **	**1,160**
16	VK7BC	3,883	44	VK3JF	2,388	72	VK3FC	1,727	100	Z23JO	1,120
17	**G3PEK**	**3,866**	45	VK3YK	2,352	**73**	**G3APN**	**1,702**		**G3VDL**	**1,120**
18	VK3ZC	3,837	**46**	**G4DRS**	**2,350**	**74**	**G3EFS**	**1,691**	102	VK7TN***	1,075
19	**G4BUO**	**3,810**		**G3SXW**	**2,350**	**75**	**G3SEP**	**1,662**	103	**G4OTU**	**1,035**
20	**G3XBY**	**3,782**	48	VK6IT	2,286	76	VK3DNC	1,632	104	VK3BKU***	1,030
21	ZL1HV	3,768	49	9J2BO	2,280	77	VK4LT	1,610	**105**	**G3TXF**	**1,019**
22	VK3AUQ	3,644	50	VK3XB	2,240	78	VK5RG	1,565	**106**	**G8VF**	**917**
23	ZB2EO	3,525		VK2DID	2,240	**79**	**G3CCZ**	**1,545**	107	VK4ANY***	913
24	VK2AQF	3,515	52	VK5UM	2,238	**80**	**G2HLU**	**1,543**	**108**	**GW2DPD**	**910**
25	VK6RU	3,180	53	VK4XW	2,217	**81**	**G3GC**	**1,532**	109	VK4LV	908
26	VK2GW	3,135	**54**	**G3NOM**	**2,197**	82	VK6AJ	1,513	110	VK3CG	900
27	**G4FAM**	**3,100**	55	VK3BDH	2,180	**83**	**G4UPS**	**1,500**	111	ZC4CW****	873
28	ZL1BLJ	3,075	56	9H1CH	2,172	**84**	**G3SWH**	**1,422**	112	VK5BS	768

Posn	Callsign	Points
113	VO1CA	760
114	**G2GM**	**702**
115	VK2IC	696
116	VK7LZ	688
117	**G3OLU******	**687**
118	ZL2BDC	683
119	**GW3ZDW**	**665**
120	**G3GSZ*****	**627**
121	VK3MJ***	610
122	VK2BHO	573
123	VK3FY***	532
124	**G3ZRH**	530
	VK3RJ*	530
126	ZL4OP	465
	VP2KBE	465
128	VK3XF	460
129	**G8FC**	**445**
130	**G4IJW**	**425**
131	**G8QZ**	**375**

Posn	Callsign	Points
132	VK2AZR	350
133	**G3AWR**	**325**
134	VE2AEJ/3*****	300
135	VE1EP	275
136	VK3SV*	225
137	**G3CWL******	**180**
138	VK7ZO	150

* 3·5MHz single-band entry
*** 14MHz single-band entry
**** 21MHz single-band entry
***** 28MHz single-band entry

RECEIVING SECTION

Posn	Station	Points
1	BCRS195	2,764
2	BRS1066	2,582
3	BRS44395	1,740
4	BRS52868	1,464

Checklogs received with thanks from G2AJB, G4DJY, GM3DPK, G3GMM, G3HRY, ZL2OM and G6NK. British stations are listed in bold type.

May 144MHz and SWL Contest results

The return of the May 144MHz contest was welcomed by many groups, and its popularity is illustrated by the large number of entries. Conditions were generally described as average with a number of slight lifts, but activity was high, with an estimated 2,500 stations, including many Continentals, operational for a significant portion of the event. In order to do well in this event, a relatively-remote coastal location was required. The leading stations were situated close to the coast in the NE, E, SE, S, SW and NW. Inland stations in the Midlands were unable to compete with the high points/contact achieved by the coastal stations because of their greater distance from the centres of activity, whether in the UK or on the Continent.

Log-keeping was generally good, except for a few cases of logs clearly written on the event under what appeared to be severe conditions of exposure, and a few logs with pages of missing "G" prefixes or QTH locators. It would greatly assist adjudicators if groups submitting computer-printed logs would send original prints and not poor contrast photocopies with "Bs" and "Es" virtually indistinguishable. Logs with 40 or more contacts per page are very difficult to check, and guilty parties are asked to format their printers to leave a space between each line and restrict the number of contacts/A4 page to 20-25. Scoring was very accurate, and it is clear that almost every entry was scored by computer. Unfortunately, the accuracy of recording contacts was not as good, with many leading stations losing points.

A few bad-signal reports were received, but only one independent complaint per station. Investigation does suggest that the complaints were not without good reason, but lack of independent confirmation rules out disqualification in this instance. Nevertheless, offending stations have been warned and are unlikely to be treated as leniently in future. Stations are also asked to adhere to the code of practice for vhf/uhf contests in order to prevent clashes in the uses of sites for /P stations.

As usual, the adjudicator's task was lightened by comments on the cover sheets, eg:

Station invaded by 120 cowes (sic) at 0600 on Sunday—G8KGI/P.
Serial numbers 450-9 repeated—op unable to add 1 and turn page at same time—G4SIV).
Never was so much drunk by so few in such a short time—G5FZ/P.
Reformed the two big electrolytics at midnight by starting generator at low revs and slowly increasing to correct voltage—G4GXK/P.
I'm getting too old for this sort of thing—G3JXN.

Congratulations and certificates go to the Parallel Lines CG (G4LIP/P), and the runners-up: Hillbillies (G4APA/P) in the multi-operator section, and GJ4ICD and G4NVA/P in the single-operator section. BRS52543 takes the certificate in the swl section, which had a welcome increase in the number of entrants. A certificate will also be awarded to G4SIV (Five Bells Contest Group) as the leading fixed station in the multi-operator section. Thanks to all who took part and helped to make the event a success. *G4JLG*

SINGLE OPERATOR SECTION

Posn	Callsign	Points	QSOs	QTH	Pwr	Best dx	Km
1	GJ4ICD	5,920	504	YJ70	+25	GM4RGC/P	858
2	G4NVA/P	5,439	608	ZN53	+26	DL8GP	739
3	G3JXN	2,627	429	ZL39	+26	DL4IAH	651
4	G8KUC	2,500	286	AL56	+21	OZ1GKU	787
5	G4HTD/P	2,095	303	YK21	+20	PA0CIS	651
6	GW6DTD/P	1,481	169	XM17	+14	ON1BCB	607
7	G4UPD	1,349	251	ZM41	+19	DL8GP	709
8	G1CDO	1,322	213	ZN24	+19	GM6WQC	525
9	G8KAX	920	120	AL13	+23	DF8VK	535
10	G6TFT	725	110	AK11	+20	GI4VIP/P	571
11	G4FVK	643	111	ZM39	+20	F1EWP	660
12	G6HXU	616	108	YN68	+13	GJ4ICD	446
13	GJ6TMM	614	72	YJ70	+20	G3WRS/P	584
14	G1DOX	602	160	YM28	+10	GM4RGC/P	473
15	G3YDY	599	107	AL23	+16	GI4VIP/P	524
16	G1CVS	571	97	ZK24	+14	GI4VIP/P	515
17	G4PDP	532	94	ZM80	+26	GI4VIP/P	449
18	G6HLL	446	74	YN68	+10	G4CRC/P	378
19	G6EPN/P	434	78	ZL41	+14	GI4VIP/P	430
20	G8RBT	418	102	YL59	+20	GI4VIP/P	418
21	GW6OSE	401	59	YL35	+14	G4APA/P	366
22	G8YGD	383	82	ZL67	+11	G3WRS/P	350
23	G4NRJ	368	64	ZM39	+19	GI4VIP/P	410
24	G6ZVH	366	60	ZK17	+10	GI4VIP/P	532
25	GW6ZUQ	327	61	YL37	+14	GI4VIP/P	327
26	GU4HUY	214	20	YJ47	+14	G4NOK/P	460
27	G1AMX	205	22	ZP73	+4	G3WOI/P	425
28	G8NMQ	203	58	ZL37	+10	GJ4ICD	272
29	G4RYV	195	39	ZL56	+10	G4NOK/P	269
30	G1FUO	183	43	ZN23	+10	G8LNC/P	183
31	G6CSY	138	36	AL41	+7	G3WRS/P	341
32	G2DHV	129	44	AL41	+14	G4NVA/P	224
33	GW6YIY	113	23	YM15	+10	G6HH/P	333
34	G6RJZ	74	28	ZL38	+4	GJ4ICD	280

MULTI-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QTH	Pwr	Best dx	Km
1	G4LIP/P	12,350	1,064	AN61	+26	OZ1RH	826
2	G4APA/P	11,559	850	ZO48	+26	DG6GP	951
3	GI4VIP/P	8,929	714	XO51	+26	F6EAM	766
4	GW6ULX/P	8,255	833	YL15	+26	DL2OM	763
5	G6HH/P	7,983	704	AK14	+26	DC2NF	727
6	GW4MGR/P	7,291	813	YN75	+26	F1BZN	975
7	G8LNC/P	7,250	744	ZK35	+26	DK5SO	937
8	G4DEZ/A	6,986	696	AL34	+26	YZ3GX	757
9	G8FUO/P	6,851	688	AL45	+26	DB2RR	784
10	G6EKR/P	6,520	593	AL56	+25	DK1KR	593
11	G3WRS/P	6,372	542	ZO46	+22	F1FHI	807
12	GW3OXD/P	6,210	718	YM55	+23	DL8GP	809
13	G4SIV	6,040	530	ZM29	+26	DL1GAL	748
14	G4NUT/A	5,528	703	ZL06	+26	OZ3GW	891
15	GD4IOM	5,243	486	XO67	+26	F1FHI	810
16	GW6GW/P	4,990	686	YL06	+20	DL9GS	695
17	G3YMD/P	4,985	534	AL76	+24	DB2RR	758
18	G4CRA/P	4,976	497	AL04	+23	GI4OPH	510
19	G3PIA/P	4,762	643	ZL33	+25	DF9UV/A	763
20	G3WQK/P	4,676	425	AK12I	+24	OZ1HOW	876
21	G4RUD/P	4,663	670	ZN51	+10	DL8GP	755
22	G4VWH/P	4,337	615	ZL34	+26	DJ0VZ	557
23	GW8VHI/P	4,295	469	XM80	+24	DC6SN	722
24	G4DDC/P	4,203	605	ZL18	+25	SM6ONH	1133
25	GW8IVO/P	4,168	587	YL05	+23	DL2OM	769
26	G4MHC	4,068	495	YM79	+25	DF7KX	724
27	G4WKY/P	3,869	557	ZL77	+24	HB9RCJ	721
28	G3WOI/P	3,825	561	ZL53	+19	DL6FAW/P	675
29	G4WAR/P	3,696	504	ZM36	+26	DF8VK	661
30	G5FZ/P	3,662	502	ZN49	+25	F1FHI	704
31	G8SSS/P	3,494	433	YL72	+25	DD9KE	769
32	G3FKF/P	3,304	496	YL80	+23	FC1JHN	823
33	G1ACC	3,284	445	ZM05	+25	DF9OX	749
34	G4UHF/P	3,164	498	ZL15	+25	DB5VW	626
35	GW4CZZ/P	3,049	462	YN64	+25	DK9TF	741
36	G4DZO/P	2,978	420	AK11	+23	DL3LAL	736
37	G4WET/P	2,849	494	ZM71	+19	DF7DJ	656
38	G4PPM/P	2,804	337	ZN58	+20	F6APE	658
39	G4ORC/P	2,604	445	ZN31	+20	DL8GP	780
40	G3SDC	2,589	436	ZM25	+26	DL8GP	670
41	GW2OP	2,513	253	XL26	+26	ON1BNB	690
42	G6XGZ/A	2,493	411	AL52	+19	GI4LKA	565
43	G4NOK/P	2,352	344	ZN23	+16	F1CVB	760
44	G3SFG/P	2,145	451	ZL76	+24	GM4RGC/P	666
45	G3TCR/P	2,068	344	ZL65	+22	GM4RGC/P	652
46	G3WKS/P	2,023	315	AL73	+20	DK1VI	613
47	G8KGI/P	1,989	342	ZK05	+21	DD9KE	588
48	G3GHN/P	1,964	389	AL52	+26	DL2OM	525
49	G4CRC	1,919	208	XK64	+19	F6FLV	572
50	G4SDZ/P	1,848	273	ZN78	+20	OZ9PW	750
51	G4TBR	1,698	338	ZL27	+23	DL2OM	599
52	G8IGQ/P	1,692	310	ZM16	+20	DL8GP	675
53	G4WRA/P	1,641	405	ZM71	+22	ON7OU	452
54	G6LJO/P	1,569	346	YN70	+16	F1FHI	666
55	G3IGQ/P	1,555	385	AL51	+26	GI4VIP/P	528
56	GM4RGC/P	1,386	108	YQ08	+15	GJ4ICD	858
57	G6MOE/A	1,189	262	AK02	+22	GI4LKA	600
58	G4GXK/P	983	142	XK27	+20	GM4SGB	640
59	G8AHK	828	230	ZL68	+17	GD4IOM	424
60	G6TDJ/P	650	153	ZN61	+13	G6HH/P	320
61	G3CMH	642	126	YK07	+23	GM3KGF/P	479
62	G4UUG/P	625	204	ZM26	+17	GI4VIP/P	280
63	G6ACM	555	119	ZL57	+18	GD4IOM	404

SWL SECTION

Posn	Station	Points	QSOs	QTH	Best dx	Km
1	BRS52543	859	122	YN15	GJ4ICD	515
2	BRS25429	771	111	ZN03	GJ4ICD	510
3	BRS26003	675	68	YO23	G6HH/P	493
4	BRS28198	576	96	AK04	GI4VIP/P	575
5	BRS46296	197	61	YN70	GJ4ICD	435
6	BRS32525	129	39	AL41	G8SSS/P	272

Check logs gratefully received from G4MYB, PE1AAP, PE1EWR, G6KNF, G2FSR and PE1HLB.

June 1,296MHz Trophy Contest results

Although many entrants to this contest found conditions average, some very good openings were exploited by the leading entrants and others. From the east coast G4MRS/P received strong dx signals from the Continent, and ducting carried these signals across central England to G4HWA/P in ZO square. However, in Wales GW4NXO/P found conditions flat and average, and GW6JIM/P had rain, thunder, lightning, hailstones, high winds and a flat band. Yet operators at G3UHF/P in ZN square suffered from sunburn and flat conditions. A number of entrants commented on the excellent level of activity; G4ANT worked more in 8h than in 24h on some previous occasions. The standard of operating was very high, and the quality of logs submitted was as good as any seen by the reviewer. Top marks in this respect go to G4HWA/P, G4MRS/P and G4KIY. G8PNN from ZP square found it difficult to contact southerly G stations but managed instead to work a number of PA0 and DL stations. G3JYP in YO square found conditions above average at the start, but then things deteriorated and he got the impression that he was sitting under a temperature inversion which in effect sealed off his valley. In Scotland GM8MJV/P in YP square also suffered from sunburn (at 2,000ft asl) and, using 130W and 4 × 23-el Tonnas at 20ft agl, worked a creditable number of stations, all to the south. Could he too have worked across the North Sea into DL as G8PNN did? We shall never know.

Overall, entrants thoroughly enjoyed the contest and its high operating standards. Only one comment was made about the radial-ring scoring system to the effect that 1pt/km seems to give a larger score. We can only assume that entrants were content with radial rings, which certainly simplify adjudication. Trophies are awarded to G4ANT and G4HWA/P for the fixed and all other sections respectively, and runner-up certificates go to G8PNN and G4MRS/P. GW8FKB is thanked for his check-log.

G3FZL

FIXED SINGLE-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QTH	Pwr	Best dx	Km
1	G4ANT	1,088	115	AM27	250	DC8UG	511
2	G8PNN	602	32	ZP52	60	DK1VC	748
3	G8FEZ	480	60	AL56	40	DB6DX	421
4	G4KIY	440	56	ZM40	50	ON5GF	421
5	G3JXN	387	77	ZL39	100	PE1CKK	383
6	G8DKK	281	51	ZL08	50	ON4ZK	389
7	G3PBV	191	21	YK32	20	F6DZK	465
8	G8GDZ	186	34	ZM41	60	G8FEZ	245
9	G4SIV	159	27	ZM29	150	F6DZK	469
10	G4LRT	122	20	ZM45	40	ON4ZK	441
11	G8IEM	94	14	ZK16	3	G3UHF/P	276
12	G3JYP	59	9	YO38	100	G3JXN	365
13	G6GJD	35	9	YN15	1	GM8MJV/P	180
14	G6LZO	17	7	ZN22	2	GW4LIP/P	120

Pwr = SSB p.e.p. output.

ALL-OTHER SECTION

Posn	Callsign	Points	QSOs	QTH	Pwr	Best dx	Km
1	G4HWA/P	1,236	86	ZO48	300	DJ5BV	651
2	G4MRS/P	1,023	113	AM67	150	DC9XG	558
3	G4JDI/P	729	59	ZN18	250	DK1VC	599
4	G4NVA/P	645	72	ZN53	25	DD8DA	629
5	GW4NXO/P	643	71	YL25	180	DJ5BV	703
6	G3UHF/P	402	58	ZN61	100	PE1CKK	489
7	G3WOI/P	363	69	ZL53	30	PE1CKK	464
8	GW6JIM/P	351	43	YM44	180	F6DZK	544
9	G4JTJ/P	230	46	ZM68	25	DD8DA	541
10	G4PRJ/P	197	25	AK12	2	PE1CKK	378
11	GW4MGR/P	181	31	YN65	20	G8FEZ	360
12	G3NJA/P	176	22	YK22	35	F6DZK	459
13	GM8MJV/P	143	15	YP42	130	G4ANT	452
14	G8CUB/P	141	35	AL23	2	F6DZK	337
15	G8ACJ/P	20	14	ZL69	1·4	G3WOI/P	

Pwr = SSB p.e.p. output.

Erratum—AFS Contest results

Apologies to the Crawley Court ARG, for inadvertently listing their station G4IBA as belonging to the Ariel RG, in position 97 of the individual scores tables, Rad Com June 1984, p509. An embarrassing association of ideas was to blame!

G4BUO

Region Round-up Contest 1984 results

The contest attracted exactly the same number of contestants as the 1983 event, and again propagation was unkind—particularly on 7MHz—where remarks such as "What happened to 40—worst year in RR from my point of view", *G4ARI*; "40 useless", *G3WVG*; "40 a struggle", *G4OBK*—told the sad story. However, 3·5MHz seemed to behave well, and the greatest number of contacts on both bands combined (130) was only three less than last year.

Many entrants remarked on the fine signals from GM3ZSP, and G2HLU was looking forward to hearing about his dipole antenna system. Several suggested that perhaps the contest was too long, as the level of activity was not enough to keep interest going for 5h. Of course, the HF Contests Commitee will take all comments into account when devising rules for the 1985 event.

As in 1983 the QRP section did not attract many entrants, although there was a 100 per cent increase from two to four! Once again there was only a very disappointing response from listener entrants—the same three as before and in the same order in the listing. One check log was received from G4HZV, who was unable to operate for the full 5h, but perhaps the best reason for not coming very high in the listing came from GW4KVJ, who simply said "domestic interruptions"!

Only a few did not work out their scores properly, but perhaps it is worth pointing out that it is the *total* QSO points from both bands added together which is multiplied by the *total* of regions from both bands—also added together. Logs were well written in most cases, but it really would help if Forms HFC1 and HFC2 could be used.

