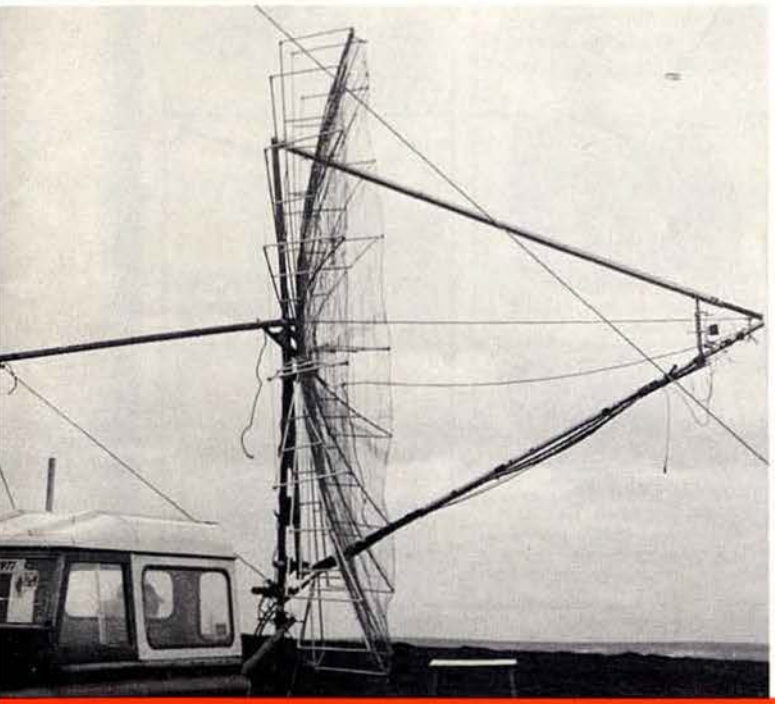
December 1982

RADio COMmunication

VHF NFD 1982

The 1,296MHz station of the Big-M Contest Group, GW4KGC/P, showing two aspects of the 13ft dish antenna

Photographs by G4AJW



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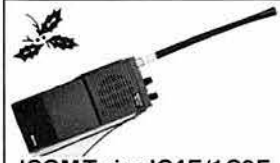

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DECEMBER 1982

VOLUME 58 No 12

RADio COMmunication

CONTENTS

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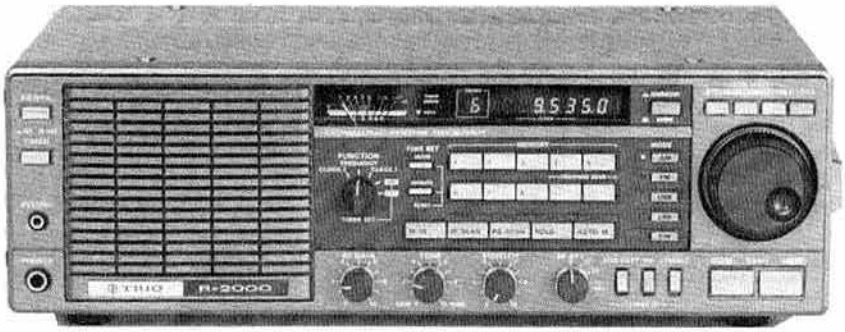

THE R2000

NEW FOR 1983

Now from Trio, the R2000 general coverage receiver. By taking all the superb features of the R1000 and combining them with the latest in microprocessor control Trio have, in one step, completely revised the standard by which short wave receivers are judged. Among the many features provided for the discerning listener are programmable scan, memory scan, memory retention of the mode set for a particular frequency and last, but not least, Trio have included an FM mode – why FM after all this time and our repeated comment that for a shortwave broadcast receiver FM is not really necessary. Take a look at the rear panel of the R2000: a socket marked VHF converter. Wouldn't it be superb if Trio produced a VHF converter covering from 118 to 174MHz – then you would require FM, you would also require AM. Study the features and I am sure you will agree the Trio R2000 is the receiver for you.

Continuous Coverage from 150kHz to 30MHz
Front panel up/down band switches allow easy selection within the full coverage of the receiver. The VFO is continually tunable throughout the full 150kHz-30MHz range.

All Modes SSB, CW AM and FM

Ten Memories Store Frequency, Band and Mode Data
Each of the ten memories can be tuned by the VFO, thus operating as ten built in digital VFOs. The original memory frequency can be recalled by simply pressing the appropriate memory channel key. All information on frequency, band, and *mode* is stored in the selected memory.
The "auto M" switch allows two types of memory storage: when the "auto M" switch is off, data is memorized by pressing the "M in" switch; when the "auto M" switch is on the frequency being used at that time is automatically memorized.

Memory Scan
Scans all memory channels or may be user programmed to scan specific channels. Frequency, band and mode are automatically selected in accordance with the memory channel being scanned.

Programmable Band Scan
Scans automatically within the programmed bandwidth. Memory channels 9 and 0 establish the scan limit frequencies. The hold switch interrupts the scanning process. However, the frequency may be adjusted using the tuning knob whilst in the scan hold position.

Clock Display with Integral Timer

Three Built In Filters with Narrow/Wide Selector
In the AM mode 6kHz wide or 2·7kHz narrow may be selected. In the SSB mode 2·7kHz is automatically selected. In the CW mode 2·7kHz is again chosen and if the optional YG455C filter is installed then 500Hz in the narrow position. In the FM mode 15kHz bandwidth is automatically selected.

Other important features are: squelch on all modes, noise blanker, a large 4 inch front mounted speaker, tone control, RF attenuator, AGC switch, high and low impedance antenna terminals, 13·8 V DC operation, record jack and, of course, provision for a VHF converter.
All in all, a truly remarkable receiver.

R2000 £365 inc VAT carr £5.00

TR3500

For those of you who have waited long for a hand held 70 cm rig then Trio have produced it for you. Based on the now classical lines and features of the popular and much used TR2500, and using all the same accessories, the new 70 cm rig from Trio is the TR3500.

Ten-channel Memory
Nine memories may be operated in simplex mode, or with transmit frequency offset (MAX ±9·995MHz) using offset switch.

Memory Scan
Scans only those channels (maximum 10) in which frequency data is stored. Stops on "Busy" channel, resumes scan automatically approximately 2 seconds after signal goes off, or when "MS" key is pressed. The "STOP" key or the PTT switch may be used to cancel the scan function. LCD displays memory channel number and "MS" arrow while memory scan function is in use.

Programmable Automatic Band Scan
Scan bandwidth (lower and upper frequency limits) and scan steps of 5kHz and larger (5, 10, 15, 20, 25kHz, etc) may be programmed into memory.

Up/down Manual Scan
UP/DOWN manual scan in 5kHz steps.

Frequency Coverage
Covers 430·00-439·995MHz in 5kHz steps, simplex or repeater operation.

Tone Burst Switch

TX Offset Switch
Selects simplex or repeater operation.

HI/LOW Power Output Selection
HI/LOW power output at 1·5W or, for extended battery life, 300mW.

Reverse Operation
"REV" switch shifts the receiver to the transmit frequency, and the transmitter to the receive frequency. Useful for checking signals on the input of a repeater, to determine if you are within simplex range.

Battery Indicator
LED battery condition indicator flashes when battery charge level approaches nominal discharged battery potential.

Two "Lock" Switches
"F. LOCK" switch prevents accidental loss of chosen frequency when in "LOCK" position. "TX. STOP" switch prevents accidental transmission if PTT switch is accidentally pressed in handling.

BNC Antenna Terminal
Allows antenna changeover to be quick and easy.

TR3500 £220 inc VAT carr £5.00

LOWE ELECTRONICS Ltd
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VHF UHF multi mode base station

Now, with the production of the TS780, the dual bander has come of age, giving the two band multimode facilities of the original concept, plus a wealth of additional operating facilities. Trio have again produced a rig which others cannot even copy.

- Full coverage of 2 metre and 70cm band. 144·00 to 146·00 430 to 440.
- All modes. Upper sideband. Lower sideband CW and FM. Also a position with which you will not be familiar FM CH. This gives the VFO a mechanical click stop feel and increments of 12·5 or 5kHz. Ideal for 2 metre and 70cm simplex working.
- Free running VFO with 2 speeds of frequency coverage, slow in 20Hz steps, fast in 200Hz steps. Add to the VFO a friction brake and ease of fine tuning is the result.
- Band scan in either 0·5, 1, 3, 5, or 10MHz widths.
- Memory scan. The rig can be instructed to scan either the 2 metre or the 70cm frequencies in the memories or to scan the total content.
- IF shift to move the receiver pass band without changing the receive frequency and give greater operability under crowded band conditions.
- Full repeater shift facility for either 2 metres or 70cm repeaters plus tone access and reverse repeater switches.
- Up down microphone supplied as standard.
- 13·8V DC or 240V AC 50/60Hz operation

TS 780

TS 780 £748.00 inc. VAT carriage £5.00

The TR9130 is the new all mode VHF mobile or base station rig from Trio giving 25 watts output on 2 metres FM, USB, LSB and CW and now having a green LED display to make for easier mobile operation.

- 25 watts output on FM, SSB and CW.
- FM/USB/LSB/CW all mode operation.
- For added convenience in all modes of operation, the mode switch, in combination with the digital step (DS) switch, determines the size of the tuning step, and the number of digits displayed.
- Six memories. On FM, memories 1 through 5 for simplex or +600kHz offset, with the OFFSET switch. Memory 6 for non-standard offset. All six memories may be operated simplex, any mode.
- Memory scan. Scans memories in which data is stored. Stops on busy channels.
- Internal battery memory back-up. With Ni-Cad installed (not Trio supplied), memories will be retained approximately 24 hours, adequate for the typical move from base to mobile. A terminal is provided on the rear panel for connecting an external back-up supply.
- Automatic band scan. Scans within whole 1MHz segments (ie 144·0-144·999MHz), for improved scanning efficiency.
- Dual digital VFOs. Incorporates two built in digital VFOs, selected through use of the A/B switch and individually tuned.
- Squelch circuit on all modes (FM/SSB/CW).
- Repeater reverse switch. For checking signals on the repeater input, on FM.
- CW semi break-in circuit with sidetone. Built-in, for convenience in CW operations.
- Digital display with green LEDs.
- Transmit offset switch for repeater shift
- High performance noise blanker.
- RIT (Receiver Incremental Tuning) circuit. Useful during SSB/CW operations.
- HI/LOW power switch. Selects 25 or 5 watts RF output on FM or CW.
- Accessory terminal. A four-pin accessory terminal is provided for use with a linear amplifier or other accessory.
- Includes quick release mobile mounting bracket and up/down microphone.

TR9130

TR9130 ALL MODE TRANSCEIVER £395 carr: £5.00

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TRIO

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NEW

The AOR Company, Authority on Radio, have, over the past few years, become known as experts in the design and construction of 2 metre and 70cm handheld equipment. Following on the previously successful models, **the new AR280** provides for the amateur who requires simplicity of operation coupled with a higher power output than other handhelds—an alternative rig. Without a doubt the AR280 with its high quality audio and 5 watts output provides a signal that commands attention on today's crowded 2 metre band.

Power Output
1 watt when in the low power position
5 watts in the high power position

Frequency Range
Using a PLL frequency synthesizer, the rig covers 140-150MHz in 5kHz steps. Electrically tuned stages ensure sensitivity and output power are constant over the entire range.

Memory Channels
Three memory channels are provided for convenience of operation, memory 3 being used for split frequency operation.

Repeater Shift
Full repeater facilities, frequency shift and tone burst are provided for easy access to the many repeaters up and down the country.

£188 inc VAT carr £5.00

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JST 100

NCM 515

Being the man I am, I cannot say I took kindly to the idea that my beloved NRD515 was about to be keyboard controlled. When I heard that JRC were about to produce a remote keyboard control system for the rig I must admit my thoughts were turned to the "other" shortwave receiver which only has a keyboard. My prejudices told me this was not the real way to wander over the band—in short, I was a knob man.

Now, after having had the device coupled to my station for the past few weeks, I have to admit I was wrong, completely wrong.

Of course JRC have done their bit in producing a keyboard controller which is perfect. I suppose you think I am biased in my opinion, but just look at the specification. First of all, a liquid crystal display that does not require a magnifying glass to read the frequency, a well designed keyboard with clear and explicit controls, all together in a case that fits nicely in the palm of the user.

Add a control cable that is flexible and not likely to make operation awkward and the NCM515 has to be a logical extension of your NRD515.

I'll just run through the commands available from your armchair. Say, for example, we are wandering through a short wave band. The receiver is obviously set to the correct mode and bandwidth. Key in the frequency—this is not a problem as the NCM515 is logical. If the frequency you want is 9·535MHz then that is what you enter, 9, 5, 3, 5. Press the pre/man button and whatever the rig was doing is overriden and the required frequency is entered into the receiver. From this set frequency one can scan up and down in either 1 or 0·1kHz steps at one of two speeds, be it fast or slow. Alternatively, you can either add or subtract any other frequency to the initial one and repeat this up and down the band. A most useful frequency stepping device.

Another nice point regarding scan, as long as you press the key the rig scans, when you stop, so does the rig. Perfect for station hunting.

Obviously the frequency steps and two speeds are also eminently suitable for single sideband and when you add to these impressive features four additional memories, the NCM515 is compatible with the 96 channel memory unit, then, as I said initially, the NCM515 controller improves the unimprovable.

A Christmas Message

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

And the angel said unto them, "fear not, for behold I bring you good tidings of great joy, which shall be to all people. For unto you is born this day, in the city of David, a Saviour which is Christ the Lord". And suddenly there was with the angel a multitude of the heavenly host, praising God, and saying:

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

LUKE 2 V 8 to 14

A PEACEFUL CHRISTMAS TO OUR FRIENDS

EMPORIUM NEWS

Good afternoon

Emporium News, some real goodies this month. I've been trying out new equipment left right and centre. **JRC** set me in a spin regarding the new digital controller for the NRD515 receiver. I must say that I was sceptical when I heard some months ago that they were producing a remote keypad controller, **the NCM515.** I had visions of another receiver, you know the one, keyboard controlled in a smart case. I suppose I've nothing against this rig but I've always been a knob man myself. However, the **NCM515** arrived in inlaid presentation box. No, I joke, the standard blue cardboard box with linen hinge. As I have complained before, I am forced to take home these new pieces of equipment to try before writing on them so, without a word of complaint, **the NCM515** accompanied me home and was duly plugged into the NRD515. Unbelievable, I should not have doubted JRC's ability to put together the necessary features to produce perfection. Frequency entry is logical and simple. Up and down shift obvious, frequency stepping up or down in whatever increments you want, simple! Add to this four additional memories plus stepping ranges of 1 and 0.1kHz at two different speeds and you have the NCM515. **In my opinion, the NCM515 improves the unimprovable.**

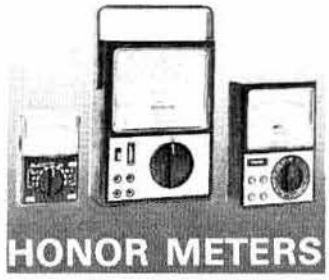
To put the piece of gear in perspective, the first shipment has all been sold to discerning NRD owners and the NCM515 has found its way on to the list of equipment which always seems to be out of stock.

Just arrived is another piece of radio equipment, again from the JRC stable. **The JST100 digitally-synthesized HF transceiver.** I have not had time to use this rig but John and Alan have had a quick tune of the bands and John's comment is that it is quite simply the best receiver he has ever handled, recalling the smooth, quite superb audio one had from earlier generation Collins equipment. Of course, the rig boasts up to the moment features now more or less standard on today's transceivers. Memories, dual VFOs, operating mode retained and switched by memory, etc. The receiver tunes in 10Hz steps and has, to give outstanding performance on today's crowded band, a notch filter and pass band tuning. All in all, a nice piece of equipment, well made and reliable in the true JRC tradition. Simple to operate and functional without resorting to excessive "styling". **In short, an "Operator's Rig".**

Now, a new piece of equipment from AOR. I am sure you remember the AOR company: their letters stand for Authority On Radio. A bit boastful some may say but not to anyone who has used the equipment. The new AOR rig is for 2 metres and is a hand-held. Built along the same lines as the AR240 and AR245, **the AR280, as the new rig is called,** features thumb-wheel frequency selection, three memories (one for special frequency offsets) 5 watts high power, 1 watt low power and, of course, the AR280 incorporates repeater shift and tone access. **The rig costs £188.00** and comes complete with charger, Nicads and flexible aerial. Optional accessories include case and speaker microphone.

You can see from what I have mentioned so far that I have had a trying time with all the new equipment. In fact, I have had to redesign my shack to include space to use the gear. My own station, a TS780 and TS700S, have had to be moved on to the top of the wardrobe and I have only been able to find space for the NRD line. Still a joy to own, to use and, to judge from the letters I have received, I am not the the only one to think that. A chap rang up only the other day to enquire about the remote controller. He said how pleased he was with **the NRD515** and that he used it just as he used to use his standard house radio. Everyone listened to it for radios 1, 2, 3 and 4 and, of course, he DXed on the shortwave bands. I suppose that is how to obtain maximum use from a piece of equipment but it says a great deal for JRC who have designed a general coverage receiver which can be used with such ease I shudder to think of some current receivers in the hands of the family. There certainly seems to be **a growing interest in shortwave reception** and many more people are finding out the pleasures that can be had from a tune around the shortwave frequencies.

Changing the subject from new equipment, and I have still two new rigs to tell you about, we are pleased to say that we are now able to supply **Strumech Towers.** I have owned a P40 tower for several years now. I consider a tower, and particularly a Strumech tower, an essential item in any self respecting amateur's equipment. What's the point of spending a lot of money on **a high technology rig with unbelievable performance** – I am, of course, speaking about **the Trio range** – then potter about with a small aerial atop some dubious pole obtained at minimum cost and bolted to the side of the house. Still engraved on my mind is the occasion that **my friend John G4ECE** assisted me to place an unwieldy aerial array atop my chimney. As all true amateurs will know, whenever you are involved with an aerial a gale force wind blows up. Well, on this occasion, John and I struggled to the top of the ladder, aerial at the top, John in the middle and myself at the bottom, well, that's what friends are for. The wind blew, the ladder shook, and down swung the array almost pulling us off the ladder. "Never mind", said John, as I straightened the elements, "I'll be back after lunch". After a period of time John returned fortified by a Ploughman's lunch and **several glasses of ale.** By himself now and with caution flung to the same howling gale, up went John and the aerial and success. All placed safely in position. So, if you want to save yourself the cost of several pints of ale, **then buy yourself a Strumech Tower** and wind it up and down all by yourself. Or, better still, do as I do and add it to the wife's daily job sheet, "5.25 p.m. wind up tower and switch on the rig" ready for husband coming home. My wife thought she would enrol for a local 'keep fit' class but that seemed to me a waste of money, better she get the exercise with the tower nightly. I am sure there are many of you who have heard me late at night shouting to the wife, up a bit or down a bit in order to achieve optimum performance!



Back to the new rigs.

From Trio a 70cm hand portable, the TR3500. Same shape and size as the TR2500 and using the same accessories. Give me a ring to discuss the specification and last, but not least, **a new general coverage receiver to replace the R1000.** The new receiver which you will have to see and hear to comprehend the outstanding performance and ease of operation. Imagine a short wave receiver with superb coverage and signal handling capabilities coupled to a system of memories, scan with programmable limits, a memory system that remembers modes and having **an optional VHF converter covering 118 to 174MHz** which actually gives the correct frequency on the digital display. Watch this space or ring for more details. The name of the rig – **the R2000** – the manufacturer: **Trio.**

Anyway, that's about it for now as I have just heard a rumour that Bill and John will be going out today to buy in the wine for our Christmas Party here at Lowe Electronics and, **being the connoisseur you all know me to be,** I want to make sure they choose the correct vintage!

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

NEW BANDS . . . . . NEW ANTENNA

Enjoy the new frequency allocations

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The NEW WESTERN DX-51 PENETRATOR covers the new bands permitted to UK operators since 1.10.82 and meets the Home Office requirements. A sae will bring you further details of this rotary dipole at £79 + VAT (£90.85)

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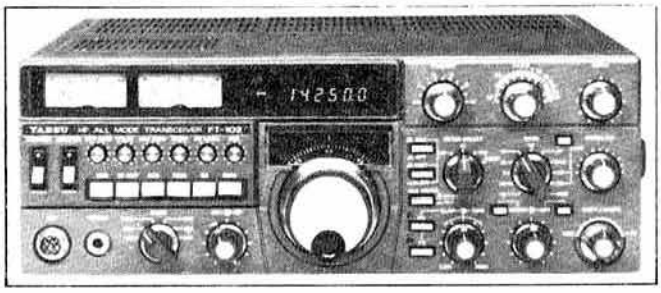
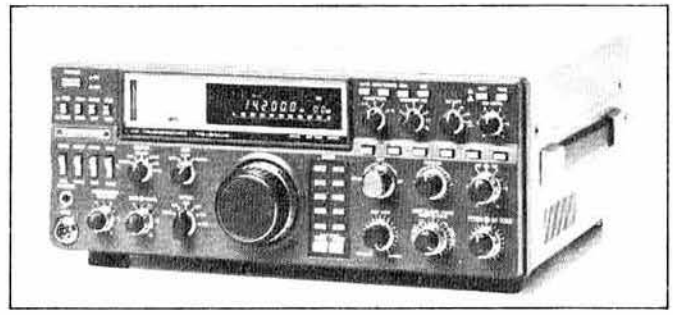


NEW! TS-930S



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1206	FRG-7	Receiver	189.00
1248	FRG-7700	Receiver	315.00
1255	FRV-7700A	Conv 118/130 130/140 140/150Mhz	69.75
1257	FRV-7700D	Conv 118/130 140/150 70/80Mhz	72.45
1254	FRT-7700	Antenna tuner	37.00
VHF Equipment			
1233	FT-227RB	2M FM 10W TCVR	179.00
1234	FT-290R	2M Multi-mode	235.00
1202	CSC-1	Case for FT-290R	3.90
1210	MMB-11	Mounting bracket 290	22.00
1211	NC-11C	Charger for FT-290R	8.00
1595	C Nicads	Set of 8 for FT-290R	21.20
1348	FL-2010	10W linear for FT-290R	62.00
1252	FT-208R	2M Hand held	199.00
1251	FT-708R	70cm Hand held	209.00
1236	FT-480R	2M All mode	360.00
1243	FT-780R	70cm Multi-mode	435.00
1220	FP-80A	AC PSU, 4.5A	59.00

1200	NC-1	Desk charger	19.00
1204	NC-2	Charger	39.00
1201	PA-1	DC Unit	19.00
1205	FP-4	AC PSU 4A, 13.8v	42.00
1258	NC-7	Base trickle charger	26.00
1253	NC-8	Base fast/trickle charger	42.00
1260	FBA-2	Battery sleeve for NC-7, NC-8	3.00
1262	NC-9C	Compact trickle charger	8.00
1349	FNB-2	Spare battery pack	17.00
1350	FL-2050	Linear amp FT-480R etc	120.00
1351	YM-24A	Spkr/Mic, FT-208/708	16.00
1241	FT-720RU	70cm FM mobile transceiver	264.00
1242	FT-720RV	2m FM mobile transceiver	239.00
1263	FT-230R	2m FM mobile transceiver	229.00
HEADPHONES, MICS, Etc.			
1208	YE-7A	Hand mic, 600 ohm	6.90
1213	QTR-240	Quartz 24hr clock	27.00
1215	YM-36	Noise cancelling mic	13.00
1214	YM-35	Hand. scanning	13.00
1352	YM-37	Hand mic	6.90
1353	YM-38	Desk scanning	24.00
1221	YD-148	Desk mic	20.00
1216	YH-55	Headphones	10.00
1217	E72-1	Remote cable for FT-720	19.50
1218	SJ72	Switching box, FT-720	52.00

TRIO-KENWOOD PRICE LIST. 2 YR WARRANTY. FREE DELIVERY.

"Carriage Free"

Cat. No		Item	Inc VAT £
1301	ST-1	Base stand/charger for TR-2400	42.94
1302	MB-2	Mobile mount for TR-2300/VB-2300	16.50
1303	SC-3	Soft vinyl case for TR-2400	10.95
1305	BO-9	Base plinth for TR-9000/TR-9500	35.00
1307	PS-20	DC PSU for TR-9000	47.95
1308	PB-24k	Spare battery pack for TR-2400	16.00
1309	MC-30S	Hand microphone, 500 ohm	12.95
1310	PS-30	DC PSU for TS-120S/130S/180S	89.00
1312	MC-50	Desk microphone, 500 ohm/50k	26.45
1315	YK-88CN	270Hz CW filter for TS-130S/830S	30.00
1316	YK-88SN	1.8kHz SSB filter for TS-130S/830S	24.50
1317	MB-100	Mobile mount for TS-130S	16.50
1318	SP-100	Matching speaker for R-1000	25.00
1319	SP-120	Matching speaker for TS-130S etc.	23.00
1321	AT-130	Antenna tuner to match TS-130S	79.00
1322	TS-130S	Solid state HF transceiver	515.00
1323	DFC-230	Dig. rem. frequ. controller	175.00
1324	TS-180S	Solid state TCVR, 160-10m	669.00
1325	AT-230	Antenna tuner to match TS-830S	119.00
1326	TS-530S	All-band HF TCVR, digital	529.00
1327	SP-230	Speaker to match TS-530S/830S	35.00
1330	TS-830S	All-band HF TCVR, digital	679.00
1332	R-1000	Gen. cov. receiver, digital	295.00
1333	DCK-1	DC operating kit for R-1000	8.26
1334	TR-2300	2m FM portable TCVR, synth	164.95
1337	TR-2400	2m FM hand portable transceiver	195.00
1338	TR-7625	2m FM 25W TCVR + memory	215.00
1341	TR-9500	70cm FM/SSB/CW mobile TCVR	440.00
1343	TR-8400	20cm FM mobile TCVR, synth	289.00
1344	DS-2	DC DC converter	39.00
1345	SMC-24	Speaker/microphone for TR-2400	15.95

SSB POWER METER
GIVES STEADY READING ON SPEECH.

The PM-2000A is an accurate means of measuring your peak envelope out put of power on SSB. The unit has been inspected by the Home Office and found suitable for its purpose. SWR measurements can also be made, but the PM-2000A does what all other SWR meters cannot do: i.e. tell you your peak output power as required in your licence.

PRICE £56.35

PM-2000A 1·5-30MHz, 2kW. PM-2001. 50-150MHz. £46

OPEN HOURS: 09.00-12.00; 13.00-17.00 Mon/Fri; SATS 09.00-12.00. **HOLIDAYS**—WE ARE CLOSED FROM 24 DEC TO 3 JAN 1983 inc.

Western Electronics (UK) ltd

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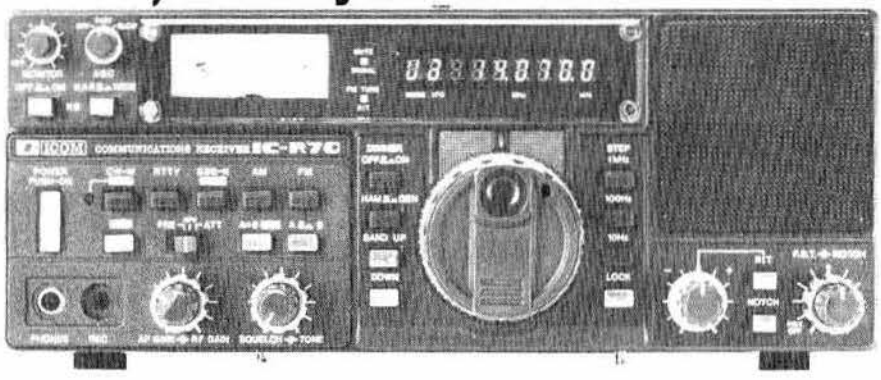
NORTHERN IRELAND: Tom and Norma Greer GI6IGR and GI6IGQ Drumbo (023126) 645

QRV? FER ICOM

IC-R70, The very latest from Icom! £469.



Now that we have tried the R70, we believe it is going to be a real winner. The R-70 covers all modes (when the FM option is included), uses 2 CPU-driven VFO's for split frequency working, and has 3 IF frequencies: 70MHz, 9MHz, 455KHz and a dynamic range of 100dB.

Other R-70 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 μv for 12dB (S+N)÷N, Am-0.5μv, FM better than 0.32 for 12dB Sinad. DC is optional on the R-70. It has a built-in mains supply.

The IC-R70 measures 286mm x 110mm x 276mm and weighs 7.4Kg., making it a very attractive package indeed. Are you ready for this truly excellent receiver? You must hear it, we know you will be impressed!

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Introducing the NEW IC-740

This latest transceiver contains all the most asked-for features, in the most advanced solidstate HF base station on the amateur market...performing to the delight of the most discerning operator.

Study the front panel controls of the ICOM IC-740. You will see that it has all of the functions to give maximum versatility to tailor the receiver and transmitter performance to each individual operator's requirements.

Features of the IC-740 receiver include a very effective variable width and continuously adjustable noise blanker, continuously adjustable speed AGC, adjustable IF shift and variable passband tuning built in. In addition, an adjustable notch filter for maximum receiver performance, along with switchable receiver preamp, and a selection of SSB and CW filters. Squelch on SSB Receive and all mode capability, including optional FM mode. Split frequency operation with two built-in VFO's for the serious DX'er.

The IC-740 allows maximum transmit flexibility with front panel adjustment of VOX gain and VOX delay along with ICOM's unique synthesized three speed tuning system and rock solid stability with electronic frequency lock. Maximum versatility with 2 VFO's built in as standard, plus 9 memories of frequency selection, one per band, including the new WARC bands.

With 10 independent receiver and 6 transmitter front panel adjustments, the IC-740 operator has full control of his station's operating requirements.

See and operate the versatile and full featured IC-740 at your authorized ICOM dealer.

Options include:
- FM Module
- Marker Module
- Electronic Keyer
- 2 - 9MHz IF Filters for CW
- 3 - 455MHz Filters for CW
- Internal AC Power Supply

Accesories
- SM5 Desk Microphone
- UP/DWN Microphone
- Linear Amplifier
- Autobandswitching Mobile Antenna
- Headphones
- External Speaker
- Memory Backup Supply
- Automatic Antenna Tuner

IC-730 The best for mobile or economy base station £586.inc.

ICOM's answer to your HF mobile problems – the IC-730. This new 80m–10m, 8 band transceiver offers 100W output on SSB, AM and CW. Outstanding receiver performance is achieved by an up-conversion system using a high IF of 39MHz offering excellent image and IF interference rejection, high sensitivity and above all, wide dynamic range. Built in Pass Band Shift allows you to continuously adjust the centre frequency of the IF pass band virtually eliminating close channel interference. Dual VFO's with 10Hz, 100Hz and 1kHz steps allows effortless tuning and what's more a memory is provided for one channel per hand. Further convenience circuits are provided such as Noise Blanker, Vox, CW Monitor APC and SWR Detector to name a few. A built in Speech Processor boosts talk power on transmit and a switchable RF Pre-Amp is a boon on today's crowded bands. Full metering WWV reception and connections for transverter and linear control almost completes the IC-730's impressive facilities.

And NOW the 70cm version IC-45E. £269.inc.

Amazingly small, yet very sensitive. Two VFO's, five memories, priority channel, full duplex and reverse. LED S-meter, 25KHz or 5KHz step tuning. Same multi-scanning functions as the 290 from mic or front panel. All in all the best 2M and 70cm FM mobiles ICOM have ever made.

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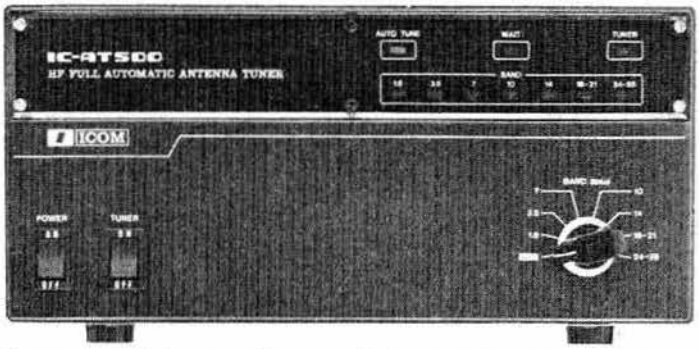
IC-AT500 Automatic antenna tuner £299.inc.
100W version AT100 £249.inc.



The Automatic Antenna Tuners which put all the others to shame.

It was only when we started to use the new fully automatic antenna tuners from ICOM that we realised just how far ahead of their competitors they are! The very fast tune up time and simplicity of use make them a real worthwhile addition to any station even if the rest of your station isn't ICOM. If it is, then you have the added advantage of fully automatic band selection so that you can virtually hide it away in a cupboard if you want (though we think you will want to show it off).

Apart from its very rapid action and auto band selection facilities it will select the correct antenna for the band (up to four). The new bands are covered of course, but the AT100 does not cover topband, whereas the AT500 does.

Dual accessory sockets are supplied so that you can easily chain your IC-720A, (or IC-701 or IC-730) together with the IC-2KL and AT-500 to produce what must be one of the most advanced automatic stations available.

Why not call us for more details or get your dealer to demonstrate one to you today?

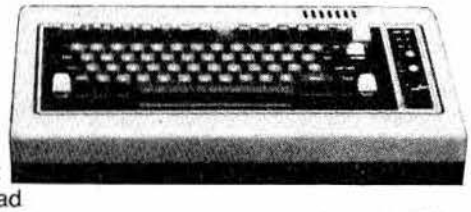
IC-2KL Super Linear £839.inc.
Matching power supply IC-2KLPS £211.inc.

To compliment the excellent IC-720A HF Transceiver, ICOM have produced the IC-2KL linear amplifier. It is of a similar size and matches the IC-720A perfectly. It produces 500W output on SSB, CW, AM and RTTY needing 80-100W of drive. As with the IC-720A it will operate from 1.6MHz to 30MHz continuously at full output power, but you still need an antenna that matches. It will follow the IC-720A automatically changing bands WITH NO TUNING – the operating is done from the prime-mover.

This automatic facility can be overriden for use on rigs other than the IC-720A, but can be added to the IC-701, IC-730, IC-74O The IC-2KL employs a heat pipe cooling system for the heatsink of the power transistors. This is a new technology used to transfer the heat, and has a high conductance, several hundred times that of copper, plus a very quick response.

The IC-2KL has a matching power supply the IC-2KLPS delivering 40vDC at 25A continuous for 10 minutes maximum.

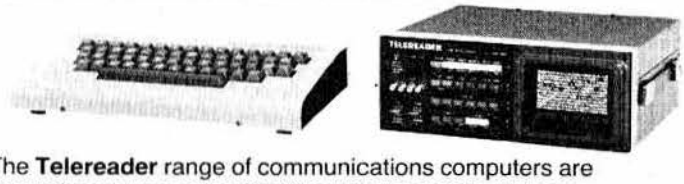
Tono RTTY and CW computers 9000E-£650.inc.



The TONO range of communication computers take a lot of beating when it comes to trying to read RTTY and CW in the noise. Others don't always quite make it!

Check the many facilities offered before you buy – especially look at the 9000E which also throws in a Word Processor. Call us for further information and a brochure?
Receive only version **Tono 550 – £299.inc.**

NEW! £699.inc. with built-in VDU.



The **Telereader** range of communications computers are becoming very popular right through the range. All have composite video and UHF output for use with a TV set. Add a new dimension to your short wave listening.

CWR685E Send/receive with VDU and Keyboard **£699**
CWR-670 Delux rx only version with CW and six selectable baud rates – 3 shifts **£259**
CWR-610 "Morse Master" Rx only (but it does RTTY also-3 baud rates). Key socket and built in oscillator for morse practice. **£198**

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IC-720A. Possibly the best choice in HF. £883.inc.

The main problem that the amateur of today has to deal with is deciding just which rig out of the many excellent products available he is going to choose. Technology is advancing at such a rapid rate and getting so sophisticated that many cannot hope to keep up. Some go too far!

Perhaps one way of dealing with the problem is to look at just What each model offers in its basic form without having to lay out even more hard earned cash on "extras". The IC-720A scores very highly when looked at in this light. How many of its competitors have two VFOs as standard or a memory which can be recalled, even when on a different band to the one in use, and result in instant returning AND BANDCHANGING of the transceiver? How many include a really excellent general coverage receiver covering all the way from 100kHz to 30MHz (with provision to transmit there also if you have the correct licence)? How many need no tuning or loading whatsoever and take great care of your PA, should you have a rotten antenna, by cutting the power back to the safe level? How many have an automatic RIT which cancels itself when the main tuning dial is moved? How many will run full power out for long periods without getting hot enough to boil an egg? How many have band data output to automatically change bands on a solid state linear AND an automatic antenna tuner unit when you are able to add these to your station?

Well you will have to do quite a bit of hunting through the pages of this magazine to find anything to approach the IC-720A. It may be just a little more expensive than some of the others – but when you remember just how good it is, and of course the excellent reputation for keeping their secondhand value you will see why your choice will have to be an IC-720A!

CUE DEE antennas

The BEST in recent tests and really well made too. Send for a catalogue of these DX antennas. Here's part of the range:-

4el 2m yagi VHF	4144A	8 dBd	£24.93
10el 2m yagi VHF	10144	11.4 dBd	£45.16
15el 2m yagi VHF	15144	14 dBd	£63.00
17el 70cm yagi UHF	17432	14.5 dBd	£48.00
4/5el HF Beam	DUO 2	(14/21 MHz) 9/8 dBd	£356.71

All matching cables, clamps and booms available for stacking 10 and 15 element yagis.

The World's most popular portables IC-2E £159.inc. IC-4E £199.inc.

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

Fully synthesized – Covering 144 – 145.995 in the 400 5KHz steps. (430-439.999 4E).

Power output – 1.5W with the 9v. rechargeable battery pack as supplied – but lower or higher output available with the optional 6v or 12v packs. Rapid slide-on charging facility.

BNC antenna output socket – 50 ohms for connecting to another antenna or use the Rubber Duck supplied (flexible ¼ whip – 4E)

Send/battery indicator – Lights during transmit but when battery power falls below 6v it does not light, indicating the need for a recharge.

Frequency selection – by thumbwheel switches, indicating the frequency. 5KHz switch – adds 5KHz to indicated frequency.

Duplex simplex switch – gives simplex or plus 600KHz or minus 600KHz transmit (1.6MHz and listen input on 4E).

Hi-Low switch – reduces power output from 1.5W to 150mW reducing battery drain.

External microphone jack– If you do not wish to use the built-in electret condenser mic an optional microphone speaker with PTT control can be used. Useful for pocket operation.

External speaker jack – for speaker or earphone. This little beauty is supplied ready to go complete with nicad battery pack, charger, rubber duck.

A full range of accesories in stock.		£ p
ICML1	10W mobile booster for IC2E	49.00
BP5	11 volt battery pack	30.00
BP4	Empty battery case for 6 x AA cells	5.80
BP3	Standard battery pack	17.70
BP2	6 volt pack	22.00
BC30	Base charger for above	39.00
BC25	Mains charger as supplied	4.25
DC1	12 volt adapter pack	8.40
HM9	Speaker microphone	12.00
CP1	Mobile charging lead	3.20
IC123	cases	3.60
All prices include VAT		each

Fully approved marine version now available £199.+VAT.

ICOM are proud to introduce the IC-M12 which is the Marine version of the worlds most popular portable, the IC-2E. It uses all the same accessories, has the same exceptional receiver sensitivity and versatility of the 2E and it is HOME OFFICE APPROVED. 12 Channels – Synthesised – No Crystals to buy!

12 programmable channels which include the private ones

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Great base stations IC-251 £499.inc./IC-451 £599.inc.

ICOM produce a perfect trio in the UHF base station range, ranging from 6 Meters through 2 Meters to 70 cms. Unfortunately you are not able to benefit from the 6m product in this country, but you CAN own the IC-251E for your 2 Meter station and the 451E for 70 cms.

Both are really well designed and engineered multi-mode transceivers capable of being operated from either the mains or a 12 volt supply. Both contain such exciting features as scan facilities, automatic selection of the correct repeater shift for the band concerned, full normal and reverse repeater operation, tuning rate selection according to the mode in use. VOX on SSB continuous power adjustment capability on FM and 3 memory channels. Of course they are both fitted with a crystal controlled tone burst and have twin VFO's as have most of ICOM's fully synthesized transceivers. There is now a superb low noise mast head pre-amp available for the IC-451.

Multimode mobiles IC-290E £366./IC-490E £445.inc.

10W RF output on SSB, CW and FM. Standard and non-standard repeater shifts. 5 memories and priority channel.

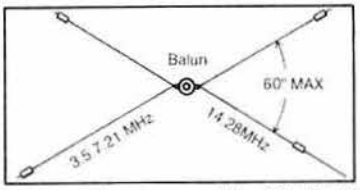
Memory scan and band scan, controlled at front panel or microphone. Two VFO's LED S-meter 25KHz and 1KHz on FM – 1KHz and 1000KHz tuning steps. Instant listen input for repeaters.

Agents Agents (phone first – all evenings and weekends only, except Scotland).
Scotland – Jack GM8 GEC (031 665 2420)
Midlands – Tony G8AVH (021 32 - 2305)
North West – Gordon G3LEQ Knutsford (0565) 4040
Ansafone available.

Ever thought about 50MHZ??

As you know, the Home Office have given permission for the 50MHZ band to be used to holders of special licences – the issue of which is to be controlled by the RSGB. This must be one of the most exciting things that has happened to the Radio Amateur since the invention of sliced bread (or should I say the micro-processor?). As you know, there are many countries in the world who already have 50MHZ – so there is already some exciting equipment available. One of these is the ICOM IC-505 which is a multi-mode portable offering a choice of outputs of 3W (portable) or 10W (fixed). We have imported a few of these excellent little transceivers and they are available at **£299. inc. VAT** so why not think about trying out this excellent band? Call us or send for technical details.

A new trap dipole £49.50.inc.



The MT-240X Multi-band trap dipole antenna (80m – 10m) is a superbly constructed antenna with its own Balun incorporated in the centre insulator with an SO239 connector. Separate elements of multi-stranded heavy duty copper wire are used for 80-40-15 and 20-10 Metres.

Really one up on its competitors £49.50 inc. VAT.

Available nationwide through local dealers a selection of which are listed below:

Tyrone Amateur Electronics N. Ireland (0662) 2043
Bredhurst Electronics Sussex (0444) 400786
Photo-Acoustics Ltd. Bucks (0908) 610625
S & S Amateur Radio Lancs (07) 744 22239
Alyntronics Tyne & Wear (0632) 761002
Fanthorpes Humberside (0482) 223096
LAM Electronics Glos (0242) 43891
Booth Holdings Avon (02217) 2402
Telecom S Yorks (0226) 5031
Gemini Lancs (0204) 652233
Poole Logic (0202) 683093

Securicor or post dispatch free.

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143 Reculver Road, Herne Bay, Kent. Tel: (02273) 63859.

Same day despatch if possible.

WATERS & STANTON ELECTRONICS

18/20 MAIN ROAD, HOCKLEY, ESSEX. Tel: (0702) 206835

IF PRICES & QUALITY ARE IMPORTANT — — —

— — — READ ON!

EASY ORDER FORM ON PAGE 472

T1200 ★ SPECIAL THIS MONTH ★ £149

- 142-148MHz FM
- 3 Watts or 1 Watt
- Programmable steps 5kHz-100kHz
- 10 memory channels
- Comprehensive scanning
- Ni-cad battery pack
- AC mains charger

Accessories: case and speaker mic

PALM II (mkII) £109

- 140MHz-150MHz FM
- 6 xtal controlled channels
- 600kHz repeater shift
- S20 and S22 fitted
- 1 Watt output
- Ni-cad battery pack
- AC mains charger

2M and 70cms — — — — — — — THE SENSIBLE APPROACH

70cms EXPANDER £199 2m M750E £259 PS750 AC PSU £66

With money getting tighter it's quite amazing that people will spend up to £800 in order to run all-modes on both 2m and 70cms Two separate all-mode rigs for 70cms and 2m may be a luxury but at a price. Not surprisingly more and more people are realising the true versatility in the M750E concept. Even the basic 2m all-mode M750E makes an £80 saving over the competition. Then for less than £200 you can enjoy all-modes on 70cms. That's half the price of any comparable all-mode rig. So forget the expensive options, get yourself an M750E set up and with the money you've saved, give the family a holiday—that's something that will meet with instant XYL approval!

*** Special price on M750E—£259 ***

GUARANTEED SAME DAY DESPATCH !

ON ALL IN STOCK ITEMS BARCLAYCARD & ACCESS TELEPHONE ORDERS WELCOMED

MONEY SAVERS

1kW 5-BAND DIPOLE with feeder

At last a 5-band dipole. Our unit is complete with 1kW traps, 14swg alloy wire, centre and end insulators, 50ft of UR43 with PL259, nylon rope and sundry wire clamps etc. Limited stocks at this price. These really are first class units that are beautifully finished and fully corrosive resistant.

80-10m 118ft long £39 p&p £2

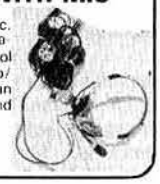
Ideal for use with WELZ AC38 ATU

NEW ADONIS MICS

Two new Adonis microphones for the modern generation of equipment. Both have high quality condensor inserts, feature up/down buttons for remote frequency control and have switchable response for FM/SSB. The 503 model also features a dual level compressor.

AM 303 £27.00 AM 503 £35.00

ADONIS HEADSET WITH MIC



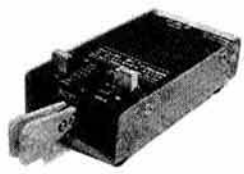
At last, a quality headset and boom mic. purpose made by Adonis for Amateur Radio. Included is a Tx/Rx control box ideal for mobile operation with up/down frequency control buttons. Can equally be used for base stations and matches all current sets.

MM 202HM £39.00

CW ENTHUSIASTS—HOW'S THIS FOR VALUE? £31.95

Model EK121

Yes, it's true, this little unit has all the features you would expect from something costing a lot more. Built in paddle, dot memory for easy sending, semi- or fully-automatic switch settings, variable speed control, LED indicators, etc. It matches all modern transceivers and comes complete with instructions and can be either self-powered from HP7 cells or external DC supply.



COMPLETE MORSE TRAINING KIT

Following our successful offer last year, we've put together another little morse training kit. It comprises professional quality morse key, morse oscillator and RSGB morse code handbook. Send for yours today—it's a sound investment.

£19.95

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WELZ®

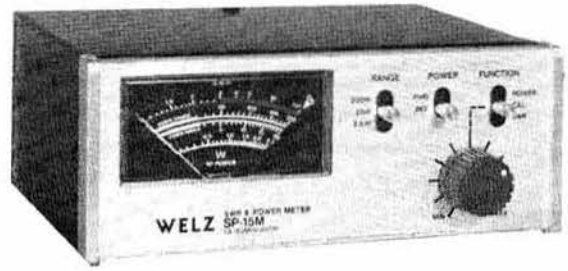
SIMPLY THE BEST!

AVAILABLE FROM US OR ALL GOOD AMATEUR RADIO DEALERS

PROFESSIONAL POWER METERS

SP200: Frequency range 1·8–160MHz; 20/200/1000 watts **£59**
SP300: Frequency range 1·8–500MHz; 20/200/1000 watts **£79**
SP400: Frequency range 130–500MHz; 5/20/150 watts **£59**

BUDGET LINE METERS



SP15M: Frequency range 1·8–150MHz; 2½/20/200 watts **£29**
SP45M: Frequency range 140–470MHz; 3/20/100 watts **£45**

SWITCH TO WELZ!

SO239 SOCKETS **£15.95**
N SOCKETS **£27.95**

Users of *Welz* equipment will already be familiar with the fine workmanship and performance of these products. Perhaps one of the finest products they have recently produced is the 2-way coaxial switch. Beautifully machined and weighing over 1lb, this switch boasts a cross-talk better than 60dB, insertion loss of 0·1dB, and is rated to 1300MHz. With a power handling capacity of 1kW this will cater for all normal amateur radio station requirements. We know of no other switch anywhere near this price that can match its performance.

A PERFECT MATCH WITH WELZ!

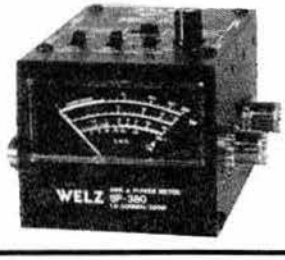
AC38 Frequency range 8 bands 3·5–29MHz
Coax Feeder 400 watts 50 ohms
Matches 20–300 ohms

£59

NEW MODELS

1·8–500MHz

* 1·8–500MHz
* 20W and 200W power ranges
* Measures power and SWR
* Completely flat frequency response
* Dual range sensors



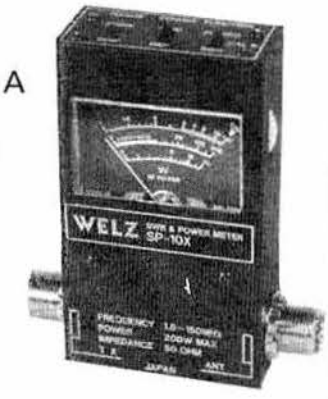
SP-380
£49

THE NEW HANDY METER

SP-10X £19.95

NOW EVERYBODY CAN AFFORD A WELZ POWER METER— ACKNOWLEDGED AROUND THE WORLD AS PRODUCTS OF SUPERIOR PERFORMANCE

* 1·8–150MHZ
* 20W and 200W power ranges
* Measures power and SWR
* Completely flat frequency response
* SWR sensitivity 3 watts



NEW FROM WELZ! AVAILABLE 1983

SP600—NEW 2KW POWER METER
TP05X—HANDHELD DUMMY LOAD/POWER METER
+ NEW "DIAMOND" RANGE OF VHF/HF ANTENNAS

WATERS & STANTON ELECTRONICS

18-20, MAIN ROAD, HOCKLEY, ESSEX TEL: (0702) 206835/204965

		Price Inc. VAT	Carr. & Ins.
FDK RANGE			
M.700EX	2m FM 25 watt.	189.00	n/c
M.750E	2m FM/SSB/CW 10w.	259.00	n/c
Expander	70cm transverter	199.00	n/c
PS750	230v AC power supply	66.00	n/c
Palm II	2m FM 6 channel	109.00	n/c
Palm IV	70cm FM 6 channel	125.00	n/c
TB1	1750Hz tone burst	10.00	0.50
TM56B	2m FM 230v/12v DC scanner	89.00	n/c
TM56B	Marine version	89.00	n/c
FDK	12v DC leads	2.75	0.65
CC2	Case for Palm II/IV	6.75	0.75
BC2	230v AC charger	4.50	0.75
BB2	"AA" size battery case	5.00	0.75
BT2	Ni-cad battery pack	12.00	0.75
Xtals	for Palm II and Palm IV	3.00	0.25
Xtals	for TM56B	3.00	0.25
T1200	2m synthesised handheld	159.00	n/c
SNAP-1	Joining plates. M750/Expander	7.95	1.00
AZDEN RANGE			
PCS3000	25w 2m FM trans.	179.00	n/c
PCS300	2m synthesised handheld	179.00	n/c
ECK	5m cable kit	25.00	n/c
AS006	Mobile extension speaker	8.95	1.00
DX-354	Deluxe base station mic.	29.00	1.50
WELZ PROFESSIONAL POWER/ SWR METERS & ACCESSORIES			
SP200	1·8-160MHz 20w-200w-1kw	59.95	n/c
SP300	1·8-500MHz 20w-200w-1kw	79.95	n/c
SP400	130-500MHz 5w-20w-150w	59.95	n/c
SP15M	1·8-160MHz 5w-20w-200w	29.95	n/c
SP380	1·8-500MHz 200w	49.95	n/c
SP10X	1·8-160MHz 200w	£19·95	n/c
AC38	3·5-30MHz Coax ATU	59.00	n/c
CT15A	50w dummy load	6.95	0.75
CT15N	15/50w dum load, N Plug	11.95	0.75
CT150	150/400w dummy load	31.00	n/c
CT300	300/kw dummy load	43.00	n/c
CH20A	2 way coax switch	15.95	n/c
CH20N	2 way coax switch "N"	27.95	n/c
ADONIS MICROPHONES			
MM202S	Safety mic. Lapel type	20.95	1.00
MM202HD	Safety mic. head band	29.00	1.00
MM202HM	Headphone & Mic.	39.00	1.00
NEW AM303	Base station mic.	27.00	1.00
NEW AM503	Base station mic.	35.00	1.00
AM802	Base station mic.	49.00	1.00
TRIO			
NEW TS930S	Solid state transceiver	1,078.00	n/c
TS830S	160-10m transceiver	694.00	n/c
VFO230	Digital VFO	215.00	2.00
AT230	All band ATU	119.00	2.00
SP230	External speaker unit	34.95	1.75
DS2	Optional dc pack	43.95	1.75
DFC230	Digital remote controller	179.00	1.75
YK88C	500Hz CW filter	29.60	0.75
YK88CN	270Hz CW filter	32.60	0.75
SM220	Station monitor scope	198.00	5.00
BS8	Panoramic display module	44.85	1.50
TS530S	160-10m transceiver	534.00	n/c
VFO240	External VFO	92.50	5.00
TS130S	8 band 200w pep mobile	525.00	n/c
TS130V	8 band 20w pep mobile	445.00	n/c
TL120	200w pep linear for TS120V	144.00	2.00
MB100	Mobile mount for TS130	17.00	1.50
VFO120	External VFO	85.00	2.00
SP120	Base station speaker	23.00	2.00
SP40	New mobile speaker unit	12.40	1.00
AT130	100w antenna tuner	79.12	1.50
PS20	AC power supply 4 amps	49.45	3.00
PS30	AC power supply 20 amps	88.50	5.00
MA5	Trio 5 band mobile aerial	88.75	3.25
MC50	Deluxe desk mic.	25.75	1.50
MC35S	Fist microphone 50k	13.80	0.75
MC30S	Fist microphone 500ohm	13.80	0.75
MC40S	Up/down microphone	13.80	0.75
LF30A	HF low pass filter	17.90	1.00
RD300	1kw dummy load	52.20	2.00
NEW TS780	2m/70cm transceiver	748.00	n/c
TR9000	2m multimode transceiver	359.00	n/c
TR9130	2m multimode 25w	395.00	n/c
BO9	Base plinth for TR9000	34.95	1.50
TR7730	Compact 25w 2m FM tcvr	247.00	2.00
TR7800	2m FM 25w transceiver	257.00	2.00
TR2300	2m FM portable tcvr	166.75	2.00
VB2300	10w amplifier for TR2300	58.00	1.50
MB2	Mobile mount	17.70	1.00
RA1	Rubber flexible antenna	6.90	0.75
PS1200	AC power supply unit & charger	29.50	1.50
NEW TR2500	Compact 2m FM h'held	207.00	2.50
ST2	Base stand charger	46.00	1.75
SC4	Soft case	12.00	0.75
MS1	Mobile stand/trickle chgr	28.00	1.25
SMC25	Speaker microphone	14.50	0.75
PB25	Spare battery pack	22.30	0.75
LH2	Deluxe leather case	21.30	0.75
TR8400	70cm FM mobile tcvr	299.00	2.00
PS10	Base station power supply	64.00	2.50
TR9500	70cm multimode tcvr	449.00	n/c
PL1	Charger lead for TR2300	1.30	0.75
R1000	Synthesised 200kHz-30MHz receiver	297.00	n/c
SP100	External speaker unit	26.90	2.00
HC10	Digital station clock	58.75	1.50
HS5	Deluxe headphones	21.85	1.25
HS4	Economy headphones	10.35	1.25
NEW R600	Synthesised 150kHz-30MHz receiver	235.00	n/c
DM81	Dip resonance meter	60.00	1.50
DL705	Digital multimeter	80.00	1.50
MC76	Case for DL705	4.95	1.00

SERVICE

"YES IT DOES GO WRONG SOMETIMES"

Even the best equipment goes wrong and you want to be in a position whereby you are assured that any faults can be rectified quickly and efficiently. At Hockley we have a well equipped, full-time service department to give you just that re-assurance. It's only when things go wrong that you begin to tell the "men from the boys" in the retailing world. Our policy is quite simple. We will service any equipment that we sell both in and out of warranty and do our utmost to get the work completed as fast as is humanly possible. Minor faults we will try and do whilst you wait but do please telephone before making a journey to us so that we can make sure it can be fitted into our day's schedule.

YAESU			
NEW FT102	All band transceiver	725.00	n/c
KEYT901	Curtis keyer	23.00	0.75
DCT1	DC lead	6.50	0.75
RAMT1	Memory board	10.00	0.75
FMUT1	F.M. Unit	t.b.a.	0.75
XF8.9KCN	300Hz CW filter	15.35	0.75
XF8.9KC	600Hz CW filter	15.35	0.75
XF8.9KA	6kHz AM filter	15.35	0.75
XF10.7KC	CW filter	13.80	0.75
FT902DM	9 band AM/FM transceiver	885.00	n/c
FT902DE	9 band transceiver	790.00	n/c
FC902	9 band atu SWR/PWR etc	135.00	5.00
FTV901R(2)	Transverter fitted 2m mod	285.00	5.00
FTV901R	T'verter main frame only	195.00	5.00
430TV	70cms module for tvtr	185.00	2.00
144TV	2m module for transverter	100.00	2.00
70TV	4m module for transverter	80.00	2.00
YO91P	Monitor scope with pan. adaptor	330.00	5.00
FV901DM	Remote vfo for 901	260.00	5.00
SP901	External speaker	31.00	2.00
FL2100Z	160-10m 1200w linear	425.00	n/c
FT101ZFM	160-10m 9 band transc.	590.00	n/c
FT101ZDFM	As above with digital readout	665.00	n/c
DCT101Z	12v DC adaptor	42.50	1.50
FV101Z	Remote VFO for FT101Z/ZD	112.00	5.00
FV101DM	External Digital VFO	249.00	5.00
FANT101	Fan for 101 series	13.80	1.00
FT707	80-10m 8 band transceiver	569.00	n/c
FP707	230v AC for FT707	125.00	5.00
MR7	Metal rack for FT707	15.70	2.00
MMB2	Mobile mounting bracket	16.00	1.50
FV707DM	Digital VFO	203.00	5.00
FL110	100w linear amplifier	155.00	5.00
FRG7	General Coverage rcvr	199.00	n/c
FRG7700	Gen. co. receiver	309.00	n/c
MEMGR7700	Memory module	90.00	1.00
DCRG7700	DC modification kit	1.15	0.50
FRT7700	Antenna tuner	37.00	1.50
FF5	Low pass filter	9.95	0.75
VHF Converters for FRG7700:			
	FRV7700 'A' 118-130; 130-140; 140-150MHz	69.75	1.50
	FRV7700 'B' 118-130; 140-150; 50-59MHz	75.50	1.50
	FRV7700 'C' 140-150; 150-160; 160-170MHz	65.95	1.50
	FRV7700 'D' 118-130; 140-150; 70-80MHz	72.45	1.50
	FRV7700 'E' 118-130; 140-150; 150-160MHz	71.30	1.50
	FRV7700 'F' 118-130; 150-160; 170-180MHz	71.30	1.50
FT208R	2½watt 2m h'held tcvr	209.00	1.50
FT708R	1 watt 70cms h'held tcvr	219.00	1.50
FNB2	Nicad battery pack	17.25	0.75
NC9C	Slow charger unit	8.00	0.75
PA3	12v charger unit	13.40	0.75
MMB10	Mobile bracket	6.50	0.75
FT290R	2m all-mode portable	249.00	n/c
FT790R	70cms all-mode portable	t.b.a.	1.00
NC11C	Charger for FT290R	8.00	1.00
CSC-1	Carrying case	3.45	0.75
MMB-11	Mobile mounting bracket	22.25	1.50
FL2010	10 watt linear	64.00	2.00
NC/WSE	2amp hour ni-cad pack	20.00	1.75
FT480R	2m 10 watt SSB/CW/FM transceiver	379.00	n/c
FP80A	230v AC power supply	63.25	2.00
FL2050	50 watt linear	126.50	2.00
FT780R	70cms all-mode tcvr	449.00	2.00
YAESU ACCESSORIES			
YM21	Hand mic. 600ohm 4 pin	13.80	0.75
YM24A	Hand mic. 2K ohm 6 pin	16.85	0.75
YM34	Desk mic. 500/50K ohm 8 pin	21.45	1.50
YM35	Hand mic. 8 pin scanning. 600ohm	13.80	0.75
YM36	Hand mic. 8 pin n/c. 600ohm	13.05	0.75
YM37	Hand mic. 600ohm 8 pin	6.90	0.75
YM38	Desk mic. 600/50K ohm 8 pin	24.90	1.50
YM39	600ohm 7 pin hand speaker/mic.	14.95	0.75
YE7A	Hand mic. 600ohm 4 pin	6.90	0.75
YD148A	Desk mic. 600/50k ohm 4 pin	21.10	1.50
YD844A	Desk mic. 600/50k ohm	25.30	1.50
FP4	230v/4 amp 12v psu	42.95	2.00
FP12	230v/12 amp 12v psu	86.25	5.00
YH55	8ohm communication headphones	10.00	1.00
YH77	Lightweight headphones	10.00	1.00
QTR24D	24 hour World clock	28.00	1.50
FF501DX	Low pass filter 2kw	23.00	1.50
YP150Z	Dummy load/wattmeter	92.00	1.50
ICOM			
IC740	HF transceiver 100W	699.00	n/c
FL30	SSB Pass band tune filter	24.70	0.75
FL44	Hi Q 455kHz xtal filter	t.b.a.	0.75
FL45	CW Narrow xtal filter	34.20	0.75
EX202	LDA unit for above	t.b.a.	0.75
EX203	CW Audio filter	11.60	0.75
EX205	Transverter controller	10.50	1.00
IC720A	HF transceiver + Gen. Cov. Rcvr.	883.00	n/c
PS20	PSU for above with speaker	130.00	5.00
PS15	PSU no speaker	99.00	5.00
FL32	CW narrow filter	29.30	0.75
FL34	AM filter	23.40	0.75
BC10A/E	Mains memory backup	5.30	0.75
IC2KL	Matching HF linear 500W	839.00	n/c
IC2KLPS	PSU for above	211.00	5.00
ICAT500	1·8-30MHz auto tuner	299.00	5.00
ICAT100	3·5-30MHz auto tuner	249.00	5.00
IC451E	70cm FM + SSB base stn	630.00	n/c
IC251E	2m FM + SSB base stn	499.00	n/c
IC290E	2m Multimode mobile 10W	366.00	n/c
IC490E	70cm multimode mobile	445.00	n/c
IC25E	2m FM mobile 25W	259.00	n/c
IC2E	2m FM handy talky	159.00	n/c
IC4E	70cm hand portable	199.00	n/c
ICML1	10 watt mobile booster	49.00	1.00
BP5	11 volt battery pack	30.50	0.75
BP4	Battery box for 6 × AA	5.80	0.75
BP3	Standard battery pack	17.70	0.75
BP2	6 volt pack	22.00	0.75
BC30	Base charger for above	39.00	0.75
BC25	Mains charger as supplied	4.25	0.75
DC1	12 volt adaptor pack	8.40	0.75
HM9	Speaker/Microphone	12.00	0.75
CP1	Mobile charging lead	3.25	0.75
LC1/2/3	Cases each	3.50	0.75
IC202S	2m SSB portable tcvr.	169.00	n/c
IC402	70cm SSB portable tcvr.	245.00	n/c
ICSP2/3	External speaker	29.00	1.50
IC3PE	3 amp psu + speaker	64.90	1.50
ICSM2	Desk mic. 4 pin plug	29.00	1.50
ICSM5	Desk mic. 8 pin plug	29.00	1.50
ICHM3	Hand mic.	12.00	0.75
ICHM5	N/C mic. as above	20.00	0.75
ICHM7	Hand mic.	12.00	0.75
ICHM10	Scan mic.	20.00	0.75
LOWE RECEIVERS			
SRX-30	General Coverage HF receiver	158.00	n/c
SRX-30D	SRX30 with dig readout	195.00	n/c

MICROWAVE MODULES RANGE

MML28/100-3	10m 100w linear/preamp	129.95	2.00
MML70/50S	4m 50 watt linear/preamp	85.00	1.25
MML70/100-S	4m 100 w linear/preamp	139.00	2.00
MML144/30L-S	1-3 w I/P 30 w O/P	69.95	1.75
MML144/50S	2m 50 w linear/preamp	85.00	1.25
MML144/100-S	2m 100 w linear/preamp	139.95	2.00
MML144/100LS	2m 100 w (1 or 3w i/p)	159.00	2.00
MML432/20	70cm 20 w linear/preamp	85.00	1.25
MML432/50	70cm 50 w linear/preamp	109.00	2.00
MML432/100	70cm 100 watt linear	228.65	2.00
MML1296/10	23cm 10 watt linear	199.00	1.25
MMC435/51	70cm ATV converter	37.90	0.75
MMC435/600	70cm ATV converter	27.90	0.75
MTV435	70cm ATV 20 watt tx	149.00	1.25
MM1000	ASCII to morse converter	69.95	1.25
MM1000KB	Morse converter with keyboard	99.95	2.00
MM2001	RTTY to TV converter	189.00	1.25
MM4000	RTTY transceiver	269.00	1.25
MM4000KB	with keyboard	299.00	2.00
MMS1	The MORSETALKER	115.00	1.25
MMS2	Advanced morse trainer	169.00	1.25
MMT28/144	10m transverter	109.00	1.25
MMT70/28	4m transverter	119.95	1.25
MMT70/144	4m transverter	119.95	1.25
MMT144/28	2m transverter	109.95	1.25
MMT432/28-S	70cm transverter	159.95	1.25
MMT432/144-R	70cm transverter	184.00	1.25
MMT1296/144	23cm transverter	184.00	2.00
MMC28/144	10m to 2m converter	29.90	0.75
MMC50/28	6m to 10m converter	29.90	0.75
MMC70/28	4m to 10m converter	29.90	0.75
MMC70/28LO	4m to 10m converter	32.90	0.75
MMC144/28	2m to 10m converter	29.90	0.75
MMC144/28LO	2m to 10m converter	32.90	0.75
MMC432/28-S	70cm to 10m converter	37.90	0.75
MMC432/144-S	70cm to 2m converter	37.90	0.75
MMC1296/28	23cm to 10m converter	34.90	0.75
MMK1296/144	23cm to 2m converter	69.95	0.75
MMK1691/137.5	1691MHz Meteosat converter	129.95	1.25
MMA28	10m low noise preamp	16.95	0.75
MMA144V	2m RF switched preamp	34.90	0.75
MMA1296	23cm low noise preamp	34.90	0.75
MMD050/500	500MHz digital meter	75.00	0.75
MMD600P	600MHz prescaler	29.90	0.75
MMDP1	Counter amplifier/probe	14.90	0.75
MMF144	2m bandpass filter	11.90	0.75
MMF432	70cm bandpass filter	11.90	0.75
MMR15/10	15dB, 10 watt attenuator	11.90	0.75

DATONG

PC1	General Cov. Converter	137.42	n/c
VLF	VLF converter 28-29MHz coverage	29.90	n/c
FL1	Agile audio filter	79.35	n/c
FL2	Multi-Mode audio filter	89.70	n/c
ASP/B	Automatic r.f. clipper (Trio)	82.80	n/c
ASP/A	Automatic r.f. clipper (Yaesu)	82.80	n/c
D75	Manual r.f. speech clipper	56.35	n/c
D70	Morse Tutor	56.35	n/c
MK	Keyboard morse sender	137.42	n/c
RFA	Broad band pre-amplifier	33.92	n/c
AD270	Active dipole (indoor mounting) 12v DC	47.15	n/c
AD370	Active dipole (outdoor mounting) 12v DC	64.40	n/c
MPU	Mains power unit	6.90	n/c
DC144/28	2 metre converter	39.67	n/c
Codecall 'A'	4000 link programmable codes	32.20	n/c
Codecall 'B'	4000 switch programmable codes	33.92	n/c

JAYBEAM ANTENNAS

10, 15 & 20 metre antennas			
TB3	HF 3 el tribander 1kw	181.70	5.00
VR3	HF Vertical triband 1kw	46.00	4.00
4 metre antennas			
4Y/4M	4 element beam	22.42	4.00
PMH2/4M	2 way phasing harness	13.22	1.50
2 metre antennas			
DC1/WB	Wide band discone (100-470MHz)	41.40	3.00
LR1/2M	Colinear 4·3db	25.87	3.00
LR2/2M	Colinear 2·8db	21.85	3.00
C5/2M	5db glass fibre colinear	47.72	4.00
5Y/2M	5 element yagi	12.07	3.00
8Y/2M	8 element yagi	15.52	3.50
10Y/2M	10 element yagi	33.35	4.00
PBM10/2M	10 element parabeam	39.67	4.00
PBM14/2M	14 element parabeam	48.30	4.00
5XY/2M	Crossed 5 element yagi	24.72	3.50
8XY/2M	Crossed 8 element yagi	31.00	4.00
10XY/2M	Crossed 10 element yagi	40.82	4.00
X6/2M/X12/70cm	dual band crossed yagi	41.40	4.00
PMH/2C	Harness for circular pol.	8.00	1.50
Q4/2M	4 element quad yagi	25.87	3.00
Q6/2M	6 element quad yagi	33.90	4.00
Q8/2M	8 element quad yagi	39.10	4.00
D5/2M	Double 5 slot-fed yagi	21.85	3.00
D8/2M	Double 8 slot-fed yagi	29.32	4.00
SVMK/2M	Kit for vertical pol.	8.00	3.00
UGP/2M	Ground plane	10.90	2.00
HO/2M'	Mobile 'halo' head only	5.15	2.00
HM/2M	Mobile 'halo' with 24" mast	5.75	2.00
PMH2/2M	2 way phasing harness	10.90	1.50
PMH4/2M	4 way phasing harness	25.30	1.50
70cm Antennas			
C8/70cm	8db glass fibre colinear	54.00	4.00
D8/70cm	Double 8 slot-fed yagi	22.40	3.00
PBM18/70cm	18 element parabeam yagi	27.60	3.00
PBM24/70cm	24 element parabeam yagi	36.80	4.00
MBM28/70cm	28 el multibeam yagi	18.40	3.00
MBM48/70cm	48 el multibeam yagi	31.00	3.00
MBM88/70cm	88 el multibeam yagi	42.55	4.00
8XY/70cm	Crossed 8 element yagi	36.80	3.00
12XY/70cm	Crossed 12 element yagi	46.00	4.00
PMH2/70cm	2 way phasing harness	9.20	1.50
PMH4/70cm	4 way phasing harness	19.55	1.50
23cm Antennas			
CR23cm	Corner reflector array	39.00	3.00
D15/1296	Double 15 slot-fed yagi	36.80	3.00
PMH2/23cm	2 way phasing harness	27.60	1.50

AN INVITATION

We're only 10 mins from Southend-on-Sea. Why not come and visit our large showroom where everything is on display and can be demonstrated. There's a couple of nice country pubs nearby that serve good ale and food And a brisk walk along the sea front (or down the pier and back if you can manage 2½ miles) will blow the old cobwebs away! You can reach us by rail on the Southend to Liverpool Street line or by road via the A127 or A130. We look forward to seeing you soon.

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Once you've made the decision to buy you'll want to get your equipment as quickly as possible. That's why we set up a completely separate mail order department to give you exactly that kind of service. Martin Pyke is our mail order manager and his number one job is to get all goods shipped out the same day as the order is received. We can take orders right up to around 5.00 p.m. for same day despatch (with the exception of the larger items where 2.30 p.m. is the limit). Either send us your order by post using our clip out order form contained in this advert or telephone us your credit card details.

CHRISTMAS SPECIALS

Trio TS830S	Transceivers	£632
Trio TS130S	Transceivers	£492
Trio TR2300	Transceivers	£135
FDK 2M 2W	FM Rigs	£189
Mizuho	2M SSB Transceivers	£89

SPECIAL VHF ANTENNAS

Scan-X	65-520MHz discone rx only	16.00	3.00
LAB	Airband ground plane	11.50	2.50
LMD	Marine dipole aerial	4.80	2.00
GDX-2	Discone aerial 50-480mHz tx & rx	39.50	3.00

G-WHIP MOBILE ANTENNA RANGE

Tribander helical for 10/15/20 metres	25.80	3.00
Base mount single hole fixing + 3m cable	6.30	1.25
LF40m coil for above aerial	6.55	1.25
LF80m coil for above aerial	6.55	1.25
LF160m coil for above aerial	6.55	1.25
LF telescopic resonator whip	4.25	1.25

AERIAL ROTATORS (complete with control boxes)

CDE AR40 (5 core cable) up to 2 el. tribander	79.00	3.50
Channelmaster 9502B (3 core) up to 8 el. VHF	54.00	3.50
9523 Channelmaster alignment bearing	14.50	1.25
Jaybeam (KR400 RC) (6 core) up to 3 el. HF beams	99.00	3.50
250 Hirschmann (3 core) suits VHF aerials up to 8 el.	43.00	2.50
SL100 Alignment bearing for 250	13.50	1.50

HF ANTENNAS (Various manufacturers)

Mini-Products HQ-1 20/15/10m 2 el. 1kw "Mini-Beam	119.00	4.00
Mini-Products C4 20/15/10m vertical dipole 1kw	55.00	3.00
Mosley TD3JR20/15/10m wire dipole 600w	40.00	2.00
Mosley "Mini-Beam" 20/15/10m 2 el. beam 600 watts	99.00	4.00
Mosley TA33JR 3 band 3 el. beam 600 w	161.00	4.00
Hy-Gain 12AVQ 20/15/10m vertical 2kw	50.60	3.00
Hy-Gain 14AVQ 40-10m vertical 2kw	64.00	3.00
Hy-Gain 18AVT/WB 80-10m vertical 2kw	109.25	3.50
HF5 80-10m vertical 200 watts	48.50	3.50
Radial kit for HF5	30.50	3.00
Jaybeam TB3 HF 3 el tribander beam 2kw	181.70	5.00
Jaybeam VR3 HF vertical 2kw	46.00	4.00
Western DX-5V 5 band 2kw vertical	89.00	3.00
5-band commercial grade 1kw 80-10m dipole	39.00	2.00

VHF/UHF MONITOR RECEIVERS

SX200N	Scanning receiver	260.00	5.00
BEARCAT 220	Scanning receiver	199.00	5.00
TM56B	FM Scanner 12v DC/230v AC	89.00	2.00
Sound Air 008	8 channel FM monitor	39.00	2.00
Sound Air M161	16 channel FM monitor	39.00	2.00
SR9(A)	2m Amateur receiver 12v DC	46.00	2.00
SR9(M)	Marine band rcvr 12v DC	46.00	2.00

ANTIFERENCE (ANTENNA SPECIALISTS) MOBILE ANTENNAS

ASP201	2m ¼ wave aerial	3.95	3.00
ASP3462	70cm colinear 3db gain	8.95	3.00
K220A	Magnetic mount for above	8.95	2.00
ASP3009	2m 3db gain 5/8th wave	9.95	3.00
ASP3677	Deluxe 2m 3db gain 5/8th wave	15.95	3.00
ASP3667	Deluxe 70cms 5db gain	16.95	3.00
K220	Magnetic mount	8.95	2.00
ASPM161	'No-hole' boot mount	3.75	1.00
ASPM124	28MHz ¼ wave whip	18.95	3.00

HOKUSHIN RANGE (MOBILE ANTENNAS)

2E	2m 5/8 wave 3·4db gain	8.50	3.00
2NE	2m 7/8 wave 4·5db gain	14.50	3.00
10SE	28MHz whip	12.65	3.00
15SE	21MHz whip	£13.80	3.00
20SE	14MHz whip	£15.35	3.00
RG4M	Base for all above aerials	4.50	1.50
GSS	Gutter/boot mount	4.50	1.50
MB5	Magnetic mount with 5m coax (not 2NE)	7.95	2.00
CBA311	2m ¼ wave gutter clip aerial	5.00	3.00

SWL AERIALS & ATU's

SW69	SWL 50ft dipole 3-30MHz	24.95	1.50
004	3-30MHz 60ft dipole with 50ft coax	29.92	2.00
Mosley RD5	All band dipole	40.00	2.00
Global AT1000	SWL antenna tuning unit 0·2MHz-30MHz	31.95	2.00

AIR BAND PORTABLE MONITORS

R517	Air band portable receiver	49.50	1.50
AIR1	Soft case for R517	3.00	1.00
Crystals for R517		3.00	0.25
ATC720SP	Synth Air Rec 118-136Mz	189.00	n/c
ATC720	Hobby version of above	129.00	n/c

MISCELLANEOUS ITEMS

PS134	13·8v 4 amp power supply	24.95	2.00
PS125	5 amp AC power supply	29.95	2.50
PP1310	PSU 240v/13·8v DC output at 10amp protected	49.50	3.00
Global PS15	6 amp psu with meter	32.95	2.00
EK121	Katsumi Electronic keyer	29.00	1.50
EKM12	Matching side tone monitor	10.95	1.25
COK2	Morse code oscillator	6.95	0.75
HK708	Telegraph CW key (manual)	11.50	1.00
YW3	Twin SWR/Power/Field strength meter	11.95	0.75
MF210	Self powered 2m FM monitor	9.95	0.75
FX1	Deluxe station wavemeter	33.00	1.50
DM81	Solid state dip meter	60.00	1.50
Altai	Dip oscillator	47.00	1.50

MAIL ORDER SLIP to: Waters & Stanton Electronics, Main Road, Hockley, Essex.

