RADio COMmunication

June 1985

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CONTENTS

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

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introducing a new **HF** transceiver from TRIO, the **TS940S**,

The TRIO TS940S is a first class competition HF transceiver designed for SSB, CW, AM, FM and FSK operation on all amateur bands from 160 to 10 metres. The transceiver incorporates a 150kHz to 30MHz general coverage receiver having an excellent dynamic range (typically 102dB on 20 metres, 50kHz spacing, 500Hz CW bandwidth). Designed to cope with today's band conditions and with the serious DX'er/contest operator in mind, the TS940S has a comprehensive range of front panel receiver controls;

SSB IF slope tuning; operating in both LSB and USB modes, front panel controls allow the independent adjustment of either the high or low frequency slopes of the IF passband.

CW VBT (variable bandwidth tuning); allows the passband width to be varied within the range of the control without affecting the centre frequency.

IF notch filter; provides in the order of 40dB attenuation to the interfering signal.

AF tune; active filtering reduces interfering signals and white noise whilst operating in the CW mode.

Narrow/wide filter selection; a selection of filters, both 8.83 and 455kHz are available for the operator who requires maximum selectivity control. The TS940S comes with both 2.7kHz SSB filters (8.83 and 455kHz) and the 6kHz AM filter (455kHz) built-in.

CW variable pitch; dual mode noise blanker and separate RIT/XIT controls complete the facilities.

To aid serious operating on both amateur and broadcast frequencies, the TS940S has;

A large heavy diecast knob with a moulded rubber cover which when rotated at normal tuning speeds results in frequency steps of 10Hz. Rotation of the tuning knob in excess of 2 to 3 revolutions per second results in the step size and tuning rate being increased acccordingly.

In addition to instant access to each amateur band using the band select keypad, the same keys can be used to directly enter any frequency within the operating range of the transceiver. Once entered, the VFO can be used to tune away from the selected frequency. Truly flexible operating in the TRIO tradition.

The TS940S has two VFOs, front panel switches enable split frequency operation, both VFOs to be quickly put on the same frequency and the reversal of the transmit and receive frequencies during split frequency operation.

40 memory channels, each of which remembers both frequency and mode are available. Frequencies can be easily transferred from memory to either VFO. Memory information is backed up by an internally fitted lithium battery. The transceiver operating system is held permanently in ROM and is not dependent upon the back-up supply.

The transceiver will scan all memory channels and between user programmed frequency limits as set in memories 9 and 0.

Accurate and quick frequency readout is ensured by the use of a large fluorescent tube digital display combined with an analogue sub-scale. The analogue display can be switched to read a 1MHz or 100kHz span, tuning in either 20kHz or 2kHz steps.

A feature new to HF transceivers is a green back-lit dot matrix LCD which shows graphically VBT and IF slope tuning positions, can be used to review the frequencies stored in the 40 memory channels and other VFO, will provide information on the automatic sequence of operations when using the internal (optional) tuning unit, and when selected, displays both the time and owner programmed on/off switching times.

In addition, break-in keying on CW, a 28 volt solid state final amplifier stage, an RF speech processor coupled to the rig's ability to monitor its own transmitted audio and all mode squelch add up to give the TRIO TS940S even greater versatility of operation.

For those with failing sight or a blind operator the TS940S is a dream come true; not only is the operating mode identified by the appropriate CW letter sent in tone (F for FM, U for upper side band, etc) but, when fitted with the VS1 board (optional), a digitally encoded girl's voice will announce the operating frequency.

Combine the comprehensive receiver controls, advanced operating features and an ergonomically designed front panel and there is little more to say, except that, once again, TRIO have produced the world's finest HF rig, tomorrow's transceiver today, the TS940S!

TS940S HF transceiver..... **£1695.00** inc VAT.

LOWE ELECTRONICS LTD.

Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 2817, 2430, 4057, 4995.

send £1 for complete mail order catalogue.

TR9130 TWO METRE ALL MODE TRANSCEIVER

This rig is proof, if one needed it, that TRIO do not bring out new models just for the sake of it. The TR9000 is remembered as a classic rig and today people are still asking for second hand ones. They're even a rarity on our S/H shelf. The TR9130 incorporates the improvements that all amateurs asked for, green display, reverse repeater, tune whilst transmitting, higher power, more memories and of course memory scan. TRIO's answer, the TR9130.
TR9130 . . . **£499.00** inc VAT.

TS780 DUAL BAND BASE STATION TRANSCEIVER

The TS780 is the perfect base station VHF/UHF transceiver for the enthusiastic operator. The rig has all the necessary control functions essential for operating on both today's busy two metre band and the wide open spaces of seventy centimetres. Full repeater facilities plus reverse repeater are included and the transceiver has the usual memory channels (10), two VFOs, up/down frequency shift microphone. IF shift, two priority channels, memory and band scan etc. A superb rig, I have one myself, write for a full enthuse!
TS780 . . . **£981.42** inc VAT.

TR7930 TWO METRE FM MOBILE TRANSCEIVER

Those who have used or owned a Trio TR7800 will know what I mean when I say that Trio, with the introduction of the TR7930 have improved on the unimprovable. The Trio TR7930 improves on the TR7800 by giving a green floodlit liquid crystal display, extra memory channels, both timed and carrier scan hold, selectable priority frequency and correct mode selection (simplex or repeater). The most significant change is the liquid crystal display, but closely following this must be the ability to omit specific memory channels when scanning and the programmable scan between user designated frequencies.
TR7930 . . . **£354.92** inc VAT.

R2000 GENERAL COVERAGE RECEIVER

The amateur bands are only a very small part of the radio spectrum, many other transmissions are available for the short wave listener. Broadcast stations provide an alternative source of current information both political and regarding the life style of the country. Fitted with the internal VHF converter the R2000 covers continuously frequencies from 118 to 174MHz giving access to amateur two metre transmissions (am, fm, ssb and cw) plus a lot more. Having 10 memories, memory scan and programmable scan the R2000 provides in one rig the perfect receiver.
R2000 . . . **£479.47** inc VAT.

TS930S HF TRANSCEIVER WITH GENERAL COVERAGE RECEIVE

Much has been said about the TS930S transceiver and it now has a place high in the affection of those amateurs fortunate enough to own one, indeed it has become the "flagship" of the TRIO range. Providing full amateur bands plus a general coverage receiver (150kHz to 30MHz), the TS930S has every conceivable operating feature for today's crowded frequencies.
TS930S . . . **£1350** inc VAT.

TR2500/TR3500 HANDHELD TRANSCEIVERS

Two first class hand held transceivers, one for two metres and the other for seventy centimetres. Ten memory channels, band and memory scan, repeater shift, reverse repeater and a low power position make the rigs extremely useful for the radio amateur who wishes to keep in touch with his local scene. A comprehensive range of accessories, base station charger, speaker microphone, mobile mount etc, can be added to enhance operation, accessories used with one rig being compatible with the other.
TR2500 . . . **£270.47** inc VAT.
TR3500 . . . **£291.85** inc VAT.

TS530SP HF AMATEUR BAND TRANSCEIVER

A logical progression from the reliable TS520 series the TS530S was the most popular HF rig in the range. I use the term "was" because TRIO decided to cease production and supplies were no more, however the demand from radio amateurs worldwide for the transceiver have continued and TRIO have reintroduced the rig. A standard HF valve transceiver without the frills but providing today's amateur with all necessary facilities for reliable worldwide communication, the TRIO TS530SP now with notch filter.
TS530SP . . . **£735.11** inc VAT.

just a part of the range

The following TRIO models although not shown are still current and available.

TS430S	HF T'ceiver	£769.50	TM201A	2M Mobile	£309.95
TS830S	HF T'ceiver	£832.75	TM401A	70cm Mobile	£340.68
TS130S	Mobile HF T'ceiver	£633.06	TM211E	2M Mobile with DCS	£396.08
TR9300	6M Multi-mode	£569.97	TM411E	70cm Mobile with DCS	£452.58
TH21E	2M Micro h'held	£188.46	TW4000A	2M/70cm Mobile	£536.51
TH41E	70cm Micro H'held	£214.50	TS711E	2M Base Station	£831.77
TR2600E	2M H'held with DCS	£295.69	TS811E	70cm Base Station	£964.97
TR3600E	70cm H'held with DCS	£314.87	R600	Gen. Cov. Receiver	£299.52

All prices include VAT. Carriage £7.00
Prices shown on the Lowe Electronics Ltd advertisement pages are subject to change without notice.

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FOUR WHEEL DRIVE

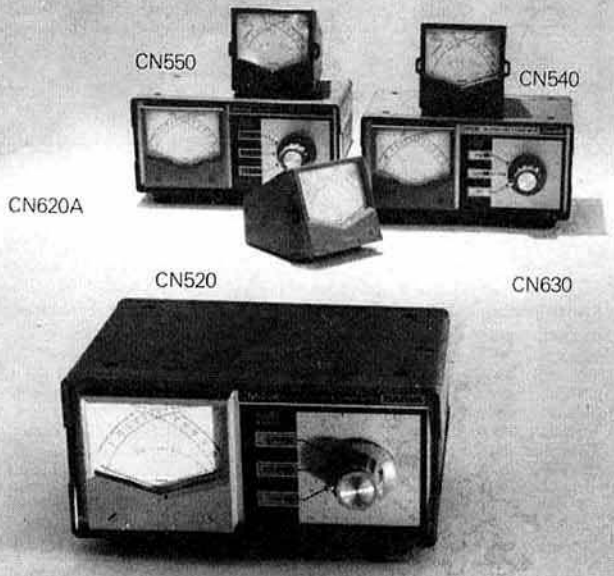
For as long as amateurs have used directive beams, be it either on the HF, VHF or UHF bands there has always been a need for a means of turning the array. Some have used string, the more fortunate amongst us have used a rotator. When buying a rotator, our advice up to now has always been, buy the largest you can afford. Our reasoning being that your aerial array will undoubtedly grow and sooner or later the overloaded rotator will break. Usually your aerials are also destroyed.

The new range of rotators from DAIWA, the MR series make this advice obsolete. They are designed so that additional motors can be added around a central core, each motor increasing the rotator's turn and braking capacity. The MR series will accept up to four motors being initially supplied with one. As the number and size of aerials increases, additional motors can be added, and both turning capacity and braking effort increased. Additional motors can be added at any time, each adding 700 kg/cm of torque and 5000 kg/cm of brake power. No additional cable runs are required, an internal harness for each motor being included, and, of course the main frame and reduction gear train have been designed to handle extremely large aerial arrays that would require the full set of four motors. There are four models, pre-set and standard and two high speed versions for the operator who can afford to sacrifice a degree of torque in order to increase the speed of rotation.

A full colour leaflet describing the rotators in detail is available on request.

MR750E standard model	£193.00 inc VAT
MR750PE pre-set model	£217.64 inc VAT
MR300E high speed version (39 sec)	£193.00 inc VAT
MR400E high speed version (25 sec)	£193.00 inc VAT
MR750U standard motor unit	£64.64 inc VAT
MR300U high speed motor unit	£64.64 inc VAT
LMC lower mast clamp	£14.00 inc VAT

for "cross needle" metering, DAIWA



What's so special about "cross needle" metering? Well, it's typically Daiwa to go direct to the heart of the matter and develop a system which will give you the true value of forward power, reflected power, and SWR all at a single glance. The elegant simplicity of the idea hides a great deal of thought, which of course is the hallmark of Daiwa products.

You will see from the photographs that the meter displays have two scales, one reading forward power, the other reflected power. Since SWR is calculated using these two values, Daiwa have arranged the meter pointers so that SWR is shown at the crossing point of the two meter needles.

Why don't other makers use the idea? Basically it's a question of power meter accuracy. The usual type of single or twin meter "SWR/power meter" uses a simple strip line to measure the VSWR on the transmission line. You will note that I have said "VSWR", and this is important. These so-called power meters are in fact only measuring the voltage standing wave and in order to display power, you need to monitor both voltage and current in the line. Daiwa meters of course, do just that, and consequently are very accurate indeed. The cheaper so-called power meters depend for their accuracy in being terminated in a load, and exhibit wild inaccuracy when terminated in a reactive load. In other words, when the indicated VSWR on the meter is other than 1:1, their accuracy is quite badly affected.

To summarise; the Daiwa cross needle power meters give you easy, unambiguous readings at a glance, and what's more those readings are accurate even in lines displaying high SWR, and since Daiwa meters measure true power, they are accurate at any point in the feedline from transmitter to aerial.

As with all Daiwa products, their meters show the Daiwa approach design, combining accuracy, ease of use and interpretation, and that indefinable feel of quality which is the sure sign of a good product. Once owned, never discarded.

CN520	1·8-60MHz	£39.50 inc VAT
A500	mounting bracket for above meters	£2.10 inc VAT
CN620A	1·8-150MHz up 1kW	£66.21 inc VAT
CN630	140-450MHz up to 200W	£98.11 inc VAT
CN650	1·2-2·5GHz up to 20W	£129.50 inc VAT

Carriage on "5" series meters £1.50, on "6" series £2.50.

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EMPORIUM NEWS

Good Morning

Well, another **NEC** over, again a superb effort by **Norman Miller** and his team of willing **volunteers**. It must take supreme effort and skill to bring together the various commercial and specialist sections of the hobby in one Exhibition. Once again **ten out of ten** to the RSGB Exhibition Committee.

On our stand was displayed the new **TRIO TS940S** HF transceiver. As I see the Yaesu FT980 transceiver which has been in production some time now costs about the same price, I am sure the **new model** from TRIO with advanced features and a proven pedigree, will prove very popular. Indeed, the **TS940S** seemed to be **constantly surrounded** by visitors. It proved so popular that towards the end of the second day our **stock** of TS940S **leaflets was exhausted**. However, by the time you read this, fresh colour information should be to hand (not just a single A4 sheet but a **full colour** many page brochure fit for any shack wall). The fact that TRIO have introduced the new TS940S does not mean that the **extremely popular TS930S** has been discontinued. In fact, it is TRIO's intention to retain the TS930S as a valuable and necessary part of the HF range.

The TRIO HF line-up is now as follows, two valve transceivers each using a pair of 6146B valves: The **TS530SP** and **TS830S**. (TS530SP . . . £735.11, inc VAT, TS830S . . . £832.75, inc VAT). The solid state transceiver line begins with the **TS130S** which provides a simple basic amateur bands only transceiver, having both digital and analogue frequency readout. The **TS430S** is about the same size as the **TS130S** but incorporates a general coverage receiver and many more facilities. Next comes the **popular TS930S** and finally the **new TRIO flagship**, the **TS940S**. Both the TS930S and TS940S have their own internal PSU—the TS130S and TS140S requiring an external PSU, the PS430. Automatic ATU's can be fitted inside the TS930S and TS940S and are both optional extras. The TS430S has an external automatic aerial tuning unit, the AT250. **An interesting feature** of the ATU is that as you switch bands on the TS430S, the AT250 follows accordingly. Prices are as follows: **TS130S** . . . £633.06, inc. VAT, **TS430S** . . . £769.50, inc VAT, **PS430** . . . £145.00 inc. VAT, **AT250** . . . £305 inc. VAT, **TS930S** . . . £1,350 inc. VAT and **TS940S** . . . £1,695.00 inc. VAT. The ATU that fits inside the TS930S is the AT930 and costs £165.13, the AT940 is slightly more expensive, being £195.00 but unlike the AT930 the AT940 also works on 160 metres. The new TS940S when being used with the internal automatic ATU is **a joy to behold**. No need as with the TS930S to manually switch to the tune position and **insert a little carrier**. On the TS940S all one has to do is press the buttons marked auto-through, "AT.T" and transmit. The rig **automatically** selects tune mode, inserts a sniff of carrier, informs you by the green back illuminated display that it is tuning and tunes. Very quickly the optimum position is found and the display changes to "TX Ready"—**simple and very impressive**! For the **blind** operator the rig is perfection, a digitally encoded girl's voice will announce frequency whilst mode is taken care of by the correct CW tone being emitted by the rig instead of an inane beep. For example, the letter C for CW, etc. Once again TRIO have taken an existing model, having an excellent reputation, listened to the comments of amateurs and have produced a higher specification transceiver. As I said earlier, the **TS930S** remains a continuing and important part of the TRIO HF range.

TS-711E £831.77 inc VAT
TS-811E £964.97 inc VAT

It is a **credit** to the **Shop Managers** that those who were able, made their way to the **"RSGB at the NEC"** this year. **Sim**, who manages our Glasgow Shop set off with his colleagues at 5.0 a.m. on the Sunday morning on a journey that took five hours. **Andy**, from London, left his wife **Jenny G8HYV**, sleeping in bed to make his way to the show. As I have said on many occasions before, the Managers are active amateurs and not just interested in making a sale. For example, **Tony G4NBS** of our Cambridge shop recently made a stage appearance at the VHF Convention as part of the **Sheppey Combined Contests Group** who **won** the **VHF NFD open section**. Visitors from South Wales and the Bristol area were surprised to see **Richard** GW3NAD, the Cardiff Manager, who spent both days with us whilst **Colin** G3XAS travelled up on the club coach from Bournemouth and whilst travelling, discussed the TS780 with an interested amateur—it just shows the dedication of the **Lowe Team**.

Now that the better weather is here, the **MT20** plus its full range of linear, batteries and carrying case provide for the radio amateur true flexibility of operation. Prices of the equipment are as follows: **MT20E** . . . £197.48, **LA20** linear amplifier . . . £79.03, **CP1** carrying case with aerial mounting strap . . . £23.48, **BA4** Nicad battery for linear . . . £33.45, **SD1** DC regulator/antenna converter for mobile use . . . £25.25, **BA2** spare receiver Nicad pack . . . £16.80 and finally the **LP3** transceiver case . . . £5.14. All prices include VAT.

Again from Daiwa are the four motor rotators which are features on the oppostie page. As a result of overwhelming requests for the DR7500R rotator, Daiwa have decided to reintroduce it. The DR7500R rotator is available at £153.67, inc. VAT, carriage £7.00. On the rotator scene it is worth noting that by the time you read this **we will have added two small rotators to our range**—the AR2200 . . . £89.50 and the AR1002 . . . £39.50. Both prices, including VAT—carriage on each £7.00. The two rotators are suitable for VHF/UHF systems, and size, number of aerials and site exposure will determine which one you choose. The AR2200 is supplied as standard for base plate fixing. An additional set of clamps for mast mounting cost £22.60, the reference being ARLB. These last two additions to the Lowe rotators complete the range in both price and capability. Incidentally, both have drive motor voltages of 24V AC and use 3 core cable. The smaller of the two accepts masts from 22–40 mm, the larger from 38–50mm.

I seem to have spent many hours recently in the shack **listening to my NRD515**. At the NEC I was asked by several people for the frequency of **Vatican Radio**. My favourite programme is **"With You in the Night"** and can be found on 6185 kHz. May I suggest to all short wave listeners that a copy of the **"World Radio & TV Handbook"** is a valuable addition to any shack. This year the publication, I presume due to exchange rates, will cost more than last year: the new price being £17.95, postage and packing £1.75. We did have a few of last year's left but by the time you read this I am sure they will all have been sold.

I spent Easter with my good friend **Bill** G3JYP, his wife **Judith** and their two sons, **Mark** and **Myles** in **"Appleby in Westmorland,"** Cumbria. For some time Bill has operated a **TS830S** with considerable success judging from the **DXCC** awards that abound on his walls. He didn't say but I am sure they must be cheaper than wall paper! He recently took delivery of a **TRIO TL922** Linear and during the weekend I saw what can happen to a man with the perfect shack. Keen he has always been but now his enthusiasm knows no bounds. I never seem to advertise the **TL922 Linear** but it is still available, still so well engineered that is needs two people to carry it and as I write this one is just being sold in the shop. Back to G3JYP, he doesn't just have TS830S and linear—hanging from a pine tree in the garden is a skeleton slot antenna cut for optimum performance on 18 MHz. Consequently with ATU it performs well on 20 and 15 metres—it will also work on 10 MHz. Fed with open wire feeder (definitely looks home-brew variety), **the antenna, TL922 and TS830S** make a **fine amateur radio station**. I'll not list the price of the TL922. If you need to ask you really cannot afford one.

Anyway, that's about it for now, the builder should complete the **Bournemouth shop tomorrow**, and as you read this it will be **well and truly open**. The shop telephone number is Bournemouth **(0202) 577760** —the Manager **Colin G3XAS**.

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

David G8GIY.

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Microwave Modules Ltd is a full time professional organisation, established over **16 years** ago in **1969**, and currently employs over **30 full time**, on site staff based in our two modern, purpose built factories. In addition, a similar number of "Outworkers" are involved in assembly and mechanical operations.

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Our Product Range now exceeds **50 individual items** in total and is the widest range available from any one manufacturing company. Our technical resources have enabled us to not only become **the largest** and **most successful** designer and manufacturer of R.F. products, such as **Linear amplifiers** and transverters, but also designers and manufacturers of **innovative** microprocessor and digital products such as **The Morsetalker**, MMSI, and the RTTY to TV Decoder, MM2001.

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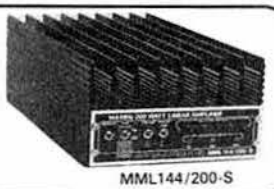
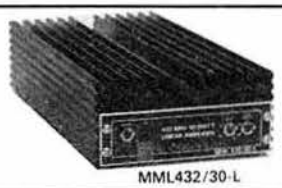
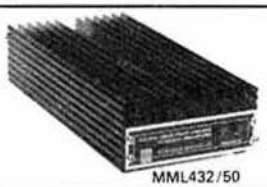
MML144/50-S


MML144/100-LS


MML144/200-S

PRODUCT	Input Power	Output Power	Modes of Operation	Preamplifier		Power Requirements	RF Vox*	PRICE inc VAT
				Gain	N.F.			
MML144/30-LS	1 or 3W	30W	SSB, FM, AM, CW	12dB	<1·5dB	13·8V @ 4A	✓	**£82.90** (p&p £3.50)
MML144/50-S	10W	50W				13·8V @ 6A	✓	**£92.00** (p&p £3.50)
MML144/100-S	10W	100W				13·8V @ 12A	✓	**£149.95** (p&p £4.00)
MML144/100-HS	25W	100W				13·8V @ 12A	✓	**£149.95** (p&p £4.00)
MML144/100-LS	1 or 3W	100W				13.8V @ 14A	✓	**£169.95** (p&p £4.00)
MML144/200-S	3, 10 or 25W	200W				13·8V @ 30A	✓	**£299.00** (p&p £5.25)


MML432/30-L


MML432/50


MML432/100

PRODUCT	Input Power	Output Power	Modes of Operation	Preamplifier		Power Requirements	RF Vox*	PRICE inc VAT
				Gain	N.F.			
MML432/30-L	1 or 3W	30W	SSB, FM, ATV, AM, CW	12dB	2dB	13·8V @ 6A	✓	**£145.00** (p&p £4.00)
MML432/50	10W	50W		12dB	2dB	13·8V @ 8A	✓	**£129.95** (p&p £4.00)
MML432/100	10W	100W		—	—	13·8V @ 20A	✓	**£299.00** (p&p £5.25)

* The RF VOX can be overridden and hard wired.

CONNECTORS . . .

144MHz products – Our standard connector on these products is SO239. We use a high quality PTFE socket of superior quality, but we are able to supply the choice of BNC or 'N' type at no extra charge. Please specify.

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DATA SHEETS . . . A full printed data sheet is available on each product, and is free on request.

CATALOGUE . . . A copy of our latest catalogue can be obtained free of charge upon request.

AVAILABILITY . . . Our products are normally available from stock, either direct from ourselves or any of our 75 UK outlets.

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		Inc VAT	Carr
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NRD515	New synthesised HF monitoring receiver	965.00	7.00
NHD518	Multi channel memory unit for NRD515	264.00	7.00
NCM515	Remote frequency controller	169.75	7.00
NVA515	Matching loudspeaker unit	45.41	3.00
JST100	Digitally synthesized 160-10M transceiver	998.00	7.00
NBD500G	Matching PSU for JST100	181.35	7.00
NVA88	Matching speaker for JST100	44.19	3.00
NFG97	ATU/SWR/POWER meter for JST100	150.00	7.00
VHF/UHF MONITOR RECEIVERS AND SCANNERS			
AR2001	NEW VHF/UHF scanning receiver 25-550MHz	378.01	7.00
SR1000E	DAIWA 1000 channel PLL receiver 144-154MHz	96.04	2.50
DAIWA ROTATORS			
MR750E	NEW Multitorque rotator controller	193.00	7.00
MR750PE	As above but with round and preset controller	217.64	7.00
LMC	Lower mast clamps for pole mounting	14.01	3.00
MR750U	Additional motor unit to increase torque and braking	64.64	3.00
DR7500X	For HF 3 element beams. Preset controller. 6 core cable	142.98	7.00
DR7500R	As for DR7500X but using the DAIWA round controller	153.67	7.00
DR7600X	Heavy duty. Up to 2 el 40m beam. Preset control	189.37	7.00
DR7600R	As for DR7600X but using the DAIWA round controller	213.41	7.00
KS065	Deluxe bearing for fixing stays to rotating mast	27.30	3.00
KR500	Elevation rotator (not Daiwa)	144.90	7.00
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CN410M	3·5-150MHz mobile cross needle power/SWR meter	48.00	1.50
CN460M	140-450MHz mini cross needle power/SWR meter	52.00	1.50
CN520	1·8-60MHz mobile cross needle power/SWR meter	39.50	1.50
CN500	1·8-60MHz mini cross needle power/SWR meter 20W	19.50	1.50
A500	Fixing bracket for CN500 series	2.10	0.30
CN620A	1·8-150MHz cross pointer pwr/SWR meter. Up to 1kW	66.21	2.50
CN630	140-450MHz cross pointer pwr/SWR meter. Up to 200W	98.11	2.50
CN650	1·2-2·5GHz cross pointer pwr/SWR meter. Up to 20W	129.50	2.50
CNW419	1·8-30MHz 200W general coverage tuning unit	159.64	7.00
CNW919	2M Power meter and antenna tuning unit	104.99	3.00
CNW518	3-30MHz 8 band hi power tuner cross needle pointer	233.09	7.00
CL680	1·8-30MHz 200W gen cov ATU (100W at 1·8MHz)	81.50	3.00
DAIWA POWER SUPPLY UNITS			
PS300	DAIWA heavy duty PSU 30A max 22A continuous	176.80	7.00
PS120M	DAIWA AC PSU 3-15V variable 12A maximum	87.33	7.00
PS80M	DAIWA AC PSU 3-15V variable 8A	72.68	3.00
PS50M	DAIWA AC PSU 9-15V variable 5·6A	55.91	3.00
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LA2035R	As above but with rx preamp	63.20	2.00
LA2065R	2M linear amplifier with rx preamp. 60W o/p	108.71	3.00
LA2155	DAIWA 2M 150W SSB/CW/FM amplifier	198.00	7.00
DATA COMMUNICATIONS EQUIPMENT			
CWR685E	TX/RX unit for RTTY/CW/ASCII with built in monitor	771.64	7.00
CWR670E	RX only unit RTTY/CW/ASCII requires external monitor	392.80	7.00
PK675	Printer kit for above unit	189.00	7.00
CWR610E	RX unit RTTY/CW/ASCII Code practise generator inc.	195.00	3.00
AMTOR10A	Comprehensive AMTOR unit	253.20	3.00
DR100	TRIO DATA-MITTER Modem for transmitting ASCII	148.10	3.00
NOVEX12A	Good quality 12" monitor. Amber phosphor	85.00	7.00
NOVEX12G	As above but with green phosphor	89.00	7.00
DM091G	9" Green monitor. All have metal cabinets	79.50	7.00
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HK708	Straight key. Ball bearing pivots. Non skid base	16.30	2.50
HK702	Deluxe version of above on marble base	31.03	3.00
MK704	Squeeze paddle	15.40	1.50
EK150	Electronic keyer. Built in sidetone	103.38	3.00
MK1024	Electronic keyer with 1024 bit memory	185.52	3.00
HOKUSHIN MOBILE AERIALS			
2E	2M 5/8, 3·4 dB gain, foldover base	11.26	2.00
2NE	2M 7/8, 4·5 dB gain, foldover base	17.06	2.00
HS430HB	430MHz mobile gain aerial on half wave extension	8.30	2.00
OSCAR430	70cm 5/8 + 5/8 + 5/8 supergain mobile aerial	21.45	2.00
320	2M stainless 1/4 wave on PL259 plug	2.62	1.00
OTHER ACCESSORIES			
SWR50	The ever popular twin meter SWR bridge. 1·8-150MHz	14.95	2.00
DL60	60W dummy load with SO239 fitting	7.87	1.00
DL150	150W dummy load SO239 fitting	19.68	1.50
DL600	600W aircooled 50ohm dummy load	39.36	2.50
WA1	AKD wavemeter. 120-450MHz. Absorbtion type	24.95	1.50

LOWE SHOPS

In Glasgow the LOWE ELECTRONICS' shop (the telephone number is 041 945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret's Drive. That's the right turn off Great Western Road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical Gardens are well worth a visit . . .