Certificates will be awarded to G3RRS (operator, G3UKS), GM3ZSP, G3SXW and G4ARI, and RSs 1066, 44395 and 52868. *G3FKM*

SECTION A

Posn	Callsign	QSOs	Points
1	G3RRS	130	14,782
2	GM3ZSP	134	13,930
3	G3SXW	109	12,388
4	G3SJJ	112	11,952
5	G3SYA	107	10,914
6	G3RTE	106	10,593
7	G3PDL	105	10,329
8	G4DRS	96	9,940
9	G3TBK	100	9,216
10	G3WVG	86	8,670
	G5MY	85	8,670
12	G4PLJ	92	8,544
13	G4OBK	85	7,905
14	G4OTU	79	7,623
15	GW3JI	79	7,347
16	G4BOU	77	6,384
17	G2HLU	72	5,375
18	G3AWR	63	5,264
19	G4MUL	72	5,136
20	G4EBK	74	5.083
21	G4BUO	60	5,040
22	GW3HCL	64	4,833
23	G4GLC	63	4,232
24	G4RCG	75	3,762
25	GW3ZDW/A	50	3,675
26	G3SHY	54	3,498
27	G3WZ	48	2,775
28	GW4PXP	44	2,470
29	G8FC	45	2,128
30	G4RPW	35	1,648
31	G6QQ	36	1,620
32	G3TXF	25	1,200
33	GW4KVJ	5	75

SECTION B

Posn	Callsign	QSOs	Points	TX	Power	Ant
1	G4ARI	71	4,876	Sugiyama F850	10W	Dipoles at 40ft
2	G3HQH	62	3,312	FT7	10W	G5RV
3	G4OGB	50	2,700	TS520S driving home-brew pa	10W	Dipoles
4	G3SB	7	126	HW8	3W	Dipoles

RECEIVING SECTION

Posn	Station	Points	Posn	Station	Points
1	RS1066	8,091	3	RS52868	4,788
2	RS44395	6,237			

May 432MHz-24GHz Contest results

For the first time, the bands above 2,320MHz were included in this IARU-co-ordinated contest. Despite plenty of activity on 432 and 1,296MHz, the higher bands were disappointingly quiet, with only one half-QSO being recorded on 3,456MHz, and none at all on the higher bands. One lone GW was heard calling for contacts on 10GHz.

Conditions were described as flat, average or average with occasional slight lifts. With this in mind, the contact between GW3WOH/P and PE0MAR/P on 2,320MHz was a remarkable achievement and is believed to be the first GW to PA0 QSO on 2·3GHz.

In general, equipment reliability appears to be improving, even on 2·3GHz where, with one exception, all entrants used GaAsfet rf stages, 2C39 variant power amplifiers, and dishes of various sizes. On 1·3GHz, the GaAsfet/2C39 combination still rules, although there is a wider spread of antenna types.

Certificates will be awarded to the winners in each section, and to the runners-up where 10 or more entries were received. *G4ERP*

432MHz MULTI-OPERATOR

Posn	Callsign	Points	QSOs	QTH	O/P(W)	First rx	Best dx	Km
1	GW8TFI/P	3,296	325	YL25	350	MGF1412	DK7KB/P	714
2	G4CLA/P	3,266	307	AN61	400	MGF1200	DL0ZF/P	759
3	G4PUB/P	2,965	317	AL65	400	GaAsfet	DL2NO	671
4	GW4THB/P	2,761	283	YL15	400	GaAsfet	DG4FAO/P	819
5	G8XVJ/P	2,252	293	ZN53	300	—	F1KNO	725
6	G4SIV	2,238	215	ZM29	400	MGF1402	DK5AI	755
7	G4HRC/P	1,256	121	AL17	100	—	DK5AI	638
8	G3UHF/P	1,227	211	ZN61	100	GaAsfet	F1FHI	677
9	G8OHM/P	905	174	YM50	50	GaAsfet	PA0PLY/A	—
10	G6EUW/A	850	102	AL34	300	—	DK5VI/P	503
11	G4MGR/A	494	103	YN55	400	BFT66	PA0PLY/A	556

432MHz SINGLE-OPERATOR

Posn	Callsign	Points	QSOs	QTH	O/P(W)	First rx	Best dx	Km
1	G4CQR	930	158	AL71	100	—	G8KPD/P	442
*	G4ERP/P	641	116	YL10	30	MGF1402	DL1EBQ/P	623
2	G8VLL	211	21	AM27	100	BFR34A	DL2KBB	393
3	G8JAY/P	115	23	ZL01	20	—	PA0PLY/A	475
4	G4LRT	108	10	ZM45	400	MGF1202	DF0ED/P	575
5	G4WGE/A	105	35	ZL68	10	—	GW8AAP/P	284
6	G4FOH	98	16	ZM60	8·5	TP390	PA0OOS/P	366
7	G6CSY/P	89	19	AL51	5	—	G8XVJ/P	250
8	G6TFT	87	21	AK11	40	GaAsfet	G8XVJ/P	304
9	GM8MJV/P	76	10	YP26	10	GaAsfet	GW8TFI/P	455
10	G1DOX	58	20	YM28	1	—	G4CLA/P	163
11	G1CTT/A	29	7	ZL68	10	—	G8XVJ/P	180

*Adjudicator
Checklog received from G8WPL.

1,296MHz MULTI-OPERATOR

Posn	Callsign	Points	QSOs	QTH	O/P(W)	First rx	Best dx	Km
1	GW4BVY/P	16,796	82	YL25	150	MGF1412	DF3EE	700
2	GW4HWA/P	14,519	72	YL15	300	NE72089	ON5GF	572
3	G4LIP/P	12,601	51	AN61	100	—	DB6BX	477
4	G4ALE/P	11,835	65	AL65	300	GaAsfet	DC9XO	562
5	G4VIX/P	7,590	39	AL17	65	—	G4DGU	407
6	G4NVA/P	7,441	51	ZN53	25	—	PI4ALK/A	430
7	G4DEZ/A	6,018	40	AL34	100	NE21889	DL0HC/P	478
8	G4ODA/P	4,904	27	ZM29	100	MGF1402	F6CTW/P	402
9	G3OHM/P	4,286	41	YM50	32	NE72089	G4ALE/P	249
10	G3UVR	1,752	16	YN55	30	—	G8VLL	299

1,296MHz SINGLE-OPERATOR

Posn	Callsign	Points	QSOs	QTH	O/P(W)	First rx	Best dx	Km
1	G4KIY	8,490	44	ZM40	50	NEC64535	DL0HC/P	542
*	G4ERP/P	5,282	44	YL10	15	MGF1402	G3JYP	294
2	G4KDH	4,956	36	AL34	70	MGF1402	DJ3ZU	401
3	G8VLL	3,498	17	AM27	100	MGF1402	GW4BVY/P	314
4	G4DGU	3,478	5	XK09	125	MGF1202	G4LIP/P	401
5	G8ZQB	2,730	20	ZM35	150	NEC64535	G4VIX/P	286
6	G8CZZ	2,584	35	ZL38	50	—	G4NVA/P	214
7	G3PBV	2,033	12	YK32	30	NEC64535	G4LIP/P	388
8	G4PRJ	1,578	9	AK12	2	—	G4LIP/P	269
9	G3WFM	674	13	ZL30	80	BFR91	GW4HWA/P	198
10	G4WGE/A	659	8	ZL68	1	—	GW4HWA/P	182
11	G4LRT	602	6	ZM45	30	NE645	GW4BVY/P	162
12	G1CTT/A	163	2	ZL68	1	—	G4ERP/P	128

*Adjudicator

2,320MHz MULTI-OPERATOR

Posn	Callsign	Points	QSOs	QTH	O/P(W)	First rx	Best dx	Km
1	GW3WOH/P	2,648	12	YL15	12	2XNE72089	PE0MAR/P	489
2	GW4NXO/P	2,639	12	YL25	30	MGF1200	G4IVV	317
3	G4GLN/P	962	5	AL65	28	GaAsfet	GW4NXO/P	288
4	G4SMS/A	1	1	AL34	0·5	GaAsfet	G4KDH	1

2,320MHz SINGLE-OPERATOR

Posn	Callsign	Points	QSOs	QTH	O/P(W)	First rx	Best dx	Km
1	G8VLL	1,999	9	AM27	12	NE64535	GW4NXO/P	314
2	G4KDH	1,238	8	AL34	50	MGF1412	PA3BPC/P	311
3	G4LRT	341	3	ZM45	8	NE645	GW4NXO/P	162

3,456MHz SINGLE-OPERATOR

Posn	Callsign	Points	QSOs	QTH	O/P(W)	First rx	Best dx	Km
1	G4LRT	18	1	ZM45	—	NE645	G3TQF/P	37

OVERALL RESULTS—MULTI-OPERATOR

Posn	Group	Band position 432	1,296	2,320	3,456	Points
1	Sheppey Western CG	1	1	2	—	2,997
2	The Hillbillies	4	2	1	—	2,702
3	HADRABS & Addiscombe CG	3	4	3	—	1,967
4	Parallel Lines CG	2	3	—	—	1,741
5	PACT	5	6	—	—	1,126
6	Five Bells	6	8	—	—	971
7	Havering & D ARC	7	5	—	—	833
8	Mudhoppers	10	7	4	—	617
9	South Birmingham RS	9	9	—	—	530
10	Wirral & D ARC	11	10	—	—	254

OVERALL RESULTS—SINGLE OPERATOR

Posn	Callsign	Band position 432	1,296	2,320	3,456	Points
1	G8VLL	2	3	1	—	1,639
2	G4LRT	4	11	3	1	1,358
3	G4KDH	—	2	2	—	1,203
4	G4CQR	1	—	—	—	1,000
5	G3PBV	—	7	—	—	239
6	G4PRJ	—	8	—	—	186
7	G6TFT	8	—	—	—	93
8	G1DOX	10	—	—	—	62
9	G1CTT/A	11	12	—	—	50

7MHz Contest 1985 rules

Licensed radio amateurs and listeners throughout the world are invited to take part in these RSGB 7MHz contests. The HF Contests Committee is hoping for a further increase in entries following the encouraging upswing in interest in the 1984 contest.

GENERAL RULES

1. Entrants must operate in accordance with the terms of their licences.
2. Unmarked duplicate contacts will be penalized at 10 times the number of points claimed, and logs containing in excess of five unmarked duplicate contacts will automatically be disqualified. Duplicate contacts should be included in logs, marked as such, and without any claim for points.

TRANSMITTING SECTION

1. **Eligible entrants.** British Isles: RSGB members only. Rest of the world: all licensed amateurs.
2. **Periods.** Phone: 1200gmt 2 February to 0900gmt 3 February 1985. CW: 1200gmt 23 February to 0900gmt 24 February 1985.
3. **Sections.** Single-operator only.
4. **Bands.** Phone 7·04-7·10MHz. CW 7·00-7·03MHz. Entrants in the cw section are requested not to operate above 7·03MHz.
5. **Exchange.** RS(T) plus serial number starting at 001. Serial numbers where sent must be recorded from non-competing stations.
6. **Scoring**
   (a) British Isles stations with: European stations, 5 points per QSO; non-European stations, 15 points per QSO; British Isles stations may not work each other.
   (b) European stations with: British Isles stations, 5 points per QSO.
   (c) Non-European stations with: British Isles stations, 15 points per QSO.
   Note: for scoring purposes aeronautical mobile and maritime mobile stations will count only as minimum score and not for multiplier. Entries from GB stations, aeronautical mobile and maritime mobile stations will not be accepted.
7. **Multiplier.**
   (a) British Isles stations: one for each different country worked (ARRL DXCC List applies). In addition VE, VK, W, and ZL call areas will each count as a country for this purpose.
   (b) One for each different British Isles prefix worked, ie G0, G2, G3, G4, G5, G6, G8, GD0, GD2, GD3, GD4, GD5, GD6, GD8, GI0, GI2, GI3, GI4, GI5, GI6, GI8, GJ0, GJ2, GJ3, GJ4, GJ5, GJ6, GJ8, GM0, GM2, GM3, GM4, GM5, GM6, GM8, GU0, GU2, GU3, GU4, GU5, GU6, GU8, GW0, GW2, GW3, GW4, GW5, GW6, GW8 (a maximum of 49).
   Note that the prefix GB will not count.
8. **Final score.** QSO points multiplied by the number of different multipliers contacted.
9. **Logs.** Log sheets should be headed: date; time (gmt); callsign of station worked; RS(T) and serial number received; RS(T) and serial number sent; if multiplier; and QSO points claimed. A summary sheet is required showing the countries or prefixes worked.
10. **Declaration.** Each log must be accompanied by the following declaration: "I declare that my station was operated in accordance with the rules of the contest and in accordance with the terms of my licence". The declaration must be signed and dated.
11. **Address for entries.** Entries must be sent to G3OZF, RSGB HF Contests Committee, Mayerin, Churchway, Stone, Aylesbury, Bucks. Misdirected entries may be disqualified.
12. **Closing date for receipt of logs.** Phone contest, 1 April 1985; CW contest, 22 April 1985.
13. **Awards.** The Thomas (G6QB) Memorial Trophy will be awarded to the leading British Isles entrant in the cw contest. Certificates will be sent to the entrants placed first, second and third in the British Isles, European, and non-European sections of each contest.
14. **Dispute.** 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.
15. Participation in this contest by UK stations will count towards the 1984/5 HF Contest Championship.

RECEIVING SECTION

1. **Rules** as transmitting section except as superseded below.
2. **Eligible entrants.** British Isles: RSGB members only, who do not hold a Class A transmitting licence. Rest of the world: all listeners.
3. **Scoring.**
   (a) British Isles listeners should log only overseas stations in contact with British Isles stations. European stations logged count 5 points, others 15 points.
   (b) Overseas listeners should log only British Isles stations participating in the contest. European listeners may claim 5 points per QSO logged, others 15 points.
4. **Multiplier.** As transmitting section.
5. **Logs.** Log sheets must be headed date; time (gmt); callsign of station heard; callsign of station being worked; report sent by station heard; if multiplier; and points claimed. Note that the callsigns of the stations being worked may only appear once in every three contacts logged unless it is a new multiplier.
6. **Declaration.** As transmitting section plus "I certify that I do not hold a Class A transmitting licence".

Contests Calendar

1-2 September	SSB FD *(Rules in May issue)*
1-2 September	144MHz Trophy and IARU VHF & SWL *(Rules in June issue)*
2 September	Howdy Days *(Rules in August* MOTA*)*
3, 11, 19, 27 September	28MHz Cumulative (Phone) *(Rules in August issue)*
5-6 September	LZ DX *(Rules in August* MOTA*)*
8-9 September	Cray Valley RS SWL *(Rules in August issue)*
8-9 September	European DX (Phone) *(Rules in July* MOTA*)*
8-9 September	International ATV *(Rules in August issue)*
9 September	DF Qualifying Event Chelmsford/Colchester *(Rules in September issue)*
15-16 September	Scandinavian Activity (CW) *(Rules in September* MOTA*)*
16 September	10GHz Cumulative (Part 5) *(Rules in April issue)*
16 September	70MHz Trophy & SWL
22-23 September	Scandinavian Activity (Phone) *(Rules in September* MOTA*)*
22 September-7 October	International "50th Anniversary Province of Latina" Tournament *(Rules in September* MOTA*)*
6 October	DF Double Night Event Slade
6-7 October	432MHz-24GHz & IARU UHF *(Rules in June issue)*
6-7 October	VK/ZL Oceania (Phone) *(Rules in September* MOTA*)*
9, 25 October	432MHz Cumulative (Parts 1 and 2) *(Rules in August issue)*
13-14 October	VK/ZL Oceania (CW) *(Rules in September* MOTA*)*
14 October	21/28MHz Phone *(Rules in May issue)*
17 October	1,296MHz Cumulative (Part 1) *(Rules in August issue)*
21 October	21MHz CW *(Rules in May issue)*
27 October	DF Treble Night Event Mid-Thames
28 October	70MHz Fixed *(Rules in August issue)*
3-4 November	144MHz CW & Marconi Memorial *(Rules in August issue)*
4 November	LF CW WAB*
10-11 November	European DX (RTTY) *(Rules in July* MOTA*)*
10-11 November	2nd 1·8MHz
12, 20, 28 November 6-14, December	28MHz Cumulatives
2 December	144MHz Fixed
16 December	70MHz CW
1985 January-February	BATC ATV Winter Cumulative *(Rules in CQ-TV)*
2-3 February	7MHz (Phone) *(Rules in September issue)*
23-24 February	7MHz (CW) *(Rules in September issue)*

* Rules, logsheets and other information from Steve Lawrence, 7 Ashfield Road, Market Harborough, Leics.

Chelmsford and Colchester DF Qualifying Event

Date: 9 September 1984
Map: OS sheet 168 1, 50,000 series Colchester and the Blackwater
Assembly: 1300bst for start at 1320bst
Location: Fordham Heath by Star PH, ngr 945 264

Competitors requiring tea should notify Mr R. A. Brocks, 30 Rowan Drive, Heybridge, Maldon, Essex, tel 0621 55707, home, or 0245 353221 ext 3086, office, not later than 4 September 1984.

Dartford Heath DF Qualifying Event results

Twelve teams assembled at the cricket ground on Dartford Heath on a very warm and humid afternoon. Two signals of identical strength were heard. Two teams headed west to tackle station B first, while the remainder headed in a southerly direction to find station A.

Station A was located in a wood near Dunstall Priory, 13km south of the start on a very steep hillside. Combined with a long run-in, this proved physically very demanding, and the distress shown by some aged competitors was not helped by the attitude of some of the younger element. Such irreverent remarks as "keep taking your pills" echoed through the woods. The radiation pattern of the 3λ/4 antenna added to the difficulties.

Station B was located only 2km from the start and hazards included gorse, bracken and a dummy antenna. The radiating antenna was skilfully woven into the undergrowth only a few feet above the ground and driven by a QRP signal.

In the event the "younger element" paid for their earlier remarks by being soundly trounced by a middle-aged Mike Hawkins who, although clearly "past his peak" can still spring a few surprises when sufficiently provoked.

Eric Mollart thanked the Dartford Heath ARS for organizing the event on behalf of the RSGB, and in particular Lynn Harding and Rosie Keeling for providing a most enjoyable tea.

Posn	Name	Club	Time of arrival Station A	Station B
1	M. Hawkins	Chelmsford	1451	1537
2	P. Lisle	Mid-Thames	1452	1547
3	T. Gage	Mid-Thames	1447	1548
4	A. Butcher	Chelmsford	1450	1559
5	F. Mepham	Mid-Thames	1451·5	1559·5
6	P. Woollett	Dartford Heath	1449	1600
7	C. Wells	Mid-Thames	1502	1600·5
8	E. Mollart	Mid-Thames	1456·5	1601
9	D. Newman	Slade	1448	1607
10	C. Oliver	Dartford Heath	1454	1615
11	A. Williams	Braintree	—	1526
12	R. Brocks	Chelmsford	—	1547

M. Hawkins and A. Butcher qualify for the National Final.

Northampton DF Qualifying Event results

The first Northampton df qualifying event was held on 24 June, when 23 teams assembled at Bucknell Wood.

Signals were not strong at the start, and some competitors required approximate bearings for either station A or B.

At 1330 competitors sped away to their chosen station, most teams choosing the northerly station B.