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BC-100FB **£253**
Hand held 16 channel programmable

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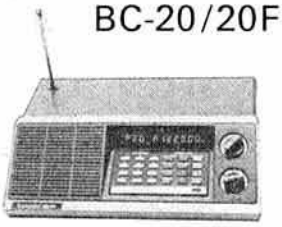

40 Channels
AM/FM
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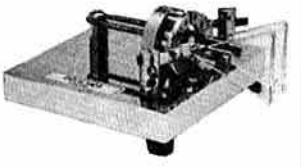
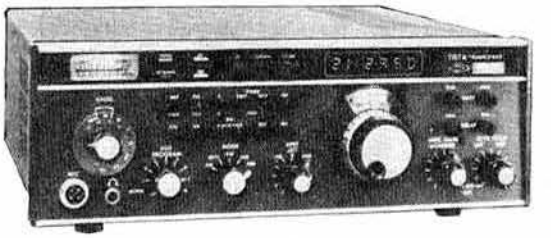
BC-150FB 10 channel	**£129.95**
BC-250FB 50 channel	**£218.50**
BC-220FB 20 channel	**£198.95**

BENCHER PADDLES

BY-1 Black Base	£31.95
BY-2 Chrome Base	£39.50
BY-3 Gold plated	£92.00
ZA-1A Balun	£13.80
ZA-2A Balun	£14.95
ZY-2 CW Audio Filter	£51.95

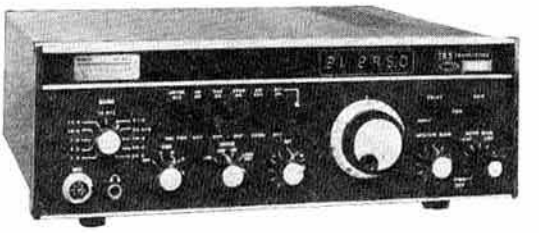


DRAKE TR7A



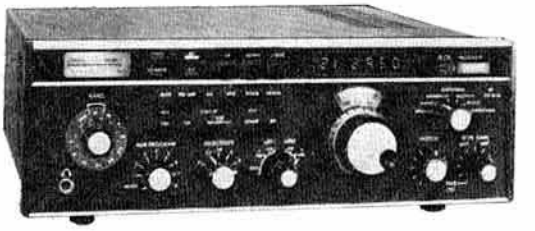
The Transceiver others try to copy
£1089.97

DRAKE TR5



DRAKE's low cost Transceiver
£598

DRAKE R7A



General Coverage Receiver
£1059.96

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G3FIK

KEEP AHEAD WITH THE NEW FT-102!

Once again YAESU lead the field with the exciting new FT-102 HF transceiver – no other manufacturer offers so many innovative features.

Better Dynamic Range
The extra high-level receiver front end uses 24 VDC for both RF amplifier and mixer circuits, allowing an extremely wide dynamic range for solid copy of the weak signals even in the weekend crowds. For ultra clear quality on strong signals or noisy bands the high voltage JFET RF amplifier can be simply bypassed via a front panel switch, boosting dynamic range beyond 100dB. A PLL system using six narrow band VCOs provides exceptionally clean local signals on all bands for both transmit and receive.

Total IF Flexibility
An extremely versatile IF Shift/Width system, using friction-linked concentric controls and a totally unique circuit design, gives the operator an infinite choice of bandwidths between 2.7kHz and 500Hz, which can then be tuned across the signal to the portion that provides the best copy sans QRM, even in a crowded band. A wide variety of crystal filters for fixed IF bandwidths are also available as options for both parallel and cascaded configurations. But that's not all; the 455kHz third IF also allows an extremely effective IF notch tunable across the selected passband to remove interfering carriers, while an independent audio peak filter can also be activated for single-signal CW reception.

New Noise Blanker
The new noise blanker design in the FT-102 enables front panel control of the blanking pulse width, substantially increasing the number of types of noise interference that can be blanked, and vastly improving the utility of the noise blanker for all types of operation.

Commercial Quality Transmitter
The FT-102 represents significant strides in the advancement of amateur transmitter signal quality, introducing to amateur radio design concepts that have previously been restricted to top-of-the-line commercial transmitters; far above and beyond government standards in both freedom from distortion and purity of emissions.

Transmitter Audio Tailoring
The microphone amplifier circuit incorporates a tunable audio network which can be adjusted by the operator to tailor the transmitter response to his individual voice characteristics before the signal is applied to the superb internal RF speech processor.

IF Transmit Monitor
An extra product detector allows audio monitoring of the transmitter IF signal, which, along with the dual meters on the front panel, enables precise setting of the speech processor and transmit audio so that the operator knows exactly what signal is being put on the air in all modes. A new "peak hold" system is incorporated into the ALC metering circuit to further take the guesswork out of transmitter adjustment.

New Purity Standard
Three 6146B final tubes in a specifically configured circuit provide a freedom from IMD products and an overall purity of emission unattainable in two-tube and transistor designs, while a new DC fan motor gives whisper-quiet cooling as a standard feature. For the amateur who wants a truly professional quality signal, the answer is the Yaesu FT-102.

New VFO Design
Using a new IC module developed especially for Yaesu, the VFO in the FT-102 exhibits exceptional stability under all operating conditions.

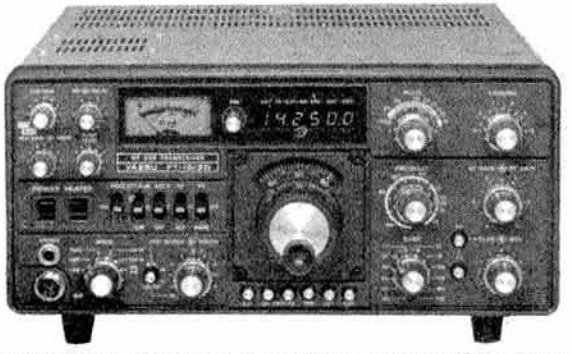
ANCILLARY EQUIPMENT

SP-102 EXTERNAL SPEAKER/AUDIO FILTER
The SP-102 features a large high-fidelity speaker with selectable low- and high-cut audio filters allowing twelve possible response curves. Headphones may also be connected to the SP-102 to take advantage of the filtering feature, which allows audio tailoring for each bandwidth and mode of operation to obtain optimum readability under a variety of conditions.

FC-102 1.2 KW ANTENNA COUPLER

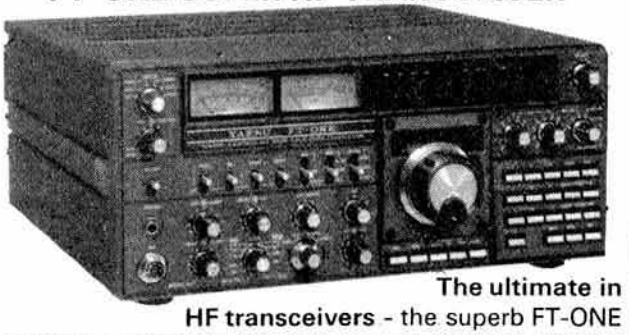
FV-102DM SYNTHESIZED, SCANNING EXTERNAL VFO

FT-101ZD MkIII



YAESU's FT-101ZD **WITH FM** is still rolling off the line as fast as YAESU can produce - thanks to its very comprehensive specification and competitive price. Incorporates notch filter, audio peak filter, variable IF bandwidth plus many other features.

FT-ONE SUPER HF TRANSCEIVER



The ultimate in HF transceivers - the superb FT-ONE provides continuous RX coverage of 150KHz-30MHz plus all nine amateur bands (160 thru 10m). All-mode operation LSB, USB, CW, FSK, AM, *FM · 10 VFO system · **FULL** break-in on CW · audio peak filter · notch filter · variable bandwidth and IF shift · keyboard scanning and entry · RX dynamic range over 95dB! and **NO** band switch!!!

*OPTIONAL

AMATEUR ELECTRONICS UK

FT-230R 25watt 2m FM mobile

- Two independent VFO's
- 10 memories ● Priority function
- Memory and band scan
- 12.5/25 KHz steps
- Large LCD readout.

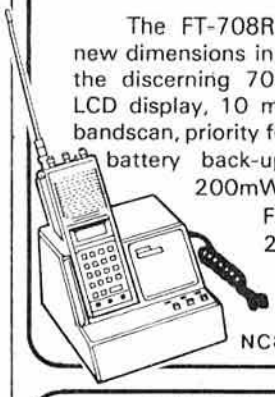
FT-290R/FT-790R 2m & 70cm portables

10 memories, 2 VFO's, LCD display, C size battery, easy car mounting tray.

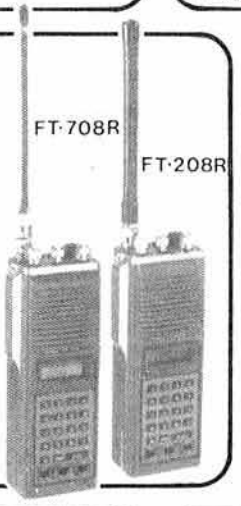
FT-290R 0.5 low/2.5 high watts out
FT-790R 0.2 low/1.0 high watts out (incorporates speech compressor).

FT-708R and FT-208R Synthesized UHF/VHF transceivers

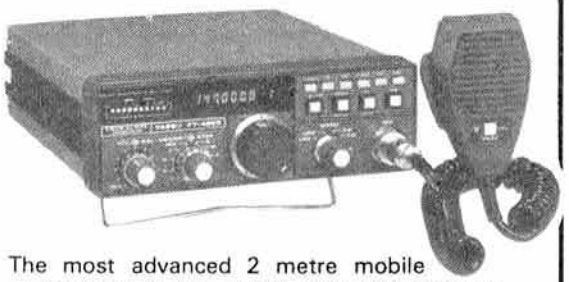
The FT-708R and FT-208R provide new dimensions in operating flexibility for the discerning 70cm and 2m operator. LCD display, 10 memories, memory and bandscan, priority function, internal lithium battery back-up. RF output FT-708R, 200mW low, 1 watt high, FT-208R, 300mW low, 2·5 watts high.



NC8 Charger DC PSU



FT-480R High technology all-mode 2metre mobile



The most advanced 2 metre mobile available today - USB, LSB, FM, CW full scanning with priority channel, 4 memory channel, dual synthesized VFO system.

FRG-7 General coverage receiver

The set with the world-wide reputation. YAESU's famous FRG-7 out-performs many a more expensive set. Rugged and reliable, it features high sensitivity and Wadley loop stability - a delight to use for the established amateur and new SWL alike.

FRG-7700 High performance communications receiver

YAESU's top of the range receiver. All-mode capability, USB, LSB, CW, AM *and* FM 12 memory channels with back-up. Digital quartz clock feature with timer. Pictured here with matching FRT-7700 Antenna tuner and FRV-7700 VHF converter.

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THE PICTURE SAYS IT ALL!

The latest FAT CAT from YAESU–
The ALL NEW FT-980 CAT HF transceiver
with continuous RX coverage of 150KHz–30MHz and computer interface option.

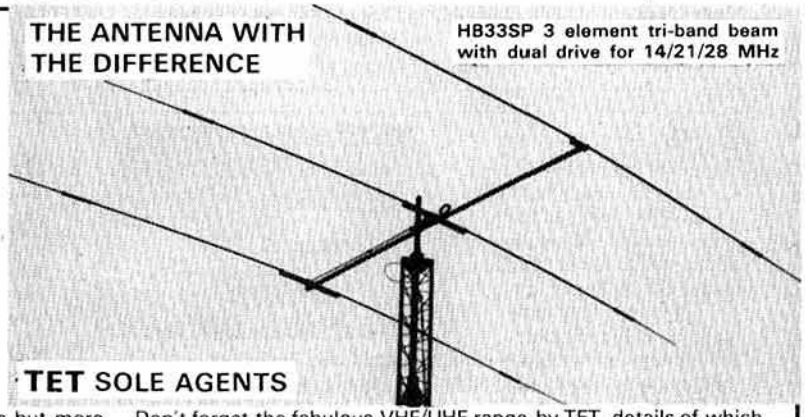
TET ANTENNA SYSTEMS

TET HF antennas are unique in that they employ dual driven elements with the following distinct advantages—

- Improved gain over conventional arrays.
- Broader bandwidth with lower SWR.
- Enhanced front to back ratio.
- Better matching into solid state transceivers without an A.T.U.
- High power handling capacity.
- All this plus superb mechanical construction.

THE ANTENNA WITH THE DIFFERENCE

HB33SP 3 element tri-band beam with dual drive for 14/21/28 MHz



TET SOLE AGENTS

See recent issues for full details of models and prices but more importantly listen on the bands for the ever-increasing numbers of delighted users of TET antennas.

Don't forget the fabulous VHF/UHF range by TET, details of which we shall feature shortly - but if you would like the full story now, an S.A.E. will do the trick.

YOUR LOCAL TET STOCKISTS

Amateur Radio Exchange,
373 Uxbridge Road,
Acton, London W3

Amcomm Services,
194A Northolt Road,
South Harrow,
Middlesex

Bredhurst Electronics,
High Street, Handcross,
Haywards Heath,
West Sussex RH17 6BW

Stephens James Ltd.,
47 Warrington Road,
Leigh, Lancs. WN7 3EA

Uppington Tele Radio,
12-14 Pennywell Road,
Bristol BS5 0JT

AGENTS

North West – Thanet Electronics Ltd. Gordon, G3LEQ, Knutsford (0565) 4040
Wales & West – Ross Clare, GW3NWS, Gwent (0633) 880 146
East Anglia – Amateur Electronics UK, East Anglia, Dr. T. Thirst (TIM) G4CTT, Norwich 0603 667189
North East – North East Amateur Radio, Darlington 0325 55969
Shropshire – Syd Poole G3IMP, Newport, Salop 0952 814275

Amateur Electronics UK
504-516 Alum Rock Road·Birmingham 8
Telephone: 021-327 1497 or 021-327 6313
Telex:334312 PERLEC G
Opening hours: 9.30 to 5.30 Tues. to Sat. continuous – CLOSED all day Monday.

We wish our many customers and friends a most happy Xmas and an increasingly prosperous New Year.

COMMISSION SALES AVAILABLE ONCE AGAIN... Call for details and have a cup of Brenda's coffee when you do the deal...

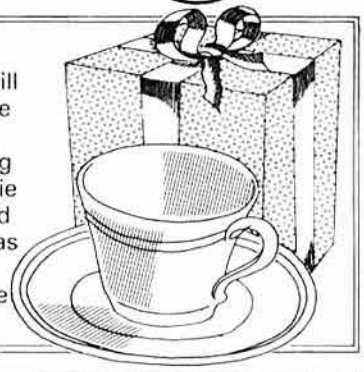
AMATEUR RADIO EXCHANGE

SOMETHING VERY SPECIAL FOR CHRISTMAS FROM BRENDA AND BERNIE

Christmas, we are always told, is the season of good-will to all men. But now Brenda has decreed that it should be the season of good-will to the ladies as well.

So, if you have the nerve to spend £500 or more on a rig at either Acton or St Helens in the month of December, Bernie has agreed that the woman in your life should be presented with a beautiful 12-piece bone china coffee service from us as some sort of compensation.

That way **you** can have the rig you want as your Christmas present... the peace will be kept at home... and you can even have a Brenda's cup of coffee any time you want!



...W · NEW · NEW

FT-980

Yaesu's latest HF transceiver, which fits neatly into their range between the FT-102 and the FT-ONE... and is an obvious competitor for the mythical (or merely elusive?) Trio TS-930.

Features like general coverage receive, notch filter, pass-band tuning and IF shift will make this rig a top-of-the-market bargain at a price yet to be announced, but which we anticipate will be not a million miles from **£925.**

FT-102

A worthy successor in the Yaesu range to the evergreen FT-101 series, with so many extra features.

- Notch filter • Three 6146B final tubes • IF shift control • Band width control from 2.7kHz to 500Hz • APF control • RF processing • Tunable audio network for speech tailoring • SSB/CW/AM/FM

OUR PRICE OF £725 INCLUDES AM/FM BOARD

IC-740

The latest addition to the ICOM transceiver range, this gives all mode coverage – AM/CW/SSB/FM – right across the amateur bands from 1.8 to 30MHz.

Incorporating such features as IF shift, pass-band tuning and notch-filter as standard, this is one rig that has to be seen and tried by anyone in the market for a really top-quality base station.

OUR PRICE £649

IC-R70

Presenting the best in today's receiver technology from ICOM, featuring:

- Two VFOs • Frequency range 100kc – 30MHz
- Three IFs 70MHz/9MHz/455kHz • HF pre-amp
- Sensitivity 0.5 μv AM – 0.32 μv S/N 12dB

All this... and much more... for £469

It's always been our policy to offer our customers the widest choice of amateur radio receivers and transmitters to be found under one roof anywhere in the UK **plus** the facility to try them out, one against the other, to find the one that's right for you.

Well, now we're doing the same with communication terminals for decoding RTTY, CW, ASCII and AMTOR. Where else will you find complete ranges of decoders by AEA, MICRODOT, MICROWAVE MODULES, TASCO – TELEREADER and TONO at prices starting from £175 for receive-only up to £700 for top-of-the-range receive-and-transmit equipment like the CWR-685 as illustrated?

One item you certainly won't find in many other places is the unique British-made ICS AMTOR decoder for which we have just been appointed the sole London retailers!

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YAESU

FT 102	160-10M 9-Band Transceiver	NEW	699.00
FT ONE	Gen. Coverage Transceiver	NEW	1295.00
FT 790R	70cm all-mode portable	NEW	295.00
FT 101ZFM	160-10m 9-Band Transceiver		590.00
FT 101ZDFM	160-10m 9-Band Transceiver		P.O.A.
DIGT 1012	Digital unit		90.00
DCT 101Z	DC Adaptor		42.50
FV 101Z	Remote vfo		112.00
FT902DM	9-Band AM/FM Transceiver		885.00
FC 902	9-Band atu, swr/pwr etc		135.00
FTV 901R	Transverter fitted 2m module		285.00
430 TV	70cm module for above		185.00
144 TV	2m module for Transverter		100.00
70 TV	4m module for Transverter		80.00
FV 901DM	Remote vfo for 901		260.00
SP 901	External speaker		31.00
FL 2100Z	9-Band 1200W linear		425.00
FT 107	9-Band 100W solid state		699.00
FT 107DMS	As above with memory		779.00
DMST 107	Memory unit		92.75
FV 107G	Remote VFO for above		98.50
SP 107G	External speaker		29.00
FC 107G	Aerial tuning unit		112.70
FP 107	230V AC power module		101.95
FP 107EG	Cased PSU with speaker		113.00
FT 707	8-Band solid state 100W		545.00
FP 707	230 volts AC power supply		125.00
FC 707	Aerial tuner (unbalanced only)		85.00
MR7	Metal rack for above		15.70
MMB 2	Mobile mounting bracket		16.00
FRG 7	0.5-30MHz receiver		199.00
FRG 7700	SSB/AM /FM recvr. dig. readout		299.00
MEM 7700	Memory unit for above		90.00

CONVERTERS FOR ABOVE

FRV 7700A	118-150MHz	69.75
FRV7700B	50-60MHz & 118-150MHz	75.50
FRV 7700C	140-170MHz	65.95
FRV 7700D	70-80MHz & 118-150MHz	72.45

FRT 7700	Receiver aerial tuner	37.85
FF 5	LF filter for above	9.95
FT 480R	2m all-mode transceiver	379.00
FP 80A	230V AC power supply	63.00
FT 780R	70cm all-mode transceiver	449.00
FT 290R	**SPECIAL** 2m all-mode portable with ARE mods	249.00
NC 11C	AC charger	8.00
CSC-1	Carrying case	3.45
MMB-11	Mobile mounting bracket	22.25
FT 208R	2m synthesized portable FM	199.00
NC 9C	AC charger	8.00
FT 708R	70cm hand-held	209.00

TRIO-KENWOOD

TS 930	Gen. coverage transceiver	NEW	999.00
TS 830S	160-10m transceiver 9 bands		650.00
AT 230	All-band ATU power meter		110.00
YK 88C	500Hz CW filter		29.60
YK 88CN	270Hz CW filter		32.60
TS 530S	160-10m trans 200w pep digital		489.00
TS 130S	8-band 200W pep		499.00
TS 130V	8-band 20W pep		445.00
AT 130	100W antenna tuner		79.00
TR 2300	2m FM synthesised portable		166.75
TR 2500	2m FM synthesised handheld		207.00
HC 10	Digital desk World Clock		58.75
DM 801	Dip meter		60.00
TR 7730	New 25W FM transceiver		247.00
R 600	Gen. coverage receiver		212.00

ICOM

IC 740	Multimode H.F. transceiver	NEW	649.00
IC 720A	HF transceiver and gen. cov. rec.		V.S.P.
IC 730	HF mobile transceiver 8-band		586.00
IC R70	New multimode receiver		469.00
PS 15	Power supply for 720A		99.00
IC 251E	2m multimode base station		499.00
IC 25E	2m synth compact 25W mobile		259.00
IC 290E	2m multimode mobile		366.00
IC 24G	2m FM mobile 10w		169.00
IC 2E	2m FM synthesised handheld		159.00
IC 4E	70cm handheld		199.00
ICL1/2/3	Soft cases		3.50
IC HM9	Speaker/microphone		12.00
IC CP1	Car charging lead		3.20
IC BP2	6V Nicad pack for IC 2E		22.00
IC BP3	9V Nicad pack for IC 2E		17.70
IC BP4	Empty case for 6 X AA Nicads		5.80
IC 8PS	11.5V Nicad pack for IC 2E		30.50
IC DC1	12V adaptor pack for IC 2E		8.40

MICROWAVE MODULES

MMT 144/28	2M Transverter for HF Rig	109.95
MMT 432/28S	70cm Transverter for HF Rig	159.95
MMT 432/144R	70cm Transverter for 2m Rig	184.00
MMT 70/28	4m Transverter for HF Rig	115.00
MMT 1296/144	23cm Transverter for 2m Rig	184.00
MML 144/30LS	2m 30W linear Amp (3WI/P)	69.95
MML 144/50S	2m 50W linear amp (10W1/P)	85.00
MML 144/100S	2m 100W linear Amp (10W1/P)	139.95
MML 432/20	70cm 20W linear Amp (3W1/P)	85.00
MML 432/50	70cm 50W linear Amp	109.95
MML 432/100	70cm 10/100W linear Amp	228.65
MM 2001	RTTY to TV converter	189.00
MM 4001	RTTY transceiver	269.00
MM 4000KB	RTTY transceiver with keyboard	299.00
MMC 50/28	6m converter to HF Rig	29.90
MMC 70/28	4m converter to HF Rig	29.90
MMC 144/28	2m converter to HF Rig	29.90
MMC 432/28S	7cm converter to HF Rig	37.90
MMC 432/144S	70cm converter to 2m Rig	37.90
MMC 435/600	70cm ATV converter	27.90
MMK 1296/144	23cm converter to 2m Rig	69.95
MMD 050/500	500MHz dig. frequency meter	75.00
MMD 600P	600MHz prescaler	29.90
MMDP 1	Frequency counter probe	14.90
MMA 28	10 meter pre amp	16.95
MMA 144V	2m RF switched pre amp	34.90
MMF 144	2m band pass filter	11.90
MMF 432	70cm band pass filter	11.90
MMS 1	The morse talker	115.00
MMS 2	Advanced morse trainer	169.00

MORSE EQUIPMENT

MK 704	Squeeze paddle	10.50
HK 707	Up/Down key	10.50
EK 150	Electronic keyer	74.00

MOBILE SAFETY MICROPHONES

ADONIS AM 202S Clip on	20.95
ADONIS AM202F Swan neck + up/dwn bttns	30.00
ADONIS AM202H Head band + up dwn bttns	30.95

DRAE

FULLY PROTECTED POWER SUPPLIES

4 amp	27.95	6 amp	44.95
12 amp	69.00	24 amp	99.00
VHF Wavemeter	130 450MHz		24.95
Morse Tutor			47.00

DATONG

PC1	Gen. Cov. Converter HF on 2m		137.42
VLF	Very Low Frequency Converter		29.90
FL1	Frequency Agile Converter		79.35
FL 2	Multi-mode Audio Filter		89.70
FL 3	FL 2 with auto notch	NEW	129.37
ASP	Auto R.F. Speech Clipper (Trio or Yaesu plug)		82.90/89.70
D 75	Manually controlled R.F. Speech clipper		56.35
RFC/M	R.F. Speech Clipper Module		29.90
D 70	Morse Tutor		56.35
AD 270	Indoor Active Filter (inc. PSU)		54.05
AD 370	Outdoor Active Filter (inc. PSU)		71.30
MK	Keyboard morse sender		137.42
PTS1	Programmable tone squelch system (two units)		45.99
RFA	Wideband preamplifier		33.92
MPU	Mains Power Unit		6.90

BENCHER

BY 1	Keyer Paddle (black base)	32.00
BY 2	Keyer Paddle (chrome base)	39.95
BY 3	Keyer Paddle (gold plated)	92.00
ZA 1A	Balun 3·5-30mHz for dipoles	12.65
ZA 2A	Balun 14-30MHz for beam ant	13.80

TONO

THETA 9000E	RTTY/CWASC11	650.00
THETA 550	The latest – a winner!	299.00

AMPLIFIERS

UC 70	430MHz 55W + preamp	149.00
2M-50W	144MHz 30-50W	65.00
2M-100W	144MHz 100W + preamp	115.00
MR 150W	144mHz 130-150W + preamp	159.00
MR 250W	144MHz 250W + preamp	259.00

ROTATORS

KR 250	Kenpro Lightweight 1-1½" mast	44.95
9502B	Colorotor (Med. VHF)	55.00
KR 400RC	Kenpro – inc. lower clamps	99.95
KR 600RC	Kenpro – inc. lower clamps	139.95

TASCO

TeleReader CWR 685 RTTY/CW/ASC11	699.00
TeleReader CWR 670E As above RX only	259.00
MorseMaster CWR 600 As above basic unit	189.00

WELZ

SP 200	1·8-160MHz 20W-200W-1KW		59.00
SP 300	1·8-500MHz 20W-200W-1KW		79.00
SP 400	130-500MHz 5W-20W-150W		59.00
SP15M	1·8-150MHz 0·2·5-20-200W		29.00
SP 380	1·8-500MHz 20W-200W	NEW	49.00
AC 38M	8 band ATU 400W		59.95
CT-15A	DC-450MHz dummy load		6.95
CT-15N	As above N-type socket		11.75
CH 20A	DC-450MHz coax switch SO239		15.95
CH 20N	As above – N type sockets		23.95

373 UXBRIDGE ROAD, ACTON, LONDON W3 9RH
Tel: 01-992 5765/6/7 *Just 500 yards east of Ealing Common station on the District and Piccadilly Lines, and 207 bus stops outside*

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SMC SERVICE

Free Finance on most substantial items. Importer guarantee on Yaesu Musen. Free Securicor on major Yaesu items. Access, Barclaycard over the 'phone. Biggest branch/agent/dealer network. Ably staffed and equipped service dept. Securicor 'B Service' contract at £4.49. Biggest stockist of amateur equipment. 24 years of communications experience.

FREE FINANCE

On *regular* priced items from: Yaesu, Ascot SMCHS, CDE, HyGain, Channel Master, Hansen, SMC, MFJ, KLM, Mirage and Hi-Mound, on invoices over £100 SMC offers Free Finance! How is it done? Simple, pay 20%, split the balance equally over 6 months or pay 50% down and split the balance over a year.

You pay no more than the cash price!!

GUARANTEE

Yaesu's *own* warranty does not extend outside Japan. Repairs are the responsibility of the UK retailer. SMC's guarantee is backed, as UK distributors, by daily contact with the factory and many tens of thousands of pounds of spares and test equipment. Avoid hawkers offering sets without serial numbers, spares, service or advice back-up.

FT980 ALL MODE HF TRANSCEIVER

NEW

★ Some facilities optional

- ★ Rx 150kHz-30MHz
- ★ Tx 160-10 met 9 bands + 3 × 500kHz Aux bands
- ★ All modes AM, CW, FM, LSB, USB, AFSK
- ★ IF shift + variable bandwidth 2·6kHz-300Hz
- ★ Inbuilt keyboard operation + Scanning
- ★ Switchable attenuator 10, 20, 30dB
- ★ Audio peak + notch filter −40dB
- ★ RF process or Auto mic gain control
- ★ 3rd order IMD −40dB at 100W PEP
- ★ AFSK shift 170, 425, 850Hz selectable
- ★ Multi channel memory + programmable scan limits
- ★ Optional computer interface available

WIDE COVERAGE ALL MODE RX; FRG7700 £299 inc. VAT @ 15% & SECURICOR

- ★ 30MHz down to 150kHz (and below).
- ★ 12 Channel memory option with fine tune.
- ★ SSB (LSB/USB), CW, AM, FM.
- ★ 2·7kHz, 6kHz, 12kHz, 15kHz, @ −6dB.
- ★ 3 Selectivities on AM. Squelch on FM.
- ★ Up conversion, 48MHz first IF.
- ★ 1kHz digital, plus analogue, display.
- ★ Inbuilt quartz clock/timer.
- ★ No preselector, auto selected LPF's.
- ★ Advanced noise blanker fitted.
- ★ Antenna 500Ω to 1·5MHz, 50Ω to 30MHz.
- ★ 20dB pad plus continuous attenuator.
- ★ Switchable A.G.C. Variable tone.

*** SPECIAL OFFER! ***

'7700 THE ONE WITH FM!

- ★ 110 and 240Vac, 12Vdc option.
- ★ Signal meter calibrated in "S" and SIMPO.
- ★ Acc; Tuners, Converters, LPF, Memory.
- ★ FRT7700; 150kHz-30MHz, Switch, etc.
- ★ FRV7700A; 118-130, 130-140, 140-150MHz.
- ★ FRV7700B; 118-130, 140-150, 50-59MHz.
- ★ FRV7700C; 140-150, 150-160, 160-170MHz.
- ★ FRV7700D; 118-130, 140-150, 70-80MHz.
- ★ FRV7700E; 118-130, 140-150, 150-160MHz.
- ★ FRV7700F; 118-130, 150-160, 170-180MHz.
- ★ FF5; 500kHz (for improved VLF reception).
- ★ MEMGR7700; 12 Channels (internal fitting).
- ★ FRA7700; Active Antenna.

FT230R £239 inc. VAT 15% & Securicor

- ★ 144-146 MHz (144-148 possible)
- ★ 25 watts RF output (Low 2.5W)
- ★ 150 (W) × 50 (H) × 176 (D) mm. 1·3Kg
- ★ Selectable 12½ or 25 KHz steps
- ★ Up/down, memory/band scanning
- ★ Ten Memories with priority function
- ★ Easy write in memory channels
- ★ Large illuminated "any angle" LCD display
- ★ Display to 100's of Hz and special functions
- ★ Two independent VFO's
- ★ Operation between memory and 'other' VFO
- ★ Memory backup "5 year" lithium cell
- ★ ± 600 KHz and simplex
- ★ Manual and automatic tone burst
- ★ Large "full sound" speaker
- ★ Concentric volume/squelch controls

YAESU

FT730R for 70cm HERE SOON!

SOUTH MIDLANDS COMMUNICATIONS LTD

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76 High Street,
Talke Pits, Stoke.
Kidsgrove (07816) 72644
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S.M.C. (Leeds),
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Chesterfield (0246) 453340
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Pinfold Lane, Buckley.
Buckley (0244) 549563
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SMC AGENTS

Edinburgh	Jack	GM8GEC	(031-657 2430 Day (031-665 2420 Eve	Bangor	John	GI3KDR	(0247) 55162	Neath	John GW4FOI	(0639) 52374 Day (0639) 2942 Eve
Stourbridge	Brian	G3ZUL	(03843) 5917	Tandragee	Mervyn	GI3WWY	(0762) 840656	Jersey	Geoff GJ4ICD	(0534) 26788

FT ONE £1,295 inc. VAT @ 15% & SECURICOR

*Option

FREE FINANCE

- ★ Rx: 150KHz-30MHz. Continuous general coverage.
- ★ Tx: 160-10m (9 bands) or 1.5-30MHz commercial.
- ★ All Modes: AM, CW, FM*, FSK, LSB, USB.
- ★ 10 VFO's!!! Any Tx-Rx split within coverage.
- ★ Two frequency selection ways, *no* bandswitch.
- ★ Main dial, velvet smooth, 10Hz resolution.
- ★ Inbuilt keyboard with up/down scanning.
- ★ Dedicated digital display for RIT offset.
- ★ Receiver dynamic range up to 100dB!!!
- ★ SSB: Variable bandwidth *and* IF shift.
- ★ 300* or 600Hz*, 2,400 → 300Hz, 6kHz*, 12kHz*.
- ★ Audio peak and notch filter. FM squelch.
- ★ Advanced variable threshold noise blanker.
- ★ 100W RF, key down capability, solid state.
- ★ Mains and 12VDC. Switch mode PSU built in.
- ★ RF processor. Auto mic gain control. VOX.
- ★ Last but not least *full* break in on CW.

FT902DM £885 inc. VAT @ 15% & SECURICOR

- ★ 160-10 metres including new allocations.
- ★ Variable IF bandwidth 2.4kHz down to 300Hz.
- ★ Audio Peak and independent notch controls.
- ★ AM, FSK, USB, LSB, CW, FM, (Tx and Rx).
- ★ Semi-break in, inbuilt Curtis IC Keyer option.
- ★ Digital plus analogue frequency displays.
- ★ VOX built-in and adjustable.
- ★ Instant write in memory channel.
- ★ Tune up button (10 sec, of full power).
- ★ Switchable AGC and RF attenuator.
- ★ Optional 350 or 600Hz CW, 6kHz, AM filters.
- ★ Clarifier (RIT) switchable on Tx, Rx or both.
- ★ Plug in modular, computer style constructor.
- ★ Fully adjustable RF Speech processor.
- ★ Ergonomically designed with necessary LEDS.
- ★ Incredible range of matching accessories.
- ★ Universal power supply 110-234V AC and 12V DC.

SPECIAL OFFER — NOW WITH CW FILTER, AM FILTER, CURTIS KEYER AT NO EXTRA!

*Option ** D & DE Models

FT102 £699 inc. VAT @ 15% & SECURICOR

"INSTANT" H.P.

- ★ 1.8-3.5-7-10-14-18-21-24.5-28MHz
- ★ All modes: LSB, USB, CW, AM†, FM†, (†Option board)
- ★ Front end: extra high level, operates on 24V DC
- ★ RF stage bypassable, boosts dynamic range over 100 dB!
- ★ Variable bandwidth 2.7KHz→500Hz *and* IF Shift
- ★ Fixed bandwidth filters, parallel or cascade
- ★ IF notch (455kHz) *and* independent audio peak
- ★ Noise blanker adjustable for pulse *width*
- ★ External Rx and separate Rx antenna provisions
- ★ *Three* 6146B in special configuration—40dB IMD!
- ★ Extra product detector for checking Tx IF signal
- ★ Dual meter, peak hold ALC system
- ★ Mic amp with tunable audio network
- ★ **SP102:**—Speaker, Hi and Lo AF filters, 12 responses!
- ★ **FV012:**—VFO, 10Hz steps and readout, scanning, QSY
- ★ **FC102:**—ATU, 1-2KW, 20/200/1200 W FSD PEP, wire
- ★ **FAS-1-4R:**—4 way waterproof antenna selector

FT101ZD £635 inc. VAT @ 15% & SECURICOR

- ★ 160-10 metres including new allocations.
- ★ Variable IF bandwidth 2.4kHz down to 300Hz.
- ★ Selectable CW fixed bandwidth CW-W and CW-N*.
- ★ Semi-break in with sidetone for excellent CW.
- ★ Digital plus analogue frequency displays.
- ★ 180W PIP and—31dB 3rd order intermod.
- ★ RF speech processor fitted—adjustable level.
- ★ VOX built-in and is adjustable from the front panel.
- ★ Wide dynamic range for big signal handling.
- ★ High usable sensitivity, for those weak ones.
- ★ Superb noise blanker—adjustable threshold.
- ★ Attenuator; 0-10-20dB, AGC; slow-fast-off.
- ★ Clarifier (RIT) switchable on Tx, Rx or both.
- ★ Low level transvertor drive output facility.
- ★ Universal power supply 100-234V AC and 12V DC*
- ★ Incredible range of matching accessories.
- ★ 6 models: Digital/Analogue—AM/FM options.

FREE SECURICOR

*Option

FT707 £509 inc. VAT @ 15% & SECURICOR

SPECIAL OFFER

- ★ 80-10 metres (including 10, 18 and 24MHz bands).
- ★ USB-LSB-CWN-AM (Tx and Rx operation).
- ★ 100W PEP. 50% power output at 3:1 VSWR.
- ★ Full "broad band" no tune output stage.
- ★ Excellent Rx dynamic range, power transistor buffers.
- ★ Rx Schottky diode ring mixer module.
- ★ Local oscillator with ultra-low noise floor.
- ★ Variable IF bandwidth—16 crystal poles.
- ★ Bandwidths 6kHz*, 2.4kHz-300Hz, (600-350) Hz*.
- ★ AGC; slow-fast switchable VOX built-in.
- ★ Semi-break in with side tone for excellent CW.
- ★ Digital (100Hz) plus analogue frequency display.
- ★ LED Level meter reads: S, PO and ALC.
- ★ Indicators for: calibrator, fix, int/ext VFO.
- ★ Receiver offset tuning (RIT-clarifier) control.
- ★ Advanced noise blanker with local loop AGC.

*Option

SMC FM MODIFIED VERSION AVAILABLE

hy-gain

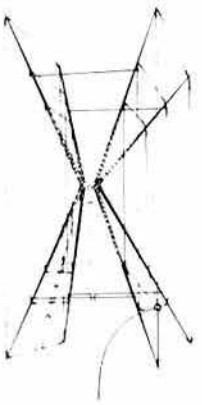
The TH7DXX is a new 7 element (10-15-20M) broadband VSWR less than 2:1 at band edges! Compact 20' (6·1M) turning radius – 31' (9·4M) longest element dual driven element Yagi which by combining monoband *and* high Q, ultra high power, trapped parasitics provides an average front to back of 22dB on 20 and 15 and 17dB on 10 meters. The antenna weighs 75lbs (34kg) and its projected 9·4 sq feet (0·9 sq m) of wind area produces a load of 240lbs at 80 mph (129 kph).

Construction features include: 6063-T832 taper swaged thick wall aluminium, 18-8 stainless hardware, diecast ali boom/mast clamps, heavy gauge ele/boom clamp and rugged phasing lines. It uses a ß match for DC ground and comes complete with preformed feeder straps and the famous BN86 ferrite balun.

		inc VAT	p/p
12AVQ	Vertical 10-20m inc.	**£50.60**	£2.20
14AVQ/WB	Vertical 10-40m inc.	**£64.40**	£2.20
18AVT/WB	Vertical 10-80m inc.	**£109.25**	£2.20
14RMQ	Roof mounting Kit	**£36.22**	£2.20
18V	Vertical 10-80m inc.	**£29.78**	£2.20
103BA	3 Ele Yagi 10m	**£67.85**	£2.20
105BA	3 Ele Yagi 10m	**£143.75**	£3.95
153BA	3 Ele Yagi 15m	**£90.85**	£2.20
155BA	5 Ele Yagi 15m	**£217.35**	£5.90
203BA	3 Ele Yagi 20m	**£166.75**	£4.90
204BA	4 Ele Yagi 20m	**£286.35**	£7.30
205BA	5 Ele Yagi 20m	**£362.25**	£9.40
402BA	2 Ele Yagi 40m	**£247.25**	£6.50
DB10/15A	3 Ele Yagi 10-15m	**£146.05**	£4.80
TH3JNR	3 Ele Yagi 10-15-20m	**£194.35**	£3.10
TH2MK3	2 Ele Yagi 10-15-20m	**£169.05**	£3.20
TH3MK3	3 Ele Yagi 10-15-20m	**£274.85**	£5.30
TH5DXX	"Thunderbird" 5 el.	**£378.35**	£6.70
TH7DXX	"Thunderbird" 7 el.	**£458.85**	£8.75
HYQUAD	2'Ele Quad 10-15-20m	**£332.35**	£6.00
18TD	Dipole Tape 10-80m	**£113.85**	£2.80
BN86	Balun 1:1-3 30MHz	**£15.53**	£1.40
LA1	Lightning Arrestor	**£48.19**	£0.92

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

Gem Quad



A light strong, boomless, quad antenna covering 10-15-20m. The centre spider is aluminium and the spreader arms (13·6ft and 2·2lb) are of a glass fibre tri-dectic construction. (Thin rods forming a triangle with tape criss-crossing for light, rigid, low wind resistance structure.)

The double cone shape offers optimum spacing between loops and maintains these critical measurements even under severe weather conditions. This optimum spacing provides "monobander" performance; high gain, maximum capture area, low angle radiation, low SWR and good F/B and F/S ratios. The toroidal balun supplied provides single 50 ohm coaxial feed on all bands, with no lossey coils, traps or switches.

2 element 18' × 18' × 9'; TR 9'; 8dB Gain; 25dB F/B
3 element As 2 ele plus 6·5 boom; 8·9dB Gain; 30dB F/B.
4 element As 2 ele plus 13' boom; TR 22'.

GQ2E	2 Ele Antenna	**£189.75**	£5.40
GQ3E	3 Ele Antenna	**£313.95**	£9.20
GQ4E	4 Ele Antenna	**£446.20**	£10.00
GQCK1	Conversion Kit 1 Ele	**£126.50**	£4.10
GQCK2	Conversion Kit 2 Ele	**£256.45**	£6.70
GQSPIDER	Centre piece (spare)	**£32.78**	£1.80
GQSPREADER	Spreader Arm (spare)	**£16.10**	£2.40

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

J-BEAM

FOUR METRES			
4Y/4M	Yagi, 4 element	7·0dB	**£22.43** £1.73
PMH2/4M	Harness, 2 way		**£13.23** £1.44
TWO METRES			
HO 2M	Halo, head only	3·0dB	**£5.17** £0.63
HM 2M	Halo, 24in mast	3·0dB	**£5.75** £0.75
UGP 2M	Ground Plane	0·0dB	**£10.92** £1.73
C5 2M	Colinear omnivert	4·8dB	**£47.72** £1.73
5Y 2M	Yagi 5 element	7·8dB	**£12.07** £0.58
8Y 2M	Yagi 8 element	9·5dB	**£15.52** £1.73
10Y/2M	Long Yagi, 10 element	11·4dB	**£33.35** £1.73
14Y/2M	Long Yagi, 14 element	13·0dB	**£36.23** £1.73
D5/2M	Yagi, 5 over 5 slot	10·6dB	**£21.85** £1.73
D8 2M	Yagi, 8 over 8 slot	12·3dB	**£29.32** £1.73
PBM10/2M	10 element parabeam	12·4dB	**£39.67** £1.73
PBM14/2M	14 element parabeam	13·7dB	**£48.00** £1.73
Q4 2M	Quad, 4 element	10·0dB	**£25.87** £1.73
Q6 2M	Quad, 6 element	12·0dB	**£33.92** £1.73
5XY/2M	Yagi, 5 element cross	7·8dB	**£24.72** £1.73
8XY/2M	Yagi, 8 element cross	9·5dB	**£31.05** £1.73
10XY/2M	Yagi, 10 element cross	11·3dB	**£40.82** £1.73
PMH2 C	Harness, Cir. Polar		**£8.05** £0.52
PMH2 2M	Harness, 2 way		**£10.92** £0.86
PMH2 2ML	Harness, 2 way long		**£11.92** £1.15
PMH4 2M	Harness, 4 way		**£25.30** £1.73
SEVENTY CMS			
C8/70	Colinear vert.	7·8dB	**£54.05** £1.73
D8/70	Yagi, 8 over 8 slot	12·3dB	**£22.43** £1.73
PBM18/70	Parabeam 18 element	14·9dB	**£27.60** £1.73
PBM24/70	Parabeam 24 element	15·1dB	**£36.80** £1.73
MBM28/70	Multibeam, 28 element	12·5dB	**£18.40** £1.73
MBM48/70	Multibeam, 48 element	15·7dB	**£31.05** £1.73
MBM88/70	Multibeam, 88 element	18·5dB	**£42.55** £1.73
8XY/70	Yagi, 8 element cross	10·0dB	**£36.80** £1.73
12XY/70	Yagi, 12 element cross	13·0dB	**£46.00** £1.73
PMH2/70	Harness 2 way		**£9.20** £0.75
PMH4/70	Harness 4 way		**£19.55** £1.44
TWENTY THREE CMS			
D15/23	15 over 15 slot	15·0dB	**£36.80** £1.73
CR/23	Corner reflector	14·8dB	**£35.08** £1.73
PMH2/23	Harness 2 way		**£27.60** £1.73

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

Kenpro

KR600RC
£132.25

360° round type meter Max. load 200kg. Rot, 600kg/cm, brake 4,000kg/m. 1¼in-2½in masts Lower casting optional.

KR400RC
£90.85

360° round type meter Max. load 200kg. Rot, 400kg/cm, brake 1,500kg/cm 1¼in-2½in masts Lower casting optional.

KR500
£86.25

Elevation Rotator (180°) Up to 50kg of Load. 1¾in-2½in mast. 1¼in-1⅝in boom

KR250
£44.85

Twist and switch controller. Rotator 200kg/cm. Brake 600kg. 1in-1½in masts.

NB: PRICES INCLUDE VAT AT 15%
Carriage free (post or road) mainland only

Channel Master

9508
£74.75

Auto control, secondary pointer gives position during travel. Stainless steel hardware. Heaviest duty "offset type". To 5sq

Takes 1-2" masts and 1-2" stub.

9502
£54.63

Automatic control box. Dial direction secondary pointer gives position during travel.

Takes 1-2" mast and 1-1⅞" stub.

Upper mast support bearing.

2" mast and 1¼" stub.

Post and packing **£1.20**
9523 **£14.38**

Rotary bearing 3-way guying.

Takes 1²⁹/₃₂" mast.

Post and packing. **85p**
9525 **£14.38**

NB: PRICES INCLUDE VAT AT 15%
Carriage free (or as shown) mainland only

CDE

AR40
£69.00

Accurate, silent self calibrating control box. Dial up desired beam heading, push knob; motor rotates to that position and then switches off.

CD45
£125.35

Large illuminated meter gives read out of antenna heading at all times. Armature brake. Low voltage meter. Handles antennas to 8½sq ft.

HAM IV
£228.85

Large illuminated meter gives read out of antenna heading at, all times. wedge solenoid brake mechanism. Handles antennas to 15sq ft.

T2X
£287.50

Large illuminated meter gives read out of antenna heading at all times. Wedge solenoid brake mechanism. Handles antennas to 30sq ft.

NB: PRICES INCLUDE VAT AT 15%
Carriage free (post or road) mainland only

SOUTH MIDLANDS COMMUNICATIONS LIMITED

BRANCHES: CHESTERFIELD · GRIMSBY · STOKE · LEEDS · BUCKLEY

COAX — SMC — PLUGS

BNC PLUG 50 ohms		
UG88	Standard type 5.5mm	£0.78
UG599	Large type 11.2mm	£3.22
BNC SOCKET 50 ohms		
UG290	Standard 4 hole type	£0.78
UG1094	Nut fixing type	£0.76
UG69	Free, cable-end, 5.5mm	£0.94
BNC COUPLER 50 ohms		
UG914	Back to back female	£1.07
UG491	Back to back male	£1.66
UG274	'T' 2 female 1 male	£2.23
SMC3FBNC	'T' 3 female	£2.02
UG306	Elbow. Male-Female	£1.86
BNC INTERSERIES ADAPTOR 50 ohms		
UG255	BNC plug – UHF socket	£1.76
UG273	BNC socket – UHF plug	£1.76
UG201	BNC socket – N plug	£3.28
UG349	BNC plug – N socket	£3.16
UG606	BNC socket – N socket	£2.59
UHF PLUG		
PL259	Standard type 11.2mm	£0.55
PL259P	Push on type 11.2mm	£0.79
UG175	Reducer 5.0mm	£0.14
UG176	Reducer 5.6mm	£0.14
PL259R	Reduced type 5.0mm	£0.67
PL259A	Deluxe type 11.2mm	£1.50
PL259B	Deluxe type 5.0mm	£1.13
PL259SL	'Solderless' 11.2mm	£0.63
PL259SS	'Solderless' 5.0mm	£0.63
PL259E	Angle type 5.0mm	£0.95
PL259M	Metric type standard 11.2mm	£0.75
L42P	For LDF2/50 Heliax	£9.20
L44P	For LDF4/50 Heliax	£9.00
PL259PM	Panel mount 4 hole.	£1.07
UHF SOCKET		
S0239F	Standard 4 hole fix	£0.48
S0239F31000	4 hole PTFE Au plate	£0.97
S0239T	2 hole fixing type	£0.48
S0239NI	Nut fixing inside type	£0.59
S0239NO	Nut fixing outside type	£0.59
S0239E	Free angle type 5.0mm	£1.01
	Free cable end 5.0mm	£2.22
MX913/C	Dust Cap c/w chain	£0.46
MX913/M	Dust Cap metric type	£0.46
UHF COUPLER		
PL258	Back to back female	£0.91
PL274	Back to back chassis	£1.07
SMCPL/PL	Back to back male	£1.38
M359	Elbow male-female	£1.07
M358	'T' 2 female 1 male	£1.38
M358AF	'T' 3 female	£1.70
M458	'X' 3 female 1 male	£2.13
UHF INTERSERIES ADAPTORS		
UG255	UHF socket – BNC plug	£1.76
UG273	UHF plug – BNC socket	£1.76
S0/25	UHF socket – 2.5mm jack	TOS
S0/35	UHF socket – 3.5mm jack	£0.79
S0/NF	UHF socket – N socket	£1.96
UG146	UHF socket – N plug	£2.25
UG83	UHF plug – N socket	£1.96
UHF CABLES		
PL36PL	3.0' RG58 PL259 ends	£1.85
N PLUG 50 ohms		
UG536	Small type 5.5mm	£2.82
UG21	Standard type 11.2mm	£1.55
L42W	For LDF2/50 Heliax	£7.40
L44W	For LDF4/50 Heliax	£10.80
N SOCKET 50 ohms		
UG58	Standard 4 hole fix	£0.94
UG1052	Free cable end 5.5mm	£2.85
UG23	Free cable end 11mm	£1.70
L42N	Free jack for LDF2/50	£7.40
L44N	Free jack for LDF4/50	£10.80
MX913C	Dust cap c/w chain	£0.46
N COUPLER 50 ohms		
UG107	'T' 2 female 1 male	£3.74
UG28	'T' 3 female	£3.16
UG57	Double male adaptor	£2.70
UG29	Double female adaptor	£2.13
UG27	Elbow male-female	£2.24
N INTERSERIES ADAPTORS 50 ohms		
UG201	N plug – BNC socket	£3.28
UG349	N socket – BNC plug	£3.16
UG606	N socket – BNC socket	£2.59
UG146	N plug – UHF socket	£2.25
UG83	N socket – UHF plug	£1.96
S0/NF	N socket – UHF socket	£1.96

NB: PRICES INCLUDE VAT AT 15%
Postage: £0.50 any quantity (UK)

HANSEN

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

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

FS710:
PEP
AUTO-SWR
RMS LEVEL

FS710 £78.20

FS710H: 1·8-60MHz. 15, 150, 1·5kW
FS710V: 50-150MHz. 15, 150W
V.S.W.R: 4:1 and to 20:1
Accuracy: ±7% of FSD
Impedance: 50 52 Ohms
Connectors: SO239
Power: 240 Volts AC 50Hz
Weight: 3·lbs (1·5Kgs)
Size overall: 8 × 4 × 5½"
Size Meter: 2 × 3½"
Time Const: PEP follow 4 second

FS500 £60.95

PEAK READING LEVEL RESPONSE
FS500H 1·8-60MHz 20, 200 & 2kW
FS500V 50-150MHz 20 & 200W
Power ±7% FSD SWR 1:1 5:1
Size: 8 × 4 × 5½"

FS600 £44.85

PEAK READING LEVEL RESPONSE
FS601M 1·8-30MHz 20 & 200W
FS601MH 1·8-30MHz 200 & 2kW
FS602M 50-150MHz 20 & 200W
FS603M 430-440MHz 5 & 20W
Power ±10% FSD. SWR 1:1 3:1
Size: 6½ × 2½ × 4½"

FS300 £40.25

LEVEL RESPONSE, LARGE METER
FS300H 1·8MHz 20, 200 1kW.
FS300V 50-150MHz 20, 200W FSD
Power ±10% SWR 1:1 3:1 ±10%
Size: 8 × 4 × 5½"

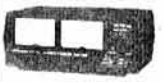
FS7 £35.65

VHF/UHF WATTMETER & BRIDGE
FS7 145MHz & 432MHz 5, 20, 200W
Power average ±10%. SWR 1:1-3:1
Power Max: 144MHz, 200W
432MHz 20W
Size: 6½ × 2½ × 4½". 'N' type sockets

FS711 £32.20

REMOTE INDICATOR TYPE
FS711H 1·8-30MHz 20 & 200W
FS711V 50-150MHz 20 & 200W
FS711U 430-440MHz 5 & 20W
Power ±10% SWR 1:1-3:1 ±3%
Indicator 5 × 2½ × 1½"
coupler 3½ × 2½ × 1½"

FS5E £32.20



INDEPENDENT TWIN METER
FS5E 3·5 150MHz 20, 200 & 1kW
Power average ±10%. SWR 1:1-5:1
Power Max: 1kW 3·5 30MHz
50W 50 150MHz
Size: 7 × 3 × 3½". 'On the Air' LED

FS300M £31.05

LEVEL RESPONSE, POWER & SWR
FS301M 1·8 30MHz 20, 200W
FS301MH 1·8 30MHz 200, 2kW
FS302M 50 150MHz 20, 200W
Power ±10%. SWR 1:1 3:1 ±3%
Size: 6½ × 2½ × 4½"

SWR3S £23.00

WIDE RANGE POWER & SWR
SWR3S 3·5 150MHz 20 & 200W
Power average ±10% SWR 1:1-3:1
Power Max: 200W 3·5 30MHz
50W 50 150MHz
Size: 6 × 2½ × 2½". Antenna/switch

SWR50B £23

TWIN METER, RELATIVE POWER
SWR50B 3·5 150MHz Scaled 1kW
Power average ±20% SWR 1:1-3:1
Power Max: HF 1kW 1:1 300W 3:1,
VHF 50W
Size: 6 × 2½ × 2½". 'On the Air' LED

8 new models in stock. Sae for details

NB· PRICES INCLUDE VAT AT 15%
Carriage free (surface post) worldwide

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.

Model	Band	Gain	Type	Power	Length	Price
20SE	20m		(½λ)	100W	1·72m	£15.35
17SE	17m		(½λ)	200W	1·92m	£14.20
15SE	15m		(½λ)	130W	1·72m	£13.80
12SE	12m		(½λ)	200W	1·92m	£13,40
10SE	10m		(½λ)	100W	1·72m	£12.65
4E	4m	0dB	¼λ	150W	1·03m	£7.65
2H/PL	2m		(½λ)	50W	0·17m	£3.45
2QW	2m	0dB	¼λ	200W	0·49m	£2.30
2VF	2m	3dB	½λ	50W	1.06m	£10.35
2NE	2m	3dB	½λ	150W	1·30m	£6.90
78SF	2m		(⅝λ)	100W	1·42m	£12.25
78F	2m	4·5dB	⅝λ	100W	1·75m	£12.25
78B	2m	4·5dB	⅝λ	150W	1·72m	£12.65
88F	2m	5·2m	⅝λ	100W	2.03m	£16.50
70N2M	2/70	2·7dB 5·1dB	(½λ) 2 × ½λ	100w	0·89m	£14.20
258	70cm	5·5dB	2 × ½λ	100W	0.91m	£11.50
358	70cm	6·3dB	3 × ½λ	100W	1·36m	£14.95

Model	Description	Price
SOWM	Wing Mount. SO239M upper SO239 under adjustable angle	£3.45
TMCAS	Boot Mount c/w 6 mtrs RG58 and PL259 plug	£7.30
GCCA	Gutter Mount deluxe cast type c/w 4 mtrs cable assemble and PL259	£8.80
SOMM	Mag Mount c/w 4 mtrs RG58 PL259 *For use with smaller antennas only*	£8.45

An alternative mounting for any of the two metre antennas listed above is the BSD stainless steel bumper strap at **£7.75** plus the HS88BK extension tube at **£16.50** which raises by 80 cms and acts as a counterpoise to the radiator.

Also fitting the bumper mount is the 10 foot, 3 section (quick disconnect and fold over jointed) mobile colinear element which provides about 7dB of gain for **£28.35.**

Stop press: ⅝λ ultra low radiation angle, typ. 30° below ⅞λ. Substantial improvement on DX (in clear).

For operation on 2 metres and 70 cms the dual band 70N2M is an elegant solution particularly when combined with the HS770 diplexer which provides 50W power handling, 30dB isolation between transceivers with an insertion loss of only 0·5dB for **£13.40.**

NB: PRICES INCLUDE VAT AT 15%
Mainland delivery: accs. £0.80, antennas £1.80

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

FT290R £249 inc

VAT @ 15% & POSTAGE

- 144-146MHz (144-148 possible)
- 2.5W PEP, 2.5W/300mW out on FM CW
- FM: 25kHz and 12.5kHz steps
- SSB: 1kHz and 100Hz steps
- ± 600kHz repeater split, 1750kHz burst
- Integral telescopic antenna
- Rx, 70mA, Tx; 800mA (FM maximum)

FT790R £295 inc

VAT @ 15% & POSTAGE

- 430-330MHz (440-450 alternative)
- 1W PEP, 1W/250mW FM/CW out
- FM: 100kHz and 25kHz steps
- SSB: 1kHz and 100Hz steps
- 1·6MHz shift with input monitor, 1,750Hz burst
- Rx: 100mA/200mA. Tx; 750mA maximum
- BNC Mounted ¼λ flexi antenna included

- Multimode USB, LSB, FM, CW '790 EX-STOCK
- Optically coupled main tuning
- 100Hz backlit LCD Frequency display
- 10 memory channels "5 year" backup
- Any Tx/Rx split with dual VFOs
- Up/down tuning from microphone
- AF output 1W @ 10% THD
- Bandwidth 2·4kHz and 14kHz @ −6dB
- LED's, "on air", "busy" m/c meter; S.PO
- 58 (H) × 150 (W) × 195 (D). 1.3kg

SMC2.2C	NiCad 2.2 A/hr, "C"	TOS
SMC2.0C	NiCad 2.0 A/hr "C"	£2.35
SMC8C	Slow Charger (220mA)	£8.80
MMB 11	Mobile Mount	£22.25
CSC1	Soft carrying case	£3.45
FL2010	Linear Amplifier 2m 10W	£64.40
FL7010	Linear Amplifier 70cms	£99.65

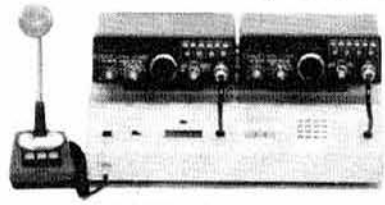
6, 2 or 70!

6, 2 or 70!

FT480R (2m) £365 inc. VAT @ 15% & SECURICOR

- 144-146MHz (143.5-148.5 possible)
- ± 600kHz standard repeater split
- Excellent dynamic range and sensitivity
- FM; 25, 12½, 1kHz steps
- SSB; 1,000, 100, 10Hz steps

- USB-LSB-CW-FM (A3j, A1, F3)
- 30W PIP A3j, 10/1 W out A1 F3
- Any TX Rx split with dual VFO's
- Four easy write-in memory channels
- Memory scanning with slot display
- Up/down tuning/scanning from mic.
- Priority channel on any memory slot
- Digital RIT. Advanced noise blanker
- Satellite mode allows tuning on Tx
- Semi break in with side tone
- Very bright blue 100Hz digital display
- Display shows Tx & Rx freq (inc RIT)
- String LED display for "S" and PO
- LED's; "On Air", Clar, Hi/Low, FM mod.
- Size (Case): 8.3" D, 2.3" H, 6.9" W



illustrated with SC1 station consol & YD148 mic

- FT780R1·6 fitted 1·6MHz Shift **£459** inc.
- 430-434MHz (440-445) possible
- GaAs Fet RF for incredible sensitivity
- FM; 100kHz, 25kHz, 1kHz, steps
- SSB; 1,000, 100, 10Hz steps

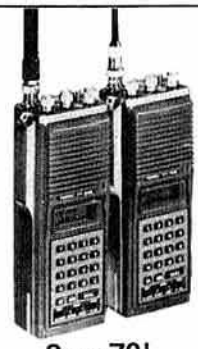
FT780R (70cm) £449 inc VAT @ 15% & SECURICOR

FT208R £199 inc

VAT @ 15% & POSTAGE

- 144-146MHz (144-148 possible)
- 12.5/25kHz synthesizer steps
- ± 600kHz repeater split
- 2.5 or 0.3W RF output
- Rx: 20mA squelch 150mA max AF
- Tx: 800mA at 2.5W RF
- 0.25μV for 12dB SINAD

- Keyboard entry of frequencies/splits
- LCD digital display with backlight
- Any split + or − programmable
- Ten memory channels "5 year" back up
- Up/down manual tuning. Memory scan
- Manual or auto scan for busy/clear
- Priority channel with auto search back
- Scan between any two frequencies
- Auto scan restart. 1,750Hz tone burst
- Built in condenser microphone
- 500mW to int/ext speaker
- External speaker/mic available
- 168(H) × 61(W) × 39(D)mm
- C/w Quick change NiCad pack, helical



2 or 70!

FT708R £219 inc

VAT @ 15% & POSTAGE

- 430-440MHz (440-450 alternative)
- 25kHz synthesizer steps
- Any split keyboard programmable
- ± 7.6MHz EU split standard
- 1W or 100mW RF output
- Rx 20mA squelch, 150mA (max AF)
- Tx:500mA it 1W RF
- 0.4μV for 12dB SINAD

2 and/or 70!!

FT720RV £245 inc. VAT @ 15% & SECURICOR

- 144-146MHz (144-148MHz possible)
- 12½kHz synthesizer, 600kHz shift
- 0.3μV for 20dB quieting
- Rx 0.5A. Tx RV 3.5A, RVH 6.5A
- 5.8 (6.5)" D × 6" W × 2(2.2)" D

- Four easy write-in memory channels
- Rx priority channel (auto check)
- Scanning band/memory empty/busy
- Up/down tuning/scanning from mic.
- Optically coupled tuning control
- Manual and automatic tone burst
- String LED's for 'S' and PO. 7 status LEDs
- 1½W of audio to internal/external speaker

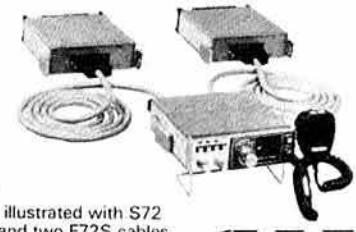
FT720 Control Head

- 3.3 (4.3)" D × 6" W × 2 (2.2)" H

S72 Switching box

- Pushbutton band change Auto steps/splits

E72S Extension cable, 2m long
E72L Extension cable, 4m long
MMB3 Mobile Mounting bracket for deck



illustrated with S72 and two E72S cables

- 430-434MHz
- 25kHz synthesizer steps, 1.6MHz shift
- 0.5μV for 20dB quieting
- Rx; 0.5A, Tx; 4.5A
- 5.8 (6.5)" D × 6" W × 2(2.2)" D

FT720RU £265 inc. VAT @ 15% & SECURICOR

SOUTH MIDLANDS COMMUNICATIONS LTD

S. M. HOUSE, RUMBRIDGE STREET, TOTTON, SOUTHAMPTON SO4 4DP, ENGLAND
Tel: Totton (0703) 867333, Telex: 477351 SMCOMM G, Telegram: "Aerial" Southampton.

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Unit 27 Pinfold Workshops,
Pinfold Lane, Buckley.
Buckley (0244) 549563
9.30-5.30 (Lunch 1.30) Tue-Sat

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Stourbridge	Brian	G3ZUL	(03843) 5917	Tandragee	Mervyn	GI3WWY	(0762) 840656	Jersey	Geoff	GJ4ICD	(0534) 26788

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The national society representing all UK radio amateurs

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Region 2—D. S. Smith, G4DAX. Tel 0947 86333
Region 3—L. W. Craven, G4EQI
Region 4—M. Shardlow, G3SZJ. Tel 0332 556875
Region 5—J. S. Allen, G3DOT
Region 6—F. S. G. Rose, G2DRT. Tel 0494 814240
Region 7—P. J. Walker, G8HMG. Tel 0737 64035
Region 8—K. A. Crouch, G8KEN. Tel 0303 55241
Region 9—W. J. Colclough, G3XC. Tel 0726 860485
Region 10—P. A. Jones, GW4HAT
Region 11—B. H. Green, GW2FLZ. Tel 0492 49288
Region 12—M. R. Hobson, GM8KPH
Region 13—A. B. Givens, GM3YOR
Region 14—V. Kusin, GM4HCO
Region 15—J. T. Barnes, GI3USS. Tel 0247 3948
Region 16—T. D. Howe, G3PLF. Tel 0268 24453
Region 17—H. G. Cunningham, G8FG. Tel 0202 876018
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Region 19—R. J. Broadbent, G3AAJ
Region 20—B. L. Goddard, G4FRG

HONORARY OFFICERS

Aerial Planning Panel co-ordinator—R. W. Price, G4BSO

Audio Visual Library co-ordinator—c/o RSGB HQ

Awards managers—**hf**—P. Miles, G3KDB
vhf—Jack Hum, G5UM

Intruder Watch organizer—S. Cook, G5XB

Microwave manager—D. S. Evans, G3RPE

Observation Service organizer—D. M. Pratt, G3KEP

Slow morse practice transmissions organizer—M. A. C. MacBrayne, G3KGU

Trophies manager—P. A. Miles, G3KDB

VHF manager—K. A. M. Fisher, G3WSN

Correspondence to RRs and honorary officers should be addressed directly to them (QTHR), not to RSGB HQ.

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

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RSGB HEADLINE NEWS—Tel 0707 59312

By telephoning the above number, members can receive up-to-date amateur radio news of immediate interest from a three-minute recording. This is generally updated twice weekly, or more frequently as necessary.

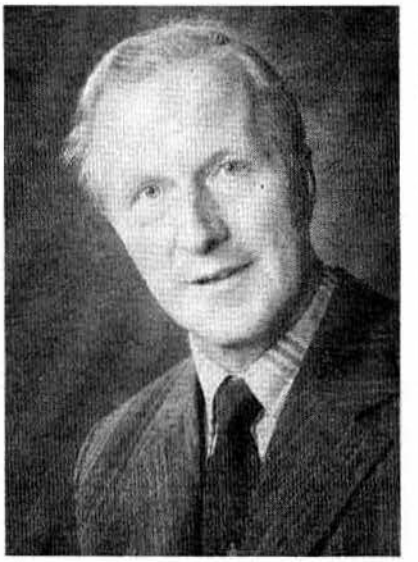
RSGB SUNDAY NEWS BROADCASTS

These broadcasts are made every Sunday morning, giving almost complete coverage of the British Isles. Stations broadcasting them (particulars below) use the callsign GB2RS.

The purpose of these news broadcasts is to provide an outlet for amateur radio news items which cannot wait for the next issue of *Rad Com*. Items for inclusion should reach RSGB HQ by letter (marked "GB2RS news") or telephone 0707 59260 before 10am on Wednesdays, although no guarantee of inclusion can be given. Once broadcast, items are not usually repeated.

INTENDED RECEPTION AREA	NORMAL READER	RESERVE READER	LOCAL START TIME
Frequency: 3·640MHz. Mode: ssb			
NE Scotland	GM3HGA	GM3VEY	1130
Frequency: 3·650MHz. Mode: ssb			
SE England	G2MI	G4ARZ	0900
Midlands	G2CVV	G8QZ	0930
SW England/Wales	G8ML	G3JFH/G4IEY	1000
Northern Ireland	GI3GAL	GI3SXG	1030
NE England	G5VO	G3MCF	1100
E Scotland	GM4CUZ	GM4FLP	1430
Midlands	G8QZ	G2CVV/G3SZJ	1800
Frequency: 3·660MHz. Mode: ssb			
Central Scotland	GM3TCW	GM3ULP	1130
Frequency: 7·0475MHz. Mode: a.m.			
UK (from Northern Ireland)	GI3GGY	GI2DHB	0900
UK (from N Midlands)	G3LEQ	G2CVV	1100
Frequency: 144·250MHz. Mode: ssb (horizontal polarization)			
N from Carlisle	G4LAA	(Vacancy)	0930
SW from the Midlands	G3BA	G3KQF	0930
NE from S Devon	G3CHN	G3PBV	1000
NW from Manchester	G3SMT	G3SMM	1000
NNW from Cleveland	G4JJB	G8FTZ	1000
W from Carlisle	G4LAA	(Vacancy)	1030
SE from Lincoln	G3NRO	G8ZVF	1030
SW from London	G3FZL/G3VAG	G3IIR	1030
S from Aberdeen	GM8GHV	GM8MBP	1030
W from Bristol	G4CJZ	G3ZWY	1100
W from Bangor, Co Down	GI3TLT	GI3SXG	1130
Frequency: 145·525MHz (S21). Mode: fm (vertical polarization)			
Caithness	GM4KNQ	GM4LNN	0930
Cornwall	G2ABC	G3NPB	0930
North Hampshire	G8CKN	G3PZN	0930
Suffolk	G3ZNU	G4FZZ/G4HMF	0930
Leeds	G3SPX	G8XGN	0930
Co Down	GI3WEM	GI4DOR	0930
Edinburgh	GM4EHO	(Vacancy)	0930
E Cornwall/S Devon	G3ZYY	G8XTE	1000
Londonderry	GI2DHB	GI4AHD	1000
London	G3FZL/G3VAG	G3IIR	1000
Birmingham	G3BA	G4LCM	1000
Lincolnshire	G3NRO	G8ZVF	1000
Tyneside	G4LDT	G8TKU	1000
Glasgow	GM4HCO	GM4CXM	1000
Elgin	GM4ILS	(Vacancy)	1000
Southampton	G8LVC	G4COM/G4IDV	1030
E Sussex coast	G8SC	G3ZFE	1030
Bristol	G4CJZ	G3ZWY/G8NNU	1030
Manchester	G3LEQ	G3JWK	1030
Dumfries	GM3MSG	(Vacancy)	1100
Brighton coast	G3ZYE	G8GEZ	1100
Preston	G8WAT	(Vacancy)	1100
Huntingdon, Cambs	G8BBK	G8TQI	1100
Jersey	GJ4JWA	GJ8YVL	1100
Barmouth, Gwynedd	GW4LNK	GW6ARL/GW3KJW	1100
Clwyd/Merseyside	GW4IEQ	G8NNS	1100
Aberystwyth	GW4JXB	GW8MAW	1130
Exeter	G3PBV	G4PCB	1130
Leicester	G4JYS	G4EYL	1130
Scarborough	G4OSD	G4EEV	1130
Enniskillen	GI4PCY	GI4CZW	1230

A SEASONAL MESSAGE FROM THE RSGB PRESIDENT



1982 has proved to be a very exciting year for our Society and has seen many changes. One of our first major problems was the chaotic situation which resulted from the appearance of the incorrect amateur licence schedule, and subsequent overtime working and sleepless nights by staff and volunteer expert members. Thankfully all the effort has proved to be worthwhile and the result now promises to be a much better working relationship with our licensing authority.

Throughout the year the urgent search for a new headquarters building continued and late in October new premises in Potters Bar were acquired. I cannot stress too strongly the importance of our move. For a considerable time HQ staff have been working under stress in very uncongenial surroundings, and I would like to take this opportunity to pay tribute to the general manager and his team for the way in which they have continued to cope with their jobs under impossible conditions. At the same time I ask members to please make allowance for delays in processing their enquiries until the new building is fully functioning.

The Society continues to grow in spite of the recession, and it is my firm belief that the increased facilities which it is offering make membership more and more worthwhile.

One consequence of taking over the Presidency at short notice, and at the same time being in full time professional employment, has been that I have not been free to visit as many clubs, attend as many functions, or meet as many members as I would have wished —for this, my sincere apologies.

May I conclude by wishing all connected with the RSGB a very happy festive season and successful 1983.

John Allaway, G3FKM

QTC
Amateur radio news

Council Letter

Many members may not have heard of an RSGB publication, which has been produced by HQ for the past five years, called the *Council Letter*. As its name implies, it is intended to keep members of the Society's Council fully up-to-date with Society activities and other amateur radio events. As a courtesy, copies of this letter are sent to all Society regional and area representatives as well as other volunteers. If local club members do not see copies of the *Council Letter*, they should contact their area or regional representative for details.

RSGB 1983
PRESIDENTIAL INSTALLATION

The installation of Mr D. E. Baptiste, CBE, as the 49th President of the Radio Society of Great Britain will take place during a

SOCIAL EVENING

commencing at 7.30pm for 8pm on

Saturday 15 January 1983

at the

Bloomsbury Crest Hotel, London
(Two minutes' walk from Russell Square station)

Admission will be by ticket only, and because of the limited number of tickets available they will be limited to two per member.

Price per ticket: £3

Applications for tickets should be addressed to Miss R. McGuffie, RSGB, Alma House, Cranborne Road, Potters Bar, Herts EN6 3JW, and must be received by 20 December 1982.

The 70MHz band

The RSGB has been in consultation with the Home Office with regard to access to the 70MHz band by Class B licensees in the UK. The present position is that access is granted at the discretion of the primary user, in this case the Ministry of Defence.

With the many changes which are taking place as a direct result of WARC 1979, and taking into account the wishes of the primary user, the 70MHz band will remain available only to Class A licensees at present.

The Society will continue to review the position.

2,300–2,310MHz

Due to the increasing pressures on spectrum space, we regret to announce that, with effect from 1 October 1982, 2,300–2,310MHz has been withdrawn from some the amateur service in the UK. The beacons presently located in this section of the band may, however, remain on their present frequencies until 31 December 1983. The 2,300–2,310MHz section will now be allocated to fixed services. This part of the spectrum has also been withdrawn from some other European countries, and several more are likely to follow.

RAE and morse classes

CVCU, Abercynon Adult Centre, Clock School, Abercynon, Mid-Glam, needs one or two tutors to take RAE evening courses in that area on behalf of the Mid-Glamorgan Education Authority. Anyone who can help should contact Mr B. Nicholas at the above address, or telephone 741332.

The Bradford & Ilkley Community College, Division of Electrical & Electronic Engineering, Great Horton Road, Bradford, W Yorks BD7 1AY, intends to run a one-year radio amateur "A" licence morse course at 7pm on Wednesdays commencing on 12 January 1983. Prospective students should contact Mr P. Nurse, course tutor, at the above address, or telephone 0274 734844.

New nets

Licensed amateurs who share beekeeping as a hobby are invited to join a proposed new net which will commence operation on 3,630kHz at 9am on 5 December 1982. Thereafter the net will be held on the first Sunday of each month. Further details from Frank Le Quesne, GJ4HSW, Brookhill House, Prince's Tower Road, St Saviour, Jersey, CI.

Licensed members of the British Fire Service who are interested in forming a firefighters net are invited to write to Damian Walker, G4DCW, 57 Denbury Mount, Holmewood, Bradford BD4 9AU.

Sinclair Amateur Radio User Group

Following a reorganization, this group will not now be closing down as previously announced, and details of SARUG may be obtained by sending an sae to Mr P. L. Newman, G4INP, 3 Red House Lane, Leiston, Suffolk IP16 4JZ. **Telephone enquiries will not be entertained.**

Members continue to devise new amateur radio uses for Sinclair personal computers, and recent achievements include the decoding of cw and rtty for display on a television screen.

RAMTOP

Radio Amateurs' Microcomputer Techniques, Operation and Programs (RAMTOP) is a project of the Wellingborough School Radio Club, which feels there is a need for a newsletter for radio amateurs who own microcomputers other than Sinclair models, and have ideas for a program, an actual program, or a need for a program to apply their microcomputers to the hobby. Anyone interested in joining such an exchange of material and ideas should send an sae to RAMTOP, The Radio Club, The School, Wellingborough, Northamptonshire NN8 2BX.

If the response is sufficient, and includes offers of help from potential reviewers and testers of programs or circuits, it is proposed to circulate a newsletter in January, May, July and September. This will contain listings, circuit diagrams and ideas for adapting programs written for one microcomputer to the peculiarities of others. A charge will have to be made to cover production costs and postage, but no money is required yet. **Telephone calls or letters without saes cannot be dealt with.**

A Raynet tie for Christmas

A tie with the Raynet motif on a navy blue background makes an ideal Christmas gift. Obtainable from Jane Balestrini, Merrivale, Willow Walk, Culverstone, Gravesend, Kent, price £2.90 including p&p.

THE RSGB'S NEW HEADQUARTERS

There have been some momentous and far-reaching changes within amateur radio during the last five years. These have affected both the levels of RSGB membership and book sales and services to members generally, and there has been considerable expansion in all of these areas. RSGB membership increased by over 50 per cent during those years, and the turnover also increased dramatically. It was essential for the Society to respond to these changes, both in terms of the services which it provides to its members and in its staffing levels, and in order to provide the level and quality of service necessary, it became necessary to find a larger headquarters building. Space at 35 Doughty Street, both for book sales operation and for sufficient staff, had reached its absolute limit—in simple terms, the Society had outgrown its premises.

The Society is pleased to announce that after a good deal of searching and much negotiation, a new headquarters building was acquired at Potters Bar, Hertfordshire, at the end of October, and the move from 35 Doughty Street was completed by 8 November. There are several reasons for moving out of central London, among which are lower overheads and the availability of property at an advantageous price.

The floor area of the new building is between three and four times greater than that at the old headquarters building, and there is ample scope for future expansion of the Society's activities. The available facilities range from good free car parking to sufficient storage area to keep much larger stocks of books than was previously possible. The building also offers better working conditions, and should eventually have a profound effect on the quality of the service the Society can offer to its members and the amateur radio trade.