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (the telephone number is 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham road out of town. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

Cambridge, not only a University town but the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (the telephone number is 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1309, past the science park and turn left at the first roundabout, signposted Chesterton. After passing a children's playground on your left turn left again (between the shops) into Green End Road. Very quickly, and without you noticing it, Green End Road becomes High Street. Easy and free street parking is available outside the shop.

For South Wales, the LOWE ELECTRONICS' shop is located in Cardiff. Managed by Richard GW4NAD, who hails from Penarth, the shop (the telephone number is 0222 464154) is within the premises (on the first floor) of South Wales Carpets, Clifton Street, Cardiff. Clifton Street is easily found, being a left turn off Newport Road just before the Infirmary. Once in Clifton Street, South Wales Carpets is the modern red brick building at the end of the street on the right hand side. Enter the shop, follow the arrows past the carpets, up the stairs and the "Emporium" awaits you. Free street parking is available outside the shop.

For South Coast Radio Amateurs, there's a LOWE ELECTRONICS shop in Bournemouth. Its manager is Colin G3XAS. The shop's address is 27 Gillam Road, Northbourne, Bournemouth. That's the north side of town just off the Wimborne Road. The telephone number is 0202 577760. Easy to find, the shop has free street parking immediately outside.

LOWE ELECTRONICS' London shop is located at 223/225 Field End Road, Eastcote, Middlesex (the telephone number is 01 429 3256). The shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings and as such being on the Metropolitan and Piccadilly lines (approximately 30 minutes from Baker Street main junction). For the motorist, we are only about 10 minutes' driving time from the M40, A40, North Circular Road (at Hanger Lane) and the new M25 junction at Denham. Immediately behind the shop is a large car park where you can currently park for the day for 20p. There is also free street parking outside the shop.

Although not a shop there is on the South Coast a source of good advice and equipment—John G3JYG. His address is 16 Harvard Road, Ringmer, Lewes, Sussex. (telephone 0273 812071). An evening or weekend telephone call will put you in touch with John.

Finally, here in Matlock, David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

MAIL ORDER

You don't need a 1750 Hz tone to gain access to the fastest mail order service for all radio amateurs and short wave listeners. With a copy of the LOWE ELECTRONICS catalogue and antenna book in the shack (send £1 for your copy) the best in amateur radio is quickly available.

I ENCLOSE £1. PLEASE SEND ME CATALOGUE & ANTENNA BOOK

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ICOM

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At last, permits are now available in the U.K. for the 50MHz (FM) band. If you wish to use this less crowded amateur frequency the IC-505 SSB CW portable transceiver has already gained an excellent reputation world-wide.

The IC-505 features microprocessor frequency control, dual VFO's and 6-channel memories with memory scan. LCD ensures clear visibility even in sunlight. The 505 accepts a standard dry-cell pack, rechargeable nicad battery pack (BP10) or 13.8V external power supply.

Standard accessory circuits such as split switch, noise blanker, squelch and CW break-in are incorporated in the 505.

Other accessories available include the EX-248 FM unit, BC-15 charger unit and the LC-10 carrying case.

All these features make the IC-505 a great transceiver that will enable you to operate on the 50MHz band, after all the rest of the world does!

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Authorised Icom dealers in the UK

Alexian Electronics Ltd. Edinburgh, 031-554 2591.
Alyntronics, Newcastle, 0632-761002.
Amateur Radio Exchange, London (Ealing), 01-992 5765.
Amcomm, London (S. Harrow), 01-422 9585.
Arrow Electronics Ltd., Chelmsford Essex, 0245-381673/26.
Beamrite, Cardiff, 0222-486884.
Booth Holding (Bath) Ltd., Bristol, 02217-2402.
Bredhurst Electronics Ltd., W. Sussex, 0444-400786.
Dressler (UK) Ltd., London (S. Harrow), 01-558 0854.
D.W. Electronics, Widnes Cheshire, 051-420 2559.
Hobbytronics, Knutsford Cheshire, 0565-4040. Until 10pm daily.
Photo Acoustics Ltd., Buckinghamshire, 0908-610625.
Radcomm Electronics, Co. Cork, Ireland, 01035321-632725.
Radio Shack Ltd., London NW6, 01-624 7174.
Scotcomms, Edinburgh, 031-657 2430.
Tyrone Amateur Electronics, Co. Tyrone, N. Ireland, 0662-2043.
Reg Ward & Co. Ltd., S.W. England, 0297-34918.
Waters & Stanton Electronics, Hockley Essex, 0702-206835.

Listed here are authorised dealers who can demonstrate ICOM equipment all year round. This list covers most areas of the U.K., but if you have difficulty finding a dealer near you, contact Thanet Electronics and we will be able to help you.

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CUE DEE antennas are designed to last for decades – the best possible aluminium alloy for this purpose is used (SIS 4212-06).

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2 metre Yagis.
4144A – 4 element, 8dBd gain £19.00.
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15144 – 15 element, 14dBd gain £49.00.
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All mode, 0·15-30MHz, HF Receiver
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FRG8800

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Synthesised Multimode Base Station
10W Output on HF, VHF & UHF, Possible
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IF Shift/Width System
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FT77

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Chesterfield (0246) 453340
9-5.30 Tue-Sat

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SMC (TMP)
Unit 27, Pinfold Lane
Buckley, Clwyd
Buckley (0244) 549563
10-5 Tue, Wed, Fri
10-4 Sat

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Kidsgrove (07816) 72644
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Grimsby, Lincs
Grimsby (0472) 59388
9.30-5.30 Mon-Sat

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Jersey (0534) 77067
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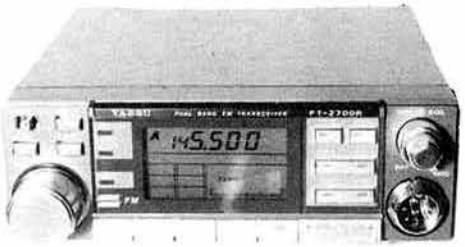
FT2700RH



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Full Duplex Operation
Aesthetically pleasing LCD Display/'S' Meter
25W power output both on VHF and UHF!
Optional Voice Synthesiser
1MHz/25kHz/12½kHz steps (12½ on UHF!)
+ / − Repeater shifts with reverse facility
10 Channel Memory, Memory Scan
Priority Memory Scan/Programmable
One piece diecast centre chassis
50(H) × 150(W) × 168(D) mm

Fully synthesised 2M FM Transceiver
45W (RH), 25W (R) Power Output
Dual VFOs
Optional Voice Synthesiser
1MHz/25kHz/12½kHz Steps
10 Channel Memory
+ / − Repearter shifts with reverse facility
Memory Priority and Programmable Memory Scan
17 Function LCD Display, LED 'S' Meter
One piece diecast alloy chassis
(Fan assisted cooling on 45W model)
40(H) × 140(W) × 180(D) mm

FT270RH

COMPACT 2M FM

THE WINNER
FT757GX

100W Multimode HF Transceiver
Fully Computer Compatible
Dual VFOs, 100% Duty Cycle
General Coverage Rx
FM & CW Narrow as Standard
Programmable Memory Scanning
All Mode Squelch, Full Break-in CW
Triple Microprocessor Control
Matching Automatic ATU (Opt)
93(H) × 238(W) × 238(D) mm

FT-290R

Multimode 2M Transceiver Dual VFOs
Microprocessor Control
Selectable Synthesiser Steps
Large LCD Display Ten Memory Channels
+ / − Repeater Function
Nicads for Portable available
2·5W/0·5W RF output
58(H) × 150(W) × 195(D) mm

THE WORLD'S NO. 1

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

SMC SERVICE
Free Securicor delivery on major equipment.
Access and Barclaycard over the phone.
Biggest branch agent and dealer network.
Securicor '8' Service contract at £5.00.
Biggest stockist of amateur equipment.
Same day despatch whenever possible.

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

Stock Carrying Agents: John Doyle, Transworld Comms, Neath (0639) 52374 Day (0639) 2942 Eve.
Jack McVicar, Scotcomms, Edinburgh. 031-657 2430

SO4 4DP, ENGLAND. Tel: (0703) 867333 Telex: 477351 SMCOMM G

Communications Ltd.

AUTHORISED YAESU

SCANNING RECEIVER

MS-8400

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

SPECIFICATIONS

Frequency Range:	Low VHF 68,000 MHz ~ 88,000 MHz Mid VHF 108,000 MHz ~ 136,000 MHz High VHF 136,005 MHz ~ 174,000 MHz UHF 380,000 MHz ~ 512,000 MHz
Scanning steps:	5, 10, 12.5 and 25 kHz VHF (10, 12.5 and 25 kHz UHF)
Channels:	40 programmable memories
Modes:	AM or FM selectable
Scan rate:	Approximately 18 channels per second
Scan delay:	2 seconds Priority sampling: 4 seconds
Audio output:	1.2 Watts
Selectivity:	Better than -60 dB @ ±25 kHz
Power supply:	DC 12V ~ 16V 0.6A max
Memory backup:	9 volt, battery (PP3)
Antenna:	Telescopic antenna or External
Loudspeaker:	2.5" x 4" oval speaker
Size:	190(W) x 250(D) x 85(H) mm
Weight:	1.7kg

£249.00 inc.

Price includes free carriage

POWER METERS

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

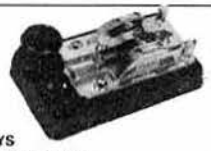
The Hansen range covers 30 quality models with top-of-the-line the FS710. This is a flat frequency response, peak envelope power and average in-line wattmeter with many novel features. Notable being the 'power independent' SWR scale—no forward power calibration knob, just direct reading SWR.

				£
		HANSEN		
FS710H	1.8-60 MHz	15/150/1500W	PEP Auto SWR	P.O.A.
FS710V	50-150 MHz	15/150W	PEP Auto SWR	107.80
FS500V	50-150 MHz	20/200W	PEP	81.95
FS300H	1.8-60 MHz	20/200/1000W		53.50
FS300V	50-150 MHz	20/200W		53.50
FS602M	50-150 MHz	20/200W	PEP	P.O.A.
FS210	1.8-150 MHz	20/200W	Auto SWR/ Power Meter	65.50
FS301M	2-30 MHz	20/200W		42.25
FS301MH	2-30 MHz	200/2000W		42.25
FS711H	2-30 MHz	20/200W	Head/ Display	43.65
W720S	130-430 MHz	20/200W	Head/ Display (1KW HF only)	41.50
FS5E	3.5-150 MHz	20/200/1000W	(1KW HF only)	42.75
SWR3E	3.5-150 MHz	20/200/1000W		28.75
SWR50B	3.5-150 MHz	Twin Meter		30.50
FS20DL	3-150 MHz	1/10W Dummy/SWR/Power		43.65
FS20D	3-150 MHz	5/20W Dummy/SWR/Power		43.65
		JD		
JD110	1.5-150 MHz	10/100W		16.50
		SMC		
S3-30L	Mini (CB style)			9.20
T3-170L	3.5-170 MHz	Relative	Twin Meter	17.25
		WELZ		
SP300	1.8-500MHz	20/200/1KW	SWR/ Power	121.50

NB: PRICES INCLUDE VAT AT 15%

Carriage free by post

MORSE EQUIPMENT



			p.p.
MORSE KEYS			
HK703	Straight Key	£29.35	£1.20
HK704	Straight Key	£19.95	£1.20
HK706	Straight Key	£16.65	£1.00
HK707	Straight Key	£15.50	£1.00
HK710	Straight Key	£39.95	£1.75
HK808	Straight Key	£49.95	£1.75
HK711	Key Mounting	£32.75	£1.50
BK100	Mechanical Bug	£24.95	£1.75
MK701	Single Lever Paddle	£28.50	£1.60
MK702	Single Lever Paddle	£29.75	£1.60
MK703	Squeeze Key	£28.95	£1.75
MK705	Squeeze Key	£25.65	£1.75
MK706	Squeeze Key	£23.50	£1.75
IKP60	Iambic	£9.95	FOC
HK802	de Luxe Brass Key	£86.30	£2.00
HK803	de Luxe Brass Key	£82.65	£2.00
HK804	de Luxe Brass Key	£78.25	£2.00
MHK831	Super de Luxe squeeze & straight key	£189.00	£3.50
MORSE EQUIPMENT			
KP100	Squeeze 230/13-8V	£82.50	£2.00
KP200	Memory 4096 Multi Ch Mem Back Up 230/13-8V	£169.50	£2.50
D70	Morse Tutor (Datong)	£56.35	FOC
MMS1	Morse Tutor (M/M)	£115.00	FOC
MMS2	Morse Tutor Advanced	£169.00	FOC
MICROWAVE MODULES—RRTY EQUIPMENT			
MM2001	RTTY to Video	£189.00	FOC
MM4001	RTTY Transceiver	£269.00	FOC
MM4001KB	RTTY Tx/Rx keybd	£299.00	FOC
MM1001KB	Morse Keyboard	£135.00	FOC
MM1000KB	ASCII CW conv c/w keybd	£135.00	FOC

PRICES INCLUDE VAT at 15%

Carriage as shown

10M FM CORNER

Join the many others who have found that operating 10M FM can be a pleasant alternative to the overcrowded 2M band. The SMC Oscar 2 10M gives you 40 channels, channel 1 being 29.310 MHz and channel 40 29.7 MHz, a power o/p of approximately 4 watts and a receive sensitivity of better than 0.3μV for 12db sinad. Also for your enjoyment when the band opens up, we have incorporated a - 100kHz repeater shift (by using the original panel Hi/Low power switch), so from the car or at home you can enjoy 10M FM.

OSCAR 2 10m FM £65.00 inc

ACCESSORIES		INC	P/P
SMCGP27	¼ Wave vertical	£29.00	£2.65
SMCVA27	¼ Wave vertical no radials	£29.00	£2.65
SMC11V11S	Glass fibre loaded radials	£32.15	£2.65
SMC10SE	10M Mobile whip	£15.95	£2.00
RSL-28b	Yaesu 10M mobile whip	£10.65	£2.00
SMCGCCA	Gutter mount and cable	£11.50	£2.00
SMCSOCA	4M cable assembly 10SE	£5.65	£1.50
FLEXI 10	G. Whip mobile 10-80M	£52.33	£2.35
MULTI-M	G. whip mobile 10/15/20	£33.92	£1.85
FLEXIWHIP	G. Whip 10M mobile	£19.21	£1.85
GW BASE	Base for all G. Whips	£6.90	£1.00
SMTC3170L	Twin meter SWR bridge	£17.25	FOC
SMC100LP30	Low pass filter	£5.30	FOC
120406	4 Amp DC power unit	£14.95	£2.35
SP55	Extension L/S	£16.50	FOC

NB. PRICES INCLUDE VAT AT 15%

and carriage by post or Securicor

PUBLICATIONS

	£	p/p
I.P.C. (PRACTICAL WIRELESS)		
Out of Thin Air	1.20	0.75
Passport to Amateur Radio	1.50	0.75
Wires and Waves	3.00	0.90
Are the voltages correct?	1.00	0.50
Introducing R.T.T.Y	1.50	0.50
R.S.G.B.		
Teleprinter Handbook	11.65	1.35
Radio Communications Handbook	8.95	2.05
Test Equipment (Radio Amateurs)	4.70	1.30
Amateur Radio Techniques	4.75	1.35
HF Antennas for all Locations	4.75	1.35
Guide to Amateur Radio (Soft)	2.75	0.75
Radio Amateur Operators Manual	4.25	0.75
1983 Call Book (UK)	1.00	0.80
1984 Call Book (UK)	5.00	0.50
R.A.E. Manual (10th Edition)	2.75	0.75
T.V.I. Manual	1.50	0.50
Morse Code for Radio Amateurs	1.00	0.50
VHF/UHF Manual (3rd Edition)	4.25	2.00
VHF/UHF Manual (4th Edition)	8.50	2.00
Prefix Map	2.25	1.25
Great Circle Map	1.50	1.20
Amateur Radio Logbook	2.30	1.25
S.M.C.		
Countries List	0.35	1.20
O.R.A. Locator Map (Special Coating)	0.50	1.20
Transparent Overlay 50km Rings	1.00	
Maidenhead Locator Map	1.50	1.20
TAB BOOKS		
Hidden Limited Space Antennas	6.95	0.75
Complete Handbook (Transmitters)	8.25	0.75
Secrets of Ham Radio DXing	6.50	0.75
Complete S.W.L. Handbook	9.95	0.85
S.W.L. Antenna Handbook	8.45	0.75
Guide to Scanners and Monitors	9.50	0.85
Radio Communications Receivers	11.75	0.90
Secret Shortwave Spectrum	6.50	0.75
UNIVERSAL ELECTRONICS INC		
Clandestine Confidential S.W.	6.35	0.85
World Press Frequencies (RTTY)	6.35	0.85
RTTY Today, Modern Guide	6.35	0.85
MISCELLANEOUS PUBLISHERS		
Amateur Radio (Stokes/Budd)	8.95	1.30
Log Book (Jaybeam)	2.30	1.25
Maidenhead Locator Map	1.50	

Prices include V.A.T. at 15% (where applicable) Postage extra. U.K. and B.F.P.O. rates for one off items only shown. N.B. For larger orders (any mix) p/p may be much lower than sum of individual charges

ROTATORS

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

KR600RC

9502B

FU200	Thro'	3 Core	Light Duty	£49.95
KR250	Bell	6 Core	Lighter Duty	£61.95
9502B	Offset	3 Core	Lighter Duty	£69.49
AR40	Bell	5 Core	Medium Duty	£115.00
KR400	Bell	6 Core	Matches KR500	£109.95
KR500	Thro	6 Core	Elevation	£139.95
AR50	Bell	5 Core	5 Position (AR40)	£139.00
KR400RC	Bell	5 Core	Medium Duty	£132.50
CD45	Bell	8 Core	Heavy Duty	£189.95
KR600RC	Bell	6 Core	Heavy Duty	£189.50
HAM IV	Bell	8 Core	Heavier Duty	£299.00
KR2000RC	Bell	8 Core	Heavier Duty	£366.50
T2X	Bell	8 Core	Very Heavy Duty	£365.00
HDR300	Bell	8 Core	Digital Readout	£699.00

Control Cable			p.p.
RC5W	5 Way	mtr £0.44	£1.90
RC6W	6 Way	mtr £0.59	£1.90
RC8W	8 Way	mtr £0.67	£1.90
9523	Support Bearing for 9502b F4200	£19.65	£2.50
KC038	Lower Mast Clamp for KR400 600, etc	£12.85	£2.50

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

STOCK CARRYING AGENTS WITH DEMONSTRATING FACILITIES

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Transworld Communications, Neath
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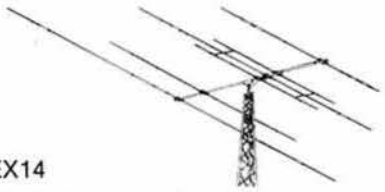
Eve (0639) 2942

John Stringer GI3KDR
SMC N. Ireland, Bangor
(0247) 464875

HF ANTENNAS

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



EX14

MULTIBAND BEAMS		Inc VAT	P&P
EX14	Explorer 10-20m	£499.00	£7.50
TH3JNR	3 Ele 10-20m	£298.00	£4.50
TH5Mk2	5 Ele 10-20m	£649.00	£7.70
TH7DXX	7 Ele 10-20m	£755.00	£9.75
TB3	3 Ele 10-20 Jaybeam	£212.75	£5.90
HQ1	Mini Quad 10-20	£199.00	£4.00
G4MH	Mini Beam 1-20	£88.50	£4.50
TA33JNR	3 Ele 10-20 Moseley	£177.10	£6.00
Mustang 2	2 Ele 10-20 Moseley	£177.10	£6.90
Mustang 3	3 Ele 10-20 Moseley	£220.80	£6.90
GQ2E	2 Ele 10-20 Quad	£299.00	£5.90
GQ3E	3 Ele 10-20 Quad	£536.00	£9.20
GQ4E	4 Ele 10-20 Quad	£745.00	£10.00
Hyquad	2 Ele 10-15M dipole 20M	£345.00	£8.00
LP1007	Log Periodic 13-20 MHz	£2195.00	DIST
3Y1015D20	3 Ele 10/15M Dipole 20M	£179.00	£5.95
DB10/15A	3 Ele 10-15m	£209.00	£4.80

TB3

MONO BAND BEAMS			
103BA	3 Ele Yagi 10m	£99.00	£3.95
105BA	5 Ele Yagi 10m	£220.00	£3.95
153BA	3 Eli Yagi 15m	£135.00	£3.90
155BA	5 Ele Yagi 15m	£339.00	£5.90
203BA	3 Ele Yagi 20m	£259.00	£4.90
204BA	4 Ele Yagi 20m	£420.00	£7.30
205BA	5 Ele Yagi 20m	£499.00	£9.40
18TD	Dipole Tape 10-80m	£230.00	£2.80

HF5V

HF5R

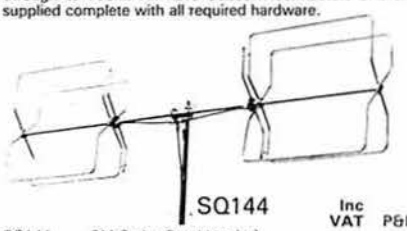
VERTICALS			
12AVQ	Vertical 10-20m	£78.95	£2.75
14AVQ/WB	Vertical 10-40m	£106.00	£2.75
18AVT/WB	Vertical 10-80m	£172.00	£2.75
18V	Vertical 10-80m taped	£38.80	£2.75
C4	Vertical 10-20m	£89.00	£2.50
SMCHF5V	Vertical 10-80m	£66.50	£3.00
SMCHF5R	Radial Kit for above	£41.00	£3.00
TRAP DIPOLE			
SMCTD/HP	High Power 10-80m	£49.00	£2.65
SMC TD/P	Portable inc coax	£69.00	£2.65
MOBILE			
Tribander	10-20m Slide sw.	£29.33	£2.20
Multimobile	10-20m	£33.92	£1.85
Flexiwhip	10m only	£19.21	£2.20
Extra coils	For above to 160m	£7.25	£1.00
Flexiten	2, 10, 12, 17, 15, 20, 30, 40, 80M	£52.33	£2.35
Bases	For above	£6.90	£1.00

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

BASE ANTENNAS

HF, VHF, UHF, BASE STATION ANTENNAS

SMC-HSA range of base station antennas covers from 80M through to 70cm. All have SO239M connectors and are supplied complete with all required hardware.



SQ144

		Inc VAT	P&P
SQ144	2M Swiss Quad Vertical Mounting	£67.95	£2.85
GP2M	2M¼ c/w ground plane 3·4dB ¼	£22.95	£2.85
GG144W	2M2 × ⅝ colinear 6·5dB ¼	£33.95	£2.85
GP23	2m3 × ⅝ colinear 7·8dB ¼	£49.95	£2.85
GP432X	70cm 3 × ⅝ 6·8dB ¼	£36.95	£2.85
70N2V	2M/70cm colinear 2·8dB ¼/5·8dB ¼	£36.80	£2.85
HS770	2M/70cm Duplexer 50W 30dB isolation	£17.65	£1.95
VHFL	65-520MHz Discone Rx only	£19.60	£2.85
GDX1	80-480MHz Discone 3dB ¼	£49.50	£2.85
GDX2	50-480MHz Discone 3dB ¼	£62.85	£2.85
GDXA	100-480MHz Discone 3dB ¼	£41.85	£2.85
LT606	50-500MHz Log Periodic 7-8dB	£159.95	£3.50
HF5V	Trapped Vertical 10-80M 5 bands	£66.50	£3.00
HF5R	Loaded Radial Kit	£41.00	£3.00
3Y1015D20	3 ele 10, 15M dipole 20M	£179.00	£5.95
GP714	70cm 14 step colinear 10dBi	£88.20	£2.85

POWER SPLITTERS

144MHz 2 way N connectors 1kW	£30.65	£1.50
144MHz 4 way N connectors 1kW	£33.75	£1.50
432MHz 2 way N connectors 1KW	£29.15	£1.50
432MHz 4 way N connectors 1kW	£31.80	£1.50
1296MHz 2 way N connectors 1kW	£24.55	£2.00
1296MHz 4 way N connectors 1kW	£25.70	£2.00

JAYBEAM

4 METRES				
4Y/4M	Yagi 4 element	7dBd	£32.78	£2.65
PMH2/4M	Phasing harness 2 way		£17.82	£1.65
2 METRES				
H0/2M	Halo head only	0dBd	£6.53	£1.50
HM/2M	Halo with 24" mast	0dBd	£7.48	£1.65
C5/2M	Colinear omni vert	4·8dBd	£86.25	£2.65
LW5/2M	Yagi 5 element	7·8dBd	£15.53	£2.65
LW8/2M	Yagi 8 element	9·5dBd	£19.56	£2.65
LW10/2M	Yagi 10 element	10·5dBd	£25.30	£2.65
LW16/2M	Yagi 16 element	13·4dBd	£35.07	£3.65
PBM10/2M	10 ele Parabeam	11·7dBd	£49.45	£3.65
PBM14/2M	14 ele Parabeam	13·7dBd	£60.95	£3.65
Q4/2M	Quad 4 element	9·4dBd	£31.63	£2.65
Q6/2M	Quad 6 element	10·9dBd	£41.40	£2.65
Q8/2M	Quad 8 element	11·9dBd	£51.75	£2.65
D5/2M	Yagi 5 over 5 slot	10dBd	£27.60	£2.65
D8/2M	Yagi 8 over 8 slot	11·1dBd	£37.95	£2.65
5XY/2M	Yagi 5 ele crossed	7·8dBd	£29-90	£2.65
8XY/2M	Yagi 8 ele crossed	9·5dBd	£38.53	£2.65
10XY/2M	Yagi 10 ele crossed	10·8dBd	£43.80	£2.65
PMH2/C	Harness cir polarisation		£11.50	£1.65
PMH2/2M	Harness 2 way 144MHz		£13.23	£1.65
PMH4/2M	Harness 4 way 144MHz		£31.62	£1.65
70CMS				
C8/70	Colinear Vertical	6·1dBd	£92.00	£2.65
D8/70	Yagi 8 over 8 slot	12·3dBd	£28.18	£2.65
PBM18/70	18 ele Parabeam	13·5dBd	£34.50	£2.65
PBM24/70	24 ele Parabeam	15·1dBd	£46.00	£2.65
LW24/70	Yagi 24 element	14·8dBd	£31.05	£2.65
MBM28/70	28 ele Multibeam	11·5dBd	£23.00	£2.65
MBM48/70	48 ele Multibeam	14·0dBd	£37.96	£2.65
MBM88/70	88 ele Multibeam	16·3dBd	£51.75	£2.65
8XY/70	Yagi 8 ele crossed	10dBd	£45.85	£2.65
12XY/70	Yagi 12 ele crossed	12dBd	£55.20	£2.65
PMH2/70	Harness 2 way		£12.07	£1.85
PMH4/70	Harness 4 way		£24.73	£1.85
23CM				
CR2/23CM	Corner reflector	13·5dBd	£43.13	£2.65
PMH2/23CM	Harness 2 way		£32.78	£1.65

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

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, anti-vandal, system checks from the feed point, portable operation and for ease of garaging etc. All models have fold over bases (either lift and lay or locking collar) except the 78B which has an inbuilt ball in case the mount must be fitted askew.