Station A was hidden in a thick hedge at the site of an old brickworks, some 12 miles from the start. The antenna was in the form of a large square, giving most teams considerable trouble. The first to arrive was George Whenham, followed by Peter Lisle.

Station B was hidden in a thick hedge on the bank of a stream, and was situated between Flecknoe and Braunstone, near the old arm of the Grand Union Canal, about 14 miles from the start. Brian Bristow was the first to arrive, finding his way through the hedge. He was quickly followed by a number of competitors who crossed the stream, arriving with a liberal sprinkling of wet feet. One competitor was heard to threaten the life of the organizer after leaving this station.

After the contest tea was served at Yardley Gobeon village hall, where everyone sat down to an excellent meal, and the prizes were presented by Charlie Smart.

Thanks are due to Eric Young, G4MZX, and Keith Howells, G4YKE, who manned station A, and to Nigel Ellis, G6MKJ, who was with the organizer G4AKL at station B. Also to Bill Mays for the time and effort spent in helping to organize and run the event.

Thanks are also due to Mrs Sue Lineham and her band of helpers for a splendid tea.

It is hoped that enough interest has been generated in the Northampton club to persuade some members to take part as competitors in future contests.

Posn	Name	Club	Time of arrival Station A	Station B
1	G. Whenham	Coventry	1441	1601
2	A. Butcher	Chelmsford	1627	1451
3	D. Yorke	S. Manchester	1628	1505
4	M. Hawkins	Chelmsford	1629	1508
5	A. Williams	Braintree	1629	1450
6	P. Lisle	Mid-Thames	1449	1630
7	B. Bristow	Mid-Thames	—	1449
8	B. Mepham	Mid-Thames	—	1450
9	B. Mahoney	B.T. Madley	—	1452
10	D. Holland	S. Manchester	1632	1504
11	T. Gage	Mid-Thames	1632	1504
12	M. Ellis	S. Manchester	—	1505
13	R. Sheppard	Mid-Thames	—	1506
14	E. Mollart	Mid-Thames	—	1507
15	I. Deacon	Dartford Heath	1631	1507
16	C. Merry	Dartford Heath	1513	—
17	W. Pechey	Mid-Thames	—	1519
18	T. Judd	Oxford	—	1539
19	C. Plummer	Mid-Thames	1543	—
20	P. Woollett	Dartford Heath	—	1619
21	S. Carey	Dartford Heath	1627	—

Two competitors did not find either station.
G. Whenham and D. Yorke qualify for the National Final

Club News

The following is the latest information received by RRs from RSGB affiliated societies, clubs and groups in time for inclusion in this issue. Basic unchanged information on other affiliated organizations, will be published again in the January 1985 issue.

RSGB affiliated organizations are requested to report all programmes and news items to their regional representatives regularly. Information for inclusion in the **November** issue should reach them by **18 September** and for the **December** issue by **23 October.**

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 B. Donn, G3XSN, 7 Thurne Way, Liverpool L25 4FQ.

Ainsdale (AARC)—11, 28 September (Normal meetings), Scout HQ, Marine Drive, near the pier. 4, 18 September (DF hunts, 7pm start), 1, 2 September (Club callsign G2OA active for SSB NFD), 23 September (G2OA active for Region 1 (RSGB) Contest). Details from sec David Norris, G4TUP/9H3CU, tel 35947.

Bury (BRS)—Tuesdays. 11 September ("Remote inspection—video vs photography", by Bob Hayter, G4OAC), 8pm. Mosses Community Centre, Bury. Centre closed on 18 September. Sec Brian Tyldesley, G4TBT, tel Burnley 24254.

Manchester (MUARS)—Wednesday afternoons and most lunchtimes. 30 September-5 October (Freshers' week activities, including special event station and exhibition). The society has a shack in the Students Union Building. Programme from sec Khee Chan, G5MUR c/o MUARS, The Students Union, Oxford Road, Manchester M13 9PR.

Oldham (OARC)—Mondays, 17 September ("Japanese morse", by Norman Kendrick, G3CSG), 8.30pm. The Bunker, Wheatsheaf Hotel, Derker Street, Oldham. Details from sec Fiona Butterworth, G4SPX, tel 061-652 8862.

Thornton Cleveleys (TCARS)—3 September ("Japanese morse", by Norman Kendrick, G3CSG), 10 September (Regular morse class with Ian, G3ZRZ), 17 September (TBA), 24 September (Judging of annual construction competition), 1 October (Demonstration of printing colour transparencies by Pete Reilly, G4BVW), 7.45pm. 1st Norbreck Scout Hut, Carr Road, Bispham. Details from Mrs Jen Ward, G8YOK, tel 0253 890114.

REGION 2—RR P. N. Butterfield, G4AAQ, 43 Lynwood Crescent, Pontefract WF8 3QT, West Yorks. Tel 0977 791071.

Hornsea (HARC)—Wednesdays, 1-2 September (SSB Field Day), 16 September (70MHz Trophy), 7.30pm. The Mill, Mill House, Atwick Road, Hornsea. Details from sec Norman Bedford, G4NJP, tel 0262 73635.

Keighley (KARS)—25 September (Talk on local radio by Mike Boothroyd of Pennine Radio). Details from sec Gerry Fuller, G3TFF, tel Keighley 42977, or pro Jack Birse, G1BOD, tel Keighley 663203.

REGION 3—G. Ross, G8MWR, 81 Ringwood Highway, Coventry CV2 2GT. Tel Coventry (0203) 616941.

Birmingham (Midland ARS)—19 September (Homebrew contest evening), 7.30pm. 29a Broad Street, Birmingham B1 2DS. Sec G8BHE, tel 021-422 9787.

Birmingham (South Birmingham RS)—12 September (to be announced on GB2RS), 7.45pm. Hampstead House, Fairfax Road, West Heath. Sec Tim G8RGQ, tel 021-459 8312.

Bromsgrove (BARS)—11 September (Main meeting), 16 September (Entry in 70MHz Trophy Contest), 25 September (Informal meeting), 8pm. British Legion Club, Bromsgrove. New sec, Andy Males, G8HAC, tel Bromsgrove (26) 71986.

Dudley (DARC)—3 September (Committee meeting), 10 & 17 September (Discussion evenings), 7.45pm. Allied Centre, Greenman Alley, off Tower Street, Dudley. Sec G4SQP, tel Codsall (209) 5636.

Halesowen (MEB Sports & Social Club)—11 September (General meeting), 25 September, ("Aerial circus", video film by G6CJ), 8pm. MEBHQ Social Club, Mucklow Hill, Halesowen. Sec G4RWH, tel 021-747 8784.

Dave Jones, GW3SSY, secretary of Abergavenny & Nevill Hall ARC, is seen at the controls of his station. The rigs are, l to r, a Heathkit HW9, HW101, Yaesu FT480R, and FRG7700

Hereford (HARS)—7 September (Informal club meeting), 21 September ("TVI", talk by Des Biggs of the DTI). Civil Defence HQ, Gaol Street, Hereford. Sec G3WRQ, tel Hereford (0432) 54064.

Malvern Hills (MHRAC)—11 September ("A lighthearted look at kite antennas", by Dave Davis, G4EYD), 7.30pm. Red Lion Inn, St Anns Road, Malvern. Sec G4TXG, tel Malvern (06845) 65802.

Redditch (RRC)—13 September (Video, "Semiconductors"), 27 September (General meeting), 8pm. WRVS Centre, Ludlow Road, Redditch, Worcs. Details from sec R. J. Mutton, G3EVT, tel Alcester (0789) 762041.

Shrewsbury (Salop ARS)—6 September (Natter night), 13 September (4th fox hunt of four—final), 20 September (Natter night), 27 September (RSGB film "The Secret Listeners"), 8pm. The Albert Hotel, Smithfield Road, Shrewsbury. Sec G4XBI, tel Shrewsbury (0743) 62737.

Stourbridge (STARS)—3 September (Current constructional project), 17 September (Main

meeting, to be announced on GB2RS). The Robin Woods Centre, School Street, off Enville Street, Stourbridge, details from sec G8JTL, tel Lye (593) 4019.
Sutton Coldfield (SCARS)—10 September (Discussion evening), 24 September (Talk by Haydn Bate, G8AMD, subject to be announced later), 8pm. Central Library, Sainsbury Building, Sutton Coldfield. Sec G6UFD, tel 021-358 6501.
Telford (TDARS)—1/2 September (HF Field Day from Lookout Point, Telford Centre), 9 September (Telford Radio Rally & Exhibition, details from G8DIR, tel Shrewsbury 64273). Club meetings at 7.45pm. Dawley Bank Community Centre, Dawley Bank, Telford. Sec Martin, G6XUF, tel Telford (0952) 47952.
Warwick (Mid Warwickshire ARS)—11 September (Talk about "The world of metal detecting"), 25 September (Junk sale), 8pm. 61 Emscote Road, Warwick. Sec G4TIL, tel Southam (092681) 4765.
Worcester (W&DARC)—1/2 September (RSGB Field Day Contest at Kempsey Common), 3 September ("Microwaves", by Glen Ross, G8MWR), 8pm. Oddfellows Club. 17 September (Informal evening), 24 September (AGM), 8pm. Old Pheasant Inn. Sec Alasdair, G4NRD, tel Evesham (0386) 41508.

REGION 4—RR M. Shardlow, G3SZJ, 19 Portreath Drive, Darley Abbey, Derby DE3 2BJ. Tel Derby (0332) 556875.
Buxton (BARS)—No meeting in September. Winter meetings start in October, on the second and fourth Tuesdays, 8pm. Egerton Hotel, St Johns Road, Buxton. Sec Dave Cooper, G6MIF, tel Buxton 6174.
Derby (D&DARS)—Wednesdays. 5 September (Junk sale), 7.30pm. Top floor, 119 Green Lane, Derby. Sec Jenny Shardlow, G4EYM, tel Derby 556875.
Derby (NHARG)—7 September ("Servicing World War 2 aircraft", a talk by Bernard Longstaff), 14 September ("Satellites", by G8OWA), 21 September ("RTTY and sundry equipment", Lowe Electronics), 28 September ("Sounds in space", by Ken Stevens), 7.45pm. Room 7, Nunsfield House, Boulton Lane, Alvaston, Derby. Sec John Robson, G4PZY, tel Derby 767994.
Grantham (GRC)—18 September (Natter and noggin night), 25 September (Visit to RAF Cottesmore), 8pm. Shirley Croft Hotel, Harrowby Road, Grantham. Sec John Kirton, G8WWJ, tel Grantham 65743.
Lincoln (LSWC)—5 September (Hamfest meeting), 12 September ("VHF aerials", by Moxon Slopes, G3FDW), 19 September (Hamfest meeting), 23 September (Hamfest, Lincolnshire Show Ground), 26 September (Activity night/night on the air), 8pm. City Engineers Club, Waterside South, Lincoln. Sec Pam Rose, G4STO, tel Gainsborough 788356.
Market Harborough (Welland Valley ARS)—A newly-formed society meets each Monday, at 7.30pm, in the Welland Park College, Welland Park Road, Market Harborough. Officers include Alan Faint, G4TZY, chairman, Judith Day, G6OFZ, publicity officer, and sec Dave Lunn, G3LSL, tel Market Harborough 880746.
Newark (N&DARS)—16 September (Social evening), 7.30pm. Palace Theatre, Appleton Gate, Newark. Sec Roger Hiscock, G4MDV, tel East Stoke 539.
Nottingham (ARCON)—6 September (Forum), 13 September (Beginners talk), 20 September (Fox hunt), 27 September (Junk sale), 3 October (Forum), 7.30pm. Sherwood Community Centre, Woodthorpe House, Mansfield Road, Nottingham. Sec Jim Towle, G4PJZ, tel Nottingham 624764.
Skegness (S&DARS)—First Tuesday in each month, 7.30pm. The White Swan, Burgh-le Marsh. Sec Clive Ironmonger, G6HYF.
Spalding (S&DARC)—14 September ("Operating on hf bands", by G4OO). The Maple Room, White Hart Hotel, Market Place, Spalding. Sec Betty Whitley, G6YBL, tel Spalding 2781.

REGION 5—RR J. S. Allen, 77 Rosslyn Crescent, Luton LU3 2AT. Tel 0582 508515 or 0582 21151.
Bedford (B&DARC)—Club reopens after the summer break. 26 September, 7.30 for 8pm. Ravensden. Sec G4PBE.
Dunstable Downs (DDRC)—14 September ("RTTY, Amtor and packet radio", by G3NRW), 23 September (National car boot sale at the Shuttleworth Collection, Old Warden, Bedfordshire), 28 September ("An insight to colour offset printing", by G4WYO), 8pm. Chews House, Dunstable Downs. Sec Phil Morris, G6EES.
Leighton Linslade (LLRC)—1, 2 September (144MHz Contest Trophy), 3 September (AGM), 8, 9 September (BATC TV Contest), 17 September (Meeting, speaker to be announced), 30 September (Demonstration station for the County Girl Guides at the Bossard Hall). Vandyke Community College. Sec Peter Brazier, G6JFN.
Luton (Kent Process Controls ARC)—5 September (Planning for October's JOTA). Luton Sports Club, Tenby Drive. Sec G3DOT.
Milton Keynes (MKARS)—10 September (Meeting, speaker to be announced), Lovatt Hall. Sec G3ZPA.
Peterborough (GPARC)—27 September (Lecture, speaker to be announced), 7.30pm. Southfields Junior School, Stanground, Peterborough. Sec Frank, G4NRJ.
Shefford (S&DRS)—6 September ("Fault finding, symptoms and diagnosis", by Hugh, G6TQT, and Alan, G4PSO), 13 September ("Oscar 10", by Graham, G3VZV), 20 September (Junk sale), 27 September ("A bit of a lift on", by Jim Bacon, G3YLA). Church Hall, Amptill Road. Details from sec Alan, G4PSO.
Wellingborough (Nene Valley RC)—5 September (Technical topics and natter night), 12 September ("RSGB topics", or "The HW8 QRP transceiver", by G3DOT), 19 September (Technical topics and natter night), 23, 24 September (Special event station, Hinwick Hall Craft Fair), 26 September (Lecture: County Emergency Planning Officer), 8pm. Dolben Arms PH, Finedon, nr Wellingborough. Sec L. Parker, G4PLJ.

REGION 6—RR F. S. G. Rose, G2DRT, 84 Cock Lane, High Wycombe, Bucks HA3 7EA. Tel Penn (049481) 4240.
Aylesbury (AVARG)—4 September (Details to be confirmed). Details from Cathy Clark, tel 0844 51461.
Bracknell (BARS)—12 September ("Propagation on hf", by G4CGS), 8pm. Coopers Hill Community Centre, Bracknell. Sec Dave Sugden, G4CGS, tel Bracknell 55898.
Banbury (BARS)—The club is holding a series of df hunts during the summer. For details contact sec G8OZH, tel 0280 702900, or the organizer, G4DLB, tel 0295 65492.
Maidenhead (British Telecom Research)—A new club. Meets after work at Plessey Ltd, Taplow Court, Taplow, Maidenhead, most Tuesdays. Not open to the public except by prior arrangement. Details from Alan Barker, G4YKC, tel Maidenhead 23351, during office hours.
Maidenhead (M&DARS)—6 September (To be arranged). Contact John F. Hicks, G8RYW.
Oxford (RAFARS)—19 September (The usual meeting), 7.30pm. Civil Service Social Club, Marston Road, Oxford. Monthly net, last Sunday in the month, 3·710MHz ssb at 1145h. Details from AR Eric Palmer, tel Maidenhead 20107.
Vale of the White Horse (VWHARS)—1/2 September (Proposed expedition to Devon and Cornwall), 4 September (Talk by Peter Chadwick, G3RZP, of Plessey Ltd). For details contact sec Ian White, G3SEK, tel 0235 31559.

REGION 7—RR R. Sykes, G3NFV, 16 The Ridgeway, Fetcham, Leatherhead, Surrey KT22 9AZ. Tel 0372 372587.
Crystal Palace (CP&DRC)—15 September ("Amateur television", by John Stockley, G8MNY). All Saints Parish Rooms, Beulah Hill, Upper Norwood SE19 (opposite IBA transmitting mast). Details from Geoff Stone, G3FZL.
Croydon (Surrey Radio Contact Club)—First and third Monday in each month, 3 September (Surplus equipment sale), 1 October ("Planetarium", by G4WPB, 7.45 for 8pm. TS Terra Nova Mess Deck (1st Floor), 34 The Waldrons, South Croydon, Surrey. Details from sec John Simpkins, G8IYS, tel 01-657 0454.
Sutton & Cheam (S&CRS)—1-2 September (SSB Field Day at Legal & General, Kingswood), 3 September (Natter Night, in Downs Bar), 21 September (TBA), 7.30 for 8pm. Downs Lawn Tennis Club, Holland Avenue, Cheam. Details from Alan Keech, G4BOX.
Wimbledon (W&DRS)—14 September (Surplus equipment sale), 28 September (Talk on kite flying, by G8VCL), 8pm. St John Ambulance HQ, 124 Kingston Road, Wimbledon SW19. Details from sec G. Mellett, G4MVS, tel 01-644 8249.

REGION 8—RR M. Elliott, G4VEC, 20 Haysel, Sittingbourne, Kent ME10 4QE. Tel 0795 70132.
Chichester (CARC)—First Tuesday and third Thursday in each month. 4 September (Visit by the Sussex Repeater Group 'roadshow', slide-show etc, illustrating the history of the group and the repeaters and their sites), 7.30pm. Fernleigh Centre, 40 North Street, Chichester. Details from Chris, G4EHG.
Dartford Heath (DDFC)—11 September (Pre-hunt meet, Horse & Groom PH), 16 September (Club hunt), Pre-hunt Tuesdays, meetings held at the Horse & Groom PH, Leyton Cross, Dartford Heath, Dartford, Kent, after 9pm. For details of starting places of club hunts, and details of night events, tel Pete, G8DYF, Greenhithe 844467.
Eastbourne (EE&ARC)—This club has just received confirmation of affiliation to the RSGB, and RR8 wishes them all success. Club meets every Friday, 7.30pm. Archery Youth Centre, Seaside, Eastbourne. It will be holding RAE and cw classes on Sundays, commencing September. Details from Mart Sullivan, tel Eastbourne 765701.
Eastbourne (Southdown ARS)—3 September (Junk sale), 7.30 for 8pm. The Chaseley Home, Southcliff, Eastbourne. Details from Peter, G8IQO, tel 0323 763123.
Edenbridge (EARS)—Second Tuesday in each month, 8pm. Women's Institute Hall, Station Road, Edenbridge. Details from sec John Grevatt, G8VCH, tel East Grinstead 24748.
Hastings (HERC)—5 September (Committee meetings), 19 September (Talk on repeater and power supplies). 8pm. The club also has various activities on other evenings, eg morse classes, micro evenings, film show, etc. Main meetings are held at the West Hill Community Centre, Croft Road, Hastings. Details from Dave, G4NVQ, tel Hastings 420606.
Horsham (HARC)—6 September (Grand autumn junk sale. Visitors welcome with or without their

Members of RAFARS who had a get-together at Longleat Rally this year. *Photo* G4AJD

junk. Doors open 7pm, sale starts 8pm prompt). Guide HQ, Denne Road, Horsham. Details from Tony Wadsworth, G3NPF, tel Horsham 66290.
Margate (Radio Club of Thanet)—2 September (Fox hunt), 11 September (Talk by KW Electronics). 23 September (Fox Hunt (annual trophy)), 20 October (AGM), 8pm. Grosvenor Club, Grosvenor Place, Margate. Details from Ian Gane, G4NEF, tel Thanet 594154.
Swale (SARC)—17 September (Club AGM (provisional)), 7.30 for 8pm. Ivy Leaf Club, 52 Dover Street, Sittingbourne. Details from Brian Hancock, G4NPM, tel Minster 873147.
Tunbridge Wells (West Kent ARS) 7 September (Formal meeting), 14 September (Informal meeting), 21 September (Formal meeting), 28 September (Informal meeting), 8pm. Adult Centre Annexe, Quarry Road, Tunbridge Wells. Details from sec J. Green, G4UPI, tel Tunbridge Wells 28275.
Worthing (W&DARC)—In order to accommodate their growing membership and provide more comfortable surroundings, the club have moved venue. They now meet every Wednesday evening from 7.30pm at Lancing Parish Hall, South Street, Lancing, West Sussex. There is ample car parking. Further details from Eric Sandaver, G4KIT, tel 0903 766418.