RSGB headquarters' new address is:

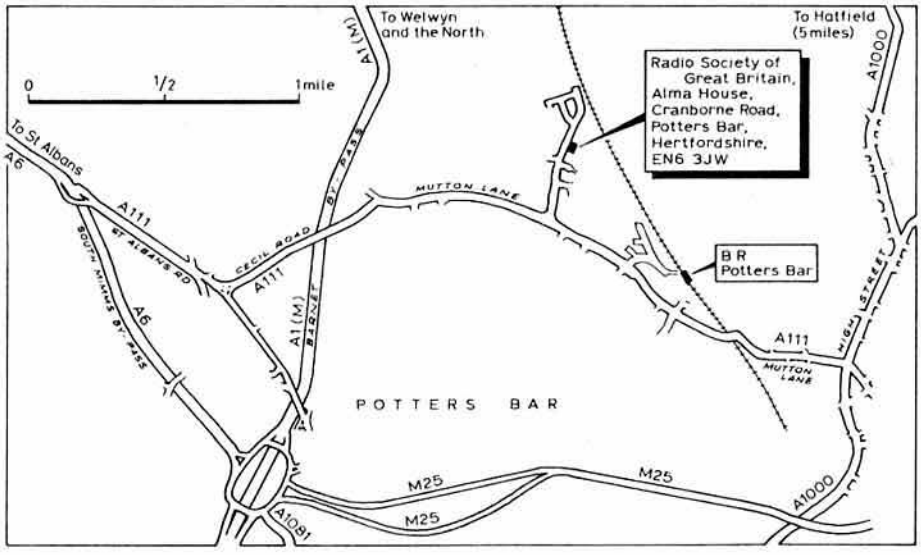
Alma House, Cranborne Road,
Potters Bar, Hertfordshire EN6 3JW

The telephone number is **Potters Bar (0707) 59015;** and the (unchanged) telex number is **25280.**

A new facility will be introduced for collection of news items for GB2RS, ORACLE and the Headline News Service. These may now be telephoned into a dedicated answering machine which will be transcribed each day: members with news items for these services are asked to leave their message on **Potters Bar (0707) 59260.**

The Headline News Service will be extended and its number will be **Potters Bar (0707) 59312.**
(From London the telephone dialling code is **77,** not **0707**)

ROAD AND RAIL ROUTE TO THE NEW HQ



A more detailed description of the new headquarters will be published in a future issue of Radio Communication.

Lightning and emp protection of amateur radio equipment

by G. R. JESSOP, CEng, MIERE, G6JP*

THERE IS a growing interest in the protection of communication equipment and systems against lightning and electromagnetic pulse (emp) radiation. This is especially of interest for emergency communication antenna installations for Raynet and repeaters, which may be located on high buildings, and therefore need positive protection against lightning and other static discharges.

The incidence of thunderstorms varies widely over the country, and from year to year. It is an old wives' tale that "lightning never strikes in the same place twice". Any building or antenna mast in an exposed position is always a potential target. A map showing the areas of the country in terms of the average number of thunderstorm days is given in Fig 1. Fig 2 is a map of England and Wales showing the resistivity of the ground. Both maps have been produced from data obtained by the Electrical Research Association from their surveys.

There can be little doubt that the greatest risks arise in areas of poor ground conductivity. This has been shown by faults in the telephone circuits

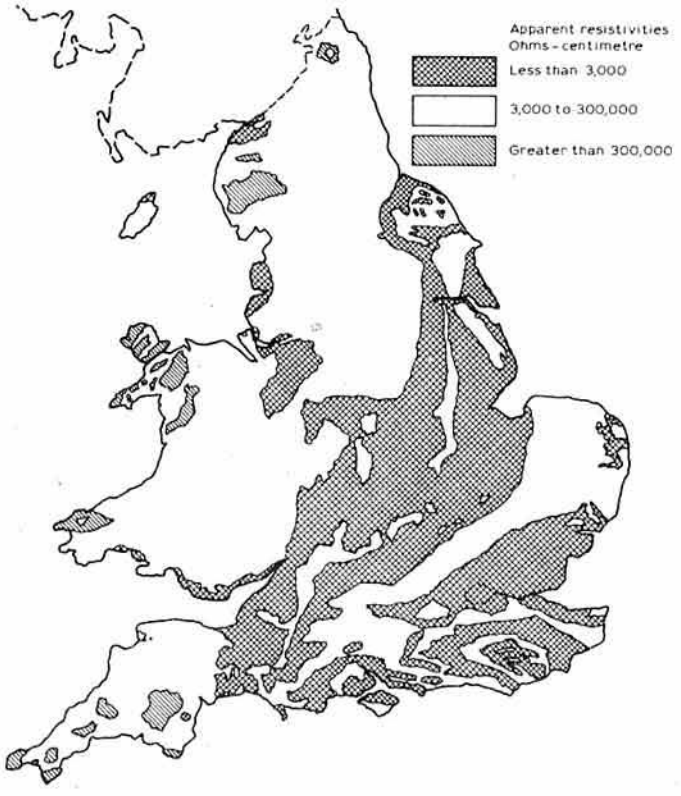
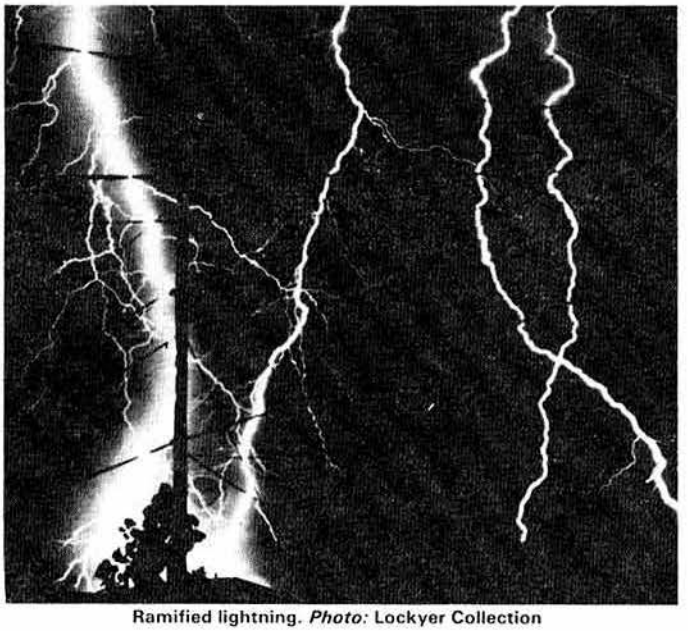


Fig. 1. Resistivity map of England and Wales



Ramified lightning. *Photo:* Lockyer Collection

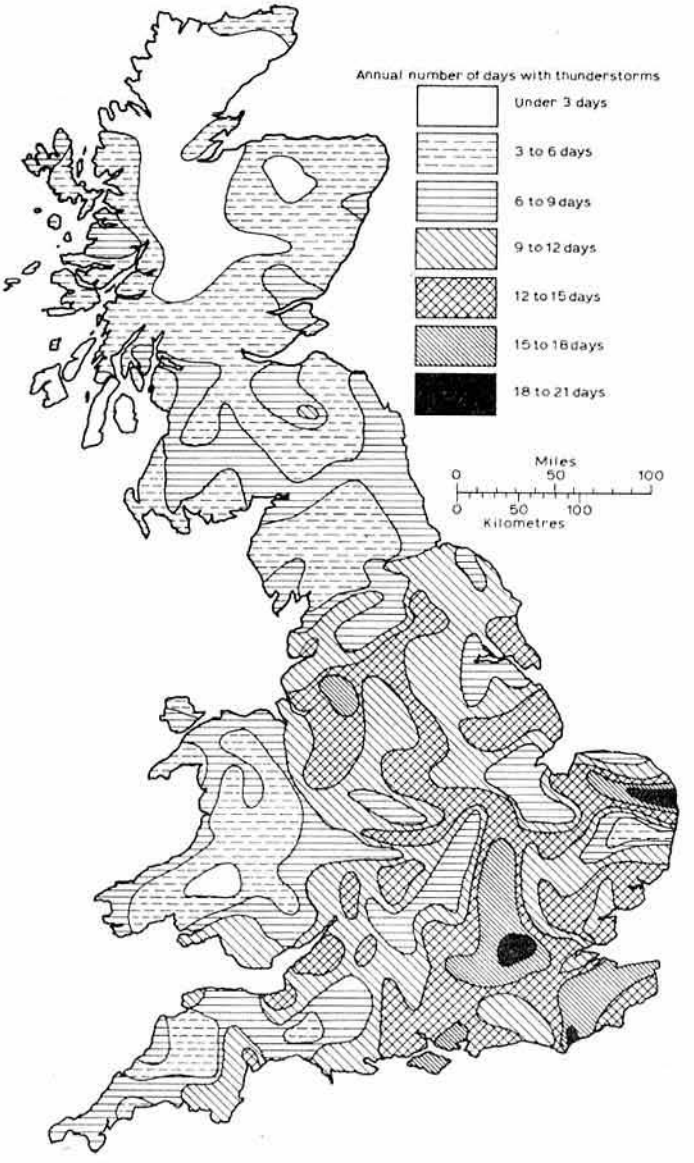


Fig 2. Average annual number of thunderstorm days in England, Scotland and Wales

*32 North View, Eastcote, Pinner, Middx.

of new exchanges in such areas in recent years. The use of gas-filled protectors (type 14A) has overcome the problem at the exchange end of the circuits, and similar devices (Type 11A) are being fitted at the customers' terminations.

In areas where both high ground resistivity and high storm frequency exist, and particularly at fairly high locations, significant failures of semiconductors can be expected. Although the UK is relatively free from storms of any great severity, occasionally one of tropical proportions does occur, with consequent damage. Protection against direct lightning strikes is virtually impossible. However, much serious damage can be caused by nearby strikes, which induce severe surges in cables and overhead lines of supply mains. Switching surges caused by interruption of the supply mains often produced by lightning strikes on the grid-system in a different area can also cause significant damage. The most likely mains-borne damage for amateurs is usually to the power supply rectifier diodes in the first instance; and progressing further into the equipment with increasing surge levels, data processors are at risk unless adequate protection is provided.

Protection should therefore be considered both for the antenna installation and the mains input to the equipment. This is more important for semiconductor than for valve equipment. Surges in the mains supply are all too often neglected when in fact this may be the most likely source of damage other than by a direct strike.

Static

The static electric field near the ground under conditions of stable fine weather is usually in the region of 100V/m. However, in the vicinity of thunderclouds this is likely to rise to several kilovolts/metre. Under these conditions it is not unknown for a man's hair to stand on end!

Development of static sometimes results in a single very violent local discharge without a storm developing. During heavy rain (or hail) there is a considerable increase in random noise due to the static charge which accumulates while it falls through the atmosphere. This will charge-up a wire antenna to quite a high voltage, and unless there is some adequate path to earth it could damage the input stage of a semiconductor receiver or other equipment.

Protection devices

There have been many types of device offered for the protection of equipment, such as special resistors (carbon blocks) or semiconductors of one type or another, but by far the most satisfactory device so far developed is the gas-filled surge arrester.

This device is the only type which will hold the voltage down to a low and constant value under wide ranges of fault current. It will maintain a voltage of the order of 20–40V when currents of 5,000A and above are present, without self-destruction. The various forms were primarily designed for the protection of telephone lines, which at the time were mostly overhead wires.

Initially these surge arresters were glass-enclosed single-gap (two-electrode) types such as the AEI type 15. More recently the three-electrode metal-ceramic types such as the type 16 etc have been introduced. These have the great advantage that when one of the three gaps fires, the gas in the tube is ionized and all the gaps come into action: the separate single-gaps need to be fired individually. For single-wire (long wire) antennas, only a single-gap device is needed, Fig 3(a), while the arrangement for twin-wire feeders is shown in Fig 3(b). The ground (earth) connection is most important. It should be arranged as far as possible to be directly below the antenna downlead—it should be remembered that lightning will not go round corners! Suitable ground connections consisting of pointed copper rods

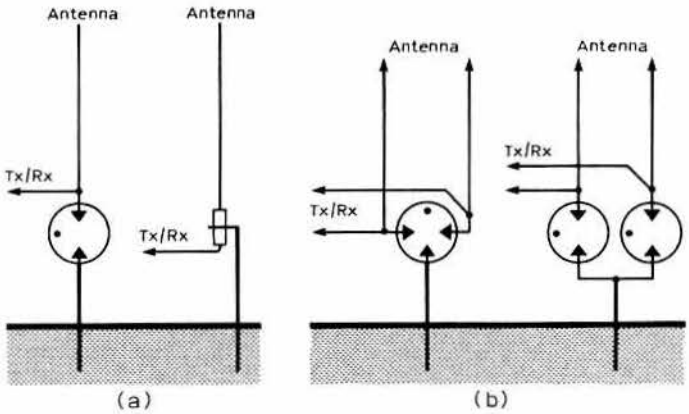


Fig 3. Antenna protection: (a) single lines; (b) twin lines

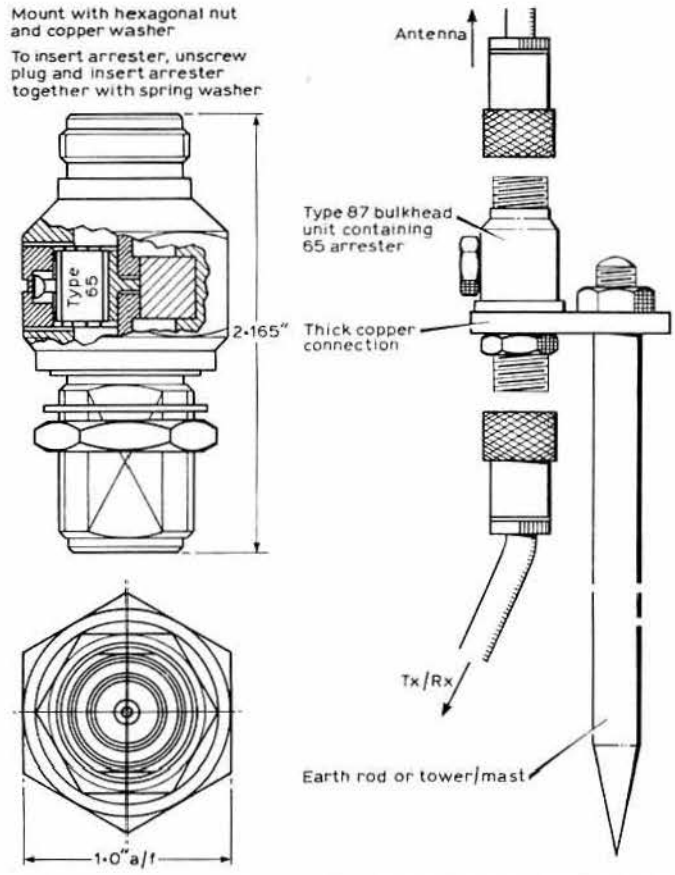
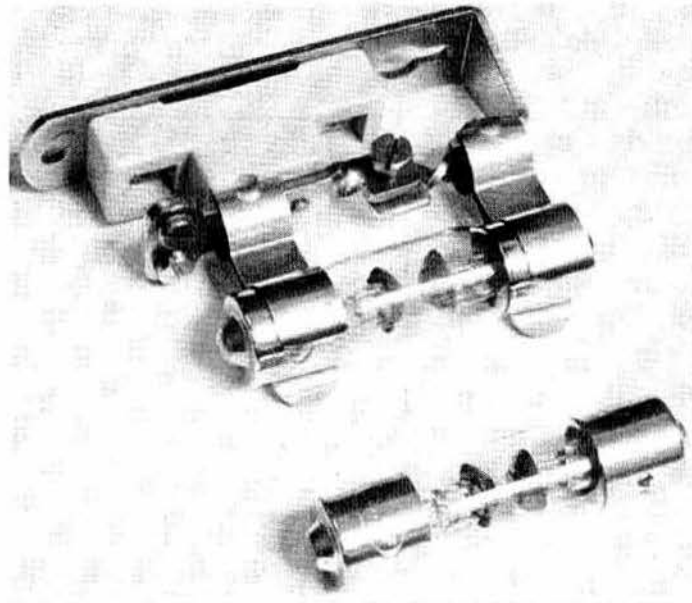


Fig 4. General arrangement for use of a bulkhead fitting in an antenna feeder

(spikes) are available, supplied either with threaded ends with couplers, or plain. To ensure an adequate contact, such rods should be driven several feet into the ground. The use of domestic water pipes is not recommended because many may contain plastic pipe connections.

In the case of twin-wire feeders the three-electrode surge arrester would be more suitable for lightning and other static discharge protection. There are several types available, together with appropriate holders. For a twin feeder system, only two single-gap devices are necessary, one for each wire, as shown in Fig 3(b), which also shows typical circuit arrangements. For coaxial line protection against lightning and emp radiation, an arrangement using a fast-operating device, such as the type 65, is shown in Fig 4.

For those who like to "see" what is happening, an earlier (though



Early glass-enclosed surge arrester type 15 with holder, including an external adjustable spark gap

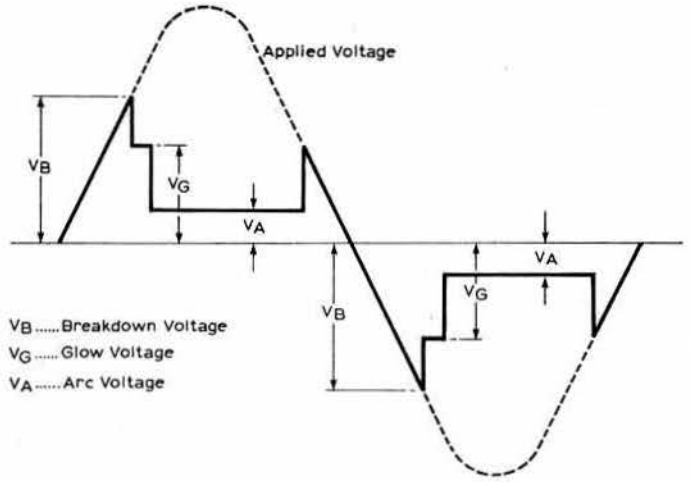
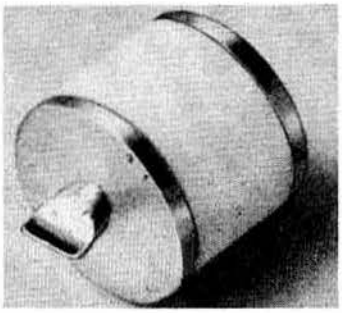


Fig 5. Voltage characteristics of a gas-filled surge arrester

obsolete and less-effective) device, the AEI type 15 glass-enclosed gas-filled surge arrester, is suitable. (The type 15 is obsolete but may be found as surplus from time to time.) When mounted in its proper holder, with an adjustable parallel spark gap included, it is very effective. With this type of device the flashes can be observed by the glow in the tube, so that operation of the station can continue until such time as it becomes obviously dangerous, shown by virtually continuous flashing of the arrester.

For some applications it is desirable that some form of fail-safe feature is provided for the gas-filled surge arrester. This is usually needed for the protection of the mains supply lines rather than antennas. Depending on the application, the fail-safe device must be suitable for the service; it can be either fail to open circuit or fail to short circuit. For example, on a signal circuit, failure needs to be to open circuit otherwise the whole system would shut down until a replacement had been installed. Fail to short circuit is normally suitable for cases such as domestic services or where regular maintenance personnel are readily available. Protector type 16B is a fail to short circuit, while type 160 is an encapsulated unit that fails to open circuit.



Type 65 surge arrester. Diameter 8mm, length 6·5mm, surge current 5,000A, striking time 1·5-2ns

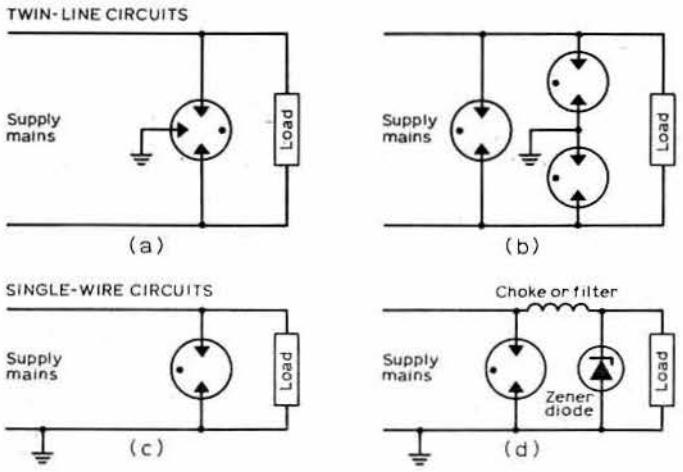


Fig 6. General circuit connections. (a) Three-electrode surge arrester. (b) Three two-electrode arrester equivalent to one three-electrode arrester. (c) General single-wire circuit with a two-electrode arrester. (d) Arrangement suitable for low-voltage or sensitive equipment zener diode voltage limiter

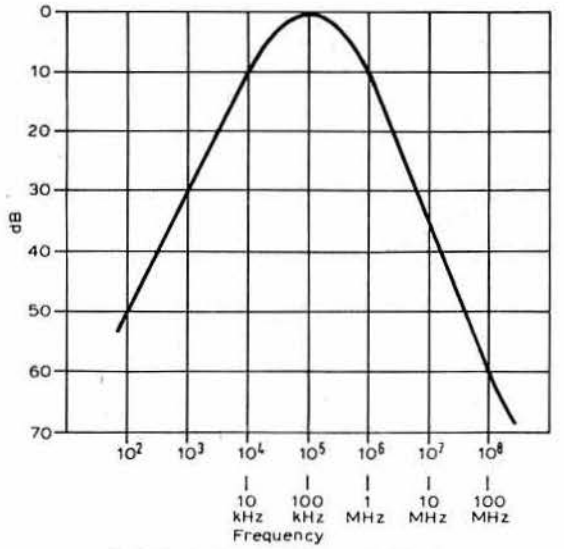


Fig 7. Typical emp radiation distribution

Earthing switches

With properly-installed gas-filled surge arresters and their large fault current capability, there is little value in having an earthing switch unless it is of adequate conductor size and installed directly in line with the earth path. If one is used, it should at least be installed outside the building.

Voltage characteristics of gas-filled surge arresters

The voltage characteristic is illustrated in Fig 5. This shows that when the voltage across the device reaches a certain value, the gas ionizes (striking voltage, Vs), and if this or larger voltage is maintained, it rapidly falls to a lower voltage (glow voltage, Vg), and as the current through the device continues to increase it falls to a still lower voltage (arc voltage, Varc). This voltage is maintained until the applied voltage falls to the glow voltage, then when the glow is extinguished the current through the device falls to zero again.

The striking voltage of the device to be used must be selected so that under normal conditions the voltage applied to it does not cause it to strike. Gas-filled surge arresters are normally selected for a narrow range of striking voltages, usually less than 2:1: for example, 150–250V.

Electromagnetic pulse (emp) protection

Protection of antennas, electronic equipment and supply cables requires very fast-operating devices that have a low "clamp" voltage (arc voltage) irrespective of the level of fault current, which will fire in 1 or 2ns. The spectrum of emp radiation covers a wide frequency range, having a peak centred on approximately 100kHz. The curve given in Fig 7 illustrates the distribution of typical radiation. The vulnerability of various electronic components is shown in Fig 8, from which it can be seen that it would take 100 times greater energy to damage a valve than a transistor, and 10,000 times more than would damage an integrated circuit. Erasure of computer memory will occur at even lower levels of radiation.

A suitable gas-filled device, type 65, is available in two through-line forms. Type 73, for insertion in a feeder cable, provides a discharge path (shunt)

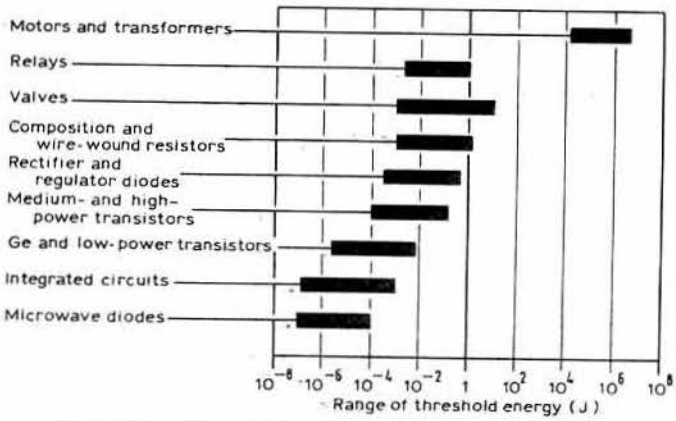
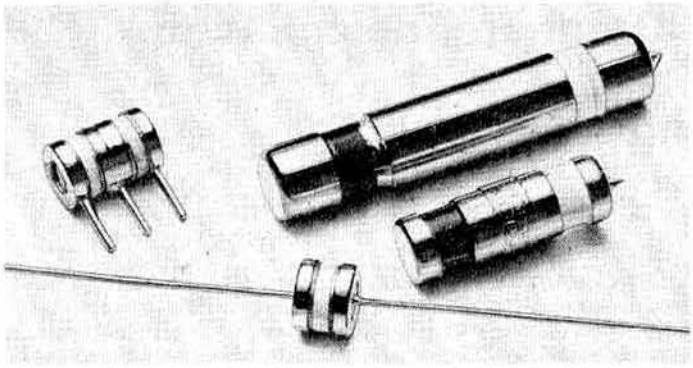


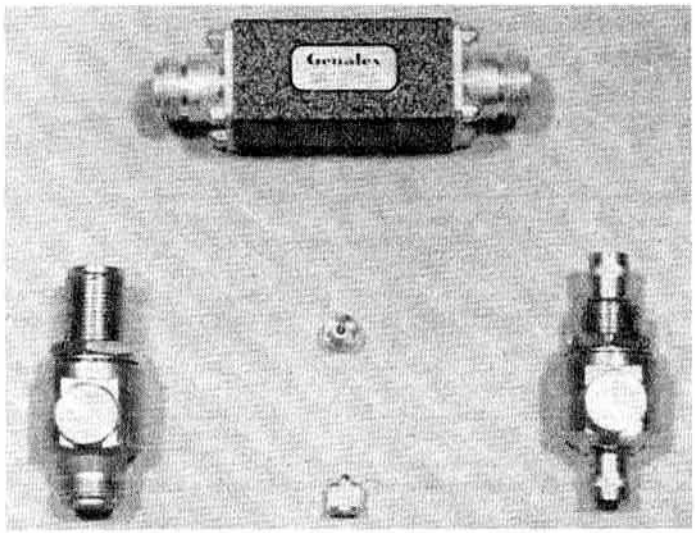
Fig. 8. Vulnerability of electronic components to emp radiation



Metal ceramic surge arresters. ***Top, l to r:*** **type 49A (PO14A) three-electrode; type 16 three-electrode.** ***Centre right:*** **type 21 three-electrode.** ***Foreground:*** **type PO11A two-electrode**

between the inner and the outer of the coaxial cable. Type 87 is similar but made for bulkhead mounting. The first can be supplied with type N, uhf or bnc connectors. This unit introduces little more discontinuity than that caused by a pair of connectors alone—a maximum vswr of 1:1 at f. 400MHz, with a capacitance of 4pF. The power-handling capacity with a type 65 of a minimum striking voltage of 150V will allow a maximum rf voltage of 100V rms on the feeder line. This allows a power of 200W at a vswr of unity; with a vswr of 2:1, a power of 100W can be handled. This level is adequate for most vhf and uhf Raynet and repeater station needs.

An alternative device is a miniature pin type 72B (series) arrester in the form of a very short length of coaxial cable, 10mm long (excluding the centre conductor ends) by 2·5mm diameter, which is suitable for use at uhf.



Through-line protectors using type 65 surge arrester. ***Top:*** **type N coaxial cable type.** ***L to r:*** **type N bulkhead type 87; type 65 surge arrester; type bnc bulkhead**

Open spark gaps

Open spark gaps as a means of protection against lightning and other discharges, especially for long wire antennas, have been used by many amateurs for almost as long as radio has been an amateur activity. These can be effective provided that the actual gap is as small as possible, allowing for the normal peak voltage that will be across the gap under usual operating conditions. Sharp, pointed electrodes are less satisfactory than those with rounded ends, due to the possibilities of ionization in the gap, especially under damp atmospheric conditions.

The minimum recommended requirements are for flat (rounded edges) or round-ended electrodes of not less than 0·125in diameter (preferably larger), adjusted to a gap spacing that will occasionally "spark over" under normal operation, with a reasonably low vswr. For the average station the gap should be 0·5mm or less.

Masts and towers

At first sight a metal mast or tower may appear to be a robust structure. Mechanically they are undoubtedly satisfactory, but electrically, as a very low resistance conductor to carry the very large currents that may be encountered with a lightning strike, they are less satisfactory. Currents in excess of 10,000A pulse are likely to be involved, and the resistance needs to be of very low ohmic value. The discontinuities in the case of the crank-up type are particularly likely to have relatively high resistance at the joints. The fixed type, where the various sections are bolted together, may also be suspect.

The only safe lightning conductor is a thick wire or strip of copper or aluminium (approximately 1·5 times the size of copper) run from the top to the earth connection, preferably extending above the top of the mast or tower with a "lightning collector" at the top. Similarly, if the antenna is to be protected the treatment needs to be applied to a wooden or other non-conducting mast.

Earth connection

Provision of an adequate earth connection is most important if the tower or mast is to be protected. Towers which are supported by a post cemented into the ground will be substantially insulated from the surrounding ground by the concrete. Wall-mounted towers suffer from the same defect.

The most satisfactory earth connection consists of a rod or tube with a pointed end driven into the ground to a depth of at least 5ft, preferably more. In dry ground it may be necessary to have two or three rods which should not be closer than about 5 or 6ft to each other. In dry weather it may be advisable to water the earth with salt water.

It is worth remembering that a mast attached to or close to a building will provide protection for the building if the mast is significantly higher than the building itself, because the building will come within the cone of protection. From this point of view the higher the mast the better.

For an antenna system used on a single frequency (band), a permanent λ/4 earthed stub (known in the early days of radar as a metal insulator) may be used. The length of the stub should be cut to a λ/4 length at mid-band, the remote end being short-circuited and connected directly to earth. In the case of a coaxial cable system, the "T" junction is best made using a T-connector; suitable components are available for either type N or uhf connectors. The length of the cable is of course an electrical λ/4 and is therefore mechanically shortened by an amount depending on the particular cable used. The velocity factor will vary from 0·65 to about 0·86 depending on the dielectric.

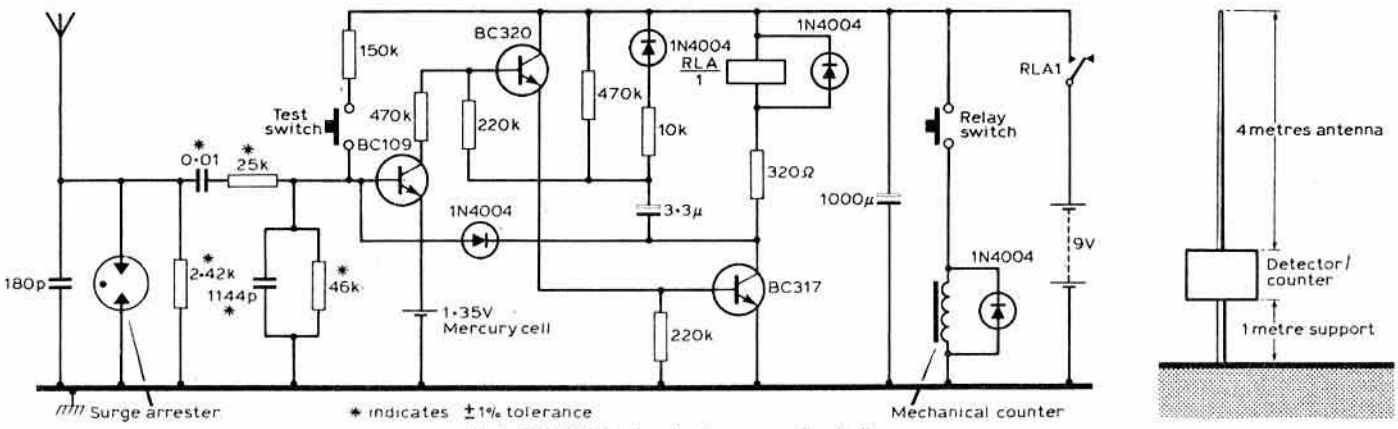


Fig 9. RSA10 lightning flash counter circuit diagram

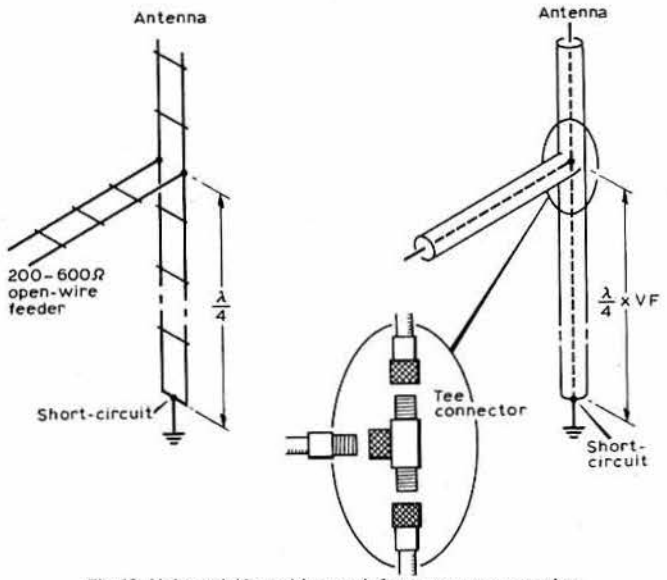


Fig 10. Using a λ/4 earthing stub for antenna protection

Appendix 1

Lightning flash detector/counter

The map in Fig 1 is the result of many observations over many years. The incidence of thunderstorms has its effect on amateur operation, often making station closedown necessary, if only as a precaution. It is thought that there may be many amateurs who are sufficiently interested in the event of storms to make their own records of the number of flashes that occur in their immediate vicinity. In South Africa, where storms are very much more frequent than here, a simple detector-counter has been designed. Details of this unit, RSA10, were briefly described in *Radio ZS* several years ago.

It consists of an effective receiver, the input of which has been designed to respond to the 10kHz radiation produced by the lightning flashes to ground, while largely ignoring the cloud-to-cloud flashes. The circuit of this unit is shown in Fig 9. The unit is intended to be used with a simple vertical antenna 4m long, and it is claimed that the unit is capable of recording flashes up to 20km distant in open country.

Of course the detector/counter could be used with a different type of antenna from the standardized one proposed. The range would then be different, nevertheless the collection of such information would be of value. These could be either on a monthly or yearly basis, and over a few years an average level could be quoted.

Appendix 2

Power in a coaxial cable

The power input to a coaxial cable will develop a corresponding voltage which becomes significant when a surge arrester is introduced. The voltage standing wave ratio (vswr) also becomes important, because the increased voltage that develops will limit the input power that can be applied without striking the surge arrester.

The maximum voltage that is developed for a given power input is:

$V = \sqrt{P \times Z} \times \text{vswr}$

where P = power in watts (either rms or peak)

Z = impedance in ohms

V = voltage across the cable (rms or peak)

(note, V peak = V rms × 1·414).

From this it can be seen that, for a surge arrester having a striking voltage of, say, 150V, the maximum rms voltage must be less than 150V peak divided by 1·414, ie 106V, so that a power level that would produce a voltage of 100V would be a satisfactory operating voltage. This amounts to a power input of 200W into a cable of 50Ω at a vswr of 1:1.

If the vswr is higher, for example 2:1, and the surge arrester is likely to be at a voltage maximum (worst case), the voltage developed will be doubled, ie the power will be reduced to half, 100W.

Wire antennas

In the case of wire or long-wire antennas the terminating impedance is likely to be quite high, often taken to be of the order of 500–2,500Ω (it can be higher). The vswr will have a pronounced effect on the striking voltage rating of the surge arrester. It requires two in series to cope with voltage at the tuning unit if the arrester is fitted to it, and some tests have shown that two type 15 arresters connected in this manner are effective.

Attenuator design with home computers

by D. FRITSCH, G5CKZ*

MOST CIRCUIT DESIGN involves long and tedious calculations which tend to make one choose either an already approved design or a trial-and-error design which usually ends up as another piece in the junk box—if it ever gets started at all. In the age of the microcomputer these tasks can be made a lot easier if one is fortunate enough to lay hands on a home computer —one may even start to make another attempt to complete an unfinished project.

A program which helped in an rf attenuator application for different input and output impedances at high power levels and predictable accuracy was written by the author for a Sinclair ZX81 with 16k of ram, but in this article a more generalized form has been adopted to cover most attenuator pads and to print the results in tables.

Attenuators

In practice T- and pi-network resistive attenuators or matching pads (Fig 1) are designed to give some convenient voltage ratio, which may be stated in decibels even though the input and output impedances are different. The attenuation figures in decibels used in the program are those equivalent to 20log(Ein/Eout).

Each type has its subtle advantages and disadvantages. The pi-type, for example, will dissipate power through all three resistors in case of no load, the T-type only through two resistors. Each network has different ratios of resistance at opposite ends of the attenuation scale.

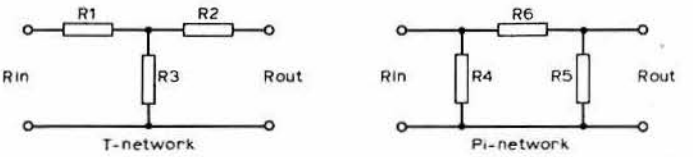


Fig 1. Resistive attenuators

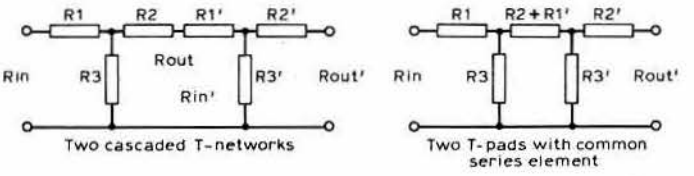


Fig 2. Two adjacent t-elements combined to form a ladder network

Attenuators giving more than 20dB loss and pads with high Rin/Rout ratios are usually built up of two or more basic networks in cascade. For each pair of cascaded pads, make sure the output impedance of the first network is the same as the input impedance of the second network. Where a more permanent connection is intended, the two adjacent elements may be combined in a single resistor to form a ladder network as shown in Figs 2 and 3.

Any number of steps may be used in order to build up the required attenuation. For balanced networks the values of the series elements are half those for the basic T- or pi-attenuator, as shown in Fig 4.

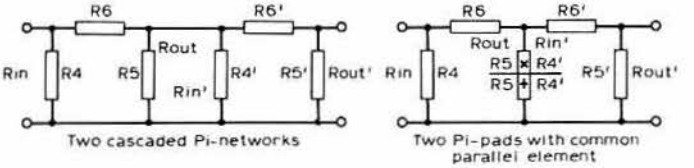


Fig 3. Two adjacent pi-elements combined to form a ladder network

*6 Station Road, Thelwall, Warrington WA4 2HS. Tel: 63540.

The program

In the program which follows, the required memory space is about 1,400 program bytes. If for a certain calculation with unequal Rin and Rout negative resistor values are obtained, then the chosen Rin/Rout ratio is too high. Try cascading to achieve the desired impedances.

RUN program and enter data as asked for on screen. If lists are longer than screen can hold, press COPY for a permanent record and press CONT for the rest of the results. This is a very convenient way to interpret and check the results before they are printed. On the other hand one could change the PRINT statements from line 160 through to line 430 and obtain immediate hard copy by inserting LPRINT statements.

Line 470 prevents the program list being displayed after each RUN. If higher than 1Ω resolution in necessary the real values for R1, R2 etc would have to be printed instead of integer values.

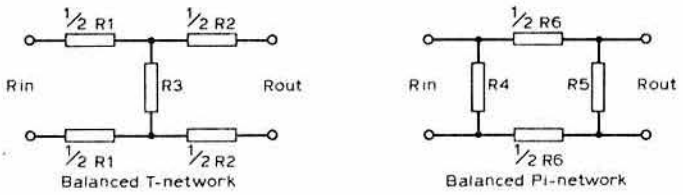


Fig 4. Balanced networks

Further reading

Useful data, Marconi Instruments, p285.

ZX81 attenuator program listing and comments

```
  10 REM ATTENUATORS
  20 PRINT "ENTER 1 FOR T-NETWOR
K ATTENUATOR       2 FOR PI-NETWO
RK ATT.",,,
  30 INPUT D$
  40 PRINT "ENTER INPUT IMPEDANC
E IN OHMS",,,
  50 INPUT B$
  60 PRINT "ENTER OUTPUT IMPEDAN
CE IN OHMS",,,
  70 INPUT C$
  80 PRINT "ENTER FIRST DB VALUE
 ON LIST",,,
  90 INPUT Z$
 100 PRINT "ENTER LAST DB VALUE
ON LIST",,,
 110 INPUT Y$
 120 PRINT "ENTER INTERIM DB LIS
T STEP",,,
 130 INPUT X$
 140 CLS
 150 FAST
 160 PRINT "UNBALANCED RESISTIVE
 ATTENUATORS",,
 170 IF D$="2" THEN GOTO 200
 180 PRINT "T-NETWORK",,,,
 190 GOTO 210
 200 PRINT "PI-NETWORK",,,,
 210 PRINT "R(IN)=";VAL B$;" OHM
S","R(OUT)=";VAL C$;" OHMS",,,
 220 IF D$="2" THEN GOTO 250
 230 PRINT "ATT.";TAB 8;"R1","R2
";TAB 24;"R3"
 240 GOTO 260
 250 PRINT "ATT.";TAB 8;"R4","R5
";TAB 24;"R6"
 260 PRINT "DB";TAB 8;"OHMS","OH
MS";TAB 24;"OHMS"
 270 PRINT "-------------------
--------"
 280 LET F=VAL B$/VAL C$
 290 FOR A=VAL Z$ TO VAL Y$ STEP
 VAL X$
 300 LET N=SQR (10**(.1*A)*VAL B
$/VAL C$)
 310 LET G=2*N
 320 LET H=N**2+F
 330 LET I=N**2-F
 340 IF D$="2" THEN GOTO 400
 350 LET R3=VAL B$*G/I
 360 LET R2=VAL C$*H/I-R3
 370 LET R1=VAL B$*H/I-R3
 380 PRINT A;TAB 8;INT (R1+.5),I
NT (R2+.5);TAB 24;INT (R3+.5)
 390 GOTO 440
 400 LET R6=1/(1/VAL C$*G/I)
 410 LET R5=1/(1/VAL C$*H/I-1/R6
)
 420 LET R4=1/(1/VAL B$*H/I-1/R6
)
 430 PRINT A;TAB 8;INT (R4+.5),I
NT (R5+.5);TAB 24;INT (R6+.5)
 440 NEXT A
 450 SLOW
 460 STOP
 470 GOTO 20
```

Used for tape saving and loading
Data entry

Decimal points at end of line are same as PRINT

Clears screen to print results
Speeds up calculation

Prints appropriate heading

Prints input/output impedance

Prints heading for list

Defines list parameters

Decibel conversion

T-pad formula

Prints rounded integer values for R1, R2 and R3

Pi-pad formula

Prints rounded integer values for R4, R5 and R6

Picture will not lose sync on next data entry

(Continued overleaf)

ZX81 attenuator program—printed lists of results

UNBALANCED RESISTIVE ATTENUATORS

PI-NETWORK

R(IN) =50 OHMS R(OUT) =75 OHMS

ATT. DB	R4 OHMS	R5 OHMS	R6 OHMS
6	87	2386	46
6.5	86	897	50
7	85	570	55
7.5	84	426	60
8	83	344	65
8.5	81	292	70
9	80	255	75
9.5	79	228	81
10	77	207	87
10.5	76	191	93
11	74	177	100
11.5	73	166	107
12	72	157	114
12.5	71	149	122
13	69	142	130
13.5	68	136	138
14	67	131	147
14.5	66	126	157
15	65	122	167
15.5	64	118	177
16	64	115	188
16.5	63	112	200
17	62	109	212
17.5	61	107	226
18	61	104	239
18.5	60	102	254
19	60	100	269
19.5	59	99	286
20	58	97	303

UNBALANCED RESISTIVE ATTENUATORS

T-NETWORK

R(IN) =50 OHMS R(OUT) =75 OHMS

ATT. DB	R1 OHMS	R2 OHMS	R3 OHMS
6	2	43	82
6.5	4	44	75
7	7	44	68
7.5	9	45	63
8	11	45	58
8.5	13	46	54
9	15	47	50
9.5	16	48	46
10	18	49	43
10.5	20	50	40
11	21	50	37
11.5	23	51	35
12	24	52	33
12.5	25	53	31
13	26	54	29
13.5	28	55	27
14	29	56	25
14.5	30	57	24
15	31	57	22
15.5	32	58	21
16	33	59	20
16.5	34	60	19
17	34	60	18
17.5	35	61	17
18	36	62	16
18.5	37	62	15
19	37	63	14
19.5	38	64	13
20	39	64	12

ZX81 copy of printout for T- and pi-networks with unequal input and output impedances

UNBALANCED RESISTIVE ATTENUATORS

T-NETWORK

R(IN) =600 OHMS R(OUT) =600 OHMS

ATT. DB	R1 OHMS	R2 OHMS	R3 OHMS
1	35	35	5200
1.5	52	52	3457
2	69	69	2583
2.5	86	86	2056
3	103	103	1703
3.5	119	119	1449
4	136	136	1258
4.5	152	152	1108
5	168	168	987
5.5	184	184	887
6	199	199	803
6.5	215	215	732
7	229	229	670
7.5	244	244	615
8	258	258	568
8.5	272	272	525
9	286	286	487
9.5	299	299	453
10	312	312	422
10.5	324	324	393
11	336	336	367
11.5	348	348	344
12	359	359	322
12.5	370	370	302
13	380	380	283
13.5	391	391	265
14	400	400	249
14.5	410	410	234
15	419	419	220
15.5	428	428	207
16	436	436	195
16.5	444	444	184
17	451	451	173
17.5	459	459	163
18	466	466	154
18.5	473	473	145
19	479	479	136
19.5	485	485	129
20	491	491	121

UNBALANCED RESISTIVE ATTENUATORS

PI-NETWORK

R(IN) =600 OHMS R(OUT) =600 OHMS

ATT. DB	R4 OHMS	R5 OHMS	R6 OHMS
1	10435	10435	69
1.5	6966	6966	104
2	5235	5235	139
2.5	4198	4198	175
3	3509	3509	211
3.5	3018	3018	248
4	2652	2652	286
4.5	2368	2368	325
5	2142	2142	365
5.5	1958	1958	406
6	1806	1806	448
6.5	1678	1678	492
7	1569	1569	538
7.5	1475	1475	585
8	1394	1394	634
8.5	1323	1323	685
9	1260	1260	739
9.5	1204	1204	795
10	1155	1155	854
10.5	1111	1111	915
11	1071	1071	980
11.5	1035	1035	1048
12	1003	1003	1119
12.5	973	973	1194
13	946	946	1273
13.5	922	922	1356
14	899	899	1444
14.5	878	878	1536
15	860	860	1634
15.5	842	842	1737
16	826	826	1845
16.5	811	811	1960
17	797	797	2081
17.5	785	785	2210
18	773	773	2345
18.5	762	762	2489
19	752	752	2640
19.5	742	742	2800
20	733	733	2970

ZX81 copy of printout for T- and pi-networks with equal Rin and Rout of 600Ω

UNBALANCED RESISTIVE ATTENUATORS

T-NETWORK

R(IN) =50 OHMS R(OUT) =50 OHMS

ATT. DB	R1 OHMS	R2 OHMS	R3 OHMS
1	3	3	433
1.5	4	4	288
2	6	6	215
2.5	7	7	171
3	9	9	142
3.5	10	10	121
4	11	11	105
4.5	13	13	92
5	14	14	82
5.5	15	15	74
6	17	17	67
6.5	18	18	61
7	19	19	56
7.5	20	20	51
8	22	22	47
8.5	23	23	44
9	24	24	41
9.5	25	25	38
10	26	26	35
10.5	27	27	33
11	28	28	31
11.5	29	29	29
12	30	30	27
12.5	31	31	25
13	32	32	24
13.5	33	33	22
14	33	33	21
14.5	34	34	20
15	35	35	18
15.5	36	36	17
16	36	36	16
16.5	37	37	15
17	38	38	14
17.5	38	38	14
18	39	39	13
18.5	39	39	12
19	40	40	11
19.5	40	40	11
20	41	41	10

UNBALANCED RESISTIVE ATTENUATORS

PI-NETWORK

R(IN) =50 OHMS R(OUT) =50 OHMS

ATT. DB	R4 OHMS	R5 OHMS	R6 OHMS
1	869	870	6
1.5	580	580	9
2	436	436	12
2.5	349	350	15
3	292	292	18
3.5	251	252	21
4	220	221	24
4.5	197	197	27
5	178	178	30
5.5	163	163	34
6	150	150	37
6.5	139	140	41
7	130	131	45
7.5	122	123	49
8	115	116	53
8.5	110	110	57
9	104	105	62
9.5	100	100	66
10	96	96	71
10.5	92	93	76
11	89	89	82
11.5	86	86	87
12	83	84	93
12.5	81	81	99
13	78	79	106
13.5	76	77	113
14	74	75	120
14.5	73	73	128
15	71	72	136
15.5	70	70	145
16	68	69	154
16.5	67	68	163
17	66	66	173
17.5	65	65	184
18	64	64	195
18.5	63	63	207
19	62	63	220
19.5	61	62	233
20	61	61	247

ZX81 copy of printout for T- and pi-networks with equal Rin and Rout of 50Ω

NEW PRODUCTS

Datong radio direction finder DF

The Model DF adds doppler direction-finding capability to existing vhf/fm communications receivers or transceivers at very low cost. Applications include tracking mobile transmitters, locating interfering signals, and locating transmitters with stuck microphones. Designed as an external accessory, Model DF needs access only to the antenna and external loudspeaker terminals of the receiver. No internal connections or modifications are required.

The Datong Model DF

A typical mobile system involves four magmount λ/4 whips mounted in a square array on a vehicle roof, and connected to Model DF's mag-mounted head unit. A single coaxial cable connects the head unit to the control and display unit located close to the receiver. Bearings are continuously displayed on a circular array of 16 l.e.ds. The operating frequency range covers from 20 to 200MHz, and depends only on the associated antennas and the receiver. A built-in rf-activated relay allows talk-back via an existing antenna when used with a transceiver.

Model DF is available from: Datong Electronics Limited, Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE, from whom further information can be obtained.

Datong broadband rf preamplifier RFA

Model RFA is a low-noise preamplifier designed for easy external connection to existing receivers or low-power transceivers in the range 5 to 200MHz. It is especially suitable for use with older mobile radio telephone equipment, and will frequently give an improvement in operating range. Send/receive switching is automatic and uses rf sensing and an internal bypass relay. It simply connects in series with the antenna feeder. Frequency coverage is from 5 to 200MHz, and the unit features excellent large-signal handling (intercept point + 20dBm) and a gain (9dB) chosen to minimize receiver overload effects.

Applications include private mobile vhf radio transceivers, vhf scanner receivers, and compensating for signal loss in long antenna feeders. Its wide bandwidth makes it ideal for use with broadband antennas and scanner receivers.

Model RFA is ruggedly constructed in a diecast case with SO239 rf connectors. It requires 12V dc power. The unit is available from the manufacturers:

Datong Electronics Ltd, Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE, from whom further information is available.

The assessment of a site for vhf

by J. STEBBINGS, G4BTV*

MUCH HAS BEEN WRITTEN about the propagation of vhf signals, taking into account the topography, the radio refractive index, heights of antennas, and other factors. The usual treatment is confined to a specific path between two given points on the earth's surface; and simple methods of plotting the path profile may be found in [1], [2].

The author decided to take the matter a bit further and to plot the obstructions to radio waves around the full circle to give a "radio panorama" from the home station located on the south coast of England near the Isle of Wight. The work proved to be quite simple, involving the study of suitable maps, the repetition of a simple calculation; and the plotting of heights on a graph. It is, however, rather time-consuming, but after a system had been established the work could be taken up or broken off as convenient.

There were many surprises as the work progressed, and the final result was very rewarding and gave quite a different view of the site from the impressions gained from local travels over many years.

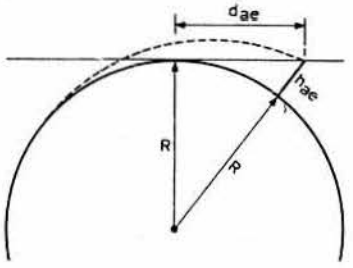


Fig 1. Height of antenna (h_{ae}) gives a line-of-sight distance to the horizon (d). Earth radius = R

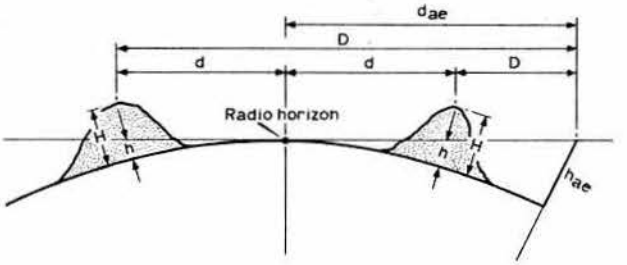


Fig 2. The effect of obstructions of height H at distance D from the station. D may be less than or greater than the radio horizon distance d_{ae}. The distance of the obstruction from the horizon circle is d

Line-of-sight vhf paths

Fig 1 shows the distance to the horizon (d_{ae}) from an antenna at a height (h_{ae}) above sea level. The earth's radius is R, and it is shown in the appendix that $d_{ae}^2 = 2R \times h_{ae}$.

Due to atmospheric refraction, radio waves and, to a lesser extent, light waves are not propagated in straight lines. The path is curved towards the earth, as shown by the dotted line, and the radio horizon is at a greater distance than d_{ae} in the figure. The problem can be overcome by introducing a refractive index factor, K, by which the earth's radius is multiplied so as to permit radio paths to be plotted as straight lines. K may vary from place to place and from time to time, but the usually accepted average value of 1·33 has been used. We therefore have: $d_{ae}^2 = 2h_{ae}$ where d_{ae} is in statute miles and h_{ae} is in feet. The derivation of this equation and the equivalent metric form are given in the appendix.

In Fig 2, d_{ae} and h_{ae} are again shown, with the addition of a hill which has a height H above sea level. The obstruction may be either between the antenna and the horizon or beyond the horizon, at a distance, d, measured from the horizon circle. In both cases the hill projects above the radio horizon by an amount (H—h) where h is the "dip" below the horizon at a distance d. Using the above equation we have $h = \frac{d^2}{2}$ (feet, statute miles). D is the distance of the obstruction from the antenna.

$D = d_{ae} - d$ up to the horizon

and $D = d_{ae} + d$ beyond the horizon

*16 Maylings Farm Road, Fareham, Hants PO16 7QU.

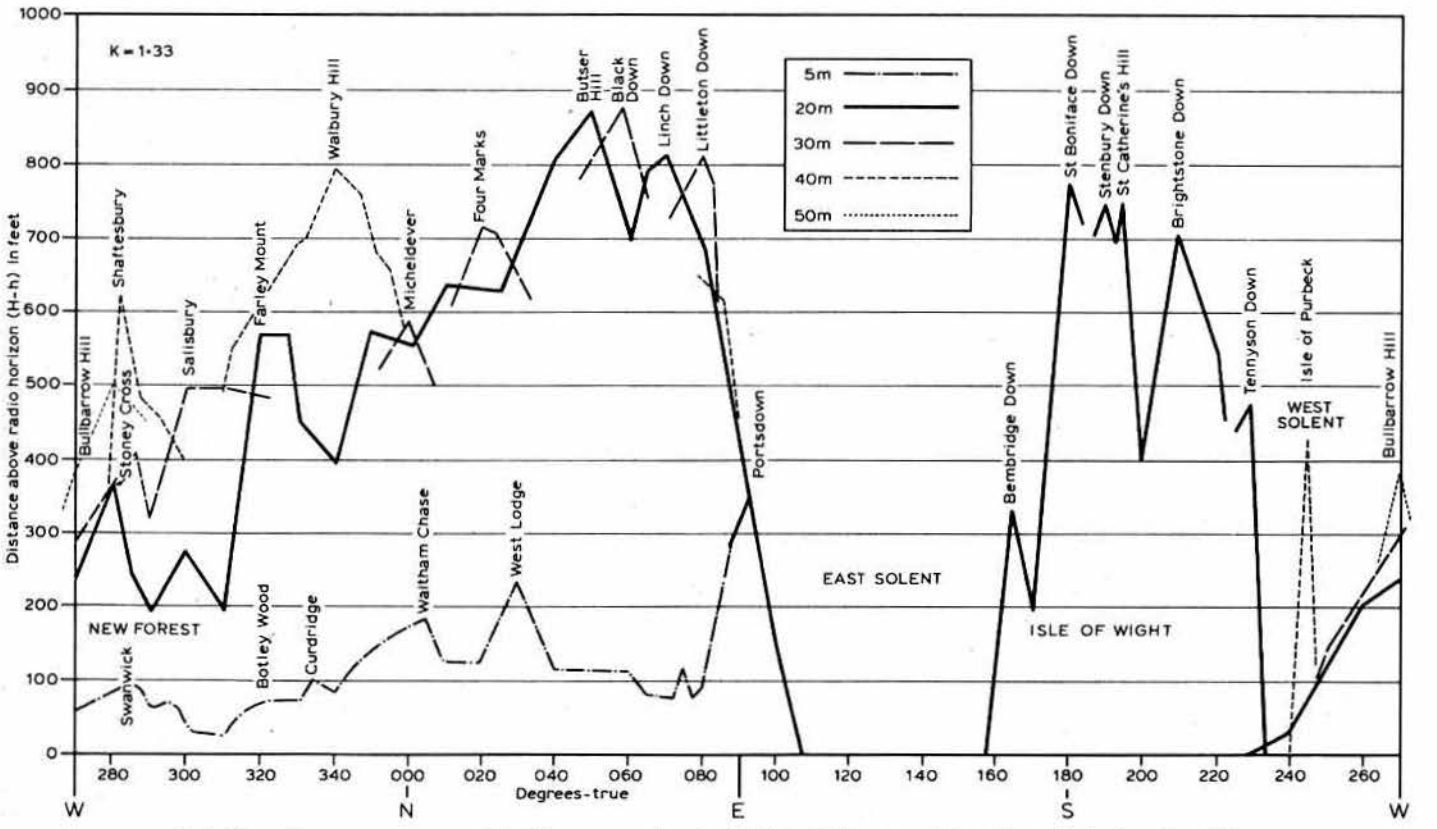


Fig 3. The radio wave panorama, with 360° coverage, showing heights of high ground above the radio horizon. K = 1·33

The "radio panorama"

The object is to tabulate all significant obstructions with their bearings, distances, and heights above the horizon (H – h). Then to plot panoramic profiles for convenient distances from west, through north and east to south, and back full circle to west again.

At first sight the job may seem to be impossibly complicated by the huge number of possible tabulations and the great distances involved. Fortunately, in the author's case, there were limitations. First, small obstructions blanketed by higher ones can be disregarded when the calculation brings this to light. With experience, however, many features may be rejected simply on inspection of the map. A second limitation is on the maximum distance from the site which needs to be considered. For example, when d = 100 miles, h is 5,000ft. So that, except in mountainous country, there is a limiting circle beyond which obstructions will not project above the horizon. In the author's case the limit proved to be 50 miles from the station (D).

The result of the author's endeavours is shown in Fig 3, where the projections above the horizon (H – h) are plotted against true bearings for distances of 5, 20, 30, 40 and 50 miles. Beyond 20 miles the work was done in 10-mile strips. On a given bearing the most significant feature within the strip was found, and its projection above the horizon calculated from the actual distance. This height was then plotted on the distance profile representing the outer edge of the strip. It should be appreciated that the lines joining points on the graphs are not actual ground profiles as in a normal ground section, because adjacent points may not be in the same plane. The lines may be considered as "solid" ground profiles 10 miles thick.

The method

Before describing the system, a few comments will be made on the maps necessary for such an investigation. The "One-inch" (1:63,360) and the metric 1:50,000 series of Ordnance Survey maps allow levels to be estimated within 25ft (7·6m) but the many spot levels given allow a much better resolution. One soon runs out of such large-scale maps and, even if the expense of new maps were justified, the job would get physically too large. They are excellent for nearby terrain, however, and are recommended. Further afield use must be made of the "Quarter-inch" (1:250,000) series on which, unfortunately, the contours are at 200ft (61m) intervals. Nevertheless it soon became evident that by the use of spot levels and a little interpolation, adequate resolution could be obtained. The author used some old "Quarter-inch" maps—hence the use of feet and miles. If a geographical relief map of adequate scale could be obtained, the work would be made easier with the omission of roads, development and other unwanted features.

Fig 4 shows the antenna site with distance circles, the horizon circle, and some of the bearings which were drawn at 10° intervals. The easiest method is to work outwards from the centre. After drawing the bearings the horizon circle, distinguished by colour or form, is added. Remember that the national grid verticals are not true north. To find true north join two identical longitude marks on the top and bottom of the map. This should be done through, or near to, the antenna site. Then add only the two circles defining the strip to be considered. The first strip, of course, will be defined by only one circle and the centre.

For ease of illustration Fig 4 shows the work progressing in the 30–40-mile strip between bearings 280° and 290°. The following remarks, however, are of general application both within and without the horizon circle.

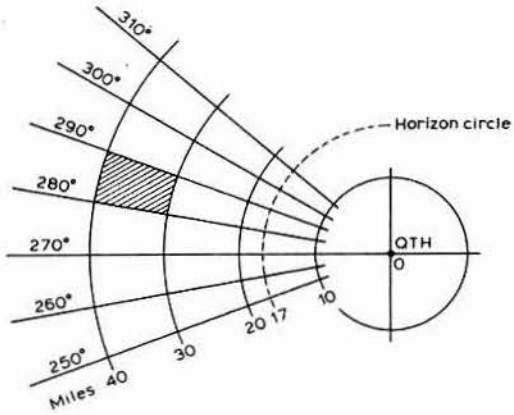


Fig 4. Circles at various distances drawn on the map (including the horizon circle). In this case each area investigated for significant features is bounded by circles 10 miles apart and by radial lines at 10° intervals

Consider an area, such as the one shaded, within the strip and bounded by two adjacent bearing lines. Working outwards look for significant features and tabulate heights and distances thus:

STRIP 40 miles ($d = 30 - d_{ac}$ to $d = 40 - d_{ac}$)					
Bearing	**d**	**H**	**h**	**$(H - h) = H - \frac{d^2}{2}$)**	**Remarks**

If bearings within the 10° sector are required, interpolation may be done by inspection. Continue around the strip and plot the profile before proceeding outwards to the next strip. The plot obtained will help to eliminate many features blanketed by higher and nearer ones.

A column has been shown for h, but it is not essential to record these values if a calculator is used. It is only necessary to compute $h - \frac{d^2}{2}$. The whole study required only 210 lines of the table.

Comments

First, there is no general significance in the strip widths and distances used in this study. They arose simply as convenient values as the work progressed. The omission of a 10-mile circle and the inclusion of one at five miles seemed to suit the local terrain. Other sites with entirely different topography will, no doubt, require other values, determined after some preliminary work. The horizon distance may also affect the choice of strips. As will be seen from Fig 4, it was 17 miles in the author's case.

No account has been taken of trees and tall buildings. Trees are probably only significant when close to the station, where their presence will be known; but tall buildings would be effective at greater distances. They are, however, usually isolated and unlikely to be in the form of a continuous block, particularly on high ground.

The 20-mile line in Fig 3 has been emphasized as a heavy line. This distance seems to dominate the picture and includes all of the Isle of Wight. Topography within the 20-mile circle is very varied, and it was not considered worthwhile to include other circles than that at five miles. The East Solent gap was expected, but is of no value for communication within the UK; oddly, though, little French activity has been heard through it. What was not expected was the narrowness of the West Solent gap with, perhaps, the greatest surprise of all the Isle of Purbeck making its presence felt at 40 miles.

The 20-mile profile constitutes a formidable barrier, but excellent communication should be possible with those areas at greater distances which project above it; provided, of course, that anyone has a station up there or an antenna sufficiently high to reach up! Finally, it has been brought home to the author that he lives in a vast deep radio hole in spite of the magnificent views which may be enjoyed by standing on the roof beside the quad.

It should be noted that K = 1·33 is a mean value about which it fluctuates. It will be less than 1·33 for about 50 per cent of the time and greater for the other 50 per cent.

The method could be extended by using a computer, with adequate graphics, which would allow the value of K to be varied. If additional information from blanketed areas were recorded and profiles displayed on the crt, the value of K could be altered at will. The result would be movement of the profiles relatively to one another exposing regions previously obscured, and vice versa. Perhaps someone with a computer will have a go.

Varying the value of K

The author has extended the study the hard way by plotting two more panoramas for K = 1·0 and K = 2·0. See Figs 5 and 6.

If we keep the value of K in the "dip" formula $h = \frac{d^2}{2}$, it becomes $h = \frac{d^2}{1{\cdot}5K}$ (feet, and statute miles).

We thus have for K = 1·0, $h = \frac{d^2}{1{\cdot}5}$, and for K = 2·0, $h = \frac{d^2}{3{\cdot}0}$, using feet and statute miles. The metric version is $h = \frac{d^2}{12{\cdot}75K}$(m, km).

The use of K effectively varies the value of the radius of the earth so that the wave path from the antenna may be drawn as a straight line instead of the curve actually caused by refraction.

Before looking closely at Figs 5 and 6 some basic principles may be established by looking at propagation in two dimensions. In Fig 7 a hill is shown between the antenna and the horizon. Its projection above the horizon is reduced as the value of K increases. In Fig 8 the opposite effect is seen when a hill is beyond the radio horizon. The projection is increased when K is increased. The letter S has been used for distance from antenna to horizon (d_{ac}) in order to avoid multiple subscripts.

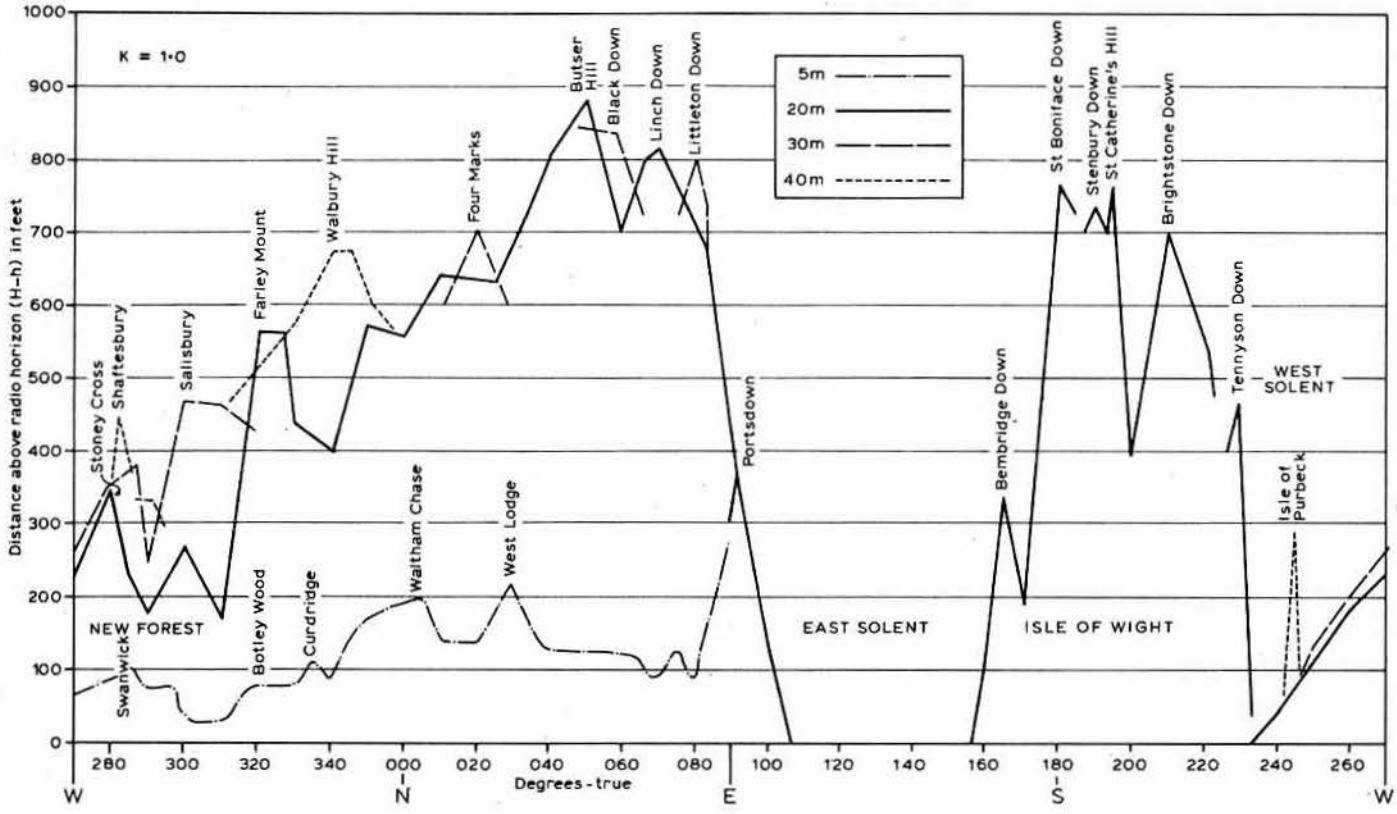


Fig. 5 The panorama of Fig 3 re-drawn with a low radio refractive index (K = 1·0) representing poor tropospheric propagation

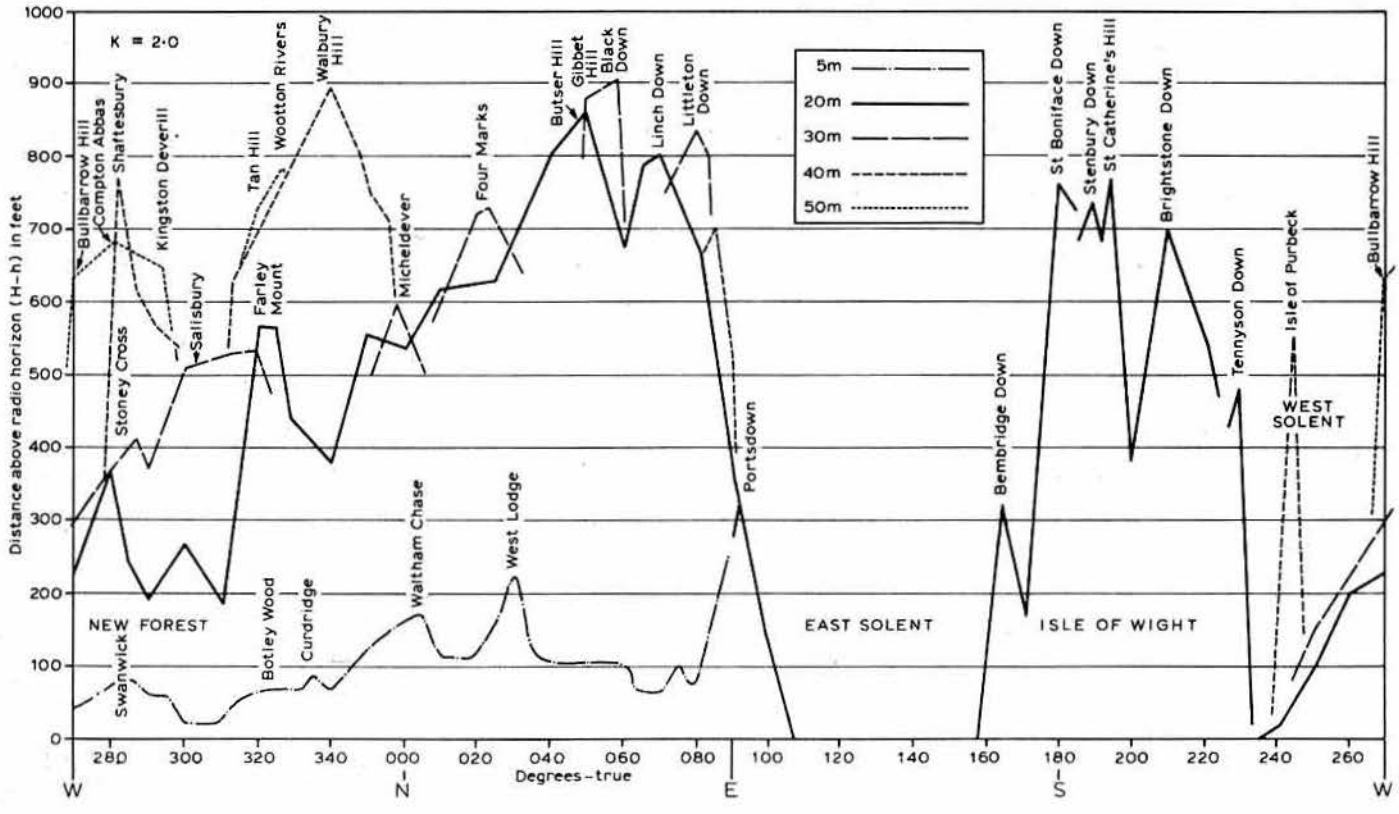


Fig 6. The panorama of Fig 3 re-drawn with a high radio refractive index (K = 2·0) representing good tropospheric propagation

A third interesting phenomenon is illustrated in Fig 8. The horizon distance increases with K from S_a to S_b, and the value of d is therefore reduced. This results in the projection above the horizon increasing rapidly with distance. In Fig 8(a) the distant hill, height H_2, is obscured by the nearer hill of height H_1. When K increases as in Fig 8(b) the distant hill is now "visible" above the nearer one, increasing the possibility of communication with sites on the higher ground of H_2.

It can also be seen from Figs 7 and 8 that the effect of an obstruction situated near the horizon circle changes very little with K. When K = 1·0, d_{ac} (or S_a) = 14·75Sm and when K = 2·0, d_{ac} = 20·85Sm.

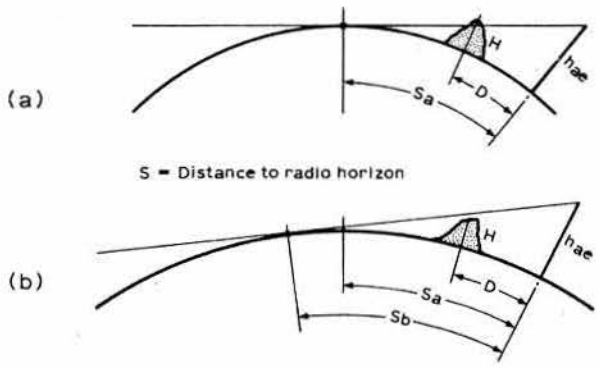


Fig 7. Obstruction between antenna and radio horizon. (a) Low K value. Hill of height H at distance D projects above the horizon line. (b) High K value and greater radius, hill projects less or may even be below the horizon

The effect of K on the panorama

When comparing Figs 5 and 6 it is seen that the five-mile line is depressed as expected, although the difference is small due to the small distance from the antenna. The 20-mile line shows even less change.

Looking at more distant profiles there is nothing "visible" at 50 miles in Fig 5, but in Fig 6 Bulbarrow Hill, Compton Abbas and Tan Hill (265°—330°) appear through gaps in the nearer profiles. The heights of Shaftesbury (285°), Walbury Hill (340°), and the Isle of Purbeck (245°) all at 40 miles, show a marked increase in height above the radio horizon.

Due to the fact that profiles represent 10-mile-wide strips, there can be relative movement of two points on the same profile at different distances within the same 10-mile strip. The effect is small and probably not significant, but it can be seen at Walbury Hill (340°), Four Marks (020°), and on the 20-mile profile below Four Marks. There is a change of shape or slope due to individual plots (not shown) moving relative to one another.

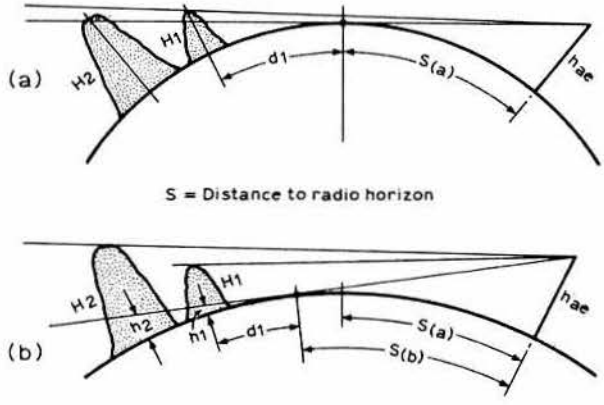


Fig 8. Obstruction beyond radio horizon. (a) Low K value. Hill H1 obscures hill H2. (b) High K value and greater radius. H2 now "visible" above H1

Conclusions

The extension of the original work has emphasized the following phenomena due to an *increase in the value of K*:

(a) The effective height of an obstruction located between the antenna and the horizon is reduced.

(b) The effective height of an obstruction beyond the horizon is increased.

(c) Changes in the value of K have little effect on obstructions near to the horizon circle.

(d) Obstructions at great distances beyond the horizon may become "visible" above nearer ones also beyond the horizon.

The use of a single value of K for the whole of the propagation path is, of course, a considerable simplification of the problem. Not only will K vary along the path but it will also vary with height. Therefore the wave path, which is curved in practice, will pass through different K values in two dimensions (or even three dimensions?).

Nevertheless, the panoramas which have been plotted show in general terms the likely propagation from the site both at low values of K (poor conditions) and at high values (good tropospheric propagation).

Figs 5 and 6 seem to explain why the first distant stations to be heard are from the West Country (W Solent gap) and from Somerset and South Wales (Salisbury gap). London stations are seldom heard (045°).

References

[1] "Microwave path checking", B. Chambers, G8AGN. *Rad Com* February 1978, p122. RSGB.

[2] "Microwaves", Charles Suckling, G3WDG. *Rad Com* March 1981, p241. RSGB.

[3] "Propagation." Ch 2. *VHF/UHF Manual* 3rd edn. 1976. RSGB.

Appendix

Consider the path of a radio wave from an antenna height h_{ae} above sea level as in Fig 1. R is the radius of the earth, d_{ae} is the distance to the horizon. By Pythagoras:

$$(h_{ae} + R)^2 = d^2_{ae} + R^2$$

$$d^2_{ae} = h^2_{ae} + 2Rh_{ae}$$

As h_{ae} is very small compared with R, h^2_{ae} may be neglected. Therefore

$$d^2_{ae} = 2Rh_{ae} \quad \ldots\ldots(1)$$

Introducing K to allow for refraction this equation becomes:

$$d^2_{ae} = 2R'h_{ae} \quad \ldots\ldots(2)$$

where $R' = K \times R$

An average value for K is 1·33.

The earth's circumference is divided into 21,600 nautical miles being 360×60 minutes of arc. R is therefore $\frac{21,600}{2\pi} = 3,438$ nautical miles. $R' = 1{\cdot}33 \times 3,438 = 4,572$ nautical miles or 5,265 statute miles, and equation (2) becomes:

$$d^2_{ae} = \frac{2 \times 5265}{5280} h_{ae}$$

$$\text{or } d^2_{ae} = 2h_{ae} \quad \ldots\ldots(3)$$

where d_{ae} is in statute miles and h_{ae} is in feet.