SMC 78F

GCD

SMC258

GCD

	SMC-HS MOBILE ANTENNAS	£	P&P
SMC6P2T/PL	Telescopic 2M PL259 fitting ¼λ	5.75	0.85
SMCT144h	Telescopic 2M ¼ wave BNC	10.35	0.85
SMC6P2T/BNC	Telescopic 2M BNC fitting ¼λ	6.90	0.85
SMC2H/PL	Helical 2M PL259 fitting	5.95	0.85
SMC2H/BNC	Helical 2M BNC fitting	6.90	0.85
SMCHS430S	70cm ¼ wave BNC 2.5dB¼	8.75	0.65
SMC2QW	2M ¼ wave 0dB¼ 1.6'	2.70	1.85
SMC2NE	2M ¼ wave fold 3.0dB¼ 4.3'	7.95	2.00
SMC2VF	2M ¼ wave fold 3.0dB¼ 3.5'	14.66	2.00
SMC78F	2M ¼ wave fold 4.5dB¼ 5.7'	14.74	2.50
SMC78B	2M ¼ wave ball 4.5dB¼ 5.6'	14.74	2.59
SMC78SF	2M ¼ wave short 4.7'	16.95	2.50
SMC88F	2M 8/8 wave 5.2dB¼ 6.5'	22.95	2.50
SMC118M	Colinear 2M 11/8 7dB¼ 9.7'	39.85	2.65
SMC258	70cm 2×½ fold 5.5dB¼ 3.1'	26.95	2.00
SMC268E	70cm 2 section colinear 6dB¼	29.95	2.00
SMC358	70cm 3×½ 6.3dB¼ 4.7'	20.95	2.00
SMC70N2M	Dual band 2M 2.7dB¼ 70cm 5.1dB¼ (½λ & 2½λ)	20.95	2.00
SMCHS770	144/432 Duplexer 50W	19.55	1.85
SMC15SE	15M 1.72M 130W PEP	16.85	2.50
SMC10SE	10M 1.72M 200W PEP	15.95	2.50
SMC17SE	17M 1.915M 200W PEP	18.75	2.50
SMC12SE	12M 1.915M 200W PEP	16.85	2.50
RSL-28b	Yaesu 10M mobile whip	10.65	2.00
SMCGCCA	Gutter clip 4 mtrs cable	11.50	2.00
SMCSOCA	Cable assembly 4M PL259	5.65	1.50
SMCSOCAL	Cable assembly 6M PL259	5.95	1.50
SMC50CALLR	Cable assembly 5M PL259	6.65	1.50
SMCROL	Rollet, 10mm thick (for above)	1.15	0.50
SMCTMCAS	Trunk mount c/w 6M cable	10.65	2.00
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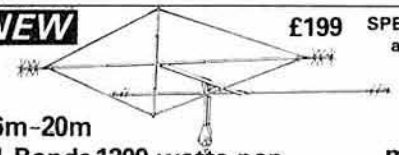

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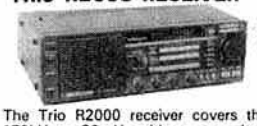

£479 + FREE H'phones, dipole antenna prefix maps and SWL book worth £21!

The Trio R2000 receiver covers the entire spectrum from 150kHz to 30mHz with no gaps. Its programmable scanning and memories combine to make this SSB AM/FM receiver a firm favourite. The optional VC10 VHF converter at £128 adds to range 118-174mHz.

YAESU FRG8800 RECEIVER

£539 + FREE H'phones, dipole antenna prefix maps and SWL book worth £21!

Covering 150kHz to 30mHz this latest offering from Yaesu provides a really high performance receiver. Now with built-in memory and optional VHF module (118-174mHz) it can be thoroughly recommended.

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£178 + FREE AC PSU & Aerial

The Sony ICF7600 is a truly remarkable receiver covering 150kHz to 30mHz SSB/AM plus FM broadcast. Despite its size it gives superb performance even from its built-in telescopic aerial. The LCD readout, built-in clock and memories all go to make what is probably the World's smallest communications receiver.

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A full 20 watts SSB/CW/FM at less than £400! Ideal as a mobile or base station this rig will give you plenty of DX and its good sensitivity means you'll hear plenty of DX as well. Complete with DC lead and mobile mounting backet.

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EDITORIAL

Updating the Society's Memorandum and Articles of Association

The functioning of an institution such as the RSGB depends on the often complex interaction between its headquarters staff, volunteers, members, bodies such as the Department of Trade & Industry, City & Guilds, British Standards Institution, CCIR and many others, not forgetting our advertisers and those companies which do business with the Society. Depending on the area involved, the procedures used are defined in different ways; for example, in standing orders, terms of reference for our committees and the formal administrative procedures used at headquarters. Many of these procedures are not clearly defined, being what we could call "good working practice", "normal business methods" and just "common sense"—whatever that is.

The legal basis of the Society's operation—and, the RSGB being a company, must have this legal basis—is enshrined in its Memorandum and Articles of Association, and in company law. Briefly, the Memorandum is supposed to describe the objectives of the Society, with the Articles of Association attempting to define the methods to be used to carry out these objectives. For example, the Articles define the grades of membership, the role of the President, Council members and other officers of the Society, together with how meetings such as the annual general meeting and Council meetings are supposed to work.

The current Memorandum and Articles of Association are based on those generated in 1926 and have served the Society reasonably well; nevertheless, being originally designed to cater for a small society composed primarily of dedicated experimenters, it is not surprising that they have had to be updated from time to time. In practice, the changes have been confined to those considered essential at the time, since the process of updating is both time-consuming and expensive.

It is becoming increasingly evident that a complete revision of the Memorandum and Articles is overdue. This is being made necessary by the changes which have taken place within amateur radio and the increased scale of the Society's operation—the doubling of its membership in nearly 10 years being but just one example.

A start has already been made on this work. It will be a demanding exercise, not only because of the legal aspects which have to be mastered as part of the process, but because it will question some of the basic definitions of what we see amateur radio to be and the way it should be directed. It is inevitable that many questions will arise. We propose to air these for members' comment as appropriate—after all, it is our Society that we are trying to improve.

D A Evans, G3OUF

RSGB NATIONAL AMATEUR

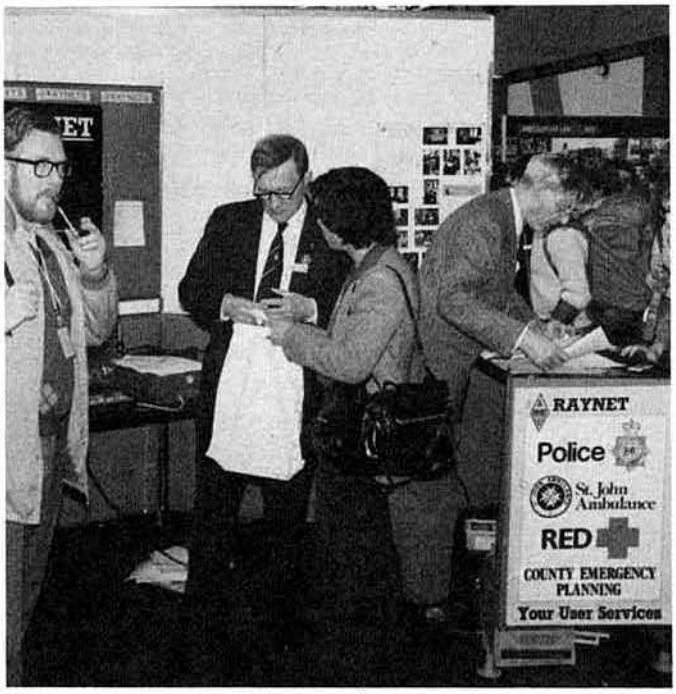
The 1985 RSGB National Convention took place on 13 and 14 April 1985 at the National Exhibition Centre in Birmingham. Despite the rather unseasonal weather, with hail, snow and high winds at times, almost 11,000 people attended, with a small majority preferring the Saturday: certainly the queue at opening time on the Saturday morning stretched virtually right round the square surrounding Hall 3!

Once inside, visitors were able to see the well-stocked stands of almost every British amateur radio dealer, a very large and comprehensive RSGB stand and displays and demonstrations from various outside bodies. There was also a "marketplace" where small items for home construction could be purchased and, to judge from the enormous crowds in that part of the hall, a large amount of equipment must be in the throes of being "home-brewed". Two new books and a new map were on sale on the RSGB stand: the largest ever edition of the *Amateur Radio Call Book*, with some 53,000 entries, sold extremely well, and the new IARU Locator Map for Western Europe was also very well received. The new edition of the *Amateur Radio Operating Manual* arrived just in time for the Convention and looks likely to be another best seller.

It was noticeable that many of the national affiliated societies who took stand space at the NEC held their agms during the course of the convention: this suggests that the event is becoming something of a focal point in the amateur radio year. Both these meetings and the lecture streams were very well attended, and the feeling of many visitors seemed to be that the convention is fast becoming "the place to be".

As is now usual, talk-in was very ably provided by the Solihull & Chelmsley Wood Raynet Group. A very popular amateur radio demonstration station was also run by the Solihull Amateur Radio Society.

All in all, the 1985 RSGB National Convention was very popular and successful. For those who already have 1986 diaries, the dates for next year are 5 and 6 April . . .



The Raynet stand

PRESENTATION OF AWARDS

During the convention, the President, Mrs Joan Heathershaw, presented trophies to the recipients of various awards, mostly for hf contests winners, and photographs of these appear on these pages

The Frank Hoosen Trophy to the Hereford ARS

Members of the Gravesend RS accepting the NFD Shield

L to r: S Cole, GW4BLE, receives the Powditch Trophy; and K M Riddoch, GM3ZSP, receives the Maitland Trophy

RADIO CONVENTION 1985



L to r: Derek Thom, G3NKS, receiving the Gravesend Trophy on behalf of the Great Western Contest Group; Richard Marshall, winner of the home-construction competition receives the Horace Freeman Trophy; and Colin Thomas, G3PSM, accepts the Houston-Fergus Trophy for the White Rose ARC

The Northumbria Trophy to members of the Cray Valley RS

Members of the Glenrothes & D ARS receiving the Scottish NFD Trophy



L to r: to J Singleton, G4WJR (ex RS47778), the Powditch Receiving Trophy; to a representative of the Stockport Radio Society, the Bristol Trophy; and to C I B Trusson, G3RVM, the Victor Demond Trophy



L to r: the G2QT Cup Winner's Cup to a representative of Rutherford Laboratory ARC, who also accepted the Whitworth Trophy on behalf of the club; the Somerset Trophy to R G D Stone, GW3YDX, who also received the 1930 Committee Cup; and the L H Thomas Trophy to another representative of the Rutherford Laboratory ARC

Amateur Radio News

Reduced and waived subscriptions

The RSGB Council introduced new rules earlier this year governing reduced subscriptions for members over 65 years of age, and the qualifications required for waiving subscriptions for the blind and disabled members.

In the case of members over 65 years of age, membership needs to have been for a minimum of five consecutive years in order to qualify for a reduced subscription.

Members who are disabled and wish to apply for their subscriptions to be waived must have been a member for at least one year.

Full details of the above are available direct from D A Evans, secretary/general manager, at RSGB HQ.

Raised in the House

On 11 March Mr Cartwright, MP for Woolwich, asked the Secretary of State for Trade & Industry what action his department had taken on the complaint of interference by citizens band radio in London SE7 which had previously been brought to his attention, and when he expected to be able to resolve the matter. The second paragraph of the reply is quite significant: it was stated that the honourable member would appreciate that, particularly in London, the RIS had a heavy case load and had to **Give priority to dealing with radio interference which endangered life and the viable operation of business and essential services.**

In the context of a reply to a question on 26 March, the Parliamentary Under-Secretary of State for Trade & Industry, Mr John Butcher, made some interesting points about the principles of radio regulation. He said that "Radio-borne services affect nearly every aspect of our lives. The absence or degradation of these services could undermine the economic viability of a wide range of important service industries ranging from taxi services to airline operations. The operations of defence, law-and-order and safety-of-life services are now virtually unthinkable without radio systems. Escalating demands for information, news, entertainment and telecommunications can also be met most readily by radio systems, and no space system is viable without effective radio communication.

"Regulation of the radio frequency spectrum is a necessary pre-requisite to . . . effectiveness in all radio operations and in all manufacturing or service operations which depend on radio. This is, firstly, because of the growing variety, scale and importance of these services and their conflicting demands for a scarce natural resource. Secondly, it is because of the characteristics of radio waves and the technologies available to handle them.

"The important characteristics are, first, that radio waves do not stop at national frontiers. A nation cannot draw up its plans unilaterally, or it will both suffer and cause harmful interference. The effective use of radio demands a very high degree of international co-operation. The more intensively the spectrum is used, the more important the international dimension becomes. Second, it is a resource that can be shared by a distinctive frequency assignment to each user, by users on the same frequency assignment on a geographical basis, by users of the same frequency on a time basis, or by invoking advanced technology to superimpose transmissions. Third, it is susceptible to pollution. Harmful interference can be caused by other users of the radio spectrum, and by spurious radiation produced by other electrical equipment. Without regulatory control, parts of the spectrum could be rendered useless by interference.

"Frequency assignment processes are technically complex and are becoming more so with the growth of demand for radio services. They are distinctively different for various types of use and in different parts of the radio frequency spectrum. In order to make the best possible use of the spectrum, most users of land mobile and fixed services do not have their own exclusive frequency. Frequencies can be re-used across the United Kingdom by exploiting geographical separation and terrain."

This is probably one of the more comprehensive statements concerning radio regulation which has been made to the House of Commons in recent times. As an outline of the radio regulatory stance of the present government, it is the best we have seen.

On 5 March the Government made its formal response to the recommendations made in the "Report of the Independent Review of the Radio Spectrum (30-960MHz)", chaired by Dr J H H Merriman, CB, OBE, FEM, published by HMSO, reference Cmnd 9000, price £8.40. Mr Geoffrey Pattie, Minister of State for Industry & Information Technology, said that the Government shared the views expressed in the report as to the importance of radio regulation to a wide range of industry, service and other users, and welcomed the many recommendations it contained which were directed towards ensuring that this task was more effectively discharged. He added that, in the 18 months since the report had been submitted, the recommendations had been studied in detail and several had already been put into effect.

Mr Pattie said that a number of recommendations concerned the optimum location within the machinery of government for the regulation of radio. These had been overtaken by the transfer of the Radio Regulatory Division to the Department of Trade & Industry in June 1983. With two exceptions identified in paragraphs 2 and 9 below, the Government accepted the recommendations of the report and the action which it would be taking was as follows:

1. Exceptional steps were being taken to overcome current difficulties in recruiting the specialist staff needed to carry out the work of the RIS in the manner in which it was envisaged in the report. In particular, it had now been agreed that an allowance would be paid to radio spectrum engineers to assist in the recruitment, selection and retention of qualified staff. The staff complement had been increased to allow for more monitoring of the spectrum, and, as staff levels increased, more effort would be devoted to planning for broadcast, ancillary and fixed services and to involvement in research into systems and propagation. Staff exchanges with industry would also be introduced when staffing levels permitted.
2. The existing structure of consultative bodies on radio regulatory matters would be reviewed and, if necessary, strengthened or extended. In the light of that review, further consideration would be given to the matter of whether there was a case for establishing a small high-level expert body as had been recommended in the report.
3. Regular reviews of spectrum usage and technical developments, on a user-group basis, would be instituted. A forward-planning unit had been set up in recognition of the long timescales involved in bringing about major changes in patterns of spectrum usage.
4. The allocation of spectrum for defence purposes would be reviewed periodically by an independent committee, which would report jointly to the Secretary of State for Defence and the Secretary of State for Trade & Industry. The members of the committee who would be asked to carry out the first review would be appointed later in 1985.
5. A study was being commissioned on the feasibility of the management of the radio frequency spectrum via the price mechanism. (See also "Amateur Radio News" last month, p340—*Ed*).
6. Economic expertise was already being applied to questions of frequency management, and the possible use of cost-benefit analysis or similar techniques would be explored. Some steps had already been taken to adjust licence fees in support of frequency management objectives, and further adjustments would be made.
7. The Frequency Allocation Table for the UK would be published later in 1985. Effort would be devoted to improving the quantity and quality of other published material which might be of value to users of radio systems and, if staff levels permitted, it was hoped to publish annual reports on the work of RRD beginning with the financial year 1985-86.
8. Responsibility for frequency assignment would continue to be delegated to common interest groups of users where this was compatible with efficient and interference-free use of the spectrum. In practice, however, the scope for this might be limited. In bands where responsibility for assignment rested with the Government, it was hoped that common-interest user groups could play a useful role in achieving fuiler and more equitable use of the spectrum by exercising a degree of self-regulation.
9. In newly available land mobile bands, preference would be given to the establishment of new service-providing systems such as trunked common base stations. Where appropriate, fixed time limits would be set for frequency assignments. However, the Government was not convinced that provisional assignments were necessary, and felt that the needs identified in the report were already met by means of existing procedures.

QSL Bureau news

The QSL Bureau will be closed between 15 and 31 July 1985. Cards should **not** be sent to G3DRN between those dates.

The sub-manager for the G4DAA-DZZ and G4RAA-RZZ callsign series, Deryck Buckley, G3VLX, has changed his address to: Little Oaks, Park Road, Marden, Tonbridge, Kent TN12 9LG.

The address given in last month's "Amateur Radio News" for GI4SJB (the QSL sub-manager for GI1, GI6 and GI8 three-letter calls) requires the following minor amendment: the house number has been changed from 28 to 30 Ballymenoch Road.

News from America

The experimental spread-spectrum beacon operating in the 144MHz band, mentioned in these pages recently, is now fully operational; it is located in Vienna, Virginia, and uses the callsign K4RS. The beacon is associated with the WD4IWG repeater on 147·21MHz and "hops" over the entire 144MHz band in one of two modes. Mode 1 is a linear sweep from the bottom to the top of the band: channel spacing is 10kHz, and each transmission on a discrete frequency lasts for 1ms, so each sweep lasts for about 4s. Mode 2 uses a pseudo-random frequency sequence according to a "channel table" containing about 380 frequencies. In this mode the beacon operates on 145·36MHz. It is understood that further information on the device is available from Hal Feinstein, WB3KDU.

The FCC has proposed new limits for cable tv system leakage. Part of the proposal would increase the allowable leakage from 20μV/m at 3m to 50μV/m at 3m between 54 and 216MHz.

An attempt by the State of Arizona to prohibit **all** radio communication from a moving vehicle has been rejected, for the time being.

JAS-1

Japan's first amateur radio satellite, JAS-1, will be launched from the Tanegashima Space Flight Centre in early 1986: the launch vehicle will be the National Space Development Agency of Japan's new H-1 two-stage rocket launcher. JAS-1 is a joint project between the Japanese Amateur Radio League and NASDA, and it will provide the latter with an opportunity to carry out a "multi-payload" launch with the new launch vehicle. NASDA has, as yet, no experience with multi-load launches, and JAS-1 is seen as a way of gaining such experience at relatively low cost.

JAS-1 is a 26-face polyhedron measuring 470 by 400mm, and its all-up weight is 50kg. The orbit will be a circular low-earth non-sun-synchronous polar type with an inclination of 50°, an altitude of 50km, and an estimated period of 120min, which is very similar to that of Oscar 7. This should give an orbital "window" of some 20min to a given ground station, and also provide about eight passes/day. The design lifetime is three years.

The payload will include two separate Mode J (145MHz uplink, 435MHz downlink) transponders: one will be linear and the other a digital store-and-forward device for non-real time communication between stations located in different time zones. The linear transponder has a design passband of 100kHz and an output power of 2W p.e.p.: an uplink power of 100W eirp will be required for best access. The digital transponder has four input channels, requiring psk/fm, and there will be one downlink channel on 435·91MHz using 1W and 1,200 baud psk. The protocol will be AX-25. Final tests on JAS-1 were taking place at NEC's Yokohama works as we went to press.

As a corollary to this, a contract for the launch of the AMSAT Phase 3C satellite was signed last November. Phase 3 is expected to be launched in mid-1986 to replace Oscar 10, and it is intended to embody some improvements. The L transponder will be redesigned, with a view to improving sensitivity and intermodulation performance. A digital transponder and a 2·4GHz beacon will also be carried. The design of the U transponder will not be changed. The national society of Germany, DARC, has promised a grant of DM250,000 towards the cost of the launch.

Flash, bang, wallop

As a result of work which has been carried out at RSGB headquarters on a power supply and control unit for amplifiers employing 4CX250 series valves, some new insights have been gained into the causes of persistent flashover between anode and screen grid. In order to gather more information on the scope of the problem —which will eventually be incorporated into a future publication—members with experience of intractable flashovers associated with these tetrodes are invited to write to the membership services department at RSGB headquarters, marking the envelope for the attention of John Nelson.

President goes south

The Society's President, Mrs Joan Heathershaw, G4CHH, visited the Hastings Electronics & Radio Club and the Southdown Amateur Radio Society on 22 and 23 February 1985. Her visit was enthusiastically received by both clubs, and she took part in the official opening of the Southdown Amateur Radio Society's new clubrooms (photo, p341, *Rad Com* May) and a dinner-dance held jointly by the two clubs. Mrs Heathershaw's visit was also the object of some attention from the local media.

Scottish trophies

Two trophies are awarded annually in Scotland: the Jack Wyllie Trophy to the Scottish RSGB member, society, club or group thought to have done most for amateur radio in Scotland, in general terms, in the past year; and the Jock Kyle Trophy to the Scottish RSGB member, society, club or group thought to have done the most in Scotland in the vhf field in the past year.

In 1984 the Jack Wyllie Trophy was awarded to J Wilson, GM3KJF, and the Jock Kyle Trophy to the West of Scotland Contest Group.

Nominations and citations for each of the trophies are required from at least five RSGB members resident in Scotland, who should send them to their respective regional representatives by 15 August, 1985. To be eligible for the awards, the member, or group of members, shall have been resident in Scotland for the period for which the award is made.

In the event of no nominations being received, the trophies shall pass to the zonal manager for safe keeping until nominations are called for in 1986.

Stolen equipment

On 1 April from NCP car park in Birmingham: FT790R, serial number 4E100196, and linear Alinco EL430H. Information to Digbeth Police Station, tel 021-236 5000, extn 2426, wpc Harris 4252 C Unit.

On 7 April from a car in Gloucester: Heathkit HW2036A 144MHz fm transceiver, sprayed black, with mic lead taken from right-hand side of front panel leaving a hole on left-hand side, and with light fitted above three channel selector switches. Information to Gloucester police, tel Gloucester 21201, or to G3MA, QTHR.

"A transceiver for the hf bands"

The author of this article (*Rad Com* June–October 1984) advises that with the vfo converter for the 3·5MHz band, some constructors have experienced trouble due to a spurious output at 8,175kHz (the fifth harmonic of the crystal frequency) which can result in spurious untunable signals.

Anyone contemplating building a vfo converter for 3·5MHz is advised to use a crystal frequency of 1,775kHz, instead of 1,675kHz as originally specified. This moves the fifth harmonic up 500kHz and away from the wanted frequencies. With the revised crystal frequency the transceiver tunes 3·4 to 3·8MHz instead of from 3·5 to 3·9MHz. Anyone who has already built a 3·5MHz vfo converter using a 1,675kHz crystal, and who is experiencing problems with spurious signals, is advised to write to the author.

"Using resonance to measure capacitance"

The author of this article (*Rad Com* April 1985) advises minor errors in Fig 9, p263. Under the column "Max error", the correct entries should be:

± 1% = ± 1·4pF
± 1% = ± 2·8pF
± 1% = ± 4·2pF
± 1% = ± 5·6pF
± 1% = ± 7·0pF
± 1% = ± 8·4pF

The correct values are a little poorer in the case of the first three examples, unchanged in the case of the fourth, and a little better in the case of the last two.

MARA (UK)

Amateur radio enthusiasts of the Church of Jesus Christ of Latter Day Saints have recently organized a club under the title of

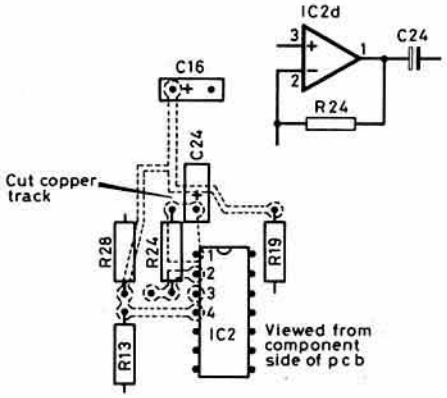
MARA (UK). It operates under the callsign G1LDS, and its station is located at 751 Warwick Road, Solihull, West Midlands. MARA (UK) is affiliated to the RSGB and to MARA International, and it participates in worldwide LDS nets. The first agm of the club was held on 13 April for election of officers and a tour of the club station.

An international MARA Convention will be held at Klamath Falls, Crater Lake, Oregon, between 20 and 22 June 1985, and representatives from MARA (UK) will represent UK LDS amateurs. Anyone interested in receiving details of the LDS amateur radio club is welcome to contact John Wiles, G4TVA, at 38 Northwood Lane, Clayton, Newcastle-under-Lyme, Staffs ST5 4BN.

"The 'Beer Mat' Mk2"

It has come to our notice that in the article describing this 14MHz d-c receiver (*Rad Com* July 1983) there is an error on the pcb layout (Fig 5, p599). Pin 1 of IC2d is shown correctly on the circuit diagram to be connected only to C24 and R24, but in Fig 5 it is shown also connected to R19, C16, R28, R13 and Pin 4 of IC2d. The correct layout is shown below. It is pointed out that the pcbs supplied by the authors (still available at £2 incl p&p) do not include this error.

In addition, while the circuit diagram is correct, the following items in the components list (p597) were incorrectly described: C2, 4, 5, 6, 8, 12, 15, 20 and 21 should be 10nF, R28 is correct on line 3 and should be deleted from line 7, and IC2 should be type LM348.



Sidebands

A doctor in a Midlands hospital has been triggering the smoke detectors with low-power 430MHz rf and is thus temporarily QRP: he needs to remain anonymous, but any helpful comments on whether the problem can be solved should be sent to the EMC Committee via RSGB HQ.

At the end of February 1985 there were 26,842 Class A licensees and 27,211 Class B licensees in the UK.