REGION 9—RR R. W. Jones, G3YMK, 10 Oaktree Close, Upottery, nr Honiton, Devon. Tel 040486 468.

Axe Vale (AVARC)—7 September ("Your RSGB", by RSGB RR Roger Jones, G3YMK), 7.30pm. Cavaliers Hotel, Axminster. Sec Bob Newland, G3VW, tel 02974 5282.
Camelford (North Cornwall ARC)—5 September. (Visit to Burlington Radar Station), 7 September (Another talk by Andy, G3TDJ), 7.30pm. RAOB Club, Fore Street, Camelford. Pro Jack Boundy, G8ZOK, tel Tintagel 770542.
Exeter (EARS)—10 September (Visit by Spectrum Communications of Dorchester), 7.30pm. Community Centre, St Davids Hill, Exeter. Other Mondays (Informal), Emmanuel Scout Hut, Okehampton Road, Exeter. Contact pro G4KXR, 11 Chancel Court, Chancel Lane, Pinhoe, Exeter EX4 8QE.
Newquay (N&DARS)—12 September (End of summer season meeting), 24 September ("Test gear", by G3XC). Drill Hall, Crantock Street, Newquay. Details from sec Andy Angrove, G6ZWI, tel Newquay 4285.
St Austell (ECCRC)—10, 24 September. Sec Mike Porter, G4OKS, tel 0726 850818.
Torbay (TARS)—Fridays (Informal), 29 September (Talk on tv by G3OZ). All communications to pro Tony Rider, G6GLP, 7 Kingston Close, Kingskerswell, South Devon TQ12 5EW.

REGION 10—RR E. J. Case, GW4HWR, 2 Abbey Close, Tyrhiw, Taffswell, Mid-Glam CF4 7RS. Tel 0222 810368.

Abergavenny & Nevill Hall (A&NARC)—Thursdays, 7.30pm. Pen-y-fal Hospital, above Male Ward 2, Abergavenny. On 11 September the club is starting RAE courses. It is a registered exam centre, sitting the December, March and May exams. Applications for December 1984 being taken in September and October 1984. Morse classes every club night. Sec D. F. Jones, GW3SSY, tel 0873 78674.
Bridgend (B&DRAC)—Please note change in both day and venue: first and third Fridays in each month, 7.30pm. The YMCA, Angel Street, Bridgend (near the recreation centre). Details from sec Trevor Morgan, GW4SML, or chairman Clive Trotman, GW6LDX, tel 0443 226198.
Cardiff (CRSGBG)—10 September ("The earth beneath", a talk by Ken Sheldon, GW4NIJ), 7.30pm. Pantmawr Hotel, Pantmawr Estate, Whitchurch, Cardiff. Sec Cyril Laws, GW6ZHP, tel Cowbridge 3212.
Pembroke (PARS)—Last Friday in each month, 7.30pm. The Defensible Barracks, Pembroke Dock. Sec Dave, GW6EHC, has moved away, so details from the chairman, Roger Baker, GW4RGI.
On a visit to the Pembroke Club at the end of July I learnt that two of their members were unfortunately involved in the explosion that occurred in the vessel *Pointsman* in Milford Haven recently. Bill Warlow GW6XOA, leading fireman, was badly burnt, and at the time of writing is in the burns unit at St Lawrence Hospital, Chepstow. His colleague and fellow club member, Peter Brennan, GW4XNZ, who helped to pull and put Bill out was also burnt, but was released from hospital the same day. I am sure that all members of the region (10) and of the RSGB would like to join with me in wishing them both a speedy recovery and a quick return to amateur activities. *John, RR10.*

REGION 11—RR B. H. Green, GW2FLZ, 1 Clwyd Court, Tan-y-Bryn Road, Colwyn Bay, Clwyd LL28 4AH. Tel 0492 49288.

Colwyn Bay (Conwy Valley ARC) (GW6TM)—2 September (Mr Louis Varney, G5RV, will lecture on antennas, tickets—non club members, £1.50), 3pm. Leisure Centre, Eirias Park, Colwyn Bay. 6 September (Visit to the new pump storage CEB station at Dinorwig, 6pm at the station), 9 September (Coach trip to Telford Rally, contact sec for seat reservation), 13 September (Talk by Mr Norman Kendrick), 8pm. Green Lawns Hotel, Bay View Road. Sec Mr J. N. Wright, GW4KGI, tel 0745 823674.
Porthmadog (P&DARS)—20 September (RSGB video), 7.30pm. Queen's Hotel, Porthmadog. Sec Mrs L. A. Jones, GW4WKQ, Henllys Bach, Llanbedrog, Pwllheli, Gwynedd LL53 7PG, tel 0758 740445.
Rhyl (R&DARC) (GW4ARC)—3 September (AGM), 17 September (Activity night), 7.30pm. 1st Rhyl Scout HQ, Tynewydd Road, Rhyl. Sec Mr J. McCann, GW4PFC, tel 0745 583467.

REGION 12—RR M. R. Hobson, GM8KPH, 17 Well Brae, Pitlochry, Perthshire PH16 5HH. Tel 0796 2140.

Aberdeen (AARS)—Fridays, 7.30pm. Club Rooms, 35 Thistle Lane, Aberdeen. Details from club sec Don Travis, GM3CXF, tel 04676 251.
Caithness (CARS)—12 September ("RTTY", by

SEEN AT THE MID-LANARK ARS OPEN DAY ON 10 JUNE 1984

LEFT. L to r: (back row) Basil, G2AMV; Jim, GM4LQR; Tom, GM4PRO; Norrie, GM4BVU; (front row) Ilene, G3WIO; Tom, GM4NDO; and Cllr V. Mathieson of Motherwell District Council

BELOW LEFT. At the morse test stand: l to r, Issy, GM6ZCP; Robert, GM3ZDH; Graham, GM6JEQ; and Richard, GM1EQW

BELOW RIGHT. Taking the money: l to r, Anne, GM4UXX; Robbie, GM4UQG; and Norrie, GM4BVU

***Photos*: GM4SRL**

GM4RZJ), 7.30pm. Loch Watten Hotel, Watten (midway between Wick and Thurso). Details from sec Iain Morrison, GM4MIM, tel 0995 3960.
Elgin (Moray Firth ARS)—Resume meetings at 7.30pm. in the Spey Bay Hotel, Fochabers, 3 September. Details from new sec Dennis Scott, GM4IZN, tel 05427 384.
Dundee (Kingsway Tech ARC)—New sec, John Hughes, GM3LCP, from whom details of the club programme may be obtained.
Inverness (IARC)—Thursdays, 8pm. Cameron Youth Club, Planefied Road, Inverness. Details from David Jones, tel 08083 240.

Club secretaries please send details of winter programmes as soon as possible for inclusion in "Club News". *RR12.*

REGION 13—RR Andrew Givens, GM3YOR, 41 Veronica Crescent, Kirkcaldy, Fife KY1 2LH. Tel Kirkcaldy (0592) 200335.
Galashiels (G&DARS)—Wednesdays, 23 September (Open day), 7.30pm. Focus Youth Centre, Livingstone Place, Galashiels. Details from Tony, GM3DAR, tel 56027.
Glenrothes (G&DARC) (GM3ULG/GM4GRC)—Wednesdays and third Sunday each month. 16 September (AGM), 7.30pm. Provosts Land Centre, Leslie, Fife. Details from Bob, GM4LYQ, tel 745047.

REGION 16—RR Alan Owen, G4HMF, 102 Constable Road, Ipswich, Suffolk.
Braintree (B&DARS)—3 September (Test gear), 17 September (Guns (Essex Clay Pigeon Ladies Champion)), 1 October (TVI), 15 October (Constructors' contest), 7.45pm. Braintree Community Centre, Victoria Street. Details from Jeff Roberts, G6OIX, tel Braintree 44857.
Chelmsford (CARS)—4 September (Junk sale), 2 October (AGM), 7.30pm. Marconi College, Arbour Lane. Details from Andrew Mead, G4KQE, tel Witham 512316 or Silver End 83094.
Colchester (CRA)—20 September (Worked All Britain Award), 4 October (AGM), 7.30pm. Colchester Institute, Sheepen Road. Details from Frank Howe, G3FIJ, tel Colchester 851189.
Ipswich (IRC)—12 September (John Nelson, RSGB), 26 September (Video of members' activities), 10 October (A night on the air), 17 October (Planning for JOTA), 31 October (Bring & buy (at Barrack Corner Church), 8pm. Club Room, Rose & Crown, Norwich Road. Details from Jack Tootill, G4IFF, tel Ipswich 44047.
Leiston (LARS)—4 September (Construction techniques), 3 October ("Satellite communication", by Dr Gee, G2UK), 7.30 for 8pm. Sizewell Power Station Sports & Social Club, St George's Avenue, Leiston. Sec Mrs I. Westcott-Freeman, G6ORK, tel Leiston 831597. Chairman, G3MYA, tel Leiston 830777.
Loughton (L&DRAS)—7/8/9 September (Rainbow and Dove field weekend), 14 September (Informal meeting), 7.30pm. Loughton Hall, Rectory Lane. Details from C. Knowles, G6FWT, tel 01-508 7190.
Stowmarket (S&DARS)—3 September (Visit to Suffolk Police Headquarters), 1 October (RNLI (Mike Smith)), 7.30pm. Red Cross Hut, Station Yard. Details from Jim Lowe, G8SCB, tel Needham Market 721296.
Vange (VARS)—6 September (Junk sale), 13 September (Sound and vision (Shell Photo Club)), 16 September (Vange Rally), 20 September (Photo night), 27 September (Computer night), 4 October (Open evening), 11 October (Junk sale), 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 T. Emery, Wilverley, Old Lyndhurst Road, Cadnam, Southampton SO4 2NL.
Basingstoke (BARC)—11 September ("AMTOR and packet radio", talk by G3NRW), 7.30pm. The Swan, Sherborne St John, Basingstoke. Chairman G4WIZ, tel 07356 5185.
Basingstoke (Repeater Holding Group)—No regular meetings held. Chairman G4PSX.
Eastleigh (Itchen Valley ARC)—14 September ("Hospital radio", by G6SNS), 28 September ("A lotta bottle", by G2HNI), 7.30pm. The Scout Hut, Brickfield Lane, Chandlers Ford. Sec G6DIA, tel 0703 863039.
Fareham (F&DRS)—5 September ("Satellite communications"), 19 September ("All-band hf antennas"), 12, 26 September (Natter nights), 7.30pm. Portchester Community Centre, Westlands Grove, Portchester. Sec G4ITG, tel Fareham 234904.
Farnborough (F&DRS)—12 September (Pre-AGM discussion), 26 September (Annual construction contest), 7.30pm. Railway Enthusiasts Club, Access Road, Farnborough. Pro G4MBZ, tel Farnborough 837581.
Guernsey (GARS)—Tuesdays and Fridays, 8pm. The Lodge, La Corbinerie, Oberlands, St Martins. Congratulations to Andy Hamon, GU4WTN, who worked his 100th DXCC country on his 16th birthday. Sec Steve Gibbs, GU3MBS, PO box 100, Guernsey, tel 0481 57605.
Liphook (Three Counties ARC)—Please listen to GB2RS News broadcasts for programme. Alternate Wednesdays, 8pm. The Railway Hotel, Liphook. Sec G6MVA, tel Headley Down 713012.
Southampton (SARS)—Wednesdays, 7.30pm. 12 September (AGM). Please call G6CPE for venue, tel Romsey 514811.
Southampton (Waterside SWC)—Second and fourth Tuesday in each month, 7.30pm. Community Centre, Blackfield. Chairman G6DLJ, tel 0703 891975.
Wimborne (FRARS)—2 September (Natter night), 9 September (DF hunt), 16 September ("The uses and abuses of the 4CX250"), 23 September ("Who's ramble"), 30 September (tba), 7.30pm. Flight Refuelling Social Club, Merley, Wimborne. Sec Mike Owen, tel 0202 882271.
Winchester (WARC)—15 September (Talk on Raynet by G8HHQ), 7.30pm. The Log Cabin, Stockbridge Road, Winchester. Sec G3SHQ, tel Twyford 713003.

May I take this opportunity of saying a heartfelt thank-you to Howard Cunningham, G8FG, for his work as regional representative over the recent years. *G3KWU*

REGION 19—RR to be announced
Chiswick (ABCARC)—18 September ("Members' problems"—discussion), 7.30pm. Committee Room, Chiswick Town Hall, Chiswick, London W4. Sec W. G. Dyer, G3GEH, tel 01-992 3778.

Two of Guernsey ARS's younger members operating from the Channel Island Herm, during a club dxpedition. 15 year-old Andrew Hamon (ex-GU6TDE) operates GU4WTN/A on 7MHz, while Geoffrey Petit (13) does some last-minute RAE revision. *Photo* GU4WTN

The Mayor and Mayoress of Enfield for 1984-5, John, G3TZZ, and Sylvia, G8SZZ, Jackson who took office on 15 May. The Southgate ARC is supporting G3TZZ at some functions, and early next year will be running sponsored special event station GB4EMC to raise funds for his charity

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REGION 20—RR N. F. O'Brien, G3LP, 26 Southfield Road, Gloucester, GL4 9UD.
Bristol (BARC)—Tuesdays, 7.30pm. YMCA, Park Road, Kingswood, Bristol. RAE course for May 1985 exam commences 18 September at 7.30pm. Video taped lectures will be included. Details from Trevor Cockram, G8GFZ, or Alan Williams, G3ZKI, tel 0272 553020.
Bristol (BRSGBG)—24 September, (Mr H. Mooney of British Aerospace will be giving a talk entitled "Bristol's contribution to the exploration of scientific space"), 7.30pm. Queens Building, Bristol University. Further information from Brian Goddard, G4FRG, tel 0272 848140.
Bristol (South Bristol ARC)—Wednesdays. 5 September (AGM), 12 September (VHF/UHF activity night, Len, G4RZY), 19 September (ATV activity night, Peter, G8WAX), 26 September (SWL activity night, Ron Gardner), 3 October (Lecture, to be advised), 7.30pm. Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol BS14 0LN. Details from Len Baker, G4RZY, tel 0272 834282.
Cheltenham (CARA)—7 September (Vertical antennas (Alan Dick & Co Ltd)), 14 September (Natter night), 5 October (Combined meeting, details to be announced), 7.30pm. Stanton Room, Charlton Kings Library, Cheltenham. Details from Gill Harmsworth, G6COH, tel Cheltenham 525162.
Cheltenham (Smiths Industries RS)—6 September, (AGM, then meetings every 2 weeks). Club House, Newlands, Bishops Cleeve, but this may change. Please check with Roger Hawkins, G8UJG, c/o Sports & Social Club Office, Smiths Industries ADS Co, Evesham Road, Bishops Cleeve, Cheltenham GL52 4SP.
Gloucester (GARS)—Wednesdays, 5 September (AGM), 12, 19, 26 September (Natter nights), 3 October ("Amateur radio in the USA", by G5AER), 7.30pm. St John Ambulance Headquarters, Heathville Road, Gloucester. 22 September (Jumble sale at St Barnabas Hall). Information from Tony Martin, G4HBV.
Weston-super-Mare (WsMARS)—10 September (Talk, "Radio and radar in the air", by George Ring, G6TAI), 8 October (ARRL video of W5LFL on the recent space shuttle mission), 7.30pm. Rugby Club (off Drove Road), Weston-super-Mare. Details from Dave Restrick, G4/KA0NGP, tel W-s-M 28482.
Yeovil (Y&DARC)—6 September (Talk by G3GC, "Are RST reports meaningful?"), 13 September (Talk by G3MYM, "How to wind your own coils"), 27 September (Natter night), Thursdays, 7.30pm. Recreation Centre, Chilton Grove, Yeovil. 14 October (QRP Convention at Preston School (Preston Centre), Monks Dale, Yeovil). Details from sec Eric H. Godfrey, G3GC, 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.

The advertisements must be limited to items of amateur radio equipment or interest, but houses, vehicles etc of which they form part may be included. Items unrelated to amateur radio, including items of citizens band equipment, will not be accepted.

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.

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: **20 September** (November); **25 October** (December); **22 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

HF station, Collins KWM2, KW600 linear, £575. Swop FT225RD, cash adj. Hammarland SP600 rx, 0·54-54MHz, £85. Set new valves SP600, £28. Liner 2, £50. ETM3 keyer, £10. Shure 202 ceramic mic, new, £10. All carriage extra. G3MOU, QTHR. Tel 0233 75316.

Sharp MZ80K, 48K of memory, comp with PNP Communications PL1, FP1, mains transformer, rtty interface, made-up but unfitted, full supporting documentation, software, manuals, etc, £260. G6IVU, QTHR. Tel Tiverton 259024.

Send sae for list 80 items, incl Swan 100MX hf/ssb tx/rx, hf, vhf antennas, computer, rtty, fax, items, aeronautical radio facilities maps, cctv camera and monitor, keyboard, printers, ASR33 terminal, meters, instrument cabinets, ics, modules, psus, telephones, Pioneer rx, all must be sold! *Wanted:* modern hf ssb, manpack tx/rx and/or accessories, as manufactured Racal, Harris, Thompson-CSF, Pye, etc. Non-working or incomplete units considered. W.H.Y? Bob Sayers, G8IYK, 40 Royal Oak Drive, Leegomery, Telford, Shropshire TF1 4SS.

Yaesu FT77, cw filter, keyer, paddle, T-match tuner, £400. Creed 7, Creed 5Y auto, ST5, offers. Heath RA1 rx, £20. Tiger tx, £20. Emigrating to VE. G4PZP, QTHR.

Yaesu FT480R, used little, comp with MM linear, 144/40, boxed, £310. GW4KDD, QTHR. Tel 0495 224782.

FT480R 2m multimode, 6A psu, mobile mount mic, base station stand, £275. G6WPJ, QTHR. Tel 0787 473812.

VHF power amp, 6in cube! Comprises grid tuned circuit, 6J4WA, 6442 valves, plate circuit, 4X150D valve, mounted in AEI ptfe force-cooled base, single knob control, can be modified for 2m, 240V ac quiet blower, £15. FB Plessey facsimile tx/rx, vgc, audio, mic interface unit, buyer collects, £50. *Wanted:* Dynamotor type DM28 with base for BC348 rx. Have a good look in your garden shed! G3JDK, QTHR. Tel Wickersley 541606.