If d_{ae} is in kilometres and h_{ae} is in metres then

$$d^2_{ae} = 17h_{ae} \quad \ldots\ldots(4)$$

BOOK REVIEW

Amateur Radio—Theory and Practice by Robert L. Shrader, W6BNB. Published by McGraw-Hill Book Company. 340 + xii double-column pages (235 by 185mm). First edition 1982. Soft covers £11.50.

This new book has one aim: to explain, in simple terms, the basic radio theory needed to pass any and all of the amateur radio licence examinations of the Federal Communications Commission (FCC). These include novice, technician, general, advanced and extra-class grades in the classic American incentive licensing system. The text includes a check-up quiz every few pages and paragraphs are prefixed with the letters N, G, A etc to indicate that the information is required for specific grades of licence. For American readers it would seem to have much to offer and, apart from one or two chapters, appears to be a sound and reasonably up-to-date primer. It is considerably longer and more detailed than any comparable British publication, including the Society's *Radio Amateurs Examination Manual*. It treats both solidstate and thermionic devices, has a chapter on "advanced amateur systems", another on "digital fundamentals", and there are sections on the j-operator, decibels, Smith charts and the like.

All this is both good and bad news for those intent on taking the British RAE. Many candidates would be confused and put off by the problem of relating American examination requirements with the City & Guilds syllabus and the British licence conditions. It is probably more suitable for someone who has just passed the RAE but wishes to extend and improve his knowledge of fundamental radio communications theory. A word of warning. The *Antennas* chapter, including transmission lines, baluns etc, has a curiously old-fashioned look and contains both errors and descriptions that are likely to mislead the reader. For example, the short note on Yagi antennas is not only based on the original $\lambda/4$ spacing but also includes the odd notion that a two-element Yagi is bi-directional with the single parasitic element acting as *both* reflector and director. W6BNB must have been singularly unfortunate in his front-to-back ratio! Emission modes are designated in the pre-WARC manner (A3J etc), a problem that is likely to persist for almost as long as Mc/s.

In brief, a better-than-average book on radio theory for amateurs but not really suitable as an examination manual in the UK.

Chapters: *Amateur radio. DC circuits with resistance. Alternating current, inductors, capacitors and transformers. Reactive circuits. Resonance and filters. Transistors and vacuum tubes. Power supplies. AF and rf amplifiers. Oscillators. CW transmitters. CW receivers. Radio waves. Antennas. Amplitude modulation systems. Single-sideband systems. Frequency modulation systems. Measuring devices. Digital fundamentals. Advanced amateur systems. Radio-frequency interference. Learning code and operating. Amateur rules and regulations. Seven appendices. Index.*

G3VA

TECHNICAL TOPICS

Pat Hawker, G3VA

THE LAWS of experimental physics, including the many variations of Murphy's Law, continue to proliferate. Jack Maling, G5JL, adds two based on amateur radio operating.

The first states that when only two stations can be heard on a band they will each be calling "CQ" on the same frequency. The second that when a very weak, interesting-sounding signal is heard calling "CQ DX" for 5min before giving his callsign, it will turn out to be Sid in Potters Bar.

Antenna gain: theory and practice

Ken Franklin, G3JFK, recently provided me with the results of an antenna gain test held in May 1982 by the Crawley ARC on a number of factory-made and homebrew 144 and 432MHz antennas as part of an inter-club competition. This test was carefully carried out and included the production of the horizontal radiation patterns of the various antennas, as well as measurement of the forward gain. Ten 144MHz antennas were entered, ranging from 16-element Tonna Yagi arrays with a boom length of 21ft, to a five-element homebrew ZL-Special with a 3ft boom.

In no case did the forward gain (dBd) quite measure up to the maker's claimed figures, although several came fairly near, and it should be appreciated that antennas deteriorate over a period of time. One 10-element array modified to have an extra four elements did achieve 1·5dB more gain than the original specification.

Two of the long Tonna 16-element arrays were measured at 13·6 and 12·1dBd (specification 13·9dBd). Two 14-element Parabeams came out at 13·2 and 11·1dBd (specification 13·7dBd). A homebrew long Yagi with 19 elements and 19·6ft boom chalked up a disappointing 5·35dBd. Two Jaybeam six-element quads measured 9·4 and 9·0dBd (specification 12dBd). The five-element homebrew ZL-Special achieved only 3·6dBd and had virtually bi-directional characteristics. The beamwidths of the main lobes were on the whole very close to the claimed figures, but sidelobes and front-to-back ratios proved a very mixed bag.

The four 432MHz factory-made antennas were all between 2·5 and 4·8dB less than the expected figures. One of the best gain/element ratios was achieved with the homebrew loop Yagi of G3ZWM: with 22 elements and a boom length of 16ft this measured 12·1dBd and had a horizontal beamwidth of only 17°. An 88-element Multibeam bettered this with 13·9dBd, but this represents only an extra 1·8dB for 66 more elements.

It should be stressed that compared with the results of some of the antenna gain tests carried out in other countries, the standard achieved is reasonably good. It does emphasize, however, that an antenna gain of much more than about 11dBd (13dBi) is not readily achieved at vhf or even at uhf. Some allowance has to be made for measurement errors, though in this case these are not believed to be significant.

The horizontal radiation patterns are noticeably different from those usually shown in the text books, with some of the sidelobes tending to make a rotator almost a redundant luxury except along the directions of the deeper nulls. It should also be appreciated that when arrays are mounted in a typical residential array, at around roof-top height, the radiation patterns are likely to become even more distorted. TV antenna manufacturers sometimes make their patterns look quite respectable by presenting the results on linear rather than logarithmic scales! In not a few cases, much of the antenna gain can be eaten up by the feeder losses.

One way of overcoming this problem was noted at the recent International Broadcasting Convention at Brighton. A new ITN communications link vehicle has a 20W microwave (2·3GHz) solidstate amplifier mounted at the top of the telescopic mast; no feeder losses, but it does require quite a substantial mast.

Optimum-shaped antennas

For many years it was generally assumed that the basic building block of an effective single-element or beam-array type of antenna should consist of straight elements approximately λ/2 long; indeed the term "dipole" has usually come to mean a λ/2 element, although more correctly it can mean any centre-fed and symmetrical system. A few years ago this idea began to break down with the development of simple, space-saving antennas that had the ends hanging down or turned inwards; most notably in the form of the VK2ABQ two-element beam in which the bent elements form, as G6XN has pointed out, a convenient means of adjusting the mutual coupling and also providing "neutralization".

An even more radical attack on the straight-line form of element has been mounted over the past few years by F. M. Landstorfer of the Technical University of Munich, which has been at the heart of the development of "active" receiving antennas. In a series of professional papers he has been advocating the use of 3λ/2 elements curved in a specific manner that provides forward gain and directivity. Most of the practical work has involved frequencies within the range 30MHz to 1GHz. The technique could also be used at hf although it would clearly be quite difficult to implement. Optimum-shaped self-supporting wire elements could be readily investigated at, say, 435MHz, possibly by modifying a conventional array designed for 144MHz.

Landstorfer's new type of shaped wire 3λ/2 element can, by itself, give a forward gain of up to 7 to 7·8dBi (that is to say, about 5 to 5·5dB gain with reference to a straight λ/2 dipole element). An experimental three-element Yagi-type array for 200MHz, reported in 1979, yielded a measured gain of 11·5dBi (9·4dBd).

My attention (and that of G3ZAY) was drawn to this work by a report in *Electronics Letters* Vol 18, No 19, 16 September 1982, by D. K. Cheng and C. H. Liang of Syracuse University, which provides a mathematical procedure for calculating the optimum shape of wire elements. However, a less formidable and more illuminating explanation of this new class of antenna element can be found in a paper presented by F. M. Landstorfer at the International Conference on Antennas and Propagation in London during November 1979, and published in *IEE Conference Publication No 169*, pp132–141. This book can be found in some technical reference libraries. The following notes are based on this conference paper.

Landstorfer notes that basically there is no real limitation to the maximization of the directivity or gain of an antenna as long as no further restrictions, such as size, costs or bandwidth have to be considered: indeed it could be said that on hf the 50-year-old rhombic remains supreme, and on shf the large dish parabolic reflector cannot be bettered.

For the amateur, of course, antenna size, or the size of the necessary real estate, both of which are to some degree equivalent to cost, is the main restriction.

The paper notes that the usual Yagi array at vhf/uhf consists of a number of straight-lined single dipoles with lengths roughly λ/2 but phase-adjusted to form radiators, reflectors and directors. Any improvement, Landstorfer argues, needs to start with the optimization of a single radiator. To do this we need to think in terms of elements longer than λ. However, if such elements are straight (with no phase-reversal stubs) then the phase reversal within the current distribution means that radiation normal to the dipole axis is poor. On the other hand, if the element is shaped in such a way as to *compensate for the phase differences* it is possible to make a long element that can be a very efficient radiator in the required direction. This can be done by suitable shaping of a long element such as a 3λ/2 element. In effect

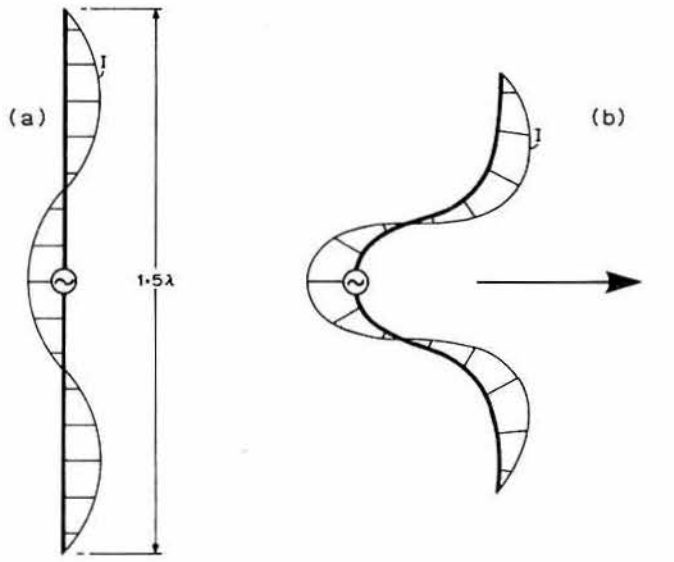


Fig 1. Showing the current distribution on: (a) a straight 3λ/2 dipole where the phase reversal reduces radiation normal to the axis of the dipole; and (b) a 3λ/2 dipole with a gain-optimized shape which causes radiation to increase greatly in the forward direction. (F. M. Landstorfer)

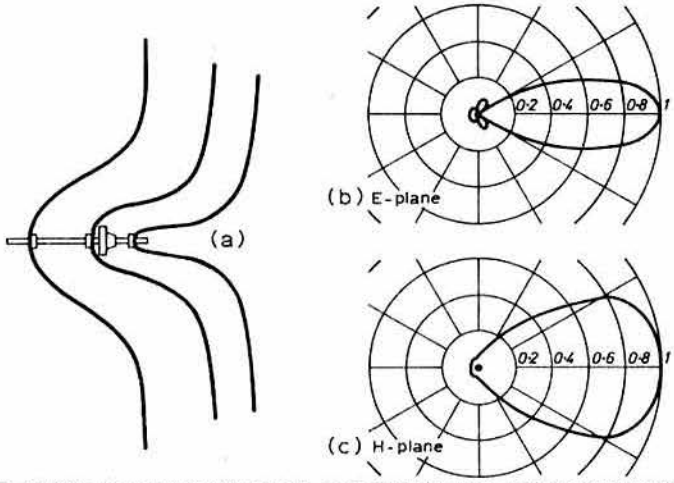


Fig 2. A Yagi-array using three gain-optimized elements each approximately 3λ/2 long. A vhf array of this type has been shown to provide a gain of 11·5dBi, sidelobe attenuation better than 20dB and a front-to-back ratio of 26dB. (F. M. Landstorfer)

a shaped 3λ/2 element can be made roughly equivalent to a colinear array of three λ/2 elements in phase, but with no requirement for phase-reversing stubs or resonant circuit elements, and with unidirectional, rather than bidirectional, characteristics—and roughly 2dB more gain.

This all sounds fantastically attractive in theory, but what about in practice? For an amateur the main disadvantage of a 3λ/2-element array is simply the larger size of the basic element, compensated for by the fact that far fewer elements are needed to obtain equivalent gain. It is also claimed that with optimum-shaped elements side-lobes can be reduced and the radiation pattern generally cleaned up.

Fig 1 shows the current distribution of a straight 3λ/2 dipole and that of a similar element in gain-optimized shape. Fig 2 shows a Yagi array with three gain-optimized elements which, it is claimed, apart from 11·5dBi forward gain can have better than 20dB sidelobe attenuation and a front-to-back ratio of about 26dB. The 1979 paper states: "Field tests over more than three years confirmed the theoretical results in practice". The paper also shows that arrays of large bandwidth suitable for tv reception can be produced, and that this type of shaped element can be built into log-periodic arrays and also backfire structures.

As shown in the recent item in *Electronics Letters*, precise calculation of the optimized shape, which is to some degree related to wire diameter etc, involves complex mathematics. However, a practical start to investigating this type of array for amateur applications could be made by copying the shapes shown in Figs 1 and 2.

Travelling-wave rectangular antennas

Another potentially-useful report on antenna developments appears in *IEEE Transactions on Antennas and Propagation* Vol AP-30, No 4, July 1982. This is a note "Unidirectional patterns of travelling-wave rectangular antenna" by Isamu Matsuzuka and Koji Nagasawa of Nihon University, Tokusada. In effect this describes a rectangular form of loop antenna, fed at the centre of one side and with a resistor placed in the opposite side: Fig 3. It is thus not unlike the small loops used in the active receiving arrays described in the November 1982 issue of *Rad Com* by J. A. Lambert, G3FNZ. This form of terminated rectangular antenna provides a backfire uni-directional pattern if the dimensions are small compared with a wavelength; but if the dimensions are comparable with a wavelength it gives an endfire uni-directional pattern. The notes in *IEEE Trans* are concerned mainly with physically small antennas, but some details are given of a 200MHz model antenna where h = λ and d = λ/4 and the matching resistor is 493Ω. This is shown to be capable of providing very high front-to-back ratios over a significant bandwidth. It would appear that both the dimensions and the resistor value are relatively non-critical, as might be expected from a travelling-wave antenna that has a family connection with long-wire rhombic and V-beams, where rf energy reaching the far end is dissipated in the terminating resistor rather than being reflected back to the feedpoint. Implementation of a rectangular array of this type would probably be easier than for a terminated circular loop antenna for physically large antennas.

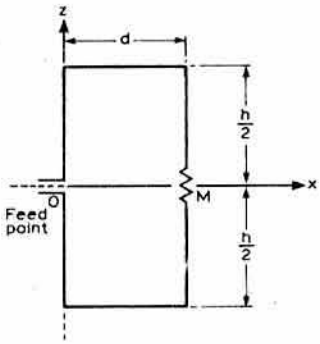


Fig 3. Basic geometry of a terminated, travelling-wave rectangular antenna as described by Isamu Matsuzuka and Koji Nagasawa

Horizontal "circular" loops

The November 1982 *TT* included some comments on horizontal quad antennas such as the "G2PI. Special" and attention was drawn to the work of ZS6AKA, some years ago, on a wide variety of horizontal loop type antennas in various shapes and sizes (*ART7*, p306, Fig 100). Some useful constructional ideas and an indication that a simple horizontal loop antenna can "surpass all expectations" has come from Andy Churchley, G4EAQ, though I should make it clear that his notes arrived well before the publication of the November issue. He has been using two circular loop antennas in cunjunction with a KW107 "Supermatch" atu for multiband hf operation. His loops have been made roughly circular, although perhaps more accurately described as a complex polygon enclosing as much area as conveniently possible.

As noted some time ago in connection with a *QST* article on rhombics,

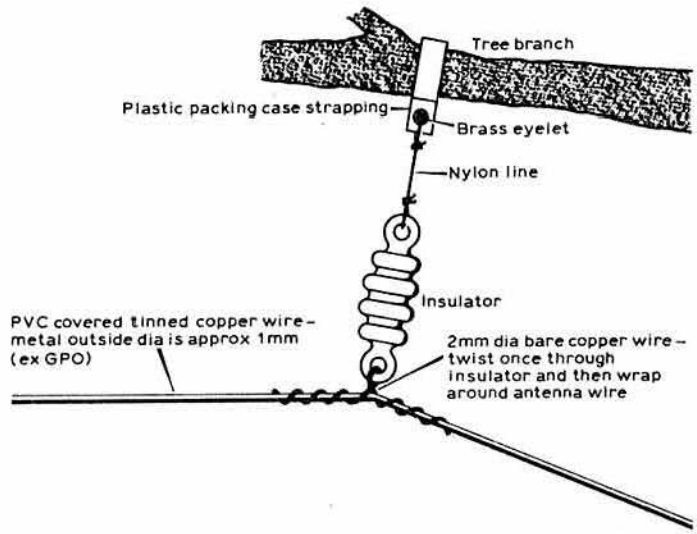


Fig 4. How G4EAQ fastens his circular loop antennas to the branches of trees without passing the antenna wire through the eye of the insulator, a technique adapted from British Telecom practice. The bare copper wire used to secure the antenna to the insulator is annealed at red heat and allowed to cool. This softens it considerably and makes it easy to wrap around the antenna wire

these horizontal loop type antennas seem to work well even when slung among trees, which can provide some of the necessary skyhooks. G4EAQ believes in good insulation, using a technique adapted from British Telecom that avoids having to pass the antenna wire through the eye of the insulator: Fig 4. This makes it easy to change or adjust the antenna or to distribute the tension around the loop.

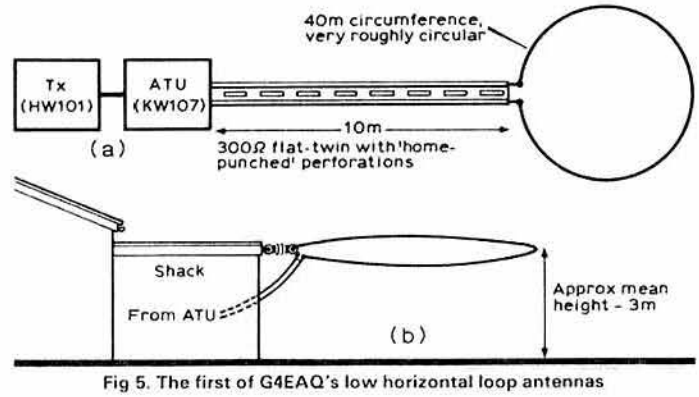


Fig 5. The first of G4EAQ's low horizontal loop antennas

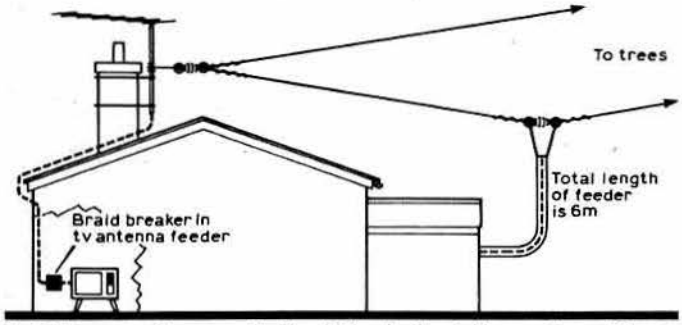


Fig 6. The second larger and rather higher horizontal loop antenna. It is at a mean height of about 5m and total circumference about 60m. The diameter is roughly 62ft, which can be fitted into some medium-sized gardens.

G4EAQ originally tried a low loop (Fig 5) and then, encouraged by the results, replaced it with a rather higher and larger loop: Fig 6. Both gave most satisfactory results, and indeed his fourth contact with the low loop gave him an unexpected VK contact. G4EAQ makes no claim to being a dyed-in-the-wool dx man, but is well satisfied with the results on all bands, including 3·5MHz. He notes a marked improvement over the results he achieved with a G5RV-type dipole.

SWR indications suggest that the antenna is reasonably broadband; with his matching unit he has no difficulty in achieving unity swr at the transmitter output.

G4EAQ was seemingly unaware of the previous work on large horizontal loop antennas, and I cannot recall any previous account of the results achieved with near circular loops. As noted in the November *TT*, there is growing evidence of the value of square, rectangular and now circular loops to form general-purpose, horizontally-polarized, multiband hf antennas.

144MHz and "Channel 53"

British amateurs are uniquely fortunate in having the vast majority of viewers watching pictures transmitted on uhf rather than vhf. The British 625-line television allocations in Bands 4 and 5 represent Channels 21 to 68 (no use is made of Channels 35 to 38, representing the gap between the two bands). In these 44 channels there are now literally thousands of high- and low-power tv transmitters carrying BBC1, BBC2, ITV and now IBA's Channel Four (C4) and the "Sianel Pedwar Cymru" (S4C) programmes of the Welsh Fourth Channel Authority. Already C4/S4C installations include 31 "main" and about 120 "local relay" transmitters, and over the next few years these networks will be transmitted from all of the hundreds of joint BBC-IBA stations, including the continuing build-up of these networks at the rate of about 70 new relays per year. By about 1986 there will be roughly 3,500 tv transmitters with output powers ranging from 0·5W to 80kW and effective radiated powers of up to 1,000kW.

The advantage to amateurs of this system is of course the much diminished problem of tvi being caused by *harmonic* radiation from amateur transmitters to the point where this is extremely unusual. Unlike direct breakthrough, harmonics are the responsibility of the amateur, and tvi caused in this way can result in the amateur being put off the air until the problem is solved to the satisfaction of the authorities.

Normally one would not expect the additional tv transmitters for Channel Four and S4C to present any more problems to UK amateurs than the relatively large number we have learned to live with. However, Pete Pennington, G4EGQ, in his spare time an RAE instructor for the South East Kent (YMCA) Amateur Radio Club, has found from personal experience that there could be new problems in quite a large number of areas. For some years he has been pointing out that while it is always important to prevent radiation of any significant level of harmonics, these are seldom the cause of modern tvi, a statement fully borne out in recent Home Office annual interference statistics (see *TT* September).

That is until the new Dover Channel Four transmitter began radiating the IBA electronic test card in August. Finding the test card going out while adjusting the black-and-white tv receiver in his shack, G4EGQ thought that other local amateurs would be interested. He put out a brief call on S20, and to his surprise the test card vanished from the screen, returning immediately he ceased transmitting. He tried the main colour set downstairs, leaving his transmitter running on S21. Result, there was bad patterning on the picture. He persuaded several other local amateurs to check-out the effect of 145MHz transmissions on their own Channel Four pictures. In each case there was some degree of tvi to an extent depending largely on the strength of the signals they receive from the Dover tv transmitters. G4EGQ is in a valley, and though quite close to the tv transmitter does not receive a particularly strong signal.

He soon discovered the cause of this unexpected problem. Dover C4 is on Channel 53 (vision carrier 727·25MHz, sound carrier 733·25MHz, with the 8MHz channel extending from 726 to 734MHz). Thus any fifth harmonic radiation from a 145MHz transmitter on channels above about S18 (145·45 × 5 = 727·25MHz) can result in patterning on a tv receiver tuned to Channel 53. Even an IC2E hand-held transceiver was found to cause detectable patterning at close range, although when checked on a professional spectrum analyser was found to have its fifth harmonic some 70dB down on carrier.

Following up these clues, G4EGQ noted that Channel 53 has never been used for any of the three earlier tv channels *but* is being quite widely used for Channel Four and Sianel 4 Cymru. For example, the high-power transmitters at Dover, Oxford, Angus, Llanddona, Carmel and (next year) Beacon Hill (Torbay), and eventually quite a number of local relays such as Reigate, Brierley Hill, Oliver's Mount (Scarborough) and a string of others.

It can be argued that a similar situation has existed for some years for those using the lower part of the 144MHz band in areas where any of the tv transmissions are on Channel 52. Again this has been only a lightly-used frequency, although it is used by BBC2 at the "main" station at Heathfield, East Sussex, and some of the relays.

So it would seem that there may be problems in areas where the 144MHz transmitter is operated very close to a tv receiver tuned to Channels 52 or 53, but probably only really noticeable in areas of weaker-than-usual tv signals. In such conditions even when the transmitter itself is "clean" there is always the possibility of generating harmonics by the "rusty bolt" natural diodes in metalwork close to the transmitting antenna. Where the transmitter is at fault it looks like being a case for a bandpass filter at 145MHz, or a notch filter at about 730MHz, in the transmission line of the 145MHz transmitter. Hopefully this will not prove a serious problem, but it has to be remembered that harmonic radiation is the responsibility of the amateur to clear and cannot be blamed on the tv receiver.

RFI and the new bands

Recently I noted in *TT* that the new 18MHz band has its second harmonic falling into the standard European intermediate frequency for television receivers, and could thus present tvi problems. Unfortunately all of the new bands, including 10, 18, 24 and 50MHz, seem likely to give rise to interference problems with vhf/fm sound broadcasting. At present in the UK, vhf/fm broadcasting in Band 2 is limited to 88–97·6MHz, but under the WARC plan this will gradually extend to 88–108MHz, although the full band may not be used in the UK for several years yet.

David Long, G3PTU, notes that a number of British amateurs are being authorized to use frequencies between 50 and 52MHz outside of television hours. In addition, the Merriman Committee has recommended that a 50MHz allocation should be available to British amateurs when Band I 405-line television closes down (and has recommended that this should be by the end of 1984 rather than 1986).

G3PTU points out that the second harmonic of 50 to 52MHz falls between 100 and 104MHz. This frequency range is currently used for public service mobile communications (police, fire, ambulances etc) but is due to be made available to broadcasting within a few years; indeed the section 102·1 to 104MHz is likely to be used for this purpose shortly. While at any time harmonics from a 50MHz transmitter need to be reduced to the degree where they do not cause interference to any other service, the broadcast service means that receivers and their antennas can be extremely close to an amateur transmitter. Indeed there is often sufficient leakage out of a transmitter enclosure into the mains wiring to affect a broadcast receiver in the same house or on the other side of a party wall etc.

G3PTU writes: "Back in the bad old days when millions of viewers depended on the Band I and Band 3 vhf television transmitters, a common trick was to have a series-tuned resonant trap tuned to the harmonic frequency across the coaxial feeder from the transmitter.

"A bench test showed that useful attenuation of the second harmonic of a 50MHz transmitter can be achieved, although a single series-resonant circuit did not give good attenuation over the entire 100 to 104MHz band. Two tuned circuits, however, did this more than adequately: Fig 7.

"Some 26dB of attenuation was obtained over the entire band. Admittedly in my case I was able to use Polyscop alignment procedures but, with care, adjustment using spot frequencies would be better than nothing.

"If in a few years time 50MHz is opened to all British amateurs, any devices that help to reduce what otherwise could become an awkward and socially difficult problem must surely be worthwhile."

To continue, from personal experience, this saga of new rfi problems, consider 10·1 to 10·15MHz. In this case, the ninth harmonic falls between 90·9 and 91·35MHz, and the tenth between 101 and 101·5MHz; the former is already in use for vhf/fm broadcasting; the latter will become so. Leakage of such high-order harmonics directly from a transmitter enclosure can

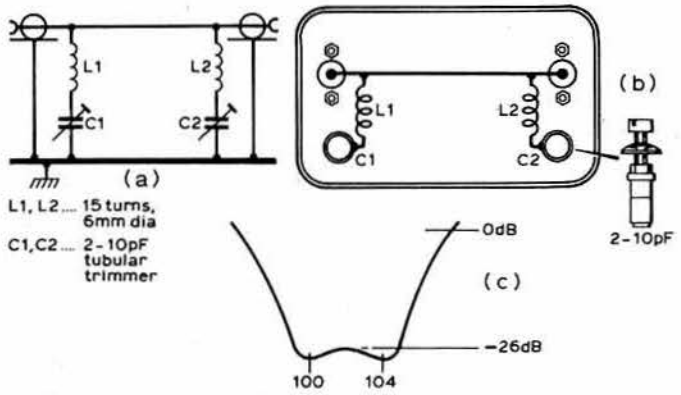


Fig 7. Twin series-resonant traps constructed and bench-aligned to reduce second harmonic for a transmitter intended for use when 50 to 52MHz is authorized

often be more than sufficient to cause rfi to a broadcast receiver in the immediate neighbourhood, particularly if this is using, as is so often the case, a simple throw-out, telescopic or other form of indoor antenna. In the London area the Wrotham Radio 3 transmitter is on 91·3MHz, and channels in this section of Band 2 are in use by the BBC in virtually all parts of the UK.

Similarly one notes that the fifth harmonics of the band 18·068 to 18·168MHz fall between 90·34 and 90·84MHz and this includes currently-used vhf/fm channels. The same applies to the fourth harmonics of 24·89 to 24·99MHz which cover 99·56 to 99·95MHz, currently used for mobile communications but due later to become part of Band 2.

Power supply topics

Recently it was noted that solid state high-power transmitting devices, particularly power fets, are tending to be suitable for use with supply voltages considerably higher than the standard 12V vehicle battery or 24V aircraft supplies. Although this introduces a requirement for some form of voltage transformation when used mobile, modern switched-mode power supply units enable this to be done at high efficiency and, by switching in the kilohertz region, weight can be kept low. High-voltage lower-current supplies are often less expensive than the heavy currents involved in 12V operation.

However, most amateurs seem likely to stick, at least for the time being, with 12V solidstate equipment. With the availability of solidstate linear amplifiers rated at tens and hundreds of watts p.e.p., the currents involved are becoming formidable. I heard recently of one West Country amateur who draws about 60A, and there is now quite commonly a need for 25 or 30A.

There are several reasons why amateurs favour 12V. It is most convenient for mobile operation, drawing directly on the vehicle battery; devices designed for 12V operation for the commercial land mobile radio services are available at reasonable cost; the 5V needed for ttl logic devices can readily be obtained from the 12V bus by using solidstate ic regulators, etc.

Recently I received a long letter from Barrie Spink, GM6CBF, providing a number of practical hints relating to 12V supplies. He stresses that one solution, which he feels is often overlooked (though discussed quite frequently in *TT* over the past decade), is to use, for domestic operation, a 12V vehicle-type lead-acid battery. He writes:

"These are readily available, although somewhat expensive and there is a certain reluctance to make use of them. This is probably due to batteries being "messy" and the dislike of using sulphuric acid in the house. But they can easily provide the 25 to 30A needed for equipment in common use for the usual one-third transmitting duty cycle. If a current-limited and 14V regulated power supply is used to trickle charge the battery, there is little danger of over-charging it with a charge rate of about 4-5A. Special provision might be needed to cope with a 24h stint during contests etc.

"I believe there are a number of advantages to this approach: *(1)* Relatively cheap components, including transformer, rectifier and series-pass transistors, can be used for the charging unit. Such components are readily available. *(2)* The output impedance of the battery is very low, and smoothing requirements are minimized. *(3)* There is little risk of an over-voltage being applied to the equipment unless the battery is allowed to become disconnected or dry.

"It is a common mistake, however, to attempt to use an old, discarded vehicle battery for this application. A new battery, or one that has been thoroughly restored, avoids the user becoming disenchanted with the system.

"It has to be admitted that lead-acid batteries do not appeal to many amateurs, and the heavy-current mains psu is still the favoured system. This involves finding a suitable heavy-current transformer. Amateurs may be overlooking some sources of second-hand transformers eminently suitable, if often rather bulky, for this application.

"For example, industrialists tend to keep equipment in use for longer periods of time than the average consumer, with the result that a lot of valve equipment is only just reaching the scrapyards. Much of this equipment used separate heater transformers, often with several 6·3V windings sometimes rated up to 25A or so; transformers with three, four or five centre-tapped heavy-current windings. Provided the correct sense of connection is used, several of these windings can be connected in series, with the centre tappings providing quite fine adjustment of the output voltage. Such transformers can prove almost ideal for heavy-duty bench supplies providing 25A or more.

"Another useful source of supply is the battery-chargers used in garages and for industrial electric trucks. Many of these are designed to charge several 12V batteries in series, have quite high voltage windings, often with a number of taps. Most are rated for 10A but there are often two battery chargers in the one casing fed from one mains transformer. In such cases it is possible to parallel-up the necessary windings to obtain a very high current transformer of adequate voltage.

"Electric truck chargers are more selective. The only ones that are suitable are those for the very small trucks, usually having a transformer winding of about 30V with a tapped choke to provide the correct charging characteristics for the batteries used on the truck. With the older type that used selenium rectifiers, the transformer almost invariably will have a number of tappings that were intended to allow the output voltage from the transformer to be increased as necessary to overcome the ageing of the rectifiers. Taps are unlikely to be found on equipment based on silicon diodes. The choke from these units is useful in providing additional smoothing; the chokes often have taps and it may be necessary to achieve the desired results by trial and error.

"There are many industrial chargers lying around in industrial premises, and almost invariably they end up at the local scrapyard. Old units with selenium rectifiers are seldom considered worth repairing, and truck manufacturers prefer to sell a truck complete with a new battery charger. A search of local liquidation sales, scrapyards etc will almost certainly provide a source of such equipment. While it may be necessary to take a gamble on their condition, units can often be acquired for about £5.

"Finally, it is worth noting that some of the old washing machines that can be found lying around at the back of department stores etc contain a module that provides a readily available source of supply for a crowbar thyristor as well as the low-value, high-current resistors needed for current-sharing of series-regulating transistors. The value of such resistors, which are used to sense the armature current of the washing machine drive motors, is typically around 0·05 to 0·1Ω.

"By following up such sources, nearly all the more costly components for a heavy current psu can be obtained relatively cheaply; some of the more modern chargers will have germanium or silicon rectifiers that can be used. The only requirements then are the smoothing capacitors and series-regulating transistors with a hefty heatsink. An old computer power supply will almost certainly yield at least some of these!"

Military equipment

A series of recent exhibitions and presentations by large electronics firms —Racal, Plessey and Marconi—has emphasized the extent to which current British work on thin-line radio communications is linked with the international arms trade. Several new ranges of tactical and strategical, hf and vhf, radios for naval, vehicle, airborne and manpack applications, electronic warfare (ew), electronic counter measures (ecm), electronic counter counter measures (eccm) and electronic support measures (esm) including sophisticated surveillance, signal analysis and df systems. There is clearly an American-led revival of interest in hf systems, and a good deal of work is going on to overcome the effects of deliberate jamming (ew) of vhf tactical systems. There are already many forms of eccm, including frequency-hopping for speech transmission and spread-spectrum techniques for data and digital transmission. In frequency-hopping the transmitters shift frequency several times a second following a pseudo-random sequence in synchronism with the receiver.

Frequency-hopping makes it difficult to intercept the messages as well as dodging a narrow-band jammer; on hf, the technique can make it difficult to detect that an ssb link has been established even on a spectrum analyser or panoramic type of display; however, particularly on vhf, such transmissions remain vulnerable to modern df techniques. Another technique that seems to have become well-established is the use of high-speed "burst" transmission which again can be very difficult to intercept,

TRANSGLOBE EXPEDITION

◀ Charles Burton using a Racal-Tacticom manpack equipment in the Antarctic cold

Lady Virginia Fiennes at one of the base stations used during the three-year Transglobe expedition that circumnavigated the globe via both poles. Some £200,000-worth of Racal communications equipment was used during this unique journey ▶

particularly when used with a frequency-agile transmitter. Burst transmission was used occasionally over 40 years ago on some U-boat and clandestine radio links, although it tends to require more powerful signals than, for example, hand-speed morse.

Plessey have developed an automatic null steerer for use between 30 and 88MHz. This is basically similar to the manual antenna vector processing units developed by G3JFK and Roger Bunney (*TT* August, November 1982). Using two whip antennas spaced $\lambda/10$ or more apart, the Plessey unit automatically places a null about 30–40dB deep on the stronger of two incoming signals. It can thus keep a communications link open in the presence of a strong jamming signal, which may be an enemy tactical jammer or your own "smoke screen" jammer placed between you and the enemy in order to conceal your radio operations.

In this connection it is interesting to note that J. K. Webb of the Mitre Corporation, whose work on hf null steering was noted in the August 1982 *TT*, turns out to be John Webb, W1ETC. He has written a full-length article on an amateur radio version of his electronic null steerer unit, including circuit details, in *QST* October 1982, pp28–32. This provides a useful anti-QRM device between 3·5 and 28MHz, using four delay lines (50, 40, 20 and 10 nanoseconds) formed from coiled lengths of coaxial cable. The basic unit is simpler than G3JFK's AVP4 processor, and uses two 2N5109 transistors as broadband amplifiers, with another transistor as a relay driver for bypassing the unit on transmit. It is claimed by W1ETC that, in demonstrations to the US Air Force, intelligible a.m. and ssb signals were received in the presence of jammer-to-signal ratios as high as 30dB, though presumably these were groundwave signals. The Plessey automatic null steerer is a good deal more complex (and much more costly) and includes a memory intended to prevent the null taking out the wanted signal if the jammer is switched on and off.

At Racalex, Lady Virginia Fiennes, the chief radio operator on the remarkable three-year Transglobe expedition, told me how Racal military-type equipment can be put to peaceful uses in demanding and difficult conditions. Both in the Antarctic and later in the Arctic, she operated her equipment in a reinforced cardboard hut for many months while keeping contact with her husband, Sir Ranulph Fiennes, and co-explorer Charles Burton. Although her links back to the UK—via Cove Radio and Portishead Radio—were mostly made using ssb, the extremely poor radio-propagation conditions in the polar regions sometimes made it impossible to use this mode for contacting the explorers equipped with 20W manpack-type radios. Polar-cap absorption and extreme multipath conditions meant that manual morse was often the only mode that could get through. The expedition showed once again that the main problem for such operations is the provision of electrical power. The vehicles carried petrol-electric generators, but when it came down to foot-slogging it was a matter of hand generators and batteries. The motorized snow scooters were equipped with 100W hf equipment but also carried 20W manpacks. The support ski-plane had programmable hf and vhf transceivers, and carried extra vhf equipment to communicate with the ship and base stations. The snow scooters were fitted with automatic morse senders. Details of the Transglobe communications set-up are given in *Electronics in Defence*, a house journal of the Racal Defence Companies, but one hopes that Lady Fiennes will one day provide her own account of what was clearly a remarkable and courageous operation that emphasized that effective radio communication involves more than an on-off switch.

TR7010 distorted audio

Several years ago Jan Martin Noeding, LA8AK, noted that the af output from his TR7010 144MHz ssb transceiver was rather heavily distorted. He modified the age system and obtained some improvement, but later discovered that, in making the modifications, the balanced modulator product detector had now become forward biased due to insufficient bfo drive level. In effect the detector was no longer working as a double-balanced modulator but rather as an i.f. limiter. This resulted in all-too-evident audio distortion appearing at times. It was, in effect, the case of solving one problem but introducing another that was unlikely to be noticed in bench testing but showed up in operational use.

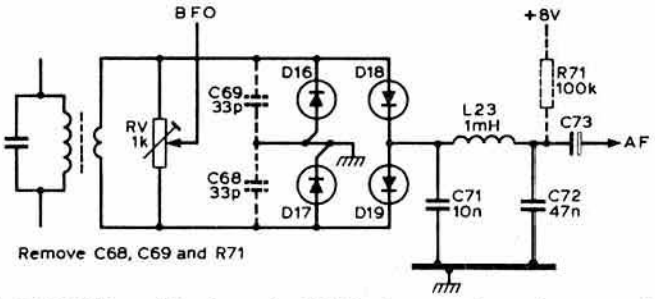


Fig 8. LA8AK's modification to the TR7010 ssb transceiver to improve audio quality

The cure for this second problem was to remove R71. However, as this causes noticeable reduction in sensitivity it is necessary also to remove the balancing capacitors C68, C69 which no longer have any useful function. LA8AK has tried these modifications on three TR7010 equipments and reports that the improvement is very noticeable. R71 is mounted below the X55-1080-00 printed circuit board. To gain access to the component unscrew the exciter board (X50-1240-00) and lift it up at the rear edge.

LA8AK believes that the only good ssb age system for the TR7010 is a rescaled version of that used in the Drake TR4/TR4C hf transceivers, although he warns that the system in the Drake R4/R4B/R4C performs no better than the original Trio/Kenwood age system.

Safety tips and topics

W. G. Borland, G3NXM, reported recently a note issued by the Talking Book Service for the Blind. This draws attention to a warning from the Department of British Trading Standards that a number of electrical plugs being sold throughout the country have been found to be dangerous. The notes continue: "The plugs are fitted with faulty fuses and, when in use, become extremely hot, which means a high risk of fire or electrocution. They also have other defects which are potentially dangerous. The plugs carry the brand name Fiora or Flora (the lettering is not easy to read), the BS number BS1363 and the words 'made in India'. Any such plug should be removed and replaced immediately."

During the summer there was also concern about a number of mains power supply units made by Phihong in Taiwan, primarily intended for use

(Continued on page 1063)

A non-mathematical analysis of the third method

by R. C. DAVIS, MSc, G3TDL*

Introduction

The author was prompted by the article "The G3MXT third method Mk2 and polyphase Mk2 ssb generators" G. V. Entwisle, G3MXT, *Rad Com* December 1981 pp 1112-6, to update his somewhat sketchy knowledge of the so-called third method of ssb generation, and turned to a recently-acquired copy of the *Radio Communication Handbook* for advice. The description given there, although a good introduction, left certain questions unanswered, implying that a rigorous mathematical treatment would be necessary for any greater understanding of the system. The author is not one to involve himself in mathematics unless it is absolutely necessary, but equally he felt unhappy about having only a partial knowledge of the operation of the system. Certain features of it had always seemed to smack of black magic rather than electronics, and it was felt to be high time that this illusion was dispelled! So an attempt was made to investigate the operation of the system using only simple mathematical devices which the author understood well, namely frequency spectra and phasor diagrams. The attempt was successful, and the results are given below.

Modulation and sidebands

Before embarking on an analysis of the third method it will be useful to examine the basic amplitude modulation process in order to see how the sidebands are produced. The material covered in this section is fairly basic, and anyone who has a reasonable working knowledge of a.m. (which should be anyone who has passed the RAE!) may omit this section and pass on to the description of the phasing method. It is recommended that the latter should be read, as a good understanding of the phasing system is a necessary prerequisite for the understanding of the third method.

So, let us consider what happens when a single tone of frequency Fm modulates a carrier Fp. Figure 1(a) shows the frequency spectrum of the signal produced, and it can be seen that in addition to Fp there are two other signals present located at frequencies Fp + Fm and Fp − Fm. (The theoretical justification of this is given in the appendix.) These extra signals are called the sidebands, and it can be seen that their frequencies differ from that of the carrier by an amount Fm. If the frequency of Fm is raised the sidebands will move away from the carrier so that their separation from it is equal to the new, higher value of Fm. A point to notice is that, whereas the sideband signal on the high frequency side of the carrier moves higher in frequency as Fm is increased, that on the low frequency side moves *lower* in frequency. Suppose now that instead of using a single tone to modulate the carrier a signal consisting of a combination of two tones Fm and Fn is used, where the frequency of Fn is higher than that of Fm. This produces the spectrum shown in Fig 1(b) where it can be seen that each of the two tones produces a pair of sidebands spaced from the carrier by an amount equal to its frequency. Once again it can be seen that, in the lower sideband (ie that on the lower frequency side of the carrier) the component representing the higher modulating frequency Fn is lower in frequency than that representing the lower frequency Fm.

In a practical a.m. system the modulating signal will be an audio waveform consisting of a large number of different frequencies, and it is convenient to draw the spectrum of this as a trapezium-shaped figure, as shown in Fig 1(c). The fall-off in amplitude at hf here will be caused by there being some form of band limiting in the af system, which may be a low-pass filter, or simply the response of the microphone! When this complex audio signal is used to modulate the carrier the spectrum shown in Fig 1(d) is produced: as might be expected from the preceding paragraphs the frequency spectrum of the lower sideband is reversed compared to that of the original audio signal. This diagram will be referred to again later.

The signal that is used to modulate the carrier can be any waveform, the only requirement being that the highest frequency present in the modulating signal must be lower than the carrier frequency. Thus another carrier Fc whose frequency is higher than Fp can be modulated by the complete signal of Fig 1(d) to obtain the spectrum shown in Fig 1(e). Fp is now described as a subcarrier (or, in the third method, pilot carrier) since it is not itself transmitted directly but is modulated on to Fc which is then transmitted. A modification of this diagram will be used later (Fig 7(c)) the modification being that both carriers (Fp and Fc) and one of the sidebands of Fp have been suppressed.

There is another type of diagram which can be used to represent the carrier and sidebands, and this is known as a phasor diagram, the word "phasor" simply being a contraction of phase vector. The term "phase" refers to the instantaneous phase angle of the waveform, which can be explained as follows. The waveform called a sine wave is simply a graph of the trigonometric sine function, sin Θ. As anyone who has studied trigonometry will know, Θ here is an angle which can have any value from 0° to 360°; after this the waveform repeats itself. In the case of the electrical sine wave, the value of sin Θ represents the instantaneous value of a voltage which varies with time, and to get this variation with time into the picture the angle Θ is made to vary with time by putting it equal to $2\pi Ft$, where F is the frequency of the sine wave and t is the time in seconds. The term 2π is present because it is conventional to express the angle in radians, and 2π radians equals 360°. To generate the sine wave start at time $t = 0$, and increase t in regular steps, working out and plotting the value of sin $2\pi Ft$ as you go. The angle $2\pi Ft$ will increase at a constant rate from its starting value of zero, and in time $\frac{1}{F}$ seconds it will have reached a value of 2π (360°) which is equivalent to 0°; thus in a time $\frac{1}{F}$ the waveform has gone through one cycle and in 1s it will go through F cycles. The instantaneous phase angle of the waveform is the value of the angle $2\pi Ft$ at any given moment in time.

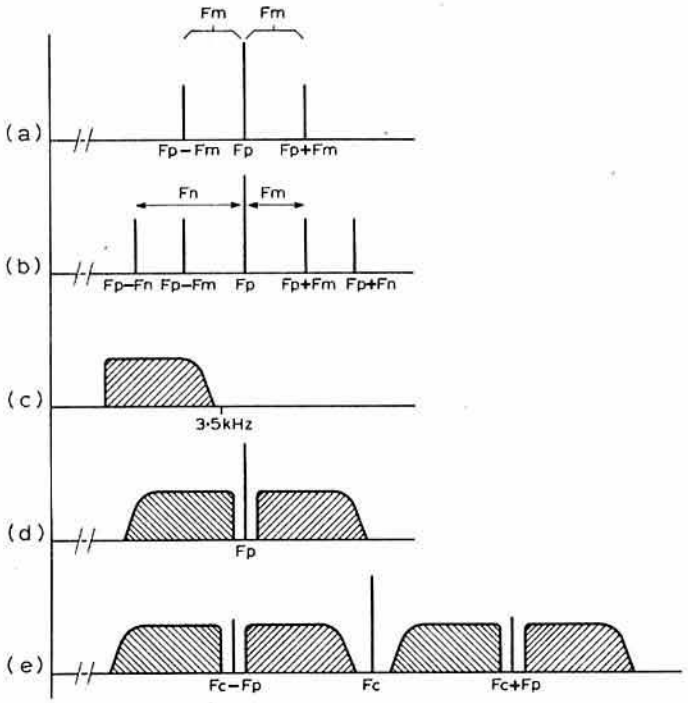


Fig 1. **(a) The spectrum produced when a tone of frequency Fm modulates a carrier Fp.**
(b) Spectrum produced with two modulating tones Fm and Fn.
(c) Generalized representation of the spectrum of a speech signal.
(d) The spectrum produced when the speech signal of (c) modulates the carrier Fp.
(e) The effect of modulating a carrier Fc with the signal represented by (d) – the frequency Fc is higher than Fp

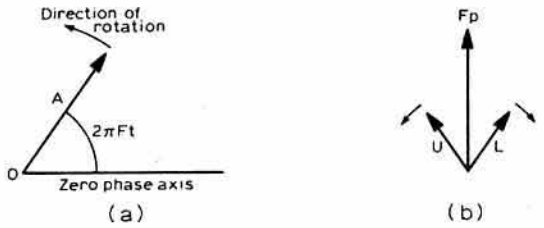


Fig 2. **(a) Phase vector ("phasor") plot of a single tone A sin2 πFt.**
(b) Phasor plot of a carrier Fp modulated by a single tone Fm

*21 Denton Drive, Brighton BN1 8LR

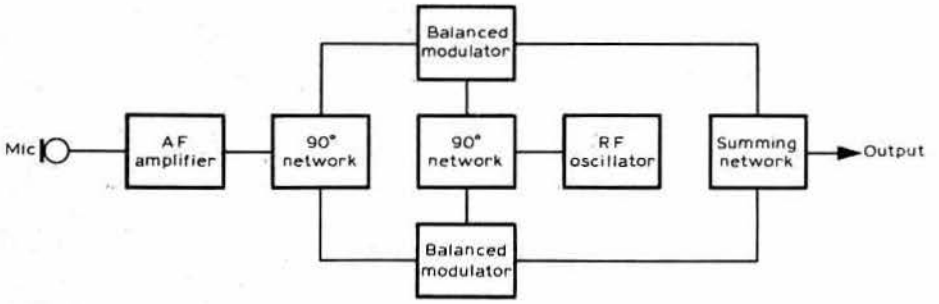


Fig 3. Block diagram of basic phasing exciter

The sine wave can now be represented by a phase vector, as shown in Fig 2(a); as it is a type of graph, the axes must first be defined. It is conventional to take the zero phase angle direction as being to the right, as shown, and to locate the point representing zero amplitude at the left-hand end of this axis, ie in the centre of the diagram. A vector representing the sine wave can now be drawn, the complete equation of which will be $A\sin 2\pi Ft$, where A is the constant representing the peak amplitude of the sine wave. To do this a vector is drawn starting from the zero amplitude point 0, whose length represents A and whose angle to the zero phase axis represents the instantaneous phase angle $2\pi Ft$. (It is conventional to measure this angle in an anticlockwise direction). If it were possible to watch the behaviour of the diagram as the time t varied it would be seen that the vector A rotates about 0, completing one revolution in $\frac{1}{F}$ seconds and F revolutions in a second. (Note that the length of A does not vary with time, since it represents simply the constant A and not $A\sin 2\pi Ft$). Any sine wave can be represented in this way, the rate of revolution being equal to its frequency.

If a phasor diagram representing the carrier and two sidebands produced in the amplitude modulation process is drawn, the result will be three phasors all rotating anticlockwise at different speeds!† Obviously this is a bit difficult to visualize, but matters can be simplified by, in effect, viewing the diagram as if one were seated on the carrier vector Fp; this means that Fp now appears to be stationary, and that any signals higher in frequency than Fp will appear to rotate anticlockwise at a rate equal to the amount by which they are higher in frequency, whereas those lower in frequency than Fp will appear to rotate clockwise. The diagram of the carrier plus two sidebands now becomes that shown in Fig 2(b), where a carrier vector Fp is stationary and two sidebands (marked u and l for "upper" and "lower") are rotating in opposite directions at a rate Fm rotations per second, and where Fm is the frequency of the modulating tone. This diagram will be used later in the article in the examination of the phasing and third methods.

The signal examined so far is the normal a.m. signal as used, for example, in long and medium wave broadcasting. To obtain an ssb signal it is necessary to remove the carrier and one sideband from this. The carrier can be removed quite easily by the use of a balanced modulator, but the unwanted sideband is not so easy, and in fact there are three main techniques for doing this. The most obvious, and most widely used, method is to pass the a.m. signal (having already suppressed the carrier but with both sidebands still present) through a narrow filter whose passband is only just wide enough to allow one sideband through. This is known as the filter method, and forms the basis of nearly all the commercially-produced ssb rigs. The second method is known as the phasing method, and is not quite so obvious in its operation. The so-called third method is based on the techniques used by both the other two, and, since it is necessary to understand the phasing method in order to understand the third method, the next section of this article will analyse the operation of a phasing exciter.

The phasing method

The block diagram of a basic phasing exciter is shown in Fig 3. The output of the af amplifier is passed through a network which produces two outputs in phase quadrature, to the inputs of two balanced modulators, which are also supplied with an rf signal, again in phase quadrature. The double sideband suppressed carrier outputs from the balanced modulators are fed to a summing network where one sideband cancels, while the other reinforces to produce a single sideband output.

The operation of the circuit can be understood from Fig 4(a), which shows phasor diagrams representing the outputs from the two balanced modulators. The dotted lines marked Fc represent the phase vectors of the two suppressed carriers, the 90° angle between them being the effect of the rf quadrature network. The modulating signals are also in-phase quadrature, and this can be seen from the positions of the sideband vectors with respect to their associated carriers; in the left-hand diagram the two sidebands are in line with the carrier, corresponding to the peak of the a.m. envelope, whereas in the right-hand diagram the sidebands are in a position 90° further on in the cycle of the modulating waveform, at which point it is crossing zero and the instantaneous value of the a.m. envelope is equal to that of the unmodulated carrier. It can be seen that if all the vectors in the two diagrams are added (remembering that the carrier vectors Fc are suppressed), the resultant is a single vector in line with a and c and rotating in the same direction and at the same rate as them; vectors b and d are equal and opposite and so cancel. Thus the sideband represented by b and d has been cancelled, leaving just the one sideband (the upper in this case, since the positive phase direction is anticlockwise, and so any vector rotating anticlockwise with respect to the carrier will be higher in frequency than the carrier).

Fig 4(b) shows the effect of reversing the phase of the audio input to the second balanced modulator (right-hand diagram), which, because of the nature of a sine wave, is equivalent to adding (or subtracting) an increment of 180° to the phase angle of the modulating signal, and thus reaching a point in the cycle where the amplitude of the modulation envelope is rising, and where the sideband phasors are converging on the carrier phasor. The situation is unchanged for the other balanced modulator (left-hand diagram). If the vector addition is performed again it can be seen that vectors b and d are now in line and reinforce, whereas a and c cancel, and thus the resultant vector rotates clockwise with respect to the carrier vector and hence is lower in frequency than the carrier. Thus by reversing the phase of the audio input to one of the balanced modulators the exciter has changed from producing upper sideband to lower sideband. This property of the phasing system is fundamental to the operation of the third method generator in its fully developed form, as will be seen later.

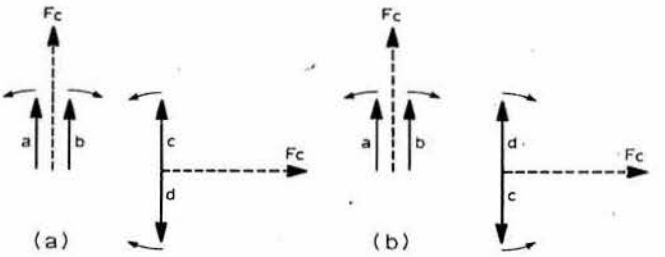


Fig 4. Phasor diagrams for output of the two balanced modulators of Fig 1: (a) for upper sideband generation; (b) for lower sideband

The main advantages that the phasing method has over the filter method are the absence of expensive crystal filters and the fact that the suppression of the unwanted sideband is not dependent on the stability of the oscillator producing the rf signal. In the filter method any drift of the rf oscillator will, at best, degrade the speech quality, and at worst may also reduce the sideband suppression. In the phasing method the sideband suppression is dependent purely on the maintenance of exactly equal amplitudes of the drives to the two balanced mixers and on the accuracy of the phase shift produced by the two 90° networks. This last point, however, represents the main drawback of the system. While it is comparatively easy to produce a 90° phase shift at any given frequency, it is rather more difficult to produce a network which will give exactly this phase shift over even the small range of audio frequencies required for communication (which still, in fact, represents about 3·5 octaves!). Any departure of the phase shift from exactly 90° will degrade the suppression of the unwanted sideband. In the past the phase shift networks used have been something of a compromise, and even then have required the use of very close tolerance components. Although nowadays, with the advent of Mr Gingell's polyphase network, it is far easier to obtain the required audio phase shift, it is still worth considering the clever way in which the third method overcomes this problem while retaining the advantages of the phasing method.

†It is assumed here that the modulating signal is a single tone; the general case of a complex waveform is rather difficult to handle by this approach.

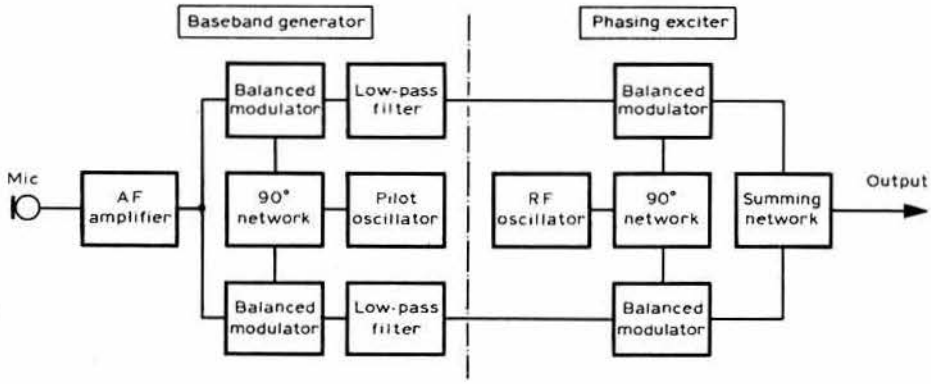


Fig 5. Block diagram of third-method ssb generator

The third method

The block diagram of a third method exciter is shown in Fig 5. In order to analyse the system it is convenient to divide it into two parts, as shown; a more or less conventional phasing transmitter is driven by a baseband generator, the function of which is to process the incoming audio to produce the two quadrature baseband signals required by the phasing transmitter.

Consider first the baseband generator. This consists of two balanced modulators, the carrier ports of which are fed in phase quadrature with a pilot carrier whose frequency lies somewhere in the audio range; the exact frequency is not critical and, for ease of analysis, it will be assumed for the moment that it is just slightly higher than the highest audio frequency to be processed. (It will be seen later that this is not generally the case.) The other ports of the two balanced modulators are fed with audio, as happens in a phasing transmitter, but with one important difference; in this case the audio is fed to the modulators *in phase* rather than via a 90° network. The effect of this is shown in Fig 6(a), where again there are phasor diagrams for the outputs of the two modulators. As in Fig 4 the carriers are at 90°, but, because there is no phase shift introduced into the audio, the modulation of both signals is in phase; hence the phases of the sideband vectors correspond to the same point in the modulation cycle for both signals. The diagrams of Fig 6(a) are drawn to represent a point corresponding to the peak of the a.m. envelope, but they could equally well be drawn for any other point in the modulation cycle. In each case, however, it would be found that the sideband pairs a/b and c/d had exactly the same phase relationship to their respective carriers.

In this case the signals from the two balanced modulators are not added, as they were in the phasing transmitter, but remain separate. What does happen is that the upper sidebands of both signals are removed by low-pass filters, leaving the situation shown in Fig 6(b), where two signals b and d are at 90° to each other. It is these two signals that are fed as modulating signals to the two balanced modulators in the phasing exciter, and it can be seen that the accuracy of their 90° phase relationship depends purely on the accuracy of the phase relationship between the pilot carriers. The quadrature network producing this shift has only to operate at a single, fixed frequency, and therefore it can be made to produce the required phase shift considerably more accurately than would be the case with the wideband network required by the phasing method. Thus the unwanted sideband suppression obtained by the third method is far better than that obtainable from the phasing method.

The phasing exciter part of the system shown in Fig 5 behaves in exactly the way described in the earlier examination of the phasing method. The only difference is that the modulating signal in this case is not the audio itself but the lower sideband of a suppressed pilot carrier modulated by the audio. Surprising as it may seem, this does not matter, as can be seen from an examination of Fig 7. In Fig 7(a) the spectrum of the audio signal is shown, while 7(b) shows the effect of modulating this onto the pilot carrier (the balanced modulators used will need to be doubly-balanced so that the audio signal does not appear at the output). The upper sideband is removed by a low-pass filter, leaving the lower sideband which, as can be seen, occupies the same frequency band as the original audio, but with the frequencies reversed—ie the highest frequencies in the audio signal will be represented by the lowest frequencies in the sideband and vice-versa. This lower sideband now modulates the rf carrier Fc, producing two sidebands which are faithful representations of itself—ie having the same reversed frequency spectrum, as shown in Fig 7(c). One sideband is suppressed by the phasing process, leaving a single sideband signal; for the moment it will be assumed that it is the lower sideband of Fc which is produced.

There is now an ssb signal on the right frequency, the only snag being that it is frequency-inverted with respect to the original audio, as shown above. However, this signal is identical to that which would have been obtained if the original audio had been used to produce an upper sideband signal with a carrier frequency *lower* than Fc by an amount equal to Fp, the pilot carrier frequency, as can be seen from Fig 7(d). Similarly the *upper* sideband of Fc is equivalent to a *lower* sideband signal with carrier frequency Fc + Fp (marked Fl in Fig 7(d)). Thus the ssb signal has been satisfactorily obtained, the only drawback being that the apparent frequency of the transmission will change by 2Fp when switching from one sideband to the other! This can easily be overcome by arranging that Fc is higher than the required output frequency by an amount equal to Fp when upper sideband is selected, and lower by Fp when lower sideband is required.

Spectrum folding

The main advantage which the third method has over the filter method is that the filters which it uses are much simpler and cheaper than those required in a filter exciter. The reason for this can be seen by comparing Fig 7(b) with Fig 7(c) and considering in each case the filter required to remove the upper sideband. If it is assumed that the audio band which is being dealt with extends from 300Hz to 3·2kHz, as shown, the attenuation produced by the filter in case b will have to go from zero to maximum in the 600Hz

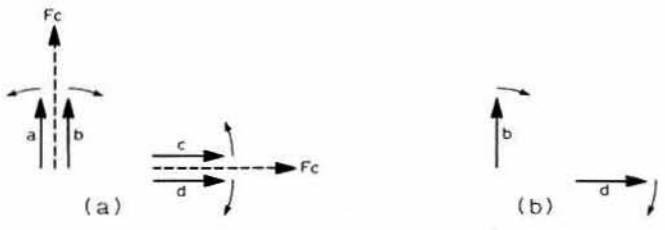


Fig 6. Outputs from the two balanced modulators in the baseband generator of Fig. 5: (a) dsb outputs; (b) signals remaining after passage through the low-pass filters

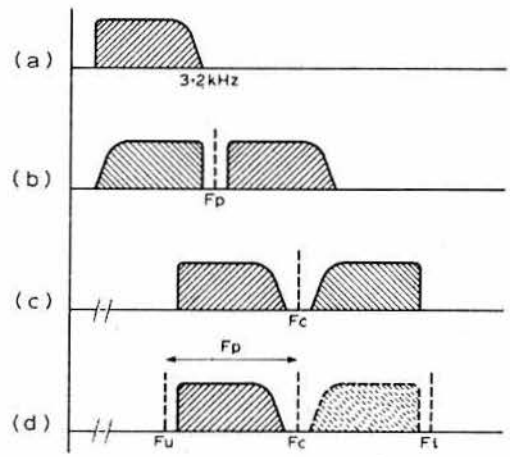


Fig 7. Frequency spectra for third-method generator.
(a) Spectrum of modulating audio signal
(b) Sidebands produced by modulating the pilot carrier Fp with the audio signal of Fig (a)
(c) Sidebands produced when rf carrier Fc is modulated by the lower sideband of (b).
(d) Output from third-method exciter. The upper sideband of (c) has been cancelled out. The apparent carrier frequency is Fu

between 3·2kHz and 3·8kHz, representing a frequency space equivalent to 19 per cent of its cut-off frequency. However, if the dsb signal is generated at 9MHz, as is commonly done, the filter will still have to go from zero to maximum attenuation in 600Hz, but this now represents only 0·007 per cent of its upper cut-off frequency! Thus the slope of the filter must be made much steeper to obtain the required performance. The filter required for Fig 7(b) can easily be made with inductors, resistors and capacitors and hence is relatively cheap.

From the above it can be seen that there is an advantage in making the pilot carrier frequency as low as possible. However, it would be reasonable to assume that one has already gone as far in this direction as possible, as Fp is now just above the top end of the audio band it is intended to handle. Surprising as it may seem, this is not the case, and Fp can be reduced still further to a point where it lies in the middle of the audio band—ie at about 1·6kHz; there is no advantage in going any lower than this. The effect this has on the signal produced from the pilot carrier balanced modulators is shown in Fig 8(a). It can be seen that, while the upper sideband is normal, the lower sideband is folded back on itself. This is because the modulating frequencies higher than Fp would produce a lower sideband having a negative frequency; however, in real terms a signal with negative frequency is equivalent to one of the same positive frequency but with a 180° phase change (see appendix). Thus the lower sideband extends away from Fp down towards zero and, having reached zero, back up again. However, as it is intended to filter out the upper sideband of this signal and just work with the lower sideband it would seem that a scrambled signal has been obtained, and it is not obvious how this can be sorted out. Nevertheless, due to a property of the phasing method mentioned earlier, this is in fact quite easily done.

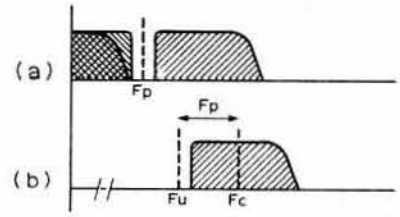


Fig 8. How the spectrum folding is removed. (a) Sidebands produced by modulating Fp with the audio signal; the lower sideband is folded back on itself. (b) Output signal from third-method exciter

To see how this works it is first necessary to examine the modulation (or mixing) process a little. In an ideal mixer, two frequencies F_A and F_B are applied to the inputs, and at the output (in addition to F_A and F_B which may or may not be suppressed according to the type of mixer involved) appear two frequencies $F_B + F_A$ and $F_B - F_A$, the "sum and difference" frequencies which can be regarded as being the two sidebands. The spectrum of this is shown in Fig 9. For the sake of mathematical convenience it is normal to assume that the difference $F_B - F_A$ is positive, which implies that F_B is the higher of the two frequencies considered, and it can be seen that the sidebands are symmetrically placed with respect to the "carrier" F_B. However, there is no reason to assume that F_B is treated in a favoured way by the mixing process—indeed, it seems wrong to assume that it would be, since there is nothing to distinguish between F_A and F_B apart from their frequencies—and, in fact, it can be shown that, unlikely as it may seem, the sidebands are also symmetrically placed with respect to F_A! The reason for this is that the lower sideband in the diagram, $F_B - F_A$, is in fact equivalent to a signal of opposite phase at a frequency $F_A - F_B$, which is negative. If the frequency axis in Fig 9 were extended to the left (negative) side of zero and the position of $F_A - F_B$ marked, it would be found that its spacing from F_A along the frequency axis would be exactly the same as that of $F_A + F_B$. Of course, a negative frequency has no physical reality, but the positive frequency $F_B - F_A$ which is present is equivalent to F_A-F_B.

The justification of this statement is relegated to the appendix, but it can be seen that, because it is equally valid to regard either input frequency to a mixer as being the "carrier" (ie the frequency about which the sidebands are grouped symmetrically), it is justifiable in practice to make the mathematically convenient assumption referred to earlier and treat the higher of the two

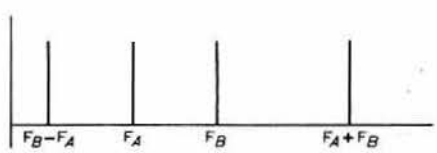


Fig 9. Spectrum of mixing process. The two input signals F_A and F_B mix to produce sidebands $F_A + F_B$ and $F_B - F_A$

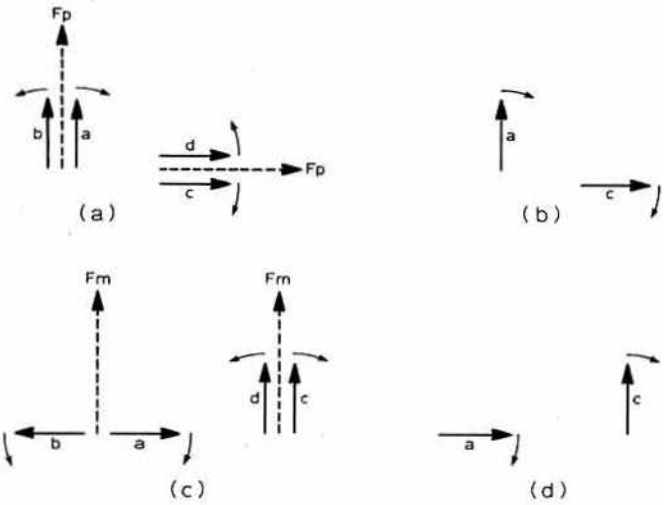


Fig 10. Phasors involved in spectrum unfolding process:
(a) Output from pilot carrier balanced modulators when Fm is lower in frequency than Fp
(b) Signals remaining after those in (a) have been passed through low-pass filters. Here signal c is 90° ahead of a in phase
(c) Output from pilot carrier balanced modulators when Fm is higher in frequency than Fp
(d) Signals remaining after filtering. It can be seen that the phase relationship between a and c has been reversed relative to that shown in (b)

frequencies as being the carrier in all cases. This procedure has interesting consequences for the third method, as will now be shown.

It was said earlier that, in practice, the pilot carrier frequency Fp is usually made about 1·6kHz, resulting in the production of a lower sideband which is folded back on itself. The two parts of this sideband, ie the normal and "folded-back" parts, are produced respectively by mixing Fp with frequencies lower than itself (ie the audio frequencies from 300Hz, the lower limit of the audio range, up to Fp), and with frequencies higher than itself, ie from Fp up to 3·2kHz. Consider the phase relationships of the sidebands produced in these two cases. Fig 10(a) shows the sidebands produced when the modulating frequency Fm is lower than Fp. The phases of Fp fed to the two balanced modulators differ by 90°, so the carrier phasors are drawn at 90° with the modulation in phase on each; after filtering the two lower sidebands a and c remain, as shown in Fig 10(b).

Now consider what happens when Fm is higher than Fp. As said above, it is quite valid to consider the higher of the two frequencies involved in the mixing process as being the carrier, and Fp as the modulating signal. (The same result could have been obtained by continuing to treat Fp as the carrier, but this would have involved questions of negative frequency, and hence more mathematics!) Now the audio is fed to the two balanced modulators in phase so the two phasors representing Fm are drawn in phase; however, Fp in the two modulators differs in phase by 90°, and as Fp is being treated as the modulating signal the phase of the *modulation* differs by 90°, as shown. Since in Fig 10(a) the phase of Fp in the left-hand diagram was 90° ahead of that in the right, in Fig 10(c) the phase of the modulation on the left is 90° ahead of that on the right. After filtering two lower sidebands a and c remain, as shown in Fig 10(d). If Figs 10(b) and (d) are compared it will be seen that, in the former, the phase of c leads that of a by 90°, while in the latter the phase of c lags that of a. (In fact, this should be the other way round, since the sideband phasors are, in absolute terms, rotating anticlockwise; it is only relative to the carrier phasor that they rotate clockwise. However, this does not affect the argument.) Going from one case to the other is equivalent to introducing a 180° phase shift into one of the two signals which, as stated earlier, will cause the phasing exciter to change sidebands. What this means in practical terms is that when the lsb signals from the pilot carrier modulators are fed to the modulators in the phasing exciter, the parts of the signal representing frequencies below Fp will produce, say, the lower sideband while those representing frequencies above Fp will produce the upper sideband.

The situation is shown in Fig 8. At (a) we have the spectrum of the output from either of the pilot carrier balanced modulators, and it can be seen that the lower sideband is folded. The upper sideband is removed by filters, and the lower sideband fed to the rf balanced modulators. When the outputs of these two modulators are combined, one sideband is suppressed and, as shown above, it will be the upper for frequencies below Fp and the lower for frequencies above Fp. The resulting spectrum is shown in Fig 8(b). The

unfolded section of the lower sideband (Fig 8(a)) has produced the lower sideband of Fc, while the folded section has produced the upper sideband. As the signal in Fig 8(a) extends right down to zero frequency and back up, there is no gap between the two sidebands in Fig 8(b), and they form a continuous signal extending from Fc – Fp to Fc + Fp. A comparison of Fig 8(b) with Fig 7(d) will show that once again an upper sideband signal with an apparent carrier frequency of Fu, ie Fc – Fp, has been produced. Thus what seemed to the author at the start of this investigation to be a conjuring trick has been successfully performed; the folded-up sideband has been unfolded and there is an ssb signal at the output!

In the past the third method of ssb generation has been little used in amateur radio circles, due no doubt to its greater complexity than the other available systems. This complexity would, in valve days, have resulted in the transmitter being considerably larger and more power-consuming than its companions. In these days, when integrated circuits have reduced the size and cost of active components, while crystal filters are still as expensive as ever, the third method is becoming an attractive proposition. The author is sure that during the next few years a lot more will be heard about this ingenious method of ssb production!

Appendix

The equation of a sine wave is:

$$E = E_0 \sin 2\pi Ft$$

where E is the instantaneous voltage, E_0 is a constant giving the amplitude of the wave, F is the frequency and t is time measured in seconds. The waveform is assumed to start at t = 0; it will complete one cycle in a time $\frac{1}{F}$ and in 1s will complete F cycles. The phasor diagram is a plot of the function $2\pi Ft$.

In the mixing process two signals F_A and F_B both having the form given above are multiplied together. Thus the process can be described by one of a set of four equations of the form:

$$2 \cos A \sin B = \sin (B + A) + \sin (B - A)$$

which shows that multiplying two sinusoidal functions together produces two further functions at sum and difference frequencies, the sidebands. The three other equations in the set describe 2 sin A sin B, 2 sin A cos B, and 2 cos A cos B. It does not matter which is used, so that quoted in full above will be employed. This equation gives the phase relationship between the two input signals and the sum and difference signals, and this relationship is important if a phasor diagram showing both input signals and the output signals is to be drawn.

Such a diagram is shown in Fig 11. It is drawn for a time t = 0 which is a convenient one to consider. At t = 0 the value of E sin $2\pi Ft$ will be zero, since sin 0 = 0, and this is represented by marking the phasor for F_B along the zero phase axis. The two sidebands u and l are also sine functions and thus they too line up along the zero phase axis. F_A, however, is a cosine function; what this means in practice is that it is 90° out of phase with F_B. The value of cos 0 is +1, and therefore F_A is at the top of its waveform and just about to descend towards zero, whereas F_B is passing through zero on its way up towards the crest; hence F_A is 90° ahead of F_B. This is shown by putting F_A at an angle of +90° on the diagram.

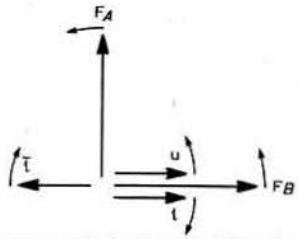


Fig 11. Phasor diagram for mixing process

Figure 11 is plotted with zero frequency as reference, so all the phasors representing positive frequencies will rotate anticlockwise, their different frequencies corresponding to different rates of rotation. The only signal which rotates clockwise is $\bar{l}$ which, represents a negative frequency.

It can be seen from Fig 11 that the sidebands u and l are symmetrically arranged with respect to F_B; in other words that their resultant is in line with F_B and at right angles to F_A. Thus it would seem that the mixing process favours F_B at the expense of F_A. It can be shown, however, that this is not the case. There is a trigonometric identity which states that:

$$\sin A = \sin (180° - A).$$

This can be seen by examining the sine curve; if a point starts from zero and moves forward along the sine curve, its value will always be the same as that of a point starting from 180° and moving backwards at the same rate. If a phasor representing

$$E = E_0 \sin (180° - 2\pi Ft)$$

is drawn on Fig 11 a phasor at +180° rotating in the opposite direction to l but at the same rate is obtained; which the author calls $\bar{l}$. Looking at $\bar{l}$ and u it can be seen that they are symmetrical with respect to F_A, so it can be concluded that F_B has not been favoured with respect to F_A because what happens can be described equally as well in terms of sidebands symmetrical about F_A or symmetrical about F_B. In practice, $\bar{l}$ represents a signal with negative frequency, which has no physical reality, and so what will actually be seen will be its positive equivalent l. It can be seen from the above that the sidebands will, in reality, always be symmetrically grouped about whichever of the two signals in the mixing process has the higher frequency. □

TECHNICAL TOPICS

(Continued from page 1058)

with cb rigs but which may have appeared suitable for mains operation of amateur equipment. It has been stated that some of these products suffered from poor insulation, accessibility to live parts, a tendency to overheat and insufficient operating instructions. Prosecutions were brought in respect of Eurosonic, Power Plus and Supreme brands (Model PP1203GS) and the Altai PP1206GS unit, all made by Phihong, but these may not be the only units presenting user-hazards.

The controversy surrounding the long-standing question of entirely safe limits for continuous exposure to rf has not gone away, despite the recent reassurance from amateurs working at the National Radiological Protection Board (*Rad Com* February 1982 pp136–7). For instance *IEE News* (October 1982, p15) in a report that is hardly "ill-informed or sensationalized" publishes a preliminary statement by the IEE's Health & Safety Committee, following study of a paper from the IEE's Merseyside & North Wales Centre, pointing out that "recent new evidence indicated resonances could take place within the body, and that frequencies in the neighbourhood of 500MHz were pertinent with respect to the skull". The implication is that such effects could cause problems in the safe use of walkie-talkies, cordless telephones and other hand-held transmitting equipment with antennas only a few inches from the users' head. The IEE's Health & Safety Committee has concluded that "a Ministry of Defence committee has recently reviewed the new medical evidence and had produced a new code of practice and that the Health & Safety Executive had requested NRPB to produce a new consultative document which could be used as the basis for any necessary new regulations."

Guide to technical writing

There are many aspects to the craft of scientific and technical writing. Wolfgang Pault let slip the following criticism of a fellow scientist: "I don't mind your thinking slowly: I mind your publishing faster than you think". Leo Szilard once said: "Don't lie if you don't have to". The great Lord Rutherford considered "If your experiment needs statistics, you ought to have done a better experiment". All quoted in Alan Mackay's *Harvest of a Quiet Eye. Break-in* January/February 1982 has published a 1min guide to understanding articles in amateur radio journals, along the lines of the following:

Author's phrase	Interpretation
It can be shown that . . .	You figure it out
A typical example showed . . .	This was the one time it did what I wanted it to.
It is technically feasible but some problems remain to be solved . . .	It costs 10 times as much as anyone would conceivably pay
A first approximation . . .	A wild guess
Various corrections have been applied . . .	I cooked the figures
Some preliminary results show . . .	Having got this far, all the transistors blew
Others may improve on these results . . .	Nothing worked.
There may be a tendency to instability . . .	It went into violent oscillation and the replacement transistors have not arrived yet
From fundamental principles . . .	This is the part I lifted from a textbook.