Nineteen people were arraigned at Clerkenwell Magistrates' Court during March on charges relating to the obtaining of amateur radio licences by deception and falsifying documents. The cases were adjourned and we were awaiting further developments as we went to press.

Mobile Rallies Calendar

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

2 June
Spalding & DARS Mobile Rally. Talk-in from 10am. Details Betty Whitley, G4ZGT, 45 Exeter Drive, Spalding, Lincs.
9 June
Elvaston Castle Mobile Rally, Elvaston Castle Country Park, 5 miles SE of Derby on B5010. Organized by the Nunsfield House ARG. Open 10am. Talk-in GB2ECR on 144 and 432MHz. Details G4PZY, tel Derby (0332) 767994; G4CTZ, tel Derby (0332) 799452; or club hq tel 0332 755900.
9 June
Mid-Lanark ARS Open Day, Wrangholm Hall, Motherwell. From 10.30am. Talk-in on S22. Details GM4UXX.
16 June
Denby Dale Mobile Rally, Shelley High School, Nr Skelmanthorpe, Huddersfield. Talk-in on S22 and SU8. Open 11am. Details G3FQH, QTHR, tel 0484 862390.
16 June
RNARS 25th Anniversary Mobile Rally, *HMS Mercury,* Leydene, near Petersfield, Hants. From 10am to 5.30pm. Talk-in on 144 and 432MHz. Details G3WAO, 3 Humber Close, Stubbington, Fareham, Hants, tel 0329 665757.
30 June
Rolls Royce ARC Mobile Rally. **This rally has been cancelled.**
30 June
Buxton Mobile Rally. Pavilion Gardens, Buxton. Talk-in on 144MHz. Open 10.30am-5pm. Admission 50p. Details G6MIF, tel 0298 6174.
30 June
28th Longleat Amateur Radio Rally, Longleat Park, Warminster. Open 10am-5pm. Authorized morse tests, preference being given to handicapped; test enquiries to G4UWS, QTHR, tel 0272 772550. Details G4FRG, QTHR, tel 0272 848140.
7 July
Nottingham Amateur Radio Electronics Fair, Victoria Leisure Centre, Gedling Street, Near Nottingham City Centre. 10.30am-5pm (10am, disabled). Details G6MIF, tel 0298 6174.
14 July
Sussex Mobile Rally, Brighton Racecourse. From 10am. Talk-in on 145·50 and 3·5MHz. Details G6YPY, QTHR, tel 07918 5103.
14 July
Droitwich Mobile Rally, Droitwich High School. Details G4ASO, tel 0905 351565.
20/21 July
Penarth Seaside Radio Picnic & Ragchew. Cliffwalk or Kymin House. From 12 noon to 6pm. Organized by Penarth Holiday Festival Amateur Radio Group. Use junction 33 on M4. Talk-in on S22. Details GW2LQE.
21 July
Cornish RAC Rally, Cornwall Technical College, Redruth. 10am-5pm. Talk-in on S22. Details G4RVP, tel Penzance 763549.
21 July
McMichael ARS Mobile Rally, Bells Hill, Stoke Poges, Nr Slough. Talk-in on S22 and SU8. Open 11am. Details G8IHF, c/o McMichael Ltd, Wrexham Road, Slough, Berks.
21 July
Anglian Mobile Rally, Stanway School, Colchester, Essex. Talk-in on 144MHz. Open 10am-5pm. Details G6HQI, 26 Pondfield Road, Colchester, tel 0206 862403.
28 July
Scarborough ARS Rally. The Spa, Scarborough. Open 11am. Talk-in on 144MHz (S22), 432MHz (SU8), and RB0, GB3NY. Details G4YWR, QTHR, ex-G6CXK, tel 0723 360587.
11 August
Derby Mobile Rally, Lower Bemrose School, St Albans Road, Derby (off Derby ring road). Open 10.30am. Talk-in GB3ERD. Details G4EYM or G3SZJ, tel 0332 556875.
11 August
Hamfest '85. Organized jointly by RAIBC and Flight Refuelling ARS. Details Miss E K Howard, tel 0202 671191.
11 August
Wythall Radio Rally. **Due to unforeseen circumstances, this rally has been cancelled.**
18 August
West Manchester RC "Red Rose Rally", Haydock Park Racecourse, Newton-le-Willows, one mile from M6 junction 23. Talk-in on S22, GB2RRR. From 10am. Details G6TYB.
25 August
18th Preston Annual Rally, Lancaster University. Leave M6 at junction 33 and proceed N on A6 for two miles. Talk-in on 144MHz fm. Entry 50p. Opens 11am. Details G3DWQ, tel 0772 53810.
25 August
BARTG Rally, Sandown Park, Esher, Surrey. Details G8VXY.
1 September
Cambridge Amateur Radio Rally, Kelsey Kerridge Sports Hall, Gonville Place, Cambridge. 10.30am-5pm (disabled, 10am). Adjoining multi-storey carpark. Details G6MIF, tel 0298 6174.
8 September
Lincoln Hamfest, Lincolnshire Showground, on A15 four miles north of Lincoln. From 10.30am to 5.30pm. Talk-in on 144 and 432MHz (S22 and SU8). Details G4STO, QTHR.
8 September
Telford Radio Rally & Exhibition, Telford Town Shopping Centre, Shropshire. Details G8UGL, tel Telford 584173, or G3UKV, tel Telford 55416.
15 September
Vange Mobile Rally, Nicholas School, St Nicholas Lane, Basildon, Essex. From 10am to 5pm. Talk-in on 144MHz, GB4VMR. Details G4OJN, QTHR.
15 September
Peterborough Mobile Rally, Wirrina Sports Stadium, Bishops Road, Peterborough. 10.30am-5pm. Details G3EEL, tel Peterborough 62881 after 6pm.
21 September
National Amateur Radio Car Boot Sale. Shuttleworth Collection, Old Warden Aerodrome, Nr Biggleswade, Beds. From 10am to 5pm. Talk-in on GB4SC. Details G6EES, tel Dunstable 607623.
22 September
Harlow Mobile Rally, Harlow Sports Centre, Hammarskjold Road, Harlow, Essex. Open 1030am. Talk-in on S22. Details tel 0279 725871 or 0279 22365 (daytime).
6 October
Great Lumley ARES Rally. Community Centre, Great Lumley, Nr Chester-le-Street, Co Durham. Open 11am. Talk-in on S22. Details G4OCQ, tel 0385 40827.
24 November
West Manchester RC Mobile Rally, Pembroke Halls, Walkden, Worsley, Gtr Manchester. Details G6YIO, West Manchester RC, Astley & Tyldesley miners Welfare, Meanley Road, Gin Pit Village, Astley, Tyldesley, Manchester.

Members of the Buxton ARS Rally Group at a pre-rally meeting. L to r: G6HLQ, G1EQJ, G6XLP, G6MDK, G6MIF, and G6YDN who also took the photograph

Special Event Stations

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

18 May–2 June, GB4GWR
The Vale of White Horse ARC will operate this station at the Didcot Railway Centre, to celebrate the 150th anniversary of the Great-Western Railway, from 11am to 5pm daily on hf and vhf. The station will also be steam mobile for 30min each day from the footplate of one of the working locomotives, operating on 144MHz fm (probably S22) low power—special QSL cards for this operation. Full details will be sent by G4PFY on receipt of an sae. Details from, and offers of help to G4PFY, tel 0235 812565.
25–27 May, GB2IWF
During the International Waterways Festival at the Boat Museum, Ellesmere Port, the Wirrel & DARC will operate this station on hf and vhf/uhf, with possibly some evening and night working. Visitors will be very welcome. Details G8TRY, tel 051-630 1393 (home) 051-227 1018 (work).
29 May–1 June, GB4RBW
Operational on all bands and cw, from the Royal Bath & West Showground, Shepton Mallet, Somerset. Special QSL cards. Details PO Box 9, Shepton Mallet, Soms.
1 June, GB2WM
To mark the Wolverhampton celebration of 1,000 years of recorded history, Wolverhampton RS will operate this station from the Mander Centre from 8am to 6pm. VHF and hf, phone and cw. Special QSL card. Details Keith Jenkinson, tel 038482 3749, daytime.
1 June, GB0POS
During Paisley on Show (Civic Week), operational on 7 and 144MHz ssb/cw/rtty and possibly atv. Details GM4FDM.
2 June (Manor Heath Park, Halifax), 30 June (Greenhead Park, Huddersfield), 21 July (Woodhouse Moor, Leeds), 18 August (Thomas Park, Wakefield), 1 September (Lister Park, Bradford) —GB4WYP
"Police Community Exhibitions" will be held on the above dates at the places shown, during which the West Yorkshire Metropolitan Police ARC will operate GB4WYP on 3,680, 7,050 and 14,150kHz + or – QRM, and 144MHz fm. Special QSL cards. Contacts will give points towards the "Sherlock Holmes Award" issued by the International Police Association RC. Details PO Box 9, Wakefield WF1 3QP.
9 June, GB4CSW
Operated from Castleton School Fete, Wickford, Essex, from 11am, on 3·5 to 30MHz and 144 and 432MHz plus atv. Details G6XCG, tel 0268 555645.
15 June, GB2HES
Operated by Gloucester ARS at Hucclecote, Gloucester, to celebrate the 50th anniversary of the formation of the Hucclecote Eleventh Scout Group. From 2pm to late, on hf bands. Details G3LP.
16 June, GB2BTC
Operated by Thornton-Cleveleys ARS during an Open Day at Blundell St Transport Depot, Blackpool, organized by Blackpool Borough Council as part of Blackpool Tramway Centenary Year celebrations. From 10am to 5pm, on 3·5 and 7MHz and vhf/uhf. Special QSL cards. Details G4BFH, tel 0253 853554.
22 June, GB0PGD
This station will be operated by the Plessey (Beeston) ARC, as part of the Plessey Gala Day, on hf and 144MHz. Special QSL card. Details C Archer, G4VFK, 3 Alexandra Crescent, Beeston, Notts NG9 2BS, tel 0602 226321.
30 June, GB4LMR
Operational mainly on hf before and during the Longleat Mobile Rally, talk-in also available. Details G4FRG.
5–7 July, GB4CSB
To mark the Chester Scouts Birthday, celebrating 75 years of Scouting in Chester. Operation by Chester & DRS from Eaton Hall, Chester, by kind permission of the Duke of Westminster, on hf and 144MHz. Special QSL card. Details G4EZO, tel 0244 40055.
7, 14 July, 12, 13 August, 1, 8 September, GB1GWR and GB0IKB
These stations will be operated from the Weston-super-Mare Railway Station by Weston-super-Mare RS to commemorate the 150th anniversary of the Great Western Railway on 31 August. The July and September operations will coincide with special steam excursion trains which will call at the station; and the August operation will mark the visit of the Brunel Exhibition Train; Izambard Kingdom Brunel built the railway. Details G4/KA0NGP.
13–14 July, GB2SMR
Operational as talk-in station on 144 and 432MHz at the Sussex Mobile Rally by the Brighton RC, it will also be active on the hf bands. Details G4IIL.
20–30 July, GB2OVV
In connection with "Orkney Viking Venture", a series of camps for Ranger Guides celebrating the 75th anniversary of the founding of the Girl Guides, GB2OVV will operate from a croft cottage at one site overlooking Scapa Flow, on hf ssb and 144MHz ssb or fm. Details GM6WPA or GM3IBU.
27–31 July, GB2CV
On the occasion of the 6th Citroen World Meeting, Cheltenham Racecourse, Prestbury Park, Gloucestershire, organised by the 2CVGB2 club, this station will be operated jointly by Gloucester ARS, Cheltenham ARA and Smith Industries RS. Conditions permitting, all hf, 144 and 432MHz bands will be used, including rtty, sstv and atv if possible. Special QSL card. Details G8UJG, tel 0242 672175.
27 July–3 August, GB2SGC
To celebrate "Peak '85", the Scout and Guide international camp at Chatsworth Park, Derbyshire, this station will be operational on hf, vhf, uhf and Oscar 10. Special QSL card. Offers of help from the Notts/Derby area to, and details from G6NED.
August, GB2BR
Swindon & D ARC will operate this station during August from the railway workshops at Swindon, during an exhibition to celebrate the 150th anniversary of the GWR. Details G8SFM, tel 066 689 307.
3 August, GB2FAA
Yeovil ARC will operate this station from the RN Air Station, Yeovilton, as part of the international air day, on hf and vhf, cw and ssb. Details G4JBH, tel 0935 23873, or G3BEC.
10/11 August, GB2YFT
Operated at the Yeovil Festival of Transport, Yeovil Showground on A37, by Yeovil ARC on hf/vhf/uhf, cw and ssb. Details G4JBH.
15 August, GB0VJD
Operated by Gloucestershire ARS for the Cheltenham and Gloucester Branches of the Burma Star Association to celebrate the 40th Anniversary of VJ Day. From 0001 to 2359 on all hf bands and 144MHz. Details G3LP.
17 August, GB2MSS
At the Mid-Somerset Agricultural Show, Shepton Mallet, Yeovil ARC will operate this station on hf/vhf/uhf, cw and ssb. Details G4JBH.
17–18 August, GB2TC
To celebrate the 500th anniversary of Henry Tudor's visit to Tamworth prior to the Battle of Bosworth, the Tamworth ARC will operate the station on 3·5 and 144MHz from 10am to 8pm on 17 August, and from 10am to 5pm on 18 August. Special QSL card. Details G4SRI.
22 September, GB8SOT, GB4SOT, GB6SOT, GB0SOT
Operated by North Staffordshire ARS from Stoke-on-Trent to mark the 75th anniversary of the amalgamation of the six towns of the potteries, and the 60th anniversary of the granting of city status to Stoke-on-Trent. From 9am to 6pm on hf, vhf, rtty, fstv and cw. Details G6MLI, tel 0782 332657.

Other Events

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

2 June
RAIBC Picnic, Broadlands, Ramsey, Hants.
4–6 June
Scotelex '85, the 16th Annual Electronics Exhibition & Convention, organized by the Institution of Electronics. To be held in the Exhibition Hall, Royal Highland Society, Ingliston, Edinburgh EH28 8NF. Details from Exhibition Organizer, Institution of Electronics, 659 Oldham Road, Rockdale, Lancs OL16 4IE, tel 0706 43661.
15 June
Staffordshire Raynet open-air picnic. 2pm. Cannock Chase Country Park. Details G4PFO.
16 June
Norfolk & Suffolk Raynet Annual Get-together, Barford Village Hall, seven miles W of Norwich, just off B1108. From 10am to 5pm. Details G3HRK, tel 0692 403584.
2 September
Scottish Amateur Radio Convention, SARCON 85, Dundee.
6 October
Welsh Amateur Radio Convention. Details later.
12 October
Midlands VHF Convention, British Telecom Training School, Stone, Staffordshire.
13 October
Second Yeovil QRP Convention. Details G4JBH, tel 0935 23873.

16 March 1986
Pontefract & DARS Components Fair, 11am–4.30pm, Carleton Community Centre, Pontefract, mid-way between Pontefract and Darrington on the A1.

OBITUARIES

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

Mr A Ariss, G3YOW
Albert Ariss died on 28 February, aged 58. He was active on 14MHz, ssb, and last year obtained the DXCC. He was also very keen on the home-construction side of the hobby.

Mr R G Foot, G4BKU
Ron Foot died on 5 January, aged 65. He was a past-secretary of the Bristol RSGB Group, and chairman at the time of the 25th Longleat Rally. A great cw exponent, he was an active member of FOC for many years.

Mr G Hutson, G6GH
Geoffrey Hutson died on 14 March, aged 80. He had been a member of the RSGB for over 50 years, and was a member of the RAF Civilian Wireless Reserve, where he was appointed as a district controller for the signals exercises conducted by the Air Ministry. He was also a long standing member of RAFARS. Geoff's main interest in his early days was construction, and then hf, cw, and dx, having worked over 200 DXCC countries. He was instrumental in setting up and operating the local NFD station, and was active up to the date of his death.

Mr D F Jones, GW3SSY
Dave Jones died on 13 March, aged 45. He was first licensed in 1964 as G3SSY and joined the RSGB in 1966. Dave was secretary of the Abergavenny Nevill Hall ARS and also a member of the G-QRP Club, the RAIBC, the International Short Wave League, the Sutton & Cheam RS and the American Radio Relay League Inc. He also ran instruction classes for the RAE, and consistently achieved a high level of passes, and he was active on all bands (phone).

Mr J F Mackintosh, GM3VJW
John Mackintosh died on 2 April. He was an enthusiastic member of the Aberdeen ARS, and the Royal Signals ARS, and was well known and popular with many amateurs throughout Scotland.

Mr A Norris, G8WLT
Bert Norris died in February. His activity was mainly on 144MHz, and in construction where he applied his practical skills to good effect.

Mr B J F Phillip, G6XKT
"Phil" Philip, who died on 23 March, played an active part as secretary of the Northampton RC. He will be remembered for his personality, wit and excellent newsletters.

Mr J Phillipson, G6TIP
Joe Phillipson died on 2 March. After many years as a short wave listener he took, and passed with distinction, the RAE two years ago. He was an active member of many radio clubs and always had time to help other people.

Also:
Mr J D Clark, GM3SZK, on 15 March;
Mr J A Mann, GU3AAM

Members' Mailbag

THE EDITOR,
RADIO COMMUNICATION,
86 BROOMFIELD ROAD,
CHELMSFORD, ESSEX
CM1 1SS

OPERATING STANDARDS—AN SWL'S VIEWS

Sir—Becoming jaded with the irritant jamming on the broadcast bands, I recently returned to the Society and the amateurs, after around 20 years off 14MHz etc—but "Things aren't quite what they used to be". I feel compelled to write for two reasons: in just over a year only two letters from swls have been seen; and to mention the real pleasure of listening to the smooth, slick, operating of an ssb station on 14,195kHz on 1 March—by a yl op.

A third more serious reason must be added: the almost unbelievable behaviour of *some* operators, eg:

1. Tuning up on full power—too often on top of a QSO. Is the dummy antenna old-fashioned now?
2. Calling without first (obviously) listening out.
3. Giving a 599 cw RST, and then asking for "repeats".
4. Trying to send faster than the other chap.
5. Some ops incapable of sending their own callsigns, and even their names correctly, at times. Probably due to No 4.
6. Calling a station already in QSO.
7. Too frequent dits, vics, QRZ? (although nobody appears to have called), QRL? (will then transmit, after being asked to QSY!).

The yl operator mentioned above was due to leave the country from which she was operating that night. The pile-up was mainly calling and tuning up smack on her frequency while she was talking. Frustration must have demanded her: "Call me only on 14,200/05"; she stayed, of course, on 14,195kHz. Most stations shifted hf, and the beautiful silence on the frequency was like a breath of fresh air.

Sometime before this fine operating, a cw dx station was heard to send: "Call 5 up. Any clg on my freq will not be worked", and he kept his instruction to the letter. Wonderful, but why can't *all* dx use this simple way of control? A semi-local G6's QSOs have been relentlessly followed for around 30 years, and not once has he been heard to send "CQ". Yet when heard he is always working dx. Some considerable time ago a similar "Call 5 up" was followed by the "pile" continuing to call on freq; he then sent "My God", and went QRT.

There was an old owl who sat in an oak. The more he heard the less he spoke.

G Curtis, BRS20104

NOVICE CW

Sir—I write to agree with Tom Morris, G4XTM, (*Rad Com* February) and ask that no hf allocation is given to a person who has not passed a 12wpm morse test.

I, like hundreds of others, have struggled (for two years in my case) to pass this test and can therefore see no justification for a change. If I can pass it, most people can if they persevere.

I must then, among the A Class licensees, offer a *NO* vote in the referendum mentioned.

Rex Thornfield, G0AAR

NOVICE LICENCE

Sir—The letter by G4ZSD in your April issue says it all—and so beautifully. In particular, his comment, "Anyone who wants a novice licence, does not want a licence very much, or not at all", should be enough to cause the novice lobby to hang their heads in shame!

Congratulations Mr Guy. That particular phrase should be printed in very large type on the front cover of *Rad Com* for years to come.

I have not had a QSO with you yet, but when I do, it will be a contact I shall value.

H N Kirk, G3JDK

QSL CARDS, AGAIN

Sir—In your March issue I read a lot of interesting comments regarding QSL exchange. I have found the bureau service to be very good, and perhaps it comes in for a certain amount of unfair critisism. At first the return rate will seem low, perhaps about 30 per cent, and it could take as much as 6-8 months before the return rate rises to between 50 and 60 per cent, which is about average. The point about making sure your bureau manager has enough stamped proper-size envelopes is very valid. My own manager mentioned that many stations he dealt with had cards, but there were no envelopes to hand.

Cards should be clearly written as well. Certainly some of the information on cards could be expanded upon. I have some from a friend of about 1948, and these show far more detail of equipment used, band conditions etc. A lot of cards themselves could be more interesting. A photograph or a drawing, or something about the operator, makes the card individual, more collectable, and of course a reply is more likely.

The return rate on cards sent direct obviously is higher at about 80 per cent or so. The highest return rate of these are of cards sent to QSL managers (not forgetting an irc or two) who in the main do a good job. It pays to chase up cards for rarer contacts by sending another sometimes as well. QSL exchange can be an enjoyable hobby within a hobby if it is treated in the proper manner, and I believe in answering all QSLs including listeners'. Sending an attractive and informative card after an enjoyable QSO is the final courtesy.

Peter Lewis, G4VFG

Sir—On the same morning that I read the letters about QSL cards in "Mailbag" in the March issue, I received a packet of QSL cards from my sub-manager. One of them, from a USSR station, was calculated to restore faith in all new licensees who worry about non-receipt of cards.

This one was for a contact that took place in 1974, 11 years ago, and I took the trouble to find my old logbook and check it out as genuine. It may not qualify for the *Guinness Book of Records*, but take hope all you new boys, the cards come in eventually!

Gordon Burton, G3GQR

PS. My percentage of returns over the years is about 60 per cent.

Sir—I read with interest the letters from G4GEU concerning QSL cards in *Rad Com* March 85. As sub-manager for the GB series callsigns, I heartily endorse his remarks concerning unclaimed cards. The space specially made available at this QTH for the storage of such cards is rapidly approaching saturation point, and very soon many cards will have to be destroyed under the three-month rule. I am reluctant to do this as there are some very collectable cards among them.

Much of the filing and storage of unclaimed cards could be avoided if special event station managers arranged to send me a batch of saes before the event takes place. I have many cards, among others, for JOTA stations; so come on, lads, don't forget your motto "Be prepared!"

I have tried writing to the special event stations concerned, but this is time consuming and expensive. To keep the QSL Bureau running smoothly and efficiently, we need your full co-operation.

G A Newman, BRS39157

Sir—Commenting on G3GMM's thoughts on QSL cards . . .

There are only one or two reasons why QSL cards are in use today:

1. They are generally required (RSGB included) to verify the contact between an amateur and his distant DXCC country or locator square so that awards issued by this society and others may be claimed.
2. That, for his own personal record, he can physically prove that a specific contact took place.

Cards are expensive to produce and are expensive to handle whether the method is via the Society's bureau or by other means. By the time the cards arrive, any technical details and/or weather data is obsolete or certainly irrelevant. Who wants to know what key the distant station is using? Who wants to know that a UC2 station used a dipole and 50W (two years further on?). I don't. If at all possible I will obtain what I wish to know at the time of contact.

I send a card every contact (asked or not), not because I'm desperate to receive mail or confirmations, but to provide the distant station with a means to verify for certification. Whensoever societies cease their insistence on verification, QSL cards will be obsolete, amateurs will be a lot richer, the Post Office will show less profit and society budgets will reduce.

I will take one example. One neighbouring country is populated by amateurs who seem not to know what QSL cards are; the majority of my missing confirmations are within the confines of that country. On vhf and uhf there must be hundreds of UK amateurs who will wait forever to claim their certificates because of the poor response.

It is time for change. Let us try to eliminate the requirement for QSL cards for *certification*, and let exchanges of cards be by mutual consent of the parties without some form of duress.

Stephen Reading, G4LZD

Does anyone else have trouble with cards confirming vhf/uhf contacts with France? One member of headquarters staff has worked all except three French locator squares and has seven confirmed!

HOWZAT FOR SPEED!

Sir—On 30 January I received a QSL card from the USA which I worked on 31 December via Oscar 10. Thirty days door-to-door via the QSL Bureau—this must be a record.

Well done, the system! It really works.

M Ruddock, G6WZR

THE "BLACK DEATH"

Sir—The "black death" that G4WAL refers is not only common to nicads, all batteries will corrode on the negative connection given the right conditions. With lead-acid batteries the corrosion is usually green/blue in colour. All rechargeable batteries release corrosive vapours from their vents, when charged or discharged. If dampness is present, a form of electrolysis takes place on the negative electrode and associated connections. The cure is to smear petroleum jelly on the negative electrode and connections, also remove the batteries when charging or not in use. I believe that the car industry changed from positive earth to negative earth due to corrosion of the negative lead etc.

E W Holt, G3MMG

Sir—I read the letter from G4WAL on p177 shortly after I received the March *Rad Com*, but at the time it seemed to me that I could be of no assistance, not flying model aircraft.

However, I have now examined my electric razor, which runs off four nicads when in use (say 6min a day) and then charges them again (for the rest of the 24h), and after some two years or so of use it shows no signs of the Black Death.

I have also examined a B&D rechargeable torch, which runs off nicads, and while I have had the torch only for a little while, I find no trace of the trouble.

I wonder whether the following factors make any difference: (a) neither the razor nor the torch are bumped about at all (cf model aircraft landings); (b) the batteries are for 99 per cent of their life left on charge, and so are fully charged most of the time; (c) they are kept well above 0°C most of the time; and (d) they do not get damp.

I expect these observations have already been made, but, for what good it may be, I add them to the pile of comments.

R D McQueen, G3DVP

MORE ON MORSEMEN

Sir—Mr Barfield is right to draw attention (March issue) to the anomalies in setting up the wpm speed of the Morseman. The 50-bit standard word has been with us for a long time now, and has stood up well to statistical analysis in several languages. Also, the 60-bit mean value of the five-randon-letter group can be readily calculated from the alphabet of morse characters.

The four-per-cent error in assuming a 48-bit word for Morseman calibration is itself probably acceptable as a basis for coarse marking the speed control, but the 50-60 difference between plain language and random code word lengths certainly is not. Morse students can be very sensitive to variations in code speed, especially as the day of the test approaches, and would not take kindly to plain language being sent at a pace equivalent to 12 random-letter groups/min.

To further aggrevate the calibration problem, the Morseman article, having offered a basically sound procedure of sending a given number of random groups in 1min, goes on to offer a "much more accurate" method using a 48-bit standard word and producing an additional error of 20 per cent in the process. One easy way out of the difficulty would be to avoid "wpm" altogether and to use dot rate as the only unambiguous measure of morse pace. Thus five dots/s will give 10 random code groups/min or 12 words of plain language. Mr Barfield states the full arithmetic correctly in his letter.

Finally, if we really need a standard word, there must be better candidates than "Paris" around. At the risk of upsetting Anglo-French relations, what about the 50-bit word "MORSE"? Samuel would have liked that.

Alan S Chester, G3CCB

Mr Chester's point has been noted by the designer of the Morseman.

A CHANGE OF HEART

Sir—I would like to take the opportunity to thank the stations who, after reading my letter in your January issue, encouraged me to continue to hold my amateur radio licence. I somtimes think it takes a crisis to know exactly who your friends are, and it is comforting to know that there are some genuine people out there.