Yaesu FT7B hf tx/rx, Yaesu YC7B frequency counter, 12A power supply unit, Welz swr power meter, Jaybeam triband vertical antenna, all boxed, vgc, no offer, £280. Tel Kidderminster 515305.

Scopex 4S6 oscilloscope, full 6MHz bandwidth, 10mV sensitivity, solidstate, perfect, manual, £90. Teleradio 146 audio generator, 10Hz-100kHz, battery powered, £25. Hodec 13·8V regulated power supply, 3A continuous, £10. All items plus postage. G3RDG, QTHR. Tel 01-455 8831.

DXers QTH, up 700ft asl in Holywood Hills near Belfast, lovely greenbelt area with panoramic views to GM, GD and EI. Modern bungalow, 1,650 sq ft approached by private laneway plus older cottage, farm buildings, 13 acres of pasture. Truly rural location, yet convenient to shops, schools and beaches, all DXCC countries confirmed from here, offers over £60,000. GI3IVJ, QTHR. Tel 0247 814132.

30in professional microwave dish, £25. VDU keyboard, £7. G3ZVC 9MHz (YF90F) transceive i.f. board, finished, wkg, but never used, £45. G8KHW. Tel 03942 70649.

Linear amplifier, 2m lunar, 2M-160P, up to 25W in, 160W out, preamp unused, £135. Preamp, ditto, £18. Tel 0624 22342, evenings.

***QST* magazines:** 49 issues from 1946 to 1959 inclusive, comp volumes 1960 to 1980 inclusive, plus January to July 1981, offers. Buyer collects. G5KM, Robin Hill, Lane Head Road, Cawthorne, Barnsley, South Yorks S75 4AA. Tel 790986.

Video equipment, Sony DXC1640P camera, Hitachi SV40ER portable umatic vcr, JVC TM41EK colour monitor, Rank Redhead lighting kit, tripod, £2,700 ono. G8NNX, QTHR. Tel 051-487 0481, weekends.

Yaesu FT208R 2m handheld, nicads, charger, soft case, mint cond, £140. Daiwa SR9 2m xtal and vfo rx, mint cond, £30. Reason for sale, university grant running low. G6GEV, QTHR. Tel Dave, Dursley (0453) 860426, evenings.

Grundig 30ch colour tv, 22in, l.e.d. readout, vcr channel, full infra red remote, stand, in perfect order, high tvi resistance, £170. Cash only, no offers. Buyer collects. Genuine reason for sale. G4JXI, QTHR. Tel Leigh (0942) 605839, after 6pm.

Yaesu FT225RD, perfect cond, £450. Brand new Tonna 23cm Yagi, £23. Four-way power splitter, £25. Stacking frame, £17. Cushcraft Ringo 2 antenna, £35. ICS Amtor program (BBC), £40. Altron SM32/RH2 rotator head, perfect, £20. G4XHF. Tel Crawley (Sussex) (0293) 515201.

HW101, professionally built, mic, as new, £175 ono. Racal RA117E, superb cond, £275 ono. Heathkit HW8, professionally built, as new, £95. Brass morse key, handmade on slate base, £20. All above with workshop manuals. G4PPG. Tel 0257 421442 (Wigan area).

Icom ICR70 rx, fm unit, £400. Yaesu FT480R 2m multimode, £275. Telereader Codemaster CWR610E, cw/rtty, £145. Tel John, Ingrebourne 43465, after 6pm.

Bargain sale: Sharp portable computer PC1500, printer CE150, CE155 8K ram pack, mains adapter, cost £400 new, hardly used, will accept £300, no offers. G6DAU. Tel Phil, 01-953 4894.

Transformer, 500VA, 200/240V input, 120V output, £4. Transformer, 200/240V input, 300-0-300V output, 120mA, 4V heater windings, 4V rectifier valves, many glass based valves, prefer buyer collects. Details of all. *Wanted:* EF50 rx c. 1946. G3SSJ, QTHR. Tel 096273 3816.

FT101E, vgc, mic, leads, £350 ono. Airmec/Racal fm/a.m. modulation meter type 409, carrier freq range 3-1500MHz, £35 ono. G5WG, QTHR. Tel 01-504 5499.

Radio Communication magazines, January to September 1974 inclusive. Complete years for 1975 to 1982 inclusive, offers. Buyer collects. G5KM, Robin Hill, Lane Head Road, Cawthorne, Barnsley, South Yorks S75 4AA. Tel 790986.

Trio TS780 vhf/uhf multimode base station, £625. 13V 15A power supply, £60. BBC/Electron morse tutor program, £6. Sharp rx short/med/long/vhf, £20. T. Tugwell, 11 The Dell, Stevenage, Herts. Tel 0438 354698, evenings.

Hallicrafter SX28 rx. Super performance, one owner, 600kHz-500MHz, seen wkg, £50. Avo automatic coil winder, motorised, vgc, £50. Tel Godwin, 01-432 9436, evenings.

Creed 7B 250V dc, no cover, wkg order, SRX30 hf rx, offers. GW4RGA, QTHR. Tel 07456 88480.

Ham International HFC/01 0-30MHz built-in psu, £23. GW4WJO, QTHR. Tel Holyhead (0407) 2330.

BXI tower, change of QTH forces sale, heavily galvanised two-section, post-mounted, tilt-over tower, £195. G3UFZ, QTHR S Devon. Tel Churston (0803) 845304.

Gentlemen—this beautiful piece of Icom equipment (IC02E) is surplus to my requirements, incl nicad-charger, used little (less than 6h), purchased new 30-1-84, Thanet, cheque for £198 secures, £229 new, save £31, lovely audio. G4WXI, QTHR. Tel 0772 792935.

FR708 70cm handheld, NC8 charger, base unit, spkr, mic etc, used mainly as base station, £200. G4NFL, QTHR. Tel Stoke-on-Trent (0782) 680763, after 6pm.

Gould MG12-10B switching psu, 12·5V at 10A, as new, £35. Old brass morse key, wooden base, restored, £10. Interesting 11ch 2m tx/rx, portable, 1W, nicads, converts to mobile 10W, £89, or exchange ICF2001 or similar. W.H.Y? Datong FL2 variable af filter, perfect, £60. Linear psu, 13·8V at 24A, protected, £35. Three switching psus, Farnell F2572. 4·5-5·5V at 60A, as new, circuits, together make ultimate 13·8V supply, £20 each. G4GXE, QTHR. Tel 0298 71410.

Yaesu FT480R multimode tx/rx, usb, lsb, fm, cw, perfect cond, orig packing, manual, £280. Hodec solidstate 3A psu, £10. Magnetic mount, £5. Sun 5λ8 2m whip, £5. All items plus postage. G3RDG, QTHR. Tel 01-455 8831.

Yaesu FRDX400 amateur band rx, hf, 2, 6m, exc cond. £150 or offers. Tel 01-391 0514, evenings.

FT301, 100W, incl 160m, exc rig, psu, spkr, used little, £300. Trio 3200, 70cm, fully xtalled, £85. 14-el 2m Parabeam, £10. Tandon 40TK s/sided disc drive, suitable BBC etc, recon, £95. Phil Green, G4PHL (G8UEB) QTHR. Tel 0742 882913.

BBC 32K/1·20 morse programs, incl random allsorts, 100 plain language 3min tests, 70 cw abbreviations/punctuation, save/playback of text typed in, morse keyboard, choice of output, variable speed etc. Learn fast! £4.75. D. Brandon, G4UXD, 1 Woodlands Road, Chester, CH4 8LB.

Yaesu FTV901R three-band transverter, 2, 70, and 4, goes with any hf rig, FL2100Z linear, FC902 atu, SP901P patch spkr, FT290R, all accessories, Trio 3500 70cm handheld, spkr/mic, mobile mount, etc,

Azden 2m handheld, spare nicads, spkr/mic etc, MM432, 30LS, Daiwa 30W 2m linear, rtty, cw tx/rx, Dragon + pnp interface, all mint. G4TKP, QTHR. Tel Derby 383442.

FT107M solidstate tx/rx, all filters, internal psu, memory, FC107 atu, FTV107R 144MHz transverter, SP107 spkr, service manual, £700. Consider split. Two 9-el Tonnas, £10 each. Two 21-el Tonnas, £18 each. G4FBK, QTHR. Tel 01-864 1412.

Yaesu FRG7 communications rx, 500kHz-29·9MHz, fine tune, mint cond, barely used, £115 ono, or exchange w.h.y? G4ECY. Tel Nottingham (0602) 313498.

Yaesu FRSDX400 rx, 2-4-10m to 160m all modes, incl fm, as new, £100. 160m homebrew tx, £5. Tel 01-788 1979.

Pye Westminster bootmount control box, cable, £5. W15AM body mount, not wkg, £10. M201, not wkg, £15. *Wanted:* VHF solidstate sig gen, faulty considered. Postage extra on above. SAE enquiries. G3XDA, QTHR. Tel 0775 66533.

Pet 3032, cassette unit, toolkit, superchip, arrow, extramon in rom, loads of software and books, £300. Swan 100MX hf rig, 80-10m, Shure mic, £250. Trio TS700, preamp, £200. MMT70/144, 4m transverter, £85. Cushcraft AV5 trap vertical, never used, £45. All items one owner/orig boxes/carriage paid. Open to offers, part exchange etc. *Wanted:* Handbook for Marconi TF995A/2. Buy or borrow. G4IAT, QTHR. Tel Preston 21603, daytime, Blackburn 57849, evenings.

Westminster W15U, 10 channels, Wood & Douglas pa, 13W output, toneburst, preamp, RB2, RB4, RB6, SU8, SU20 fitted, comp with control unit, £100, carriage extra. GW4HAT, QTHR. Tel Swansea (0792) 290770, evenings.

Mast and rotator system, comp 45ft Hilomast, pneumatic telescopic mast, KR400RC rotator, guys, tensioners, stakes, LDF450 feeder, 70ft, UR67 feeder, 80ft, two Tiger 10-el long Yagis, 144MHz power divider, £425, may split. G4FBK, QTHR. Tel 01-864 1412.

TenTec Corsair and external vfo, £600 ono. Both about one year old. C. H. Brain, G4GUO, QTHR. Tel Worthing (0903) 45400, anytime.

Cushcraft A3 Yagi, unused, still in maker's packing, too big for local planners, £150 ono. G4NJO, QTHR. Tel Mobberley (Cheshire) 2492.

IC701, IC701PS spkr, matching desk mic, perfect, not used mobile, £450. RM3 available, £50. Trio remote VFO240, suit 830, 530, etc, as new, £50. "Angus" type 464 three-section alloy fire ladder, ideal telescopic mast, comp cables, guys, etc, 47ft max, 19ft closed, put your beam at 55ft, superior product, £195. TET HB35T, brand new, unopened, £215. Marconi Globespan hp tx, comp, £60. Delivery arranged, bargains. *Wanted:* good radio gear in exchange for Microlight aircraft Hiway Skytrike CAA reg, 250cc Fuji-Robin engine, 1gph, low hours, vgc, easy to fly, value £1,050. GM3BQA, QTHR.

400W 144MHz linear amp, 4CX250R, professionally built, full switching and metering, contest proven, rugged, £350. 432MHz power divider, £20. Mutek 144MHz preamp, SLNA144S, £20. Heath HM2102 vhf power meter, £15. 12V 10A psu, £20. G4FBK, QTHR. Tel 01-864 1412.

Daiwa CNA1001 automatic atu, all bands, 3·5-30MHz, £100. Kenwood DM81, multi-purpose dip resonance meter, £45. Kenwood LF30A, hf lowpass filter, 1kW, £14. All unused, as new cond. *Rad Com,* Sept 1977 to date, offers. G4HLV, QTHR. Tel Bath (0225) 26718.

Eddystone EC10 Mk2, £63. Spacemark rtty terminal unit, type SRD7, £37. G3NCA, QTHR.

Minitenna 15m beam, £25. 2m colinear, £15. 2m magmount, £7. Texas TI99/4A computer, cassette lead, three months old, £55. BC221 frequency meter, stab psu, £15. Prefer buyer collect or plus carriage. G3VSD, QTHR. Tel Rossendale (0706) 225007.

Must have space! Selling pair ex-service ringing telephone sets type F Mk2, £15. FRG7700 rx (1984), mint, FRT7700 atu, £245. Joystick car-top harness, £4. Minimitter mobile a.m./cw tx, 160/80/40, control box, £25. Codar T28 160/80 superhet rx, £20. Codar CR45 ac straight rx, £15. Ex-Army type 38 set walkie-talkie, 7MHz (tuned to amateur band), £20. Hand generator, a.m. type 1, ht/lt, dc outputs, £15. Recent professional 10/15/20 trap dipole, four quality traps, £40. Air Ministry 600V 200mA power pack, £20. Buyer collects or agreed carriage extra. G2FKS. Tel 0954 50597.

FT101ZDFM Mk3, narrow cw filter, fan, £450. FT290R, Mutek board, carrying case, NC11C charger, £220. MM30LS 2m linear, nearly new, £50. Jaybeam, 10-el crossed 2m Yagi, £28. FT730R, uhf mobile, four months old, £185. G4OBS, QTHR. Tel 0980 862922 (Wilts).

Avo valve characteristic meter type VCM163, comp with orig manuals, swap for 290R or Datong FL3 filter. G4UNM, QTHR. Tel 0983 402273.

Heathkit solidstate SB303 rx, 80-10m, matching SB401 tx, transceive capability, SB610 spkr, HDP21 desk mic, manuals, professionally built, vgc, tx never used on the air, £275 ono. Buyer inspects and collects. G6XHR, QTHR. Tel 070-14 55459.

FT207R, cw spkr mic, mobile charger etc, £120. Heath IO4540 scope, mint, hardly used, £65. Rechargeable 4ch 2m scan rx, fitted R0, S18, S22, £20. Practica 1VF slr, 135mm telephoto etc, £45. G4PFO, QTHR. Tel Cheslyn Hay 416419.

Heathkit SB300 rx, SB401 tx, fair cond, manuals, £180 ono. Telequipment D54 'scope, probes, manual, £120 ono. G3JCB, QTHR. Tel Northampton 890965.

Andrews spun aluminium dish, 1·8m, 0·25f/D, support spider, el-az mount, horn support tripod, £325. Hugh Cocks KB1 satellite tv downconverter, 3·65-4·2GHz, i.f. 750MHz, perfect working order, cost £235, will sell £155. BW video monitor, 18in, separate sync inputs, suitable satellite tv, £16. Digital multimeter, mint cond, £19. Mutek broadband amplifier, 470-860MHz, £9. Mutek high dynamic range broadband amplifier, 20-500MHz, £13. Labgear CM7066 low noise amplifier, 26dB gain, 470-860MHz together with CM7061 power supply, £12 for both. Various WG16 waveguide bits incl cross-coupler, flexiwaveguide, vane attenuator, gunn osc, mixer cavities, £12 the lot. Two NEC 72089 GaAs fets, unused, untouched, in orig packing, £5 each. 4GHz copper tube type feed horn, SMA connector, ptfe polarizer, £7. Large amount assorted components, cables, satellite tv, microwave bits, many unused quality items, everything must go, offers? *Rad Com* magazine, Aug '77-Dec '83, £3 the lot. UR67 coaxial, 20m, £6. Satellite tv news magazine, all issues from No1, £10. Regulated, transient protected power supply, suitable satellite tv equipment, offers. Large quantity electronic tools, soldering irons, precision tools, etc, offers. Aluminium rack cabinet, suitable linear, £4. G3CQU, QTHR. Tel 01-660 5474 (Surrey).

Creed 444 teleprinter, vgc, 45 and 50 gears, comp with tape punch, tape reader, (some paper supplies), Radprint terminal unit, cabled to suit, mains operated, comp, £85. G4TZY, QTHR. Tel 0858 62827.

Aerosol Compuclean dust remover cans, ideal for fine cleaning of electronic radio and displays/front panels etc, £5 each. Buyer collects. £5.75, incl post and packing. G3ZQF, QTHR. Tel Medway 723694, evenings or weekends.

Creed 444, vgc, tape reader, perforator, the pick of the bunch, ST5 tu, local copy, tx, rx, tx without print switch, £60 ono. GM4MOA, QTHR. Buyer collects. Tel 0542 32093.

Contest operating trailer, privately built in 1976 for use by Wulfrun Contest Group (GW8BHH/P and others) on exposed locations. The all double-skinned wooden body has side window, roof skylighting and large rear door. It contains two car seats, folding table, interior lights, ventilation fans, cable entry panel, now surplus, offers invited around £150. Enquiries please, to Doug Lovesey, G3ONP, QTHR. Tel 0902 788459, or works, 0384 293948.

MM4001, rtty, ASCII, kb, tx/rx unit, used little, all plugs and leads, keyboard, booklet, up to 1200 baud ASCII, or 100 rtty, auto cq, ry, four stores etc, perfect, £200. G3UKV, QTHR. Tel 0952 55416.

Tono 7000E, send, receive, rtty, morse, seven memories, split screen, great for morse practice, many features, £385. FRG7700, pristine cond, £230. A. Thawes, G4RUZ, Porch House, Coniston Cold, Skipton BD23 4EA. Tel Gargrave 685, home, 561, business.

Computer printer, Seikosha GP100A Mk2, Centronics interface, 10 months old, vgc, £160 ono, or w.h.y? G4WTW, QTHR. Tel Market Harborough (0858) 64047.

Yaesu YO901P, provides bandscope, monitor for FT901/2, FT101ZD, Yaesu FT7B, both with manuals and all cables. Tel 07372 46518.

Radio Communication, unbound, 1974-83, *Practical Wireless, Practical Television* 1948-66, buyer collects, offers. Hills, 66 Richmond Road, London SW20 0PQ. Tel 01-946 4573.

QTH: E Kent, tower and beams, four-bed, three-rec, sep bungalow, purpose-built dental surgery, 2/3 acre rural, quick sale needed, offers near £115,000. G4AXS, QTHR. Tel 0227 831709.

2m eight-el Yagi, 2m Slim Jim, FT290R, no mods, Akdwai absorption wavemeter, flexible Slim Jim, all mint cond, £210. G1BSZ. Tel Kings Langley (09277) 65572.

Tonna four-stack 23-el 23cm ant, frame, harness, power splitter, £85. Tonna 9-el 2m, £10. Jaybeam 48-el 70cm, £20. Bird wattmeter, Thruline, choice of two, £60 each. 14 Bird elements covering 250-5W, 2m, 70cm, £20 each. 2m cavity bandpass filter, two-section, by DB Products, USA type 4001, 400W variable input, calibrated coupling loops, £80. 2m handy talkie VF2031, fitted R0, R3-7, S20-21, charger, hand mic, leather case, £75. Four-stage interdigital filter, 1,296, from Germany, £20. G8AVA, QTHR. Tel 03745 52434.

FT101ZD, FC902, SP901, all exc cond, orig packing, £450. G3PAX, QTHR. Tel 0903 40513.

Yaesu FT101 six-band tx/rx, £220. HW7 QRP three-band tx/rx, £70. Yaesu FT290R rig, vgc, £180. GM4OSS, QTHR. Tel Stewarton (0560) 83800.

Yaesu FT107M, int psu, cw and a.m. filter options fitted, £550. FTV107R transverter, 4m, 70cm modules fitted, £200. FC107 atu, £50. Icom IC251, £350. MM 100W 4m linear, £50. *Wanted:* mains trany for Advance OS1000 scope. G4BPY, QTHR.