The self-administration and, to a large extent, self-regulation of amateur radio means that we depend to a marked degree on a large number of hard-working committees. A committee, so they say, apart from producing camels, is a body of people who by themselves could do nothing but who collectively can decide to do nothing.

4 - 2 - 70

Ken Willis, G8VR*

THE EXCEPTIONAL CONDITIONS of the past summer finally gave way to a very flat period commencing towards the end of September and continuing throughout October. On many days the weather map resembled a dart-board centred on the UK, and the resulting high winds and rain made good tropo working virtually impossible.

At such times other propagation modes deserve attention. Although we have no control over the appearance of *Es* or auroras, there are some satellites in predictable orbits which are easily accessed by anyone with reasonable 144MHz ssb/cw equipment, plus a 28MHz receiver. There are also some useful meteor showers coming up, as mentioned later, so dedicated vhf dx operators might do worse than investigate these other methods of communication when more conventional modes are denied us. Repeaters and fm simplex are, of course, largely unaffected by conditions, so the devotees of those modes probably welcome the fact that the bands seem very quiet at the time this is being written.

Winter can produce some excellent auroras, however, and on those rather rare bright days when the glass is high the tropo can be very good too, so keep the receiver turned on or you might miss it!

The big tropo opening

Last month the big opening of 13/14 September was reported, and it was thought to be possibly the biggest ever, with many superlatives used to describe it. I wondered if this was true, so I asked G3POI to cast his mind back over the years and attempt to recall anything remotely like it. He immediately suggested October 1975, and sure enough in *4-2-70* for December 1975 was a report on another "best ever" opening with many Russians being worked, including UQ2GDA, UC2ABN, UP2PCO, UP2PN—all in exotic squares of course. It is the ability to hear and work the Russians which seems to be the deciding factor in determining whether an opening is exceptional, since many stations these days have the capability to work as far as OK and (when they are operational) SP. The September 1982 opening certainly included a good selection of Russian prefixes. G3POI worked UQ2IV (KQ), RC2WBR (NP) and RC2WCG (OP), this last contact being over a distance of 1,903km. Clive hoped to hear something from UA3LBO (QO) since this station has eme capability, but perhaps he was not QRV on this occasion. G4IJE also worked UQ2IV (as did many others for a new country), as well as UQ2GDA (KQ) and RC2WBR (NP) at 1,787km. UQ2GDA also featured in the 1975 opening.

Whether or not it was the best ever, or just a very good opening, it provided thrills for many newcomers to the vhf bands, though no reports at all have been received of Russians being worked on any mode other than cw, so if you have anything to report along these lines please write. Meanwhile all reports received by *4-2-70* will find their way to the Propagation Studies Committee for assessment, especially those relating to contacts over distances in excess of 1,000km. Forecasting is always a tricky business, but G3POI reckons that such openings, the really big ones, have in the past occurred only every six or seven years. What will 1988 bring in the way of super dx?

Aurora

There has been little in the way of auroral activity since the event on 26 September, reported briefly last month. In this one, GI4LKA (XO) had more than 50 contacts, all on cw, the best being with OK3TJK (II). Paul said that his fellow GIs had a good time too, and GI8TVK in Co Tyrone worked OE5OLL (GI) on ssb. The beam headings used by GI4LKA started around 50° but moved steadily out to 90° during the event, returning at the end to 45°. He commented that the usual "trick" of aligning the antenna to pick out specific countries and areas did not seem to work, and at one stage he could hear stations from Denmark to France on the same heading. He also found doppler shifts more variable than usual.

GM8OEG (Dundee) also caught this aurora and had many good contacts, the best being HB9RFR (EH), LX1JA (CJ) and stations in FI, FJ and FK. He heard stations calling him from OE, but was swamped by the many DLs and PAs calling him. Andy was also incensed to hear such delicacies as OKs being worked on cw, and vows to take the test soon so that he can improve his chances of dx contacts by using this mode. However, he says that being at the centre of a pile-up, even if they are not the prefixes calling that you would like, they are a great deal better than having nobody at all come back to a CQ call.

I have again consulted the expert, Charlie Newton, G2FKZ, the IARU auroral co-ordinator, to discuss our chances of getting more of these good auroras now that the solar cycle is on the decline. He confirms his previous forecast (*4-2-70* August 1982) that we should get some big auroral events during the spring of 1983, after which there will be a steady decline. He commented that the auroras of 13 July and 6 September, which were generally regarded as very good, were by no means the largest on record. There was one in 1942 when the index stood at 300, more than twice the levels which were measured on the days of these recent events. In 1942 we were in the middle of a war, so there were no amateurs in Europe able to take advantage of the conditions. Charlie also affirms that the current high level of amateur activity, the sophistication of the equipment used (especially directional antennas) and the existence of warning nets, have all contributed to a situation which makes present-day auroras seem much more intense and widespread than in the past. He attributes the regular appearance of the Russian stations more to an improvement in their equipment and warning systems than to any change in the nature of auroral conditions. Also, much more is now known about the mechanism involved; the advent of satellites has enabled particle counts to be carried out on a regular basis in the upper atmosphere, and an interesting point has emerged. The aurora on 6 September followed a particle count representing a daily average power input of 141 gigawatts, whereas that on 13 July was accompanied by a count of only 104. The September figure was the biggest recorded in the entire solar cycle 21. However, many amateurs will feel that the event on 13 July was much more widespread and "intense" than that in September.

To end on a slightly sour note, G2FKZ can identify years in his records going back to 1932 when there were actually *no* auroras recorded. One was in 1964, which was at a fairly low point of the solar cycle. Also based on these records, an estimate was given of the possibility of auroras occurring in any particular month; the figures are April 79 per cent, September 76 per cent, March 74 per cent, May 62 per cent and October 56 per cent.

If you are keeping a 27-day chart and finding it difficult to interpret, perhaps you are missing some small auroras which were not audible in your particular location. For the record, there were auroras recorded somewhere in the UK on 6, 7, 9, 21, 22, 26 and 27 September and 1 October. Those on 21 and 22 September were apparently due to an old active area on the sun which produced previous auroras as long ago as February and April, though this is not conclusive.

Meteor scatter

A late report of operation during the Perseids shower has been received from GM4CXM, Strathclyde. Ray was operating ssb and cw on the random channels during the early hours of 13 August, and completed a remarkable series of contacts within a few hours. Among the stations contacted were YU7AR (HG), YU3EW (GF), YU3CAB (HG), YU3ZV (HG), IW3QBC (GG), I4BXN (FE), UC2ACA (NN), HG6VX (JH), OH7PI (NW), OK2KZR (IJ), OK3KCM (JI), SK2KW (KY), SM2CKR (KX), SM3BIU (HX), F1GHU (BD), F6CJG (BF) and F1JG (CD). Quite apart from the quality of this dx, the number of completed ms contacts in so short a period is really impressive. The contact with OH7PI near the Russian border was a particularly good one. This also puts ms working in a new light. There are many who dislike the mode, feeling that the usual "sked" operation reduces the level of achievement, but in this case many contacts were made randomly by GM4CXM with no knowledge of who was "at the other end" until he copied the callsigns, so he must be congratulated on a log which would do justice to 14MHz under short-skip conditions.

This further emphasizes the fact that ms is becoming a much more "conventional" mode, with an increasing number of operators using it every year. Those who have not yet tried it will have some good opportunities to practice in forthcoming showers.

Sometime between 12 and 14 December, the Geminids meteor shower is expected to peak. It is a useful one which produces good reflections over a 2-3-day period, and has a stated hourly rate of 55. By comparison, the Perseids, which is generally regarded as being an intense shower, has a rate of 65. As 12 December this year falls on a Sunday, that day and the early hours of 13 December could see much activity on the random calling channels (144·100MHz cw, and 144·200 and 144·400MHz ssb).

Another good shower, but a short-lived one, is the Quadrantids, due around 3 or 4 January 1983. This typically produces long reflections during daylight hours as well as at night, but it is difficult to predict just when it will peak, and generally speaking it is of much shorter duration than the Geminids.

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For newcomers to the ms mode, the full operating procedure is set out in *4-2-70* for August 1981. If in doubt about how to proceed, listen on 144MHz for an hour or two to get the hang of it, and when finally you decide to enter the fray make sure your timing is accurate so that you are not guilty of transmitting during listening periods. It is not nearly as difficult as at first it might appear, provided one sticks rigorously to the rules. The results can be rewarding in the shape of new countries and squares, and very exciting too. If you try it but run into problems, let *4-2-70* hear about them so that others can learn from your experiences.

John Matthews, G3WZT (W Sussex), is a very well-known ms operator who has written about operation on the random channels during the Perseids shower. With the great increase of activity in the ms mode, John has found, like many others, that the QRM on the random calling channels is becoming so great that it is making it difficult to complete contacts. He made the point in *4-2-70* for September that it was possible to receive "rogers" intended for someone else when activity on the random channel was high. He suggests a new procedure for random operation as follows:

When calling "CQ-MS" on 144·400MHz, say, listen for replies on a frequency dictated by the last letter of your callsign. For example, G8VR: last letter of call is "R", this is the 18th letter of the alphabet, so listen on 144·418MHz. Any station hearing the CQ will reply automatically on the off-set frequency of 144·418MHz if the procedure is generally adopted.

Conversely, if HG8ET is heard calling "CQ-MS" on 144·400MHz, reply to him on 144·420MHz ("T" is 20th letter) and he will reply on that frequency if he hears you. It goes without saying that when a station is heard replying, both will continue on the off-set frequency to clear the calling channel.

G3WZT says that much of the above is based on ideas from G8NGO. There is no doubt that it would be a very good system to operate if all European ms operators could be persuaded to adopt it. Another suggestion which has been put forward is that to avoid any ambiguity, the off-set frequency (always *above* the calling channel), be coded into the CQ call, eg "CQ 20 HG8ET". Readers views on these and other possible procedures to reduce QRM would be welcome.

Meteor scatter activity has continued since the last report, with the usual "regulars" being in evidence. In order to show that ms contacts via sporadic meteors are possible on most days between well-equipped stations, G4IJE (Essex) has for the past few months been operating a weekly schedule with DJ5MS (GI) which so far has never failed. On most days they complete within the minimum number of periods required to exchange callsigns, report and rogers; that is, within half an hour. It has reached the point where if nothing is heard in the first period, then it can be assumed the other station is not QRV. Paul has had much the same success with YU3ES who runs quite modest power from GF square.

Between 25 September and 20 October, G4IJE had four completed contacts with DJ5MS, and others with YU3ES (GF), F6DRO (AD), LA6QBA (GV), OE3CEW (II), OK1MAC (HJ) and OK6WW, the last being a special event station in GK square.

50MHz

Dave Newman, G4GLT (Leicester), has sent information on some recent 50MHz openings to South Africa. The first occurred on 2 October around 1300gmt when G4BPY and other UK stations heard the ZS6PW and ZS6LN beacons at good strength. Later, at 1931gmt, G4GLT started hearing ZS6PW via transequatorial mode (tep) with typical flutter-fading effect. The signal peaked 579 until it disappeared at 1957gmt, presumably switched off by the owner since it is known not to run continuously.

On the same day between 2002 and 2011gmt, G4GLT heard ZS6RAC calling CQ on cw, peaking 549 in tep mode. Later Dave discovered that the South African had been heard while working local stations in a contest. Throughout, and right up to 2200gmt on this day, the ZS6PW beacon in the 28MHz band was readable, which Dave regards as exceptionally late. The occurrence of night-time tep on 50MHz (also noticed in March 1982 by G4GLT and G4BPY) is commonplace in the Mediterranean (eg the QTH of SV1DH, Athens) but most unusual so far north in the UK.

There was another minor opening to ZS on 50MHz on 6 October from 1532 to 1714gmt, when weak signals were copied from beacons ZS6PW and ZS6LN, and from ZS6XJ (ssb) and ZS6BUF (cw), all exhibiting deep QSB. ZB2VHF was copied on this band on the same day in the UK.

On 7 October G5KW, at his westerly listening post near Land's End, heard FY7THF for 18min starting at 1400gmt. He believes this to be the first time that this beacon has surfaced here this autumn.

There was a much more significant opening on 10 October, starting at 1158gmt and lasting more than 5h. ZS6PW was heard in beacon mode by G4GLT until 1707gmt, and another beacon, ZS3E on 50·075MHz, was copied. Around 1400gmt signals from ZS6LN peaked to 599 plus 20dB. This was interesting since this station (at Pietersburg) is some 180 miles further north than the rest of the ZS stations copied on this occasion, and they all averaged 569 with deep QSB, suggesting a different propagation mechanism. During this opening G4GLT had crossband contacts (50/28) with ZS6XJ (Randburg), ZS6LN (Pietersburg), ZS6BUF (Johannesburg), ZR6AIG (Nr Johannesburg), ZS6BMS (Nr Pretoria) and ZS3E (Luderitz, Namibia). ZS6BUF was using only 10W to a double-delta antenna.

It was reported that during this opening ZS6LN's beacon was heard in the USA, though at the time the solar flux was no higher than 135. G4JCC (Hants) and G5KW (Cornwall) both caught the opening and had crossband contacts.

From G4JCC also comes news that I5TDJ has again received permission to operate on 50MHz and will be looking for crossband contacts on 28,885kHz. His authorization extends until 31 December 1982.

Between 1100 and 1430gmt on 18 October both ZS6PW and ZS6LN in beacon-mode were copied at good strength at G8VR using only an indoor dipole and no preamplifier ahead of the converter. The 28MHz band was not very lively at the time, so no crossband contacts were monitored, although ZS6LN could be heard changing to cw and ssb to work other stations not audible here.

Expeditions in retrospect

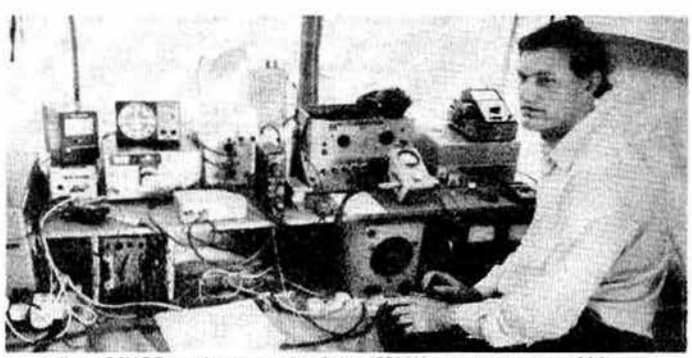
With the winter upon us, it is pleasant to look back on some of the expeditions that operated during the summer months and activated some of the rarer and exotic areas. Meteor scatter enthusiasts were particularly lucky this year in having F6KAW/EA6 and LA6HL/TF on the 144MHz band, the former providing many stations with contacts via aurora as well as by the ms mode. Another rare one was DL0SP/HB0 in Lichtenstein, not too far distant from the UK but a prefix seldom heard on the vhf bands. An enormous amount of planning and hard work must be undertaken in mounting a successful expedition. Last month the exploits of G4OAE/OH0 were described, as were those of G3OUL from the University of Liverpool. Now some further information is available which admirably describes the determination of "expeditioneers" in reaching the parts that mere mortals cannot hope to reach.

G3WRR, chairman of the Addiscombe ARC, has supplied some details of his club's operation as GW4ALE/P in the June 70MHz contest. Their site was the summit of Calder Berwyn, some 2,700ft asl. Only a rough track exists to the summit, virtually impassable by vehicles of any sort above 1,200ft, though they did manage to transport the less-fragile gear on the back of trials motor cycles. Most of the equipment had to be manhandled from that point upwards. A 2kW petrol generator was slung between two 12ft antenna poles and carried up, Sherpa style, by four bearers. In *good* conditions G3WRR reckons they can go from base camp to summit in a mere 2·5h. When the weather is bad it takes longer of course.

The GW4ALE/P base camp was six miles from the nearest village, but there was one saving grace. The local beer cost only 52p per pint, brought up from the cellar in a jug by the lady of the house.

By comparison, the Oxford University Radio Society's operation from Alderney (GU3OUR/P) from 11 to 22 August, reported by G4KNZ, was almost genteel, but this was no handheld portable affair, since equipment was carried which outshone that to be found in many a permanent station. The accompanying photograph bears witness to this. On 144MHz 400W to a pair of 16-element Tonnas at 35ft produced a potent signal, while on 432MHz, full eme capability was provided by a K2RIW linear, a gallium arsenide fet preamp with 0·5dB noise figure and eight 21-element Tonnas in a box of four vertically by two horizontally. Full elevation control was available for this array. Over 1,000 contacts were made on 144MHz, the best being with SM7BAE (GP), and 53 squares in 16 countries were worked in 11 days, all except SM7BAE being via tropo.

On 432MHz five contacts were made using eme mode, namely ZS5JJ, YU1AW, DL9KR, I5MSH and K2UYH. These are believed to have been the first eme contacts from GU on 432MHz, and at times GU3YGF's own



Julian, G3YGF, at the controls of the 432MHz eme set-up on Alderney

echoes could be copied. About 200 stations were also worked on 432MHz tropo, a total of 28 squares and 12 countries being worked on this band.

Those still awaiting a QSL for a contact with this expedition station should send a card to Robert Henshaw, G4GCM, QTHR, who is also handling cards for a previous expedition by the group to Scotland (GM3OUR/P).

Almost as an aside, Steve, G4KNZ, mentioned that the group took equipment for *all* bands except 70MHz and 2·3GHz, comprising 1·25 tonnes in the back of each of two long wheel-base Land Rovers. The vehicles had to be lifted by crane on to the ferry using bars under each wheel!

Next time we hear a /P and find it difficult to get through the pile-up, let us remember what was involved in getting the station on the air, and not complain too much about them "being deaf". With 1,000 QSOs on one band alone, it puts the QSL problem in better perspective too!

Beacon information

EI2CA, the Eire vhf manager, has supplied further details of the new beacon signing EI4RF, mentioned in *4-2-70* last month.

It operates on 70·130MHz and was designed and built by EI6DT. The location is near Dublin (WN38c) at the QTH of EI6DN. Power is 5W, all solidstate, and two antennas are used, both five-element Yagis. The keying sequence automatically switches from one antenna to the other every 30s, one antenna pointing southeast and the other northeast. The mode used is A1A. Reports would be welcomed by the Irish Society addressed to IRTS, PO Box 462, Dublin 9.

G3XC, beacon keeper of the GB3CTC complex, reports that all three Cornish beacons became operational at 1630gmt on 16 October. G3OSS has already heard and copied all three on 70·030, 144·915 and 432·970MHz. He reports that the 70MHz signal is particularly useful. The base of the mast at the new site of Hensbarrow Downs is 910ft asl, and the antennas are between 50 and 60ft above ground. All three antenna systems beam 045°.

Satellite channel interference

There have been reports of fm stations operating within the part of the 144MHz band allocated to satellite communication. Recently such interference seriously hindered critical experiments with the UOSAT satellite. Operators are requested to stay clear of 145·850 to 146·000MHz for any purposes other than direct communication with amateur satellites. Even if the band sounds dead at the time it should not be assumed that it is available for general use. Co-operation would be greatly appreciated.

Repeater news

Repeater applications in uhf Phase 6 are with the Home Office. All applications have been agreed in principle, but it has been decided that with these and all future proposals a submission will be made to an inter-departmental committee to obtain frequency clearance. This will become standard practice for any operation in shared bands and where the amateur service is a secondary user. Hopefully this will add no more than a month to the delays which have already occurred. VHF Phase 5 proposals are the next to be dealt with, and progress will be reported here and through GB2RS news bulletins.

G3XC reports that as a result of the donation of a 60ft tower by G3TLK, the GB3TR repeater at Torbay now has antennas up to between 50 and 70ft which has considerably improved the coverage of the repeater compared with its previous location. The antennas are professional-grade SE100 vhf unity gain dipoles. Reports on reception of GB3TR should be sent to G4FCN, QTHR.

G4NVQ (Hastings) was interested in the reports of repeater dx working and wrote to say that on 17 August he worked F9OE/M through the Paris repeater on R0. He also heard FZ4THF (R4) which is close to the Spanish border at Pau. He proceeded to work EB2PU (ZC), F1CCC (CG) and EA2UT (ZD). EA2UT is in San Sebastian, and could hear G4NVQ on the repeater input despite the fact that Dave was using only 25W to a "Slim Jim" antenna. The time of these contacts was around midnight gmt.

Awards

G5UM reports that for the first time in six years he received a claim for a Four Metres and Down certificate in respect of mobile operation. It came from Frank Craven, G4LAW/M of Bristol, and contained cards for a contact on ssb with an OK, and others ranging from the Shetlands to Cornwall. There were many cards also for fm contacts.

Another interesting claim was from Paul Hodgkins, G8VGM, who submitted cards for the 10 countries 40 squares award, all arising from portable operation from a single site near Scarborough. He used only equipment which could be collapsed to a small enough size for it to be carried on a bicycle or motor-cycle, and he has in fact worked 18 countries and 82 squares from the site, but is awaiting confirmations to support a claim for the higher level award.

G6ECM (Kent) has been awarded a sticker to upgrade his 10/40 certificate, gained only last August, to the 15/60 level, so only six weeks elapsed between his two claims. G8TGM (Sussex) followed up the award of a 15/60 certificate in 1981 by a successful claim for a 18/80 award, and is only the eighteenth operator to achieve this level of award.

Others who have gone for the 144MHz Standard award are G6GGE (Chiswick) and G4LBV, awarded Nos 620 and 621 respectively.

Miscellany

Following my reference in *4-2-70* for October to a new 17-element 144MHz antenna by Tonna, Franck Tonna, F5SE, has written with further information. F5SE describes himself as the second operator of F9FT and the designer of the new antenna. He is using a prototype at his home station, and claims that although the 17-element antenna exhibits a gain of only 0·5 or 0·6dB over the existing 16-element model, it has the same length and gain as the 19-element Cushcraft model. Incidentally my statement that the original information came from F6BST was not correct. In was in fact F6BSJ who mentioned it to me on the vhf net. Apologies to F6BST.

F5SE says that the only "dx-minded" 144MHz operator in C1 square is F6CVN (C123b), but his take-off towards the UK is very poor. Signals which are S9 plus 40dB in neighbouring locations are only S3-4 with him. F1SA is said to be the only 432MHz operator in C1 square, and he does not operate at all on 144MHz.

G4KGC and G6CSY both report a station signing S1AD, giving the location as Sealand and claiming to be a new country. The location is, in fact, only a few miles off the Norfolk coast. QSLs have been requested through a West German station. Does anyone have any more information?

G3ZQF (Rochester, Kent) reports that his callsign is being pirated on 144MHz. He believes the culprit to be located in south London.

GJ4ICD has sent details of a proposed expedition by GJ amateurs to Eire (WL square) in August 1983. Operation is to be on 70, 144 and 432MHz as well as microwave and hf bands. In addition, special tests on tep, eme and ms are scheduled. A few more really experienced operators are required. Anyone interested should write to GJ4ICD, QTHR.

G4IGZ (Lancs) sent in a late report for very good reasons. After working the dx on 13 September, his last contact being with OK1KGS, he set off hot-foot for the hospital where, some 40min later, his wife Val gave birth to a daughter, Alexia. He makes no mention of having had any /M contacts on he way, but did work three EAs in VD square as well as many other dx contacts during the opening.

1983 VHF Convention

The date of the RSGB VHF Convention for 1983 has been set for Saturday 26 March, the venue being Sandown Park.

As in previous years, three lecture streams will operate during the afternoon session. The programme is still somewhat tentative, but it will probably include such topics as rf hazards, field-aligned propagation, amateur computing, microwaves and satellite topics.

It is also hoped to make available facilities for the measurement of receiver noise performance, so that those attending can bring along their pet preamplifiers for comparison and assessment. Make a note of the date in your diary.

VHF Contests Committee

John Quarmby, G3XDY, secretary of the VHF Contests Committee, reports that the committee intends to carry out a complete review of all vhf contest matters early in 1983. To this end, readers are asked to provide as much input as possible by giving the committee members their own views on such matters as contest dates and duration, scoring systems, multipliers, number of contests each year etc. All such comments should be addressed to the committee's chairman, Frank Mathews, G8ACJ, Easedale, Woodway, Merrow, Guildford, GU1 2TF. It is planned to hold a meeting to discuss these matters in February 1983, so the earlier such comments are received, the better the chance of their being taken into account by the committee.

Finally . . .

When the next issue of *Radio Communication* appears a new year will have commenced, so I would like to take the opportunity of wishing all readers a very merry Christmas. May all your ambitions for the New Year be realized, and let us hope that 1983 provides as much excitement on the vhf bands as we enjoyed in the year now ending.

Please send any news intended for the February issue to arrive not later than 16 December (last-minute items by 29 December). □

MICROWAVES

Charles Suckling, G3WDG*

Microwave contests

The VHF Contests Committee intends to review vhf/uhf/microwave contests early in 1983 and would like to receive as much input from members as possible. Aspects which will be examined include the number of contests during the year, scoring systems, the introduction of multipliers, the duration of contests and the co-ordination with IARU events. Comments about microwave contests would be much appreciated and can be sent to the writer or directly to the chairman of the VHF Contests Committee: Mr F. Mathews, G8ACJ, Easedale, Woodway Merrow, Guildford, Surrey.

Martlesham round table

The round table meeting held on 17 October at the British Telecom Research Laboratories at Martlesham Heath was very well attended, with visitors from as far afield as Bradford and Belgium. A large amount of test equipment had been assembled, and it was gratifying to see that much equipment had been brought along to be measured, tuned-up or got working. The afternoon lecture was on the subject of satellite communications for small businesses. The experiments carried out by British Telecom in this area using the OTS satellite were described, and the lecturer painted a very bright future for satellite communications at moderate data rates with small ground stations. The audience was particularly interested in (and rather jealous of) the 200W output twts used in the 14GHz uplink transmitters! An open discussion forum took place and the topics included talkback frequencies, microwave contests and how to improve the distribution of technical information. The reasons behind the use of 432·350MHz by Dutch stations for microwave talkback were discussed, and it appears that 144MHz activity levels in Holland are such that this band is impractical for talkback due to QRM. Thus anyone interested in working Holland on the microwave bands would be advised to equip themselves with 432MHz ssb. ON6UG revealed that the Belgian vhf convention, which has been an excellent event over the past few years (due largely to the very warm hospitality of the Gent group) is unlikely to be held in 1983. However, a microwave round table is being planned.

Thanks go to the Martlesham group for a very well organized and most enjoyable meeting.

A five-bit switched attenuator

Very often when attempting to make accurate measurements of receiver noise level changes, for example when measuring sun noise or sky/ground noise, one is faced with either relying on the calibration of the receiver S-meter, audio measurements, or substituting fixed attenuators. All of these techniques suffer from potential error, which can sometimes be quite large. One way of improving accuracy is to use a reliable switched attenuator in the i.f. chain.

The design of a suitable attenuator developed recently by the writer is shown in Fig 1. Attenuation settings of 0 to 31dB are available in 1dB steps. The attenuator uses switched T- and pi-resistive networks. The choice between T- or pi-networks for each section was based on the closeness of the calculated values to available preferred values for the resistors.

The attenuator was built in an RS diecast box type 509-923 (approximate dimensions 89 by 35 by 30mm). The switches were miniature dpdt types (RS type 316-989) mounted in one of the sidewalls. BNC sockets were fitted in the two end walls for input and output connections. The resistors used were 0·4W metal film one per cent tolerance types (RS type 148) with minimum leadlengths. Grounding of the appropriate points was accomplished using 8BA solder tags.

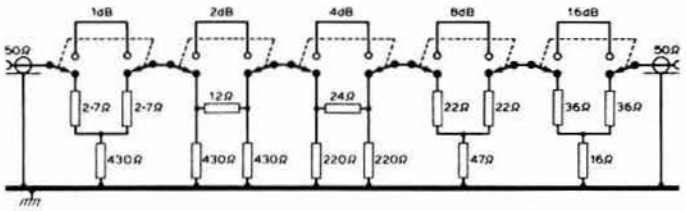


Fig 1. Circuit diagram of the switched attenuator

The performance of the attenuator was checked using a Hewlett Packard 8755 amplitude analyser. This permitted simultaneous vswr and attenuation measurements to be made at each attenuation setting. The performance was excellent up to 30MHz—the maximum error was +0·2dB (the average error was +0·05dB). The vswr was less than 1·2 at all settings. Measurements were also made at 144MHz; the attenuation levels were fairly accurate, but the vswr was poor, and it is not recommended, therefore, to use the attenuator for accurate measurements at that frequency.

In use, of course, the attenuator will give accurate results only when working into a 50Ω load impedance. It may be necessary to use a fixed attenuator (6dB or greater) between the attenuator and the receiver input to ensure that this condition is met.

UOSAT microwave beacons

Now that UOSAT is back under control, interest in the two on-board microwave beacons on 2,401·0 and 10,426MHz is growing again. The 2·4GHz beacon was built by Richard Porter of Microwave Modules, and is crystal controlled with 100mW output. The antenna is a three-turn helix. The 10GHz beacon was built by Jim Arnold of Plessey Research (Caswell) Ltd, and uses a dielectric resonator-stabilized GaAs fet oscillator using a GAT6 chip device driving a PGAT100 pa, which produces 125mW output. The 10GHz slot antenna was built at Sheffield University under the supervision of Barry Chambers, G8AGN.

Of the two, the 2·4GHz beacon should be far easier to receive. The calculated carrier-to-noise ratio is approximately 40dB when the satellite is overhead, assuming a 2dB noise figure, a 1·5m dish and 2·5kHz bandwidth. Theoretically, it should be relatively easy to receive the satellite, when overhead, using only a horn antenna (eg a dishfeed). On the other hand, the 10GHz beacon will almost certainly require the use of a 1·2m dish, a preamp and very skilful tracking!

In preparation for receiving tests, the writer has tested his "standard" 2·3GHz interdigital converter at 2,401MHz, using a 94·000MHz crystal in the oscillator to give a 145MHz i.f. Both the local oscillator and signal sections of the mixer seemed to tune up quite satisfactorily for operation at 2,401MHz.

At the time of writing, tests should be under way at Surrey to check the performance of the beacon.

Operating news

Conditions on the lower microwave bands slumped to normal or worse during the second half of September and the first half of October. Poor conditions were experienced by many in the October UHF/SHF Contest, as well as in the first two events of the 1·3GHz Cumulatives. It is nice, therefore, to be able to report more successes during the good conditions earlier in September.

Further details have come in of the remarkable 1·3GHz contact between G4KDH (AL34h) and OH0NC (KU71g) on 15 September at 2011gmt, which may be a new IARU Region 1 record at 1,524km. Reports of 53/51 were exchanged on ssb; the equipment in use at G4KDH consisted of a SOTA transverter, a 2C39 pa delivering 80W of rf, and a G3JVL loop Yagi at 64ft. The station had only been reassembled a few days previously—so the contact was particularly rewarding for the team at G4KDH!

Another east-coast operator, G3ZEZ, made good use of the September conditions by working OE2CAL, OE2KMM and GU3KFT on 1·3GHz for two new countries. Signals were very unstable, varying in strength from S2 to S9+. G3ZEZ missed the dx which was around on the 15th, but on the next day he was pleased to have a crossband contact with PA0CRA on 5·7GHz. Unfortunately his 5·7GHz transmitter did not have enough power to be heard in Holland that night. A new multiplier with more output has since been completed!

From further north, G8PNN (ZP52d) using only 1W worked his first ON station during the early September lift, in the form of ON1JE (BL80f). During the second lift he worked SM1BSA (JR22e) at 1,248km with a 57 report, to bring his squares worked total to 25 (in eight countries). He notes that counties are more difficult to come by (10 so far) from his part of the country.

G8IFT reports more 1W successes: G4MAP (YM50d) worked SM6ESG in GR at 1,050km and OZ7IS (GP) on 14 September. G8IFT also worked SM6ESG, with 20W to a single-loop Yagi.

Frank Tonna, F5SE, reports via G8VR that F1SA in CI square is operational on 1·3GHz; this station is worth looking out for during the next lifts, as he is the only 1·3GHz station in this square.

(Continued on page 1069)

* 46 Windsor Close, Towcester, Northants

SWL NEWS

Bob Treacher, BRS32525*

THIS YEAR has certainly been a good one for vhf dx in terms of good tropo, aurora, ms and sporadic-E, and it is hoped that more listeners will submit information on vhf events in 1983. HF conditions were good in the first half of the year, with plenty of dx to be heard—remember the pile-ups for 1A0KM, KP2A/KP1 and ZK1CG? For 1983 there are the two planned Heard Is trips, and catching up with BY1PK to think about. With luck, VE7BC will have sorted out his tvi problems by the time this is read and will be more active as BY1BC.

1983 countries table

Entries for this year's table have been on a par with those of previous years, and it will appear in the same format in 1983 (no 10, 18 or 24MHz). It will reflect the number of countries taken from the ARRL Countries List heard on each of the six bands between 1 January and 31 December 1983. Each new country should be noted and the *totals only* (not a list) for each band, a grand total and modes used, should be sent to your scribe by the first deadline date quoted each month. The all-time list will also appear in March, June, September and December, but at least one update every six months is necessary to keep a place in the table. The starting score for the yearly table will be 150, while entry into the all-time list will remain at 750. Entries from G6s will also be accepted.

Lower frequency band challenge

Another regular feature aimed at listeners improving their 7, 3·5 and 1·8MHz scores is the January challenge. The 1982 task was, on reflection, somewhat difficult, so the rules have been changed again. For January 1983, the challenge is to amass as many points as possible based on the number of countries heard on 7, 3·5 and 1·8MHz as follows:

7 and 3·5MHz: each European country logged counts one point, each dx country logged counts three points.

1·8MHz: each European country logged counts five points, each dx country logged counts 15 points.

A prize will be awarded to the best entry, but a special prize will also go to the best entry from a new listener—any swl with a BRS number higher than 50000. Entries to your scribe before *21 February 1983*, giving date, time, RS(T), points claimed and the *full* callsigns of the stations heard.

UBA 1983 SWL Contest

Marc Domen, ONL6945, has forwarded details of the UBA's all-year-round SWL Contest. Copies of the full rules, together with an example of how to lay out your entry, can be obtained from your scribe by sending an sae *and* either one irc or 20p in stamps. The idea is that each country logged on each band (28 to 3·5MHz) counts one point, that total then being multiplied by the number of different countries heard. A good idea, and another competitive venture for the swl.

While on the subject of competitions, just a reminder that the 1·8MHz slp takes place over the weekend of 18/19 December. Remember that the European ssb dx can be found between 1,825 and 1,850kHz. The ssb leg is between 2200 and 2400 on the 18th and the cw leg between 2000 and 2200 on the 19th. Log data to BRS48909. QTH as per p233, March *SWL News*.

Christmas gift ideas

The new joint editors of *DX News Sheet*, G3XTT and G3ZAY, have expressed their surprise that so few listeners subscribe to this weekly publication. For those who are beginning to find it difficult to add to their country scores, it could be just the thing to get them moving again. Apart from giving current dx information and news of forthcoming expeditions, it gives contest rules and propagation forecasts. Certainly very good value. A year's subscription costs only £14.

The *DX edge* is another useful "stocking filler" if the lower frequency bands are your main interest. By the use of charts it enables you to see at a glance the times when there is the best chance of hearing dx on the lower frequency bands at sunrise and sunset times throughout the year. An interesting innovation at only £8.45 from RSGB Publications (Sales).

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1982 HF COUNTRIES TABLE

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS8841	195	208	224	137	103	15	882	ssb/cw
BRS47745	171	198	207	129	118	30	853	ssb/cw
BRS25429	170	187	186	147	111	35	836	ssb
ORS46084/7Q7	162	205	204	81	35	1	688	ssb
BRS44703	129	155	162	106	103	26	681	ssb
ORS45992/7Q7	160	205	199	75	27	0	666	ssb
BRS46228	115	108	170	134	107	32	666	ssb
BRS25901	121	162	151	84	91	29	638	ssb/cw
BRS35509	121	140	158	95	94	6	614	ssb
BRS1066	105	147	140	100	68	41	601	ssb/cw
A8808	102	117	107	93	73	16	508	ssb/cw
BRS48675	98	121	126	73	57	21	496	ssb
BRS30694	115	135	108	53	51	28	490	ssb/cw
BRS31440	118	85	106	74	67	27	477	ssb
BRS45033	161	123	183	3	6	0	476	ssb
BRS18529	39	76	68	114	108	28	433	ssb
RS45466	51	102	92	54	57	16	372	ssb
BRS30493	47	89	112	40	31	6	325	ssb
ARS50886	63	101	88	30	28	2	312	ssb
RS44984	43	40	106	26	13	1	229	ssb
RS49327	44	43	94	11	10	14	216	ssb

ALL-TIME COUNTRIES LIST

(Starting score 750)

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS25429	275	306	329	236	224	62	1432	ssb
BRS32525	267	301	317	240	246	53	1424	ssb
BRS8841	248	278	310	190	175	26	1227	ssb/cw
A8808	235	271	291	166	166	55	1184	ssb/cw
BRS48909	203	234	241	145	99	32	954	ssb
BRS1066	185	200	260	149	95	58	947	ssb/cw
BRS44703	184	199	207	144	128	36	898	ssb
BRS30694	179	238	244	112	75	32	880	ssb/cw
BRS47745	167	195	195	125	111	32	825	ssb/cw
BRS18529	121	181	228	134	102	35	821	ssb
ORS45992/7Q7	196	232	234	75	32	0	769	ssb
ARS50886	183	183	211	86	69	22	754	ssb

The new bands

Paul Tittensor, A8808, reported his first findings on 18 and 24MHz. DL, G, GW, HB9, OE and OZ had been logged on 18MHz, while DL, F, G, GJ, GW, HB9, LA and OZ had obliged on 24MHz.

Brad Bradbury, BRS1066, had managed DL, F and GD on 18MHz. VP8ANT had been fairly active, but contacts with Gs had been scarce. Richard skeds his QSL manager, G3ZAY, at 2000 on 14,270kHz on Mondays. Skeds for contacts with VP8 on the new bands can be arranged after the formalities have been completed. Although the new bands will not figure in the tables, news of activity on the bands will be gratefully accepted.

DX swl

News this time from both 7Q7 correspondents. Stan, ORS45992, will be on his travels when this is read, but caught PY0ZSB from St Peter & Paul Rocks. John, ORS46084, reported the QRN level on 3·5 and 1·8MHz as extremely high, with little hope of further dx now that tropical storms are in season. On the QSL scene, John remarked on JW0P, TN8AJ, VE3ICR and ZL4PO/C. For his 5B SWL DXCC, John still needs GD, GJ, GM and GW on 7 and 3·5MHz, GU on all bands except 21MHz, and GI on 3·5MHz. If any operators would care to let John know of their operating habits on these bands, he would be only too pleased to send listener reports on their signals. He can be reached at PO Box 467, Blantyre, Malawi. A useful snippet of information which John passes in return is that ZS2MI (Marion Island) is QRV on Saturdays at 1100–1200 between 14,150 and 14,200kHz.

144MHz aurora

Dave, BRS25429, reported that the aurora of 26 September provided four hours of dx during which 39 squares were heard in 13 countries. VM square, however, was the only new square for Dave, provided by EI5EG and EI2BBB. Furthest dx heard was Y38ZA in HN01e, but DG7AT, DL4OX and DF3AR were all heard from FM square, while Y23BD and Y24QO were heard from GM square.

DX review

October certainly brought the hf bands to life. The Society's 21/28MHz SSB Contest was blessed with good conditions, and those who took part obviously found plenty of dx to log. Dave, BRS25429, managed 82 countries on 28MHz, including AH8A, N7DUU/NH0, JT1AN, A92P, P29MF, VP8NO, A6XJA, HH2CL and KH6IBA. He also logged 198 USA and 71 Japanese callsigns. There was also some good dx and plenty of USA west coast dx during the afternoon on 21MHz.

Several expeditions were mentioned by most reporters, namely the PY0 trip to St Peter & Paul Rocks, PY0ZZ (Fernando de Noronha) and SM0AGD's Pacific trip—SM0AGD/KH1 and T31AE. It seems that the QSL situation for the St Peter & Paul Rocks trip is a trifle odd, as those who worked (or heard) them on more than one band will have their QSLs

delayed, as before the trip the operators made it clear that each station should only work the expedition once.

A further selection of dx reported on the hf bands throughout the month is as follows: **28MHz:** DU1RD, FK8CC, H44BS, WD4GDK/TI8, 1A0KM, 3B8FK. **21MHz:** KD5ME/DU2, HS1AMH, J6LHY, VK9ND, VS5HG, YC2BSF, 5Y4ITU. **14MHz:** CR9T, FO8DP, T32AF, VS5PP, ZS3KE, 5W5DQ. **7MHz:** AL7H, HS1ALF, KL7Y, OD5KN, UA0YAE (Zone 23), VE7SZ, XT2AW, 5N8ARY, 5T5TO, OE2VEL/3D6. **3·5MHz:** D44BC (ex-D4CBC), TR8DX, ZL4PO/C, ZS4PB, 5N8ARY, 5Z4GS, 6W8DY, 7X4AN. **1·8MHz:** EA8QL, LX1PD, SP51X1/OE6 (via PA0NOL), OH0W (via OH2BAZ).

Some good QSL returns reported too: XZ5KNU/9, 3C0AC, H44RW, VR6HI, VK9YB, T32AF, 9M8NL, FR0FLO/J and A71AA.

Here and there

Mark Rogers, RS46276, who is 14, reported passing both the RAE and morse test. Peter Norris, BRS47513, wrote to PO Box 88 about 1·8MHz operating habits. The reply he received was probably very informative, but was written in Russian! If it can be translated in time the contents will be reported next month. Steve Muster, BRS47745, has started studying for the RAE, so dx-chasing will take second place during 1983. Stan Clark, BRS48815, has received a number of interesting QSLs from USA stations, all of whom make it clear that they are only too pleased to QSL accurate reports. QSLs have started to flow following the summer's vhf dx conditions. Those reported this time were GB4GM (YS24f), GM3XOQ/A (ZT06e), GM4DHF/P (XS80d), SM7HTH (HQ71e), SM7JLT (GQ68f), SM7MRJ (GP27h), I2FAK (EF77g), I5KKW (FD60d), OE5ODL/P (GI78j) and OZ1FTW (EQ04h).

G3PVA has a quantity of ircs for sale at five for £1 plus sae. John Goodrick, BRS44395, has been inactive due to a change of QTH to the Isle of Wight, but has now installed an AD370 active antenna and hopes to be more active soon. GM4ELV passed on information for those seeking a QSL from FM7WS—via F2BS. Kevin Cooke, RS45466, has received the Radio Vaticana Award for logging (or contacting) all three HV stations—1CN, 2VO and 3SJ; it measures 24 by 18in, on parchment vellum, is highly decorative, and free.

Robert Small, BRS8841, remarks that the QSL card from WH0AAB shows a photograph of his shack. Looking closely at the QSL cards on display, Robert noticed his own—the only swl card among them.

Finale

A mixed bag to finish 1982. News, views, comments and table scores should reach your scribe by **14 December** for the **February 1983** issue. □

MICROWAVES

(Continued from page 1067)

Recent awards

The superb conditions of September have increased G5UM's workload considerably, with large numbers of claims arriving. A particularly noteworthy one was that by G4BYV for his record-breaking contact with DB5KS at 464km, the second ever for a 3·4GHz distance award. The first was issued to G3LQR in 1979 for a 425km contact.

On 1·3GHz, G4MAW won sticker No 7 in the 20 squares category to add to his microwave award certificate. Distance award No 43 went to GW8AAP/P for a contact with DK8VR over 828km, and No 44 also went to Wales—GW3CCF gained it for a QSO with DB4LT. GW3CCF's claim also included one for the 1·3/5 squares award and he was issued with No 27 in this category. All GW3CCF's contact to date had been made with 1·5W into a homebuilt G3JVL loop Yagi. On the stocks are a 2C39 pa and a 2 × extended loop Yagi array. Although sited at 500ft asl GW3CCF suffers from hills of over 1,000ft in all directions, but says, "I managed to fire between the gaps!"

Missing info

In the item about interdigital converter improvements which appeared last month, some component details were unfortunately omitted. The missing information was: L–45mm length of 20swg wire bent to form a 1t loop; RFC —3·5t of30swg wire on FX1115 ferrite bead. □

Radio Amateurs' Examination May 1982

Report of the City & Guilds of London Institute on the examination

STATISTICS

OVERALL RESULTS

Year	No of candidates completing exam	UK candidates qualifying for award No	%
1980	3,559	2,488	69·9
1981	5,869	3,961	67·5
1982	8,169	5,468	66·9

COMPONENT RESULTS FOR THIS EXAMINATION SERIES

Component No	Name of component	No of candidates	Distinction %	Credit %	Pass %	Fail %
1-01	Licensing conditions and transmitter Interference	8,549	13·8	37·9	23·3	25·0
1-02	Operating practices, procedures and theory	8,168	13·0	36·2	25·9	24·9

Reports on multiple-choice question papers

PAPER 1-01

Syllabus topic or objective	No of items	Comments on performance of candidates
1. Licensing conditions	23	It is pleasing to report again that candidates appear to have been very well prepared in Licensing Conditions. The only noticeable weakness lay in some confusion between what constitutes "calls to amateur stations in general" and "messages to amateur stations in general".
2. Transmitter interference	12	Questions on transmitter interference were very well done in general. There was some confusion between the key clicks arising from poor keying waveform envelope shaping and that from sparking at the key contacts. Answers on methods of suppressing parasitic oscillations in power amplifiers were poor. A majority of candidates were wrong, and one suspects that the nature of parasitic oscillations was not clearly understood. There was a similar weakness in the treatment of restrictions of telephony modulation to the range 300-3,000Hz although in this case the more able candidates were in little doubt as to the correct answer. There was also weakness about screening of mains transformer windings to minimise mains-borne interference.

PAPER 1-02

Syllabus topic or objective	No of items	Comments on performance of candidates
1. Operating practices and procedures	5	Quite well done. No significant weaknesses.
2. Electrical theory	11	Treatment of this section appeared weaker than any other part of the paper. Calculations of resistance, current and voltage, the definition of power and the effect of reactance in circuits all caused problems.
3. Solid state devices	9	Some candidates had difficulty with full-wave rectification by diodes as used in power supplies.
4. Radio receivers	9	The most poorly answered questions were those involving calculation of heterodyne frequencies, both for i.f. frequency changing and for use of bfo.
5. Transmitters	9	Quite well done in general.
6. Propagation and aerials	10	Definitions of skip distance and fading caused most difficulty.
7. Measurements	6	Quite well done.

EPHEMERIS
Satellite news and views

R. O. Phillips, G4IQQ*

UOSAT

After the successful re-acquisition of control of the satellite, system checkout continues. By the end of October most of the on-board systems had been investigated with positive results, though some anomalies had been identified in the secondary computer. The next stage involves the highly complex attitude control manoeuvres which should result in correct alignment of the body of the satellite with respect to the earth. At this time it should be possible to carry out a more accurate analysis of the CCD camera and, assuming this proves to be OK, the satellite will be regarded as fully commissioned and should become available to users on a well-defined schedule.

Phase 3B

At the time of writing, the official report from the European Space Agency concerning the failure of the Ariane L5 launch had not been released. However, support has increased for the theory of a gearbox failure in a third-stage turbo-pump. Until the matter has been resolved the on-going launch programme for Ariane cannot be restarted. One consequence of this is that if the next launch (L6) is delayed beyond the third week in January then some re-scheduling of the payloads will be required. This is likely to result in the Phase 3B spacecraft and ECS-1 being launched on L6 instead of L7. It is obviously too early to forecast the actual launch date, but mid-April looks to be a likely proposition at this time.

Table 1. Measured data on Phase 3B spacecraft (at 25°C)

Mode B (435-146MHz)		Mode L (1,269-435MHz)	
Receiver noise figure	3dB	Receiver noise figure	3dB
Transmitter output power	50W p.e.p.	Transmitter output power	32W p.e.p.
Receiver agc threshold	−104dBm		
Engineering beacon	145·987MHz	General beacon	145·810MHz

In the meantime some hard data has at last come to hand on the spacecraft itself. Results of measurements on the transponders in the middle of October provided some very encouraging information. A summary of the data is given in Table 1, and while this does not tell the whole story it does allow more confidence in some of the overall system performance calculations that are being carried out in a number of areas. It should of course be noted that the output power values indicated will be augmented by the appropriate antenna gains, and this should result in very useful levels of effective radiated power.

Satellite status reports

Four of the Russian RS satellites carrying transponders are now active—RS5, RS6, RS7 and RS8; between them they provide access to transponders (145 to 29MHz) for many hours each day.

On Oscar 8 both the mode A and mode J transponders continue to provide good service with regular increases in the range for mode J contacts.

Getting started

An increasing number of people are asking how they can break into the world of amateur satellites. Comments are made that publishing data on the orbital characteristics of satellites is all very well for those that know what to do with them, but they are meaningless to the newcomer. These complaints are not entirely justified because information is available from a variety of sources, including the *Amateur Radio Operating Manual* from RSGB Publications, and the *Guide to Oscar Operating* obtainable from AMSAT-UK, London E12 5EQ (55p plus 16p postage). Having said that, it is nevertheless proposed to include some of the basic techniques in this column from the beginning of next year.

Other news

A meeting was held at the beginning of October in Paris to which most of the amateur satellite construction groups around the world were invited. A wide-ranging discussion took place which, among other things, pointed to the increasing need to co-ordinate activities in an attempt to spread the ever-growing cost of satellite construction. □

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

RAYNET

G. Cluer, G4AVV*

A MAJOR LANDMARK in the development of Raynet was reached in September, when the entire Raynet Committee, including the 12 elected zonal representatives, attended a meeting at the Home Defence College to hear a talk by Sir Leslie Mavor, who is responsible to the Home Secretary for co-ordinating voluntary effort in Civil Defence.

Sir Leslie outlined Government policy and where the services of radio amateurs, and more especially Raynet, should fit in the grand design. In brief, the nation must be capable of moving from a peace to war footing in seven days, including the mobilization of all voluntary effort needed to fill out institutional emergency services, police, fire and casualty.

The prospect of widespread prolonged breakdown of communications and services means that local communities must be prepared to look after and support themselves unaided. At the same time they must be ready to do their bit towards survival and regeneration over a wider field as soon as communications are re-established. In other words, the system of government would be stitched up from ground level. Responsibility of central Government will be devolved to a nationwide system of regional and local wartime Government headquarters.

Decision and action must wait upon information received. Adequate intelligence and communications are of supreme importance. The message to Raynet is that in this extremity local controllers will need to make use of every available and surviving communication facility, and time will not be on their side. This is why county authorities must prepare contingency plans to make the fullest use of communications support by radio amateurs and, more particularly, Raynet. To be worth anything at all, such plans have to be validated by exercises, and local authority planning staffs will wish amateurs to take part in properly authorized Civil Defence exercises whether on a local or national basis. Officers of the Home Office Radio Regulatory Department now seem well aware of the need to look at the problem of licensing for war use, and have recognized that in the immediate aftermath of nuclear war radio amateurs could have an important—perhaps vital—part to play in enabling civil administration to "get off the ground" independent of any surviving military or police links. At present, radio amateur participation in CD exercises requires separate clearance for each one, but Sir Leslie hopes that a more helpful policy will emerge once the RRD have completed a study with MoD.

From the local authorities' viewpoint, any difficulties arising over co-operation with radio amateurs is mainly organizational. Not all amateurs are members of Raynet, which means that they have to be mobilized individually and formed into some local authority set-up for emergency communications. As far as Raynet is concerned, some county emergency planning officers report that the organization is neither as adequate or accessible as they would wish. Some local authorities are stalling or just inching along on the statutory duty to plan against possible war emergency, while others have taken their war emergency planning to an advanced stage. They are explaining the requirement at parish and community level, and are making notable progress towards creating within communities a capacity for self-help by mustering and training bodies of volunteers as community and scientific advisers and for other civil defence tasks. They have also embarked on exercises and reciprocal training programmes with the voluntary organizations.

Between these levels of performance, a significant number of county and district authorities have in the past year taken their first steps towards the organization of communities against possible war emergencies and the selection and training of community advisers and other CD volunteers. These have received an encouraging response from the public, and the readiness of voluntary organizations comes more than half way in the cause of local co-operation.

To sum up, Sir Leslie said the radio amateur can make a contribution of vital importance in volunteer involvement in the Government plans for Civil Defence. He is keen to see that the potential of Raynet is fully exploited by local authorities.

A transcript of the lecture, and a recording of the lecture and parts of the question and answer session afterwards, should be available from zonal Raynet representatives. □

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THE MONTH ON THE AIR

John Allaway, G3FKM*

TO DATE the new 10MHz band has not been very heavily populated, and this seems to be a cause for concern to some. A few organizations and individuals are beginning to suggest ways in which activity can be increased, but the writer feels that they are missing the point of the decision taken by all three Regions of IARU to recommend that, in order to make best use of the restricted space, only narrow-band transmission modes should be used.

In the course of a few years, when sunspot activity declines, 28, 21 and even 14MHz will be closed for long periods during darkness, particularly during the winter. When this happens 10MHz could well be the only real long-distance band open. At the time of writing, USA amateurs were still not allowed the use of 10MHz, but were hoping that they may be towards the end of the year, and there are other countries where it is not yet released. The arrival of these will certainly change the picture. The conclusion must be drawn that no deliberate attempts to increase activity are necessary and that in a few years time the QRM will be dreadful!

Piracy seems to be on the increase. G3TSO is being impersonated as G3TSO/A on all bands from 3·5 to 28MHz, and the operator gives his name as Mike and location as Shrewsbury. G4LJW (who has only been active on hf between 8 April 1981 and 13 January 1982) is receiving QSLs made out to Bill and Colin (his name is Jon). G4CKL is not active on 14, 21 or 28MHz ssb, but is receiving QSLs for Bob who is alleged to live in Bradford. G4MGQ, who lives in the Scarborough area, is receiving a very large number of QSLs from those who have worked his double who claims to be in London. G4LES has been receiving QSLs for contacts allegedly made during 1981 on 14, 21 and 28MHz—a time when he was only active on 3·5MHz. Peter suspects that some result from misread callsigns—would the pirate please improve his code?

G3SJH, QTHR, would be very grateful to anyone who is able to help him to locate Al Baron, who operated from Kandahar as YA2AG in 1971 (and possibly later as 5U7AG).

A further offer of help to any dx station or expedition—Sam Kennard, G4OHX, QTHR, would be willing to offer his services as QSL manager. Please write to him direct.

DX news

GM3ITN says that VP8AEN will be on the air from Rothero Base, Antarctica, until March 1983, and will then move to Faraday Base where he will stay for one year. He has VP8AEN (South Georgia) logs from last "season" prior to the invasion of the islands. He also mentions that he will receive the logs of the late Ambrose Morgan, VP8AEI, who lost his life a few months ago; they will come via the base commander, VP8AEG. The *DX Bulletin* says that VP8AOE and VP8AOH are both located on Signy Is, South Orkney, and that they have schedules on Tuesdays at 0000 on 14,275kHz and on Saturdays at 0430 on 7,005kHz.

Joaquin Mas, EA3YQ, located in Barcelona, who is a member of the RSGB

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VK0AN (Macquarie Is) keeps a regular schedule with VK9NS around 0630 on Saturdays and Sundays in the 14,210—14,220kHz area. He also appears on 7,080kHz around 0700.

VK3VU is due to be in Tonga for two years, but at the time of writing his A35 call is not known. ZL4OY/A is active daily on 3·5MHz at European sunrise time. According to *DX-NL* many QSLs sent to his QSL manager ZL1BQD before June this year were lost in the mail. Anyone who sent a card and has not received a reply is asked to write again. Chris was expected to leave the island about the time this is read and it is believed that there will then be no amateur on Campbell Is.

DX News Sheet says that ZL1AMO has said that he hopes to visit Pitcairn Is for a month's stay. Dates have not been given as transportation is so unreliable because in poor weather conditions ships do not call.

Rumours continue of an expected increase in activity from China in 1983. Another BY1 and also BY4, BY7 and BY8 stations are anticipated.

YI1BGD is still active on Fridays and Saturdays from 0100 in the 14,215–14,220kHz area. Another time when the station may be found is at 1700 around 14,250kHz, and on the same frequency at 0500 on Fridays. Only YI1BGD and YI4SC QSLs are currently being accepted for DXCC credit.

JT60AB and JT60UB will continue to operate until 31 December. They are usually heard between 1000 and 1300 near 14,210kHz being operated by JT1AO, and the special prefix is in connection with the 60 years of the Mongolian people's revolution.

FR7CE closed down and is now at home in France. He expects to go to FO8 in mid-1983. QSLs for FR7CE and also for FO8DT during 1978/79 should be sent to the address in "QTH Corner".

American news sheets report that YJ8RG, in Vanatu, is to be found regularly about 20kHz above the lower limits of the USA phone bands after 2300. H44SH and H44DX are reported to have installed a super antenna system in the former's property. H44SH keeps a schedule with AD1S (his QSL manager) at 1200 on Sunday on 14,220kHz, and tends to be found at around 1330 on 14,230kHz.

9L1EX has returned to Norway and should have answered all QSL requests by the end of October. However, some mail has gone astray and Arild invites those still without to apply again (see "QTH Corner").

Expeditions

Iris and Lloyd Colvin circulated a bulletin headed "Mission Impossible" announcing that they were intending to travel to the Middle East on 1 October and to enter and set up their radio station "in each country" and work all the dx amateurs of the world during the ensuing six months. The bulletin was signed by Bob Vallio, W6RGG, secretary of the YASME Foundation, and the final sentence read "If you run into trouble, or in any way fail in your mission the secretary will disavow any knowledge of your activities. Good luck, Iris and Lloyd!" QSLs will as usual go the YASME Foundation, and first stop was expected to be Djibouti.

Malta QSL Bureau

The president of MARL has asked for the following to be made known to members and other societies: "It has come to our knowledge that some societies are sending QSLs to another radio club. We wish to inform all societies that the MARL, PO Box 575, Valletta, Malta, enjoys IARU recognition, and is the official society representing the interests of amateur radio on an international basis. Our League runs a very efficient bureau for our members, and also for the members of the other local clubs. The only persons for whom we do not handle cards are those who do not belong to any club. We wish to inform societies who do not address QSLs to MARL that these will not be distributed by our League and we will not handle outgoing QSL cards addressed to the societies in question".

10MHz

Reaction to the paragraph which appeared under this heading in April *MOTA* has been received from M. S. Reda, SU1CR. He says that Cairo Radio was certainly responsible but that the transmitters are not co-sited —in fact they are located more than 100 miles apart. He believes therefore that there is no question of demodulation and beating from non-conductor unlinearity. Reda feels that the problem is non-linearity of the ionosphere —the phenomenon known as the "Luxembourg" effect because it was first heard as a result of interaction between Radio Luxembourg and stations in the UK. Finally, he feels, thanks are due to the Egyptian Broadcasting Service for vacating 7,050 and 7,075kHz.

28MHz

A table will be published during 1983 to encourage use of 28MHz. Will readers please submit monthly totals of DXCC countries worked (starting 1 January)—the first listing will appear in March *MOTA*.

Ed, W4MGN, at the controls of G3GIQ's station during a visit with other members of the Chiltern DX Club. He has operated as EL2AG, FH8CL, FR0HIF, S79ARB, 9X5MH, 9U5JM, and from other exotic locations

QRP

The ARRL Board of Directors has instructed the DX Advisory Committee to investigate the possibility of a non-endorsable QRP DXCC Award and to report back to the next board meeting. The proposer of the motion, W4RH, is a QRP enthusiast with close to 100 countries worked while using 900mW output.

K8IF, president of the QRP ARC International for the past three and a half years, has had to retire due to pressure of other business. His replacement is Ed Popp, K5BOT. In the recent QRP ARCI elections, Chris Page, G4BUE, was elected to the board of directors as the only non-American member.

Welcome

The following new members from outside the UK joined the Society during September: EI2BUB, EI8AR, HS1ALK, LA9PCA, ON1ABU, SM7FGD, SM0NGX, VE2UG, VP8NX and WA6BAN. New listener members include R. Hilton and R. Hill (HZ), E. Shelmerdine (A7), B. Hoare (9J), D. Taylor (9Y) and L. Rudjord (LA).

QSL via . . .

PY0SJ	-via N6CW	OH2TL/T5	-via OH2TL	ZF2DS	-via K2ITT
PY0ZSA	-via N6CW	U2G	-via UQ2GW	DK9XB/3B9	-via DL0LH
PY0ZSB	-via N6CW	VP8APQ	-via G4LPQ	4U37ITU	-via W2MZV
PY0ZSC	-via N6CW	ZF2BS	-via K2ITT	9J2TS	-via JA2LZB
T32AF	-via WH6AIF				

All-time countries table

Scores received to date are as follows (band leaders in bold type). The next table will be in the March 1983 *MOTA*—scores to G3GIQ, QTHR, please.

Callsign	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
G3KMA	67	**203**	**281**	326	**327**	**311**	1515
G3GIQ	47	159	200	323	324	303	1356
G3MCS	29	174	197	314	313	300	1327
G3UML	3	187	187	324	287	250	1238
G3HTA	42	153	190	296	271	237	1189
G4DYO	26	85	151	298	288	277	1125
G4FAM	39	136	196	251	250	236	1108
G3XTT	65	143	182	227	251	236	1104
G2DMR	34	125	125	274	284	249	1091
G3NOF	4	79	58	**337**	315	271	1064
G3IGW	**87**	127	226	215	191	170	1016
G3TXF	29	147	152	240	241	196	1005
G3XJS	26	33	32	265	275	269	900
G3XQU	1	72	110	249	237	218	887
VK9NS	5	114	169	218	187	160	856
G3VKW	20	71	74	237	236	213	851
G3RUR	1	44	123	255	179	178	780
G4FXT	1	59	80	162	251	207	760
G3JJG	16	62	83	180	236	182	759
G3YMC	58	60	111	160	183	144	716
GM3YOR	36	62	83	157	155	152	645

Awards

The OZ Prefix Award

The Copenhagen division of EDR, on the occasion of its 50th anniversary on 19 December, is issuing this award which is available to licensed amateurs and listeners on the following basis: OZ stations must work three stations with each OZ prefix (OZ1—OZ9), other Europeans two with each prefix, and the rest of the world one. A QSL card from the club station OZ5EDR can be used to replace any missing card. Any band/mode is allowed and special mode/band endorsements will be made. Send a certified list of QSLs plus 10 ircs: Allis Andersen, OZ1ACB, Kagsaavej 34, DK-2730 Herlev, Denmark.

IARU Region 3 Award

This new award is designed to publicise Region 3 and is being issued on its behalf by NZART. It is available to licensed amateurs and listeners for contacts or reception reports after 5 April 1982. Certificates will date from 1 January 1983—World Communications Year. The basic award requires contacts with or reports from seven countries—a silver star endorsement is issued for 12, and a gold star for 17 of the following list: JA, VK, ZL, HL, DU, VS6, HS, P29, 9V, 3D2, VU, YB, 9M2, 4S7, A3, 5W, H4 and S2. Awards may be endorsed for band or mode if requested. Send certified list of eligible contacts from log book plus NZ $1 (for surface mail) or NZ $2 (for air mail) to NZART Awards Manager, 152 Lytton Road, Gisborne, New Zealand.

Mary Rose Award

Notification has been received from the sponsors that the charges for this award have been amended. UK claimants should now send £2 (not ircs please) and others 15 ircs.

Contests

HA DX Contest

2200 15 December to 2200 16 December

CW only. Restricted to segments 3,500—3,590kHz, 7,000—7,035kHz, 14,000—14,090kHz, 21,000—21,090kHz and 28,000—28,090kHz. Single-operator single- and multi-band and multi-operator multi-band sections. Exchange RST and serial number. HA stations will also give a two-letter code indicating their county: BA, BE, BN, BO, BP, CS, FE, GE, HA, HE, HO, NO, PE, SA, SO, SZ, TO, VA, VE or ZA. Each contact with Hungary counts five points, and with stations outside one's own continent three. Those with one's own continent do not count. The multiplier is the sum of HA counties worked on each band (maximum 100). Separate log sheets should be used for each band and a signed declaration included. Entries must be posted within six weeks of the contest to: Radio Amateur League of Budapest, Budapest PO Box 2, H-1553 Hungary.

Canada Contest

0000 to 2400 19 December

1·8 to 144MHz. Phone and cw. Single-operator single-band, and multi-operator single-transmitter multi-band categories. There is also a single-operator QRP section (5W dc, 10W p.e.p. output). All QSOs are valid and stations may be worked on both modes on each band—but note that band plans must be observed. Exchange signal reports and serial numbers. VE1s will indicate their province. Each Canadian contact counts 10 points, others count one. Ten bonus points may be claimed for each contact with a CARF official station using a TCA or VCA suffix. The multiplier is the total of Canadian provinces/territories worked on each band on each mode—these are VO1/VO2, VE1-PEI, VE1-NB, VE1-NS, VE2, VE3, VE4, VE5, VE6, VE7, VE8 and VY1. Suggested frequencies are 1,810, 3,525, 3,770, 7,025, 7,070, 14,025, 14,150, 14,300, 21,025, 21,200, 21,400, 28,025 and 28,500kHz. Enclose summary sheet with logs and a "dupe" sheet. Cover sheets and multiplier lists are available from the organizers, and entries must be mailed within one month to: CARF, PO Box 2172, Stn D, Ottawa, Ont, K1P 5W4, Canada.

ISWL 14MHz SSB Contest

0000-2400 9 January

Single-operator, licensed and listener sections. Spot frequencies of 14,175kHz and 14,225kHz will be used. One point per station worked/logged—five points for working ISWL officers who will identify by sending "LO" after membership number. Multiplier is number of continents worked/heard. Logs should list time, station worked/heard, serial number sent and received, points claimed. Listeners need not record number exchanges. Send logs before 20 February to Archie Brown, Oakwood, Lower Frankton, Oswestry SY11 4PB.

In the **1982 PACC Contest** UK scores were as follows: **G2HLU** (3,392 points), G3ESF (2,958), G3AEZ (1,914), and **GM3KLA** (544). In the listener section **RS15822** scored 3,472 points, RS44395 2,480, and ARS42876 1,275.

In the **1981 CQ M Contest G3DCZ** came world fifth with 9,990 points on 7MHz. In all, the contest attracted some 35 entrants from the UK—most unusual and perhaps a result of RSF's generosity with participation medals. In England **G3MPN** led with 7,688 points on 3·5MHz, **G3DCZ** with 9,990 on 7MHz, **G3WPF** with 27,588 on 14MHz, **G4KLQ** with 966 on 21MHz, and **G3IFF** with 29 on 28MHz. In the multi-band category **G3ESF** scored 66,120 points, and in the listener section **RS44395** 234. **GI4JTF** scored 994 points on 21MHz, and **GW3MRI** 1,140 in the all-band group.

QTH CORNER

A4XCB	PO Box 18530, Salalah, Sultanate of Oman.
A4XYF	via GM3ITN (see VP8AEN).
FO8JO, FO8OJ	via W6GO/K6HHD, Box 700, Rio Linda, Cal, 95673, USA.
ex-FR7CE	via R. Kremmeicke, DF2OU, Box 1113, D-3120 Wittingen 1, FR of Germany.
FW0XN	DK7XN, R. Ulrich, Hummelsbuetteler Weg 68, D 2000 Hamburg 63, FR of Germany.
FW0XR	DK6XR, H. Rambatz, Heidlohstrasse 35, D-2000 Hamburg 61, FR of Germany.
G4LRS	via K. Weathersbee, 19 Galliard Rd, London N9.
G4OBH/JW	G. Wimpenny, Queens College, Cambridge.
J20DU	YASME Foundation, PO Box 2025, Castro Valley, Cal, 94546, USA.
T32AJ	via SM3CXS, J. Svensson, Berghemsv 11, 86021 Sundsbruk, Sweden.
V3CQ, V3DX	via N6ADI, M. Brozowsky, 1147 Forest Av, Ojai, Cal, 93023, USA.
VP8AEN, VP8HZ, VP8NX	via GM3ITN, L. Hamilton, "Halls Land", Hardgate, Clydebank.
YI1BGD	Box 5864, Baghdad, Iraq.
3B8FK	PO Box 108, St Louis, Mauritius.
DL0HSC/5B4	via DF8ZH, F. Kuppert, Heppenheimer Str. 70, D-6090 Ruesselscheim 5, FR of Germany.
5T5TO	via F6BUM.
9L1EX	LA2EX, Borlivein 34, N-5033, Fyllingsdalen, Norway.

G8PG has kindly supplied results of the **DL AGCW Summer QRP Contest**. In the Class A section (under 3·4W input) K4LTA won with 7,152 points, **GW8PG** (5,538) was second and G3DNF (3,197 points) seventh. In Class B (under 10W input) OK3AUI led with 14,671 points. The next contest will take place on 15 and 16 January.

Annual 40m World SSB Championship
0000 to 2400 8 January
Annual 80m World SSB Championship
0000 to 2400 9 January
Both sponsored by *73 Magazine*. In each contest there are single-operator and multi-operator single-transmitter sections. Single-operator entrants may only operate for 16h. Note off periods in log and summary sheet—they must each be of more than 30min. One point is scored by working W/VE or stations in own country, two by working others. Each USA state, contiguous VE province or territory (13 maximum) or DXCC country counts as a multiplier. Entries must include log, summary and multiplier check list. Copies of official forms are available from the sponsors. Entries must be postmarked no later than 12 February and sent to 80 (or 40)m Contest, Billy E. Maddox, 468 Century Vista Drive, Arnold, Md, 21012, USA. Omission of any required entry form, use of excess power, manipulating of score or counting duplicate contacts can cause disqualification.

Spanish DX Contest
2000 4 December to 2000 5 December (Phone)
2000 11 December to 2000 12 December (CW)
3·5 to 28MHz. QSOs with EA count one point, and the multiplier is the number of EA call districts worked on each band added together. Include summary sheet and signed declaration, and post logs no later than 15 February to URE International Contest, PO Box 220, Madrid, Spain.

ARRL 28MHz Contest
0000 11 December to 2400 12 December
CW and ssb—stations may be worked on both modes. W/VE send RS/T and state, others RS/T and serial number. Only 36h operation allowed and no cross-mode QSOs. Two points per QSO, four if with Novice or Technician class licensee. Multiplier is USA states, VE call areas, DXCC countries and ITU regions (for contacts with M/M). Dupe sheets required for more than 500 QSOs. Mail before 12 January to ARRL, Communications Dept, 10 Meter Contest, 225 Main St, Newington, Ct, 06111, USA. A large sae plus some ircs will produce log forms and rules from this address.

A correction to the results of the **CQ WW DX Contest (CW) QRP** section listed in October *MOTA*. The only British entry in the contest was **G3CWL** who came 13th in the world listing with 6,480 points on 21MHz. The results listed were, in fact, those of the CQ WPX Contest.

Around the bands

Unfortunately the G8KG report had not been received at closing date, but the summary submitted by G3KSH very adequately sums up the past month: "Conditions on the hf bands have been better this month, and there has been increased activity on all bands. The 3·5 and 7MHz bands have shown signs of earlier openings into the USA in the evening, when 7MHz has also been open to JA and VU. There seems to have been less activity on 10MHz. 'Woodpecker' activity has been very severe on all hf bands, particularly on 14, 21 and 28MHz. On 14MHz from 0630 to 2100, on 21MHz from 0700 to

ARI INTERNATIONAL MEETING-CEFALU

The second international radio amateurs' meeting took place in conjunction with the celebration of the eighth Day of Peace and Fraternity in Cefalu, Sicily, on 12 September. The meeting began on 8 September and was again organized by the Termini Imerese branch of ARI (the Italian national society) under the expert guidance of its president Dr Salvatore Alescio, IT9AZS.

The topic this year was "The radio amateur in today's society", and the discussions were very ably chaired by Rene Vanmeusen, ON4VY, president of UBA, the Belgian national society. Many distinguished representatives of the Italian administration and armed forces attended. These included the president of the Sicilian region, Sr M. D'Acquisto; assessor of the regional government, Sr P. Iocolano; director of the PTT (Sicily), Sr G. Salomone; and General Rizzo, deputy commander of the Sicilian region. Prince Don Francesco M. Langelletti and Dr Aldo Farina (general secretary of the international committee of UNICEF) were present on behalf of the Sovereign Military Order of Malta and UNICEF respectively. Others attending included the president and many officers of ARI and the presidents of DARC, MARL, REF, UBA, VERON and RSGB, as well as the secretary of the Moroccan society.

Special presentations were made to Prince Langelletti and to HRH Prince Halal of Saudi Arabia (HZ1TA) (through the latter's personal representative) for their outstanding work on behalf of children's welfare.

Matters discussed during the meeting ranged from data transmission to dxpeditions, and included a number of contributions from the authorities —an indication that amateur radio in Italy is receiving increasing support from the Italian administration.

Dr E. J. Allaway, G3FKM, RSGB President, addressing the ARI meeting.

1900, and on 28MHz from 1500 onwards. So much for *exclusive* allocations at ITU conferences!"

The following kindly submitted material for this part of *MOTA:* G2HKT, G3YY, G5JL, G3s BDQ, GIQ, GVV, IMW, GM3ITN, G3s KSH, SEP, SJH, XBY, YRM, G4EHQ, GW4KGR, G4s LDS, LRS, G5CFJ, and RS 30694.

Stations listed in italics were on A1A.

1·8MHz. 0000 *ZB2EO.* **0600** K1MEM, WA2SPL, 6Y5IC. **2300** *U2G, ZB2EO, 5N8ARY.*

3·5MHz. 0000 K2DV, K2KK. **0100** *UA9FCF,* 8P6OR. **0400** K0SE, *VP2VI, ZS1BS.* **0500** *CN2AQ, VK3BK, W7, XT2AW, ZP5CD, 5N8ARY, 5T5TO.* **0600** D44BC, J73PP, WB7RGN (Wyo), ZL2s BFJ, BT. **0700** K6MYC, K0RF (Colo), ZL4AP. **2000** *VK2OI.* **2100** *JA3CSZ.* **2200** *EA8RG.*

7MHz. 0000 ZF2DZ. **0200** *WA6ZVO/PJ4.* **0300** HZ1AB. **0500** *CM,* D44BC, *EA9, FG7AM, PY, SV0BP/9, VE7, W6-W7, 4K1H.* **0600** *JA3CSZ, KL7YS, K6NQ/7, ZF2DC, ZL2, 5T5TO,* 9L1AP. **0700** *JW5MY, PY0ZSC, W7QK, ZL.* **2000** *JA* (to 2300). **2100** *FP8s AA, HL, VK3MR, VU9ARZ,* OE2VEL/3D6. **2200** *JA5BJC, ZL1JJ* (? Kermadec), *5N8ARY, 7X4AN.* **2300** *ZS6BCR,* DL0HSC/5B4.

10MHz. 0500 *ZL* (to 0800). **0600** *VE2LI, VK* (to 0800). **0700** *FK8EB.* **2000** *VE1ASJ.* **2100** *JA1BFN.* **2300** *DL2GG/YV5.*

14MHz. 0400 *T32AF, VE7, W6-W7, ZL* (to 0900). **0500** HC0, *HH2VP,* PY0ZZ, *3B8FK.* **0600** KH6, KL7, VK. **0700** *FO8GM,* PY0SJ, T32AF, *TA1EJ,* VK9NS, ZL, 5W1DQ. **0800** *CR9T, FK8KAA/P,* KM6IMX/KH4, VR6KY, VS5GA, ZK1CG, 1A0KM, *3D2RW.* **0900** *SM0AGD/KH1.* **1300** ZM7AG. **1500** XZ9A. **1600** *CR9T,* KH6, *KX6OB.* **1700** *T31AE.* **1800** J20DU, *N7DUU/KH0,* SM0AGD/KH1, OH2TL/T5. **1900** ZD7AL. **2000** T31AE, *VK9DR,* ZD9BW. **2100** F6FIC/TZ, OE2VEL/ZS3. **2200** VP8LP, 4K1A. **2300** VP8AOS, VS6CT.

18MHz. 0800 *F, HB, OE.* **1300** *HB0AYC.* **1400** *YU.* **1800** *OZ.* **2100** *VP8ANT.*

21MHz. 0700 VK, ZL. **0800** *BY1PK, WB4ACI/CE3, HL0B,* KE6RD/KH0, ZL4OY/A. **0900** *FK8CE,* JD1BBH, NL7J, PY0SJ, *VK9NS,* YK1AO. **1000** EP2TY, JA, VK, K7TI/VS6, ZL. **1100** VK9ND. **1200** *FK0AF,* 4U37UN. **1300** *HZ1SS,* PY0ZZ, *SV5OX.* **1400** FR7ZN, *VK, ZL.* **1500** *VU9AJ, YC1BSA.* **1600** A71BJ, N3RD/VP9. **1700** VQ9CI, W6-W7 (to 2100), 1A0KM. **1800** *PY0CW,* S83H, DK9XP/3B9. **1900** CE0ZAD, FP0FSZ, M1V, PY0SJ, OH2TL/T5, *VP8ANT,* VP8QG, ZD9BW, 7Q7LW. **2000** VK (LP), VP8APQ, ZD9BV, 5Y4ITU. **2200** JA.

24MHz. 0800 *DL, PA.* **1500** *F, OE.* **1700** *5T5TO.* **1800** *OZ, VP8ANT.*

28MHz. 0600 *KH6IJ.* **0700** A22CT, ZL1-ZL3. **0800** *FK8CE,* JA (to 1000), JT1AN, *VU9LO.* **0900** *SU1IM, ZL3GQ.* **1000** A92P, OD5LX, VS6IC, OE2VEL/3D6. **1100** *HL2GY,* N7DUU/KH0, KB7IJ/KH2, P29MF. **1200** *A71AE.* **1300** AX9NYG, *J20DU,* PY0ZZ, TR8JD, V3TV, W1-W4 (until 2100), DL9EAJ/3B9. **1400** A22GM, J20DU, SU1BA, W7 (until 2000), ZD9BW, *5Y4ITU.* **1500** A71BJ, VU. **1600** *PY0ZSC,* VQ9CI, W6 (to 1830). **1700** XT2BO. **1800** C6ADC, FY7BB, KH6s *CC, CF,* IBA, PY0ZSB, S79WHN, 5T5DR.