I would like to thank G2BUV and G6BJP for their comments in your April issue, which have been studied and noted, but my feelings towards cbers will always remain the same.

With regard to the particular comment made by G6BJP about my advertisement on "Page 61". Because of my feelings towards operating procedures of the number of "wally" stations I had the misfortune to come across, I was getting quite a bit of flack from my xyl, so coupled with that and a certain catch phrase from a television series, the advert appeared as it did. It was successful, I had a lot of enquiries, and in fact the complete station was sold to G1HMA in South London.

To sum up, I will be renewing my licence at the end of the month, but I feel it will be some time before I become fully active again, probably after I have taken the morse test.

A D Smith, G6HPQ

"AMATEUR PACKET RADIO"

Sir—With reference to "Amateur Packet Radio" (*Rad Com* March) it is noted that the program will not run on the BBC computer fitted with the disc filing system unless it is downloaded to the TAPE PAGE = &0E00.

A convenient method of doing this is to add these five extra lines at the beginning of the program, as shown below. If you then type CH."PACKET" <RETURN> the program will load, automatically download to &0E00 and RUN to come up with the first question "Are you debugging?".

T G Ward, G2FKO

```
1 IF PAGE < &E01 GOTO 10
2 *TAPE
3 *KEY 0 "FOR A% = 0 TO (TOP-PAGE) STEP 4:
  A%!&E00 = A%!PAGE: NEXT|M PAGE = &E00|M OLD|M RUN|M"
4 *FX 138,0,128
5 END
```

GB2GWR DERAILED

Sir—Bristol special event group would like to apologise to all swls and operators for the following: (a) not operating on 9 April, and (b) not operating 144 and 432MHz ssb. We would like to offer the following explanations.

1. It was thought that it would aid more operators if we were operating during the holiday rather than the Tuesday when a great many would have returned to work. Therefore, we operated on Sunday 7 April and Monday 8 April. During this time we worked approximately 300 stations. We were at times overwhelmed with calls, mostly on 3.5MHz.
2. 144 and 432MHz ssb were not available to us due to an error of communication between ourselves and British Rail. It was realized at a very late date that our location was in a listed building and would require planning permission, to erect our 144/432MHz 40ft pole on the roof. This, if applied for, would have taken nine months to complete and could have been refused. Anyhow, we have now, we hope, found a way to succeed in our objective, and will be operating 144 and 432MHz ssb on 26 July 1985, when members of the royal family will be at Temple Mead station.

Finally, may I thank all operators who patiently waited to be worked, thereby helping us to work them all more quickly. Also, thanks to all those who turned up to help on the day: and to Bernard, G3NXU, Booth Holdings Ltd, who supplied the hf equipment.

R B Miller, secretary, BSEG

THANK YOU, RAIBC

Sir—Please would you remind everyone who reads your journal about the wonderful job that the RAIBC does for amateurs, licensed and swl. I am a member, and although Mrs F Woolley has been awarded the British Empire Medal, I think that it should have been made clear that the club is an active helpful body of wonderful people at Rannock Close, Surbiton. The financial support by those who are more fortunate is used for members, and we are grateful beyond words.

I know that there are people with greater problems than I. However, I injured my spine five years ago, as a male nurse. I received no compensation, but I managed to support my wife and family. Then I found amateur radio three years ago, and joined the RAIBC. This has kept me from going down the drain altogether.

Thanks to the RAIBC and G2DYM, I am able to work on 3·5MHz. Thanks to amateur radio I am able to go to the Portland Training College for the Disabled at Mansfield to study electronics full-time. The RAIBC assisted me with information about amateur radio, which helped me to pass the RAE with two credits at Derby College. Then the Manpower Services Commission looked upon me and my wheelchair with greater faith, which got me my place on a TOPS course at college.

Please give the RAIBC a plug in your journal. God bless them, because until someone like me says something, who would know.

W Guy, G4ZSD

SOCIAL CONTACTS

Sir—I am prompted to comment further "On the social side" and G3IMP's letter in your December issue regarding the hospitality he received from hams here in the USA.

I spent six months last year in Scotland and became a member of the Ayr Amateur Radio Group. As in Mr Poole's case, I was made most welcome. I received assistance in setting up my UK QTH, was lent a transceiver for the duration of my visit and had many enjoyable social contacts.

They're a "right grand group" and I am looking forward to meeting them again this spring when I return for another six months' stay.

Leo Caney, GM/N6ITL

BELATED GRATITUDE

Sir—I received a component for an AR88 following an ad in miscellaneous sales. I was obviously delighted but the donor appeared to be anonymous. It was not until I was burning garden refuse along with other domestic paper that I saw on the back of the component package "From G3???", the remainder already having burned.

I feel ungrateful that I have not acknowledged receipt of the item, and no doubt G3??? will be disgusted. My request to you is the only possible way I could think to make amends.

D D Hitchcock, G3ESB

EARLY BROADCASTING

Sir—I notice that Mr Frank Templeton's letter in your April issue has an error of fact, this is . . . "2OM Bournemouth . . ."

2OM was actually operated by Harold S Walker, from Brentford Lodge, Middx (long since buried under the Great West Road) and used to announce his broadcast as "Brentford Calling". He was connected with the Radio Communication Co until he joined the BBC and became the engineer-in-charge of Bournemouth BBC. In later years, when I knew him well, he was engineer-in-charge of the BBC valve dept at the White House, Motspur Park, Surrey. I spent many hours with him at BBC Daventry when conducting valve tests on the Marconi SWB18 transmitters there. Incidentally he was responsible for equipping all main BBC stations with amateur type transmitters against failure of the public telephone service due to enemy action.

G R Jessop, G6JP

Sir—The letter from Frank Templeton contains some small errors to which, for the record, I would venture to offer a correction.

(1). The time signal transmitted by the Eiffel Tower in the early 'twenties was on 2,600m (spark), not 1,600m.

(2). The station in communication with 2MT Writtle is referred to as 2OM Bournemouth. If this was the BBC station in Bournemouth, the callsign would have been 6BM, but as this station was not operative until 1925, it is possible that the contact was with the amateur station 2OM. This would have been on the nominal wavelength of 440m.

Such reminiscences of those exciting pioneering days are always of intense interest to me as an old-timer (having started in 1920). As I recall, 2OM was the amateur station I heard most frequently around 1921/2, especially his "test" gramophone record "Three O'clock in the Morning" which he included in most of his transmissions. Another station which I frequently heard was 2FG, operated of course by Leslie McMichael. I well remember his booming voice—"This is 2FG McMichael, West Hampstead, transmitting"—a very loud signal on my crystal set at a distance of a quarter of a mile.

S K Lewer, G6LJ

FROM WAB

Sir—I would be grateful if you could express thanks in *Rad Com* on behalf of the Worked All Britain Awards Group. Due to continual support, we have been able to donate the sums of £100 to *QTI*, the talking newspaper for blind radio amateurs, and £250 to RAIBC, the latter being used to purchase a receiver for one of their disabled swls.

We hope that people will continue to support us, and to that end we would be also grateful if you could mention that the WAB record books are still available, price £5, from Brian Morris, G4KSQ, 22 Burdell Ave, Headlington, Oxford.

Many thanks in advance, it's always nice to hear good news for a change.

D R Brooks, G4IAR
WAB treasurer & president

LAPSED CALL

Sir—It has recently come to my attention that the callsign G4SSU, for which I was licensee, is being used on the hf bands. This call was that of the club station of the RAF special signals units at Woolwich, and it lapsed about 12 months ago.

I believe it is intended to reactivate this call later this year but, until further notice, any station using G4SSU should be treated as very suspect.

D A Haines, G4IPZ

A Dual-Conversion Multimode Receive I.F./AF Strip

S NIEWIADOMSKI, MSc, BRS54049*

(PART 2)

Audio filter driver/audio filters

The low-level audio at the junction of R67 and R72 is connected to the input of the low noise bifet operational amplifier IC5. The inputs and hence the output of IC5 are biassed at approximately mid-rail by R74 and D15. IC5 has a gain of unity, and its main function is to act as a low output impedance driver stage to the three audio filters.

L1, L2 and associated capacitors form a fifth-order elliptic lowpass filter with a cut-off frequency of approximately 6·6kHz and a stopband attentuation of more than 45dB at frequencies greater than 9·7kHz. This filter has input and output impedances of 1kΩ which are matched by R75 and R76. In keeping with the design aim of using pre-wound components for all inductors, L1 and L2 are Toko type 10RB miniature inductors. Despite their small size and comparatively low Q at audio frequencies, these inductors have been found to be suitable for audio filter applications [8]. This filter is intended for use when listening to broadcast stations where high-frequency background noise is not excessive. A plot of the response of this filter is shown in Fig 3.

A communications-quality bandpass audio filter is formed by inductors L3–L6 and associated capacitors. This filter consists of a fifth-order highpass filter followed by a fifth-order lowpass filter. The total effect is a bandpass filter with cut-off frequencies of 450Hz and 3kHz, and a stopband attenuation of 45dB at frequencies less than 150Hz and greater than 4·4kHz. Again the input and output impedances are 1kΩ. The correct drive impedance is provided by R77, and the terminating impedance by R78 and R79 which appear to ac signals to be connected in parallel. This filter gives excellent results with weak ssb signals, cutting down the level of hum and hiss and eliminating shifted-frequency ssb signals which have not been eliminated by the i.f. filter. A plot of the response of this filter is shown in Fig 4.

L7 and C75 form a cw peaking filter centred at approximately 750Hz. This filter has a −3dB bandwidth of 200Hz and −20dB bandwidth of 2kHz, giving useful peaking of cw signals. A plot of the response of this filter is shown in Fig 5.

These Toko inductors are sensitive to dc currents, which can cause core saturation and hence reduction in inductance value. In the case of L1 and L2, the current is limited to approximately 3mA by R75 and R76. L3, L4, L5 and L6 have no direct connection to dc and so have no standing dc current. L7 is particularly sensitive to dc, so both ends have been biassed to approximately 6·2V to prevent any current from flowing through it.

Audio filter output selection

The outputs of the audio filters are selected by IC6, another cmos analogue switch, controlled by switch S3. IC6 is permanently powered from the 12V rail. S3 supplies 12V to the control input of whichever analogue gate is selected. The control inputs to the unselected gates are pulled down to 0V by R81, R82 or R83.

DC bias for the signal input to IC6d, pin 11, is provided by the potentiometer effect of R75 and R76. Bias for IC6b pin 3 is provided by R78 and R79, this being the reason why a single 1kΩ resistor was not used to terminate the communications filter. IC6a pin 1 is biassed to approximately 6·2V by R80 and L7.

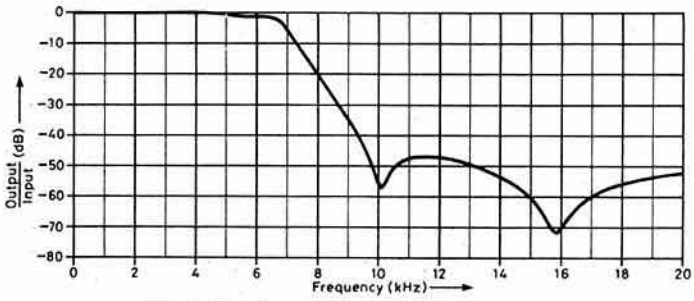


Fig 3. Wide bandwidth audio filter response

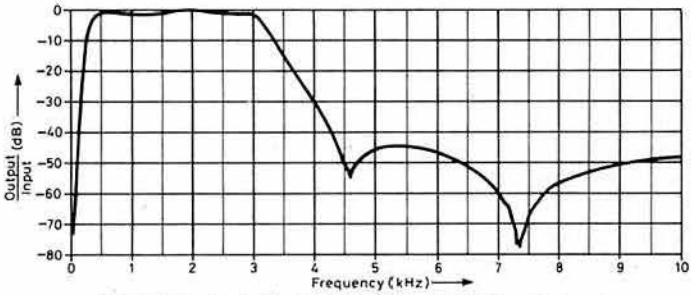


Fig 4. Communications bandwidth audio filter response

The outputs of IC6a, IC6b and IC6d are commoned together and connected to the dc-controlled volume control circuit and the agc generator.

Volume control/audio power amplifier

IC7 is an operational transconductance amplifier, manufactured by RCA. The output of this amplifier acts as a voltage-controlled current source, and the maximum gain is given by the product of the output transconductance (in this case typically 9·6mmho) and the load resistor, R90 [9]. R90 is necessary to convert the output current to a voltage to drive the audio power amplifier. With the value of R90 as in this application, the maximum voltage gain from IC7 is approximately 2.

Pin 5 of IC7 controls the amplifier bias current, enabling the output transconductance to be varied from zero to its maximum value. It is this feature which allows the device to be used as a volume control, the voltage gain being adjustable in this application from 0 to approximately 2 by potentiometer RV6.

Audio power amplification is provided by IC8, an LM380. The Zobel network, R91 and C82, on the output of IC8, prevents the possibility of rf oscillation under certain load conditions. Capacitor C80 bypasses an internal bias point within IC8.

In this application, with a supply of 12V, the maximum audio output is 1W rms into an 8Ω load.

AGC circuit/S-meter

The output of whichever audio filter has been selected by S3 is sampled by C84 and R92 and amplified by IC9a, one half of an LM1458. Preset potentiometer RV2 allows the gain of IC9a, and hence the agc threshold point, to be varied. Since IC9a is working from a single rail supply, its non-inverting input, pin 3, must be biassed at some voltage above 0V for correct operation. A 9·1V supply is derived from the 12V rail by R93 and D17 for use later in the agc circuit, so this is also used to bias IC9a.

IC10, a Plessey SL1621, generates the agc timing. A 6·8V supply is provided by R94 and D16. The SL1621 can draw heavy transients of supply current,so a large value of capacitance, C87, is positioned on the supply rail to IC10. This ic was designed to give a fast-attack, slow-decay agc characteristic, ideal for ssb reception. It also gives good results when

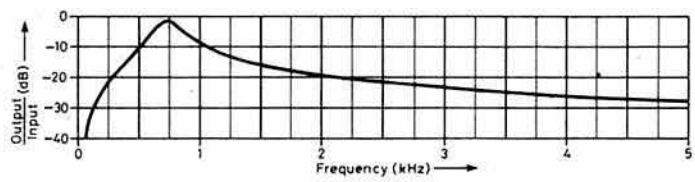


Fig 5. Narrow bandwidth audio filter response

*29 Mackinley Avenue, Stapleford, Nottingham NG9 8HU.

receiving a.m. and cw. Full details of the operation of this ic can be obtained from the Plessey literature [10]. C88, C89 and C90 determine the agc timing characteristics.

Audio derived agc for a.m. works best when the modulation is fairly full and only brief pauses in the modulation occur. The a.m. mode included here was intended for broadcast use where both these criteria are generally met.

The SL1621 was designed for operation with the SL1600 series of rf/i.f. amplifiers and has an output agc voltage range of typically 1–5V. The MC1350, however, requires an agc voltage range of typically 5–7V; therefore, a voltage conversion has to be provided. This conversion is provided by R95 and R96. Assuming that the voltage at the D17 end of R96 is 9V, when IC10 pin 2 is at 1V, the junction of R95 and R96 will be at 5V. When IC10 pin 2 is at 5V, the R95/R96 junction will be at 7V. For voltages on IC10 pin 2 between 1 and 5V, the R95/R96 junction will track linearly between 5 and 7V, which is the required age range. IC10 is only specified as sourcing current from pin 2 and, since in this application it is sinking current, the values of R95 and R96 have been made quite high to reduce the current into IC10 pin 2 to a minimum.

To boost the current available from the agc line to the MC1350, IC9b is configured as a non-inverting buffer whose output follows the voltage of R95/R96. The points labelled AGC1 and AGC2 give access for control of the front-end amplifier(s) of the receiver in which the i.f. strip is installed. This assumes that the voltage range of AGC1 or AGC2 is compatible to the front-end devices: if neither is suitable, an external voltage conversion will be necessary.

Drive for an S-meter is derived from the output of IC9b, pin 7. Preset potentiometers RV3 and RV4 allow the zero and full scale deflection of the meter to be set. The values of RV3, RV4 and R97 are suitable for a meter with a 200μA movement.

Supply decoupling

In the preceding description, no mention has been made of the supply decoupling arrangements. To prevent rf from being transferred among the circuits on the supply rails, use is made of rf chokes, RFC1–RFC6, and 0·1μF decoupling capacitors. These capacitors are also used to decouple the zener diodes to eliminate noise generated by these devices.

Construction

All the components for the i.f./af strip, apart from the external controls S1–S3, RV5, RV6, LED1 and M1, are mounted on a single-sided pcb. Fig 6 shows the pcb tracking, Fig 7 the drilling plan, and Fig 8 the component positions.

It is always difficult to describe the construction of a piece of electronic equipment. The author runs the risk of either insulting the intelligence of the experienced constructor or leaving the relative beginner with insufficient information. If the reader feels that more information is required, for example on the production of the pcb or the tools required, previous issues of *Radio Communication* or other magazines should be consulted. A particularly comprehensive description of the construction of a similar pcb was given for the RX80 Mk2 receiver [11].

Drill all the holes on the pcb to 0·85mm and then open out the fixing holes for the board to 3mm. Open out the holes for the can lugs on the transformers and filters, the connectors, the preset potentiometers and the trimmer capacitors. It is worthwhile to check carefully that all holes have been drilled to the correct size before mounting any components, otherwise components can be damaged if some holes have been missed and have to be drilled later.

In my opinion, it is best to start inserting and soldering components at the top lefthand corner of the pcb (when viewed from the component side)

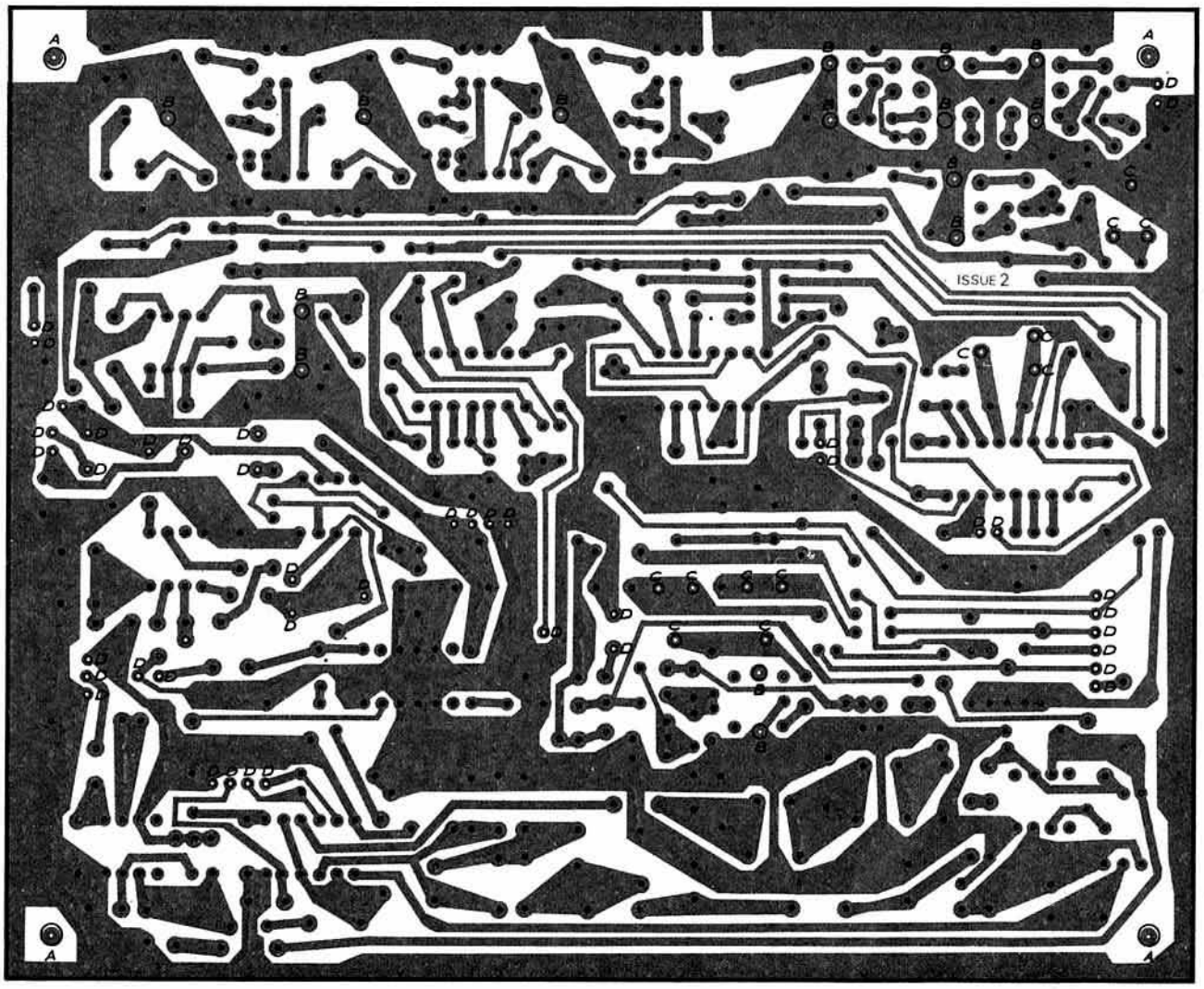


Fig 6. PCB layout

and work down to the bottom right-hand corner. Mount the components as they occur on the placement diagram, rather than mounting, say, the resistors first, then the capacitors, and so on. I have found that this method results in less mistakes than mounting one component type at a time. Use an earthed soldering iron and take the usual handling precautions with the fets.

To prevent the placement diagram (Fig 8) from becoming too cluttered, all resistors have been shown standing up; capacitors and diodes have been represented diagrammatically so that, where relevant, their polarities can be indicated. The best position for each component should be found, lying down on the board where possible.

Sockets were used for all the ics on the prototype, and no instability problems were encountered later. This contrasts with the usual advice given for this type of circuit, but it helps greatly when testing if a suspect ic can be changed easily.

For coupling and decoupling, 0·1μF capacitors are used extensively, and in most positions a physically fairly small component is required. The prototype used the Mullard 50V X7R component (available from Farnell). Another component which seems to be suitable is the Siemens type B37449, available from Electrovalue. Siemens polyester capacitors are ideal for use in the audio filter area, being very compact and having a lead spacing of 7·5mm. Tantalum beads were used for the other capcitors, apart from the three 470μF electrolytics. Here radial capacitors with 5mm lead pitch are required.

There is a total of 27 links on the board, which should be inserted at the same time as the other components—apart from links LK1, LK2 and LK3, which should be omitted at the construction stage and added later.

On the prototype board, connections were made to the external controls via 0·1in pitch connectors which are available from Cirkit Holdings. Alternatively, wires can be soldered directly into the pcb. The external connections are shown in Fig 10.

If wire is available with several colours of insulation, do not use the same colour twice on the same connector. For example, six colours would be required to wire all the connections to PL2 in different colours. This technique helps greatly in reducing the possibility of wiring errors. S1 and LED1 are optional, so if they are not fitted simply omit the connectors. Similarly, connections to PL10 and PL11 (AGC1 and AGC2) may not be required. The leads to the speaker (or phones) are best done as a twisted pair of wires.

Cable shells and crimp terminals (again available from Cirkit Holdings) are used to connect the wires from the external controls to the on-board connectors. Do not rely solely on a crimped connection to the crimp terminals, but pinch the wire onto the terminal with pliers and then solder it. To ensure a good power supply connection, two connectors for each polarity are provided and should be commoned together.

It goes without saying that the board should be checked very carefully after completion, particularly the polarity of the diodes and capacitors. The board layout has been arranged that all the ics are orientated the same way round, and this helps to avoid mistakes. Similarly, check the external connections to the board, particularly the power supply polarity. If the board is being used with an external power supply, it does no harm to connect a diode in series with the supply leads and this can prevent wiring mistakes from being expensive.

Because all the controls to the board are simply dc levels, the lengths of leads to the front-panel controls are not critical. The board can be positioned wherever it is convenient. Connection to the i.f. input should be made with miniature coaxial cable with the outer conductor earthed at both ends.

Testing and alignment

The exact method of testing and alignment of this unit depends on what test equipment is available and whether it is tested on its own or when installed in a receiver. Experienced constructors may find it possible to complete alignment with the use of no test equipment at all, relying on a receiver front-end to generate an input signal at 10·7MHz, and their ears to detect when the transformers are peaked and the oscillators are at the correct frequency. For the sake of this description it will be assumed that a method of frequency measurement is available (at around 10MHz and 455kHz). This may be a digital frequency meter or a general coverage receiver. Also,

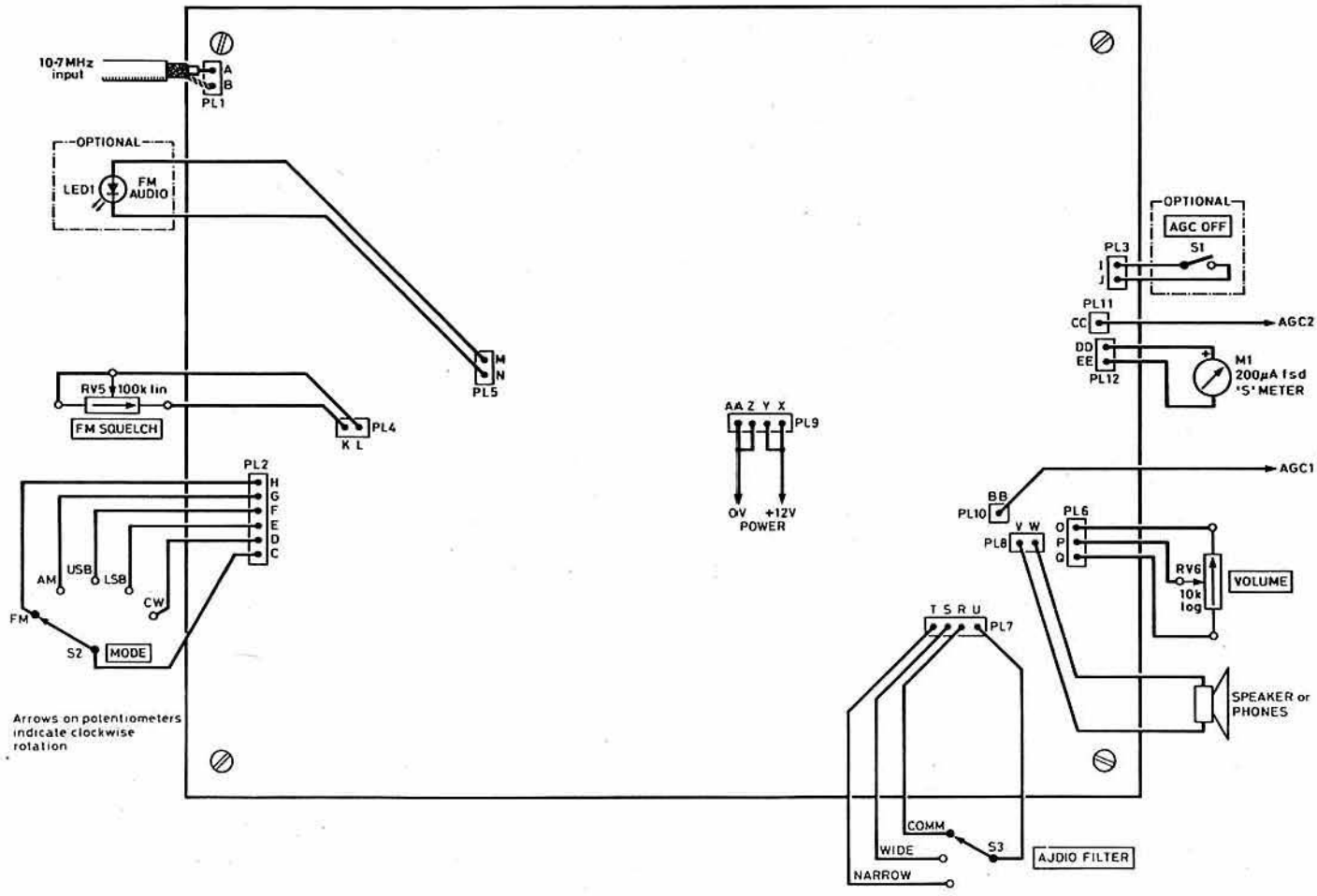


Fig 10. Wiring diagram of external connections

a signal generator is assumed to be available, working at audio frequencies, 455kHz and 10·7MHz. An oscilloscope and high input impedance voltmeter are assumed to be available for making measurements, though in many cases the ear will give a similar indication that a correct setting has been obtained.