FDK Multi 700EX 2m fm tx/rx, 25W tx, fitted rx preamp, £119. Tel Sheffield (0742) 669450, after 7pm.

Wood & Douglas ATV1 tx, £59. 48-el Jaybeam, 70cm, £23. Akai VC40E colour video camera, one year old, £215. Power pack, leads, £22. Vic 20 morse, log, QRA, etc, tapes, Microwave Modules 70cm atv converter, £20. G8KOM, QTHR. Tel Littlewick Green 2453.

Antennas galore! 14-el 2m Parabeam, £35. Four-el 2m Cushcraft beam, £9. 48-el Jaybeam multibeam for 70cm, £20. Two 7λ/8 mobile whips, £9 each. Buyer collects in all cases. Peter Crosland. Tel 0905 620041, evenings only.

101ZD Mk3, fan, a.m./fm boards, cw narrow, spare valves, w/manual, dc converter, £500. IC25E, hardly used, £250. Datong D70, vgc, £35. Kenpro KP100, as new, £55. Hansen FS710H, as new, auto swr, £65. G4TSR, QTHR. Tel Hastings 812303.

Hygain 203BA 3-el mono-bander, £60. DB 10/15 3-el duo-bander, £40. Buyer must collect. G4CPJ, QTHR. Tel 0636 892301 (Notts).

Kenwood TS520SE ssb tx/rx, DG5 digital display, exc cond, PKW inverted-V multi-band dipole, model 171 swr/power/fs meter, £350. Tel Trowbridge 64281 (Wilts).

Hammarlund SP600 Super Pro, 560kHz, 56MHz, manual, perfect, £225. HRO, manual, coils etc, perfect, £65 or exchange BRT400. G6XNC, QTHR. Tel 01-462 4461.

FT726R, 2m, mint cond, as new, unmarked, eight months old, £600, no offers. G4WHQ. Tel Roy, Grimsby (0472) 824124, evenings.

SSB Electronics 144/432 transverter module, matching 10W pa module, £80. G6YNL NOT QTHR. Tel 0235 816401.

TS130V, WARC, new, still guaranteed, £300. 10m fm mobile, £20. Multi U11, £70. Avo 8, £40. Seven-section Hallicrafters 35ft mast, £20. BC221, £10. Heathkit gdo, £20. G4FQS, QTHR. Tel John, 01-253 0661, extension 129, daytime, 01-459 2543, evenings.

HQ1, good dx antenna for limited spaces, five broken spokes, will swop for hf mobile antennas or w.h.y? Lost planning permission. G4RXU, QTHR. Tel 0438 725282.

Swap: FRDX500, FLDX500, hf equipment, in exc cond, full output, for ssb QRP rig. Cash adjustment if required. HB digital readout available if required. Cash sell of equipment if unable to swap, £250 ono. G4XBD. Tel Stevenage 62554.

Creed 75, £50. Ditto spares, £15. 24 dc/240 ac motor generator, £50. 24V/dc 3hp motor, £25. 3ph/1hp motor, £15. Heavy duty mast wall brackets, £7. 13m RG8U, £6. Various junk shack clearance, offers? Tel Chris, 0734 734289, evenings and weekends.

Tx/rx station, Cambridge, 144-146MHz, fixed or mobile, a.m./fm, £60. Heathkit Mohican, £60. Heathkit valve voltmeter, £25. Speaker in box, 70W, £80. Avo meter Mk2, £45. Minor, £25. Racal SA520 freq meter, £25. Box of valves, transformers, transistors, small spkrs, Elf 2, £200. Computer junior, £200. G6CPD, QTHR.

Heavy brass morse key, engraved date 1916 on polished wood base, heavy brass morse sounder, sell or exchange, B2, type A Mk3, 10m fm rig with repeater shift, HW7. All offers considered. W.H.Y? G3JFC NOT QTHR. Tel 0474 87243.

Over 350 used valves from advertised lists, when new, 227 would cost £450, some rare. Of course I do not expect this price. Highest offer gets the lot. SAE for list. G4KFW, QTHR. Tel 021-357 2009.

Yaesu FT101ZD, nine bands, fm, cw filter, fan, mic, exc cond, £475. G4ATS, QTHR. Tel Leeds (0532) 603823.

FT290R, 2m all mode, £190. R1000 hf rx, £185. MMT 70/144 2m in, 4m out transverter, £75. Garry

Orford, G4FRO, QTHR. Tel Bristol 426851, work, 47112, home.

Trio VFO120, mint cond, boxed, £38 ono. *Wanted:* Any info on adding 160m to TS120V. G4ABF, QTHR. Tel Malvern (06845) 66202.

Yaesu FT230R, 25W, 2m, fm, vgc, boxed, comp with 2m 7λ/8 ant, cost over £280 new, will accept £160 (any trial). Buyer collects. G4TUM. Tel Jon, Hull (0482) 862094.

Trio TS530S, MC35S mic, deluxe ball race knob, £460. AT230 atu, £90. LF30A filter, £15. All as new, never used on tx. G6KGU. Tel Knutsford (0565) 54650, evening only please.

Liner 2 with 40W linear to suit, £100. IC24G 2m tx/rx, vgc, £100. G4WTE. Tel Medway (0634) 221061, evenings.

KW Vespa Mk2, Shure 201 mic, exc cond, just back from servicing at Chatham, super tx for old and new licensees, £75 ono. G4PNN. Tel Mark, Kidlington 3420 (nr Oxford), after 6pm.

Datong D70 morse tutor, £35. Got me a G4 in three months! Cushcraft ATV3 vertical, 10-15-20m, £20. Prefer buyer arranges delivery. G4YNG. Tel Kettering (0536) 524577.

Trio TR2300, nicads, charger, helical, comp, boxed, no mods, £100. G6DTR, QTHR. Tel Southend (0702) 230300.

Pet toolkit, adds 10 commands to basic for old rom, small keyboard machines, £5. KDK FM2015R, 15W, 144-9MHz, fully synthesized, four memories, scanning repeater shift etc, hi-low output, s/pwr meter, rit, rev/shift, auto toneburst. G8PZF, QTHR. Tel Bradford (0274) 43453.

Yaesu FT7 tx/rx, recent overhaul, bnos psu, Hansen p.e.p. power swr meter, SEM Transmatch, separate Ezitune, YH55 headphones, connecting leads, all above accessories brand new cond, £360, carriage included. G4YDM, QTHR as G6CHB. Tel John, 091-4162606.

B40D, £25. Creed 7E with sound proof cover, £10. Teleprinter terminal unit type TT10, £20. Pye Pocketphone tx/rx on RB0, £20. Buyers collect please. G4URN, 106 Foxwell Street, Worcester WR5 2ET.

Trio DFC230, external vfo, scanning memories, etc, suits TS130, TS530, TS830, £75 or swap for 2m transverter for 10m rig, eg MM144/28, FTV901 etc. G4VFP. Tel Stoke-on-Trent (0782) 322128.

FT901DM, fm, memory, £495. Trio TS700S, digital readout, 2m all mode, £350. MMS2 morse tutor, voice synthesizer, £90. MML432/50 70cm amplifier, 10W in, 50W out, £50. G8AYN NOT QTHR. Tel 04555 57790 (S Leics).

HW8 QRP tx/rx, in fb cond, comp with manual, circuits, £115 incl delivery by Securicor. G4BLI, QTHR. Tel 051-722 9538.

FRG7700RX, brand new cond, used maximum 10h, £260. Will deliver carriage paid. Tel Llandudno (N Wales) (0492) 40771, evenings.

Comp 2m station, as used on GB2XQ expedition: FT221R tx/rx, just overhauled, Mutek board fitted, £225. Mirage B108 linear, 10W in, 80W out, as new, £70. Tempo 2002—the ultimate 2m linear—rated at 1·2kW output, 2 × 8874, perfect, £750. Pair of 14-el Cushcraft Jnr boomers, £40 each. Tonna 2m power dividers: two-way, £25, four-way, £30. All ono. GW3NYY NOT QTHR, PO Box 21, Swansea SA1 1ED. Tel 0792 201111.

Yaesu FRG7, vgc, £140 ono. G3KXE, QTHR. Tel E. W. Bettles, 0329 43031, ext 2568, during business hours, 9am-5pm.

KW2000A, speech processor, manual, spare valves, vgc, £165 ono. Prefer buyer collect. G6BVW, QTHR. Tel St Ives (Cambs) (0480) 67447, after 6pm.

Yaesu converters, FRV7700C, FRV7700D, £55 each, or both, £100. Post paid. Five months old. G8CN, QTHR. Tel Cleethorpes 697881, evenings after 6pm.

FT101ZFM, nine bands, mic, fan, £435. G3JXR. Tel Milton Keynes (0908) 642398.

Yaesu FT720R 10W 2m fm, memories, scanning, £125. G3UEY, QTHR. Tel Pershore 553037.

FT980, new, boxed, spkrs, mic, etc, £1,000. FC902 atu, 10-band, perfect, £95. Tel Nantwich (0270) 623538.

16k ZX81, keyboard, computing course, £59. Component box, resistors, capacitors, ics, transistors, tv valves, incl swr bridge, £9. Amstrad lw, mw, sw, vhf, airband, marine, £22. *Wanted:* rotator for nine-el 2m beam, R528 airband scanner. G1EOJ. Tel 0253 45431.

Ajax (1969) marine tx/rx, a.m., 160-4,000MHz, 2 × TT22, exc tank coil, transistorized pwr supply, relays, hf chokes, ceramic switches, 16 xtals, as new, suit experimenter, for parts or conversion, £18. Buyer collects. May. Tel Liss 892143.

FT901DM, used little, as new, orig packing, modes: ssb, cw, fm, fsk, a.m., bands: 160, 80, 40, 20, 15, 10, WWV; built in: memory, processor, mains, battery psu, £450. G4LEV. Tel Brighton (0273) 27571.

Icom IC290E multimode 2m tx/rx, £200. Yaesu 107 psu, internal spkr, 20A, £50. Microwave Modules 2m linear, 100W, £65. Commander 400 heavy duty rotator, controller, £40. Yaesu ptt mic, £5. SWR bridge, 2m, £7.50. G3VWE, QTHR. Tel 0272 656783.

Heathkit DX100U tx, vgc, £25 ono. Heathkit RG1 rx, rf preamp, vgc, £10 ono. Tel 0483 575870, evenings and weekends.

FT480R, boxed, as new, £275. Mirage B108, perfect, £85. Kenpro 400RC antenna controller, £90. FT230R 25W 2m, £220. FP700 20A, incl spkr, £90. MMS1 morse tutor, £50. MM4001 rtty rx, RCA, comp, perfect, as new, £200. Tel Nantwich (0270) 623538.

2m 100W pa, Microwave Modules MML 144/100, as new, £95. Tel Petersfield (0730) 64059, evenings.

KR500 elevation rotator, exc cond, £65. 19yd six-core rotator cable, £4. 19yd 13-core, £4. Two lengths 10yd 13-core, £2 each. Jaybeam antennas: 8XY70cm, £12; 8XY2m, £9; five-el Yagi, £7. Mosley hf dipole 10/15/20m, £10. MM 70cm converter, £9. PTFE uhf base for 4CX250B, chimney, new, unused, £9. Coaxial relays: new unused up to 70cm, £3. Another QRO, £3. Well-made homebrew 12V supply, 15A all day, £15. Antennas and supply, buyer collect, Manchester. Others plus postage. Immac country and western guitar, Yamaha FG300, quality instrument, £30. Tel Atherton 894182.

RXs: R278B/GR, 225-400MHz, manual, spares, £90. SX200, scanning rx, manual, psu, £160 ono. Eddystone 770U, 140-500MHz, manual, spares, £70. Carriage at cost. Prefer buyer collect. G6EPO. Tel 06373 2182, after 5.30pm, or St Austell 2381, extn 12, daytime.

FT227R, 10W fm, fully synth, TR7010, 10W, ssb xtal for 144·260 to 144·455, both good cond, mobile mounts, orig packing, manuals, £110 each. Carriage extra. G6CLP, QTHR. Tel Ashby de la Zouch (Leics) 414164.

70cm Trio TM401A 12W fm, six months old, £240. MM432/28S transverter, six months old, £110. Trio TR3200, portable, 12cm, eight xtals, £110. Jaybeam MBM88 12 months old, £25. IC02E, as new, £190. G4VID, QTHR. Tel Kettering (0536) 516547.

HQ1 hybrid quad minibeam, balun, four spare spokes, vgc, £70. CW key HK703 hi-mound, almost new, £12. G3BHA, QTHR. Tel Bournemouth (0202) 528140.

Heathkit SB301 rx, SB401 tx, all filters, SB600 spkr, vg wkg cond, clean, manuals, £260. Datong UC1, 0·1-30MHz on 2m 10m rx, vg wkg order. £90. LCV 10m, fm, 40ch tx/rx, £30. G3GIQ. Tel Camberley 24706.

Cossor 1035 double beam scope, manual, wkg order, £26. BCC 2m tx/rx, a.m., 12V, working £10. *Rad Com*, July '63-Dec '70, free to collector. Tel St Albans (0727) 67387.

Eddystone 940, exc cond, about £100. Blue Box uhf solidstate fixed station, (tx, rx, rc), about £60. Number of ancient valves and boot mount rangers, some with vibro packs! G3OWB, QTHR. Tel 0223 359127.

Wavemeter for 144MHz, by DRAE, £15. 2m atu, by LARS, £12. DRAE 4A psu, £20. Jaybeam 2m colinear, £15. Buyer collects in all cases. Tel Peter Crosland, 0905 620041, evenings only.

Trio 2400, 2m, handheld, charger, leather case, used little, £140. G4KOJ, QTHR. Tel Derby 514462, evenings.

Wireless set No11 tx/rx, low/high psus, needs connecting leads, one knob, plug-in meter incl, but needs suitable shunt, unusual item, suitable restoration, offers. Vintage valves, approx 60, many types incl 12 PX4, untested, boxes scruffy due storage but valves believed unused. Offer for lot considered, or separately. Ferrograph F307 amp 20/20W, switches need cleaning, otherwise OK, £20 ono. Tandberg TCD310, part dismantled, service manual, spares or rebuild, £10. G1ADC, QTHR. Tel 01-680 2674, evenings/weekends.

FT290R, carrying case, nicads, charger, power unit, Jaybeam 5XY antenna, rotator, £250. G6XBD. Tel 01-504 7686 (S Woodford, Essex).

Video Genie 48k, RS232, disc and printer interface, joystick, sound synthesizer, S100, £300. Large selection of software, books, add-ons, ssae. 12in high resolution, green monitor, £50. Daiwa automatic atu, £90. Datong automatic speech processor, £45. IRCs 10 per £2. G4CVZ, QTHR. Tel 051-220 5470.

FDK Multi 700EX 2m, fm, 25W, comp with mic, mobile brackets, bargain, £130. Creed 444 teleprinter and terminal unit for rtty, for quick sale, £55. G4LEI, QTHR. Tel Durham 64301.

Bang & Olufsen 7000 slim-line hifi music centre, as new, boxed, cost near £800 new, bargain, £495. QSTs 1926-47, approx 150, offer the lot. Consider exchange good hf tx/rx. Atlas 210X, exc, £250. G4ERU, QTHR. Tel Bournemouth 510400.

FL200B, FRDX400 hf rig incl 2m converter, cw filter, transceive or separate operation, manuals, could deliver central Scotland, owner emigrating, needs smaller rig, £170 or thereabouts. GM4BRM, QTHR. Tel Blantyre (0698) 825016.

Trio R2000, mint cond, handicapped owner G6WPS unable to use, £350. G8YVW, QTHR. Tel 0742 375790.

Icom ICR70 rx, fitted fm board and dc kit, immac, three months old, save £130 on new price, £450. Tel 0834 3057.

FT290R, nicads, case, Amateur Radio Exchange mods, incl improved front end, as new, £200. HF linear, 12V, 10W, *R&EW* design, wkg, £20. Datong Clipper, "K" bleep, £15. Buyer collects or carriage extra. G4CIK, QTHR. Tel Reading (0734) 666153, evenings/weekends.

Trio R1000 gen cov rx, 12V conversion, as new cond, handbook, leads, orig packing, £210 ono. G4PMG, QTHR. Tel 0923 33973, home 01-432 2252, work.

Yaesu FTDX560, mic, spare pas, £225. Heathkit HW101 comp with psu, digital display, matching spkr, mic, full set manuals, £175. G3SHD, QTHR. Tel 0908 566089.

NRD515 remote controller type NCM55, comp, used little, £75. Telereader CWR670E, only few weeks old, comp with AVT green monitor type DM091G, £375. Morris. Tel Bolton 52384.

Kenwood TS530S, immac cond, £470. Three-el TET tri-band, six months old, £120. AR40, £30. EDD888, £60. G4OVS, QTHR. Tel 0709 890481.

Yaesu FC902 atu, £90, or exchange for Yaesu FP707 power supply, or similar. GW4TGF. Tel Swansea 403526.

Property G1AIW silent key: FT726R, all modules, £1,000. 720A, psu, 500 atu, £850. ICR70, FRT7700, £425. SX200 scanner, £130. MML 432/50, £90. Tokyo HL82V, £110. BNOs 12A psu, £60. SEM Tranzmatch, £55. Enquire comp satellite antenna system and tower. G4VEZ, QTHR. Tel Mitchell (Cornwall) 642.

Trio TR2200GX, 2m portable, nicads, charger, telescopic and rubber duck, fitted S20-22, R5-6, 145·00, vgc, in box, £85. G8ETD, QTHR. Tel Swindon (0793) 694479.

Trio TR2300 80ch synth portable, boxed, nicads, etc, £100. MML 144/30LS 30W, pa, as new, £50. ZX81, 16k ram pack, books, extras, £25. *Wanted:* FT290, FRG7. Part exch considered. G8VXK, QTHR. Tel 01-747 1702, evenings only.

KW2000B with psu, £190. HRO, coils, psu; BC348R, output stage; psu; AR77; all carefully restored and working superbly, £50 each. Digital frequency counter, programmable to 500MHz, £90. Harvey Jackson, Lowick, Cumbria. Tel 0229 85669.

TET HB33SP three-el tribander beam, dual drive, four months old, as new, cost new well over £200, offers around £140. G4NZY, QTHR Birmingham. Tel 021-427 1788.

Brand new LS20XE, nicads, soft carrying case, battery pack, Duracells and car charger, would cost £165, selling for £120. G4LDB, QTHR. Tel 0703 733626.

8085AH2 genuine Intel cpu, brand new, unused, £12 each. G4BMM NOT QTHR. 10 Collingtree, Luton LU2 8HN. Tel Luton 451839.

Icom IC255E, 25W, 2m, fm tx/rx, five memories, remote control, scanning mic, mint cond, orig packing, £175. G3YDU. Tel Plymouth (0752) 701878.

Gem two-el quad, unused due to planning permission problems, £200. Approx 50yd 50Ω feeder plus seven-core cable for rotator. G3DKR, QTHR. Tel 01-360 5000, evenings, 01-803 3590, daytime.

Trio R599S and T599S, 200W input, 2m converter fitted, £320. HF5 antenna with ground plane, already dismantled, £35. G4HRT, QTHR. Tel 0532 665568.