Thank you to all who contributed to this month's *MOTA*—and to all who have supported the column during 1982. Very best wishes to all readers for the festive season—and for a very successful 1983.

Thanks are also due to the following for news items extracted: the *Long Island DX Bulletin* **(W2IYX)**, *DX News Sheet* **(G3XTT/G3ZAY)** the *Ex-G Radio Club Bulletin* **(W3HQO)**, *Long Skip* **(VE3EUP)**, *Dx'press* **(PA0GAM)**, *CQ Magazine* **(W1WY)**, *DXNL* **(DL3RK)**, and the *DX Bulletin* **(K1TN)**.

Please send all items for **February** issue to reach G3FKM no later than **29 December. Please note also that this is very early!**

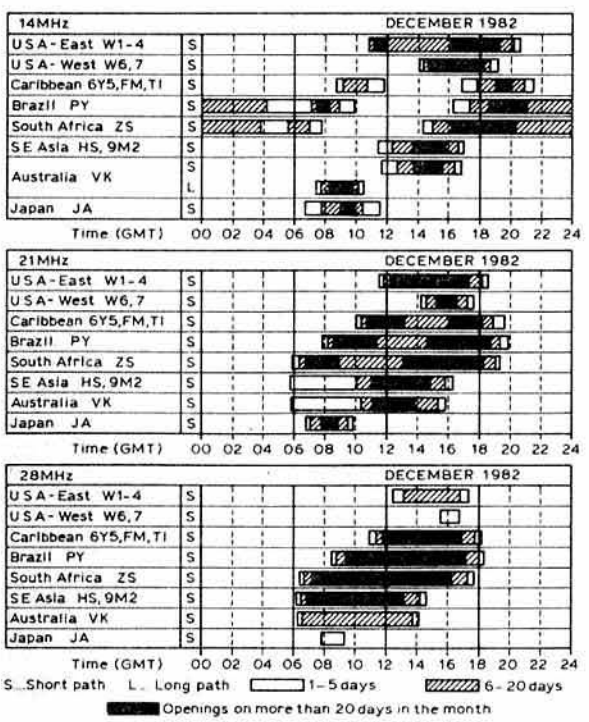
Propagation predictions

The seasonal change in propagation is always noticed in December, as conditions are below those of the previous month. This has two causes: first, the mid-winter conditions reach their maximum, ie with the shortening days traffic times on the hf bands are also much shorter; and second, the F2 mufs in the northern hemisphere are much lower than in the previous month.

For this reason traffic with eastern North America will not be certain on **28MHz** (it will only be possible on days with above average mufs). Western North America and Japan will only be heard under exceptional circumstances. On the whole, traffic from the southern half of the UK will have more chance of getting through.

Traffic with all continents will be possible on **21MHz** even though the mufs are lower than last month. Mid-winter conditions will allow dx traffic on this band via the indirect path, especially traffic with South America and Japan. DX will also be possible on **14MHz** under favourable conditions via the indirect path, and especially mentioned here are South America, Japan and western North America. During the latter half of the night traffic with South America and Africa will only be possible on favourable days on this band.

During the long winter nights **7** and **3·5MHz** will offer the possibility of dx, QRM permitting. Local traffic on **3·5MHz** will be interrupted by the dead zone shortly before sunrise.



HF propagation study

Band predictions for December 1982

Using the table

The time is presented vertically at two-hour intervals 00(00)gmt to 22(00)gmt for each hand.

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 "plus" sign in the 28 and 3·5MHz columns respectively.

Time/GMT	28MHz 000001111122 024680246802	21MHz 000001111122 024680246802	14MHz 000001111122 024680246802	10MHz 000001111122 024680246802	7MHz 000001111122 024680246802	3·5MHz 000001111122 024680246802
EUROPE						
Moscow	....48861...	....89996...	...3888894..	542766668954	987543346888	++52....3+++
Malta	....47652...	....89997 1.	.28778931	663765568996	998632236899	+++4....3+++
Gibraltar	.....5442...	....4998 71.	....9888983.	452186567995	998753335899	++++2....25++
Iceland	.....1551...	.....6997...	....488896..	231.87678952	887264456888	++++3..245++
ASIA						
Osaka	....2.....	....72.....	...1862.....	2..253332214	31124663	45
Hong Kong	....662....	...18872....	...156663...	2...23346541	1....1124785	.....4+3
Bangkok	....8984....	...279984...	....266783..	3....3347855	2....1.24787	.....4+5
Singapore	....5665....	...268885...	....266783..	3....3347864	1....1.24786	.....4+3
New Delhi	....8872....	...37887....	...225676..1	631..2346456	73.....14788	4.....44+
Teheran	....8986....	...678895...	2..633678411	7543.1346877	873....14788	+5.....45+
Colombo	....8897 1...	...357896...	3678521	52....346877	51.....14788	2.....45+
Bahrain	...18775....	...567884...	31.412578732	8631..246888	872....14788	+4.....45+
Cyprus	....9988 3...	...3989981..	431766689853	986533357998	88731.135898	++4....25++
Aden	...187772....	...4567982...	5..3.1368864	953....46898	872....14788	+4.....455
OCEANIA						
Suva (S)	.....11.....	.....3662.....	....466782...	....643464...	....1311242..	.....
Suva (L)	....221.....	11..77532332	.127656773.	....4532364...	....12..131..	.....
Wellington (S)	....22.....	....26751.....	....766771..	....1633473...	....311241..	.....
Wellington (L)	.....	....21.....	11.75434421	....2532353...	....2..131..	.....
Sydney (S)	....4443....	...188883....	....2666782...	....3334762...	....1112451..	.....2....
Sydney (L)	.....	....242.....	66554642	....4323563...	....11.134..	.....
Perth	....4442....	...368875....	1..126678511	1....3346863	14762	.....43..
Honolulu	.....	.....1.....	11.1.1.351.	24.4232641	44311141	....4.....
AFRICA						
Seychelles	...13453....	...3457842...	3..1..368864	831....46899	83.....14788	5.....45+
Mauritius	....45552...	...3457883 1.	63.1..368985	841....46899	62.....14788	4.....44+
Nairobi	....75662...	...35568852..	7213..158997	973....26899	872.....3788	+4.....44+
Salisbury	...345531..	1..245578641	8613..37998	983....15899	862.....2688	+3.....4++
Capetown	...2455411.	2...55568753	97131..15899	9831....2689	862.....378	+4.....4+
Lagos	...7877721.	21..86568863	981451.16899	99752....3799	7883.....488	555.....2++
Ascension Is	...376551..	11..76556533	885161.12699	99953....389	88851.....168	+5+2.....3+
Dakar	...2887731.	11..78657863	875.731.3799	999551....489	87862.....268	55+4.....3+
Las Palmas	...288872...	....7999973..	554.87667897	999574334799	989741112589	+++5.....2++
S AMERICA						
South Shetland	....12334...	11..67766332	665.75322245	4563421....13	13321.....	.....
Falkland Is	....33551...	57665442	676.7521.136	688452....13	46752.....1	342+4.....
Rio de Janeiro	....53231...	38544432	766.751..268	999452....37	88873.....14	+5+4.....
Buenos Aires	....22242...	57544441	666.862...36	899463....4	688631.....1	35+4.....
Lima	.....8863...	.....8665 3.	324.35511.25	7793533....3	578731.....1	25+4.....
Bogota	.....8863...	.....8655 3.	324..462.135	7783433....4	778731.....2	4554.....
N AMERICA						
Barbados	.....19864..	.....686564.	324.1651.256	8783432....37	877731.....5	544.....2
Jamaica	.....6974...	.....8765 3.	213.14631135	7782533....15	778631.....2	4554.....
Bermuda	.....7984...	.....3887 73.	213.16632365	76825331.137	877631.....15	554.....2
New York	.....3883...	.....8887 2.	112.14664564	767243331237	877631.....15	5444.....2
Mexico	.....683....	.....875 1..	112.21462112	56825333....2	378631.1.....	.454.....
Montreal	.....3883...	.....8987 2.	112.15665663	767243332347	8776311.25	5444.....2
Denver	.....51.....	.....4861..	112.1..66441	577152243113	47863111.....1	.454.....
Los Angeles	.....31.....	.....85.....	111.11.46421	3671531431.2	2685311111..	354.....
Vancouver	.....	.....33.....	121.11.17631	466.53135433	368531113111	354.....
Fairbanks	.....	.....	12..1322451.	465.53346643	356431124432	234.....

The provisional mean sunspot number for September 1982 issued by the Sunspot Index Centre, Brussels, was 119·2. The maximum daily number was 176 on 4 September, and the minimum was 78 on 12 September. The predicted smoothed sunspot numbers for December 1982, and January, February and March 1983, respectively, are: (classical method) 107, 105, 103 and 101; (SIDC adjusted values) 112, 111, 108 and 104.

COUNCIL PROCEEDINGS

A brief report on the Council meeting held on 16 September 1982

Present: Dr E. J. Allaway (President, in the chair), Messrs R. G. Barrett, R. Bellerby, P. F. D. Cornish, Dr D. S. Evans, L. N. G. Hawkyard, Mrs J. Heathershaw, Messrs G. R. Jessop, I. Kyle, T. I. Lundegard, W. J. McClintock, B. O'Brien, H. S. Pinchin, D. M. Pratt (members of Council), D. Baptiste, CBE (by invitation), D. A. Evans (secretary/general manager), A. W. Hutchinson (editor), and Mrs H. M. Allin (minutes secretary).

Apologies for absence were received from Messrs Bazley, Fisher, Hall and Knight.

Financial report by the honorary treasurer
A copy of Mr Cornish's report was circulated at the meeting. The treasurer also circulated copies of the Consolidated Income and Expenditure Accounts for the year ended 30 June 1982; these were approved, with one abstention.

Dr Allaway pointed out that the information relating to the Society's proposed purchase of Alma House, Potters Bar, must remain confidential until exchange of contracts had taken place. The secretary agreed to inform Council immediately this stage was reached. It was suggested that the membership be informed via GB2RS and the headline news service, when applicable.

The treasurer quoted some interesting figures showing the present-day equivalents of old subscription rates, which indicated that the current fee of £14.50 was, in fact, less than the equivalent of 10 years ago!

Secretary/general manager's report
Mr Evans gave details of plans he had made for transfer of headquarters to the new building once contracts had been exchanged. He also gave a detailed report on the working of the existing computer system.

Membership and representation
Council noted that:
(i) Reduced subscriptions had been granted to two members.
(ii) Affiliation had been granted to: Blackmore Vale Amateur Radio Society, Dorset; City University Amateur Radio Society, London: Marconi Avionics Radio Society, Herts; and New Scotland Yard Amateur Radio Society.
(iii) Life membership had been granted to Mr G. H. Grayer, G3NAQ.
(iv) The following area representatives had been appointed: Mr A. W. Faint, G6GWH, Leicester; and Mr D. H. Lander, G4LQL, Mansfield.

Election of Council members to committees
Considerable discussion took place on the recent decision to fill Council places on committees by a Council ballot.

Dr Evans proposed that the original standing orders be reverted to and that the Forward Planning Group be instructed to look at all aspects of election to committees. This was seconded by Mr O'Brien. A ballot was conducted and the proposal was accepted by nine votes to four. It was agreed that a meeting of the Forward Planning Group be convened as soon as possible.

Vice-Presidents and honorary vice-Presidents
It was proposed, seconded and approved that Messrs S. Cook, G5XB; R. Flavell, G3LTP; C. Newton, G2FKZ; and Sir Evan Nepean, G5YN, be made vice-Presidents of the Society.

It was also proposed, seconded and approved that Mrs F. Woolley, G3LWY, be made an honorary vice-President of the Society.

Publications
Dr Evans gave a comprehensive report which covered individual publications of particular interest, the current production programme, new books in the pipeline, and possible new publications.

Spectrum abuse
Mr Lundegard had submitted to Council a short paper on this subject, which was discussed at length. Council agreed on several courses of action to attempt to alleviate the problem.

Spectrum reports
Dr Evans spoke of the recent achievement of a contact over 1,000km on 10GHz. Arrangements were being made for the presentation of Microwave Associates' award to acknowledge this significant landmark.

Dr Allaway reported that the FCC's proposed phone extension at 7MHz was still opposed by the ARRL.

The general manager said that the vhf manager had received over 100 letters expressing interest in the 50MHz experiment. A questionnaire would be sent out to enable Mr Fisher and the VHF Committee to judge the level of activity each person would be able to put into the experiment.

Review of committee business
Education
Mr Pratt referred to a memo from the chairman about the committee's investigation of RAE correspondence courses. It was agreed that the Society would negotiate with the National Extension College and Open University to produce an RSGB/NEC(OU) RAE course.

HF
Approval was given to the committee's recommendation to award the Rotab Trophy to Mr W. R. Hawthorne, G3MCS.

Membership and representation
It was agreed that an official regional meeting be held in Region 9 on 13 March 1983.

Propagation Studies
It was agreed that an item be placed in *Radio Communication* giving simple instructions on how to obtain maximum benefit from the published propagation predictions.

Raynet
The minutes of a meeting of the committee were accepted.

Technical & Publications
It was agreed that Mr J. P. Hawker, G3VA, be made a corresponding member of the committee.

VHF
Mrs Heathershaw drew Council's attention to the BBC's proposed charges for rental on repeaters at transmitter sites.

Mr Evans said he had been in touch recently with Mr D. S. Smith, G4DAX, about this subject and it was hoped that the proposed figure of £600 could be renegotiated to a lower standard charge.

Correspondence
The President, Mrs Heathershaw, Mr Lundegard and Mr O'Brien commented on letters they had received and the actions taken.

The President had received invitations to attend VERON's "Day of the Amateur", and a meeting in Hanover from DARC. His attendance at both meetings was approved.

YOUR OPINION

THE MORSE TEST

Space does not allow publication in full of the *many* letters from members generated by the "Your Opinion" letter from Roy Hersford, G8WLS, in the September 1982 issue, page 785. The following brief extracts (in some cases slightly paraphrased) reflect the gist of the main arguments, without undue duplication of frequently made points, pro and con the retention of a mandatory morse test for would-be hf operators.

It is an ITU requirement ("Radio Regulations"), confirmed with modification at WARC 79, that administrations should ensure morse proficiency before issuing amateur licences for use below 30MHz. Where, as in Japan, restricted low-power licences for phone operation are issued without a code requirement, this is on the basis that such operation is unlikely to cause interference in other countries. Japan retains code tests for other classes of licence. In the USA *no* amateur licences are issued without a code requirement, although FCC is currently considering waiving this in respect of the vhf Technician-grade licence which otherwise roughly corresponds to the British Class B licence. Many countries issue novice licences with only an elementary code requirement for some hf bands.

From the letters, it would seem that many newcomers and some Class B operators interested exclusively in vhf operation are unaware of the extent to which cw operation is still energetically pursued on the hf bands throughout the world. It is also clear that the weak-signal advantages of manual morse over machine telegraphy and electronic decoders are not always appreciated.

"To a person of average ability the morse test is not difficult but it does require concentrated effort. The amount of time required is negligible compared with the result – the opening of worldwide communication. CW contacts *can* be interesting and enjoyable" – *Les Navier, G3UYV.*

"Far from wasting time learning by rote, I spent pleasant hours practising sending and receiving for my morse test . . . now I spend enjoyable evenings on hf with a few watts and a dipole. Amateur radio is about communicating; not technical superiority, but technical competence. Using morse code is FUN" – *Phil Rose, G3ZZA.*

"The RAE and the morse test are intended to *encourage* rather than *discourage*" – *Paul Thompson.*

"May I suggest G8WLS listens with the bfo *on* and takes note of the large number of dits and dahs he will hear between 100kHz and 500MHz" – *C. B. Raithby, G8GI.*

"The moment one introduces a machine to do the reading it becomes a big signal system . . . the human operator's brain is greatly superior to any machine so far invented for reading morse signals on hf in noise. Technically, rtty is a very poor communications medium because of the crudity of the synchronization-in-time method, particularly susceptible in multipath propagation. HF cw operation gives the easiest dx, the cheapest equipment, is well within the scope of 'homebrew' equipment, gets one away from 'net' maniacs, and gives a craftsman's satisfaction not available from ssb transceivers" – *N. H. Sedgwick, G8WV.*

"I admit I found it an effort to learn morse in middle age, but I found also the rewards were considerable . . . there are hundreds, perhaps thousands, of patient cw operators all over Europe willing to help and encourage a beginner" – *R. H. Pearson, G4FHU.*

"I agree with G8WLS. All vhf bands down to 30MHz should be open to Class B amateurs, and hf bands and phone on hf with a higher technical standard" – *C. J. Reed, G8MFP.*

"I support G8WLS but do not suggest A1A should be eliminated. I would like to see an incentive system similar to that in North America but excluding the morse code requirement. I would suggest A1A is the *last* skill one needs to be a true radio amateur" – *Bob Ralph, G4KSG (ex G8LJG).*

"Roy Hersford, in trying to propound a hopeless case, puts forward extremely weak arguments. With tape recorders and random morse generators, any person of average intelligence should pass the morse test in four

to six months . . . candidates cannot be tested in practical skills by a theoretical examination"—*A. D. Taylor, G8PG.*

"Oscar Wilde believed 'society is only despised by those who fail to enter into it!' It has been my experience that 'gentlemen prefer cw', but perhaps G8WLS has a point when he suggests the RAE standards should be raised."—*Richard Farley, G3SSJ.*

"The time has now arrived at which the morse test should be scrapped. There can be no real reason for its retention other than as a limiting factor to prevent access to the hf bands"—*P. J. Peake, G8FVM.*

"CW has proved to be, and is likely to remain, the most effective form of radio communication, and is fundamental to the very existence and credibility of amateur radio as a true hobby. I am content to struggle on towards 12wpm"—*T. E. O'Neil, GM6HDK.*

"So morse is an inferior method of 'modulation'. Oh really? The readability of rtty in poor conditions is much inferior. RTTY requires complex extra equipment. As to electronic morse encoders/decoders we *don't* want one! But the suggestion about a two-level RAE is excellent—the sooner the better"—*John and Julie Butcher, DA1DC/G4GWJ, DA1EL/G4HKZ.*

"If people are not prepared to learn the morse code they must be prepared to stay on 144MHz. Being a radio amateur is a privilege not a right"—*K. S. Osborne, G4IGO.*

"I have not the slightest interest in hf and no ambition to obtain a Class A licence. However, I would like to learn and use morse. Why are telegraph modes omitted from the Class B schedule?"—*P. Clarke, G6ECO.*

"Suppose everyone said 'why not a simple test on using a black box?' I would be disappointed if amateur radio turned away from cw and a reasonable standard of RAE. Amateur radio is for self-training"—*Keith Barrett, GW4NBY.*

"If the morse test really avoids cb mentality on hf perhaps it is no bad thing!'—*Gordon Moore, G3MCY, ex-ZC4GM.*

"I can't even copy eight *letters* a minute. Never mind, I'll get there one day—it's fascinating"—*Steve Thornber, RS49363.*

"I agree the deletion of the morse test is long overdue but what to have in its place needs further consideration"—*B. D. Jones, G8XWA.*

"I am sure a good proportion of Class A operators would welcome Class B stations on 28MHz to stem the cb invasion"—*N. Wakeman, RS45634.*

"I took three years to achieve 12wpm, have seldom used cw but in no way begrudge having had to make the effort . . . it gave me a sense of achievement and is still an interesting and unexplored facet of the hobby available to me."—*M. J. Grierson, G3TSO.*

"The latest plea for the abolition of the morse test is as barren as its predecessors . . . I have found telegraphists most courteous and a welcome contrast to some high-power ssb operators. For amateurs on a low income, cw offers more world-wide communications potential than any other mode and *greatly* restricts bandwidth"—*E. H. Lewis, G3OCG/G3PII.*

"I disagree with all the points made by G8WLS . . . even with the most sophisticated equipment propagation conditions mean that one needs sometimes to resort to morse to keep a link open. It is rewarding to use 1W for solid dx contacts while others battle their way across Europe with 400W p.e.p. output."—*Bob Morrison, G3VZP, ex-DL5YO/DA2YP/ZC4ZP.*

"It was gratuitously offensive to label thousands of Class A licence holders 'Pavlov's dogs' . . . I had a QSO with a disabled hf operator with difficulty in speaking who operates with the toes of his right foot . . . an example of an amateur who felt the hobby was worth the effort" — *Quentin Campbell, G4OEU.*

"As a teacher I cannot agree that 'practical skills can easily be tested by a theory examination'. They can be properly assessed only by a practical examination or by looking at practical work done over a period of time (eg home-constructed projects). It is cheeky to liken telegraphists to Pavlov's dogs when presumably the writer lacks the dogged determination to pass the morse test"—*Robert Coleman, awaiting issue of G4RJC.*

"All that is required is to scrap the morse test *and* designate all hf bands as cw/rtty *only*. It might not be such a bad idea on 144MHz either!"—*Alan Williams, G3KSU.*

"I agree with G8WLS. When I see how cbers get away with anything I wonder why we legal operators put up with all the pettifogging restrictions."—*L. S. Chase, G8BHT.*

"The multiple-choice RAE should be scrapped and the old-type examination re-introduced if only to stop 'old-timers' suggesting that 'new' amateurs are inferior. I suggest morse at 8wpm for the Class B licence, and 12wpm plus some theory on electronic encoders/decoders for the 'A'. Operators should take an examination every five years and revert to Class B if they fail. 144MHz is now no better than legalised cb"—*D. S. McDonald, RS50653.*

"The privilege of amateur radio is granted in most countries to ensure a nucleus of trained radio operators . . . Morse is a paramount skill for the real radio operator . . . why not an annual proficiency test in cw and station maintenance?"—*T. Kirk, G3OMK.*

"Any decline in cw would be detrimental to amateur radio. It enables non-English-speaking peoples to make contact; simple equipment enables people in developing countries to participate; commercial equipment is not available in some East European countries and far more amateurs there use cw than phone; cw is the most efficient way of getting through QRN and QRM. Morse is vital if amateur radio is to help bring together the peoples of the world, perhaps its greatest ideal"—*Richard Allisette, GU4CHY.*

"I cannot accept that rtty is 'becoming more popular than code' if the number of signals heard is anything to go by. The morse test is successfully taken by young and old, and few regard it as an insuperable test. Those initially hostile often find it generates new interests. I can guarantee I will *never* buy an electronic encoder/decoder"—*J. R. T. Beaven, G3PPR.*

ELECTROMAGNETIC RADIATION

The Editor
Radio Communication

Sir—I read with considerable interest the articles on rf hazards (*Rad Com* February 1982) and microwave rf hazards (*Rad Com* April 1982). I note that in the first article reference is made to the Home Office and Medical Research Council recommendation that the maximum for continuous exposure is a power density of 10mW/cm². It is further stated that this limit may soon appear in the form of a European Community Directive.

Members may like to know that the Swiss Federal Office for the Protection of the Environment, together with a team of university and telecommunications experts set up to establish threshold limits for electromagnetic radiation, have recommended a tlv of 1mW/cm². This value is 10 times less than that recommended by other Western countries, who have since the late 'sixties maintained an apparently arbitrary value of 10mW/cm².

From my research it would appear that the general consensus arising from more than 5,000 studies of electromagnetic radiation carried out since the second world war is that not only is ionizing radiation a health threat but that all electromagnetic radiation may well constitute a health hazard. It probably affects, for example, metabolism and growth, hearing and sight, causes modification of blood constituents, influences reproduction and development of the foetus, and produces behavioural changes—even, it is feared, at levels below the present 10mW/cm² limit.

Acceptance of the Swiss value of 1mW/cm² will provide a greater safety margin for people exposed to such radiation in the microwave range, and one would hope that the proposed EEC directive will take into consideration the work undertaken by the Swiss, since the concept of "safe" standards of exposure is complicated for certain types of radiation by the fact that current safety standards measure *average* power produced over time.

P. G. Johnson, RS41331

BAND 1

The Editor
Radio Communication

Sir—It will be a great shame if a small portion of Band 1 is not allocated to radio amateurs when it becomes available. This is a unique and valuable section of the spectrum for experimentation.

I propose the section 48-48·6MHz, giving 48 12·5kHz channels, with the third harmonics falling in the amateur 144MHz band, making them easily policed and identifiable. Any fourth harmonics would fall on the IBA's Ch9 only. (As a tv technician in North Devon, I know of only one customer using this channel.)

With careful avoidance of specific local radio frequencies, second harmonics should not be any problem either.

These are my personal views; and I welcome comment or letters of support.

John Stacey, G8BXO

S-METERS AND THE T-MATCH ATU

The Editor
Radio Communication

Sir—May I be permitted to raise a couple of technical points; the first on S-meter readings and the second reference T-match atus.

As I understand it, an S9 signal is defined as 50μV across a 50Ω input—IARU Region 1 for frequencies below 30MHz. Thus P. J. Hart is indeed correct in believing that the TS830 (*Rad Com* July) is nearer the truth than many others.

Regarding the T-match atu (*Rad Com* August, and LAR Omni-match), whose popularity is presumably due to the ability to use receiving variable capacitors and the convenience of toroidal inductors; it should not be forgotten that they are high-pass filters. Thus the automatic protection against harmonic radiation given by the traditional pi-network is foregone. Admittedly Band 1 television is slowly being phased out, but the benefits of the ubiquitous pi-tank should not be forgotten.

J. W. Barker, G3WAL

OBITUARIES

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

Mr N. H. Baugh, G4AGF, ex-7Q7NB
Noel Baugh died on 15 September, aged 50. Although not so active recently, he had been a keen supporter of the Sparks RC in Carlisle. He was active on the hf bands using cw.

Mr A. Bryant, PhD, BSc, G4HQV
Arthur Bryant died on 4 October. He became a radio amateur after his retirement, but quickly became efficient on both ssb and cw on hf. He was keen to help other amateurs, especially blind operators, for whom he designed a talking frequency meter for use with transmitting equipment.

Mr M. J. Harwood, G3PMY
Martin Harwood died on 12 September, aged 52. He was an enthusiastic constructor, and gained a significant knowledge of the technical side of the hobby through experimentation. He was keen to help other amateurs, and shortly before his death had been giving morse practice sessions.

Mr M. V. Rubeck, G4DMO
Victor Rubeck died on 31 July, aged 75. He was a sea-going operator in the 'twenties, and was one of the radio operators on the ill-fated R101 airship. He lived in Brussels before the second world war, and held an early ON callsign. He was active in all aspects of the hobby before being called up. He gained the callsign G4DMO in the early 'seventies, and had since been very active on the hf bands on both ssb and cw. He was a committee member of the Reigate ATS, and a regular member of the RAOTA net.

Mr D. Thomas, G4GZR
Derek Thomas, who died on 4 October, was a keen home constructor and a member of Wolverhampton ARS.

Mr A. H. G. Waton, G3GGJ
Mr Waton died on 15 October. He was a member of RAEN, and had been secretary of Cambridge & DARS. He was an expert on sstv, and built the first WB9LVI digital slow scan converter and W0LMD sstv keyboard in Europe.

Also:

Mr Chalmers, RS14446, on 3 September;

Mr C. E. Dixon, RS21632;

Mr R. O. Fill, G6BQX, on 24 August;

Mr F. Friedl; OE1FF, on 3 October;

Mr M. H. Henley, RS49688;

Mr H. Lucas, RS49682;

Mr D. M. Owen, RS45639;

Mr D. Parker, RS49546;

Mr E. Pritchard, G3NMB, on 6 September;

Mr D. Reed, G4IS, in July;

Mr E. Sherlock, G3BQH;

Mr J. F. Squires, MBE, G3DBF, on 13 August *and*

Mr D. Whittaker, G8WOV.

CONTEST NEWS

1982 VHF National Field Day results

	OPEN SECTION	RESTRICTED SECTION
Winner	Norfolk VHF/UHF CG	Westmorland VHF Group
Runner-up	HADRABS & Addiscombe CG	Harwell ARS
Band leaders		
70MHz	South of Scotland CG	Westmorland VHF Group
144MHz	HADRABS & Addiscombe CG	Edinburgh DARC
432MHz	Norfolk VHF/UHF CG	Blackwood ARS
1·3GHz	The Hillbillies	Westmorland VHF Group
Leading GD	Southampton University CG	No entry
Leading GM	South of Scotland CG	Glenrothes DARC
Leading GW	Parallel Lines CG	Blackwood ARS
Leading GI	N.W. Ireland CG	Queens University RC
Leading GU	No entry	Guernsey ARS

The amount of time devoted by the co-ordinating adjudicator to this year's contest has been in excess of 100 hours. His tasks included: registration; receiving entries over a three week period; checking; requests for forms; dividing entries into bands for distribution to band adjudicators; bringing together the results; editing; cross checking; overall tabulating; and finally checking that a fair and reasonable result for this major contest could be ready for publication in the December issue of *Radio Communication*.

Registration

This year saw the introduction of site registration, which proved useful for inspection, and served to identify groups from their registered number on a master list, rather than having a group name followed by four different callsigns when sorting into bands and subsequently re-sorting. Some registrations did not give sufficient information, some groups changed their /P QTH and callsigns withour re-notification, some failed to register but sent in entries, others registered and did not send in entries. The committee are proposing a registration form for 1983.

Rules

Rule 13: "different QTH form on each band" was not observed by a large number of groups, who did not refer to the general rules in the January issue of *Radio Communication*. This rule was changed from that of previous years, 432/1,296MHz being the exception. Although scant publicity was given to the rule change, rules should be thoroughly read and understood before a contest. Non-compliance has resulted in loss of points.

Rule 8iii for the Restricted section produced raised eyebrows from the inspectors (restricted stations were mainly selected for inspection). 1983 rules will define more precisely the types of acceptable antenna.

Rule 19 resulted in a number of groups losing points because of bad levels of spurious radiation. Those who knowingly radiated bad quality signals, as reported by written statements on the 427 forms, were also penalized.

The VHF Contests Committee endeavours to keep abreast of contest requirements gleaned from comments, and tries to provide acceptable and interesting major contests over the year. It is the intention of the committee to be less tolerant of offenders against the rules, so read the rules, complete all information asked for on the forms, and post logs in good time to the correct address before the stated date.

Comments

The usual problems of weather, generators blowing up, generator regulation, mast head amplifiers and attendant relays are still in evidence.

"Bring back band multipliers, won't bother with 432MHz any more" — *Scunthorpe Group.*

"Return to double-sided log sheets, think of total weight of logs" — *Clifton Group.* (Try adjudicating double-sided logs).

"Not sure if the present scoring on 432MHz is worthwhile, although everyone is in the same boat, apply same rule as 70MHz" — *Horsham Group.*

"Water pouring into tent reached blower, which burnt out. Replacement obtained after 3h" — *Crystal Palace & Socam Group.*

"We all enjoyed the contest for the first time in five years" — *South of Scotland Group* (Who also supplied a meteosat printout of 4 July weather.)

"Try a contest where Continental stations do not count, score 1pt regardless of distance" — *Victory Group.*

"Horizontal rain, I can understand how people die of exposure" — *Bury Group.*

"Get rid of Sydelis" — *Hull Group.*

"Cat & Custard Pot Contest Group named after an adjoining pub" — *G8ULU.*

Awards

Congratulations to the overall winners and runners-up for both sections, and to the band winners. The Surrey Trophy will be awarded to the Norfolk VHF/UHF Group in the Open Section, the Arthur Watts Trophy to the Westmorland VHF Group in the Restricted Section, and the Tartan Trophy to the leading Scottish group, the South of Scotland Contests Group. Certificates go to the band winners and runners-up.

G8ACJ

70MHz

Over the years the committee has on numerous occasions spent time discussing the 70MHz band, particularly in the context of VHF NFD. The two main problems have been the inability of the band to support a 24h contest, and the geographical advantages and disadvantages. To some extent the imbalance is partially nullified by similar, and to some extent opposite, factors on the 1·3GHz band. Interesting

Tim Hodkinson, GU6JSC, operating the Guernsey ARS 144MHz station GU3HFN/P in the restricted section. A week before the event he received his licence on the day *before* his 14th birthday. *Photo:* GU3MBS

suggestions have from time-to-time been received from correspondents for balancing these anomalies. No simple, practical solution has yet appeared.

The committee decided, early this year, to tackle the "boring Sunday" problem, announcing their decision for radical changes at the VHF Convention. Reaction was almost universal disapproval. The logs with their "427" comments were awaited with some trepidation! The changes have been received with enthusiastic acclaim, the only criticism coming from conservative entrants who preferred that "it be left as it was". "Four metre cw, magic!" was, without doubt, the most appreciated comment. Some marginal changes to the rules have been suggested for next year. These will be incorporated.

The runners-up are both to be congratulated for outstanding logs from sites lacking geographical advantage. The best dx of the contest was 626km — GW3SNN and G4DDK scored 393km and 380km respectively.

A number of stations were inspected, the operators taking the opportunity to "bend the ears" of the inspectors, who in most cases were VHFCC members.

Only one serious "poor signal" complaint was received, the offender being docked 25 per cent. Invalid entries, due to non-registration, were used as check logs, and these were received from G4MEO/P and G5AQQ. *G5HD*

144MHz

The almost universal opinion was that conditions were generally flat, but several stations, particularly those in the west, noted an overnight lift which enabled good dx to be worked. The best contact made in the contest was DB7XX/P in FI46g, contacted by G4BAR/P on the Sunday afternoon when conditions seemed otherwise rather average. The HADRABS group established a substantial lead in the Open section, thanks to their ability to work a considerable number of Continental stations and also maintain a high contact rate despite the remoteness of their Dartmoor site. The east coast stations piled up their usual stack of Continental contacts but found it difficult to penetrate deep into Germany. The Welsh portables made plenty of contacts, but could not achieve the same scoring rates.

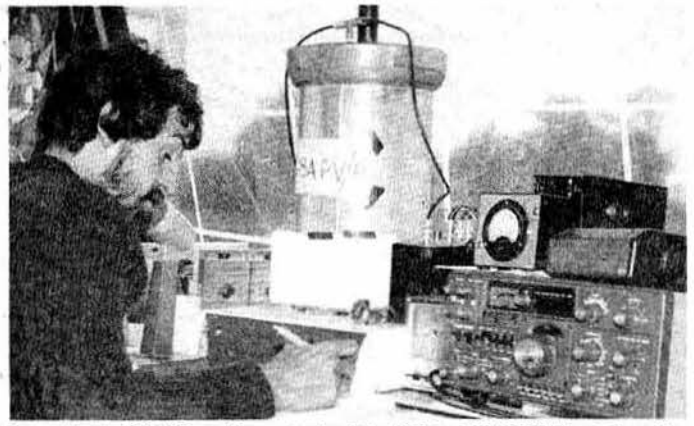
In the Restricted section GM8MJV/P of the Edinburgh DARC showed that quality not quantity of contacts is important, and became the first Scottish winner of a major 144MHz event for some time. The second place went to GW6GW/P, who had many more contacts but found dx scarce.

A few poor signal quality reports were received, but most were not sufficiently specific to allow action to be taken. In one case however two independent reports were received that a station had continued to radiate a very wide signal after being informed that a problem existed. Distances and equipment details indicated that receiver overload was unlikely, so the station concerned has been penalized. Looking through the cover sheets, many stations are using receiver front ends with diode ring mixers and the ubiquitous 3SK88 as the rf amplifier, and are in a position to be fairly certain that receiver overload is unlikely to occur.

Most logs were well presented, but some computer logs were poor. One contained about 50 contacts per page in minute print, and another had the columns arranged in random order, making checking very difficult. Callsigns logged without the /P suffix were the reason for loss of points in most logs.

Some comments from the entrants illustrate the usual crop of VHF NFD problems:

"Thanks for inspecting stations. Please continue to inspect stations" — *G6BRA/P;*



Peter Firmin, G8TYQ, at the controls of the Clifton ARS 144MHz station. The cylinder in the centre of the picture is an rf filter which helped to keep out the BBC Wrotham fm transmitter less than a mile away

Equipment used by leading stations:

OPEN SECTION

	Transmitter	Receiver	Antenna
G4BAR/P	FT225RD + 8877	Modified FT225RD	2 × 11Y at 40ft
G4APA/P	FT221R + 2 × 4CX250B	FT221R + Mutek	4 × 9Y at 50ft
G4MRS/P	FT221R + YL1440	Modified FT221R	2 × 2 × 14Y at 80ft
G3ZIG/P	FT221R + 2 × 4CX250B	FT221R + Mutek	4 × 11Y at 90ft
GW4LIP/P	TS700 + 2 × 4CX250B	TS700	2 × 16Y at 40ft

RESTRICTED SECTION

	Transmitter	Receiver	Antenna
GM8MJV/P	IC251	IC251	16Y at 25ft
GW6GW/P	FT221R	FT221R	13Y at 25ft
G3PIA/P	TS700S + PA	TS700S	17Y at 29ft

"For sake of safety had to close down early and leave site (the highest point in GI)" – *GI4MAC/P;* "Such was the dedication of one of our operators that he found he had a new son after the contest" – *G8UGT/P;* "How did the rain, which always comes one hour before the end, know it finished 2h earlier this year?" – *GW4ERP/P;* "QRM dreadful, but would still prefer 400 clean "valve" watts against 50 solidstate watts on the neighbouring hills" – *G4HRS/P;* "Station was put off the air by thunderstorm, with water pouring into the tent and burning out the blower" – *G4BWG/P;* "Very, very noisy. At one point the rf relays were clicking due to rf coming down the aerial!" – *G3WOR/P;* "Tried our hand at aircraft scatter using the Red Arrows, Lancaster, Spitfire and Hurricane aircraft that were using our bright orange tent as a turning marker in an air show on a nearby airfield" – *G3CNX/P*

Unregistered entries received from G3FJE/P, G8HRC/P and GW4ARC/P.

Check logs gratefully received from: G2SU/P, G8XTV, G6CW, G3YCW/P, G8LXY, G4HOL, G2MI, G6DCL/A, G6FDW, G2DHV. *G3XDY*

432MHz

Compared with last year's event, there was a considerable reduction in the number of contacts made by the leading stations. This would seem to have been a direct result of poor conditions, rather than any real reduction in activity, although there was a slight reduction in the number of stations submitting entries for the band. Comments on the band cover sheets described conditions as: "Ugh", – *G4KAL;* "Abysmal" – *GW4BRK;* "Is it worth it?" – *G8BQX.*

Equipment caused the usual run of headaches, but it is noticeable that there would seem to have been fewer stations where organizers felt that high power was really necessary. At GW4CLA "the gasfet joined the big contest group in the sky" while at G3SDS the "mast and aerial went awol on the morning of the contest". G4IRC seemed to have things tied up this year since the group comment that the "string in the K2RIW didn't break this time". Only two logs contained any comment on the subject of bad signals – could the message at last be getting through to the greater number of operators?

Congratulations to the leading stations and runners-up in both sections. Check logs are gratefully acknowledged from G4ENR/P. Unregistered entries were received from G4LOO/P, G4HRC/P, and GW4NLD/P. *G3LCH*

1,296MHz

The combined total entry was 12 up on 1981, although a few entrants wondered whether 1,296MHz was worthwhile in view of the small contribution from this band to the overall score – but see below. Equipment was much the same standard as last year, with a number of entrants using high power amplifiers having two or more 2C39s in a resonant cavity configuration. Leading stations used either multi Yagi arrays or dish antennas – the latter being on more than one occasion assembled on site.

Conditions were poor, although there was some ducting in the early hours of the morning and later on Sunday. The best dx worked was some 15 per cent down on 1981. The scoring system was changed to radial rings, and the absence of unfavourable comment is taken to mean universal approval. Adjudication was considerably simplified by the change. Some entrants disliked the method of calculating the overall result, preferring specified band multipliers as used several years ago. Another suggestion to increase the level of activity on 1,296MHz so that it can support a 24h contest was to adopt this year's 70MHz arrangement, which has proved so successful. This contest has both a phone and cw sections with repeat QSOs. This would of course exclude B licensees from part of the contest, but inspection of this year's entry reveals a total of five "B"s and three "B"s in the Open and Restricted sections respectively. Is some compromise possible? Further views are invited.

The problem of poor quality signals has now been encountered on this band and the guidance given by G2HIF in his notes concerning the adjudication of the 1981 144MHz section are worth reading again (see December 1981 *Radio Communication*). The comments on portable power supplies are particularly relevant. Overall the activity on 1,296MHz was sufficient to make operation on this band worthwhile. However to obtain the highest score it proved necessary to use 432MHz to attract stations to the higher band. Unregistered entries were received from G4GDG/P and G4DRS/P. *G3FZL*

Equipment used by leading stations

OPEN SECTION

	Transmitter	Receiver	Antenna
G4HWA/P	FT221R + transverter + linear. 6X2C39. 300W p.e.p. output	NEC64535. RF amp. Diode ring mixer	4 × 23-el Yagi at 50ft
G4ANT/P	2C39A mixer + 2C39A driver + linear. 2X2C39A. 300W p.e.p. output	2 × GAT4. RF amp (mast head). MM converter	4 × quad loop. Two 6-el Yagi at 50ft
G4JAR/P	FT225RD + transverter + linear. 6 × 3CX. 100AS. 300W p.e.p. output	MTF1400. RF amp (mast head)	4 × F9FT. 23-el Yagi at 32ft
G3XDY/P	FT221R + transverter + linear. 4 × 7289. 250W p.e.p. output	MGF1400. RF amp (mast head). Mixer. 2 × HP2800	4 × 26 quad loop Yagi at 75ft

RESTRICTED SECTION

G3SPJ/P	Linear 2C39. 25W p.e.p. output	NEC645-35. RF amp	2m dia dish at 2m
G3NNG/P	Linear. 3CX100A5. 18W p.e.p. output	NE645. RF amp. Ring mixer.	28-el Yagi at 20ft.
G3VCT/P	Linear. 2C39. 25W p.e.p. output	NEC645-35. RF amp. Ring mixer.	5ft dish at 27ft
G3OHM/P	7289 mixer + linear amp 7289. 20W p.e.p. output	NEC645-35. RF amp.	30-el quad loop Yagi at 25ft.

OPEN SECTION OVERALL RESULTS

Posn	Registration number	Club name	Total points	Band position 70MHz	144MHz	432MHz	1,296MHz
1	47	Norfolk VHF/UHF CG	3,264	6	4	1	2
2	111	HADRABS CG	3,052	4	1	2	3
3	024	Martlesham RS	2,919	21	3	3	4
4	011	The Hillbillies	2,802	12	2	10	1
5	003	Parallel Lines	2,645	5	5	6	5
6	012	Cotswold & Big M CG.	2,601	2	8	5	6
7	072	S Scotland CG	2,219	1	13	9	12
8	097	S Bucks CG	2,016	11	6	4	23
9	004	Quantock CG	1,685	11	20	8	15
10	136	Plymouth RCG	1,622	13	23	7	11
11	110	Leicestershire	1,616	34	35	21	7
12	007	Scunthorpe VHFG	1,577	27	16	19	10
13	087	PACT	1,454	24	18	11	18
14	041	Martlet CG	1,419	10	39	13	9
15	022	Cray Valley RS	1,408	18	9	12	30
16	034	Albright & Wil	1,387	15	10	14	28
17	052	Crawley ARC	1,380	23	24	16	16
18	075	Dunstable Downs	1,299	37	22	20	8
19	127	Hastings E & RC	1,276	22	7	25	–
20	042	Horsham ARC	1,216	38	12	22	19
21	103	Malvern Hills	1,203	16	36	24	13
22	094	S Manchester RC	1,198	25	31	18	20
23	025	Hornsea ARC	1,171	9	27	15	25
24	006	Worthing DARC	1,157	7	38	29	17
25	122	Grafton RS	1,057	33	41	17	14
26	029	Clifton	998	29	26	33	21
27	079	Preston ARS	979	3	46	45	–
28	124	Telford DARS	961	14	42	23	27
29	126	White Rose RS	959	8	32	32	36
30	050	Southgate ARC	954	17	21	30	40
31	030	Bournemouth RS	923	19	44	39	25
32	054	N Bucks CG	915	35	15	40	39
33	038	Cheltenham	869	39	19	34	37
34	081	Verulam ARC	819	32	37	42	22
35	018	Southampton URS	802	–	11	31	–
36	077	Victory CG	744	40	14	44	–
37	061	Kidderminster	721	36	45	26	–
38	117	Hull DARC	718	28	28	55	33
39	013	S Dorset RS	692	30	43	53	31
40	101	Newbury DARC	689	26	34	46	–
41	021	Newark DARC	679	20	53	36	–
42	017	RAF ARS	540	–	25	28	–
43	116	Tamworth ARS	515	–	40	35	24
44	090	Basingstoke RC	508	–	30	27	–
45	036	Southdown ARS	504	43	17	–	–
46	023	Bury St Eds RSCG	469	–	33	49	32
47	045	C Palace & Socom	459	–	29	12	–
48	002	Grimsby ARS	429	31	57	54	–
49	133	Barry C of FERS	415	28	54	52	–
50	026	Warrington ARC	381	37	55	51	–
51	064	Lincoln SWC	376	–	48	47	29
52	108	Chester DRS	373	49	47	41	33
53	051	Doncaster ARC	361	41	56	48	35
54	091	Turk's Head G	351	–	52	50	26
55	027	Northumbria	347	–	50	38	38
56	066	Leyland 100 VHFG	347	–	49	37	–
57	080	Bolsover ARS	275	–	51	43	–
58	049	N Bristol ARC	159	–	58	52	–
59	106	NW Ireland CG	73	–	59	–	–
60	001	Bridgend DARC	71	–	61	56	–
61	059	Kelso ARS	65	–	60	57	–

RESTRICTED SECTION OVERALL RESULTS

Posn	Registration number	Club name	Total points	Band position 70MHz	144MHz	432MHz	1,296MHz
1	060	Westmorland VHFG	2,914	1	13	10	1
2	082	Harwelll ARS	2,898	18	3	2	2
3	071	B Telecom T College	2,727	2	8	3	5
4	112	S Birmingham RS	2,711	6	19	5	4
5	099	RS of Harrow	2,509	10	6	6	10
6	119	Cat & Custard CG	2,496	17	7	7	7
7	128	Blackwood ARS	2,446	3	2	1	–
8	076	Reading ARC	2,428	4	15	11	6
9	035	Sutton & Cheam	2,318	9	5	4	20
10	039	Bracknell ARC	2,114	12	22	14	9
11	132	Surrey RCC	1,987	25	10	8	12
12	078	Gt Lumley	1,934	5	4	15	22
13	031	White Horse ARS	1,838	34	14	17	11
14	010	Maidenhead DARC	1,817	21	24	33	3
15	089	Norfolk ARC	1,786	19	12	9	–
16	086	Farnborough DRS	1,754	31	18	20	13
17	057	Coulsdon CG	1,710	14	39	18	14
18	067	St Neots DARS	1,658	35	11	13	21
19	048	Five Bells	1,655	22	9	42	18
20	015	Chiltern ARC	1,421	40	47	27	8
21	046	Edgware DRS	1,386	20	32	23	16
22	069	U of Surrey	1,366	7	35	32	–
23	068	Guildford DRS	1,355	15	38	29	23
24	040	Edinburgh DARC	1,335	47	1	48	–
25	070	Ayr ARG	1,284	8	27	28	–
26	009	Bristol ARC	1,283	32	36	36	15
27	105	Six Fifty CG	1,212	26	21	31	–
28	134	Guernsey ARS	1,161	30	40	41	19
29	135	Swindon ARS	1,140	13	29	39	26
30	008	N Kent RS	1,107	22	23	40	–
31	102	Shirehampton ARC	1,068	36	31	21	–
32	123	Glenrothes DARC	1,037	16	16	57	–
33	107	Queens URC	984	33	26	49	–
34	020	Mid Cheshire ARS	983	41	28	26	–
35	033	Derbyshire Hills	983	–	17	24	–
36	032	Exeter ARS	959	38	42	25	–

Posn	Registration number	Club name	Total points	Band position 70MHz	144MHz	432MHz	1,296MHz
37	028	Salisbury R & ES	929	–	20	16	–
38	053	S Walden DRS	929	27	49	38	–
39	085	Coulsdon ATS	926	44	51	43	17
40	014	Torbay ARS	876	46	34	22	–
41	109	Bolton QRP G	861	39	54	30	24
42	062	MTL CG	826	24	37	–	–
43	098	W Kent ARS	750	–	24	34	–
44	115	Bury RS	725	29	30	–	–
45	043	Burton/Derby CG	688	–	48	19	–
46	074	Conway Valley RC	647	–	32	44	–
47	088	Gt Peterboro ARC	579	–	50	37	–
48	055	Barnsley DARC	530	–	44	46	–
49	019	GM3TAL & GM3SHK	507	42	–	35	–
50	063	G6HIC & G4OCR	497	–	46	51	–
51	104	Saltash DARC	480	45	43	–	–
52	129	EMI Wells RC	433	–	45	53	–
53	130	Charnwood CG	431	–	55	47	–
54	084	SE London Raynet	422	–	53	45	–
55	138	Magherafelt ARS	389	–	41	56	–
56	096	B Stortford DARC	362	48	52	–	–
57	037	Mansfield ARS	291	–	58	50	–
58	118	Mid Wark ARC	286	–	57	55	–
59	044	Mexboro ARS	270	–	56	54	–

70MHz BAND RESULTS

OPEN SECTION

Posn	Callsign	Points	QSOs SSB	QSOs CW	QRA	Best dx km
1	GM3WOJ	2,876	123	86	XO26	570
2	GW3SNN	2,009	142	104	YN75	393
3	G3SYA	1,870	111	91	YO78	502
4	G4ALE	1,856	102	81	YK31	626
5	GW4HNS	1,688	133	90	YN75	363
6	G3MPN	1,504	84	74	AM07	514
7	G3YHM	1,503	120	80	ZK09	622
8	G3PSM	1,464	84	74	ZO71	560
9	G4GGD	1,444	84	78	ZN07	472
10	G4CIK	1,353	108	70	AK11	539
11	G2ASF	1,349	104	73	YL75	479
12	G3ZTZ	1,316	93	76	AN61	444
13	G4HTD	1,288	80	57	YK21	464
14	G3UKV	1,287	112	83	YM28	396
15	GW3UEY	1,264	106	73	YM54	440
16	G4BVY	1,259	113	86	YM79	461
17	G4AEZ	1,249	113	82	ZL42	536
18	G3TAA	1,245	88	74	AL65	554
19	G2BRS	1,175	96	59	YK19	456
20	G3TBK	1,174	103	70	ZN78	426
21	G4FAW	1,173	87	61	AM67	537
22	G3YYF	1,133	89	61	AK03	551
23	G3TIR	1,117	90	85	ZL76	593
24	G4BVE	1,101	103	66	ZN53	340
25	G4IRB	1,025	96	67	ZN61	316
26	G3UAX	1,019	68	69	ZL53	433
27	G4ERG	1,013	64	65	ZN49	410
28	G3RDM	1,008	61	58	ZN19	352
29	G3JKY	936	80	78	AL52	499
30	G3JRL	898	69	56	YK28	470
31	G4EBK	886	55	55	ZN38	406
32	G4DJX	880	100	64	ZL17	411
33	G3ZKE	849	65	55	AL06	495
34	G8LM	848	113	65	ZM26	389
35	G4BJM	790	86	70	ZM77	396
36	G4CTU	774	93	37	YM48	322
37	G4ARD	763	82	63	ZL18	438
38	G3SWC	699	58	67	ZK08	510
39	G4ILI	659	68	53	YL20	492
40	G4JMM	387	47	35	ZK07	495
41	G4NQX	289	40	9	ZN44	361

RESTRICTED SECTION

Posn	Callsign	Points	QSOs SSB	QSOs CW	QRA	Best dx km
1	G3JYP	1,642	87	64	YO29	475
2	G4DDK	1,311	112	86	YM10	380
3	GW4EAI	1,231	104	75	YL06	483
4	G3WGV	1,180	108	83	ZL54	561
5	G3UTS	1,177	66	49	ZO11	455
6	G4EYD	1,120	121	64	YM50	433
7	G4CWH	1,029	95	79	ZL41	409
8	GM3VMG	1,022	46	42	XO19	554
9	G3DCZ	1,014	94	72	ZN71	310
10	G3MLS	978	94	78	ZL06	506
11	G4NWT	956	95	55	AL45	524
12	G4DDN	954	66	63	YK18	457
13	G3FEC	929	92	67	ZL32	524
14	G4BFJ	922	93	64	ZL59	484
15	G3PJX	910	85	70	ZL69	486
16	GM3YOR	895	28	33	YQ64	606
17	G3LTY	889	58	53	AL76	567
18	G4HLX	870	94	62	ZL33	405
19	G3PDH	853	56	56	AM56	472
20	G3PSP	847	91	64	ZL29	447
21	G3TWG	810	88	72	ZL17	420
22	G4CW	805	86	48	AL51	480
	G4EMK	805	81	47	ZM29	
24	G4MTL	775	54	58	ZM80	432
25	G4FUU	764	75	65	AL51	498
26	G4HVR	740	53	60	YN37	359
27	G3PGN	736	79	54	AM72	452
28	GW3VKL	716	57	55	YL25	402
29	G3BRS	684	59	45	YN29	378
30	GU4ASO	640	34	30	YJ38	508
31	G4DKN	633	62	61	ZL66	467
32	G3TAD	603	74	39	YL49	394
33	GI3LLQ	599	53	–	XO61	451
34	G5RP	585	54	49	ZL34	532
35	G4FOH	565	71	36	ZM70	419
36	G4EQP	563	56	53	YL39	390
37	G3MMD	519	60	25	YN58	330
38	G4CIZ	498	55	20	YK13	404
39	G4AQB	480	55	20	YN38	324
40	G3NCL	455	56	47	ZL26	426
41	G4CAX	433	58	10	YN67	344
42	GM3TAL	391	9	18	XP15	592
43	G3WQK	374	42	31	AK12	404
44	G6HC	313	46	36	ZL59	326
45	G4GXK	254	33	–	XK39	460
46	G3LHJ	248	21	23	YK33	296
47	GM4LHW	204	16	8	YP42	479
48	G3TVW	270	34	30	AL02	310
49	GW3TZO	31	15	–	YN65	100

144MHz BAND RESULTS

OPEN SECTION

Posn	Callsign/P	Points	QSOs	QRA	Best dx	Km	Power
1	G4BAR	9,038	732	YK31	DB7XX/P	1,097	400
2	G4APA	8,028	663	AN61	DB5AQ	734	400
3	G4MRS	7,676	700	AM67	F6CJG/P	734	400
4	G3ZIG	7,635	648	AM07	DK8MA/P	906	400
5	GW4LIP	7,499	763	YN75	DF0DA/P	749	400
6	G3ZWK	6,916	598	AL45	DB6HL	701	400
7	G6HH	6,834	638	AK03	DL1ZC	704	400
8	GW4ERP	5,970	692	YN75	F6KFH	857	400
9	G4BUO	5,845	551	AL65	EA2DJ/P	917	150
10	GW3OXD	5,833	621	YM54	DB6KI	784	100
11	GD3KMI	5,286	532	XO59	F6ASS/P	694	300
12	G4HRS	5,223	592	ZK08	EB1IC	976	400
13	GM4CXM	5,179	450	XO26	ON1AEY	706	400
14	G8LNC	4,980	596	ZK07	DC6NY	856	280
15	G4NUT	4,274	471	ZM77	DK0OX	745	300
16	G4CDC	4,010	446	ZN49	DF1OY/P	659	400
17	G4MJC	3,884	385	AK12	DK0KE/P	817	100
18	G4NVA	3,809	548	ZN53	F1EKJ/P	794	190
19	G5BK	3,739	531	YL20	F1BOF/P	779	300
20	G4ETN	3,576	454	YL75	HB9XC/P	869	250
21	G3SFG	3,559	514	ZL42	DL4FAF/P	754	100
22	G8DDC	3,511	543	ZL18	DL9HAJ/P	660	400
23	G3PRC	3,399	403	YK21	DF8KV	777	400
24	G3WSC	3,350	429	ZL76	EA2DJ/P	894	150
25	G8RAF	3,211	395	YL68	DL2QC	758	200
26	G8APV	3,206	488	AL52	F6CGB/P	639	80
27	G3TEU	3,119	401	ZN07	DF0VK/P	661	300
28	G8GBY	3,069	343	ZN19	F1FPL/P	744	400
29	G4BWG	2,930	258	AL45	OK1KRA/P	842	300
30	G3TCR	2,864	398	ZL54	DL4FAF/P	714	100
31	G3FVA	2,827	447	ZN61	ON1KSI	721	400
32	G3XEP	2,756	407	ZO71	F6FAE	596	200
33	G6BSE	2,666	311	AM64	DB5AQ	685	400
34	G3WOI	2,516	397	ZL53	DL4FAF/P	737	250
35	G4JFW	2,413	385	ZM26	F6KFH	699	400
36	G4MHC	2,350	416	YM79	F1BDE/P	691	80
37	G3VER	2,314	396	ZL17	DJ2EO	601	130
38	G3WOR	2,236	361	ZK09	EI5EG	626	100
39	G4DZO	2,215	292	AK11	EA2DJ/P	876	400
40	G8TRS	2,179	361	ZM73	F6CJG/P	758	400
41	G3AFT	2,092	241	AL06	DK0TT	620	400
42	G3ZME	2,053	361	YM28	F6ASS/P	484	150
43	G8SDS	2,037	262	YK28	DL9GS	680	100
44	G8YCA	1,971	261	YK19	GM8FFX	690	200
45	G4GXP	1,808	320	YM48	PE1EBF/A	485	200
46	G3KUE	1,767	279	YO78	F0FF/P	514	100
47	GW3GIZ	1,763	318	YN65	F6HMQ/P	536	120
48	G5FZ	1,734	286	ZN58	F6KFH	724	400
49	G8WXA	1,727	225	YO67	F6HMQ/P	639	200
50	G4AAX	1,600	232	ZP62	DL0SE/P	758	150
51	G4MQH	1,482	286	ZN63	PA0WCR	505	100
52	G8YYB	1,455	225	ZL77	GI8YDZ	605	100
53	G3PJR	1,452	207	ZN78	F6KFH	707	100
54	GW4BRS	1,400	229	YL25	F6KCY/P	493	100
55	G4CDA	1,370	240	YN58	GM4IMX/P	554	250
56	G4AWU	1,239	208	ZN44	PE1AYA/P	438	150
57	G3CNX	975	151	ZN38	ON1AEY	410	100
58	G4GCT	865	134	YL38	ON7KM/A	497	40
59	GI3CFH	657	69	WO25	G3TCR/P	543	100
60	GM3VLB	605	70	YP28	G3WOI/P	486	60
61	GW4LNP	584	120	YL33	F9ON/P	450	100

SWL SECTION

Posn	Station	Points	QSOs	QRA	Best dx	Km
1	BRS32525	1,008	188	AL41	GM4GRC/P	572

RESTRICTED SECTION

Posn	Callsign/P	Points	QSOs	QRA	Best dx	Km	Power
1	GM8MJV	2,968	275	YP42	F0FOE	732	15
2	GW6GW	2,872	463	YL06	F1BDE/P	696	25
3	G3PIA	2,658	416	ZL33	DL9HAZ/P	734	25
4	G4EUZ	2,362	263	ZO11	F6ASS/P	690	25
5	G3LQP	2,347	383	ZN71	F6AMQ/P	542	25
6	G3EFX	2,261	349	ZL06	GM4JLY	585	25
7	G8YMD	2,220	269	AL76	DK0ON	583	25
8	G4HUP	2,178	337	YM10	DF0OK/P	648	25
9	G8NWM	2,132	274	ZM29	F6EKJ/P	695	25
10	G4DDY	2,066	322	AL51	DL0LO	551	25
11	G8BBK	1,882	270	ZM70	F6KFH	630	25
12	G4ARN	1,756	200	AM56	DK2BJ/P	537	25
13	G3FDW	1,720	203	YO29	F0FF/P	582	25
14	G8FXG	1,707	284	ZL34	DF0VK/P	647	25
15	G4CDJ	1,679	306	ZL54	DF0OK/P	548	18
16	GM4GRC	1,668	165	YO64	F0FF/P	745	25
17	G6APZ	1,616	286	ZN52	PA0XMA	600	12
18	G4EFY	1,613	357	ZL66	EI5DD	567	25
19	G8RGQ	1,570	291	YM50	PA0WRC/P	525	25
20	G3FKF	1,546	217	YL80	DL0CK/P	620	23
21	G4LBJ	1,507	286	YN37	ON1RN/A	594	10
22	G6BRA	1,457	191	YK18	F6BSJ	695	25
23	G8TNK	1,329	263	AL51	GM8MJV/P	518	25
24	G3WKS	1,239	196	AL73	DL4FAF/P	591	25
	G3WKX	1,239	232	ZL17	DF0DA/P	553	15
26	GI4MAC	1,228	118	XO61	F0FF/P	660	25
27	GM8ZGC	1,200	115	XO19	F0FF/P	655	10
28	G3ZTT	1,184	251	YN67	F6ASS/P	543	24
29	G8SRC	1,178	230	ZL32	GI4MFT	485	10
30	G6BRS	1,155	227	YN29	F0FF/P	478	25
31	G4AHG	1,116	192	YL39	PA3CBK/P	467	25

Members of the Shirehampton ARC VHF NFD team at their site near Bath. *Photo:* G3YHV

Posn	Callsign/P	Points	QSOs	QRA	Best dx	Km	Power
32	GW6TM	1,115	158	YN52	F6ASP	460	10
	G3ASR	1,115	233	ZL29	F6ASS/P	667	25
34	G3NJA	1,103	146	YK33	PE0MAR/P	551	15
35	G3IGO	1,094	190	ZL41	GM4GRC/P	536	22
36	G8UGT	1,054	174	YL49	GM4GRC/P	535	25
37	G8MTL	1,052	205	ZM80	GI4GTY/P	470	25
38	G6GS	1,050	255	ZL69	GI8YDZ	609	25
39	G4KKC	1,027	249	ZL59	DL0SE/P	542	25
40	GU3HFN	1,013	106	YJ38	GM4CXM/P	593	25
41	GI4MFT	987	101	WO27	F6ASP/P	684	25
42	G4ARE	979	128	YK13	PE0MAR/P	541	15
43	G8SAL	966	120	XK39	G3FDW/P	487	25
44	G6AJ	918	168	ZN33	ON7KM/A	510	10
45	G3ORA	909	157	YL68	F6KCY/P	451	10
46	G4OCR	903	198	ZM04	F6HMG	539	25
47	G3CAR	836	201	ZL26	F6HMQ/P	427	25
48	G6CHE	822	192	ZM13	PA0WRC/P	498	10
49	G4KF	818	130	AM72	DK4LC/P	532	25
50	G4EHW	798	140	ZM48	PA0WRC/P	415	12
51	G4FUR	794	178	ZL59	F1KNO	495	10
52	G6AIG	707	147	AL02	GD3KMI/P	350	20
53	G8EZM	695	163	ZL36	F6HMQ/P	412	12
54	G4AGJ	692	104	YN38	ON1RN/A	581	10
55	G4ISN	645	157	ZM14	PA3CBK/A	390	10
56	G4BTS	508	90	ZN35	F6HRO	571	13
57	G3GQC	507	112	ZN64	ON7KM/A	466	20
58	G8TMI	358	68	ZM73	GI4EFF/P	403	25

432MHz BAND RESULTS

OPEN SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km	Power
1	G4LOJ	3,155	273	AM07	DK0OXD	675	400
2	G8PUB	2,740	231	YK31	PA0THT	760	400
3	G4IRC	2,481	257	AM67	F6ETI	589	400
4	G8TFI	2,396	246	AL45	GM3SHK/P	623	400
5	GW4BRK	2,325	274	YN75	DK8VR/A	777	300
6	GW4CLA	2,195	286	YN75	DK8VR/A	774	400
7	G4DGU	1,657	166	YK21	DF3EE	768	400
8	G4DSF	1,607	190	YL75	DF1FX/P	826	350
9	GM4DIJ	1,492	124	XO26	F0FF/P	658	400
10	G3YTE	1,439	179	AN61	F1KNO	654	70
11	G3ZLL	1,252	216	ZN53	PA0LVO	584	90
12	G4FAM	1,237	151	AL65	GM3SHK/P	655	150
13	G4GZO	1,173	159	AK11	GM4DIJ/P	539	150
14	GW3TGL	1,104	160	YM54	DL2KBB	775	100
15	G4EKT	997	133	ZN07	F0FF/P	469	130
16	G3JKF	982	151	ZL76	DL0BX/A	537	400
17	G4EYV	961	111	AL06	GM4DIJ/P	510	100
18	G3UHF	954	168	ZN61	F6FJE/P	526	100
19	G4GZA	934	126	ZN49	F6FJE/P	515	100
20	G4DDC	928	170	ZL18	PA0WRC/P	452	100
21	G4FOX	919	161	ZM26	F6FJE/P	465	150
22	G3WZT	908	144	ZK08	DL0BX/A	508	250
23	G4NKC	886	163	YM28	DL2KBB	634	150
24	G4GFX	862	154	YM79	PA3BPI/LX/P	632	50
25	G8BQX	843	113	AK03	DF7VX	564	100
26	G8NTU	796	154	YM48	EI5DD/P	408	50
27	G8JYN	782	131	ZL54	DL0BX/A	550	50
28	G3RAF	773	125	YL68	PE0MAR/P	464	40
29	G4FNL	713	129	ZK09	F1KNO	465	80
30	G3RWL	711	124	ZL42	PA0EZ	483	100
31	GD4KMI	685	73	XO59	G8TFI/P	473	60
32	G8LVO	671	100	ZO71	F0FF/P	505	100
33	G4DBW	641	115	AL52	GM4DIJ/P	530	100
34	G8HZK	602	122	YL20	DJ9DL	642	100
35	G8HWZ	587	123	ZM73	PE0MAR/P	383	80
36	G4HVC	585	107	ZN78	F6FJE/P	485	50
37	G8BQO	491	67	YO67	G8DPV	433	50
38	G6AAX	488	56	ZP62	G8PUB/P	531	100
39	G4LFM	483	86	YK19	PE0MAR/P	461	10
40	G4MEZ	482	105	ZM77	DL2KBB	494	60
41	GW8GIZ	472	84	YN65	G4GZO/P	346	40
42	G4IVW	456	102	ZL17	GM4DIJ/P	415	50
43	G4MQH	447	106	ZN63	F0FF/P	401	45
44	G8HUL	445	97	ZK07	GW4CLA/P	285	25
45	G8RIP	421	77	YO78	G8PUB/P	393	15
46	G2CPM	420	100	ZL53	G4EKT/P	291	15
47	G6COL	397	80	ZN58	F0FF/P	394	50
48	G3UER	389	77	ZN44	GM3SHK	362	50
49	G8XJK	356	60	AM64	F6FJE/P	363	50
50	G6GGE	331	84	ZL77	PE0MAR/P	380	10
51	G8XVJ	288	58	YN58	GM3SHK/P	319	10
52	G8TEA	254	55	YL38	GM4DIJ/P	380	35
53	G3SDS	210	42	YK28	G4LOJ/P	358	100
54	G4KAL	192	42	ZN38	G8PUB/P	406	10
55	G3AMV	155	36	ZN19	G6EU/P	368	30
56	GW4LNP	19	7	YL33	G4LFM/P	125	10
57	GM4NLJ	18	6	YP28	G3PRD/P	107	6

RESTRICTED SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km	Power
1	GW4JKV	985	151	YL06	F1KNO	665	10
2	G4CXJ	847	158	ZL33	DL2KBB	544	25
3	G8JBZ	799	150	YM10	F0FF/P	398	25
4	G4CMU	789	137	ZN71	PA0EZ	490	20
5	G8OHM	765	152	YM50	DL2KBB	592	20
6	G4JWD	736	129	ZL06	F6FJE/P	411	25
7	G3YMD	697	87	AL76	DK8VR/A	420	25
8	G3ZPB	677	117	AL51	GM4DIJ/P	498	19
9	G4DYC	665	91	AM56	DL4EA	419	25
10	G3PRD	648	66	YO29	F0FF/P	582	25
11	G3SCZ	599	114	ZL54	PA0EZ	456	25
12	G3VCP	587	85	AL45	DF7VX	544	25
13	G8ZOO	583	122	ZM70	GM4DIJ/P	419	25
14	G4DDL	580	90	YK18	PA0EZ	549	20
15	G4KUX	562	62	ZO11	F8FJ	697	25
16	G8NQP	504	90	YL80	-	-	12
17	G3SEK	503	104	ZL34	PA3BPC/P	496	10
18	G4FKK	490	99	ZL59	GM4DIZ/P	484	25
19	G8TNE	480	99	ZM13	F0FF/P	345	10
20	G4MBZ	476	102	ZL66	GD4KMI/P	413	25
21	G4DVV	461	92	YL39	ON7WR	481	25
22	G8NJA	444	57	YK33	F1HQT/P	409	15
23	G3SHY	442	88	ZL29	GM4DIJ/P	448	25
24	G8ROU	432	100	ZN52	F0FF/P	475	12
25	G4KXR	426	58	YK13	G4LOJ/P	404	17
26	G8ZTT	423	87	YN67	G8BKE/P	335	10
27	G4LWA	397	96	ZL26	GM4DIJ/P	426	10
28	GM3THI	394	38	XO19	G4FAM/P	542	10
29	G3TLM	393	85	ZL69	G8LVO/P	325	10
30	G8HXE	391	71	YN38	F0FF/P	476	10
31	G4AKC	382	74	YN37	F0FF/P	480	10
32	G4DLD	365	89	ZL41	G4EKT/P	283	10
33	G3LVW	356	84	ZL17	GM4DIJ/P	421	15
34	G4BIA	328	58	AL63	GW4CLA/P	328	10
35	GM3SHK	320	32	XP15	G4FAM/P	654	25
36	G4LAW	311	71	YL49	G8BQO/P	302	10
37	G4DXW	305	61	ZM48	PA0EZ	375	10
38	G4HPU	304	62	AM72e	PA0EZ	333	10
39	G4LDL	297	69	ZL32	GM4DIJ/P	407	10
40	G4CW	288	66	AL51	PA3BPC	340	10
41	GU8NIS	286	32	YJ38	G3ZLL/P	427	25
42	G8VPC	285	56	ZM29	GM4DIJ/P	367	18
43	G4LRV	284	64	ZL59	F6CER	370	10
44	GW8WFS	267	49	YN52	G8TFI/P	377	10
45	G6CSY	231	72	ZL36	PE0MAR/P	343	2
46	G6AJ	217	57	ZN33	G4DSF/P	298	10
47	G8ZOG	210	64	ZM14	GM4DIJ/P	315	10
48	GM4BWT	208	26	YP42	G3YTE/P	359	10
49	GI4LGP	202	28	XO61	G8PUB/P	419	25
50	G8UIO	200	54	ZM73	G4GZO/P	175	11
51	G6HIC	190	58	ZM04	F0FF/P	373	4
52	GW6BRC	181	43	YL25	F0FF/P	332	10
53	G6EMI	172	54	YL68	GW4CLA/P	206	0-3
54	G4NXS	127	39	ZN35	G8TPI/P	268	10
55	G3GQC	113	44	ZN64	G4IRC/P	204	10
56	GI4LVC	98	14	WO27	G4CMU/P	431	10
57	GM4MOX	45	11	YQ64	GW4BRK/P	345	25

432MHz

LISTENER SECTION

Posn	Station	Points	QSOs	QRA	Best dx	Km
1	BRS45019	179	31	ZN40	G8PUB/P	425
2	BRS32525	135	45	AL41	G4DGU/P	294

1,296MHz BAND RESULTS

OPEN SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G4HWA	763	95	AN61	DL6CX	498
2	G4ANT	684	74	AM07	DL0HC/P	458
3	G4JAR	669	61	YK31	PA0EZ	649
4	G3XDY	668	83	AM67	GM4BYF/P	492
5	GW4CBW	631	86	YN75	PE0MAR/P	502
6	GW4KGC	606	95	YN75	F6DZK	594
7	G3LRS	582	98	ZM26	DL6CX	525
8	G4CPE	378	88	ZL18	GM4BYF/P	423
9	G3YKI	373	61	AK11	G3SPJ/P	460
10	G4CCH	370	52	ZN49	G8AGU/P	385
11	G8AGU	346	36	YK21	F1FHI	448
12	GM4BYF	320	25	XO26	G3MCD/P	502
13	G4CDQ	279	53	YM79	G3SPJ/P	291
14	G3MCD	262	42	AL06	GM4BYF/P	505
15	G4HRY	237	34	YL75	G4ANT/P	369
16	G3GRO	236	54	ZL76	PE0MAR/P	365
17	G3LOI	221	45	ZK09	PE0MAR/P	332

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
18	G4BOH	193	47	ZN53	GM4BYF/P	263
19	G3NPF	185	44	ZK08	GW4CBW/P	299
20	G4NTY	173	39	ZN61	G3YKI/P	285
21	G3GHN	172	43	AL52	GW4CBW/P	302
22	G3WFM	155	49	ZL17	G4JAR/P	260
23	G4NBS	121	29	AL45	GW4KGC/P	326
24	G4FWC	111	29	ZM73	G4JAR/P	230
25	G3VPC	109	25	YK19	G4ANT/P	339
26	G6AWM	95	30	ZL77	G4HWA/P	230
27	G4IUT	86	24	YM28	G4ANT/P	265
28	GW3NZS	81	17	YM54	G3XDY/P	318
29	G3VRD	76	23	ZN58	G3SPJ/P	198
30	G3RCV	71	21	AL65	G3LRS/P	207
31	G3SDO	67	15	YK28	GW3CBW/P	267
32	G8SDK	47	15	AM64	GW4KGC/P	273
33=	G3POY	45	13	ZN19	G4ANT/P	161
	GW8AAP	45	13	YN65	G3VCT/P	220
35	G4NKV	31	13	ZN44	G3LRS/P	91
36	G4MIC	30	10	ZO71	G4CCH/P	122
37	G8IVO	27	9	YL20	GW4CBW/P	150
38	G8PNN	12	4	ZP62	G8SFI	151
39	G4MEJ	11	7	ZM77	G8IZV/P	72
40	G3ZVW	5	3	ZL42	G3VCT/P	76

RESTRICTED SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G3SPJ	351	37	YO29	G3YKI/P	460
2	G3NNG	328	69	ZL33	F6DZK	405
3	G3VCT	262	64	ZL17	GM4BYF/P	396
4	G3OHM	254	51	YM50	GM4BYF/P	314
5	G3WOH	241	45	YM10	G4JAR/P	298
6	G3ULT	188	53	ZL45	G4ANT/P	253
7	G4ICM	175	29	AL76	GW4KGC/P	366
8	G3COJ	161	43	ZL26	G4JAR/P	254
9	G4BRA	159	27	YK18	PE0MAR/P	471
10	G4AUF	142	38	ZL06	G4JAR/P	253
11	G8IZV	139	35	ZL34	G4ANT/P	234
12	G8TB	126	40	AL51	G4JAR/P	280
13	G4FRS	120	38	ZL66	G4ANT/P	239
14	G4DMA	107	33	ZL59	GW4KGC/P	275
15	G4MCQ	86	21	YL49	G4HWA/P	250
16	G3SHY	70	26	ZL29	GW4KGC/P	245
17	G3ZMF	63	25	ZL59	G4HWA/P	210
18	G4ODA	55	15	ZM29	GW4KGC/P	190
19	GU3KFT	49	7	YJ38	G3YKI/P	239
20	G4CMU	38	10	ZL33	G3NNG	172
21	G4LIN	31	11	ZM70	GW4KGC/P	227
22	G4OCQ	23	5	ZO11	GW4KGC/P	209
23	G5RS	17	9	ZL69	G4CPE/P	70
24	G8ZZM	12	6	YN38	GW4KGC/P	79
25	G4IGY	6	2	ZN07	G8WYR/P	78
26	G8SFM	1	1	ZL32	G3NNG/P	13

Affiliated Societies Team Contest 1983 rules

IMPORTANT RULE CHANGE. Teams should note that the rules for this contest have been changed for 1983. The requirement that stations should send "AFS" has been dropped.

1. The general rules for RSGB hf contests, published in the January 1982 issue of *Radio Communication*, will apply.
2. **When.** 1300 to 1700gmt, Sunday 9 January 1983.
3. The Affiliated Societies Team Contest is a competition between teams of stations, each team or teams representing an RSGB affiliated society. Each such society is encouraged to enter as many stations and teams as it can.
4. **(a)** A society entering one team will have its placing determined by the aggregate scores of the five highest scoring stations in its team.
   (b) A society may enter more than one team. The aggregate scores of the five highest scoring stations will be placed in team "A", the next five highest scoring stations placed in team "B", etc.
5. **(a) Eligible entrants.** Each operator must be a member of the society he represents, but need not be a member of the RSGB.
   (b) Each station may be single- or multi-operator, but no operator may use more than one callsign during the contest period.
   (c) All stations representing a society must be operated within 50 miles of the normal society meeting place.
   (d) No station may represent more than one society.
   (e) In the case of a society with national coverage, eg RNARS, each team may define a different society meeting place, but this should be a place of recognizable significance, eg a naval base. For all purposes, other than the indication of affiliation, each such team entry will be considered to be entirely separate.
6. **Contacts.** CW (A1A), only in the band 3,510 to 3,590kHz.
7. **Exchanges.** Only RST and serial number commencing with 001 need be sent.
8. **Scoring.** Each contact will be worth 10 points.
9. **Entries**
   (a) Each individual entry shall conform to the general rules. All such entries from one society are to be sent in one package to RSGB HF Contests Committee, c/o R. A. Treacher, BRS32525, 79 Granby Road, Eltham, London, SE9 1EH. Packages underpaid and bearing postage-due stamps will be returned to the sender.
   (b) Each package must include a declaration signed by an officer of the society that each entrant is a member of that society, and the normal meeting place address must be given.
   (c) There should also be included a note stating the number of teams representing the society. If the package does not include this information it will be assumed that the society wishes to enter only one team.
   (d) Packages must be postmarked not later than 24 January 1983.
10. An individual entry will be invalid if more than 20 per cent of the points claimed are for contacts with members of the entrant's own team.
11. **Awards**
    (a) The Edgware Trophy will be awarded to the leading affiliated society.
    (b) A certificate of merit will be awarded to the station having the highest individual score.
    (c) A certificate of merit will be awarded to the leading affiliated society in each RSGB zone.