If available, connect a milliammeter (200mA minimum) in series with the +12V lead. Set all the preset potentiometers (RV1–RV4) to mid-way. Set the volume control (RV6) and the fm squelch control (RV5) fully anticlockwise. Set S3 to communications filter.

Now follow this procedure:

(1) Apply the +12V supply. In usb, lsb or cw mode, the supply current should be approximately 130mA. In a.m. or fm mode, the current should be approximately 125mA. If the current is greatly different from these figures, switch off and check for a wrong connection or short circuit on the pcb.

(2) Now set the oscillators to the correct frequencies. Monitor T4 pin 6 and adjust C95 for a frequency of 10·245kHz. Rotate the core of T4 (using the correct trimmer tool) for maximum output. Approximately 1V peak-to-peak should be obtained at T4 pin 6.
Monitor IC2 pin 10, switch to lsb mode and rotate the core of T5 for a frequency of 456·5kHz.
Switch to usb mode and adjust C97 for 453·5kHz.
Switch to cw mode and adjust C96 for 454·25kHz.
Switch to fm mode and set the free-running vco frequency of IC3 to approximately 455kHz by adjusting C98. Check that the frequency is similar in the a.m. mode.

(3) Set the level of injection into IC2 to approximately 800mV peak-to-peak by rotating RV1 while in usb mode. Then switch to a.m. and make sure the injection level is similar (but it will now be a square wave, rather than a sine wave).

(4) Now begin testing the audio sections. Connect a 10kΩ resistor to IC5 pin 2 (LK3 is not fitted at this stage) and inject a 1kHz signal into the other end of the 10kΩ resistor. If the generator is not ac coupled, connect a 0·1μF capacitor in series with the 10kΩ resistor. Monitor the audio output of IC8 either by ear or with an oscilloscope. Increase the volume control RV6 and make sure the volume level increases.
By varying the frequency of the generator while each audio filter is selected in turn, some idea of the performance of the filters can be obtained. Figs 3, 4 and 5 show the responses that should be obtained. When checking the narrow filter response, make a note of the frequency at which maximum output is obtained.
When satisfactory performance has been verified, remove the 10kΩ resistor and fit link LK3.

(5) The main 455kHz amplifier (IC1) and the product detector (IC2) can now be tested. Disable the agc action by operating S1, if fitted, or with a wire link across PL3 if S1 is not fitted. Inject a low-level unmodulated 455kHz signal into IC1 pin 4 (via a 0·1μF capacitor if the generator is not ac coupled) and monitor IC2 pin 1. Adjust the core of T6 for maximum signal. The response of T6 is fairly flat and so its core position is not too critical.
Set S2 to usb mode, and monitor IC2 pin 12 (the audio output) or listen to the speaker output. A tone of approximately 1·5kHz should be detected. Switch to lsb mode and the output should be of similar frequency. Now switch to cw mode, the output should be at 750Hz. At this stage C96 can be slightly re-adjusted to set the cw mode audio output to the frequency of the narow audio filter, as noted in **(4)**.
When these tests have been completed satisfactorily, solder in link LK2.

(6) Now the 455kHz filters and a.m. and fm demodulation can be checked. Inject a low level unmodulated 455kHz signal into the junction of C11/C17/C22 (link LK1 is not fitted). Switch to usb, lsb and cw mode in turn and check that D2 has approximately +6V applied to it at the junction of R33/C26/D2 in these modes. Check that D1 is not conducting while in these modes. Audio outputs as described in **(5)** should again be obtained.
Now switch to a.m. mode and check that D1 is conducting and D2 is not. If the input frequency is varied on either side of 455kHz, the vco of IC3 should track it, as measured at IC2 pin 10. This shows that the fm signal path, via F1, and probably IC3, are working correctly.
While still in the a.m. mode, if amplitude modulation can be applied to the input signal, recovered audio at the modulating frequency should be obtained.
FM demodulation can be checked if fm can be applied to the input signal and fm mode is selected. At this stage, operation of the fm squelch circuit can be verified by adjusting the fm squelch control (RV5) while alternately applying and removing the input signal. A position should be found for RV5 where audio output is obtained and LED1 (if fitted) lights when the input signal is applied and a quiet, muted output with LED1 extinguished is obtained with no signal input.
Link LK1 can now be fitted.

(7) Inject a low level unmodulated 10·7MHz signal into the 10·7MHz input (PL1). This input is very sensitive and a resistive potential divider may be necessary to reduce the input level sufficiently. Monitor T3 pin 6 and adjust the core of T3 for maximum signal at 455kHz or maximum audio output. Then adjust the cores of T1 and T2 for maximum 455kHz signal at T3 pin 6. Adjust T1 and T2 cores alternately as adjustments of one may affect the other.
The tests with modulated signals, as described in **(5)** can now be repeated if desired.

(8) AGC operation can now be checked and the S-meter calibrated. The exact setting of the agc threshold control (RV2) and the S-meter calibration controls (RV3 and RV4) should be completed when the strip is installed in a receiver, but confidence can be obtained at this stage that they are capable of operating satisfactorily.
Enable the agc by operating S1 or removing the link across PL3. Do not fit the S-meter yet. Set S3 to usb mode. Monitor the dc voltage on IC10 pin 2 (connector PL10 is a convenient point). With no signal input, the voltage here should be close to 0V. Now measure the voltage on IC9 pin 7 (or PL11); this should be close to 5V.
Apply a low-level unmodulated 10·7MHz signal to PL1 and slowly increase the level. The voltage on IC9 pin 7 should start to increase in sympathy with the increase in input signal level after a certain threshold level has been reached. The threshold level should be adjustable by varying the setting of RV2. If the audio output is monitored, it should remain almost constant in amplitude after the agc threshold has been reached despite a large increase in the input level. This verifies that the gain of IC1 is being reduced as the input signal level increases.
With the input signal level set at a level beyond the agc threshold, remove the input suddenly while monitoring IC10 pin 2. The voltage should remain at its old level for approximately 1s and then rapidly fall to close to 0V. This is the "hang" facility which IC2 provides, holding the gain of IC1 constant during inter-syllabic and inter-word breaks in transmission and returning to high gain when a break is long enough to indicate a probable end of transmission. Now fit the S-meter. With no input signal, adjust RV3 for zero reading on the meter. RV4 can now be adjusted for full-scale deflection on the meter when a strong signal is being received. This can only be done when the strip has been connected to a front-end. Readings from the S-meter should be used for comparison purposes rather than as an absolute indication of signal strength.

This completes the testing and alignment procedure.

Fault tracing may be simplified by referring to the typical voltages measured on the transistors and ICs of the prototype. These are shown in Table 1.

Alternatives

With such a comprehensive design there are many alternative or sub-equipped versions which can be built to suit individual preferences. Some are described here.

The advantages of 9MHz as a first i.f. may be attractive, and this can be catered for by tuning T1 and T2 to this frequency. They will tune to 9MHz simply by core adjustment, and no modifications to the windings are necessary. X1 will need to be changed to 9,455MkHz and T4 tuned to this frequency.

The agc-off facility can be omitted by not connecting S1. Alternatively, a manual i.f. gain control can be incorporated by switching pin 5 of IC1 to the wiper of a potentiometer having potentials of 5 and 7V at each end. If any overloading effects are encountered, the gain of the input amplifier can be reduced by removing C3.

AGC can be applied to the 10·7MHz stage without modifying the pcb by using a PIN diode (such as a BA379) variable attenuator prior to TR1. A description of the use of PIN diode attenuators is given in [12].

For some applications, single-conversion starting at 455kHz is sufficient. In this case, TR1, TR3, T1, T2, T4 and associated components should be omitted. TR2 and T3 can be retained if required to act as a buffer amplifier and to provide 455kHz selectivity. TR2 will require a 100kΩ resistor from its gate to 0V for dc bias, and the 455kHz input coupling through a 470pF capacitor. Alternatively, TR2 can be used as the conversion mixer from rf to i.f. Inject the local oscillator into the source of TR2.

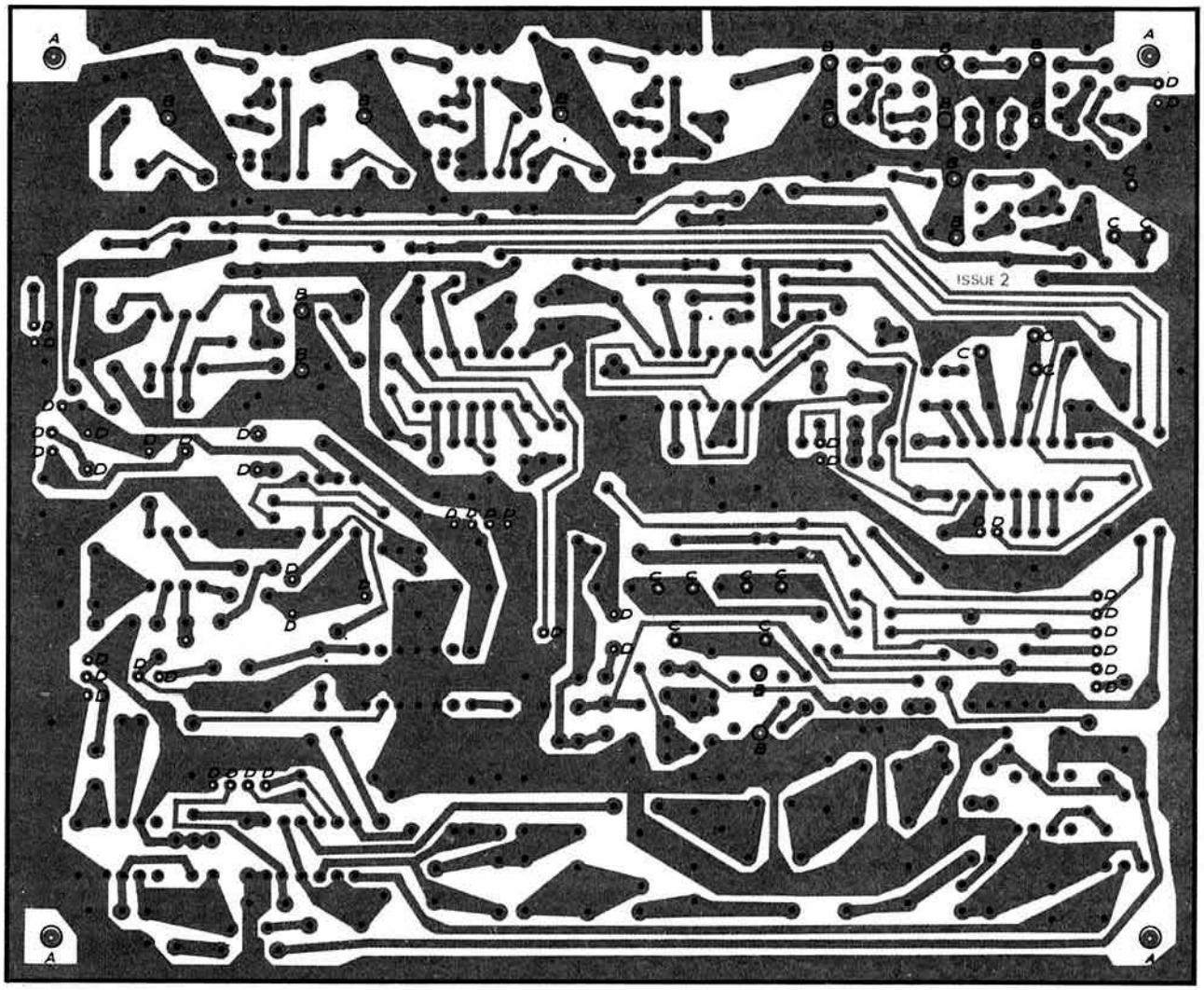


Fig 7. PCB drilling plan. Holes shown ● are 0·85mm diameter. Four holes "A" are 3mm diameter. 15 holes "B" are 1·6mm diameter. 12 holes "C" are 1·3mm diameter. 43 holes "D" are 1mm diameter

Components list

R1, 36, 37, 60, 70, 92, 95, 96	100kΩ
R2, 4, 8, 16, 42, 43, 50	100Ω
R3	3·3kΩ
R5	3·9kΩ
R6, 7	15kΩ
R9	5·6kΩ
R10, 18, 26, 65, 68	12kΩ
R11, 19, 27	8·2kΩ
R12, 15, 20, 23, 29	1·5kΩ
R13, 21, 46, 48, 49, 61, 64, 74, 75, 76, 77, 93	1kΩ
R14, 22	220Ω
R17, 94	470Ω
R24, 25, 32, 33, 34, 35, 51, 66, 67, 69, 72, 73, 80, 81, 82, 83, 84, 85, 86, 87, 88, 97	10kΩ
R28, 31, 78, 79	2kΩ
R30, 62	330Ω
R54	680Ω
R38	1·8kΩ
R39	560Ω
R40	68kΩ
R41, 56, 59	4·7kΩ
R44	1·2kΩ
R45	820Ω
R47	51Ω
R52, 53	2·7kΩ
R55, 71, 90	22kΩ
R57	33kΩ
R58, 89	470kΩ
R63	2·2kΩ
R91	2·7Ω

All resistors are 0·25W 5% carbon film type

RV1	1kΩ	Miniature
RV2	470kΩ	Horizontal carbon
RV3, 4	10kΩ	Film presets
RV5	100kΩ Lin	Carbon variable
RV6	10kΩ Log	Carbon variable
XI	10·245MHz HC18U	
S1	SP, single make toggle	
S2	SP, five-way rotary	
S3	SP, three-way rotary	
M1	200μA S-meter	
C1, 9, 28, 53	470pF cp	
C2, 4, 6, 8, 14, 15, 27, 32, 34, 36, 37, 38, 39, 40, 44, 45, 48, 50, 54, 55, 56, 58, 60, 61, 76, 78, 79, 82, 84, 86, 91, 92, 93, 94	0·1μF dc (see text) 30V	
C3, 11, 12, 13, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26	10nF dc 30V	
C5, 31, 33	68pF cp 63V	
C7	2·2nF cp 63V	
C10	100pF cp 63V	
C29	22nF c 63V	
C30	1nF cp 63V	
C35, 41, 42, 52	4·7nF cp 63V	
C43, 57, 59, 77, 85	10μF tb 16V min	
C46	33pF cp 63V	
C47	1·5nF cp 63V	
C49	6·8pF cp 63V	
C51	1μF tb 16V min	
C62, 66	47nF poly	
C63	4·7nF poly	
C64	56nF poly	
C65	12nF poly	
C67, 69, 75	0·22μF poly	
C68	0·18μF poly	
C70, 74	0·1μF poly	
C71	10nF poly	
C72	0·12μF poly	
C73	27nF poly	
C80	4·7μF tb 16V min	
C81, 83, 87	470μF rle 16V min	
C88, 90	100μF tb 6·3V min	
C89	47μF tb 6·3V min	
C95, 96, 97, 98	5-60pF pdt	

dc = disc ceramic
cp = ceramic plate
c = ceramic
tb = tantalum bean
poly = polyester (Siemens type)
pdt = polypropylene dielectric trimmer
rle = radial lead electrolytic

T1, 2, 4	Toko KACS4520A
T3	Toko YRCS11098AC
T5	Toko YMCS17104G
T6	Toko YLE4A888EK
LED1	To suit own preference
RFC1, 2, 3, 4, 5, 6	470μH Axial rf chokes

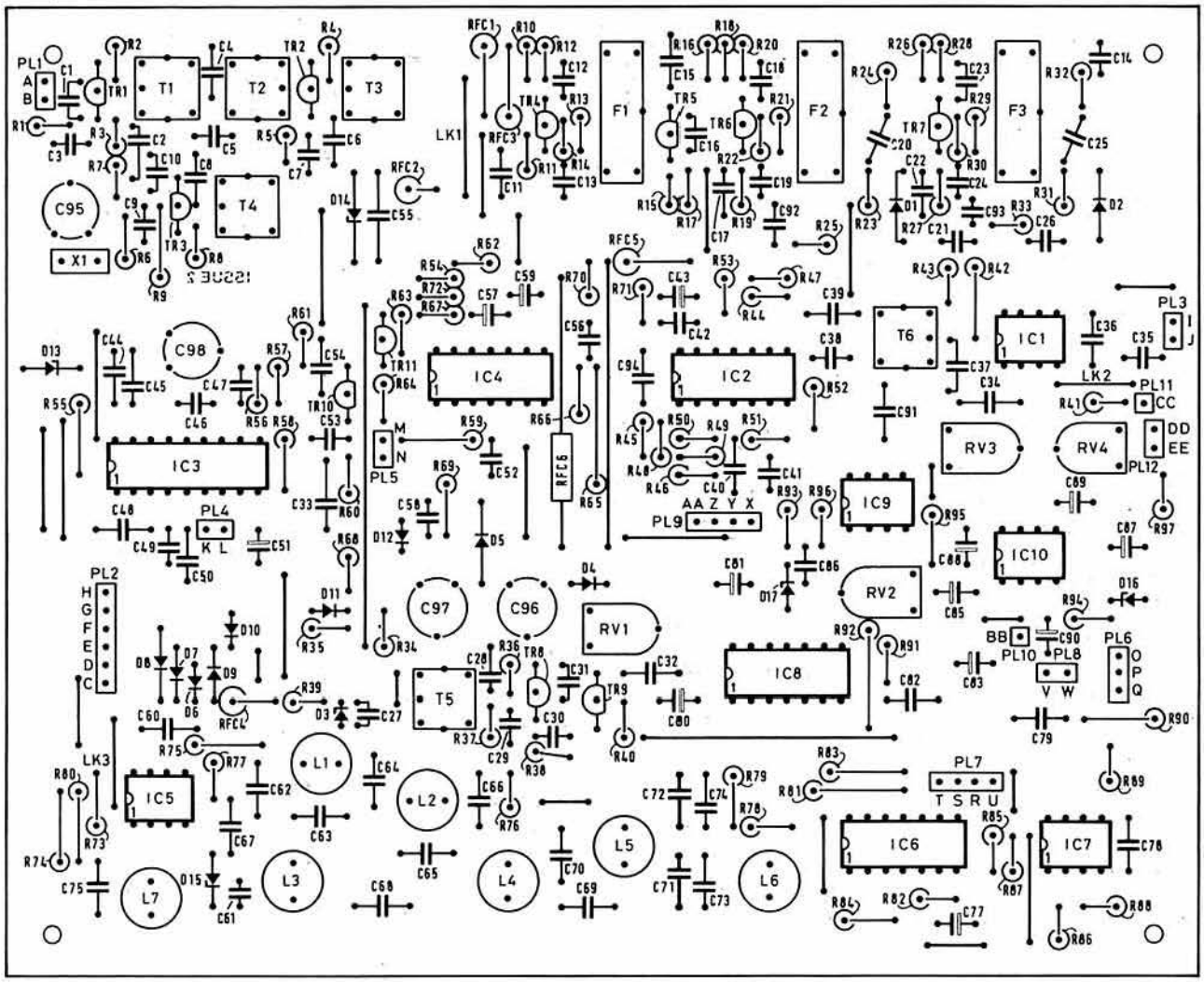


Fig 8. PCB component layout

PL1, 3, 4, 5, 8, 12	Two-way	0·1in pitch pcb plug, cable shell
PL2	Six-way	
PL6	Three-way	
PL7, 9	Four-way	
PL10, 11	One-way	
L1, 2	Toko 22mH type 10RB	
L3, 4	Toko 470mH type 10RBH	
L5, 6	Toko 47mH type 10RB	
L7	Toko 220mH type 10RBH	
F1	Murata CFM455F or NTK LFC12	
F2	Murata CFM455G or NTK LFC8	
F3	Murata CFM455JI	
IC1	MCI350 (Motorola)	
IC2	MC1496 (Motorola or National)	
IC3	SL6600 (Plessey)	
IC4, 6	CD4066B (Various Mftrs)	
IC5	TLO71 (Texas)	
IC7	CA3080 (RCA)	
IC8	LM380 (National)	
IC9	LM1458 (Various mftrs)	
IC10	SL1621 (Plessey)	
D1, 2, 4, 5	BA244	
D3, 13, 15	6·2V zener diode	
D6, 7, 8, 9, 10, 11, 12	IN4148	
D14, 16	6·8V zener diode	
D17	9·1V zener diode	
TR1, 2, 5, 10	BF245	
TR3, 4, 6, 7	BF241	
TR8, 9, 11	BC238	

Sockets 5-off, 8-pin dil ic. 4-off, 14-pin dil ic. 1-off, 18-pin dil ic. 31-off, crimp

Not all modulation modes need to be catered for. A.M. can be omitted by leaving out TR6, F2 and associated components and removing the a.m. position on S2. If the fm mode is removed, by omitting TR4, TR6, F2, TR10, TR11, IC3, IC4 and associated components, a.m. will have to go as well because of the method used to demodulate a.m. A strap will be required between pins 8 and 9 of the vacated IC4 position to allow the ssb/cw audio into the audio stages. If this is stripped down, ssb/cw-only version is constructed, the wide-bandwidth audio filter may be omitted as well. If ssb only is required, the narrow audio filter along with IC6 and S3 can also be omitted. Strap together pins 3 and 4 of the IC6 position to allow the filtered audio into the volume control, IC7.

A conventional volume control can be used insted of IC7. However, the

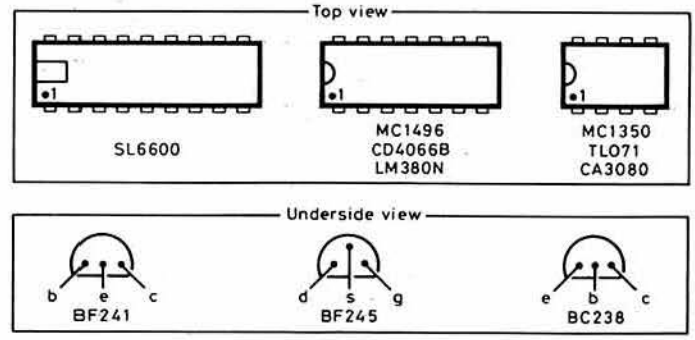


Fig 9. Component pin-outs

Table 1. Voltage check chart

Voltages measured with volume and FM squelch controls fully anti-clockwise. No signal input, no audio output. Supply equal to 12V. All voltages measured with high impedance dvm. Voltages marked * are at floating points and may differ greatly from those measured without malfunction.

TRANSISTORS

TR	Emitter	Base	Collect	Source	Gate	Drain
1	—	—	—	1·2	0	12
2	—	—	—	1·4	0	12
3	4·6	5·2	11·9	—	—	—
4	3·7	4·4	6·4	—	—	—
5	—	—	—	1·0	0	11·7
6	3·8	4·5	6·3	—	—	—
7	4·0	4·6	6·7	—	—	—
8	2·3	3·0	6·3	—	—	—
9	9·2	9·9	12·0	—	—	—
10	—	—	—	0	0	6·9
11	6·0	6·6	6·7	—	—	—

USB, LSB or CW MODE. COMMUNICATIONS AUDIO FILTER SELECTED

INTEGRATED CIRCUITS

IC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	11·3	11·0	0	3·7	5·3	7·3	0	11·3	—	—	—	—	—	—	—	—	—	—
2	4·0	3·3	3·3	4·0	1·2	9·3	0	7·2	0	7·2	0	9·2	0	0	—	—	—	—
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	6·6	0	0	6·6	4·9	0	2·2	2·2	*2·4	0	0	0	6·7	—	—	—	—
5	0	6·6	6·6	0	0	6·6	12·0	0	—	—	—	—	—	—	—	—	—	—
6	6·6	6·1	6·1	6·1	12·0	0	0	12·0	12·0	6·1	3·2	0	0	12·0	—	—	—	—
7	0	6·0	6·0	0	0	0	12·0	0	—	—	—	—	—	—	—	—	—	—
8	6·2	0	0	0	0	0	0	5·8	0	0	0	0	0	12·0	—	—	—	—
9	10·6	9·0	9·2	0	4·7	4·7	4·7	12·0	—	—	—	—	—	—	—	—	—	—
10	1·2	0·2	1·0	7·1	1·0	0·5	0	0	—	—	—	—	—	—	—	—	—	—

TRANSISTORS

TR	Emitter	Base	Collect	Source	Gate	Drain
1	—	—	—	1·2	0	12
2	—	—	—	1·4	0	12
3	4·6	5·2	11·9	—	—	—
4	3·7	4·4	6·4	—	—	—
5	—	—	—	1·0	0	11·7
6	3·8	4·5	6·3	—	—	—
7	4·0	4·6	6·7	—	—	—
8	0	0	0	—	—	—
9	9·2	9·9	12·0	—	—	—
10	—	—	—	0	0	6·9
11	0·2	0·3	6·7	—	—	—

FM MODE NARROW AUDIO FILTER SELECTED

INTEGRATED CIRCUITS

IC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	11·3	11·0	0	3·7	5·3	3·7	0	11·3	—	—	—	—	—	—	—	—	—	—
2	4·0	3·3	3·3	4·0	1·2	9·3	0	7·2	0	7·2	0	9·2	0	0	—	—	—	—
3	0·8	0·8	1·2	2·4	1·7	6·3	5·3	4·7	6·2	6·2	6·0	6·1	4·9	4·9	6·4	3·3	0	0·7
4	0	0·3	4·7	*4·0	0·3	0	0	2·2	*2·8	*2·7	*4·0	5·4	6·3	6·7	—	—	—	—
5	0	6·6	6·6	0	0	6·8	12·0	0	—	—	—	—	—	—	—	—	—	—
6	6·6	6·6	6·1	6·6	0	0	0	12·0	12·0	6·6	3·2	0	12·0	12·0	—	—	—	—
7	0	6·0	6·0	0	0	0	12·0	0	—	—	—	—	—	—	—	—	—	—
8	6·2	0	0	0	0	0	0	5·8	0	0	0	0	0	12·0	—	—	—	—
9	10·6	9·0	9·2	0	4·7	4·7	4·7	12·0	—	—	—	—	—	—	—	—	—	—
10	1·2	0·2	1·0	7·1	1·0	0·5	0	0	—	—	—	—	—	—	—	—	—	—

TRANSISTORS

TR	Emitter	Base	Collect	Source	Gate	Drain
1	—	—	—	1·2	0	12
2	—	—	—	1·4	0	12
3	4·6	5·2	11·9	—	—	—
4	3·7	4·4	6·4	—	—	—
5	—	—	—	1·0	0	11·7
6	3·8	4·5	6·3	—	—	—
7	4·0	6·6	6·7	—	—	—
8	0	0	0	—	—	—
9	9·2	9·9	12·0	—	—	—
10	—	—	—	0	0	6·9
11	0·2	0·3	6·7	—	—	—

A.M. MODE. WIDE AUDIO FILTER SELECTED

INTEGRATED CIRCUITS

IC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	11·3	11·0	0	3·7	5·3	3·7	0	11·3	—	—	—	—	—	—	—	—	—	—
2	4·0	3·3	3·3	4·0	1·2	9·3	0	7·2	0	7·2	0	9·2	0	0	—	—	—	—
3	0·8	0·8	1·2	2·4	1·7	6·3	5·3	4·7	6·2	6·2	6·0	6·1	4·9	4·9	6·4	3·3	0	0·7
4	0	0·3	4·7	*2·0	0·3	5·2	0	2·2	2·2	*6·0	*2·0	0	6·3	6·7	—	—	—	—
5	0	6·6	6·6	0	0	6·6	12·0	0	—	—	—	—	—	—	—	—	—	—
6	6·6	3·2	6·0	3·2	0	0	0	12·0	12·0	3·2	3·2	12·0	0	12·0	—	—	—	—
7	0	6·0	6·0	0	0	0	12·0	0	—	—	—	—	—	—	—	—	—	—
8	6·2	0	0	0	0	0	0	5·8	0	0	0	0	0	12·0	—	—	—	—
9	10·6	9·0	9·2	0	4·7	4·7	4·7	12·0	—	—	—	—	—	—	—	—	—	—
10	1·2	0·2	1·0	7·1	1·0	0·5	0	0	—	—	—	—	—	—	—	—	—	—

extra cost of IC7 is so minimal as to make this alternative not really worth considering.