Computer ICs 2764, 4116, 2147, 8035, 8212, 8755, 8156, 4027, memories, TMS6011, 8154, 2102, 2114, 8255, 8279, 8251, 8253, 74S287, 74S188, 74S189, 4702, XR2206, 81LS95, 6502A, 8085, SAA5050, all cheap, many more. Tel 091-271 0834, after 5.30pm for details and prices.

FDK Multi 700EX 25W, fm, used only rarely so in exc cond, £150. *Wanted:* mains transformer 10V at 10A SR9, 2m, rx. G3RB, QTHR. Tel Whitley Bay 530504.

Mirage B108 linear, 144MHz, 80W, remote relay, new, boxed, £85. New mics, Shure 401A Hi-Z, £10. Trio MC35S Hi-Z, £10. Yaesu YD148 dual-Z, desk,

£18. CDE BT1A rotator, new, £85. AR30, new, £40. Mobile mounts, FT707, TS130, £10. G4ERU, QTHR. Tel Bournemouth 510400.

Yaesu FRG7 rx, still boxed, comp with atu, 2m converter. Codar AT5 80-160m QRP tx and psu. Exchange for 144MHz tx/rx. G6ZGU. Tel Jeff, 01-439 6512, daytime, 01-803 5235, evenings.

Drake TR7, full TR7A spec, vgc, gen cov tx/rx, mic, workshop manual. Datong SRB2 Woodpecker blanker, latest model, brand new, boxed. *Wanted*: 465kHz xtal filters, ssb/cw. G4HSB, QTHR. Tel Pete, 0642 816608, after 6.30pm.

Datong FLZ Multimode audio filter, as new, £60. G4ILQ. Tel Ray, Kidderminster (0562) 4930.

FT290R, nicads, charger, case, orig packing, no mods, £200. Ambit 10dB linear for above. £15. Eight-el Yagi, £10. LAR 7MHz traps, still boxed, £10. G4OPB. Tel Ipswich (0473) 626415.

Telescopic mast, heavy duty, 40ft two section tiltover, wall mounting, base hinged, adjustable to tilt left, right, or direct, £100. Luffing winch etc, mains rotating motor, £50 extra. G3TQE, QTHR. Tel 021-783 6822.

Trio 9000, plinth B09 PS20, spkr SP120, sold as comp station, £410 ono, Microwave Modules 144/100S linear, £110. G4RWQ, QTHR. Tel Brian, Penkridge 4963.

Trio YK88C 500Hz cw filter, £26. MFJ 722 ssb/cw audio filter, incl notch, mains psu, £35. G3PEK, QTHR. Tel 0244 300897.

Trio TR9130 2m multimode trans, 25W, mic, boxed, £295. Yaesu FT227RB, 2m, fm, trans, 10W, mic, £130. Icom 255E 2m, fm, trans, 25W, mic, boxed, £140. BNOS lpm 144.25.160 linear amp, £130. Yaesu FRG7 rx, £120. FDK 725X, £165. Tel 0305 786930.

One-third acre of cracking vhf take-off on south slopes of the Mendips, nice sized bungalow with superb views of Cheddar valley, situated on traffic-free private lane, two beds, lounge, bathroom, kitchen-diner, large utility, separate shack with woodburner, two-el, tribander, ten-el, 2m, rotator. Family increase forces reluctant sale, complete package offered at £49,000, full details on request. Steve Vincent, G4MQX, QTHR. Tel Axbridge (Somerset) (0934) 732655.

Yaesu FT230R, mobile fm tx/rx, boxed, one year old, £195. MM 144/25 linear amplifier/pre-amp, £45. G4KSI, QTHR. Tel Southampton (0703) 692820.

Silent key sale. SAE for details to G8EWO, QTHR.

Cushcraft R3 antenna, £100. Lunar 2m 30/160 linear, £120. Datong Woodpecker blanker, £45. Marconi TF801D/1/S, 485MHz, £60. Marconi TF867, 10MHz, £40. Send sae for list. Any offers considered. G4KDV, 25 Ashfield Place, Otley, W Yorkshire. Tel 463083.

Collins KWM380 with all mods plus key pad, the best, as new, £1,350. Tel Derby 557705.

National NC81X amateur band rx, very rare 1937 model, ten metal octal tubes, xtal gate, good cond, manual, £75. Nikon F2SB, top 35mm, pro outfit, 28mm, 50mm, 135mm, Nikkor lens, many filters, etc, £750. Exch good hf tx/rx. Tel Bournemouth 510400.

Bearcat 100 handheld uhf/vhf scanner, case, nicads, charger, helical, new £345, exc cond, £160. Tel Wellington (Somerset) (082347) 3562.

Icom 720A, tx/rx gen cover rx, cw filter, absolute mint cond, hardly used, five months old, £650. G4TTX, QTHR. Tel 0536 515082, after 6pm.

FRDX400, FLDX500, Welz swr/power meter, Cushcraft three-band vertical 10-15-20, sell £250, or swap for computer, BBC, Commodore 64, or w.h.y. G3XHC, QTHR. Tel Dartmouth 3621, evenings.

2m 25W mobile fm tx/rx, detachable microprocessor control unit, mobile mount, £150. Would consider exch for Codemaster cw/rtty decoder or FT208 incl charger/psu. G4URC, QTHR. Tel Evans, 021-779 6459.

Mains transformers, outputs 215-0-215, 100mA, 11V 2·5A, 4V 2·75A, 2V-CT-2V 1A, 4V 6A twice, ex-WD, offers. Standard mains 275-0-275, 100mA, 6·3V 2·5A, 6·3V 1A, 5V 2·5A, £4. Ellison 350-0-350, 120mA, 6·3V 5A, 5V 5A, £5. G3MBL, QTHR. Tel 01-445 4321.

Yaesu FTDX560 hf tx/rx, FV400S ext vfo, matching spkr, cw filter, mic, fan, spare valves. £230. GI4GYE, QTHR. Tel Belfast 771679.

FT757GX, mint cond, under warranty, £595. FC707 atu, £60. SP102, spkr with filters, £30. All are boxed and mint. HQ1 mini beam with balun, £70. G4UDT, QTHR. Tel 01-200 1839.

TS530S hf tx/rx, boxed, as new, and mic, absolutely mint cond, £475. G4HMW. Tel 0246 36496.

Comp receiving station. Eddystone 830/7 rx, 2m/70cm converters, switched psu, £195. Delivered 50 miles Manchester. G6TPQ, QTHR. Tel 061-633 3895.

Kenwood TS830M (same as TS830S but with additional mode of a.m.), nine bands tx/rx, AT230, 200W atu/pwr meter, £550 ono. Yaesu FT480R, 10W, 2m, multimode, £295 ono. All mint, orig packaging etc. G4WZS. Tel St Helens 817144.

IC240 2m fm tx/rx, recently serviced, manual, spare power lead, £120 ono. SB200 Heathkit hf linear, £240 ono. G4KMG. Tel Bristol 731569.

High voltage transformers etc, 3000CT, 3000V, at 300mA, 1290CT 1290, at 150mA, oil filled, continuous ratings, used but almost perfect, £15 each. Chokes, 8H at 300mA, £3 each. Swinging choke, 5-20H, 30-300mA, £3.50 each. Caps, paper, 10μF at 2000V, £2.50 each. GM3TNT, QTHR. Tel 0955 2292.

FRG7, best offer over £75. Eagle signal generator to 250MHz, £40. 110V variac, £10. Class D wavemeter, £10. *HF Antennas for All Locations*, £4.50. *Amateur Radio Operating Manual*, £3. Transit extra or collect. G2CDN. Tel 01-657 1037.

TS430S with fm, £650. AT250 automatic antenna tuner, £190. MC42S mic, up/down, £20. FP707 psu fitted appropriate plug, £80. All near new, perfect, carriage extra, but £925 the lot Securicor incl (list £1,260). G2KF NOT QTHR. Tel Newquay (Cornwall) 78741.

Free IEE Journal *Electronics & Power*, from 1971 to date. Clubs given first choice. Exc general ref for electrical science, cover price £8 per issue, free to first good home. To collect. Henry Higgins, 34 Coberley, Bristol BS15 2ES. Tel 0272 673578.

IC251E, £400. FT707, FC707, FP707, £460. NAG 144XL linear, 250W, p.e.p., £325. W&D ATV2, 10W linear, pattern generator in attractive case, £125. MM432/100 atv linear, £200. Frequency counter YC500E, £150. 6MHz 'scope, £100. G4NTS, QTHR. Tel Hook (Hants) 3656.

Manuals, instructions, circuits: BCC, vhf tx/rx, £2.50; Codar AT5, Aiwa AR158/159, NC121, Advance B4 etc, 78 rx, USA IE46B, BC906D, BC1066B, USA tx MI 8167HJ, Eddystone 750, £2 each. Add postage. G3MBL, QTHR. Tel 01-445 4321.

Datong MK morse sending keyboard, 15 months old, perfect cond, sale reason gone AMT1 and computer, £100. G4KPT, QTHR. Tel 0984 23762.

KW2000A, stabilized psu, manual, Shure 201 mic, spare valves incl new pas, spare xtals for 21MHz, £190. Buyer collects or pays carriage. GW4GNY, QTHR. Tel 0938 75441.

Masts! Looking for a cheap mast or tower? I have a few hollow glassfibre poles, 8·5m long, tapered from 12in to 9in, head loading in excess of 0·25 ton. Tel David Pickett, 0420 86512, day, 04203 4140, evenings.

WANTED

Anything for homebrew station from scratch. Recently disabled enthusiast, RAE 1948, never amateur licensed, sold even the junk box on house move, seeks AR88, TU5B, 807, or similar old but friendly junk for licensed use. Collect Bristol area. Tel Almondsbury 614178.

FP707 in gwo but reasonably priced, or good quality power supply at least 20A. FC707. Cash awaiting. G4WMO NOT QTHR. Tel Phil, Lincoln (0522) 752563.

Yaesu FC102 atu to complement FT102, must be comp with manual, can collect within 100 mile radius. G4DIB, QTHR. Write, or tel 01-690 8441, before 5pm.

Argonaut 509 or 515. *For sale*: 1·8kHz ssb xtal filter for FT101ZD, FT901, FT902, FT107, FT707. Tel 04536 3994.

Any data on amateur related software in Forth. Sensible prices paid. GI8OLV. Tel Jimmy, 026-582 3287.

4CX250, 4CX1000, 4CX1500, 8877, 8874, etc, also bits and pieces sockets, chimneys, big transformer, etc. GW8VHI, QTHR. Tel 0639 821308.

Genuine collector seeks anything T1083, also ARR1S, T111S, W.H.Y. wartime airborne, even accesssories. All letters answered. Also like to exchange letters anyone interested same. Disposing German prewar Siemens domestic set, military valves, eight bands. D. Parsonage, 52 Bramble Lane, Mansfield, Notts.

FT290R or TR9130. FT790R. MMT432/144R. Must be in good cond. Tel Coventry (0203) 412494.

For the wireless museum: radio books, magazines, catalogues, service sheets, callbooks (especially 1950s), manuals, *Radio Times*, QSL cards, valves, components, testgear, beehive/letter neons, car radios. Any knobs! Details please to hon curator, G3KPO, Arreton Manor, IoW. Tel 0983 62513.

For National HRO rx, comp tuning dial assembly incl mounting screws (cash waiting). GI8PGJ, QTHR. Tel Denis, 08462 74474.

Three Bright emitters type R4. TL120 linear amplifier. G3BEX, QTHR. Tel 049 46 5097.

For Heathkit HW17 2m a.m. rig: any info, circuit diagrams, handbook etc. Would gladly pay photocopies. Working/non-working rigs to enable restoration project to go ahead. GM6JAG, QTHR. Tel 031-664 5403.

FT225RD. PL172/PL8295 valve, base chimney. AM912 USA surplus vhf pa, coaxial switch. 144MHz reflectometer. VHF coaxial, N type relay. Coaxial switch, N type sockets. Prop pitch motor. Drake 7077 desk mic. G3MOU, QTHR. Tel 0233 75316.

SB200 linear, in good cond, with handbook. G4ITB, QTHR. Tel 0533 766405.

Rad Com, May '80-March '84. Can collect SE England. P. Hirons, G1CEI, QTHR. Tel 01-848 3400, daytime, 0256-781540, evenings/weekends.

Old radio books by collector, not dealer, pre-1925. G3GNR, QTHR. Tel 040-923 301.

Shortwave rx or converter, for car use, covering broadcast bands. Richard Creak, Danbury, Essex. Tel 0245 41 3725.

HW101, in clean, unmodified, good wkg order, manual. Would consider kit-built model if construction good. Price and particulars, please. G3LGX, QTHR.

BBC disc interface or 8271P. Gregory, G6KZI, 75 Station Road South, Belton, Gt Yarmouth, Norfolk, NR31 9LZ. Tel 0493 781035.

Buy or borrow: handbooks for Tektronix spectrum analyser plug-in, type 1L30 and for series 530/540/550 scopes. For spares, Leak 2000 tuner amplifier. G8ZKZ, QTHR. Tel Romford (0708) 69770, evenings.

For wireless set No19 Mk2: circuit diagram, rotary converter and atu. Tel Swindon 486809.

6ft 19in rack cabinet, can collect. Details to G4LDA, QTHR. Tel 020-881 2795, after 6pm.

BBC Acorn disc interface. 8271P, 6116LP, 6264LP, 5565LP, 2764, 27128, AM7910, 0·10S in eprom. G6KZI, 75 Station Road South, Belton, Gt Yarmouth, Norfolk NR31 9LZ.

HROs by collector for own use. Any cond considered. Replies to Ian Pordum, 56 Gowland Avenue, Newcastle-upon-Tyne 4. Tel 091-273 5320.

2m 16-el Tonna, any cond considered. Several required. Boom and radiator must be sound. G3LTF, QTHR. Tel 0279 415051.

HQ1 minibeam, in good cond, will collect. G8UQN, QTHR. Tel John (G4XJS), St Albans (0727) 62052, 1 September onwards.

Marconi vtvm type TF1041C, does anyone have a circuit diagram/manual for this equipment which I could buy/borrow to copy. Your costs refunded. G4OZM, QTHR. Tel David, 0780 54433, or 0733 313337.

R21, ex-Govt rx, was sold in 100s during '50s and '60s without case, used ARP12s and 6V vibrator pack. Equipment required to settle old technical problem. G8BIH, QTHR. Tel John, 0420 82739.

Any information on tuner, radio freq type L342 (NATO stock No 5820-99-947-5257) manufactured by Mullard Equipment Ltd. G8AVJ, QTHR.

Shure 444 desk mic, non-working body would suffice. Tel Herne Bay (02273) 3511, evenings or weekends.

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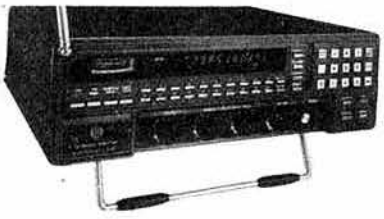

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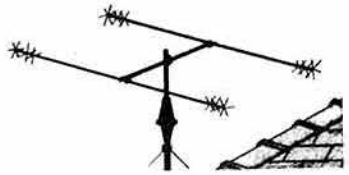

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5th OVT	110.00 TO 125.0MHz	£7.40
7th OVT	125.00 TO 175.0MHz	£10.00

DELIVERY 2.0 TO 175.0MHz 2 to 3 weeks
5 TO 999.9kHz 6 to 8 weeks
1 TO 1.499MHz 3 to 4 weeks

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TVHF 230c
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The TVHF 230c 144MHz to hf transverter is a complete self-contained transmit and receive frequency translation system from 144MHz to all 9 current amateur hf allocations.

Most multimode 144MHz transceivers possess somewhat limited dynamic performance (unless a muTek front-end is fitted!) and will restrict the potential performance of the complete system unless the transverter is designed with a degree of cunning.

HF is a rather different environment to that at VHF! Signals are more numerous and their absolute levels tend to be greater. External noise levels limit the usable sensitivity. Presented with the output of existing amateur HF transverter designs, many VHF transceivers simply give up! To overcome this problem the TVHF 230c has extensive filtering and employs the technique of "noise equalisation". This is a technique, used here for the first time in amateur radio equipment, in which the sensitivity of the transverter is tailored so that it is consistent with external noise; this ensures optimum dynamic performance from the system on each band. A front-panel switchable preamplifier provides the extra sensitivity needed when using electrically small antenna.

Another important factor in good receiver performance is the cleanliness of the local oscillator. The frequency synthesiser employed in the TVHF 230c has been designed around an LSI controller chip, and benefits from muTek's considerable experience in this field. Both the noise performance and reference sideband suppression are excellent and will not be the limiting factor in most instances.

The transmit side has also been designed with high performance in mind. The 10W pep output is generated by a push-pull pair of hf power transistors of 50W combined dissipation rating in class-AB driven by a class-A amplifier. The output level selected is compatible with many existing linear amplifiers and indeed is itself quite adequate in many applications. An ALC loop and excess VSWR protection circuitry are incorporated to ensure long-term reliability and a clean signal.

Connection to the 144MHz transceiver could hardly be simpler. The transverter will accept anywhere between 1 and 5W pep input drive without need for adjustment, and up to 20W pep with the optional VFAT 206 power attenuator. The TVHF 230c has built-in rf sensing and also a facility for hard-line (ground-on-transmit) control from the 144MHz transceiver. RF switching will always override this function in order to prevent potentially expensive accidents! The TVHF 230c requires 12·5 to 14·5v at 4A (ripple voltage less than 0·5v p-p), and so is ideal for portable and mobile operation in addition to fixed use with a suitable power supply.