RSGB Cumulative Activity Periods 1983 rules

The next series of activity periods will be held in January 1983. As a result of comments following the last event, there are several changes to the rules. First, the number of sessions on 1·8 and 3·5MHz has been reduced to two on each band in accordance with the wishes of most entrants. To meet the many suggestions for additional bands, two sessions have been added on 28MHz. These extra periods are experimental and the HF Contests Committee will be pleased to hear from competitors as to whether they should become a regular feature.

There were also comments regarding the omission of a receiving section and the committee will welcome logs from listeners and class-B licensees. These will be tabulated separately in the results classifications. Club activity, either from club stations or by individual club members will be welcomed, and secretaries are asked to publicize and encourage their members to take part in these mini-contests. Club membership should be shown on the entries so that proper recognition can be given in the results.

1. **Aims.** To encourage activity on cw from newly licensed amateurs and to provide training and practice for potential contest operators and listeners.
2. **Eligible entrants.** Members of RSGB or members of any RSGB affiliated society.
3. **Sections.** CW (A1) only, single-operator only from individual entrants, multi-operator from club entrants (all calls must be shown on entry).
4. **Frequencies.** 1·810-1·860MHz, 3·540-3·590MHz and 28·000-28·050MHz.
5. **Periods. 1·8MHz** 2000-2200gmt Monday 3 January, Wednesday 19 January.
   3·5MHz 1000-1200gmt Sunday 2 January, Saturday 8 January.
   28MHz 2000-2200gmt Tuesday 11 January, Thursday 27 January.
6. **Contest call and exchange.** CQ Test. Exchange RST and serial number starting at 001.
7. **Scoring.** One point per completed contact.
8. **Additional information.** Entrants may operate in as many sections as desired. The scores for each session will be shown separately and a station may be worked once in each session. Listeners may log each side of the contact and should show the RST and serial number that was transmitted by the station being logged and the callsigh of the station being worked. Listeners may claim one point for each complete log entry.
9. **Entries.** To R. L. Glaisher, G6LX, 279 Addiscombe Road, Croydon CR0 7HY, to arrive not later than Wednesday 9 February 1983.

70MHz CW Contest rules

1000—1500gmt, 16 January 1983.

The following general rules, published in the January 1982 issue of *Radio Communication* will apply: 1, 2, 3, 4a, 5a, 6b, 7a, 9, 10a, 11a, 12a, 13-26. All entries and checklogs to: Mr M. Pharoah, G3LCH, 49 Streathbourne Road, London SW17 8QZ.

ROPOCO 2 Contest 1982 results

Once again ROPOCO has proved to be a successful, high-speed, quick-fire contest. Two hours of figures and letters being exchanged around the country which, judging by the comments in the logs, was enjoyed by all participants. An increase in the number of logs received is also a sign that a different type of contest is proving to be very popular.

The winner is G3XTJ by the margin of *one* contact over G4MCC, operated by G4HIU. The equivalent of two contacts further behind, taking third place, is G3SXW.

A small book could be written entitled *"The Life of a Postcode"* when adjudicating this contest. Of the 40 known postcodes that started out, only *two* ended up correct after being exchanged around 50 times. A further five were recognisable having only had one character changed. The rest were anybody's guess as to where and how they started their travels. How the postcode NE61 2AY could end up as the last code received in four logs is beyond the comprehension of the adjudicator. Does anybody recognize it?

Only one unmarked duplicate was found, this resulting in a loss of 100 points under the HF Contest Committee's current policy on this subject. It pays to check your log! Other points worth noting from the logs—to send N for 9 can cause problems as does the writing of 0 and O, I and 1. Please try to clearly differentiate next year. The check log from G3LQI was received with thanks. *BRS20249*

Posn	Callsign	Points	Posn	Callsign	Points
1	G3XTJ	530	21	G3SHY	350
2	G4MCC	520	22	G3ORY	330
3	G3SXW	500	23	G4HZF	326
4	G4BUO	486	24	G3MCK	318
5	G4DRS	480	25	G3HKO	310
6	G4ARI	474	26	G4KZD	308
7	G3NOM	470	27	G3WJS	306
8	G3UFY	456		G4IZB	306
9	G3KHZ	446	29	G3ZZD	298
10	G3TXF	440		G4BLX	298
11	G3WVG	436	31	G4KDL	284
12	G3YCP	418	32	G4IXF	278
13	G4KGG	416		G4JKW	278
14	G4BOU	412		GW3SB	278
15	G3NKS	408	35	G4JQL	268
16	G3CCZ	394	36	G3AWR	260
17	G3JKS	386	37	G4OKN	240
18	G4EBK	382	38	G3MKR	188
19	G4KRS	364	39	G3GMM	178
20	G4CZB	356			

March 144/432MHz Multi-band Contest results 1982

Coming at a time of confusion with regard to licence conditions, several entrants felt that activity on 432MHz was lower than usual, and this does seem to have been reflected in the number of single-operator entries on this band. However, the leading stations seem to have been able to find the activity.

The popularity of the multi-band contest generally seems to be increasing, with very few entrants expressing views against the use of more than one band. However, the view was expressed that only one callsign should be used. Most logs contained no comment at all on this point, so it must be assumed that most groups prefer the "mini-field day" approach, although it is known that at least one group did not compete, because they would have liked "something a little different".

There were allegations of poor signals made against several stations, but none were more than isolated cases. There is no doubt that a high power contest station on a local hill can cause considerable receiving problems, particularly if the receiving equipment is not usually subjected to a very high signal level. However, contestants are reminded that politeness goes a long way in keeping local fixed station operators happy about the use of "their area" by groups often based many miles away. Equally, anonomous comments, repeatedly made on the frequency being used by a competing station, are not likely to be very well received by even the most conscientious contest operator. A little common sense applied on both sides would clear many bad signal situations very quickly.

The completed logs were generally of a very high standard, and very few points were deducted. A number of entrants did not enclose a multi-band cover sheet and in these cases their achievements are shown only in the band tables. The method of giving the QTH in a different form on each band is now generally understood and there were few cases of obvious cross checking*. A few logs contained remarks against the passing of QTH as well as QTH locator but this is obviously an accepted procedure by all but a few contestants.

The leading stations are congratulated, and checklogs are gratefully acknowledged from G8XTV, G3SVW/M, G8NQP, G8CKC, G4LAW/M, G8NRJ/A, G8RAF, G8UOV, G6EIP and G4LRS.

*Rule 13

G3LCH

MULTI-OPERATOR SECTION

Posn	Name of group	Points scored 144MHz	432MHz	Overall score
1	Parallel Lines Contest Group	1,000	878	1,878
2	HADRABS Contest Group	816	1,000	1,816
3	Mudhoppers	786	401	1,187
4	Norfolk VHF/UHF Contest Group	655	512	1.167
5	RS of Harrow	495	365	860
6	Albright & Wilson ARS	505	352	857
7	PACT	380	386	766
8	Dau a Deugain	–	683	683
9	Harwell ARS	273	394	667
10	DJ & JM Brakespear	564	95	659
11	Hastings E & RC	538	–	538
12	Five Bells	392	126	518
13	Victory Contest Group	472	–	472
14	East Kent RS	243	163	406
15	Malvern Hills RAC	197	201	398
16	Brass Monkey Contest Group	221	172	393
17	Southdown ARS	359	–	359
18	Isle of Man ARS	269	55	324
19	South Manchester RC	182	141	323
20	North Bucks Contest Group	220	103	323
21	University of Kent ARC	317	–	317
22	Coulsdon Contest Group	189	127	316
23	Tamworth ARS	152	139	291
24	Wirral & District ARC	200	47	247
25	Mid-Ulster ARC	236	–	236
26	Fareham & District ARC	168	35	203
27	Southgate RC	202	–	202
28	Giant Contest Group	182	16	198
29	Barnsley & District ARC	163	34	197
30	North Wakefield RC	153	36	189
31	White Rose ARS	111	67	178
32	Chris Dunn Group	139	29	168
33	Abingdon Contest Club	143	–	143
34	Lincoln Shortwave Club	104	37	141
35	Mexboro & District ARC	104	35	139
36	West Mercia Contest Group	133	–	133
37	Bury St Edmunds RS	131	–	131
38	Stevenage Contest Group	78	33	111
39	Midland ARS	65	23	88
40	Notts & Derby Border ARC	63	21	84
41	IBM ARC	64	18	82
42	West Ulster ARC	54	3	57
43	King Edwards School ARES	50	–	50
44	Peter Young Group	22	–	22

SINGLE-OPERATOR SECTION

Posn	Callsign	Points scored 144MHz	432MHz	Overall score
1	GJ4ICD	1,000	618	1,618
2	G3JXN	339	1,000	1,339
3	G6DDK	708	–	708
4	GM8YJU	553	–	553
5	G6FPU	216	266	482
6	G4JZF	322	43	365
7	G3NVO	219	–	219
8	G4MWD	200	–	200
9	G8ITS	3	186	189
10	G8LXY	29	125	153
11	G8YYV	146	–	146
12	G8XWA	99	–	99
13	GW6FLU	242	11	85
14	G8UYD	82	–	82
15	G6DTD	74	–	74
16	G4ASL	61	–	61
17	G8NMQ	35	24	59
18	GU6BNH	40	–	40
19	G4DMW	25	–	25

144MHz MULTI-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G4LIP/P	8,675	682	AN61	DK8ZB	758
2	G4BAR/P	7,083	664	AL47	DL7BAC/P	726
3	G4DEZ/A	6,815	602	AL34	DB2RR	806
4	G3ZIP	5,680	501	AM27	DL6SAP/P	650
5	G8RZP	4,901	531	AL45	DF2HC	783
6	G8SJP/P	4,756	406	ZN50	F2YT/P	951
7	G6HH/P	4,672	510	AK03	F1HI	791
8	GW3OXD/P	4,381	634	YM54	DF9KT	683
9	G3EFX/P	4,295	519	ZK10	DC6NY	803
10	G8LNC/P	4,097	608	ZK06	DK0IK/P	767
11	G3ZWK/P	3,753	461	YL29	–	–
12	G4ANB	3,607	544	ZL34	DL0UI	662
13	G3YMD/P	3,583	409	AL76	DF2HC	775
14	G8ZHP	3,398	336	ZM29	DK8ZB	759
15	G3WFW/P	3,295	544	ZN61	F0TA/P	770
16	GM3OUL/P	3,273	312	XO26	–	–
17	G3WQK	3,112	333	AK12	DK3JU	653
18	G2BRS/P	3,102	431	YK19	GM4IRD	691
19	G8YDW/P	2,832	487	ZN11	F1FHI	716
20	G3UKC	2,754	325	AL56	GM4JLY	669
21	G3PIA/P	2,368	423	ZL33	DF3DZ	630
22	G2CH/P	2,352	446	ZM45	LA1ERO	820
23	GD4IOM	2,329	234	XO67	F6DWG/P	679
24	G8JC/A	2,190	381	YM58	DL0BSA/P	663
25	G6EKR/P	2,104	314	AL56	DD7FG	564
26	GI4BAC/P	2,051	176	XO61	F1KBF/P	675
27	G8NCT/P	1,923	377	ZL18	DL6FAW/P	588
28	G4MEJ/A	1,910	328	ZM77	F0TA/P	622
29	G3SFG/P	1,755	389	ZL29	F1EWP	572
30	GW4MGR/P	1,738	320	YN75	ON7KLS	589
31	G4MHC	1,710	330	YM79	PE1HTE	573
32	GW4ARC/P	1,676	301	YN54	PA0GN/P	663
33	G8KKC/P	1,643	354	ZL59	GI8TBQ	505
34	G3FVA/P	1,578	306	ZN61	F1CDX/P	721
35	GI4KIS/P	1,577	145	XO11	PE0MAR/P	734
36	G6AJ/P	1,413	245	ZN33	PE1HTE	571
37	G8KGI/P	1,460	299	ZK05	DF0VK/P	580
38	G4IAU/P	1,327	251	ZN23	DL7OI/P	764
39	G8TRS/P	1,314	253	ZN71	F6EPU/P	417
40	G6ABT/P	1,238	253	ZL24	DF0VK/P	628
41	G6CHK	1,202	287	ZL27	GI4GZW/P	533
42	G6DZH/P	1,153	244	YM36	PE0MAR/P	465
43	G4GSU	1,152	200	YN49	GJ4JWA	475
44	G6BSE/P	1,134	188	AM64	GI8TBQ	485
45	G3NVO	1,043	210	ZL44	DF0OK/P	510
46	G3KMI	994	195	ZK03	GI3CFH/P	562
47	G4HYG/P	969	137	ZL46	G3CHN	503
48	G8IUT	926	208	ZM05	GM4IPD	459
49	G5FZ/A	904	147	ZN68	DG4KBE	543
50	G4BTS/P	898	225	ZN44	–	–
51	G8VJI/P	793	203	ZL80	GM8YJU	475
52	G3IHH	772	204	ZL46	GM3OUL/P	480
53	G6AJN/A	678	192	ZL10	F1KNO	541
54	G3NTJ/P	632	195	YN18	F1KAW/P	520
55	G8KMK/A	609	171	ZN32	PE0MAR/P	365
56	G3RR	603	125	YN10	G6HH/P	383
57	GI3CFH/P	561	69	WO25	F1KAW/P	681
58	G3MAR	560	195	ZM41	F1FJT	375
59	G6CAQ	559	186	ZL39	DK9VZ/P	540
60	G4NIO	542	111	ZN74	F6HGO/P	451
61	G4LYM	530	123	ZN13	GU2FZC	495
62	GI6DRK/P	471	80	WO33	G8APB/P	574
63	G8ZKE/P	435	109	YM50	GM4IPD	515
64	G8ZYL	309	89	AL43	G8YDW/P	315
65	GW6EWA	192	22	XL19	GM4AXG/P	404

144MHz SINGLE-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	GJ4ICD	4,757	377	YJ70	PE1GHV	719
2	G6DDK	3,366	330	AM76	DK0OX	729
3	GM8YJU	2,632	245	YO05	F6HGO/P	670
4	GI8TBQ	1,644	156	XO33	PE0MAR/P	685
5	G3JXN	1,612	300	ZL39	GM6ALC	577
6	G4JZF	1,532	256	YM30	F1FHI	623
7	G6FPU	1,026	202	ZM51	DF0VK/P	657
8	G8XVJ	971	157	YN48	PE1MAR/P	470
9	G4MWD	952	219	ZL69f	DL0BSA/P	542
10	G8YYB	692	154	ZL49	GI4BAC/P	495
11	G4FVK	683	92	ZM39	F1FQM/P	875
12	G3FIJ	672	100	AL05	GI8UPV/P	535
13	G8ZOB	567	127	ZM35	ON7RB	375
14	G6FIO	563	121	ZM41	–	–
15	G8ZVW	493	89	ZM39	GI4KIS/P	425
16	G3ORX	490	84	YL49	F1FHI	470
17	GW3NYY	489	41	XL40	OK1OA	1305
18	G8XWA	470	114	YN19	GM4IPD	365
19	G8UYD	391	79	ZN64	F1KAW/P	384
20	G8OMI	355	77	ZM41	GI8UPV/P	345
21	G6DTD	351	81	YN48	F1KAW/P	410
22	G8RGO	320	73	XM41	GI8UPV/P	347
23	G6BDV	302	124	ZL27	F6HGQW/P	297
24	G4ASL	290	64	ZL60	PA0LGJ/P	358
25	GW6FLU	242	43	YL34	ON1RNA	550
26	G6DSA	237	60	YN68	GJ4JWA	370
27	GU6BNH	190	24	YJ48	GI4BAC/P	560
28	G6CSY	164	52	AL41	GW3OXD/P	248
29	G6DFE	147	19	XK63	G4BAR/P	502
30	G8LXY	139	57	ZL09	G4HYG/P	280
31	G6GJD	121	23	YN16	G8RZP	375
32	G8TZJ	198	32	YN07	F1KAW/P	481
33	G8NMQ	164	55	ZL37	ON1AEY	304
34	G3FPK	150	18	ZL60	GI4BAC/P	505
35	G4EFV	120	34	ZN02e	G2BRS/P	340
36	G4DMW	118	45	ZL49	F6HGO/P	284
37	G6FUZ	87	31	YN79	GM3OUL/P	251
38	G8ITS	76	15	ZL40	G4BOH/P	221

432MHz MULTI-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G4JAR/P	2,057	223	AL47	DK2GH	705
2	G4CLA/P	1,805	182	AN61	DG4FAO/P	741
3	G4FRE/P	1,404	184	YL20	DD1JT/P	642
4	G3JOC	1,054	112	AM27	DK0AE/P	587
5	G4BCH/A	828	100	AL34	DK0SO/A	598
6	G4HLX/P	812	125	ZL33	DJ9DL	603
7	G4BOH/P	794	169	ZN61	PE1BIF	440
8	G4FBK/P	751	123	ZK10	HB9MIN/P	666
9	GW3UEY/P	725	111	YM54	F6FJE/P	571
10	G8TFI/P	651	107	YL29	F6FJZ/P	475
11	G8YMD/P	573	78	AL76	F1DLT/P	485
12	G4BVY	413	79	YM79	PE0MAR/P	440
13	G8PTP/P	354	98	ZL18	DC6MV	480
14	G4ERO/P	339	59	YK19	DJ5RE	595
15	G3LTY/P	336	60	AL56	DJ9DL	424
16	G3UHF/P	289	73	ZN61	G4JAR/P	301
17	G4FWC/P	285	60	ZN71	G8YMO/P	305
18	G4KKC/P	263	79	ZL59	G8SFI	297
19	G4EMK/A	260	52	ZM29	F6FJE/P	452
20	G4BJM/A	212	55	ZM77	F6FJE/P	417

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
21	G8RZO	196	34	AL45	DF3EE	478
22	G4MIC	138	30	ZN13	G4JAR/P	336
23	GD4GNH	113	17	XO67	G4HLX/P	349
24	GW8WDC	97	22	YN75	G4JAR/P	359
25	G6COL/A	76	18	ZN68	PE0MAR/P	344
26	G3SPX/P	74	40	ZN23	G4FBK/P	331
27	G4IHZ/P	71	35	—	—	—
	G3VEF/P	71	21	ZK05	G4FWC	250
29	G6AJ/P	70	18	ZN33	G4JAR/P	315
30	G4NMA/P	67	27	ZL10	G8YMD/P	127
31	G4KVI/P	59	23	ZL27	G4JAR/P	143
32	G8EXW	48	18	ZM41	G4FBK/P	210
33	G3NTJ/P	44	19	YN18	GD4GNH	150
34	G4NID	43	17	ZN74	G4FRE/P	169
35	G6CAQ	37	17	ZL39	G8TFI/P	132
36	GI4FUM/P	33	5	—	GW8AAP/P	
37	GI6DCC/P	7	3	WO33	GI8NBW	90

432MHz SINGLE-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G3JXN	327	71	ZL39	DF1JC	504
2	GJ4ICD	202	21	YJ70	G4CLA/P	459
	G4JZF	202	48	YM30	PE0MAR/P	424
4	GW8OHZ/P	180	33	YL16	F6KBF/P	365
5	G6FPU	87	23	ZM51	G4JAR/P	240
6	G5UM	77	23	ZM35	G4ERO/P	212
7	G8ITS	61	35	—	—	—
8	G8LXY	41	19	ZL09	G4CLA/P	142
9	GW6FLU	11	5	YL34	G4ERO/P	
10	G8NMQ	8	6	ZL37	G4FBK/P	86

MARCH 144/432MHz LISTENER CONTEST

Posn	Station	144MHz score	432MHz score
1	BRS32525	620	91
2	BRS28198	197	60

Microwave Cumulative Contest 1982 results

2·3GHz

Posn	Callsign	Points	QSOs	Best dx	Km	QTH
1	G4FRE/P	648	4	PA0FRE	210	AM
2	G3FYX/P	254	3	G4MBS	107	YL
3	G4LRT	241	3	G3BNL	95	ZM
4	G8ADC/P	166	4	G3FYX/P	102	ZL
5	G4MBS	107	1	G3FYX/P	107	ZL

3·4GHz

Posn	Callsign	Points	QSOs	Best dx	Km	QTH
1	G4MBS	107	1	G3FYX/P	107	ZL
	G3FYX/P	107	1	G4MBS	107	YL
3	G4LRT	0	0	—	—	ZM
	G8ADC	0	0	—	—	ZL

5·7GHz

Posn	Callsign	Points	QSOs	Best dx	Km	QTH
1	G3FYX/P	221	3	G4KGC/P	136	YL
2	G8ADC/P	102	1	G3FYX/P	102	ZL
3	G4KGC/P	68	1	G3FYX/P	136	ZN
4	G4MBS	56	2	G4KGC/P	109	ZL

24GHz

No scoring entries were received this year. G3FYX/P reported several QSO attempts without success.

Certificates of merit go to G4FRE/P, the leading station on 2·3GHz; G4MBS, the leading station on 3·4GHz; and G3FYX/P, the leading station on 3·4 and 5·7GHz.

Bandleaders' equipment

G4FRE (2·3GHz)
RX: Microwave Committee source, multiplier ×6 to 2176MHz.
DCODA interdigital + 2× NE645 at masthead. BF981, IC202.
TX: DCODA 005, amplifier, multiplier ×3 giving 5W at 1160·1. Masthead doubler (BXY27) giving 2W output.
Ant: 23-el loop Yagi.

G4MBS (3·4GHz)
RX: Ring mixer using CV2155/4 diodes.
TX: Interdigital mixer, twt giving 2W output.
Ant: 4·5 ×6ft flyswatter at 55ft agl fed with 3ft dish.

G3FYX (3·4GHz)
RX: Interdigital mixer.
TX: BXY28 multiplier giving 2W output.
Ant: 3ft dish.

G3FYX (5·7GHz)
RX: 1N21 mixer.
TX: BXY28 multiplier giving 30mW output.
Ant: 18in dish with G4ALN feed.

G3WDG

10GHz Cumulative Contest results

Activity was certainly up on last year, as the higher scores and numbers of QSOs clearly show. The number of stations active was very similar, but most stations seem to have been more regularly active. The leading three stations had the advantage of 1W or more rf output, but G3ZME/P and G8HMV/P made a good job of showing what can be achieved with simple low power wideband equipment. Two entrants had used the *PW* exe system.

A large number of stations did not observe rule 11b, which requires *all available logs* to be sent to the adjudicator for checking purposes.

There were no comments on the rules and little change is anticipated for next year. The improved weather over that of last year's contest was the most common remark, and that the contest had been very enjoyable. G4MBS commented that although the contest season was over, he hoped that activity would not die off, especially with the prospect of lots of nice bad weather over the winter for rain scatter etc. He also noted that an entrant's position in the overall table of results did not necessarily reflect the effort put in, as attempting interesting tests often made one's score suffer. G2DSP remarked that in his area (south coast) the number of stations had fallen considerably, but this was made up by welcome activity from France. He would like to see more stations on in his area next year! The "reliability" of the cross-Channel paths was found to be excellent by G4ETU, who worked French stations in four of the five periods he was active.

Leading station's equipment:
Gunn oscillator (wb) or G3JVL transverter (nb).
10W rf output from a twt.
RX preamp using GAT5 gallium arsenide fets.
4ft dish at 8ft agl.

Certificates of merit go to GW3YGF/P, the winner; GW4KNZ/P, the runner-up; G4MBS, the leading fixed station; F8WN/P, the leading overseas station; G8HMV/P, the highest-placed station not having won an award before, and G3ZME/P, the leading low power wb station. In addition, the Alpha Cup is awarded to GW3YGF/P.

G3WDG

Posn	Callsign	Points	QSOs	Best dx	Km	WB/NB	QTH
1	GW3YGF/P	5,169	52	F8WN/P	339	wb + nb	YL
2	GW4KNZ/P	4,196	52	G4KGC/P	181	wb + nb	YL
3	G3YJH/P	4,084	56	G4MBS	172	wb + nb	YM
4	G3ZME/P	3,797	57	G8AFC/P	128	wb	YM
5	G8HMV/P	3,672	53	G8GUH/P	103	wb	YM
6	G8AGN/P	3,150	32	GW3YGF/P	181	wb + nb	ZN
7	F8WN/P	3,045	27	GW3YGF/P	339	wb + nb	AJ,ZJ
8	G3PHO/P	2,978	34	GW3YGF/P	181	wb + nb	YN,ZN
9	GW3PPF/P	2,815	33	G3PHO/P	141	wb	YM
10	G3FYX/P	2,445	33	G4KGC/P	136	wb + nb	YL
11	G3PFR/P	2,202	33	GW3PPF/P	128	wb	YN,ZN
12	G3KPT/P	2,085	39	GW3YGF/P	107	wb	YM,ZM
13	F6DCK/P	2,015	18	G3JHM/P	194	wb	AJ
14	G8MWR/P	1,725	22	GW3PPF/P	120	wb	ZM
15	G4ETU/P	1,620	18	F8WN/P	180	wb	ZK
16	G4MBS	1,617	17	G3YJH/P	172	nb	ZL
17	G2DSP/P	1,601	17	F8WN/P	180	wb	ZK
18	G4FHQ/P	1,547	27	GW3PPF/P	100	wb	YM
19	G3AYJ/P	1,290	22	G8AGN/P	94	wb	YM
20	G4KGC/P	1,138	16	G3YGF/P	236	nb	ZM,ZN
*	G3WDG/P	1,138	16	G3YGF/P	236	nb	ZM,ZN
21	G6IKQ/P	983	13	G8AGN/P	120	wb	ZM
22	G4EBF/P	963	14	GW3YGF/P	118	wb	ZM
23	G4KGC	152	2	GW3YGF/P	152	nb	ZM
*	G3WDG	152	2	GW4KNZ/P	152	nb	ZM

Note: * indicates adjudicator

Contests calendar

4-5 December	Spanish DX (Phone) *(Rules in December* MOTA*)*
4-5 December	Tops Activity *(Rules in November* MOTA*)*
5 December	144MHz Fixed *(Rules in September issue)*
11-12 December	Spanish DX (CW) *(Rules in December* MOTA*)*
11-12 December	ARRL 28MHz *(Rules in December* MOTA*)*
11-12 December	HA DX *(Rules in December* MOTA*)*
19 December	Canada *(Rules in December* MOTA*)*
1983	
2/8 January	3·5MHz Cumulative *(Rules in December issue)*
3/19 January	1·8MHz Cumulative *(Rules in December issue)*
8 January	Annual 40m World SSB Championship *(Rules in December* MOTA*)*
9 January	ISWL 14MHz SSB *(Rules in December* MOTA*)*
9 January	AFS *(Rules in December issue)*
9 January	Annual 80m World SSB Championship *(Rules in December* MOTA*)*
11/27 January	28MHz Cumulative *(Rules in December issue)*
16 January	70MHz CW *(Rules in December issue)*
29-30 January	White Rose RS 3rd LF Bands Contest *(Rules in December issue)*
January/April	70MHz Cumulative
5-6 February	7MHz (Phone) *(Rules in September issue)*
6 February	432MHz Fixed
12-13 February	First 1·8MHz
26-27 February	7MHz (CW) *(Rules in September issue)*
5-6 March	144MHz/432MHz/SWL
12-13 March	Commonwealth *(Rules in November issue)*
2 April	1,296MHz Trophy
3 April	432MHz Trophy
3 April	ROPOCO 1
17 April	144MHz CW
17 April	Low Power
7-8 May	432/1,296/2,304MHz
8 May	144MHz Low Power
15 May	Region Round-up
21-22 May	144MHz
4-5 June	NFD
12 June	70MHz/SWL
25-26 June	Summer 1·8MHz
2-3 July	VHF NFD
17 July	3·5MHz FD
31 July	432MHz Low Power
14 August	70MHz Trophy & SWL
28 August	ROPOCO 2
3-4 September	144MHz Trophy & SWL (IARU)
3-4 September	SSB Field Day
October/ November	432MHz Cumulative
1-2 October	432-24GHz & SWL (IARU)
9 October	21-28MHz Phone
16 October	21MHz CW
16 October	1,296MHz Cumulative
5-6 November	144MHz CW
12-13 November	Second 1·8MHz
4 December	144MHz Fixed

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 in the January 1983 issue.

RSGB affiliated organizations are requested to report all programmes and news items to their regional representatives regularly. Information for inclusion in the **February 1983** issue should reach them by **11 December** and for the **March 1983** issue by **15 January.**

Club programmes are given in order of date, subject time and place of the meeting. All callsigns of club secretaries and other contacts are QTHR (correct in the current *RSGB Call Book)* unless otherwise stated.

All clubs welcome visitors and would be pleased to hear from potential new members.

REGION 1—RR W. R. Parkinson, G3FNM, 141 Norris Road, Sale, Cheshire M33 3JR. Tel 061-973 1472.

Accrington (North Western Repeater Group)—16 December, 8pm. Globe Bowling Club, Willows Lane, Accrington. Sec Howard Aspinall, G3RXH.

Ainsdale (AARC)—7, 21 December. Ainsdale Scout Headquarters. Details from sec Norman Horrocks, G2CUZ, tel 0704 77604.

Barnoldswick (Rolls-Royce ARC)—1 December (A film show by Lynn Millard, G8LWK), 8pm. Rolls-Royce Sports & Social Club, Barnoldswick. Sec Leslie Logan, G4ILD, tel 0282 812288.

Blackburn (East Lancs ARC)—7 December (AGM), 4 January (A talk on Raynet by Tony Hore, G8LTC), 7.30pm. Shadsworth Leisure Centre, Blackburn. PRO Norman Jenkin, G4CGT, tel 0254 75037.

Blackpool (B&Fylde ARS)—7 December and 4 January. Details from sec Jim Newland, G5ND, tel 0253 64508.

Bury (BRS)—14 December (AGM), 7, 21 December (Informal meetings), 7.30pm. Mosses Youth & Community Centre, Cecil Street, Bury. Sec Mike Bainbridge, G4GSY, tel 061-761 5083.

Liverpool (L&DARS)—7 December (Junk sale), 14 December ("All at sea with cw", by S. J. Alpine, G4LKH), 21 December ("Bring your own bottle night"), 28 December (Natter night), 8pm. Conservative Rooms, Church Road, Wavertree, Liverpool. Sec G. L. Purslow, 20 Ridley Road, Liverpool L6 6DN.

Macclesfield (M&DRS)—14 December ("DFing and foxhunts", by Eric Turner, G4IRG), 28 December (Christmas activity night), 7.30pm. St Andrews Old School Hall, St Andrews Road, Brough Street West, off Crompton Road, Macclesfield. Sec Dave Lucas, G6HLQ, tel Macclesfield 28610.

Manchester (South Manchester RC)—3 December ("Getting started on rtty", by Roger Higson, G4NTY), 10 December (To be arranged), 17 December (Christmas party), 24 and 31 December (Club closed), 8pm. Sale Moor Community Centre, Norris Road, Sale. Sec Dave Holland, G3WFT, tel 061-973 1837.

St Helens (St H&DARC)—Contact the new pro Alan Manchester, G6FJU, tel 0744 56889, for the December programme.

Stockport (SRS)—8 December (AGM), 22 December (no club meeting), 8pm. The Blossoms Hotel, corner of Bramhall Lane and Wellington Road, Stockport. Sec Stan Aspinall, G3VSA, tel 061-437 1437.

Tarporley (Mid-Cheshire ARS)—1 December ("Video recorders", by Rick Dodd, G8PNL), 8 December ("HF operating", by D. R. Borley, G4CAX), 15 December ("RTTY", by P. P. Fox, G8HAV), 22 December (A musical evening with G6EPV), 29 December (An informal evening), 8pm. Cotebrook Village Hall, Sadlers Lane, off A49, Tarporley. Sec Rick Dodd, G8PNL, tel Winsford 57766.

Warrington (WARC)—3 December (Annual dinner at Statham Lodge), 7 December (Talk on the club project, 23cm converter), 14 December (Talk on rtty by Bob Jackson), 21 December (Christmas binge in the bar), 28 December (No meeting), 4 January (Club project night and discussion of club stand for the Southport Show), 7.30pm. Grappenhall Community Centre, Bellhouse Lane, Warrington. Sec Chris Crotty, G4PDJ, not QTHR.

G4DAX, centre, RR2, gave a talk to Pontefract & D ARS in September, and is seen here with G3SYC (l) and G3HCA. *Photo:* **G4ISU**

Warrington (UK FM Group Western)—2 December, 6 January. Grappenhall Hall Community Centre, Bellhouse Lane, Warrington. Sec Gordon Adams, G3LEQ, tel 0565 4040.

Wirral (W&DARC)—8 December (Chairman's night), 15 December (D & W at the Greave Dunning, Greasby), 22 December (No club meeting), 8pm. Irby Cricket Club, Irby Mill Road, Irby. Sec Gerry Scott, G8TRY, tel 051-630 1393.

Woodford (RATEC)—Mondays, 8pm. British Legion, Moor Lane, Woodford, Cheshire. Nigel Spears, G6JQH, editor of *RATEC News*, reports that included in forthcoming constructional projects are a 2m/70cm multimode, 2m/70cm 400W pa, top band receiver, 16-el for 2m. A RATEC radio and electronic rally is also scheduled for 22 May 1983. Contact Dave Kirby, 17 Laleham Green, Bramhall, for this item. Sec Bob Marsh, G8TYH, tel 061-439 1422.

The RR was pleased to see the members who attended the Regional meeting at Chorley in October. Fifteen of the clubs in the Region were represented. However, some prominent ones were conspicuous by their absence! Finally, a happy Christmas and successful New Year to all in Region 1. — *G3FNM.*

REGION 2—RR D. S. Smith, G4DAX, Red Roof, Goathland, Whitby, North Yorks YO22 5AN. Tel 094-786 333.

Barnsley (UKFM Group Northern)—5 December, 2 January, 7.30pm. The Royal Hotel, Church Street, Barnsley. Sec G4LUE.

Denby Dale (DD&DARS)—Second and fourth Wednesday in each month, 7.30pm. Pie Hall, Denby Dale. Sec J. Clegg, G3FOH. Note for your diary: Denby Dale 1983 Rally on 19 July. A member of the RSGB Planning Panel, G4GJB, attended a meeting between the planning officer of the Kirklees Council and the club to discuss the controversial draft policy for radio masts and antennas. G4GJB subsequently prepared a comprehensive report which is now being acted upon by Council.

Goole (G&DARS)—7 December (SSTV), 14 December (Computing), 21 December (Christmas night out), 28 December (Christmas lecture, by G4BDX), 8pm. Junior Chamber Buildings, Boothferry Road, Goole. Sec G8IOH, tel Reedness 462.

Halifax (H&DARS)—7 December (A noggin and natter night), 21 December ("Crime prevention", by G6COG), 18 January (Emergency planning), 7.30pm. Clairmount Liberal Club, Clairmount Road, Halifax. Sec G4LEC, tel 0422 33080.

Pontefract (P&DARS)—9 December (Cheese and wine party), 16 December (Informal), 6 January (AGM). The Carleton Community Centre, Pontefract. Sec G4ISU.

Scarborough (SARS)—6 December (Surplus gear sale), 13 December (GB3NY repeater update), 17 December (Christmas dinner and club photograph), 27 December (On the air contest, no meeting), 3 January (Junk sale), 7.30pm. Scarborough Cricket Club, North Marine Road, Scarborough. Sec G4JAQ, tel 862638.

Spen Valley (SVARS)—Thursdays, 9 December (Committee/project night), 23 December (Christmas social evening), 6 January (Equipment alignment), 8pm. Old Bank Working Men's Club, Mirfield, W Yorks. Sec G4MLY.

Wakefield (NWRC)—Thursdays, 9 December (Christmas dinner at The Dam Inn, Wakefield), 7.45pm. Carr Gate Working Men's Club, Wakefield. Note new sec G6CLP. The club call is G4NOK, and a shack is being built.

Wakefield (W&DARS)—14 December (Christmas social evening at Holmfield House bar), 28 December (On the air/natter night), 8pm. Holmfield House, Denby Dale Road, Wakefield. Sec G4BLT, tel Wakefield 255515.

York (YARS)—Fridays, except the third in each month, 7.30pm. United Services Club, Micklegate, York. Sec Keith Cass, G3WVO. Contact is still being maintained with G4MIY/MM, sked details from G3WVO (sae please).

Not a lot of input this month. Please chase up your club secretaries again and also remind them of the closing dates given in the "Club News" heading panel. It is a pity when items arrive too late to use.

Visiting clubs is always a pleasure, and answering even the awkward questions is just part of the job, but sometimes it is difficult to explain the Society's policy of steady pressure with regard to the Home Office. It was a great pleasure therefore to receive information about the 18, 24 and 50MHz allocations and the "open mic" concessions immediately before visiting one of the area's major clubs. The pleasure with which the news was received made the trip worthwhile, and most people agreed that the Society's policy was completely vindicated. It also made a mockery of some of the remarks and letters in certain other magazines, particularly since last February. There is more money in being sensational than in quietly working for the future of amateur radio.

REGION 3—RR L. W. Craven, G4EQI, "Grass Moor", Radford Road, Alvechurch, Birmingham B48 7DT. Tel 021-445 1347.

Atherstone (AARC)—9 December ("Making the most of your tape recorder", by Richard Margoschis), 7.30pm. The Tudor Centre, Coleshill Road, Atherstone. Sec G4IAG, tel Fillongley (0676) 41814.

Birmingham (Midland ARS)—7 December (Christmas party), 7.30pm. 294a Broad Street, Birmingham B1 2DS. Sec G8BHE, tel 021-422 9787.

Birmingham (South Birmingham RS)—1 December (No meeting), 15 December (Christmas party, families welcome), 5 January (Surplus sale by auction), 7.45pm. Hamstead House, Fairfax Road, West Heath, Birmingham B31. Sec G8RGQ, tel 021-459 8312.

Bromsgrove (B&DARC)—10 December (Christmas party, open to members and families), 8pm. Avoncroft Art Centre, Bromsgrove. Sec G4LVK, tel 021-445 2088.

The Lord Mayor of Birmingham, Coun Peter Hollingworth, paid a visit to the Sutton Coldfield Radio Society's 25th Anniversary Exhibition. Among those present were (l to r) Les McCullough, G6DCI, the society's public relations officer; Harry Griffiths, G3BOQ, the exhibition organizer; George Coffin, G3XFN, Raynet controller Sutton Coldfield area; the Lord Mayor; Vernon Sutton, G3GLQ, the society's founder chairman; Tom Douglas, G3BA, a founder and honorary member; and Alan Dennis, G3CNV, a founder member

Hereford (HARS)—3 December (Club meeting), 17 December (Christmas quiz), 8pm. Civil Defence HQ, Gaol Street, Hereford. Sec G4CNY, tel Hereford (0432) 3237.

Malvern Hills (MHRAC)—5 December (144MHz fixed competition), 14 December (AGM), 8pm. The Red Lion Inn, St Ann's Road, Great Malvern. Sec G4GFX, tel Malvern (06845) 62900.

Much Wenlock (Wenlock ARES)—8 December ("Radio control aircraft", by Martin Walsh), 15 December (Christmas natter night), 8.30pm. Raven Hotel Club Room, Much Wenlock. Sec G3ZSL, tel Bridgnorth (0746) 861332.

Shrewsbury (Salop ARS)—2 December (Natter night), 9 December (Calibration night, ac/dc/rf, thanks to Don, G3UGH, and others), 23 December (Natter and snack night—Father Christmas), 8pm. Albert Hotel, Smithfield Road, Shrewsbury. Sec G6AKE, tel Shrewsbury (0743) 66969.

Stourbridge (StARS)—6 December (Constructional and natter night), 20 December ("Sleighs on 70", by C. Kringle, SN0WS), 7.45pm. "Cross Inn", Hagley Road, Oldswinford, Stourbridge. Sec G8JTL, tel Lye (038482) 4109.

Stratford-upon-Avon (S-upon-A&DARC)—13 December ("CW", talk and demonstration by a leading Midlands expert), 27 December (No meeting), 7.30pm. Bearley Radio Station. Talk-in on S22. Programme sec G6CWK, tel Stratford (0787) 68863.

Sutton Coldfield (SCRS)—13 December (Natter night), 7.30pm. 27 December (Closed). Central Library, Sutton Coldfield. Sec G8TUR, tel 021-353 2061.

Telford (T&DARS)—1 December (Club night on the air, slow morse session), 8 December (Telford and Shrewsbury clubs combined Telford Mobile Rally Group AGM. Larger committee anticipated for 1983), 15 December ("Experiences as Pye Electronics engineer—area representative", by Don Goddard, G3UQH), 22 December (HF evening), 29 December (Club projects evening), 5 January (Informal evening), 12 January ("SW dx broadcast stations", by Tom Crosbie), 8pm. Phoenix Centre, Webb Crescent, Dawley. Sec G8UGL, tel Telford (0952) 584173.

Walsall (WARC)—1 December ("RSGB", talk by G4EQI, RR3), 15 December (G4HLL on the air), 8pm. Forest Community Centre, Hawbush Road, Leamore, Bloxwich. Sec G4FAJ, tel Brownhills (05433) 2169.

Warwick (Mid-Warwickshire ARS)—7 December (Open meeting), 21 December (Social evening), 8pm. 61 Emscote Road, Warwick. Sec Mrs Mary Palmer, G8RZR, tel Warwick (0926) 499730.

Wolverhampton (W&DARS)—6 December (Natter night), 13 December ("TV production in the Far East—Taiwan", by Derek, G8JBT), 20 December (Christmas social at the Anchor, Coven), 8pm. 27 December (No meeting). Wolverhampton Chamber of Commerce & Industry, 93 Tettenhall Road, Wolverhampton WV3 9PE. Sec G6AKN, tel Wolverhampton (0902) 782883.

Worcester (W&DARC)—6 December ("Microwaves", by Harry Ashworth, G3CUF, at Oddfellows Club), 20 December (Informal evening at the Old Pheasant Inn), 8pm. "Oddfellows Club", New Street, Worcester. Sec G4NRD, tel Evesham (0386) 41508.

REGION 4—RR M. Shardlow, G3SZJ, 19 Portreath Drive, Darley Abbey, Derby DE3 2BJ. Tel Derby (0332) 556875.

Bolsover (BARS)—1 December (Natter night), 8 December (Quiz), 15 December (Christmas dinner), 22 December (Video show), 8pm. The Angel Hotel, Bolsover. Sec David Brocklehurst, G8KIF, tel Chesterfield 811666.

Derby (D&DARS)—1 December (Bring & buy sale), 8 December (Visit by John Birkett of Lincoln), 15 December (Constructor's contest), 22 December (Christmas party), 29 December (The year in retrospect), 5 January 1983 (Junk sale), 7.30pm. 119 Green Lane, Derby. Sec Jenny Shardlow, G4EYM, tel Derby 556875.

Derby (Nunsfield House ARG)—3 December (Talk by G3OZ), 10 December (Progress with the club's amateur television), 17 December (The year in retrospect), 24/31 December (No meetings), 7.45pm. Room 7, Nunsfield House, Boulton Lane, Alvaston, Derby. Sec Ian Cage, G4CTZ, tel Derby 71875 or 799452.

Grimsby (GARS)—Mondays fortnightly, 7.30pm. Cromwell Social Club, Cromwell Road, Grimsby. Sec Reg Scarlett, G4HZF.

Ibstock (IARS)—Tuesdays, 7.30pm. 3 December (Christmas supper, Hastings Arms, Ibstock). Sec Glenn Tyers, G6DWD, tel Coalville 39661.

Loughborough (L Falcon ARC)—3 December (Discussion evening), 10 December (Technical film show), 17 December (Christmas meal out. TBA), 24/31 December (No meeting), 8.30pm. Brush Sports & Social Club, Fennel Street, Loughborough. Sec F. Hopewell, G4PGC, tel Loughborough 263369.

Mansfield (MARS)—3 December (Tape lecture—"TX design and tvi), 21 December (Social evening), 7.30pm. Victoria Social Club, Princes Street, Mansfield. Sec Duncan Walters, G4DFV, tel Mansfield 648679.

Melton Mowbray (MMARS)—17 December (Bring & buy, G3FDF Trophy presentation), 7.30pm. St John Ambulance Hall, Asfordby Hill, Melton Mowbray. Sec Richard Winters, G3NVK, tel Melton Mowbray 63369.

Nottingham (ARCON)—2 December (Forum), 9 December (144MHz propagation), 16 December (Christmas quiz), 23/30 December (Activity nights), 6 January 1983 (Forum), 7.30pm. Sherwood Community Centre, Woodthorpe House, Mansfield Road, Nottingham. Sec Paul Chapman, G4IJL, tel Nottingham 623828.

Scunthorpe (SARC)—7 December (Construction contest), 14 December (Crossword—G8TIY), 21 December (Christmas party), 28 December (Club year in review), 7.30pm. Grange Farm Hobbies centre, Franklin Crescent, Scunthorpe. Sec Joe Sheardown, G8TIY, tel Scunthorpe 732438.

Spalding (S&DARC)—10 December (Junk sale and Christmas social evening), 7.30pm. White Hart, Market Place, Spalding. Sec Ian Buffham, G3TMA, tel Spalding 3845.

REGION 5—RR John Allen, G3DOT, 77 Rosslyn Crescent, Luton LU3 2AT. Tel 0582 21151, work, or 0582 508515, home.

Bedford (B&DARC)—1 December (A visit by Garex Electronics), 15 December (Christmas dinner. This date may be wrong so please check with the sec or on the local repeater), 7.30pm. Club House, Ravensden. Sec Julian Wanden, G8ATI.

Cambridge (C&DARC)—3 December (Informal), 10 December (Talk on 6m), 17 December (Informal), then closed until the 7 January, 7.30pm. Coleridge Community College. Sec Dave Leary, G8JKV.

Cambridge (CUWS)—Closed during Christmas vacation. Details from T. J. Gleeson, G8TUG.

Dunstable Downs (DDARC)—3 December (TV show), 17 December (Club party, (members only)). Chews House, Dunstable. Sec G4ENB.

Leighton Linsdale (LLRC)—13 December (Fun night), 7-10pm. Vandyke Community College, Room A64, Vandyke Road, Leighton Buzzard. Sec J. Hart, G8GIK.

Northampton (NRC)—2 December (Digital frequency meters), 16 December (The annual Christmas get-together at "The Horseshoes", Sywell), 23 December (Informal), 8pm. Kingsthorpe Community Centre. Sec G3VMU, tel Northampton 28516.

Peterborough (GPARC)—16 December (Informal). Details from sec G8ZVW.

Shefford (S&DRC)—2 December (Q & A night, postponed from 21 October), 9, 16 December (Informal), 23 December (The chairman's mince pie and wine party), 7.45pm. Details from sec G4MEO.

Wellingborough (Nene Valley RC)—8 December (Annual dinner), 8pm. The Royal PH, Knox Road, Wellingborough. Sec G6CPX.

Thanks to all the club secretaries who have supplied this month's information. December is a month when many clubs who hold meetings in schools and community centres have to close until the new year, a pity I know. But enjoy your Christmas break and from my xyl and myself, have a happy Christmas.—*G3DOT.*

REGION 6—F. S. G. Rose, G2DRT, 84 Cock Lane, High Wycombe, Bucks HA3 7EA. Tel Penn (049481) 4240.

Aylesbury (AVRS)—28 December (Club dinner for members and their partners only). For details of other club activities, and bookings, contact sec M. Marsden, G8BQH, tel 0296 641783.

Chesham (C&DRS)—Wednesdays, The Stable Loft, Bury Farm, Pednor Road, Chesham. Details from sec J. Alldridge, G6LKS, tel Chesham 786935.

Harwell (HARS)—21 December (AGM, members please attend. There will also be a construction contest). Details from Ann Stevens, G8NVI.

High Wycombe (Chilton ARS)—Monthly meeting and Christmas dinner, please book early. For details of date contact G3NCL, tel High Wycombe 712020.

Maidenhead (M&DARS)—2 December (Home construction contest), 21 December (Christmas dinner), 7.30 for 8pm. The Red Cross Hall, The Crescent, Maidenhead, Berks. Sec Roger Hemmings, G3VCT, tel Bourne End (06285) 21036.

Vale of the White Horse (VWHARS)—20 December (Social evening). Sec Ian White, G3SEK, tel 0235 31559 (note new telephone number).

REGION 7—RR Pat Walker, G8HMG, 12 Brownlow Road, Redhill, Surrey RH1 6AW. Tel Redhill 64035.

Ashford (Echelford ARC)—13 December ("Your Regional Rep", by G8HMG), 30 December ("Microcomputers in amateur radio", by Brian Coleman, G4NNS), 8pm. The Hall, St Martin's Court, Kingston Crescent, Ashford, Middx. Sec Anton Matthews, G3VFB, tel 01-892 2229.

Bexleyheath (North Kent RS)—First and third Tuesday in each month, 18 December (Christmas party and film show), 8pm. The Pop-In Parlour, Graham Road, Bexleyheath. Sec Pelham Conduit, G4KCZ.

Biggin Hill (BHARS)—Last Tuesday in each month, 21 December (Christmas dinner), 8pm. Biggin Hill Memorial Library. Sec Ian Mitchell, G4NSD, tel Biggin Hill 75785.

Coulsdon (CATS)—13 December (AGM), 7.30pm. St Swithun's Church Hall, Grovelands Road, Purley, Surrey. Sec A. R. Bartle, tel 01-684 0610.

Croydon (Surrey Radio Contact Club)—First and third Mondays in each month, 6 December (Silly questions evening), 10 January (New Year party), 8pm. TS Terra Nova, 34 The Waldrons, Croydon. Sec Ray Howells, G4FFY, tel 01-642 9871. The second meeting each month is an informal discussion with an opportunity to practice cw.

Crystal Palace (CP&DRC)—18 December (Film show and Christmas party), 8pm. All Saints Church parish rooms, Church Road, South Norwood SE25. Sec Geoff Stone, G3FZL, tel 01-699 6940.

Guildford (G&DRS)—Second and fourth Friday in each month, 10 December (Model aerial farm), 14 January (New Year party), 8pm. Model Engineers HQ, Stoke Park, Guildford. Sec Helen Mullenger, G8SXB, tel Aldershot 20384.

New Cross (Clifton ARS)—Fridays, 8pm. Above the New Cross Inn, Clifton Rise, London SE14. Details of programmes from R. Hinton, 42 Sutcliffe Road, Welling, Kent.

Redhill (Reigate ATS)—21 December (Constructional contest, with wine and cheese!), 8pm. Constitutional & Conservative Club, Warwick Road, Redhill. Sec Chris Barnes, G8FEE, 25 Hartswood Avenue, Reigate RH2 8ET.

Thames Ditton (Thames Valley ARTS)—First Tuesday in each month, 1 December (Junk sale), 8pm. Thames Ditton Library, Watts Road, Giggs Hill, Thames Ditton. Sec Julian Axe, G4EHN, tel 01-946 5669.

Wimbledon (W&DRS)—Second and last Friday each month, 8pm. St John Ambulance Hall, 124 Kingston Road, Wimbledon SW19. Sec Geoff Mellett, G4MVS, tel 01-644 8249.

Thanks to those clubs which provide regular information. Would clubs not mentioned above send details of their *new* programmes. *RR7*

REGION 8—RR K. A. Crouch, G8KEN, 14 Victoria Road, Capel-le-Ferne, Folkestone, Kent CT18 7LR. Tel 0303 55241.

Canterbury (EKRS)—9 December (Raffle draw at Bun Penny PH), 16 December (TBA but suggested cheese and wine party). The Cabin, Kings Road, Herne Bay. Details from Derek, G8ELS, or call him on GB3KS.

Chichester (C&DARC)—7 December (Meeting in the Long Room), 16 December (Christmas Social in Green Room), 7.30pm. Fernleigh Centre, North Street, Chichester. Further details from club sec T. M. Allen, G4ETU, tel West Ashling 463.

Crawley (CARC)—8 December (Members' evening), held at member's house. Formal meetings held fourth Wednesday in each month at Trinity United Reform Church, Ifield Drive. Sec G4IQM.

Dartford Heath (DHDFC)—8 December (Meet at Malt Shovel PH), 12 December (DF hunt), 22 December (EGM at Malt Shovel PH). All people interested in df'ing, whether swl or licensed, should contact G4NKM at Malt Shovel PH where they will be made welcome.

Dover (SEKYMCAARC)—1 December (Natter night and committee meeting), 8 December ("Magic lantern show", by Peter, G8EGT), 15 December (TBA), 22 December (TBA), 7.30 for 8pm start. YMCA, Leybourne Road, Dover. RAE night Mondays, details from G4EGQ. Thursday evenings, morse, details from G3VSU. Talk-in available on S20 or GB3KS. Listen for G3YMD or G8YMD.

Eastbourne (Southdown ARS)—13 December (AGM, followed by coffee and open forum in Jubilee Room, Red Cross HQ, 30 The Avenue, Eastbourne). Details from Dick Jefferies, G4KAR, tel Hailsham 845418.

Gravesend (GRS)—Mondays (Informal drink and chat), 8pm. The Windmill Tavern, Shubbery Road. Details from sec G4NBQ.

Hastings (HERC)—15 December (Christmas social—bring the family). First Wednesday in each month (Committee meeting. Ashdown Farm Community Centre), second, fourth and fifth Wednesday (Micro night), Ashdown Farm, third Wednesday in each month (main meeting, West Hill Community Centre), 7.30pm. Sec Alan, G8VEM, tel Hastings 216516.

Maidstone (MYMCAARC)—3 December (Beginners' RAE), 10 December (Annual VK5QG construction contest), 17 December (Christmas social), 24 December (No club meeting but members will be on air to send

Guernsey RSGB members who attended an area meeting on 9 July on the occasion of the visit to Guernsey by RR17. L to r: (standing) GU4EON; GU8OVO; Jim E. Martin, GU3YIZ, AR Guernsey; Howard Cunningham, G8FG, RR17; GU4GNS; GU3HKV; GU8KUT; GU6EFB; GU2FZC; GU8JKS; John Wild; Peter Bannier and Andrew Hamon; (kneeling) GU6JSC; GU6JQF; GU8TGP and GU4LJC. *Photo:* GU3MBS

Yuletide greetings. Join us if you can), 8pm. "Y" Sportscentre, Melrose Close, Maidstone. Contact G4GKW or G4EMC for details of events.

Sittingbourne (SRC)—This club started out earlier this year and is going strong. Club now meets every week, 7.30pm at Nina's, 43 High Street, Sittingbourne. Details from Brian Hancock, G4NPM, tel Minster 873147.

Tunbridge Wells (WKRS)—Alternate Fridays, 10 December (Junk sale), 8pm. Adult Education Centre, Monson Road. Informal meetings held following Tuesday at Drill Hall, Victoria Road, Tunbridge Wells. Club nets: hf—Sunday, 11am, 28·7MHz; vhf—Monday, 8pm, S23, 145·575MHz; cw—Sundays, 10am, 3·510MHz. Details from Brian, G4DYF, tel 0732 456708.

Thanet (RCT) (G2IC)—3 December (Lecture on dx operating), 17 December (Christmas party), 8pm. Birchington Village Hall. New sec Ken, tel Thanet (0843) 32198.

RR8 would like to thank all club secretaries who have sent in details during 1982. Also all the clubs that have entertained him in one way or another. May I and my family wish you all a happy Christmas and prosperous, healthy and active New Year. *73, Ken.*

REGION 9—RR W. J. Colclough, G3DC, "Highview", Indian Queens, St Columb, Cornwall TR9 6LL. Tel 0726 860485.

Camborne (Cornish CRAC)—2 December (Christmas party with films), 7.30pm. SWEB Room, Poole, Camborne. 20 December (Computer section, details not available). PRO S. Rodda, G6DFE, tel 0736 3948 or 3524.

Caradon Hill Repeater Group—The group will be having an informal Christmas get-together at 8.30pm on 9 December at the Arscott Arms, Chapmans Well, Launceston (about 4 miles north of Launceston on the Holsworthy Road). Excellent beer and bar snacks will be available. Details on the group and the above activity from sec Chris Bartram, G4DGU.

Exmoor (ERC)—The club now possesses hf as well as vhf, fm and rtty equipment, and hopes soon to have the club call G4SSS to match G8SSS. The winter programme includes "Maritime radio", by G3UJB; "VHF/UHF techniques", by G4DGU; "HF dx", by G3HTA; and a talk on meteorology with regard to vhf propagation. Thursdays, 8pm. Loughrigg, East Street, South Molton, Devon. New sec P. Dixon, G4JBR.

Saltash (S&DARC)—3 December ("The Secret Listeners", RSGB video film), 17 December (Social evening at the Holland Inn), 7.30pm. Toc H, Burraton, Saltash. Acting sec R. Rayment, 30 Alma Road, Plymouth.

Torbay (TARS)—Fridays, 7.30pm. December meeting, Christmas party, date to be notified. Bath Lane, rear of 94 Belgrave Road, Torquay. Sec A. Cooper, 41 Kingsway Avenue, Paignton, tel 0803 843350. SSB Field Day produced 726 contacts, and 279,276 points. The club repeater GB3TR is now back on the air from the new location. Reports suggest almost 100 per cent access from Haldon Hill to Plymouth on the A38, which should please regular users of this road and visitors to the South West. In all other directions there have been improvements on the old location. Further details from Colin Coker, G4FCN. Donations would be welcome, to G4FCN, and cheques made payable to Torbay Club. Club details from G2CWR.

Treverbyn (English China Clay RC)—Alternate Mondays, 21 December (Christmas get-together at Britannia Inn), 7pm. Pentewan Labs, Pentewan Road, St Austell, Cornwall. A microwave group has been formed—meeting times to be arranged. Anyone interested in an swl group or cw lessons contact G4JYF. Other club information from Jack Redfearn, G8HSZ.

REGION 10—RR P. A. Jones, GW4HAT, 68 Pastoral Way, Tycoch, Swansea SA2 9LY.

Pembroke (PRSGBG)—7.30pm. The Defensible Barracks, Pembroke Dock. 31 December—(VHF activity night. For teetotallers?) Sec Martin Shelley, GW3XJQ, tel Pendine 267.

RR10 would like to wish all members in the region compliments of the season and a very prosperous and dxy new year. I would also like to express my appreciation to the faithful few secretaries who do send me their club news, hoping that more will be encouraged to do so in 1983.

REGION 11—RR B. H. Green, GW2FLZ, 1 Clwyd Court, Tan-y-Bryn Road, Colwyn Bay, Clwyd LL28 4AH. Tel 0492 49288.

Anglesey (ARG)—A new society. Contact Mr C. Williams, GW6DOK.

Colwyn Bay (Conwy Valley ARC) (GW6TM)—9 December (Surplus radio sale), 7.30pm. 6 January (Christmas dinner, names to be given to club treasurer, GW4IYN). Green Lawns Hotel, Bay View Road, Colwyn Bay. Sec Mr J. N. Wright, GW4KGI, 46 The Dale, Woodlands, Abergele, Clwyd LL22 7DS, tel 0745 823674.

Dolgellau (Meirion ARS) (GW4LZP)—11 December (Annual Christmas dinner), Nannau Hall Country Club, Llanfachreth, nr Dolgellau. Sec Mr R. Halhead, GW3KOR.

REGION 12—RR M. R. Hobson, GM8KPH, 4b Tummel Crescent, Pitlochry, Perthshire.

Dundee (Kingsway Technical College ARS)—Tuesdays, 7pm. Kingsway Technical College, Dundee. Details from sec GM6BML.

Elgin (Moray Firth ARS)—First Monday in each month, 7.30pm. Spey Bay Hotel, Spey Bay, nr Fochabers. Wednesdays, 7.30pm. Moray College of Further Education, Elgin. Details from sec Rev Stanley Bennie, tel Buckie (0542) 32312.

Perth (P&DARG)—Mondays, RAE class, 7pm. Tuesdays, 8pm. Wednesdays (Practical evening and morse tuition), 8pm. All held at the Perth City Sports & Social Club, Leonard Street. Details from sec Richard, GM6ESY, tel 073882 575, day.

The above are the only societies which have contacted the new RR12 with new programmes or information. Secretaries please take note. More area reps are urgently needed in Region 12. Contact RR for details.

REGION 13—RR A. B. Givens, GM3YOR, 41 Veronica Crescent, Kirkcaldy, Fife KY1 2LH. Tel Kirkcaldy (0592) 200335.

Fife Raynet Group—Details from GM4LYQ.

REGION 14—RR V. Kusin, GM4HCO, 109 Weymouth Drive, Glasgow G12 0EL.

Ayr (AARG)—3 December ("Computers in amateur radio", by GM4LVW), 7.30pm. Community Leisure Centre, 24 Wellington Square, Ayr. Details from sec R. D. Harkness, GM3THI, tel Ayr 42313.

Glasgow (WOSARS)—Fridays, 7.30pm. 22 Robertson Street, Glasgow. Morse classes. Details from sec R. James, GM4CXM, tel 041-942 6657.

Helensburgh (HARC)—First and third Wednesday in each month. John Logie Baird School, Helensburgh. Operational night Thursdays. Details from sec B. P. Spink, GM6CBF, tel Dumbarton 64401.

REGION 15—RR J. T. Barnes, GI3USS, Whitegables, 95 Crawfordsburn Road, Bangor, Co Down BT19 1BJ. Tel 0247 3948.

Antrim (ANDARC)—Third Thursday in each month, 7.30pm. Clotworthy House, Castle Grounds, Antrim. Sec GI4FUM NOT QTHR. Tel Antrim 64672.

Bangor (B&DARS) (GI3XRQ)—3 December ("Computer selection", by GI6ANC), 7 January ("The beginnings of amateur radio", by GI5SJ). Sands Hotel, Bangor. Sec GI4JTF.

Belfast (BRSGBG)—Third Wednesday in each month, December ("Pioneering days of amateur radio", by GI5SJ—check date with sec), January (ID cards night), February ("An engineer looks at the sky", by GI6DEQ), 8pm. 90 Belmont Road, Belfast. AR GI6DGP.

Belfast (COBYMCAARC) (GI6YM)—Tuesdays, 7pm. Saturdays, 2.30pm. Club room, Fourth floor, YMCA, Wellington Place, Belfast. Sec GI6BJO.

Colraine (C&DARS) (GI4NRQ)—Fridays, 8pm. Flowerfield Arts Centre, Portstewart. Sec GI4LNJ.

Colraine (NWIARC)—Contact GI4KIQ or GI4AHD.

Craigaven (Mid-Ulster ARC)—First Sunday in each month, 3pm. QTH of GI4BAC. Sec GI4NKD.

Enniskillen (Lough Erne ARC)—Third Monday in each month, 8pm. Lakeland Forum. See GI4PCY (Ex-GI6EZT).

Lisburn (Lagan Valley ARS) (GI4GTY)—13 December ("Video", by GI4PCQ), 10 January ("Mobile installation", by GI3USS), 14 February ("Raynet", by GI4IYD), 7.30pm. Rathvarna Teachers' Centre, Pond Park Road, Lisburn. Sec GI8SXN.

Londonderry (NW of IARC) (GI4CFH)—First Monday in each month, 7.30pm. The New Brathouse, Victoria Road, Prehen, Londonderry. Sec GI4OUN.

Magherafelt (MARS) (GI4MFT)—First Tuesday in each month, 7.30pm. Other Tuesdays (CW and construction). 12 Garden Street, Magherafelt. Sec GI4OMO (ex-GI8JNP).

Omagh (West Ulster ARC)—Second Monday in each month, 8pm. McAleers, Campsie, Omagh. Sec GI4OHW (Ex-GI8XQM).

REGION 16—RR T. D. Howe, G3PLF, 18 Vange Hill Drive, Basildon, Essex SS16 4DD. Tel 0268 24453.

Chelmsford (CARS)—7 December ("Christmas clearout"), 7.30pm. Marconi College, Arbour Lane. Details from Andrew Mead, G4KQE, tel Silver End 83094.

Colchester (CRA)—2 December ("Care and use of batteries", by G8UNZ), 16 December (Films in the lecture theatre), 7.30pm. Colchester Institute, Sheepen Road. Details from Frank Howe, G3FIJ, tel Colchester 70189.

The wedding of Michael Sinclair, GM4GPN, to Claire Bruce in Unst, Shetland. L to r: GM4GQD, GM3SKX, bridesmaid Wilma, GM4GPN, GM3TSG, Claire, bridegroom's parents Rose and Bill, GM3KLA and GM3RFR

Ipswich (IRC)—8 December ("Amateur radio in the USA", by G5EEP), 22 December (no meeting), 29 December ("Metal bashing for the radio amateur", by G6CRN). Club Room, Rose & Crown, Norwich Road. Details from Jack Tootill, G4IFT, tel Ipswich 44041.
Norwich (Norfolk ARS)—Wednesdays, 1 December (RSGB films), 8 December (Short meeting), 15 December (Bring your xyl/yl evening), 22 December (Short meeting), 29 December (short meeting). Crome Community Centre, Telegraph Lane East. Details from Paul Gunther, G8XBT, tel Norwich 6110247.
Stanford-le-Hope (SLHDARS)—Mondays, 8pm. Scout Hut, Hardie Road. Details from Alan Taylor, G4KJI, tel Stanford-le-Hope 5057.
Vange (VARS)—2 December (Junk sale), 9 December ("Model engineering", by G3YTF), 16 December (Christmas party), 23 December (No meeting), 30 December (No meeting), 7.30pm. Main Hall, Barstable Tennants Community Association, Long Riding, Basildon. Details from Mrs D. Thompson, 10 Feering Row, Basildon SS14 1TE.

I should like to wish all clubs, club members, and their families a very happy Christmas and a prosperous new year. *RR16.*

REGION 17—RR H. G. Cunningham, G8FG, 235 Station Road, West Moors, Wimborne, Dorset BH22 0HZ. Tel Ferndown (0202) 876018.

Basingstoke (BAEC)—15 December ("Amateur television", by G8GYS), second Tuesday in each month, 7.30pm. The British Legion Hall, Crown Lane, Old Basing, Nr Basingstoke. Sec G6CPA, tel Tadley (07356) 4964.
Bournemouth (BRS)—3 December ("Receiver design", by John Button), 17 December ("Transformer design"), 7.30pm. Kinson Community Centre, Kinson, Bournemouth. Sec G4EKE, tel Ferndown (0202) 877945.
Fareham (F&DARC)—1 December (Natter night), 8 December ("A station for satellite operation", by G8VOI), 15 December (Slide show), 22, 29 December (No meetings), 7.30pm. Portchester Community Centre, Sec G4ITG, tel Fareham (0329) 234904.
Farnborough (F&DRS)—8 December (Chairman's evening), 22 December (Christmas social evening with yls and xyls), 7.30pm. Railway Enthusiasts Club, Access Road, off Hawley Lane. Sec G4BJQ, tel 0252 43036.
Wimborne (FRARS)—Sundays, 12 December (Video evening, talk and competitions), 19 December ("Constructing techniques", by G8MCO), 7.30pm. Flight Refuelling Social Club, Merley, Wimborne. Sec G8VFY, tel Wimborne (0202) 882271.
Winchester (WARC)—18 December (New members' night), 8pm. The Log Cabin, Stockbridge Road, Winchester. Sec G6FBR, tel Winchester (0962) 66764.

Your RR wishes all members a very happy Christmas and lots of luck in 1983. Many thanks to all club officers who have taken the trouble to keep me informed of club activities in time for publication. To those that have not I would call your attention to the information at the beginning of "Club News" in every *Rad Com.*

REGION 18—RR W. A. Ricalton, G4ADD, 4 South Road, Longhorsley, Morpeth, Northumberland NE65 8UW. Tel 067 088 259.

Prudhoe (Tynedale ARC)—7, 28 December, 7pm. Falcon Hotel, Prudhoe, Tyne & Wear. Refreshments and drinks served to order. Bring and buy most meetings. UHF-vhf-hf-video in operation most evenings. CW also served to those with appetites. Details from Ken, G4IZW, tel 0632 678828, evenings.

REGION 19—RR R. J. C. Broadbent, G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQ. Tel 01-989 6741.

Cheshunt (C&DARC)—1 December ("Town and country planning and the radio amateur", by G4MAS), 8 December (Natter night and RAE debriefing), 15 December ("The amateur radio video show", by G8NDR), 17 December (Christmas dinner, details from G8YGP), 22 December (Natter night), 29 December (No meeting), 8pm. Church Room, Church Lane, Wormley, nr Cheshunt, Herts. Details from Bob Gray, G6CNV, tel Dane End 254.
Chiswick (ABCARC)—21 December ("The Icom 720A", demo by G3CCD), 7.30pm. Committee Room, Chiswick Town Hall, High Road, Chiswick, London W4. Details from sec W. G. Dyer, G3GEH, tel 01-992 3778.
Edgware (E&DRS)—9 December (Junk sale), 12 December (DF hunt on 1·8MHz by Radio Society of Harrow). 145 Orange Hill Road, Burnt Oak, Edgware. This club holds regular morse classes. Details from sec Howard Drury, G4HMD, tel Northwood 22776.
Harrow (RSH)—2 December (Christmas dinner), 3 December (Informal night), 10 December (Talk on "orienteering"), 12 December (DF hunt with Edgware, Watford and St Albans clubs (what a good inter-club idea. *RR19*), 17 December (To be announced on GB2RS), 24, 31 December (No meetings), 8pm. All Friday meetings are held at Harrow Arts Centre, High Road, Harrow Weald. DF hunt is on 1·8MHz and maybe 144MHz. Contact G4JNZ, tel 01-868 2159, for details, as soon as possible. Club sec Chris Friel, G4AUF, tel 01-868 5002.
Havering (H&DARC)—1 December (Junk sale), 8 December (Informal), 15 December (Video show—lecture on aerial circus, by G6CJ, and "Secret Listeners"), 22 December (Christmas party), 29 December. Informal meetings held at Fairkytes Arts Centre, Billet Lane, Hornchurch, Essex. Sec A. Negus, G8DQJ, tel Upminster 24059.
London (CSARS)—This club is now affiliated to RSGB and will soon be producing a newsletter. They request that all past members of the Civil Service Amateur Radio Society get in touch with the sec, George Costin, G4GFU, with a view to rejoining this society. Meetings are held at the CS Recreation Centre, Monck Street, Millbank SW1, during lunch hour, 12.30-2pm.
London (UK FM Group)—The meetings and dates of venues can be obtained from J. Parkins, G8KVP, in return for an sae.
Southgate (SARC)—9 December (AGM), 7.30 for 8pm. St Thomas's Church Hall, Prince George Avenue, Oakwood, London N14. Sec G4MCD, tel 01-360 5832.
St Albans (Verulam ARC)—21 December (AGM) (not the fourth Tuesday of month), RAFA HQ, New Kent Road, and not at the Charles Morris Memorial Hall. Details of this event and the club from Peter Hildebrand, G3VJO, tel Redbourn 2761. Will all members make a special effort to be at the AGM.
Stevenage (SARC)—7 December, 21 December. No details of meetings but it should be noted that meetings are now held at "TS Andromeda", Shephall View, Stevenage, Herts, at 8pm. Morse class at 7.30pm. Details from Terry, G6CRF, tel Stevenage 62860.

RR19 wishes to thank all those club secretaries of the 39 clubs who responded to his specific letter of 13 September. Only four replies were received on the subject of input to the regional reps conference on 30 October.

REGION 20—RR B. L. Goddard, G4FRG, 2 Greenfield Park, Portishead, Bristol BS20 8NQ. Tel 0272 84140.

Bristol (BRSGBG)—20 December, (Christmas party) 7.30pm. Queens Building, Bristol University. Members together with wives or girl friends are cordially invited. Further information on the party can be obtained from Chris Short, G8GLQ, tel 0272 621253.
Bristol (North Bristol ARC)—Fridays, 7pm. c/o Self Help Enterprise, Braemar Crescent, Northville, Bristol. December meetings will be announced on GB2RS and further information will be available from Ted Bidmead, G4EUV, tel 0272 691685.
Bristol (Shirehampton ARC)—Fridays, 7pm. Twyford House, Shirehampton. The new committee welcomes ideas for next year's programme and is planning a skittles match for December. Further details from Ron Ford, G4GTD.
Gloucester (GARS)—Thursdays. 2 December. (Talk on crime prevention by the local police.) 7.30pm, Chequers Bridge Centre, Painswick Road, Gloucester. Details from Tony Martin, G4HBV.
Mendip Repeater Group—GB3WR: 144MHz, R0; GB3UB: 432MHz, RB4; GB3VS: 432MHz, RB13 (awaiting site clearance); GB3UT: 1·3GHz, RMT1 (licence applied for). Membership cards are now issued to paid-up members, (annual subscription £2). Further information from Steve Gardner, G8GMZ, tel Midsomer Norton 413902.
Yeovil (Y&DARC)—Thursdays, 2 December ("P.E.P. and dbW", by G3MYM), 9 December ("An investigation of chordal hop", by G3MYM), 16 December ("An amateur radio discussion", chaired by G3MYM), 23 December ("Aerial tuning units", by G3MYM), 30 December ("Natter night") 7.30pm, Building 101, Houndstone Camp, Yeovil. During 1983 G3MYM hopes to set up some experimental projects which will include "search for chordal hop", "measurement of D region absorption", and to commemorate the 60th anniversary of the first transatlantic QSO, some work using very low power transmissions. Information and details on club night activities and the experimental projects from Don McLean, G3NOF, tel 0935 24956.

RR20 wishes all a very happy Christmas and a prosperous new year.

The Mayor and Mayoress of Luton visiting the JOTA station GB2IDS of Icknield District Scouts. Also in the photograph are Ray Aldous, G8CBU (2nd from right) and G4HPY (2nd from left). Photo Press picture by Roy Bushby

Mobile rallies calendar

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

12 December—Leeds & DARS Christmas Rally, Pudsey Civic Centre. Open 11am. Admission free. Licensed bar and full catering facilities. Talk-in on S22. Details from G4FIM, G3YEE or G6CNP, all QTHR. Tel 0532 794507.

11 March 1983—Lagan Valley RS Hamfest 1983, Lisburn Markets (beside Lisburn Swimming Pool). Opens 7pm. Talk-in, bring & buy, and trade stands. Refreshments available. Details from sec GI8SXN, QTHR.

13 March 1983—Pontefract & DARS Components Fair, Carleton Community Centre, Pontefract. Open 11am. Talk-in on S22. Licensed bar, refreshments, bring & buy. RSGB publications. Emphasis on build-your-own. Details from G4AAQ, tel 0977 791071.

15 May 1983—Northern Mobile Rally, Great Yorkshire Showground, Harrogate. Open 11am. Details from G4KDV (G8DFZ, QTHR), tel 0943 463083.

19 June 1983—Denby Dale & DARS Mobile Rally, The Shelley High School, Skelmansthorpe, nr Huddersfield. More details early next year.

10 July 1983—Worcester & DARC Annual Mobile Rally, Droitwich High School, Ombersley Road, Droitwich. Open 11am-5pm. Attractions will include "strawberry fields", fancy dress competition, model aircraft displays. Details from rally manager, Brian Jones, G8ASO, QTHR, tel Worcester 351565.

31 July 1983—Rolls Royce ARC (Barnoldswick) Mobile Rally, Sports & Social Club, Barnoldswick. Open 11am. Details from Leslie G. Logan, G4ILG, QTHR.

MEMBERS' ADS

CONDITIONS OF ACCEPTANCE

These subsidized flat-rate advertisements are accepted as a service to members of the RSGB only. They must be submitted on the Members' Ad form printed on the back of a *recent* address label carrier used to mail *Rad Com* to the advertiser: this will automatically provide proof of membership and should not be more than two months old. No acknowledgement of receipt will be sent, and advertisements not clearly worded or punctuated, or which do not comply with the conditions of acceptance, will be returned. No correspondence concerning this service will be entered into.

Trade or business advertisements, even from members, will not be accepted for "Members' Ads" but should be submitted as classified or display advertisements in the usual way. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions, or for the quality of goods offered for sale. Advertisements for citizens band equipment will not be accepted.

Warning. Members are advised that they should, as far as possible, ensure that the equipment they intend to purchase is not subject to a current hire purchase agreement. The "purchase" of goods legally owned by a finance company could result in the "purchaser" losing both the goods and the cash paid.

The current rate is £1 for 40 words or less: advertisements containing more than 40 words will cost an additional £1 for every additional 40 or less words. Each advertisement must be accompanied by the correct remittance, either as a cheque or postal order made payable to Radio Society of Great Britain.

The closing date for the February issue is 16 December.

Post to: MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS
Do not post to RSGB HQ or Advertising officer.

FOR SALE

TR9000 2m multimode in exc cond, never used mobile, orig packing, £280. Multipalmsizer 2 ext mic, charger, £90 or £350 the pair. G4GTS, QTHR. Tel 0442 42603.

FDK Multimode 750E fm/ssb tx/rx, nearly new, £220. Cushcraft Ringo Ranger antenna, nearly new, £20. Lowe FT1 absorption meter with coils, new, £20. SML SWR25 meter, £7. W. F. Rollason. Tel Telford (0952) 603482, after 6pm.

Pye Cambridge, wkg on 2m, 6ch, S20-23, R3, R5, toneburst, comp, incl handbook, £40 ono. G8PAI. Tel Colchester (0206) 271311.

ZX81 16k callsign index program, stores 420 callsigns with QTH etc, instant retrieval cassette, £3.95. D. Sweetland, 5 Ridgeway, Ingatestone, Essex CM4 9AS. Tel Ingatestone 2797.

2m multimode station: Yaesu FT280 (480R), £280. 100W power amp, fitted preamp, £80. Transmatch, £25. 9-el Tonna, £20. 50m UR67 coaxial, scanning mic etc, £400. Complete, wkg at home QTH. GW6DXI. Tel Ken, Swansea 71732, day, Swansea 204206, evenings and weekends.

Sig gen, Marconi TF144F, old but wkg, handbook, artificial antenna, some spare valves. Will accept best offer within seven days of advert. G3VTJ, QTHR (Birmingham). Tel 021-475 1107.

Accessories for Yaesu FT290R MMB11 mobile mount, fitted with 15W homebrew linear, NC11C charger, CSC1 soft cover, £45 the lot, or will split. Can deliver near Uxbridge or central Scotland. G4KFK, QTHR. Tel Mike, 0895 843167, evenings.