The audio stages of this strip, from IC5 to the loudspeaker driver, could be used without the i.f. stages. The communications filter in particular is good enough (and cheap enough) to be incorporated into many other designs.

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Equipment Review

The Trio TS430S HF Transceiver

PETER HART, G3SJX*

Introduction

Anyone considering the purchase of a 12V-operated multimode hf transceiver with built-in general coverage receiver is likely to consider the Yaesu FT757GX and Trio TS430S. The reviewer had the opportunity to compare directly these two rigs both in the laboratory and on the air, and a review of the FT757GX has already been published [1].

Principal features

The TS430S is a 12V-operated, 100W nominal-output amateur bands transceiver which also incorporates a general-coverage receiver tuning 150kHz to 30MHz. CW, ssb and a.m. modes are provided with fm as an optional extra. A 2·4kHz bandwidth main i.f. filter is fitted as standard, with narrower bandwidth cw and wider bandwidth a.m. filters as extras. A 10 or 100Hz per step frequency synthesizer is used, providing twin vfos for split-frequency working, eight memories and scanning facilities. The vfos and memories store mode information as well as band and frequency, and the contents are retained by an internal lithium back-up battery when the power is removed. The tuning rate is 10 or 100kHz per revolution of the 45mm control knob. Frequency readout to 100Hz is indicated on a blue fluorescent display, although 10Hz resolution may be optionally selected by a simple internal modification.

Receiver functions include i.f. shift, irt (clarifier), non-adjustable noise blanker, switchable rf attenuator, audio notch filter and all-mode squelch. No switching of agc time constant is provided.

Transmitter functions include audio speech processor, vox, semi-break-in on cw, metering of alc or final stage collector current, and thermostatically-operated fan.

The rear panel carries connectors for dc power, antenna, key and external speaker. Three DIN connectors allow interfacing to transverter, linear, separate receiver or separate receiver antenna. Band data is outputted in coded form.

A 36-page instruction manual is provided which covers operation and installation of the equipment. Circuit diagrams are given but no technical descriptions or service information.

Matching accessories include the SP430 external speaker, PS430 mains psu and AT250 automatic atu.

Description

The TS430S is somewhat larger than the FT757GX, measuring 27(w) by 10(h) by 31cm (d) and weighing 6·5kg. The transceiver is constructed as five units which separate to allow for servicing. These comprise the front panel unit including display and controls, the rear unit containing power amplifier and relay-switched filters, and three parallel-mounted panels containing the remainder of the circuitry. The upper unit hinges to gain access to the central panel (see photograph). A 7·5cm diameter speaker is mounted in the upper section of the case.

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Fig 1 shows a block diagram of the transceiver on ssb. Both receiver and transmitter are double conversion with i.fs of 48·055 and 8·83MHz. No receiver rf amplifier is used; after front-end filtering, signals are fed directly to a push-pull 2SK125 fet mixer. A similar mixer is used for the second conversion. Push-pull mosfets are used for the transmitter mixers.

It is difficult to identify the operation of the frequency synthesizer from the instruction manual, hence this is not shown in any detail in the block diagram. The main synthesizer loop employs an MC145156 lsi frequency synthesizer ic serially controlled from a cmos microcomputer type 8049C. This eight-bit mask-programmed microcomputer controls all frequency functions, display driving and filter switching via I/O expanders.

Measurement technique

The measurement technique was similar to that used in previous reviews [1], [2], [3] and [4]. All signal input voltages are given as pd across the antenna terminal, and two-tone intermodulation products are quoted with respect to either originating tone. Unless otherwise stated, all measurements were made on ssb and only in the amateur frequency allocations.

Receiver measurements

Sensitivity

Table 1 shows the sensitivity figures on ssb. These indicate a noise floor of −133 to −136dBm or a noise figure of about 5 to 8dB. This is remarkably sensitive considering the absence of an rf amplifier. The a.m. sensitivity was 0·7μV for 10dB s+n:n for 30 per cent modulation depth.

S-Meter calibration

The input signal level required to give an S9 meter reading is shown in Table 1. These levels are 20dB greater with the rf attenuator in circuit. On 14MHz the calibration was as follows:

S-reading	Input signal	Relative increase
S1	1·4μV	
S3	2·8μV	6dB
S5	6·3μV	7dB
S7	14μV	7dB
S9	45μV	10dB
S9+20	316μV	17dB
S9+40	3·5mV	21dB

The accuracy and linearity are reasonable.

Table 1. Receiver measurements

Frequency	Sensitivity on ssb for 10dB s+n:n	Input for S9	Image rejection	48·055MHz i.f. rejection
1·8MHz	0·14μV (−124dBm)	56μV	91dB	86dB
3·5MHz	0·13μV (−125dBm)	56μV	96dB	101dB
7MHz	0·14μV (−124dBm)	63μV	91dB	95dB
10MHz	0·11μV (−126dBm)	45μV	89dB	103dB
14MHz	0·11μV (−126dBm)	45μV	82dB	87dB
18MHz	0·13μV (−125dBm)	45μV	86dB	103dB
21MHz	0·13μV (−125dBm)	45μV	86dB	104dB
24MHz	0·16μV (−123dBm)	63μV	84dB	96dB
28MHz	0·14μV (−124dBm)	56μV	80dB	94dB

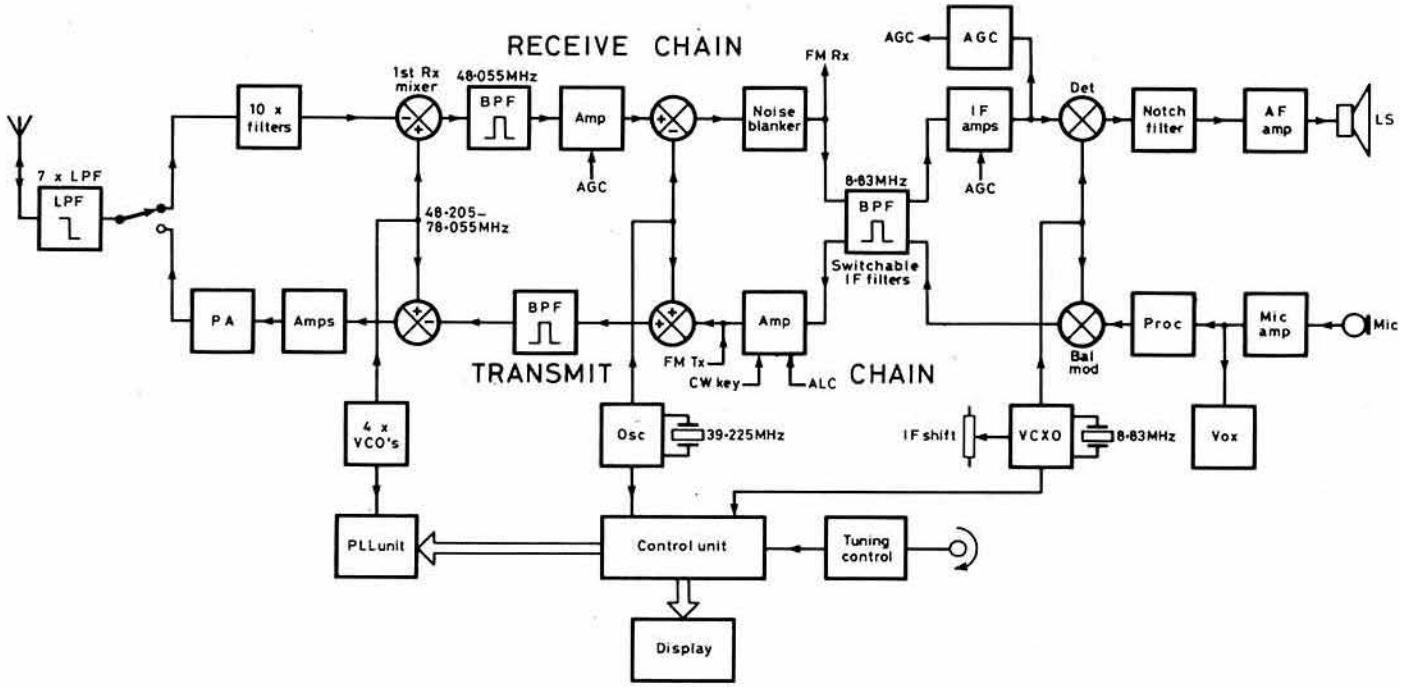


Fig 1. Block diagram of the Trio TS430S on ssb

Spurious responses

Table 1 shows the 48·055MHz i.f. rejection and primary image response figures. The primary image response occurs 96·110MHz above the frequency to which the receiver is tuned. Half first i.f. rejection of 24·028MHz was about 85dB on bands above 14MHz, and better than 100dB on the other bands. One third i.f. rejection of 16·018MHz was about 95dB from 14 to 21MHz and unmeasurable on the other bands. Rejection of the 8·83MHz i.f. was greater than 86dB. With no response greater than −80dB, these are reasonable figures.

With the antenna terminated in 50Ω, several weak spurii were noted, principally on 21 and 28MHz. None were sufficiently strong to move the S-meter.

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

Frequency	Worst response	Other responses
1·8MHz	70mV	None below 100mV
3·5MHz	100mV	None below 100mV
7MHz	32mV	Five around 100mV
10MHz	18mV	Five up to 100mV
14MHz	45mV	One up to 100mV
18MHz	28mV	Three up to 100mV
21MHz	45mV	Four up to 100mV
24MHz	25mV	Five up to 100mV
28MHz	45mV	Four up to 100mV

AGC performance

The agc threshold was measured as about 1μV. A 110dB increase in the signal level above the threshold resulted in a 2dB increase in audio output. Depending on signal level, the attack time was 2 to 5ms, and the decay time 1–4s on ssb or 0·3–2s on cw. Note that the agc speed cannot be set by the user.

Selectivity

Only one filter was fitted in the review receiver. This exhibited a 6dB bandwidth of 2·43kHz, and 60dB bandwidth of 4·57kHz (6:60dB shape factor = 1·88). Reciprocal mixing limited measurement to about 60dB down the filter skirts.

Reciprocal mixing

Measurements made at 21·4MHz on ssb were:

Frequency offset	Input level	Level with respect to noise floor
5kHz	−60dBm	75dB
10kHz	−53dBm	82dB
20kHz	−43dBm	92dB
30kHz	−38dBm	97dB
50kHz	−31dBm	104dB
100kHz	−23dBm	112dB
200kHz	−16dBm	119dB
300kHz	−12dBm	123dB

These figures indicate an oscillator noise sideband performance of −115dBC/Hz at 10kHz off-tune. This is slightly worse than the FT757GX.

Blocking

Front-end blocking occurred at input levels of +1dBm (250mV) for frequency offsets greater than 20kHz from the on-tune frequency. Closer in, the blocking level was degraded by up to 14dB by signals passing through the 48·055MHz roofing filter and blocking the second mixer. Also it was noted that spurious peaks in the stopband of this filter resulted in a degradation in blocking performance by up to 10dB at certain frequencies.

Third-order intermodulation

The intermodulation performance was evaluated on 7MHz with tone spacings of 5 to 200kHz. The results were as follows:

Tone spacing	Third-order intercept	Two-tone dynamic range
5kHz	−41dBm	62dB
10kHz	−35dBm	66dB
20kHz	−18dBm	77dB
30kHz	−2dBm	88dB
40kHz and greater	+10dBm	96dB

28MHz gave similar results, but on 14MHz the third-order intercept was +5dBm for greater than 40kHz tone spacings. As with the FT757GX, the close-in dynamic range is being degraded by the use of wide roofing filters. Fig 2 summarizes the dynamic range measurements.

Overall in-band linearity was assessed with 200Hz signal spacings [3]. The level of intermodulation products generated was fairly constant at about −30dB for signal levels up to 7mV.

Audio

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

Transmitter measurements

CW power output, harmonics and spurii

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

Frequency	Power output	Harmonics	Other Spurii
1·8MHz	86W	−53dB	Two at −60dB, several −75dB
3·5MHz	91W	−54dB	Two at −60dB, several −70dB
7MHz	93W	−58dB	Several −60 to −70dB
10MHz	92W	−58dB	Many −50 to −70dB
14MHz	93W	−52dB	Many −50 to −70dB
18MHz	90W	−50dB	Many −55 to −70dB
21MHz	90W	−57dB	Many −50 to −70dB
24MHz	86W	−56dB	Many −50 to −70dB
28MHz	85W	−56dB	Many −50 to −70dB

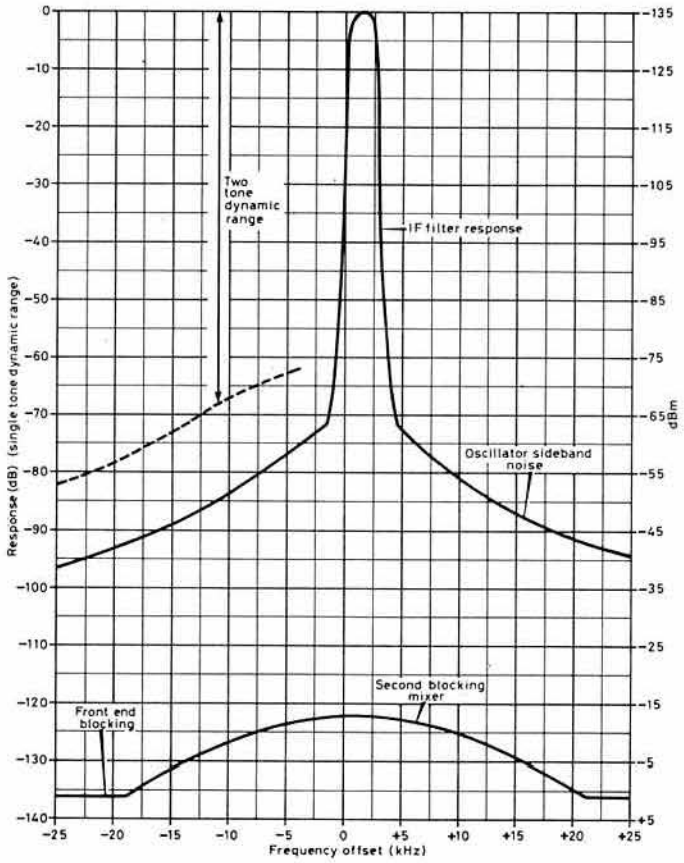


Fig 2. TS430S effective selectivity curve on usb

The quantity and levels of spurious output signals are undesirably high on most bands, particularly above 10MHz. Fig 3 shows the output spectrum on 14MHz.

Fig 4 shows the cw keying envelope when keying dots at 40wpm. This is tolerably well rounded with negligible distortion. This is a big improvement on the FT757GX.

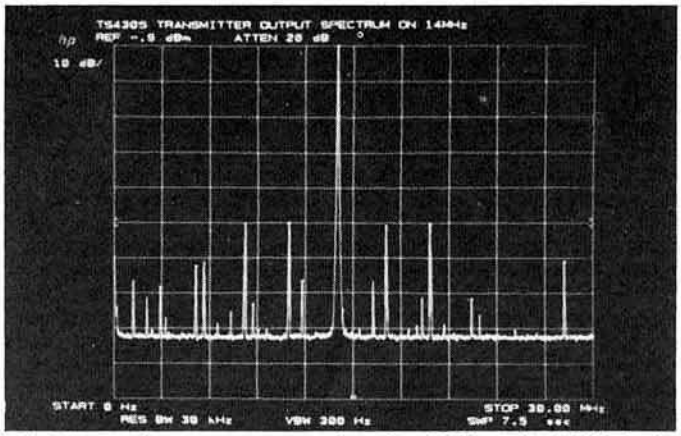


Fig 3. Transmitter output spectrum from 0 to 30MHz on the 14MHz band. Vertical scale 10dB/division

SSB power output and distortion

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

Frequency	Power output (p.e.p.)	Third-order ips	Fifth-order ips
1·8MHz	96W	−32dB	−37dB
3·5MHz	100W	−26dB	−40dB
7MHz	98W	−16dB	−25dB
10MHz	98W	−22dB	−34dB
14MHz	99W	−22dB	−34dB
18MHz	96W	−20dB	−34dB
21MHz	96W	−21dB	−32dB
24MHz	93W	−18dB	−26dB
28MHz	90W	−22dB	−25dB

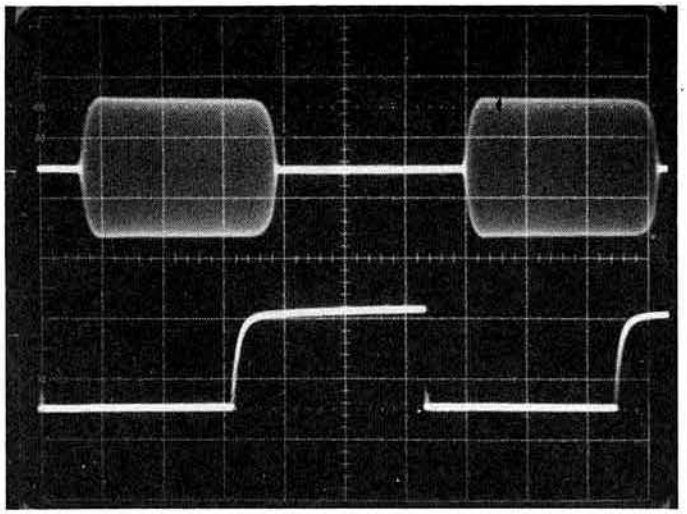


Fig 4. CW keying waveform (bottom) and rf envelope (top) at 40 wpm. Horizontal scale 10ms/division

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

Reducing power to around 60W (just before the start of alc indication) gave a substantial improvement in distortion. The processor did not significantly degrade the distortion figures.

The carrier suppression was −50dB, and sideband suppression with a 1kHz audio tone was −70dB.

Audio

The audio bandwidth on usb was 380Hz to 2·55kHz at the −6dB points, and full output could be achieved with 1mV af input at the microphone. LSB operation gave similar results. The audio distortion level varied according to drive, being around 6 per cent at full alc indication, reducing to 1 per cent at lower power levels.

Transmitter noise output

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

Frequency offset	Noise output	Noise output with respect to carrier in a 2·5kHz bandwidth
5kHz	−55dBm/Hz	−70dB
10kHz	−63dBm/Hz	−78dB
20kHz	−73dBm/Hz	−88dB
50kHz	−83dBm/Hz	−98dB

This is very similar to the FT757GX, and in reasonable agreement with the receiver reciprocal mixing figures.

Operation into mismatched loads

To achieve a reasonable power output, it is important that the load impedance is well matched to 50Ω. On 28MHz with full cw power output, the transmitter delivered between 26 and 86W into a 2:1 load vswr, and between 13 and 38W into a 3:1 vswr.

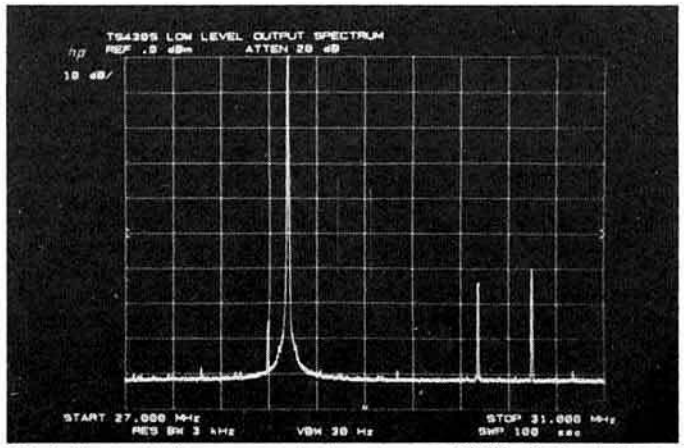


Fig 5. Transverter low-power output spectrum on 28MHz. Horizontal span 27 to 31MHz. Vertical scale 10dB/division

Low power (transverter) output

The transmitter power amplifier stages are disabled by inserting a seven- or eight-pin DIN connector in the X.VERTER socket and grounding pin 4. This is not immediately obvious and is not described in the manual. About 0dBm cw and p.e.p. ssb output is available from pin 7. Above 0dBm output the spurious products increase rapidly. Leakthrough of the 39·225MHz second-conversion oscillator is fairly high at −33dBm on all bands. Fig 5 shows the output spectrum on 28MHz.

Other measurements

Frequency indication and stability

The frequency drift on 28MHz amounted to 50Hz during the first hour from switch-on. On cw, the frequency display indicated true transmit frequency which is correct for received signals with an 800Hz beat note.

Battery operation

The current consumption on receive was about 1A, and on full power transmit 17A. The receiver operated satisfactorily down to a supply voltage of 9·6V, and the transmitter down to 10·7V. The power was reduced by about 15W at 11V supply.

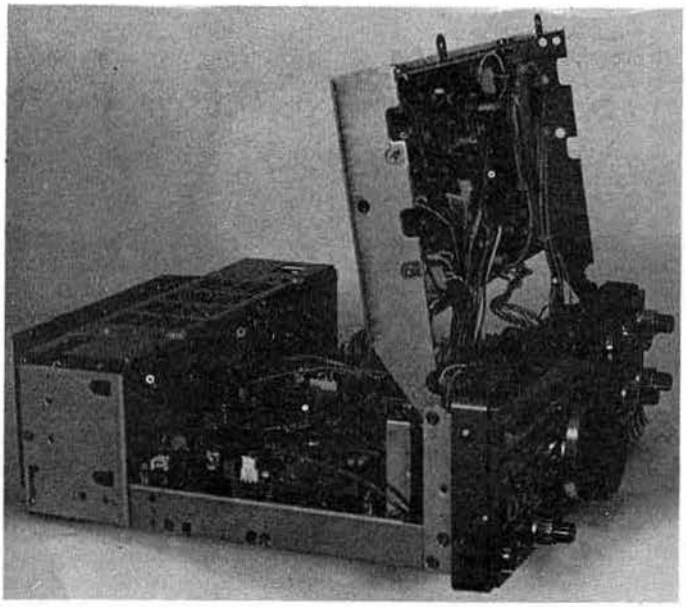
Transmit-receive switching speed

As with the FT757GX, a measurement was made of the time taken to switch between transmit and receive, important for Amtor operation. The time taken to mute either the transmitter or the receiver was about 2ms. The receiver took 50ms to recover to full sensitivity, and the transmitter 25ms to give full output. These latter two times need speeding up for satisfactory Amtor operation.

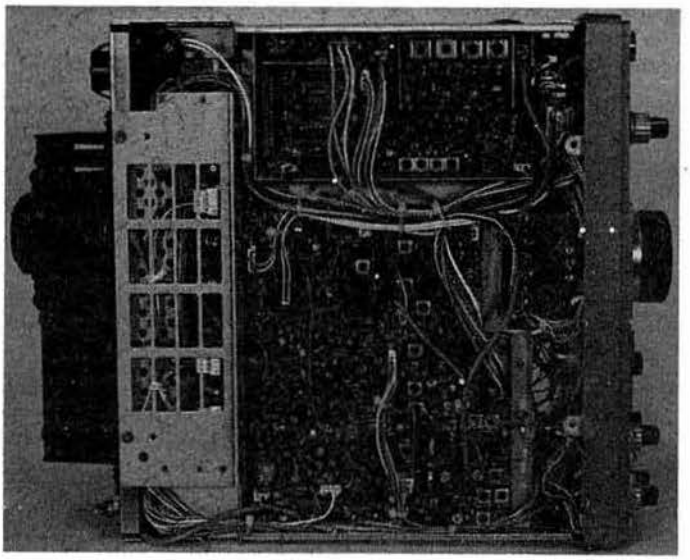
On-the-air performance

The TS430S was easy to use and the controls well laid out ergonomically on the front panel. The receiver sounded clean and generally performed better than the FT757GX, particularly in the presence of strong adjacent signals. The frequency synthesizer is one of the best that the reviewer has used. With an absence of clicks and at 10Hz per step, the tuning characteristic was just like an analogue vfo. This is much better than the FT757GX. The dual tuning rate also greatly eased rapid changes from one end of a band to the other. The audio quality was good but the speaker rattled at high volume levels. This may have been a fault of the particular unit obtained for review. The measurements showed that the agc decay time varied significantly with signal level, being much shorter with stronger signals. There is unfortunately no user control over the time constant and, while the agc performance on ssb seemed satisfactory, on strong cw the decay time was often too short. If a.m. receive operation on the broadcast bands is required, the wider bandwidth i.f. filter option is a must. The ssb filter is far too narrow for this use, making a.m. almost unreadable. The noise blanker was totally ineffective on the "woodpecker".

On transmit, good quality audio reports were received on ssb provided the drive was not advanced too high. The speech processor added extra punch. The FT757GX audio quality was reckoned to be slightly superior, but often opinions here differed. On cw just audible key clicks were reported immediately adjacent to the transmission.



TS430S with covers removed, showing the construction



Bottom view of the TS430S with covers removed

User reports

The January 1985 issue of *Radio Communication* contained a questionnaire requesting user reports on items of commercial equipment, and of the many hundred replies received, 19 concerned the TS430S. All 19 appeared satisfied with their purchase; 18 stated that they would buy the same again and one was undecided. Five of the 19 transceivers required servicing, all under guarantee; dry joints appearing to be the most common fault. The best features were considered to be the small size, ease of use and control ergonomics, general coverage receiver, twin vfos and overall performance. The worst features were the noise blanker, no transmit power metering, poor a.m. reception, wide fm receive bandwidth, and uncontrollable fm power output. (The review transceiver was not equipped for fm operation.) Scanning appeared to be the least-used facility.

Conclusions

The TS430S is a popular and versatile transceiver with a good overall performance. Like other transceivers of its type, FT757GX for example, the close-in dynamic range is limited by a wide bandwidth first i.f. filter, but further out the dynamic range is excellent. The frequency synthesizer has an excellent tuning characteristic but, in common with other synthesized equipment, sideband noise is worse than with a well-designed analogue vfo.