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1196	SP-102	Speaker	52.00
1197	SP-102P	External speaker & phone patch	69.00
1198	FV-102DM	VFO Scanner	219.00
1199	FC-102	ATU	175.00
1206	FAS-1 4R	Antenna Switch	40.00
1204	FT-1	Transceiver All Mode/General Coverage	1490.00
1224	FT-101Z/AM	Transceiver with AM unit	515.00
1225	FT-101ZD/AM	Transceiver (digital) with AM unit	589.00
1228	DIG101	Digital Unit	99.00
1274	Fan B	Fan	13.00
1229	FT-77	Compact Transceiver	455.00
1256	FV-700DM	Digital VFO	199.00
1247	FT-980	Transceiver (CAT)/General Coverage	1250.00
1243	SP-980	Speaker	59.00
1244	FT-757GX	All Mode Transceiver/General Coverage	675.00
1245	FP-757GX	AC PSU	139.00
1264	FC-757AT	ATU	239.00
1248	FRG-7700	General Coverage Receiver	365.00
1249	FRG-7700M	General Coverage Receiver with Memory	430.00
1254	FRT-7700	ATU	46.00
1255	FRA-7700	Active Antenna	42.00
1257	FRV-7700D	Converter 118/130, 140/150, 70/80MHz	85.00
1273	MEM7700	Memory Unit	73.00
1246	FL-2100Z	HF 1200W Linear Amplifier	499.00
1251		Cabinet for SP-101	17.00
1276		AM Unit for FT-101Z	15.00
1209	NC-1	Desk Charger for FT-202R	19.00
1201	PA-1	12V Adapter for FT-202R	19.00
1205	FP-4	AC PSU, 4 Amp	42.00
1220	FP-80A	AC PSU, 4.5 Amp	53.00
1234	FT-290R	2m All Mode Transceiver, portable	260.00
1202	CSC-1A	Carrying Case	4.00
1210	MMB-11	Mobile Mount	27.00
1211	NC-11C	Charger	10.00
	FL-2010	2m 10W Linear Amplifier	63.00
1241	FT-720RU	70CM Mobile Transceiver, 10W	219.00
1217	E-72L	Extension cable 4m	14.50
1218	S-72S	Switching box	37.00
1233	FT-208R	VHF Handie FM Transceiver	199.00
1258	NC-7C	Base Charger for FT-208/708	33.00
1260	FBA-2	Battery Sleeve for NC-7/8	3.50
1261	MMB-10	Mobile Bracket	8.00
1262	NC-9C	Compact Trickle Charger	9.00
1263	FT-230R	2m FM Mobile Transceiver, 25W	255.00
1237	FT-726R	VHF/UHF Multiband, multimode Tr ceiver c/w 2m	735.00
1238	430/726	70cm module	245.00
1239	SAT726	Satellite Unit	95.00

MICROPHONES/ACCESSORIES

1208	MH1BB	Hand mic., scanning	15.00
1214	YM-35	Hand mic., scanning, for FT-1/102/707 series	15.95
1235	YM-38	Desk mic., scanning, for FT-1/102/707 series	26.50
1250	YM-49	Speaker/mic. for FT-290/230R	18.00
1213	QTR-24D	24-hour quartz clock	32.00
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1330	TS-930S	+ ATUAs above, with automatic ATU	1225.00
1329	SP-930	Speaker and filters	57.00
1313	MC-60A	Desk Top Microphone, scanning	54.00
1357	YK-88A1	6kHz AM filter	32.00
1356	YK-88C1	500Hz CW filter	32.00
1348	YG-455C-1	500Hz CW filter	75.00
1349	YG-455CN-1	270Hz CW filter	90.00
1324	TS-430S	Transceiver, HF, w. gen. cov. receiver	730.00
1310	PS-430S	DC power supply, de luxe cooled	113.00
1319	SP-430	External speaker	30.50
1334	FM-430	FM Unit	33.75
**1327	MB-430	Mobile Mount	12.50
1352	YK-88SN	1.8kHz SSB filter	–
1314	PS-30	DC PSU	114.00
1326	TS-530S	Transceiver, HF	619.00
1327	SP-230	External Speaker	45.00
1325	AT-230	Antenna Tuning Unit	149.00
1302	KB-1	De luxe VFO knob	11.50
1328	R-600	Receiver	259.00
1333	DCK-1	DC Operation Cable kit	8.26
1332	R-1000	Receiver	299.00
1333	DCK-1	DC Operation Cable kit	8.26
1335	R-2000	Receiver	415.00
1337	TR-2400	Transceiver, 1.5W FM, 10CH Mem	195.00
1301	SF-1	Base Stand	45.00
1309	MC-30S	Hand Microphone	14.00
**1337	AT-250	Automatic ATU	280.00
1338	TR-2500	2m FM Transceiver	219.00
1304	ST-2	Base Stand	52.00
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1306	SMC-25	Speaker microphone	17.00
1361	BT-1	Manganese Battery Case	6.50
1311	PB-25	Nicad Battery	26.00
1305	SC-4	Soft case	14.00
1375	TR-2300	2m Transceiver (demo)	170.00
1325	AT-230	Antenna Tuning Unit	130.00
1340	SM-220	Station Monitor	275.00
1344	DS-2	DC/DC Converter for TS830S	55.00
1343	TR-8400	70cm Transceiver	279.00
1369	SP-40	Compact Mobile Speaker	15.75
1371	MC-45	Auto-patch Up-Down microphone	41.50
1339	TR-9130	2m All Mode Transceiver, 25W	435.00
1373	SP-120	External Speaker	34.00
1370	BC-1	AC Adaptor for memory back-up	6.43
1307	PS-20	DC Power Supply	59.00
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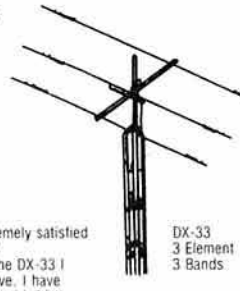

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1081	DX 31	Dipole 10/15/20m 2Kw p.e.p.	83.95
1082	DX 32	2 element 10/15/20m 2Kw p.e.p.	128.80
1083	DX 33	3 element 10/15/20m 2Kw p.e.p.	188.60
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1085	DX 31/32	Conversion Kit	51.75
1086	DX 32/33	Conversion Kit	65.15
1087	DX 33/34	Conversion Kit	78.20
1089	DX 103	3 element 10m Yagi	93.15
1090	DX 105	5 element 10m Yagi	117.30
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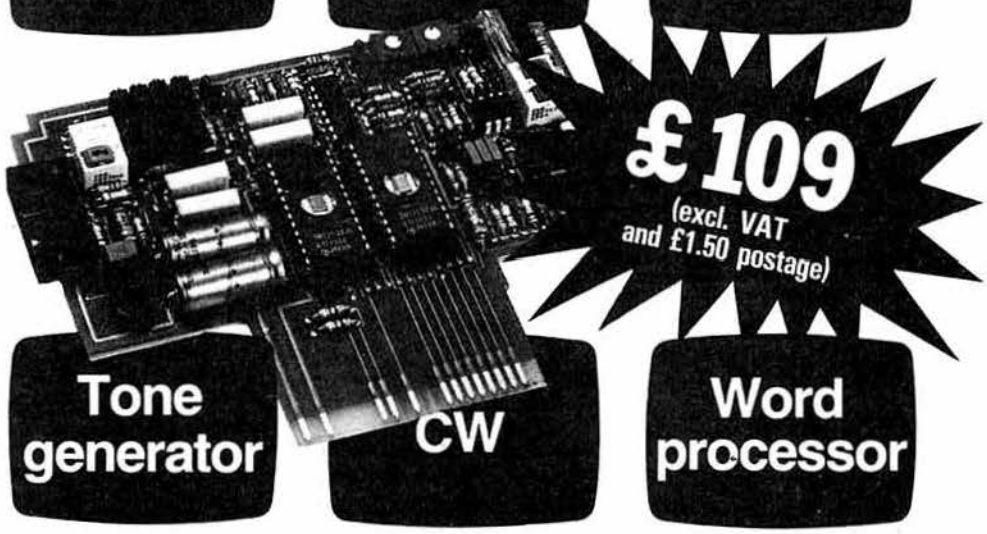

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Major features of the COM-IN 64 program:

- Written in fast and efficient 6502 machine language.
- Baudrates 45, 50, 75, 110 and 300, each adjustable with fine tuning system.
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- Fully autom. Morse speed, 5 to 99 words per minute.
- Split screen. Compose and edit text while receiving.
- 12 K byte text buffer in memory.
- Three active cursors. Receive, transmit and keyboard.
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- Disk-based mailbox system.
- User definable WRU.
- Create brag tapes on disk or cassette files.
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- Replay received message with resend command.
- Four CW identification options.
- CW FSK identification for RTTY.
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- Quick brown fox generator.
- Several callsign generators available.
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- Direct mode for fast break-in operations.
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- Ignore carriage return on receive option.
- User definable switch facility.
- Page mode allows reception of RTTY pictures etc.
- Byte mode allows transmitting program files.
- Modem mode with automatic Bell/CCITT selection.

Further details:

Zero's COM-IN 64 program is supplied with self supported power supply, cables and connectors. In the extensive user manual you'll find the complete schematic and 2 program listings for QTH locator and LOGBOOK. Send for free details and order form.

ZERO ELECTRONICS

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TS430S	£779.55	R2000	£436.75	AT930	£150.41	TR3500	£265.85	TS930S	£1195.00
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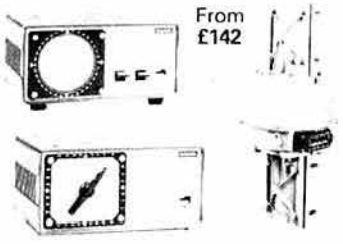

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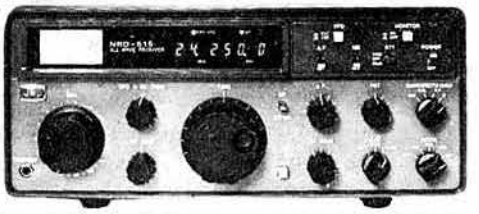

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DL600 Dummy load	£36.00
DL1000 Dummy load	£49.45
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WELZ SP5M swr/power	£41.00
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203BA 3 Element 20m Beam	£178.25
Mini Products HQ-1 Minibeam	£169.00
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be it Glasgow, Darlington, Cambridge, Cardiff, London or here at Matlock, then you can be certain that, along with a courteous welcome, you will receive straightforward advice. Advice given, not with the intention of "making" a sale, but the sort which is given freely by one radio amateur to another. Of course, if you decide to purchase then you have the knowledge that LOWE ELECTRONICS are the company that set the standard for amateur radio after-sales service. The shops are open Tuesday to Saturday and close for lunch 12.30 till 1.30pm.

In Glasgow the LOWE ELECTRONICS' shop (telephone 041-945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret's Drive. That's the right turn off Great Western Road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical gardens are well worth a visit.

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (telephone 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham road out of town. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

Cambridge, not only a University town but the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (telephone 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1039, past the science park and turn left at the first roundabout. After passing a children's playground on your left, turn left again into High Street. Easy and free street parking is available outside the shop.

Cardiff now has its own LOWE ELECTRONICS' shop. Managed by Richard GW4NAD, who hails from Penarth, the shop (our telephone number is 0222 464154) is located within the premises (on the first floor) of South Wales Carpets, Clifton Street, Cardiff. Clifton Street is easily found, being a left turn off Newport Road just before the infirmary. Once in Clifton Street, South Wales Carpets is the modern red brick building at the end of the street on the right hand side. Enter the shop, follow the arrows past the carpets, up the stairs and the "Emporium" awaits you. Free street parking is available outside the shop.

MOVING . . . MOVING . . . MOVING . . . From the 13th September 1984 the LOWE ELECTRONICS' **London** shop will be located at 223/225 Field End Road, Eastcote, Middlesex (the new telephone number is 01-429 3256). The new shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings. Immediately behind the shop is a large car park where you can currently park for the day for 20p. There is also free street parking outside the shop.

Finally, here in Matlock, David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

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1. 500mW TV Transmit	(70FM05T4 + TVM1 + BPF433)	35.00
2. 500mW TV Transceive	(As 1 above plus TVUP2 + PSI 433)	60.00
3. 10W TV Transmit	(As 1 above plus 70FM10 + BDX35)	65.00
4. 10W TV Transceive	(As 2 above plus 70FM10 + BDX35)	90.00
5. 70cms 500mW FM Transceive	(70'T4 + 70'R5 + SSR1 + BPF)	75.00
6. 70cms 10W FM Transceive	(As 5 above plus 70FM10)	105.00
7. 2M Linear/Pre-amp 10W	(144PA4/S + 144LIN10B)	40.00
8. 2M Linear/Pre-amp 25W	(144PA4/S + 144LIN25B)	42.00
9. 70cms Synthesised 10W Transceive	(R5 + SY + AX + MOD + SSR + 70FM10)	150.00
10. 2M Synthesised 10W Transceive	(R5 + SY + SY2T + SSR + 144FM10A)	120.00
11. 2M Crystal Controlled 10W Transceive	(R5 + T3 + BPF + 144FM10 + SSR)	85.00
12. 70cms Linear/Pre-amp	(70LIN10 + 70PA2/S)	45.00

70cms EQUIPMENT	*CODE*	*ASSEMBLED*	*KIT*
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FM Transmitter (0.5W)	70FM05T4	48.00	28.75
FM Receiver (with PIN RF c/o)	70FM05R5	65.40	45.80
Transmitter 6 Channel Adaptor	70MC06T	21.30	14.25
Receiver 6 Channel Adaptor	70MC06R	25.20	17.90
Synthesiser (2 PCB's)	70SY25B	88.00	62.25
Synthesiser Transmit Amp	A-X3U-06F	34.15	22.10
Synthesiser Modulator	MOD 1	8.95	5.50
Bandpass Filter	BPF 433	6.50	3.30
PIN RF Switch	PSI 433	7.55	5.35
Converter (2M or 10M i.f.)	70RX2/2	27.10	20.10
TV Products			
Receiver Converter (Ch 36 Output)	TVUP2	27.50	22.80
Pattern Generator (Mains PSU)	TVPG1	42.25	36.50
TV Modulator (For Transmission)	TVM1	9.85	5.75
Ch 36 Modulator (For TV Injection)	TVMOD1	9.80	5.50
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50mW to 500mW	70FM1	18.45	12.80
500mW to 3W	70FM3	23.45	17.80
500mW to 10W	70FM10	41.45	33.45
3W to 10W	70FM3/10	23.95	18.30
10W to 40W	70FM40	65.10	52.35
Combined Power Amp/Pre-Amp (Auto Changeover)	70PA/FM10	56.60	40.15
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500mW to 3W (Straight amp, no changeover)	70LIN3/LT	27.90	19.90
3W to 10W (Auto Changeover)	70LIN3/10E	41.05	30.15
1W to 7W (Auto Changeover)	70LIN10	44.25	32.50
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MOSFET Miniature (14dB)	70PA3	9.65	7.50
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GaAs FET (16dB)	70PA5	20.10	12.80
6M EQUIPMENT			
Converter (2M i.f.)	6RX2	28.40	20.80
2M EQUIPMENT			
Transceiver Kits and Accessories			
FM Transmitter (1.5W)	144FM2T3	39.35	26.30
FM Receiver (with PIN RF Changeover)	144FM2R5	65.50	47.20
Synthesiser (2 PCB's)	144SY25B	78.75	60.05
Synthesiser Multi/Amp (1.5W O/P)	SY2T	27.80	20.65
Bandpass Filter	BPF 144	6.50	3.30
PIN RF Switch	PSI 144	7.55	5.35
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Linears			
1.5W to 10W (SSB/FM) (Auto Changeover)	144LIN10B	38.40	28.50
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Simple Low-cost Wire Antennas (RPI)	£6.83	£6.15
Solid State Design for the Radio Amateur (ARRL)	£7.87	£7.08
Television for Amateurs (BATC)	£2.23	£2.01
UHF-Compendium Parts 1 and 2	£14.43	£12.99
Understanding Amateur Radio (ARRL)	£4.73	£4.26
VHF Propagation Handbook (Nampa)	£3.75	£3.38
Weekend Projects for the Radio Amateur (ARRL)	£4.95	£4.46
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(Raynet supplies should be obtained from Mrs J. Balestrini, Merrivale, Willow Walk, Culverstone, Gravesend, Kent)

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FT-290R
FT-790R

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MULTIMODE OPERATION
Never before possible from such a compact package, true multimode —USB, LSB, CW & FM—operation is yours to enjoy. With CW and SSB activity at an all-time high, you will not be left out of the satellite or DX action and you can still ragchew on FM simplex or even via a repeater (inbuilt shift and 1750Hz tone burst).

ADVANCED MICRO CONTROL
Advances in microprocessor circuitry allows selectable synthesizer steps, up/down scanning from the microphone, priority channel operation, and ten memories (with memory scan), all called up with fingertip ease.

LCD DISPLAY
A large, newly developed Liquid Crystal Display provides readout of the operating frequency, and an indication of a number of the control functions. It is highly readable under conditions of bright sunlight and is backed up by a lamp for night-time operation.

PROGRAMMABLE SYNTHESIZER
The optimum synthesizer steps for SSB/CW or FM operation are very different. That's why Yaesu gives you the flexibility of two synthesizer steps per mode: 100Hz or 1kHz per step on SSB and CW, and 12½/25kHz (2m), 25/100kHz (70cm). When changing modes from SSB/CW to FM, your transceiver is automatically set to the nearest standard channel when you start scanning or tuning.

TEN MEMORY CHANNELS
As many as ten frequencies may be stored into memory, for instant recall. The priority feature allows you to check a favourite frequency every few seconds, with automatic halting (FM mode) when the channel is clear or busy, as desired. Memory backup is provided by a built-in lithium cell, with an estimated lifetime of five years.

DUAL VFO SYSTEM
These transceivers feature a digitally synthesized dual VFO system which provides tremendous flexibility in day to day operation. For example, one VFO may be set up in the SSB portion of the band, and the other in the FM sub-band, for immediate QSY when changing modes.

CONVENIENT FEATURES
Among the many features adding to the convenience of the transceiver is a supplied portable antenna, a high-performance noise blanker, a high/low power switch, and a battery condition meter. A clarifier (offset tuning) allows you to follow unstable or Doppler-shifted signals.

FT690R
In addition to the two metre and 70 centimetre units detailed here, the FT690R six metre (50-54MHz) transceiver completes *for the time being*, the range. The general specifications are similar but modes are USB-CW-AM-FM, power is 2½W PEP [0.8W AM—for which a 4kHz filter is fitted]. Further details on request.

GENERAL FEATURES

Modes of operation:
SSB (USB, LSB) CW & FM

Frequency response:
300-2,700Hz @ −6dB

Carrier Suppression:
Better than −40dB

Sideband Suppression:
Better than −40dB

FM Deviation:
±5kHz (max)

Tone burst frequency:
1,750Hz

Selectivity:
SSB/CW: 2.4kHz @ −6dB
4.1kHz @ −60dB
FM : 14 kHz @ −6dB
25 kHz @ −60dB

Image rejection:
Better than −60dB

Audio output:
1 Watt @ 10% THD

Audio output impedance:
8 Ohms

Dimensions:
58H × 150W × 195D mm
1.3kg (without cells)

Power requirements:
8 × C size dry cells
8 × C size Nicad cells
External 8.5-15.2VDC
Memory backup: Lithium cell

Microphone:(YM47 supplied)
600 ohms ppt with scan

ACCESSORIES

YM49
Remote speaker mic

YM50
DTMF keyboard mic

MMB11
Mobile mounting bracket

FL2010
2 metre 10W amplifier

FL6010
6M 10W amplifier

CSC1A
Vinyl carrying case

NC11C
Battery charger

YHA15
Helical antenna (FT290R)

FT-290R

Frequency coverage (MHz):
144-146 or 144-148

Synthesizer steps:
SSB/CW: 100Hz/1kHz
FM : 12.5/25kHz

Current consumption:
70mA receive
800mA Tx (2.5 W RF FM)

Antenna:
SO239 on rear
Telescopic ¼ Wave supplied

RECEIVER

Intermediate frequencies:
1st IF 10.81MHz
2nd IF 455kHz (FM)

Sensitivity (better than):
SSB/CW : 0.5μV for 20dB S/N
FM : 0.25μ for 12dB SINAD

TRANSMITTER

Power Output:
2.5 Watts at 12VDC

Spurious radiation:
Better than −60dB

Repeater split:
600kHz (+ and −)

FT-790R

Frequency coverage:
430-440MHz

Synthesizer steps:
SSB/CW: 100Hz/kHz
FM : 25/100kHz

Current consumption:
100mA receive
750mA Tx (1W RF FM)

Antenna:
BNC on top panel
¼ Wave flexi supplied

RECEIVER

Intermediate frequencies:
1st IF 67.3MHz
2nd IF 10.7MHz
3rd IF 455kHz (FM)

Sensitivity (better than):
SSB/CW : 0.16μV for 10dB S/N
FM : 0.25μV for 12dB SINAD

TRANSMITTER

Power Output:
1 Watt at 12VDC

Spurious radiation:
Better than −50dB

Repeater split:
1.6MHz (input listen)

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