Hygain TH3JR tri-band beam, £69 collected. Cheesley, G4CHP, QTHR. Tel Swainsthorpe 470365.

Icom 701, £575. Trio 520, £325. Tono Theta 7000 communications computer, £385. All immac, possibly deliver. G3NZT. Tel Newby Bridge (0448) 31550.

Trio TS520SE hf tx/rx, 160-10m, provision for 10MHz, offered with mic, new pa valves fitted, £375 ono. MM4000 rtty tx/rx, keyboard, as new, offers? Pye PF2 ub uhf handheld on RB10, RB4, SU8, three batteries, case, as new, offers G4KUO, QTHR. Tel Mark, 0272 716093, after 6pm, please.

AR245 1 to 5W switchable handheld, cw charger, mobile charger, psu, socket fitted, orig packing. Tel Sheffield 667242, or Sheffield 680954.

DX300 10kHz-30MHz rx, exc cond, property of late swl, £150. Oscilloscope, Kikisui model 538A 5MHz, 5mV, hardly used, mint cond, £45. G3KKQ, QTHR. Tel 0784 51636.

Icom IC202 ssb portable rig, recharge cells, £100, or willing to swap for decent car radio cassette. G6DAU. Tel St Albans 72528, evenings only.

Trio TR2500, unwanted gift, £160. Creed 7B teleprinter, £20. Both plus delivery. *Wanted:* Trio TS700G in good cond, prefer no mods but preamp mods acceptable. Will collect. G8EBM, Leamington House, Windley Lane, Weston Underwood, Derbyshire. Tel Brailsford (033528) 755.

FT101Z mic, fan, 600Hz filter, six bands, Yaesu mod for 10MHz, used little, £350. G3LRP, QTHR. Tel Barnsley (0226) 726975, evenings only.

Many second world war collectors' items: BC151-BC1335, some intelligence items (RS series radios), manuals etc. Have rare crank knobs for SCR274N (command) and AN/ARC-5 series (only source in the USA). *Wanted:* WS A510 items. Txs, rxs, cables, control units, antennas, etc for WS46. Canvas for w sets 38,46. REME manuals (depot type) for WS46,38,18. W.H.Y? Tony Grogan, WA4MRR, 5 Rollingwood Drive, Taylor's, S Carolina, USA.

FDK750E, continuous coverage 144-146MHz, ssb, cw, a.m., fm, hardly used, mint cond, boxed, with λ/4 gutter mount antenna, £240. 5-el Yagi, unused, £7. G4GKN. Tel Bristol 833572.

Sleeping bag, good for 40°, exc cond. Telefunken two-way spkrs, cassette play/record 14W perc, requires slight attention. Ever Ready Old Vale battery portable 5in r/r tapes, £50. W.H.Y? Amateur gear. RX antennas etc. P. W. Hall, 10 Dulverton Square, Leeds LS11 0LL. Tel Leeds (0532) 771090.

Bearcat scanner 250FB, as new (purchased July 1982), £190 or part exchange for Bearcat Scanner 220FB. Tel 031-442 1082.

FT101Z 160-10m cw ssb, fan, cw filter, exc cond, SEM Europac 2m transverter, mic, key, all cables, £400. G4MDS, QTHR. Tel 07816 2905.

Swan Cygnet 240/12V, 80-10m, comp with homebrew atu, many other accs, £100. G4ETN, QTHR. Tel Bridgwater (0278) 451357.

MML144/100S, 2m linear amp, 1W drive, 100W output, £110. 12V 24A psu, suitable for most solidstate hf rigs, vhf pas etc, £80. Both virtually new. G4ILW, QTHR. Tel Newcastle (0632) 872661.

TS130V (all filters fitted), VF120, AT130, £525. MMT144/28, £65. MMD050/500, £40. MMA144V, £20. BC221, £15. G3TUX, QTHR. Tel Chris, 0428 3229.

FT101ZD, mint cond, six band, comp with fan, mic, cw filter, dc/dc converter for mobile wkg, manual, G-whip antenna, £475. G3RRM, QTHR.

IC202 ssb/cw tx/rx, 144-144-4, manual, mic, new batts, 5-el Jaybeam, all virtually new cond, £90. Electronic slide rule, brand new with instruct, £2. G3RRD, QTHR. Tel Amberley (Glos) 2365.

50Ω dummy load carbon resistors, brand new, dissipates 150W in air, 250W in oil, £13. G3PVD. 30 Edmonton Road, Woodsmoor, Stockport, Cheshire. Tel 061-487 1376.

Yaesu 502DM; Amtech 300 atu; Skyking SU4000 rotator; Cushcraft ATV5 vertical 80/10m, £950 ovno. Will separate. Genuine reason forces reluctant sale. Tel Preston (0772) 742922.

Swan 500, comp, £300. 10-15-20 beam, comp, £50. 25mH dig freq meter, £15. Airmec 784 millivoltmeter, £20. Cintel square wave gen, £20. Eddystone 740 gc rx, £25. Pye pot, 0-100k, £12. Transformer, 2kVA, 240-100V, £60. Transformer, 1kVA, 240-115V, £20. Hill. Tel Tadcaster (0937) 832253.

FRG7 2·4kHz filter, attenuator fitted, £100. FL200B, £70. Acorn Atom 8k, fp rom, 4A ps, £120. Any trial. 53 Heys Avenue, Swinton, Manchester M27 3QU. Tel Brian, 061-794 4423, after 6.30pm.

Yaesu cpu 2500R 2m fm 25/3W keyboard, mic, orig packing, vgc, £160 ono. Buyer pays carriage. Tel Weymouth 786930.

OK1 CP110 matrix printers, one upper case only, serial/parallel interfaces, (suit Video Genie etc), £100 ono. Other has lower case but serial RS232 only, suit UK101 etc, £175. G8ZZR, QTHR. Tel Peter, 03722 72713.

Creed 7B teleprinter, wkg, comp with silence cover, £10 ono. Buyer collects. 250W transformer, 240-110V, £6. G3SIP. Tel Horncastle (06582) 7086, after 6pm.

Creed 7ERP teleprinter, cover, good cond, £25. 6S6 tape reader, £5. MH311 14-el dx tv antenna, £15. Bush tv 125, dx tv tuner, offers? G3JKN, QTHR. Tel Denham (0895) 832229.

TS510 tx/rx, £190. AR77, £45. B123, £8.50. SSB board filter xtal, £8.50. Transistor rx units, require front end, £6.50. 2m Green Davis converter, £6.50. Redifon RX475, £25. Valve frequency counter for spares, £7.50. Buyers collect. G3JTU, QTHR. Ring Daventry 2909.

Three monitor scopes, £7 each. Solartron scope, requires attention, £7.50. BC639 100-155MHz, £12. Wee megger, £6.50. All ono. G3JTU, 8 Browning Close, Daventry, Northants.

Free to museum collector: 100 plus copies *Practical Wireless*, 1946-62; Mullard high speed valve tester; old car radios; ht eliminators; tv preamps; USA plane identification unit. Sell *Practical Wireless* full volumes 1962-80, £10, you collect. G3XLC, QTHR. Tel 0782 311811.

Yaesu FT7000 gen cov rx, no mods, hardly used, handbook, orig packing, mint cond, £160. G6IYT NOT QTHR. Tel 061-861 9990.

FT500, new valves, £200. AR88D with 7360 mixers, £45. Vanguard a.m., boot mounting, low band, comp, wkg, one Vanguard less connections, offers? G3LBX, Rectory, Lorton Road, Cockermouth CA13 9DU.

FT100 tx/rx, solidstate except pa, 80-10m, built-in mobile psu, £165. Tel 0529 21 327 (Lincs).

Video recorders, Ampex 7000, 1in reel-to-reel, some tapes, needs new drive belts, £75. Two IVC700 series 1in reel-to-reel, some tapes, £150 each. Tel 0283 71 3865.

Yaesu FRG7, 0·5-30MHz communications rx, immac, £120. MM preamp for 28MHz Oscar, £14. 70cm antenna, 19-el Tonna, £15. Alba hi-fi, £25. Brott sit-on lawnmower, £250. Atco self-propelled rotary mower, £80. Gas fires, £35. Other bargains. G6ASA. Tel Oxford 863333.

2m plus 70cm monitor rx, consists of SMC HA12A12, fitted repeater xtals, Microwave Modules preamp, 70cm converter, all in portable box with antenna, £50. Tel Simon, Aylesbury (0296) 82237.

Heathkit 32A ssb tx/rx, 20m less p-p, £30. HW8 15-80m QRP cw tx/rx, less p-p, £90. Datong rf speech clipper, mint, £25. G3PPV, QTHR. 30 Nethway Avenue, Blackpool.

Daiwa CNA1001 automatic antenna tuner, 20/200W all bands 3·5-28MHz, perfect cond, £75 ono. G3LP, QTHR. Tel Cheltenham 512481.

Trio R1000, used little, communication rx, £200. G4GIQ, QTHR. Tel Northwich 45584.

North Leeds, quiet cul-de-sac, four bedroom detached in one-third acre landscaped gardens, one minute from bus, rural outlook at rear. Cushcraft A4 tribander, new, Daiwa hd rotator in situ. Fantastic dx location, £47,000. G3AAS. Tel 0532 686036 or 683107, evenings.

RTTY terminal, sts board homebrew, Creed 7E, good cond, Creed 54 dual speed controlled from tu, Creed 6S reader, leads, plugs, paper, tape spares, motor, brushes, all for £90. Will split. G4NAB. Tel Chris, Fareham 0329 662144, any reasonable time.

Philips N1702 LVC video recorder, 11 tapes, exc wkg order, only 20 months old, ideal for atv etc, £150 ono secures. R1155, psu, offers? *Wanted:* TA33JR etc, must be wkg and cheap, ideally local to Birmingham. G4OIN NOT QTHR. Tel Andy, 021-451 2571.

Trio 2300, as new, reverse repeater nicads, etc, boxed, £140. Liner 2 144 and 28MHz, ssb preamp, piptone, good cond, £90. Trio 9R59DS communications rx, good cond, boxed, £45. G6BGW, QTHR. Tel 061-665 1722.

QTH, four double bedrooms, detached house, bathroom/shower, downstairs cloakroom, study, lounge/diner, fitted kitchen, double glazed, fully carpeted, 2yr old, two garages, parking area, 50ft garden. Good take off to east, have worked into Scandinavia on vhf/uhf, £41,500. G6EUW. Tel Chelmsford 469473.

Yaesu CPU 2500RK, 25W fm, £170. BC221, psu, £15. Cowl gill rotator, £10. 12AVQ, £25. 18AVT/WV, £30. Yaesu YC305, £55. FRG7000, £195. FV101, £35. Standard SRC830/M15 marine handheld, ch5, 6, 9, 16, 25, base charger, £100. Yaesu FT901DM, £585. FV901DM, £160. FTV901R, 2m and 70cm, £400. FC901, £95. FV901DM, £200. SP901P, with phone patch, £30. Heathkit Panadaptor, £50. All mint. G3AAG. Flat 21, 17 Clarges Street, London W1Y 7PG. Tel 01-499 0264 (answering machine).

Have Bird 25W thruline element for 70cm, would exchange for 2m element, 100W or 250W. Marconi TF801B/3/S sig gen, exchange for IC2E or similar. Bonner. Tel Knockholt (0959) 33296.

FT901DM, £575. SP901 spkr, £15. FTV901R transverter, 2m and 70cm, repeater shift, £360. Welz SP400 swr bridge/power meter, £40. All above mint cond. Advance OS15A scope, £20. AVO 8, leather cased, £40. Deceased amateur's effects. G3OLM, QTHR. Tel Ashtead 73775.

Mizuho SB2M, 2m portable ssb/cw, tx/rx, vxo controlled, exc cond. G6HPA, QTHR.

Yaesu rx FR1010 dig 2 plus 6m fm a.m. cw filter, a.m. filter, digital display, matching tx FL101 rf proc connecting cables for separate or tx/vx operation, both £425 ono. KW107 Supermatch, £125. Bearcat 220FB, new cond, £175. G2CGF, QTHR. Tel 0494 29950.

Cushcraft AV5 trapped vertical, comp with Lowe five-band radial kit, £50. Tel 021-459 7041, after 6pm.

Racal rxs: RA117E, RA117A, each £225. SSB adaptor, £35. Racal atu, £55. Racal synthesizer for RA117 rx, £160. Racal double diversity unit, new, £20. All good cond. Buyers collect. G4HES. Tel Chesham (0494) 785557.

B40 naval rx, ex-HMS Hermes, £40 ono. AT5 1·8-3·5 tx, psu, £20 ono. G3TDF, QTHR. Tel Redditch 65931, evenings.

FT221R contest winner with Mutek rf board, coaxial relay, matching spkr, exc cond, £310. TA33JR, new traps fitted, £70. 4-el 2m Jaybeam quad, £8. *Wanted:* FT101E. G3ZIG, QTHR. Tel 0362 4634.

Creed 75, nearly new, pair of 8in disc drives. G8HJT, QTHR. Tel 0202 764724, after 6pm.

Yaesu YR901, £275. YVM1 monitor, £55. YO901P Panadap, £230. All mint. Four DL6WV Yagis, new, 7-el, £20 each. G3XNH, QTHR. Tel Godalming 29757.

IC280E 2m fm tx/rx, immac cond, psu, mag mount, vertical antenna, £160. Ex-G8DHZ, 9 South Terrace, Redland, Bristol. Tel Bristol (0272) 731365.

Shack clearance: IC202, no mods, £90 ono. 16-el F9FT, £25. 50ft low-loss coaxial, £10. 5-el Jaybeam, £6.50. 5/8 mobile whip with mag mount, £8.50. Will split or sell the lot for £140 ono. GW6AJK. Tel 051-733 9427, after 6pm.

Heathkit SW717, manual, Heathkit aligned, four bands, 500kHz-30MHz, S-meter, bandspread, bfo. I. Fletcher, 21 Ilex Way, Bognor Regis, W Sussex. Tel 024 369 4207.

Yaesu FT707, 100W, FV707DM digital vfo, 30A, SMC power supply, YM35 mic, £907 of immac equipment, save over 30 per cent, the lot for £690. G4IJS, QTHR. Tel 0925 64075.

FDK Multi 2000 fm, ssb, cw, 10W, 240/12V, toneburst, Duplex, synthesized in-built preamp, £150 ovno. G8VWI, QTHR. The Cottages, Pennsylvania, Chippenham, Wilts SN14 8LB. Tel Pete, Marshfield 300.

FT480R, 2m multimode tx/rx, SOTA 40W linear, AT145 Packer atu, all 15 months old, leads, a comp station for £370 ono. G4OXD NOT QTHR. Tel 0462 35248, after 6pm.

FT225RD 11ch xtals, £440. FT80R, fitted repeater mod by ARE, £330. 70cm MM linear with preamp, £65. 70cm co-linear antenna, £15. Moving house forces sale. G3JTQ, QTHR. Tel 0990 26764, anytime.

Yaesu FT707, FP707, FC707, not used for mobile, mic, instructions, £520. Limited distance delivery possibly available. G4DGG. Tel 0235 20230.

On the air for £175: comp station, tx FL50B, rx FR50B 10-80m, 3-el beam, 10, 15, 20m, mic, dummy load, power/swr meter, key, 3-way switch. All cable conn, etc. Tel Northampton 491309.

Icom IC2E, orig packing, rubber duck, charger etc, leather case, used only as QRP base rig, £125. G4LUF, QTHR. Tel Swindon 782787, evenings.

Eddystone EC10 rx, S-meter (Eddystone circuit), good cond, fully lined up, £45. Drake SSR1 rx, vgc, £110. Leak TL12 amplifier, Varislope preamp, through line tuner (vhf), two 10in loudspkr units, no case, wkg well when last assembled, £15. Transistorized gate-dip oscillator, four coils, needs finishing, £7. Buyers to collect please or pay postage. Lindars. Tel 01-647 6157.

ASR33 printer, 230V, 50Hz, 110 baud, friction paper drive, 20mA loop fldx interface, ASCII coded, paper tape punch, reader, eight-hole, comp with stand, synchronous motor, £85. G8EQD, QTHR. Tel Rotherham 556864.

KW2000B plus remote vfo, 4B mains psu, £250. SB301 rx, fitted switched attenuator, phones, £90. SB620 Scanalyzer, i.f. choice, 455-6,000kHz, requires i.f. line-up, £50. Mizuho audio peak, notch filter, £20. 100m of 4mm polypropylene rope, unused, £10. G3RHM, QTHR. Tel 01-423 0306.

Mosley TA33JNR, £50. Jaybeam 6-el 2m quad, £5. Rotator CD44, £35. Icom IC215, immac, £70. 13·8V, 10A, homebrew psu, £20. 32ft (8 by 4ft sections) hd tubular aluminium mast, £30. Buyer collects. G4HIY, QTHR. Tel Crowmarsh 788.

Datong asp automatic speech processor, £40. 30ft UR67 brand new coaxial, £2. SWR meter, £3. G8OVQ, QTHR. Tel Tiptree 816677.

IC24G, £120. IC240, £100. Both used little, immac cond, orig packing. ASP 2m 5/8 base antenna, unused, £5. 2m 2×5/8 colinear base antenna, sealed in orig packing, £15. G3ZYN, QTHR.

Yaesu FT225RD multimode, one of the last specimens available, £475. Orig packing £5 extra. Microwave Modules 144/432R transverter, used little, £120. Two 16-el Tonnas plus phasing harness, £50. Tel 01-366 5638 (N London).

Qty tx/rx valves: 4CX250B, QQV06-40A, QQV03-20A, QQV03-10, DET22, DET24, DET29, etc, all brand new, boxed. May be cv equiv. Tel and quote a price. W.H.Y? RS52250. Tel 0704 25851.

Telford TC10 all mode 2m tx, £60. G8AEV conv, TC7 28/30 i.f./af, modified to tune to 1MHz bands, £25. Buyer collects. G8NN, QTHR Sheffield.

Portable oxy-methyl-acetylene welding outfit, Ergo-flame type, comp with five jets, valves, etc, virtually new, very light and efficient, suitable for steel up to 0·125in and all brazing. Cylinders full. Brock. Tel Oxted 2141, evenings.

Icom IC2E 2m portable, as new, boxed, £90. Channel Master rotator, alignment bearing, £25. Jaybeam Q6/2M 6-el quad, £15. X6/2m/X12/70cm dual band colinear, £10. 2m 7/8 mobile whip, bracket, £8. 2m handheld colinear, £10. G6CIG, QTHR. Tel 0234 41013.

FRG7700, as new, orig packing, now owner of FT101ZD, £285 ono. 9 Tolstoi Road, Parkstone, Poole, Dorset. Tel Parkstone 730263.

Argonaut 505 QRP ssb cw, 5W input, homebrew atu incl Sentinel auto 2m preamp, new. *Wanted:* Mini beam. Auto atu Daiwa CN1001A or similar. Good rotator. Bencher keyer paddle. G4LOP, QTHR. Tel Skegness 810192.

Yaesu FL2100Z linear amp, boxed, as new, £350 ono. Icom IC260E, scanning mic, vgc, £240 ono. MMT144/28 2m transverter, MMT28/144 10m transverter, £60 each. 10m 100W linear, £50. Two 10m mobile ants, £15. G4GNU. Tel 0268 774947.

Standard C146A 144MHz fm handheld, five xtal channels, S20-23, 144·800, toneburst, helical, telescopic, λ/4 flexi-whips, nicads, charger, handy spkr/mic, leather case, manual, good wkg order, £65 ono. G8GZZ, QTHR. Tel Ned, Woking (04862) 23506.

Kyokuto Digital 2, 2m mobile, 5kHz steps, £135. Creed 75R, £25. 5FP7, crt for sstv, £10. G3SZY, QTHR. Tel Stetchworth 366.

Oscilloscope, Heathkit 10-12, £35. Serviscope S32A, £35. Wobulator, E.K. Cole Ltd, £15. Creed 7 teleprinter, £12. Five-octave organ keyboard, £50. 22in colour ITT CVC5 television, £10 ono. All need attention. 22in colour tv tube, £40. G8PLL, QTHR. Tel John, St Austell 64463.

Trio 2300 incl two sets of nicads, charger, etc in orig box, bargain at £110. G6INQ NOT QTHR. Tel 0245 468149.

Going QRT: Hygain TH3JR, BN86 balun, Sommerkamp FLDX500, Trio TR2200GX, psu, Catronics DFM5 digital freq meter, Lafayette TE57 gdo, Heath IM18U vvm, RF40, Drake TV3300 lpf, Marconi B43/R220 tx/rx, etc. SAE for list. GM3VXR, QTHR. Tel Motherwell 65443, evenings or weekends.

FRG7700M, memory version, as new, orig packing, £275. G3FPN, QTHR.

KW2000B, £195. Eddystone EC10 Mk2, mains/batt psu, £40. Heathkit GR78 gc rx, £25. All in vgc, and comp with ccts/manuals. Tel Luton (0582) 20226.

Search 9 2m rx, vfo, three xtals fitted, discone base antenna, 26-514MHz, Jaybeam 5/8 mobile antenna, new unused gutter clamp, all as new, bargain at £60 the lot. S Clifton, G6MEF, 97 Redland Drive, Kingsthorpe, Northampton.

Palm 4 70cm tx/rx handheld, nicads, charger, RB0 6, 10, 14, SU8, S20, mint, orig packing, £105. G3UCK, QTHR. Tel Cullingworth 272417.

Video Genie EG3003 with sound, editor/ass program, many games programs, £275. G8LVX. Tel Dave, 01-904 0878 (Wembley).

Comp 2m-70cm station: FT208 tx/rx, MM144/432 transverter, two-band mobile antenna, 70cm base antenna, PA3 mobile psu, ac psu, 13·5V, 3A, total value £450, accept £300 or FT107, FC107 with cash adjustment. G8HTP, QTHR. Tel 061-764 2722.

Daiwa Search 9 fm rx, 11 xtals fitted, S13-23, £40. DRAE 12A psu, £40. Datong morse tutor, £30. FX1 wavemeter, £20. 70cm 48-el multibeam antenna, £20. G6ADL, QTHR. Tel Kettering 710004.

10m ground plane antenna, worked lots of dx, £12. Daiwa CL22 antenna tuner, ideal for swl rxs, £12. Both in vgc. G4MUW, QTHR. Tel Winchcombe (0242) 603682.

Jaybeam 8XY 2m antenna, one year old. £15. Homebrew 20A power supply, £20. Buyers collect. *Wanted:* Yaesu FP707 power supply. G4DIC, QTHR. Tel Hinckley (0455) 636315, evenings or weekends.

AM10D Cambridge 4m, a.m., Garex fm board, 6ch, 70·20, 70·26, 70·45 fitted, handbook, £40 ono. Tel Aberdovey 367.

Eddystone 940 gen cov rx, offers. Would exchange for JR310 or similar ham band rx. G4EYD, QTHR. Tel 021-478 2429, evenings.

FT220 vhf multimode tx/rx, cw mic, handbook, has faulty fm i.f., noise blanker, boards, otherwise in vgc, £50 ono. Carriage and inspection by arrangement. G2LL, QTHR. Tel Cooden (04243) 4645.

Yaesu FT780R 70cm multimode tx/rx base or mobile station, mint cond, £330. X6/2m X12/70cm Jaybeam two-band beam, £20. G3YWS, QTHR. Tel Newark 702413.

Trio DM81 dip meter, 0·7-250MHz, new, current shop price £60, £40. Boris Diplomat chess computer, multi-level incl p/supply, £20. Both ono. *Wanted:* 70cm 50W linear, 6A, 12V power supply, ZX81 or similar computer. W.H.Y? G4ABF, QTHR. Tel Malvern (06845) 66202.

Simple to operate TR7500 mobile tx/rx, gives a good 1/10W output, vgc, comp with mobile mount, orig packing, £145 ono. Consider part exch FT290, IC2E or similar. G4KTE, QTHR. Tel 0253 736684.

Icom IC720, PS15 power supply, cw/a.m. filters, used little, as new, £675. Icom IC720A, PS15 power supply, cw filter, brand new, in orig wrapping, £800. Icom ICAT500 auto ant tuner, unused, £220. GW4ACO, QTHR. Tel 0492 55240.

TRS80 level 2 basic, two weeks old, orig packing, comes with modulator, £300 ono. Will pay carriage. Reason for sale going mobile shortly. Tel Tim, Hawkshead 347 (pub hours only please).

R1000, exc cond, with accs, box, used little, £200. Carriage paid or exch FT480R with cash adj. GM4IIR, QTHR. Tel 0555 2737.

PF1 rx, £4. PF1 tx/rx, £12. Eddystone 770R, £85. TF995A2 sig gen, £75. Airmec 407 a.m./fm sig gen, £65. Eddystone 830 hf rx, £100. Pye Superlynx camera, £55. National Panasonic 12V dc portable camera, £65. Sony AV3420CE portable vtr, £90. G8EPR. Tel 0299 403773.

AVO 8 Mk5, £35. Eddystone 898 dial, £7. *Wanted:* Heathkit SB610 or KW108 monitorscope. Tel Weston Zoyland 740, evenings, Burnham-on-Sea 782039, office.

MMT 432/144 2m-70cm transverter, £125. AR88D, £45. FP707, £90. All items buyer collects or by arrangement. G8CLC, QTHR. Tel Kings Lynn (0553) 71389.

Yaesu FT101 Mk2 cw filter, fitted, good cond, £200. G4BWU, QTHR. Tel 0438 54261.

FRG7, good cond. £105. MMC 144/28LO 2m conv, £15. MMC 432/28 70cm conv, £15. IC22A 2m mobile, 10ch, £60. Creed 7B, £20. Buyer collects. G3RUD. Tel Tamworth (0827) 69386.

Yaesu FT227 2m fm synth, £100. Burndept uhf handheld and mobile, £45 each. Compact b&w camera, £45. G4EIG. Tel 021-706 2339.

FRG7, mint cond, used little, orig packing, handbook, incl 30 *Rad Coms*, circle dx wall map, Callbook DX Listings, halfwave dipole centre feed, £130. G3XYT, QTHR. Tel 021-384 5796.

FRG7700, mint cond, used very little, manual, £250. *Wanted:* 14 AVQ/WB Hygain vertical. Smith, BRS46232. 122A Poolstock, Wigan. Tel Wigan 45563.

KW Viceroy hf ssb/cw tx, in good wkg order, homebrew psu, £55 ono. Buyer collects. G3WRO, QTHR. Tel Harlow (0279) 30609.

TS120V, psu, mic, phones, never used mobile, absolutely immac, will split, £380 ono. Five-band vertical ant, £30. Daiwa SR9 2m rx, £38. 12/24V 5A psu, £10. Long lengths UR67, 40p/m. 2N5642 rf power transistors, never used, £5 each. Morse practice osc, £2. All exc cond. Legit reason for sale. Postage at cost, but prefer buyer inspects first. *Wanted:* Data on Redifon GR286 and CR150. Buy or prompt return. G4LMJ, QTHR. Tel 051-336 4359, after 14 December.

Transmitter, 100W ssb/cw/a.m., Hallicrafters HT32B, covers 80-10, superb quality, exc wkg order, £125. *Wanted:* computer (not Sinclair) and Datong active antenna. Tel G3HCM NOT QTHR. Tel 0203 473698, evenings or weekends.

Trio 9000 2m multimode tx/rx, exc cond, no modifications, comp with mobile mount, mic, used little, £265 ono. G4MVS, QTHR. Tel 01-644 8249.

FT480R 2m multimode, as new, orig packing, £280. FP4 13·8V 4A power supply, £30. Together, £300. G4MER, QTHR. Tel 0225 703092.

Sommerkamp FTDX150, £195 ono. 80-10m, aux, vox, cw, ssb, a.m., mains, 13·8V inverter fitted, in good wkg order. May swop for 2m gear, or offers. G6KXH NOT QTHR. Tel Malton (0653) 4646, anytime.

Brand new FT480R in box, never used, genuine reason for sale, £330 ono. G6HTJ, QTHR. Tel Warrington (0925) 53411.

Yaesu FT7 mobile bracket, leads, mic, extra 28·0-28·5 xtal, never used mobile, exc cond, £250 ono. GD3ESV, QTHR. Tel 0624 5026, evenings.

Yaesu FRDX400S communications rx, a.m., fm, usb, lsb, cw, 160-10m, all extras incl 2m and 4m bands, wide and narrow cw filters, vgc, £150 ono. Will deliver 50 miles round Cannock, or buyer collects. G4ENG, QTHR. Tel Dave, Cheslyn Hay 417477.

FT107M, black, used little, perfect cond, new bands, all options, internal psu, memory, cw and a.m. filters, scanning mic, offers, £575 for quick sale. G4JQI, QTHR. Tel 0254 823366.

DX300 communications rx, 15kHz-30MHz, a.m./ssb, only two years old, £120 ono. Splitting collection of Commonwealth mint stamps, mostly 1976 Caribbean, S. Atlantic and Pacific islands. SAE for list. GW6MPY, 8 Llys Enfys, Gwernymynydd, Mold, Clwyd. Tel 0352 56486.

Sony Betamax SL8000 video recorder, £165. Philips 1700N lp vcr and tapes, £95. Philips 1501N vcr and tape, £55. All have video options. Liner 2, ssb, power supply, £65. All items in good wkg order. Tel 0376 24845.

IC2E, ICDC1, ICBP4, ICCP1, nicads, charger, helical, exc cond, £110 ono. G4NAD. Tel Richard, Portsmouth (0705) 817498.

FL2100B, manual, boxed, exc cond, £200 ovno. GW6HDW, QTHR. Tel Penarth (0222) 708771.

Yaesu FR101 rx, amateur bands incl 2m, 4m, broadcast bands, ssb, a.m., cw, fm, fitted with wide and narrow filters on a.m. and cw, 100 per cent cond, £325 ovno. Tel 021-742 8850 (West Midlands).

FT480R 2m multimode tx/rx, hardly used, boxed, manual, £300 or exchange for suitable hf rig, eg TS120S. HW32A 20m ssb tx/rx, modified to include 40m, psu, £65. G3WDX, QTHR. Tel 09277 65998.

Marconi CR150 communications rx, 2-60MHz coverage, incl power supply, £50. Kent Modules plug-in nbfm adaptor for FT101 up to FT101E, £50. G4ORJ. Tel Rushden (Northants) 314250.

AR40 rotator, brand new, unused, £50. Magnetic mount with 6m RG58, PL259 plug etc, also unused, £10. SWR/relative power meter, twin meters 3·5-170MHz, £8. G. France, 2 Leopold Drive, Bishops Waltham, Hants. Tel Bishops Waltham 4876.

UHF equipment, mainly homebrew, 1·3GHz-144MHz transverter, DF8QK, MM boards, used, £55. Two stage linear, 2x2C39A in cavities, 2W in, +50W out, psu, in two small cases, £150. Remote preamp and antenna relay, £10. 432-28MHz transverter, 4CX250 in cavity linear, £150 pair. SWR meter with remote heads for 2m, 70cm, 23cm, £12. G4ONN/G8CVO. Tel Jim, 0202 518828.

Yaesu FT200, FP200, Shure 201 mic, good cond, recent overhaul. £210. Welz AC38 atu, £40 or £230 together (preferred). G4OWN. Tel Flitwick (Beds) 714003.

Scope, Cossor double beam oscillograph, model 1049 Mk3A, two spare tubes type 89, double beam, 4in diameter, complete stand, instruction book, £50 ono. Buyer collects. G3BWN, QTHR. Tel 0602 227624.

YE17 scanning mic, 600Ω, fits FT227RA/B, CPU2500R, no longer available, equivalent model is £13.80, mint cond, £7. G4JLU, QTHR. Tel David, 01-954 6728.

Microwave Modules 144/100 2m linear/preamp, 100W output for 10W input, £85. J. Bulls 20A 13·8V protected dc psu kit, unused, cost £44.50, £35. Both carriage extra. T. Knight, G2FUU, QTHR. Tel Nazeing 2274.

Casio 502P prog scientific lcd calculator, 251 steps, 20m, FAI tape adaptor, boxed, £45. G8BKU. Tel 01-928 7772.

Telequipment scope S51E, hb, £50. Sony ICF2001 rx, brand new, £120. Part-built Catronics 2m 10W pa transistor, untouched, £10. Pye Ranger, no mods, £5. HF5 vert antenna, unused, still in box, £35. G3WPI, QTHR. Tel 0703 734513.

Trio TR2200GX 2m fm tx/rx, boxed, as new, £85. Computer psu, 5V at 7A + 12V at 0·5A, all stabilized, £30. Ex-computer patch panels, over 800 sockets with plugs, £40. G8CUY, QTHR. Tel E Dereham 850073.

Kenwood, surplus to requirements: SP820 spkr with audio filters, £24. MC50 dual impedance mic, £15. Mods 820 series: cascaded filter; QRO using 6146W. SAE full details, Any offers accepted. G4CHP, QTHR. Tel Swainsthorpe 470365.

Yaesu XF89HCN, 300Hz, £10. FT221RD, YC221, 11 xtals, £300. Belcom LA106 valve linear, £100. Both, £350 ono. FC707 tuner (unbalanced), £60. SP101, £20. FV101Z, £75. Tasco Telereader 680 cw rtty, £150. Buyers collect or carriage extra. G4IOT, QTHR. Tel Folkestone 76063.

FT480R, listen on input mod, exc cond, £295. MMT 432/144R 70cm transverter, £115. FRG7 hf rx, fine tune version, £105. G4HWL, QTHR. Tel Petersfield (0730) 4059, evenings/weekends.

Eddystone B34 psu, one coil, collector's item, one year's *QST*, 1982, offers. G2DRT, QTHR. Tel 0494 814240.

Superb spec Coutant 20A dc power supplies with circuit diagram, cont rated 6-30V output, 1,000 + VA, as new, units can be operated in parallel, £65, collected. G4AQV, QTHR. Tel 0533 552809, evenings/weekends.

Sony ICF2001 fm/a.m./ssb hf rx, unmarked, psu, six months old, £100 or exchange 25A 13·8V dc psu. RS52078. Tel Dick, Sellindge (nr Ashford, Kent) 2788, evenings.

TR2300 80ch 2m tx/rx, modded 0·5W, 2·5W rev rpt, comp with nicads, charger, case, carrying strap, rubber duck, 12V lead, mobile mount bracket, orig box, manual, £150 ono. G3OUL NOT QTHR. Tel Liverpool (051) 922 5508, after 6pm.

FT101EE 160-10m, immac cond, £325. FC901 ant tuner, £98. Datong asp speech processor, £68. G4JYH, QTHR. Tel 01-886 0126, day.

RTTY gear, 7B, £2.50. 75, parallel interface for spares, £5. TDM S6 test unit, £9. ASR33 manual Vol 1, £2. Minimitter amateur bands converter, 1·5MHz i.f., £2. Following are £5 each: box dynamotors, Gee display, vintage radio parts. G8UDJ, QTHR. Tel Abingdon 20005.

FT-ONE with psu, i.f., local unit/mods, still under guarantee, incl fm, no more need be added, £1,100. G4JYH, QTHR. Tel 01-886 0126, day.

HF tx/rx, 80-10m Dentron HF200A, solidstate, 200W input, ssb, cw, rtty, sstv, incl mains psu/spkr, bargain, £150. G4KWA, QTHR. Tel 01-777 9061.

FT225RD, fitted Mutek front end, mint cond, used little, any trial your shack or mine, £475. Going hf. G8MPB, QTHR. Tel Ken, Bloxwich 75057.

FTV901R, 2m installed, £225. KLM15-160BL 2m linear, £150. Cushcraft 214B junior boomer, £40. 2m ORO linear kit, incl 2x 4CX250Bs, SK620A bases, relays, etc, £250. Tel Ian, Leeds (0532) 737475, ext 481, office hours.

SR9 monitor rx, eight xtals, vfo, £35. SEM 2m preamp, 12V adj gain, cost £29, sale £17. Bird type 43 with bnc SO239 N-type sockets, 3-el, as new, offers by letter please. G8TOM, QTHR.

KW line, comp hf station: KW2000B, KW1000, VFO4B, KW107, 444 mic, handbooks, £634. G3PLX rtty vdu system, flashing cursor, keyboard, monitor, psu, terminal unit, ready to send and receive, with all documentation, will demonstrate. G4DFU, QTHR. Tel Langley Mill 60334.

MMT 28/144 10m linear transverter, 2m input, 6h air time, switchable 27/29MHz, 28/30MHz, 15dB, 10W attenuator, £75. G4GXF, QTHR. Tel 037-52 2089.

Europa 2 2m transverter, fitted QQV03-20 pa, but will take QQV06-40 with receive preamp, comp with CPS10 psu, built-in attenuator, instruction book, circuit diagrams, wkg order, £40 ono. G4BAL, QTHR. Tel 01-302 4062.

Sinclair ZX81, 16k memory, i/o ports, proper keyboard, psu, books, software, £100. Heathkit 10-18V 5in laboratory scope, £25. Barlow Wadley XCR30 Mk2 rx, £70. G3SJX, QTHR. Tel 01-656 9054.

HW101, comp with psu, cw filter, Shure 444 mic, £200 ovno. GI3ZCK, QTHR. Tel 0232 56221, business hours.

QTH: four-bed modern s det, 2 receptions, fitted bedrooms, kitchen, sep wc, integral garage, utility, brick workshop, store, greenhouse, rural open farmland, 400ft asl, large gardens, superb radio site, panoramic views, M66, M62 1 mile, £36,000. G3FUF, QTHR. Tel 061-643 6000.

Yaesu FT107M, FP107E psu, 9-band hf tx/rx, mint, £645. Eddystone 880/2 high grade comm rx, 30 bands, £250. Standard C8800 2m fm, £145. Bearcat hh scanner, 6ch, four bands, £69. Jaybeam MBM88/70cm, £25. PBM14/2m, new, £40. Part exchange? *Wanted:* Hallicrafters SX42 rx, any cond, Eddystone 958, 990R. IC210 2m. W.H.Y? G4AFY. Tel Bob, Kidderminster (0562) 753358.

10m ssb tx/rx, Uniden SB505D 28·5-28·95MHz, has Home Office import licence, £80. Sony ICF2001 scanning ssb/a.m./fm world radio, £95. GM4DHJ, QTHR. Tel 041-889 9010.

Icom IC202E 2m ssb, £90. Hustler bumper mount hf mobile antenna, 20m, 15m resonators, £20. Geloso 80-10m vfo, 4/102, £5. Pye 12V dc psu, suitable 6146 type ssb amps, £10. G3ZXY, 8 Davenport Lane, Arclid, Sandbach, Cheshire. Tel 047 75 545.

Collectors' items: Gee navigation rx/indicator, rf units 24-27, RAF 1224 rx, offers. Star bandspread swl rx SR150, 550kHz-30MHz, new cond, £40. RX AP100335, 60kHz-30MHz, selectivity 200Hz-6kHz, grey case, £70. Buyers collect. G2CVY, QTHR. Tel Barnstaple 3355.

FT301 solidstate 200W ssb/cw tx/rx, mic, 250Hz cw filter, 10-160m old bands, FP301 25A power supply, cond immac, £300. G2MA, QTHR. Tel Rotherham (0709) 542708.

NAG 144XL 2m linear, in perfect cond, orig packing, £300 ono. FT290R, charger, nicads, 2·2AH, case, £215. *Wanted:* HF linear, TS830S, TA32 hf beam. M.E. Wright, 27 Bulbridge Road, Wilton, Salisbury, Wilts SP2 0LQ.

TR2200GX 2W fm portable, R0, R3-7, S16, S20-23, nicads, charger, helical, case, mobile mount, Liner 2, 2m ssb, PA3, accessories, both fb cond, £140 ono for the pair. G4JTP NOT QTHR. Tel Southport (0704) 67910.

Drake TR4C, low output but otherwise ok, reasonable offers for silent key sale. Ten brand new, full spec Eimac 4CX350A valves for disposal, offers. Mrs E. Jones, 30 Chichester Way, Newton Abbot, Devon TQ12 4HP.

Eddystone EA12 amateur band rx, superb, mint cond, £165. G2BSW, Sea Hill House, Castle Hill, Seaton, Devon EX12 2QP. Tel 0297 22131.

FRG7, only 5 months old, in mint cond, no modifications, manual, orig packing, £165. Tel H. Webb, 0249 56702.

Closing down sale: please send 9 by 4in sae for lists of equipment from hf to 10GHz. F.B. Jones, G2AKQ, 85 Woolsbridge Road, Ashley Heath, Ringwood, Hants. BH24 2LY. Tel Ringwood 5643.

RTTY Creed 444: convert these machines from 50 baud speed to 45·45 bauds by changing one gear, instructions supplied with gear, £9.25 incl postage. G3PPD, QTHR. Tel 01-422 4153.

Graupner model helicopter, comp with stand, radio controls, fuel, the lot, ready to fly, cost over £1,000, open to offers. Wanted: radio equipment, plus or cash. 2m equipment or all bands linears etc. Tel 01-361 2167, evenings, 01-801 2916, days.

VHF/uhf scanning rx, 66-86, 140-154, 430, 450MHz, xtalled for SU20, SU18, SU16, RB14, RB4, 70cm, S20, S23, R2, 2m, £50, 4m rig xtalled 70·26MHz (Pye Ranger), £15. 2m 6ch tx/rx, incl wire connectors a.m. only, £15. G6HKA. Tel Jon, 061-226 1754.

Valves: 336 assorted, as one lot, £100. 1,000 integrated circuits, assorted, £50. SAE for lists. Dries, 1 Parkthorn View, Dundonald, Ayrshire KA2 9EY. Tel 0563 850343.

Trio TS830S, £550. SP230 spkr, £25. Daiwa auto antenna tuner, £105. MC50 mic, £15. Daiwa DR7500R rotator, £75. Trap dipole, 80/40, £15. Key, £5. SWR meter, £5. All immac cond. Prefer collect or carr extra. GM4JEM, QTHR. Tel 031-661 4429.

Icom equipment: choice of IC701 at £425, or IC730 at £475. Power supply available extra. GD3KHE, QTHR. Tel 0624 6636.

FT707, FP707, FC707, £600. FT480R, £300. G4PFD. Tel Ashton-under-Lyne, (061-) 339 2204, evenings.

FT290R 144/148 mods, improved reception, immac, orig packing, nicads, charger, case, whippy λ/4 ant, £200. MM 25W amp/preamp psu/charger. G4MUH, QTHR. Tel 0837 3274, evenings.

Pye Vanguard AM25B, highband, control box, xtal, manual, £10. Marconi sig gen, TF390G, 16-150MHz, £10. G8BMQ, QTHR. Tel 01-653 8489 (S London), evenings.

TS180S, dfc, all filters, WARC bands fitted, PS30, external spkr, offers together or separately. 1980 International Callbooks, offers? G3XTT, QTHR (Cambs). Tel 0954 210630.

Collectors' item: Murphy "baffle" radio 146C, mid-'thirties, polished woodwork, in super cond, electrically wkg order but could be improved, best offer. G3FLD, QTHR. Tel 0952 3758.

Marconi Atalanta 2207C comm rx, 15kHz-28MHz, in 10 bands, 13 valves, cw/a.m., inbuilt 700kHz xtal osc, mains psu, handbook, plug-in test meter, cases, set reconditioned, re-aligned, £100. G3YAA, QTHR. Tel 0482 866865.

Clegg 2m 25W tx/rx, fm, mobile bracket, £130. KF430 70cm 10W fm 12ch tx/rx, fully rocked on popular channels, very compact, mobile bracket, £130. *Wanted:* 30ft Strumech Versatower. Tel Astwood Bank 2282.

Belcom FS1007P 144MHz scanning tx/rx, teak case, xtalled 17 channels, integral psu, immac cond, £110. IC202, 10W linear, £100. Pye 26in colour tv, requires attention, buyer collects, £10. G8GHZ, 26 Westminster Gardens, Chippenham, Wilts. Tel 0249 4188, ext 154, office hours.

Datong D70 morse tutor, £35 ono. Kenwood DM81 grid dip meter, exc cond, orig packaging, manuals, £48 ono. G6JBN NOT QTHR. Tel Burntwood (Staffs) 72344.

Racal RA117E rx, exc cond, manual, £275. RA63H ssb adapter, £60. RA137A lf 10-980kHz converter, £70. SA77 crt tuning indicator, display for RA17, £75. MA197B preselector, £35. G8EBM, Leamington, Windley Lane, Weston Underwood, Derbys. Tel Brailsford (033528) 755.

Professional psus, 25A 13·8V adjustable, two meters, £75. Carlsboro Marlin 150W pa amp, new, £268, accept £175. Carlsboro 150W pa spkr, new, £160, accept £100. All as new. IC240, S13-24, repeaters, £130. Scanner to suit IC240, £30. G3MMN, QTHR. Tel 02233 73 2277.

Yaesu FT707 hf mobile, mint cond, still in box, bargain, £475. FP707, £85. Shure mic, accessories (poles, coaxial, brackets etc), must sell. Can deliver. Tel William Stone, Manchester (061) 766 6078, after 3pm.

TS700S 2m multimode, in exc cond, orig packing, mic, etc, £390. G4AWU, QTHR. Tel Doncaster 710987.

KW202 rx, £100. KW204 tx, £100. IC240, £110. All vgc. IC202S, mint, £95. Manuals for all gear. Buyer collects. G3TKU, QTHR. Tel 0270 624792.

Icom 2m portables, both almost like new, IC215 3W fm, all channels xtalled, including all repeaters, orig packing, IC202E 3W ssb with extra xtals for continuous coverage 144·0-144·8, £100 each. Could deliver Manchester area. G3VYE, QTHR. Tel Poynton 876850.

Global AT1000 swl atu, new, unused, in orig box, £23, incl postage. RSGB *Radio Communication Handbook*, V1 and 2, *VHF/UHF Handbook*, 3rd edn, *Amateur Radio Techniques*, 5th edn, comp set, £20, incl postage. G6CHB, QTHR. Tel 0632 462606.

Kenwood TS820S, used only as back up to my TR7 so used little, cw filter, offers over £420. Datong FL1, £40. Pair of 888A tilts, £5. Tel 021-454 1825.

Trio TR2300, mint cond, comp nicads, charger, boxed, £120. 12ch Standard C8600, six repeater, six simplex, boxed, £85. Two Pye base rxs, 6ch, £8 each. 9-el uhf Yagi, £15. 200 xtals, 3·0-80MHz, £1 each. Three, £1·50. Sundries. G8LGB, QTHR. Tel 0223 248650, after 6pm.

IC240, programmed S13-23, R0-8, Raynet 1-2, reverse repeaters unique S20 automatic flashing led, the only safe mobile rig available, comp with handbook, £110. Grundig Satellit 3000 digital readout, 150kHz-30MHz rx, £180. G-whips, 10-160m, mount, £22. G3IES, QTHR. Tel Bristol 500742.

FT224, 24ch, 1/10W vhf tx/rx, toneburst, priority channel, £80. FT2 auto 8ch 1/10W vhf tx/rx, 12/240V, toneburst, priority channel, autoscan/lock, £80. FT2FB 12ch 1/10W vhf tx/rx, toneburst, £70. All with mic, manuals, ono. G3MFL, QTHR. Tel 0275 833269, evenings.

Cushcraft AV3 three-band hf ground plane antenna, 12 months old, £25. Transam Triton home computer, level 4 Basic, machine code, all manuals, programs etc, Motorola b&w monitor, £95. G3WDW. Tel Bradford (0274) 633387, after 6pm or weekends.

QR666 Trio rx, orig box, instructions, etc, £55. MM2000 rtty to tv converter, hardly used, as new, first offer over £100 secures. RS41542. Tel 061-980 4357 (leave message if owner away travelling).

Trio 2200G, exc cond, 10 channels fitted, auto toneburst, nicads, charger, handbook, £75. PET 2001 8k, integral cassette, as new, 20 tapes, £320 or exchange good hf rig. G4CCI NOT QTHR. Tel Loughborough (0509) 32700.

FT227R 2m tx/rx, synthesized 144-146MHz, 10W output, fixed or mobile, in mint cond, boxed, all standard accessories, £160 ono. G4NBR, QTHR. Tel 0775 61379, after 5.30pm, or weekends, anytime.

Microwave Modules transverter, MMT 70/144, 4m, £75. 6-el 2m quad, £10. 2m 4CX series valve linear amplifier, psu, £70. New teleprinter rolls, £1.50 each. Garrard belt drive deck, Shure cartridge, £25. *Wanted:* 23cm teipler. G4ERX, QTHR. Tel 0277 225736.

BC342N, superb, £30. PCR2, vgc, £28. BC221, vgc, £15. All 240V mains. Eddystone 358X spares, Jason fm tuner, £2. Withers 2m converter, £2. Loads of other stuff. Some foc. G4IXY. Tel St Albans 39908.

Trio JR310 amateur bands rx, incl 160m, all 10m, narrow filter, exc cond, £80. MM 2m converter, 10m i.f., exc cond, £10. G4CMU. Tel Burgh Heath (Banstead) 54497.

Three USA 1,000lb ratchet winches, as new, £20 each. Four 20ft 7G dural poles, £14 each. Five Jaybeam 15in couplers, £4 each. 2kW trap dipole, balun, etc, unused, £25. Ant base plate, £15. Books, coaxial, ant hardware. Tel 0446 741520.

KW204 tx, new pa tubes, immac cond. SP600 rx, recently realigned, retuned, exc cond, £130 ono. *Wanted:* Small centrifugal blower for 4CX250B. G4OEP. Tel Bristol 427954.

KW2000A, 160-10m, 180W p.e.p. input, good cond, fitted vfo, stabilized heater supply, Shure mic, handbook, £140 ono. G3SZU, QTHR (Leicester). Tel 0533 865726.

13cm interdigital rx mixer, £15. 23cm Microwave Modules converter, 28MHz i.f., lo output, £15. 23cm transmit converter DF8QK, 28MHz i.f., £20. Tel 0473 718217.

Russian multimeter spares, U4324, broken hairspring, pointer, booklet, £3. 2m λ/4 mobile antenna, gutter clamp, CBA311, £3.50. Transistor modulator, 12V, Garex, pair OC35 output, 15W, suit QQV03-10, 3-20A pa, 15Ω output, circuit, wkg, £6. G3MBL, QTHR. Tel 01-445 4321.

Drake desk mic, £10. Sentinel hf preamp, £10. MMC 144/28LO converter, £10. Heathkit electronic keyer HD1410, £20. Tradiper gdo, £8. T&T loglaw speech processor, £10. SST t2 ultra tuner, £12. All exc cond. Prices plus carriage. Jenner, G3KIW. Tel 021-705 5249.

TS280 Sommerkamp 80ch 2m/10W tx/rx, mobile, mic, vgc, £120 ono. HRO with coils, offers. G3VUD, 36 Cavendish Place, Jesmond, Newcastle upon Tyne.

Printer terminal: teletype model 33, ASCII keyboard, 110 bauds, data dynamic control unit, very clean, comp with Basic manual, pedestal, buyer collects, £45. G3WXZ, QTHR. Tel Needham Market (Suffolk) (0449) 720422.

Beltek W5570 10W mobile, xtalled for NL, P1, DA/SN, 144·825, S19-21, S23, handbook, offers? Exchange w.h.y? G4IOY, QTHR. Tel 01-455 0540, before 8.30am.

TR2200GX 2m 2W fm tx/rx, 12ch, mobile bracket, carry-case, telescopic whip, helical, nicads, charger, manual, good clean cond, £85. G4OCH, QTHR. Tel Keith, 0543 376366, evenings, weekends.

FDK multimode 750E 2m fm/ssb/cw tx/rx, nearly new, £220. Cushcraft Ringo Ranger antenna, £15. Lowe FT1 wave absorption meter, coils, nearly new, £18. SML SWR25 meter, £7.50. Tel Telford 603482, after 6pm.

Shure 526T transistorized Super Punch mic, high or low impedance, splendid audio, lovely present, as new, £36. G2KF, QTHR. Tel 072-681 2337.

Dentron linear amp MLA2500, £500. Tandy digital rx, DX302, 10kHz-30MHz, £100. Both as new. Trio TS520, in top cond, £300 ono. All plus carriage for each. G3KUF, QTHR. Tel Terry, 0272 296544, or 027581-3648, evenings and weekends.

Hallicrafters CHL46130C/S36 vhf rx, 27-145MHz, £60. G8HQI, QTHR. Tel Wokingham 782236.

FT290R 2m multimode portable, ARE modified, MMB11, nicads, two cases, flexi λ/4, helical, an extremely versatile performer, £180. Tel Yves, 01-200 1839.

Going rtty? Pre-tuned 88mH toroids, comp with complementary high stability capacitors, tuned for 1,275/1,445Hz, suitable for ST5 terminal unit, £7.50 per pair, post free. P.V. Hodson, G8RBY, 43 Thorpe Road, Melton Mowbray, Leics LE13 1SE. Tel 0664 67118.

IC240 2m fm mobile, £110. Liner 2 preamp, ext vfo, full coverage 2m ssb beacons, satellite, £80. AVO9 multimeter, £40. DX tv converter, vhf to domestic tv, ideal SPE monitor, Labgear, £15, G8SES, QTHR. Tel 0534 61354.

HW8 Heathkit QRP hf tx/rx, ideal for low power work, new G4s, bands covered 15, 20, 40, 80m, comp with Tavasu antenna tuner, manual, £85. G6ASC, QTHR. Tel 021-705 1253.

Station sale: FT480R, 4A power supply, both 12 months old, exc cond, orig packaging, leads, a bargain, £260 ovno. IC211E, remote control pad (ICRM3), exc cond, orig packaging, £350. 15A power supply, £50. 100W linear amp, as new, still under guarantee, rotator, Awasaki, heavy duty, azimuth indicator, comp with all cables etc. G6CZV, QTHR. Tel 0933 675095.

FT101ZD, comp with cw filter, SP901 spkr, YD148 desk mic, Yaesu hand mic, rig is three years old, in vgc, having just come back from servicing, bargain, £390. Cushcraft tri-band beam model A3, 14 months old, hence super cond, tuned mid-band, £100. Racal RA17 communication rx, exc rx, £140. G3GWW. Tel 0452 82 3435.

60ft crank-up tower, comp with three bedroom detached house, in Aldridge, West Midlands: 600ft asl, full planning permission for large rotary hf and vhf antennas, £32,000. G3NAS, QTHR. Tel Aldridge 53718.

Hamvision SS303M slow scan television monitor, as new, runs from receiver headphone socket, no other interface required, wkg and delivered within 70 miles of Hull, orig cost £185, offered at £99. Bob Murden, G4BHF NOT QTHR. Tel 0482 562382.

Complete hf and vhf station: FT101ZD fm hf tx/rx, FC902 all band atu, FV901DM ext scanning vfo, FTV901R transverter, 2m fitted, SP901 ext spkr, SB610 multiscope, fan, mic, dummy load, etc, 10 months old, mint, boxed, no mods, £1,150. Tel Pete, Evesham (0386) 830614.

Trio 9000 2m tx/rx, 10W (similar to model 9130 advertised in this issue) as new, one year old, mint, £300 ono. 100W Microwave Modules linear 2m pa, preamp, MML 144/100S, £100 ono. G8KKJ. Tel Ashford (Kent) (0233) 37238, weekday evenings.

FT202R, channels S20-22, R1, R3, R6, spare R5, incl nicads, rubber duck, external mic/spkr, £80 ono. Tel Saxmundham (0728) 2952.

Adonis scanning mobile boom safety mic, MM202HD, £18. 2m antenna HB9CV, £4. Bantex 5/8 2m magmount whip, £10. All vgc. G3UFQ, QTHR. Tel 021-560 77802.

35ft tower, 10in triangular section, hd tiltover base, 24in sq, £128. *Wanted:* 5 or 6-el triband beam. G4ODQ, QTHR. Tel 0509 843830, after 3.30pm.

Trio TS599S tx/tr separates, used little. Regret cannot devote time to their sophistication. Fitted 2m converter, unmarked, as new, £480 or £250 each separate. *Wanted:* micro-computer with word processing or printer. G4HRT, QTHR. Tel 0532 665568.

Pye Continental DC25FM 2m (boot mounted), 6ch box, spare single-channel box, service manual, comp with xtals for S20-23, R0, R3, R6, in good order, £69. Billy Garrett, G5MVH, QTHR. Tel 0274 638377.

HF5, vert ant. £25. ATU, Mizuho, £10. Mizuho audio processor, £15. Datong D70 morse tutor, key, £35. G4MH mini-beam, 15m coaxial, 15m control cable, rotator, £100. Buyer collect or arrange carriage. BRS46105, 11 Clifton Place, Wakefield, West Yorks.

Trio TR2400 handheld, charger, nicads, mint cond, used little, £125. Belcom AMR104H, 2m fm scanning monitor rx, eight channels, lockout, mains or 12V, £45. Vic Kusin, GM4HCO, QTHR. Tel Glasgow (041) 334 2472.

Nascom 48k ram B card, £75. 32k ram A card, £45. Gemini 64k ram 64 card, £95. 8in Shugart single sided disc drives, no documentation or connectors, £140. Arfon speech synth (Digitalker) nasbus/80bus type, £60. Tel John, 01-574 5265.

HF linear, Green Davis, LA600, offers. G2DAF type linear, almost complete, fully metered, requires ht supply, only two ht transformers available, two spare 813s. G3SRZ, QTHR. Tel Par, Cornwall (072681) 3375.

WANTED

Second world war radio equipment for private collection. No19 sets, incomplete units considered. RS40042. 2 Park Road, Amersham, Bucks. Tel Amersham 6881.

Drake L4B 1in amp and MN2000. Collins tx/rxs. Must be in wkg cond. Tel Derby 55705.

For the National Wireless Museum: old radio books, magazines, catalogues, QSL cards, service manuals, valves, components, eight-track cartridge player, Tractrix horn, Voight pickup, early Avo, collection arranged. Details please to hon curator G3KPO, QTHR. Tel Ryde (0983) 62513.

To complete restoration projects: handbook and metal RCA badge—AR88D. Volume and frequency knobs—BC342. Coil pack 50/100kHz—HRO. Meter deflection and aural sense knobs and switches—R1155. Peter Hopwood, G3UKH, 58 Bolbec Road, Newcastle upon Tyne NE4 9EP. Tel 0632 744115.

Info on making or commercially available dx receiving lw (200kHz), mw (909kHz) antenna, tuning circuits, filters (atmospheric and station interference) etc, for difficult conditions. Replies assured. Crookall, Lot J. d'Arc 33, 83220 Le Pradet, France.

UHF hand portable, cheap, not PF1, eg PF2, PF70, etc. *For sale:* PF1 nicads, pair, £2.50. G8RHU NOT QTHR. Tel Newhaven (07912) 6801.

R1132A vhf rx. Service handbook required. Details of how to push rx up from design coverage of 100-122MHz, to cover airband 118-140MHz. All replies acknowledged. G4BCJ, QTHR. Tel 01-478 5303.

For restoration of 53 tx: antenna tuning unit type 2A. Master oscillator type 2. Any other 53 set parts. Morriss, G4GEN, QTHR. Tel 082571 2205.

Drake "C" line separates, later models. *QST* Jan, Feb 1974. *For sale:* G3LLL clipper for FT101B, £15. G4DJC NOT QTHR. Tel 0245 62728.

Dot matrix printer and disc drives for micro, need not be wkg. Jake Adamson, Woodend, Victoria Road, Deal, Kent CT14 8DY. Tel Deal (03045) 3788.

Variable roller coaster coil unit, heavy duty for atu. Barnes, G3AOS, QTHR. Tel 061-980 2415.

TR7800 fm tx/rx, exchange for SX200N scanner. Also wanted to purchase Sony ICF2001. Tel Bristol (0272) 502584, after 6pm.

Catholic amateur radio group has been in operation for eight years, would like new members. Skeds can be arranged to suit everybody. Details G3AKG, 116 Lowfield Road, Caversham, Reading. Tel Reading 476718.

2m multimode or hf tx/rx for cash, or exchange/px with oscilloscope (dual beam, 0-35MHz). Tel 09803 3371, ext 5243, daytime, 0239 230307, weekends.

Trio AT120 antenna tuning unit. G3OIC, QTHR. Tel 0564 826124.

Mobile whip antenna, bumper mounted for 1·8MHz band. G3RQJ, QTHR. Tel Four Elms (073270) 276.

Monitorscope, preferably Yaesu but any considered. Panadaptor not required, Two-tone facility essential. Cheesley, G4CHP, QTHR. Tel Swainsthorpe 470365.

Urgently: HW8 or similar QRP rig (incl homebrew). G4OJR NOT QTHR. 31 Laburnum Grove, Hounslow, Middx TW3 3LU. Tel Andrew, 01-572 0742.

KW E-Zee Match or KW107/9. G8YEX, QTHR. Tel 0453 882786.

G2DAF Mk2 rx, prefer good wkg order, but any cond considered. *For sale:* P40 Versatower, comp, £325. Tel Kidsgrove 74504, after 6pm.

Buy or borrow manual for Telequipment D67 scope, photocopy will do. G3RCQ, QTHR. Tel Hornchurch 55733.

Power supply for R209 rx, must be 6V dc, will pay carriage or collect within reasonable distance. David Traynor, BRS50190. Tel 051-356 0883, (Cheshire).

KW linear model 1000 or 600. G4IIL, QTHR. Tel Brighton 607737, evenings.

Gen cov rx for young swl, valver or semiconductor.

Can collect 30 miles Llantrisant area. GW4NHH NOT QTHR. Tel Mike, Cardiff 65963.

HQ1 mini beam or similar, or dimensional details. Older hf tx/rx, make not important but must be gc. Accommodation required in London area for work in Chelsea, room in shared house etc. G4PAU, ex-G6DIP. Tel Tricia, Melton Mowbray 60917.

Urgently, manual for Telequipment D53A scope, buy or borrow to photostat, prompt return, all postage paid. G6PNM NOT QTHR. Tel 0203 318301, after 7pm please.

1930s Bush "all-wave superhet", domestic mains radio, type No AC71. Has "teleflic" logging device. G4CJF. 52 Kenilworth Court, Coventry, CV3 6JA. Tel Coventry 504021.

HQ1 mini-beam, good cond. Rotator to suit or heavier duty, with control. World clock. Vertical antenna for 7MHz and 3·5MHz. *For sale:* or exchange two Communique walkie talkies, powerful a.m. 29·8MHz, new, £70 ono. Tel 0926 315740.

Hygain TH2 Mk3 2-el beam for 10/15/20. Must be in good cond. Tel 0639 820356.

CR100 or equivalent, preferably with manual or schematic. G3VDG, QTHR.

For VIC20 computer: morse or rtty program listings or on cassette. Mr Fox, RS49701, 15B Seymour Gardens, Ilford, Essex. Tel 01-518 0341.

FM10D Pye Cambridges, two. Must be complete and wkg, but no xtals required. Will collect over a reasonable distance. G8BWR. Tel Warwick (0926) 498388.

Trio TX599, state condition and price. Collection could be arranged. G3GWD, QTHR. Tel 01-650 3163.

FR101D Yaesu rx, must be in vgc, no modifications, please write or phone H. Webb, 5 Queens Square, Box, Nr Corsham, Wilts. Tel Box (Wilts) 742681.

Drake MN4 or MN2000 matching network. Drake rf wattmeter W4 or WY4. Trio DG5. Eddystone 504. Tel 0203 349461.

Urgently required: newly formed school radio club (8-12) with limited resources needs communications rx with ssb to replace aged HA63 long past retirement. Can you help? Pols. BRS31440, Robert Kett Middle School, Hewitt's Lane, Wymondham, Norfolk. Tel 0953 604237, evenings.

Drake TR4CW with rit, Collins 75A series rx. G3RFI, QTHR. Tel 0767 260800.

Mobile harness for IC215, IC202. Information please on transistor test set model D900 by Beulah Electronics, with meter value. *For sale:* transformer, 230-6V at 18A, £5. G3MBL, QTHR. Tel 01-445 4321 (N London).

G2DAF Mk2 rx, G3PDM type rx, preferably comp but consider partly constructed rx. NEC CQ110E tx/rx. G6BAN, QTHR. Tel Glossop 65752.

Yaesu or Sommerkamp FL200B or FL100B tx. G4OIG (G8CXK) QTHR. Tel 0604 408438, after 6pm, or weekends.

Service manual for IC245E, borrow to photo copy, or pay for photo copy. Would even take orig if willing to sell. Write or phone, weekends. G8TVV, QTHR. Tel Gosforth (0632) 842495.

Oscilloscope: Dynamco 72 series No14A or similar, leads. Manuals or circuit diagrams for Advance valve voltmeter VM76 and Advance fm/a.m. sig gen. Borrow, copy or buy. *For sale:* Eddystone comm rx, 730/4, £75. G4NAA, QTHR. Tel Middlesbrough 318449.

HRO rxs, any type or cond. Spare parts, valves, cans, etc, particular plug-in xtals, pus, spkrs, handbooks. Meters, coil packs, command rx/txs. G4LBY, QTHR. Tel Mansfield 29473, evenings or weekends.

Yaesu FT225RD, in good cond, preferably with Mutek Feb, Bird 43 thruline elements, 50E, 25E, 5E, 50C, 5C. G4AWU, QTHR. Tel Doncaster 710987.

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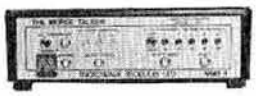

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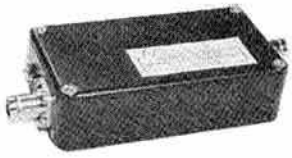

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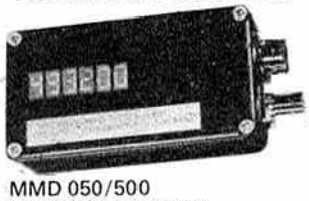

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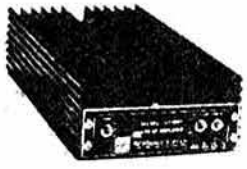

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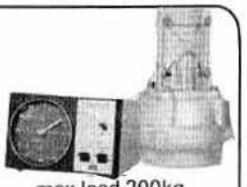

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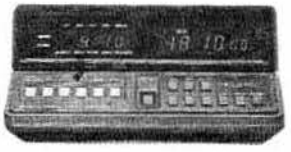

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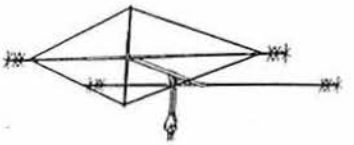

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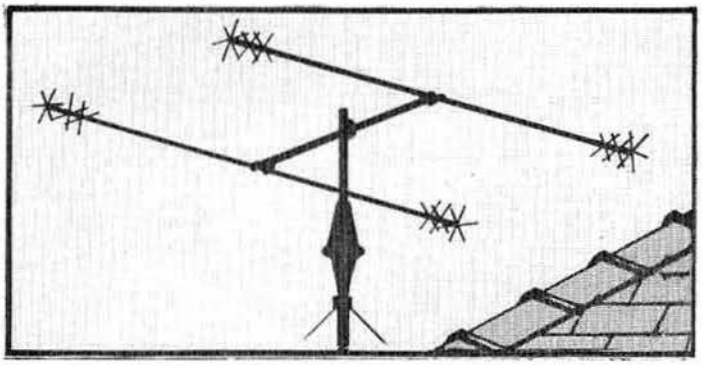

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MV4 BH	Vertical 10/15/20/40 mts	49.50
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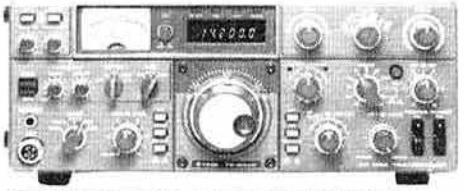

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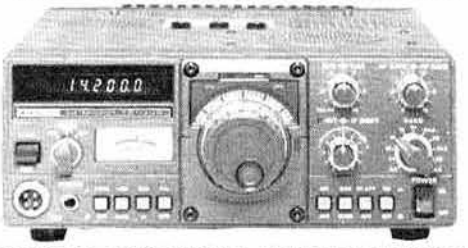

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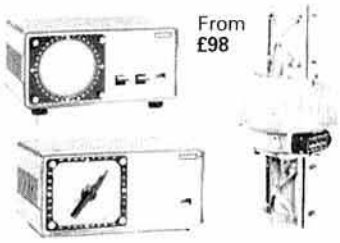

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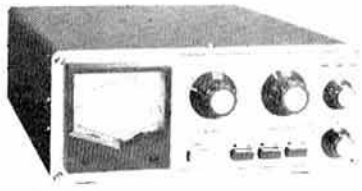

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In one stylish case Model FL3 offers the complete solution to receiver audio processing. We believe that such a powerful combination of filtering capabilities has never been offered before in one package.

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SHOOTS DOWN TUNE-UP WHISTLES AND HETERODYNES

Imagine the benefits. A tune-up whistle no longer causes any problem; after a second or two it simply drops out of ear shot. Those tiresome whistles that occasionally descend on a QSO become a thing of the past. Only the "LOCK" lamp on the FL3's panel reminds you of what you are thankfully missing.

PLUS LOW PASS, HIGH PASS AND MANUAL NOTCH

While all this is happening you still have three other independent filters at your disposal. Imagine, for example that another SSB station starts up 2 kHz high. Instead of trying to copy through all that high-pitched monkey chatter simply wind down the low-pass filter (the right hand knob) and wipe it out.
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This is a fully assembled PCB module with its own board-mounted "IN/OUT" switch and "LOCK" lamp. Installation involves four soldered connections to the existing FL2 PCB and one track cut.
Model FL2/A is also suitable for building into other equipment where an automatic notch function is required.

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As an introductory offer Model FL2/A will be supplied complete with a punched and printed FL3 front panel to replace the FL2 panel, plus PCB mounting hardware.

TECHNICAL REPRINT OFFER

The filtering in Model FL2 and now in Model FL3 has been carefully conceived to give maximum possible benefit in real life reception conditions. The thinking behind the product design has been described in depth by the designer, Dr D A Tong in "Ham Radio", November 1981. A limited number of reprints of the article are available free on request.

DATONG ELECTRONICS LIMITED

PRICES All prices include delivery in U.K. basic prices in £ are shown with VAT inclusive prices in brackets.

FL3	112.50	(129.37)	AD370	56.00	(64.40)	RFA	29.50	(33.92)
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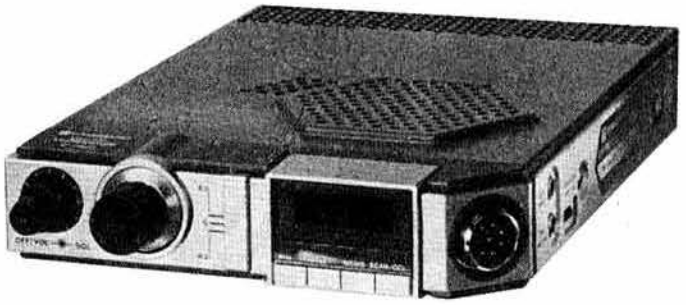


Prices: C8900 - £269 inc. & C7900 - £239 inc.

SPECIFICATIONS

General	
Frequency coverage	144-146MHz
Mode of operation	F3
Voltage	DC 13.8V
Power drain	2.8 Amp TX, 0.4 Amp RX-Standby
Polarity	Negative only
Dimensions (H x W x D)	**31 x 138 x 178 mm**
Weight	**1.1 Kg**
Transmitter	
RF power output	10 watt minimum
Spurious emission	60dB
Maximum deviation	± 5 KHz
Modulation	Reactance modulation
Receiver	
Sensitivity	– 10dB (12 dB SINAD)
Bandwidth	± 7.5 KHz (– 6 dB)
Receiver system	Double superheterodyne
Intermediate frequency	1st IF 10.7 MHz 2nd IF 455 KHz
Selectivity	More than 60 dB
Squelch sensitivity	– 16 dB
Audio output	2 W (into 8 ohms with 10% THD)

The specification for both sets is the same, it's the frequency that's different!!

We have improved and enlarged our workshop facilities to provide a better service for our customers.

At long last Standard have released the C5800. They have taken a long time to satisfy themselves (and us) that there are no bugs to sort out. I hear you snigger "No Bugs?" Well, after 6 months of field testing what do you expect!! Now read on, the specification follows.

C5800 MULTIMODE

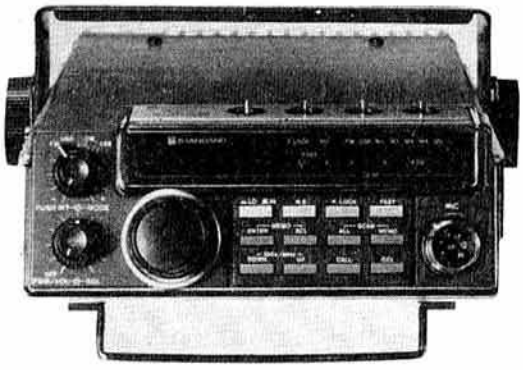
SPECIFICATIONS

1. General Specifications

Transmission frequency	144.00000 – 147.99999MHz (E) 144.00000 – 145.99999MHz (W)
Type of emission	FM (F_3), SSB (A_3J), CW (A_1)
Frequency stability	±300Hz within 1 – 60 minutes after power on 50Hz every 30 minutes
Power supply	13.8VDC
Power consumption	Transmission: HI; 3.7A, LOW; 1.5A Reception standby: 450mA
Microphone input impedance	600Ω
Antenna inpedance	50Ω
AF output impedance	4 or 8Ω
Grounding system	Negative
Dimensions	149mm (W), 55mm (H), 218mm (D)
Weight	1.90 kg

2. Reception Specifications

Reception system	FM: Double super heterodyne SSB, CW: Single super heterodyne
Intermediate frequency	FM: 1st IF 10.7MHz 2nd IF 455kHz SSB, CW: 10.7 MHz
Sensitivity	FM: 0.19μV (12dB SINAD) SSB, CW: 0.15μV (10dB S/N)
Pass bandwidth	FM: ±6kHz, SSB, CW: 2.2kHz
Selectivity (60dB)	FM: 25kHz, SSB, CW: 4.2kHz
Squelch selectivity	0.15μV (FM)
AF output	More than 2W (into 8 ohms with 10% THD)



3. Transmission Specifications

Power output	25W/1W
Modulation	FM: Reactance modulation SSB: Balanced modulation
Maximum frequency tolerance	±15 x 10^{-6} (-10 – +50°C)
Spurious attenuation	60dB
Carrier suppression	40dB
Undesired side band suppression	40dB
Maximum deviation	±5kHz

Price: £359 inc.

These specifications are subject to change without notice in the event of improvements.

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D200S 2mtr 400wfm 1KW PEP	£600.00

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VV7 RPS SO259	£22.00
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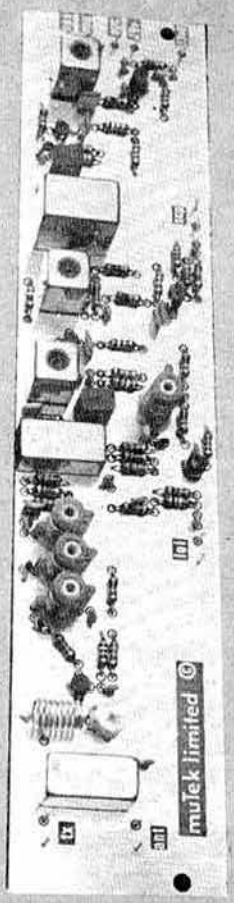

For some time we've had people worrying us to produce a replacement front-end for 144MHz transceivers other than the FT221/225 series. Finally we've done it! Our new front-end for Icom's IC251 and 211 series transceivers offers all the performance improvements associated with the well established RPCB 144ub plus some others!

The circuit now includes an integral inert gas-filled relay to eliminate the losses associated with Icom's diode antenna changeover circuit and an improved mixer post-amplifier using a combination of noiseless and resistive feedback technologies for improved strong signal performance on today's crowded 144MHz band. Other features include a signal path using a class-1 diode ring mixer and a six pole crystal filter.

Fitting is not quite as straightforward as for the RPCB 144ub but should be within the capability of most people who can use a soldering iron competently! For those who'd rather somebody else do the work we've negotiated a fitting service—give us a ring for details.

RBCB 251ub
£69.90 inc VAT

It's December again! Thank you everyone for your continued support—we've appreciated it. It's been an exciting year with lots of hard work. Next year promises to be even more exciting with many additions to the range both planned and under development.
From all of us in Bradworthy: peace, prosperity and happiness both at Christmas and in 1983.
Chris G4DGU

SLNA144s — rf switched 144MHz preamplifier — 0·9dB noise figure/15dB gain typical — **£33.90**

As various reviewers have commented, our SLNA144s is a very fine preamp for the 144MHz band. It has been designed to complement most current transceivers—having the right combination of noise and gain parameters to ensure that the overall receiver sensitivity is limited by external factors such as sky and ground noise. Its dynamic performance is such that the following receiver will normally be the limiting factor with regard to large signal handling whilst the superb bandpass filtering will provide a substantial degree of protection against out of band signals.

The SLNA144s has been designed from the start as a preamplifier not as an afterthought to increase the sales appeal of a power amplifier.

Each sample is individually tested by people who understand the design in a pretty fundamental manner. This results in what we still consider to be the best product of its kind available.

THE RANGE

		£
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SLNA 70u	Unswitched version of the SLNA 70s	20.38
SLNA 70ub	Unboxed SLNA 70u	12.41
SLNA 144s	144MHz switched preamplifier	33.90
SLNA 144u	Unswitched version of the SLNA 144s	20.38
SLNA 144ub	Unboxed SLNA 144u	12.41
TLNA 432s	432MHz 1·4dB nf/13dB gain switched preamplifier	54.90
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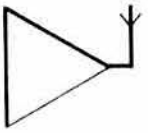

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The illustration to the left shows the complete FT707 System, here neatly mounted in the MR7 rack unit along with a YM35 fist microphone with scanning controls. Alternatively there are two other 600 ohm fist mics, the noise cancelling YM36 or the larger YM37 and the choice of two 50K/600 ohm swan neck desk mics, the standard YM34 or the scanning YM38.

The FC707 ATU can transform loads between 10 and 250 ohms to 50 ohms. An accurate illuminated power meter (15 and 150W FSD) and SWR bridge (to 5:1) plus an inbuilt 150W dummy load complete this attractive package.

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