Compared with the FT757GX, the TS430S has a better receiver performance in terms of signal handling and a better frequency synthesizer. However, the FT757GX offers considerably more built-in features: keyer, selectable bandwidth filters, fm and extensive interfacing to ancillary equipment. Extra filters and fm operation may be optionally fitted to the TS430S, in which case the price is somewhat higher than the FT757GX.

The basic TS430S is currently £769 and the PS430 mains psu £145. Additional i.f. filters are around £40, and the fm board £45. All prices include VAT.

Acknowledgements

The reviewer would like to thank G3WRR and G3WBN for critical comments on the transmission, and G4GLN for the loan of the equipment.

References

[1] "The Yaesu Musen FT757GX hf transceiver", P. J. Hart, G3SJX. *Rad Com* May 1985, pp352–6.

[2] "The Icom IC720A hf transceiver", P. J. Hart, G3SJX. *Rad Com* February 1982, pp 129–33.

[3] "The Yaesu Musen FT102 hf transceiver", P. J. Hart, G3SJX. *Rad Com* January 1983, pp32–36.

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

MODERN VHF/UHF FRONT-END DESIGN

Ian White, G3SEK*

PART 3. INTERMODULATION ANALYSIS

THIRD-ORDER INTERMODULATION is one of the most common and annoying front-end overload effects. However, it can be analysed, and we can use the analysis to design front-ends. In general, a front-end designed to be resistant to third-order intermodulation will also be resistant to intermodulation at higher orders, and probably also to gain compression. So let's take a closer look at third-order intermodulation.

In Part 2, I explained that third-order intermodulation is an effect caused by two strong parent signals, which drive the front-end beyond its linear range and produce spurious signals called intermodulation products (ips). I also mentioned that third-order ips increase in amplitude three times as quickly as the pair of equal parent signals. Fig 12 plots the power levels of the signals coming out of a "black box" (eg, an amplifier or a mixer) against the input power of either one of the two parent signals. With no input signal, the output is merely noise at the noise-floor power level. At low input levels (point A), the only output signal is the amplified parent, increasing at 1dB/decibel of increase at the input. At higher input levels, the third-order ips appear out of the noise floor (point B), and then increase at 3dB/dB. Ultimately, it looks as if the level of the ips would catch up with the main output signal. The point where they would do so is the third-order intercept point (I).

The strength of the intercept-point concept lies in its simplicity. Its weakness is that intermodulation intercept points do not really exist. Before the ips can catch up with the parent signals, the amplifier or mixer goes into gain compression and its output level flattens off (Fig 12). Thus the intercept point cannot be measured directly; it can only be determined by a theoretical extrapolation of measurements made at lower signal levels. There is no guarantee that real systems will behave in the obliging manner

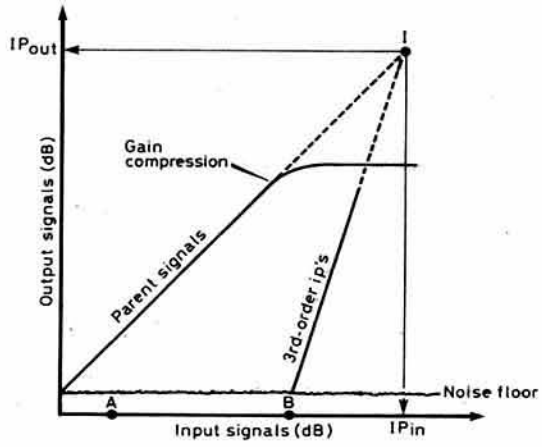


Fig 12. Third-order intermodulation plot, showing intercept point I and corresponding input and output levels IP in and IP out

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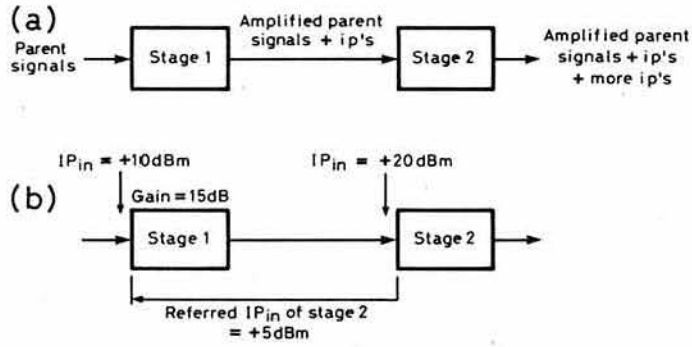

Fig 13. (a) Intermodulation in cascaded stages. (b) Input intercept of Stage 2 is referred to input of Stage 1 by subtracting Stage 1 gain

that the simple theory demands; sometimes they do not. However, agreement between theoretical predictions and *accurate* measurements is generally pretty good, and one thing is for sure: a system designed with the aid of the intercept-point theory will be a lot closer to optimum than a system that has not been designed at all!

In Fig 12 the intercept point (I) can be specified in two ways, by reference to the corresponding input power, IP_{IN}, or to the output power, IP_{OUT}. Either is valid (accepting the fact that both are purely theoretical), and the two differ simply by the small-signal power gain of the stage in question. If an amplifier with a power gain of 19dB has an output intercept of 30dBm (decibels over 1mW), its input intercept is (30 – 19) dBm; ie, 11dBm. Note that the output intercept of an amplifier *looks* better than the input intercept, so beware of anyone who avoids mentioning which intercept he's quoting—especially if he's trying to sell you something! On the other hand, if a diode ring mixer with a *loss* of 6dB has an output intercept of 10dBm, its input intercept is 6dB *greater;* ie, 16dBm. The third-order intermodulation intercepts of individual amplifiers, mixers etc can usually be estimated either from manufacturers' design data or by some simple rules-of-thumb, as we shall see later. It then becomes possible to predict the intermodulation performance of a multi-stage front-end, in the same way as we predicted its small-signal performance in Part 1.

So far we have been thinking about intermodulation in single stages. Now, what about intermodulation in cascaded stages that make up a complete front-end? If two equally-strong signals are fed into the input of a two-stage system (Fig 13(a)), the first stage will produce an amplified output, plus some internally-generated ips. The next stage will accept all these as inputs, and as well as amplifying both signals and ips it will produce yet more ips of its own making. The two sets of ips will be on the same frequencies (having the same parent frequencies), and will usually add in phase at the output of the second stage [1]. If the input intermodulation intercepts of stages 1 and 2 in Fig 13(a) are $IP_{IN}1$ and $IP_{IN}2$, the system input intercept is given by:

$$1/IP_{IN}sys = 1/IP_{IN}1 + 1/(IP_{IN}2 / G1) \quad (6)$$

Let's look at this formula more closely. It may seem vaguely familar, because it is rather like two formulas you have seen before. One is the formula for adding noise temperatures in cascaded stages:

$$T_{SYS} = T1 + (T2/G1).$$

That was equation (2) in Part 1, where I mentioned that the action of dividing T2 by G1 was called "referring T2 to the input", so that it could be added directly to the noise temperature T1 of the first stage. In just the same way we are referring $IP_{IN}2$ to the input when we divide it by G1 in equation (6). The other familiar aspect of (6) is that when the two intermodulation intercepts have both been referred to the input, they add together just like resistors in parallel. As you know, the resistance of a parallel combination is always less than the lowest of the individual resistances. It is exactly the same with intermodulation intercepts: the input intercept of the system is lower than the lowest of the individual stage intercepts—all intercepts having first been referred to the system input. Unlike the chain in the proverb, this one is *weaker* than its weakest link.

Time to try some numbers. Fig 13(b) puts typical values to the general system of Fig 13(a). Using equation (6)

$$1/IP_{IN}sys = 1/(10dBm) + 1/(20dBm - 15dB)$$

This equation cannot be evaluated as it stands. The intercept of the second stage can be referred to the system input simply by subtracting the 15dB gain of the first stage, but power levels in decibels relative to 1mW must be converted to milliwatts before they can be combined. So, more correctly,

$$1/IP_{IN}sys = 1/(10mW) + 1/(3 \cdot 16mW),$$

so $IP_{IN}sys = 2 \cdot 40mW$ or $3 \cdot 80dBm$. Note that the result is lower than either of the individual stage intercepts.

What happens if one stage has a much higher intercept than the other

(both of course having been referred to the system input)? If the second stage is the more "robust", the system input intercept still cannot be greater than the 10dBm limit imposed by the first stage. Conversely, no matter how robust the first stage, IP_{IN}sys cannot be better than 5dBm owing to intermodulation in the second stage. Note also how the effective performance of the second stage is made worse by the gain ahead of it in the first stage. Time after time, we keep coming back to the need to keep the system gain down.

Worksheet methods

In part 1 we used a worksheet (Fig 6) to analyse the noise temperatures and noise figures of a 144MHz front-end. Now we will use the same worksheet technique to analyse its third-order intermodulation performance. Unlike the noise temperature analysis, which would have been incomplete without considering noise from the antenna, the intermodulation analysis can be confined to the receiver alone. Fig 14 shows the front-end with the same stage gains as before, and with typical intermodulation intercepts for each stage. Later I will suggest some ways of estimating these intercepts.

Each intercept is referred to the input of its stage, so the first thing to do is to refer all intercepts to the receiver input. This is done by subtracting the cumulative gain up to that point, remembering that we are working in decibels: check Fig 14. To combine the stage intercepts into a system value, convert everything into milliwatts, and add all the values as if they were resistors in parallel—go on, get out your calculator and do it! The answer you should get is 0·299mW, which converts to −5·23dBm as shown in Fig 14.

So the third-order input intermodulation intercept of this front-end is −5·23dBm. What else does the analysis tell us? As soon as we referred each of the stage intercepts to the input, we could see straight away which are the vulnerable stages. The mixer is the most vulnerable, for its referred intercept (−3dBm) is the lowest of all. Next comes the rf stage (0dBm) and after that the i.f. filter. Thus the first step of improvement would be to change the diode mixer to one with a higher input intercept; but that would only improve the system intercept a little, because of the 0dBm intercept of the rf stage.

Another thing the analysis tells us is the predicted dynamic range for third-order intermodulation. Recalling from Part 1 that the receiver noise temperature was 153K, its noise floor in a typical ssb bandwidth of 2·5kHz is −142·8dBm (from equation (1)—check for yourself). The so-called spurious-free dynamic range (sfdr), also known in this context as the intermodulation-free dynamic range or the two-tone dynamic range, is given by:

sfdr = (input intercept—noise floor) × 2/3 ..... (7)

everything being measured in decibels; ie,

(−5·23dBm − −142·8dBm) × 2/3 = 91·7dB.

Measurements on front-ends like that in Fig 14 agree quite well with our predictions, and so does experience on the bands. Assuming a decently-calibrated S-meter (a big assumption!), with 6dB per S-point and S0 at the noise floor, absolutely no third-order intermodulation should be noticeable until signals reach almost full scale; ie, about S9+40dB. That is the kind of performance you should expect from a modern front-end.

Estimating intermodulation intercepts

If you went ahead and built the whole receiver, had enough test equipment, and also had the knowledge to use it, you could make measurements without having to do all this paper analysis. But that doesn't measure up to my idea of the word "design". The reasons for doing the paper design and analysis are to avoid wasting your time building a front-end that you could have predicted to be inferior, and also to substitute for test equipment which we amateurs don't possess. Of course, a fully-professional approach to front-end development requires both analysis and measurement.

The whole concept of third-order intermodulation analysis rests on three assumptions: that intermodulation in each stage can be characterized by an intercept; that intercepts add up, as shown earlier; and that you know what values to assume. I have already dealt with the first two assumptions. They may not be totally accurate but they're far better than nothing at all. So now we need some information on values; and if manufacturers' datasheets shed no light we can estimate the intermodulation intercepts for ourselves.

Intermodulation intercepts in amplifiers can be estimated by thinking first about gain compression. A Class A amplifier without negative feedback can be considered simply as a controllable resistor in series with a load impedance. In bipolar transistor amplifiers the control is via base current; control in fets is via gate-source voltage, in valves via grid-cathode voltage. The same principles apply to all devices, so for simplicity let's talk in terms of bipolar transistors. The output of the amplifier will be limited either if the device is instanteously turned hard on; ie, the collector-emitter voltage V_{CE} swings right down to zero (voltage limiting); or alternatively if the device is instaneously turned completely off and no current flows (current limiting). Any further increase in drive will result in severe compression. Hayward shows [2] that the maximum output powers in these two cases are approximately:

$V_{CE}^2/2R_L$ for voltage limiting, and $I_B^2 R_L/2$ for current limiting,

where R_L is the load resistance, and I_B is the Class A bias current.

The lower of these two power levels is the maximum undistorted power output of the amplifier. For a bipolar amplifier biased to 20mA at 6V, and terminated in 50Ω, current limiting is the operative factor and occurs at an output power of 10mW. The same upper limit would apply to *any* device, including a GaAsfet or even a valve, biased to the same I_B and terminated in 50Ω. For an old-fashioned bipolar device giving its lowest noise figure at an I_B of only 2mA, current limiting would occur at a mere 0·1mW output —no wonder they had a bad reputation for overload! In these applications, voltage limiting hardly comes into the picture at all, though it may do so for fets or valves terminated in high rf load resistances [3].

Subtracting typical stage gains of 15-20dB or more for modern low-noise devices, the input powers at the compression point will be −10dBm or worse. As a rough rule of thumb, the third-order input intercept of a *good* bipolar amplifier is about 15dB above its compression point [2], and the same may be true of some fets. Badly-biased or non-linear devices may be much worse! Thus the input intercepts of present-day low-noise amplifiers are most unlikely to be above +5dBm, and 0dBm is far more typical [4]. Negative feedback gives some improvement in linearity, and also gets rid of surplus gain, so it can be a highly effective means of breaking out of this "intermodulation trap". However, negative feedback does tend to detract from low-noise performance, and even with heavy feedback the fundamental limitations on *output* voltage or current swings still apply.

In Fig 14 the input intercept of the rf amplifier is assumed to be 0dBm in accordance with the above estimates, while the value of +20dBm assumed for the i.f. amplifier is typical of a feedback amplifier using a bipolar transistor designed for linear operation and biased to about 50mA.

Measurement on diode-ring mixers show apparent variations in third-order input intercepts so the simple theory does not work too well for these mixers. Some of the reasons are not too hard to see. All the power coming out of one of these passive mixers must be supplied either from the incoming signal or from the lo. Thus there is competition for the available power, and the level of each wanted or spurious signal depends on all the other levels as well as on the non-linearities of the mixer. However, as a rough guide the third-order input intercept of a *properly terminated* passive ring mixer is about 5dB above the lo power level [5]. DeMaw and Collins have examined the intermodulation performance of some other types of mixers at hf [6]. Mixers with gain are most likely to limit at their outputs, and can be assessed like amplifiers.

It is not safe to assume that *any* passive circuit device is immune to intermodulation without careful examination of how it works. Resistors are

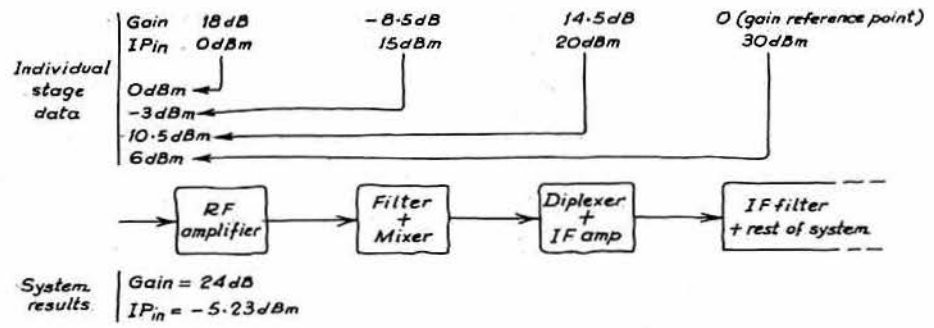

Fig 14. Intermodulation analysis of receiver from Part 1 of this article

a fairly safe bet, according to Ohm's Opinion, and so are most capacitors. But variable-capacitance diodes will intermodulate impressively if the instantaneous signal voltage nearly cancels out the reverse bias. Similar problems can occur with all kinds of diodes (including the "parasitic" diodes on transistor chips) so diodes should be firmly biased either on or off, and varicaps should be avoided. Any kind of ferrite or dust-iron cored device can cause intermodulation unless the magnetic material is operated a long way below saturation. Peter Chadwick, G3RZP, has pointed out the possibilities of intermodulation even in such apparently harmless devices as crystal filters [7], and we saw in Fig 14 that this can indeed be significant in high-performance front-ends.

Finally, remember that all these methods of estimating intermodulation performance are approximate, and that they generally apply to idealized devices of their type. The performance of badly-chosen or badly-used devices will be *worse!*

The TCALC program

TCALC is a computer program to analyse the noise and intermodulation performance of receiver front-ends. It works on exactly the same principles as the noise analysis in Part 1 and the intermodulation analysis described earlier. Stages are numbered backwards towards the antenna, starting with Stage 1 which is always the "rest of the system". The program works interactively, stage by stage. It first asks you what kind of stage is coming next, (eg, an amplifier or an attenuator) and then prompts you to enter appropriate data. TCALC then calculates the noise and intermodulation performance of the system, referred to the input of that stage, and then asks you about the next stage.

A particular feature of TCALC is the ease of repeating a calculation. You can change the input data if you want, or a single keystroke recalls the old data for any stage you want to leave unaltered. Thus you can quickly optimize the system performance by comparing new and old results.

Two versions are available, one written for the BBC micro and the other in Microsoft Basic-80, the nearest thing to a common Basic dialect. Both versions are written for ease of understanding rather than economy or speed, for they occupy little memory and run very quickly anyway. Of the two, the Microsoft version is recommended for easier translation into other dialects of Basic.

A listing of the Microsoft Basic version of TCALC appears in the June 1985 issue of the RSGB *VHF/UHF Newsletter*. You can also obtain either the BBC Basic or the Microsoft Basic listing by sending an A4 sae to *VHF/UHF Newsletter,* PO Box 73, Hereford HR2 9EW. Please don't forget to state which version you want.

Noise analysis

The program starts by telling you that each stage can be called either an AMPlifier, a MIXer, an ATTenuator, a CABle or an ANTenna. Each label is recognised by its first three capital letters, and treated accordingly.

Inside the program, an AMPlifier stage is treated the same as a MIXer, the different labels being purely for your own convenience. The program asks you for the stage's noise temperature or noise figure (nf); for convenience a value less than 20 is assumed to be a nf (in decibels), while any greater value is assumed to be a noise temperature (in Kelvins). AMP/MIX stages also have gain, so TCALC asks for an input in decibels; negative gain values (losses) are of course allowable. Internally the program works in terms of noise temperatures and ratio gains/losses, as I recommended in Part 1. TCALC automatically treats the first stage, the "rest of the system", as an AMP/MIX type and sets its gain to 0dB as we did in the worksheet example.

ATTenuators and CABles are the same as far as the TCALC is concerned, and the only input requirement is the loss in decibels. CAB or ATT should also be used for other devices that introduce attenuation, such as filters. The program assumes that the attenuator is at a physical temperature of 290K in order to calculate the noise contribution from its resistive losses.

The only input requirement for the ANTenna is its noise temperature. TCALC recognizes that the antenna is always the final stage, though if you want to finish the calculation earlier you can input END. The program finally displays the system results and asks if you want to repeat the calculation.

On repeating the noise analysis calculation, you are once again prompted stage by stage for input. If you do not want to change the characteristics of any stage, you can re-use the old data by simply pressing the "return" key. To change the input data for any stage you re-specify its type as AMP, MIX etc, and TCALC then asks for your new input data.

Fig 15 is the printed record of a noise analysis using TCALC, corresponding to the worksheet in Part 1 (Fig 6). Note that for the final stage, the antenna, only the total noise temperature is displayed (because noise figure and cumulative gain have no meaning in this context).

Intermodulation analysis

The input intermodulation intercept of each stage needs to be referred to the system input, before all can be combined using equation (6) to give the input intercept for the whole system. For TCALC to do this, it must already know the gain of every stage in the front-end, so you have to start with a noise analysis which gives the program the gain information it needs. In the

```
Stages are numbered backwards towards antenna
'Stage 1' always represents the rest of the system: specify its noise figure
or noise temperature.
For all subsequent stages you are asked to specify the type.
  The following types of stages are recognised by their first 3 CAPITAL letters:
AMPlifier or MIXer, CABle or ATTenuator, ANTenna, END.

STAGE PARAMETERS                          SYSTEM PARAMETERS
                                    T(K)        NF(dB)      G(dB)
Stage 1 (rest of system)
T(>20K) or NF(<20dB): 6.0
                                    864.5       6           0
Stage 2 Type: AMP
T(>20K) or NF(<20dB): 2.5
Gain (dB): 14.5
                                    256.4       2.75        14.5
Stage 3 Type: MIX
T(>20K) or NF(<20dB): 9
Gain (dB): -8.5
                                    3828.5      11.52       6
Stage 4 Type: AMP
T(>20K) or NF(<20dB): 1.2
Gain (dB): 18.0
                                    153         1.84        24
Stage 5 Type: CAB
Loss (dB): 0.4
                                    195.7       2.24        23.6
Stage 6 Type: ANT
Ant noise temp (K): 200
                                    395.7
================================================================================
Repeat, Intermods or Quit (R/I/Q)?
```

Fig 15. Printer output of noise analysis using TCALC, corresponding to the Worksheet (Fig 6 in Part 1)

```
THIRD-ORDER INTERMODULATION ANALYSIS

INPUTS
3rd order input intercepts for 'rest of system' and AMP/MIX stages.
Enter values in dBm, or RETURN to input a high value.

OUTPUTS
For each stage: 3rd order input intercept, referred to system input.
 For whole system: input intercept (dBm), noise floor (dBm), dynamic range (dB).

STAGE PARAMETERS                          SYSTEM PARAMETERS
                                  T(K)    NF(dB)    G(dB)    IPi3(dBm)
Rest of system ip3 (dBm): 30
                                  864.5   6         0        6
Stage 2 (AMP) ip3 (dBm): 20
                                  256.4   2.75      14.5     10.5
Stage 3 (MIX) ip3 (dBm): 15
                                  3828.5  11.52     6        -3
Stage 4 (AMP) ip3 (dBm): 0.0
                                  153     1.84      24       0

Whole receiver:                                               -5.2
Noise floor (2.5kHz) = -142.8dBm
Dynamic range = 91.7dB
================================================================================
Repeat, Intermods or Quit (R/I/Q)?
```

Fig 16. Printer output of TCALC intermodulation analysis corresponding to Fig 14

intermodulation analysis, TCALC steps through stage by stage, displaying the existing data on stage type and cumulative noise temperature, nf and gain. Only if the stage is an AMP/MIX will you be asked for its input intercept. CAB/ATT stages are assumed to be intermodulation-free [8], and the same can be assumed for AMP/MIX stages by simply pressing "return" instead of entering an intercept value in dBm. The program then displays the input intercept of each stage, referred to the system input. TCALC recognizes when it has arrived at the system input, and then displays the system input intercept, the noise floor in decibels relative to 1mW and the intermodulation-free dynamic range in decibels.

Fig 16 is the printed record of an intermodulation analysis corresponding to the worksheet (Fig 14). There are two ways of entering the +30dBm intermodulation intercept of the i.f. filter: the method used in Fig 14 is to absorb the filter into the "rest of the system" and assign a +30dBm intercept to the latter; another more general way is described in [8]. Note also that for the intermodulation analysis the chain of stages in Fig 16 has been cut short at the receiver input.

Using TCALC

After typing TCALC into your own micro, translating the Basic where necessary, use Figs 15 and 16 to check that it works properly. Also make sure that the results of previous calculations are accurately recalled. The general objective of the screen layout is to keep inputs on the left-hand side and results on the right, taking advantage of an 80-column display. If your display is narrower you may have to make some compromises, and old results will disappear more rapidly off the top of the screen.

TCALC is not intended to make noise and intermodulation analyses more accurate: it is intended to make them more convenient. With old-fashioned front-ends, with their vast excesses of unnecessary gain, you could get away with comfortable generalizations about the effects of individual stages on system performance. But those generalizations are not true in modern front-end design. Today we are trying to keep front-end gain as low as possible, and minor changes to a single stage can affect the performance of the whole system. Even so, you are still tempted to guess at results, especially if the alternative is yet another marathon session with a pocket calculator. With TCALC you can *know* the answer in a couple of minutes—and find out (as I did) how poor your guesses usually are!

TCALC and the ideas behind it are all analytical techniques, and you have to create an initial design before you can start to analyse and optimize it. It is a lot easier to optimize a good initial design than a bad one, and Part 4 will show that the main difference lies in good or bad gain distribution.

Notes and references

[1] The assumption that ips will add in phase (coherently) is pessimistic, so any surprises should be pleasant ones. Coherent addition will apply either in wideband systems, where incidental phase-shifts are low, or (as here) where the frequency separations are small.

[2] *Introduction to Radio Frequency Design,* W A Hayward (Prentice-Hall Inc, Englewood Cliffs, New Jersey, 1982, ISBN 0-13-494021-0), Chapters 1 and 6.
NB. There is a misprint in the formula for the current-limited output; the formula given here is correct and so is the rest of Hayward's text on the subject.

[3] A significant exception where voltage limiting may apply is the case of the dual-gate GaAsfet. Unlike silicon dual-gate mosfets, or single-gate GaAsfets, dual-gate GaAsfets have Schottky gates which will conduct if forward biased. John Regnault, G4SWX, has pointed out that owing to the physical layout of the gates on the chip, forward conduction of Gate 2 can limit the peak signal at the drain to 2V or less. In this case, terminating the drain in a high impedance will make voltage limiting *worse* rather than better.

[4] This generalization has been immortalized by G4DGU as "Bartram's Law". (*TT, Rad Com* April 1984, p315). Witness a recent description (in another magazine) of a dual-gate GaAsfet preamp with a "third-order intercept" of +20dBm. You shouldn't need either me or G4DGU to tell you that this intercept was referred to the *output* of the preamp: subtracting the gain of 24dB left the input intercept a miserable −4dBm!

[5] Peter Chadwick, G3RZP, has surveyed a large number of ring-mixer data sheets, and found that the third-order input intercept is generally about 5dB above the lo level, and the 1dB gain compression point is about 5dB below it. However, achieving the potential intermodulation performance of most diode-ring mixers depends very much on proper termination of the input, lo and i.f. ports.

[6] "Modern Receiver Mixers for High Dynamic Range", Doug DeMaw, W1FB, and George Collins, AD0W. *QST* January 1981, p19. Hayward gives a good description of diode-ring switching mixers in Chapter 6 of *Introduction to Radio Frequency Design.*

[7] "Dynamic Range, Intermodulation and Phase Noise", Peter Chadwick, G3RZP. *Rad Com* March 1984, p221.

[8] Normally it is convenient for TCALC to assume automatically that passive attenuators (CAB/ATT stages) contribute no intermodulation. Intermodulation in such stages can still be introduced by making TCALC treat them as AMPlifiers. For example, a crystal filter with an insertion loss of 3dB can be described as an AMP having a noise figure of 3dB and a gain of −3dB. The result of the noise analysis remains exactly correct, the only penalty being that the filter is given the inappropriate label "AMP", but it now becomes possible to input an intermodulation intercept.

TO BE CONCLUDED

Modifying receiving-type variable capacitors for use in transmitting applications

A R THOMSON, GM3AHR*

ON RETURNING to the hobby after an absence of some years, and having lost or given away the contents of the junk box, components, etc, I was faced with the problem of finding wide-spaced capacitors to build an atu. Not having the time or the patience to search for second-hand commercial capacitors, and the cost of new ones being so high, I decided to try modifying receiving types.

Not all of these are suitable and, as a guide, the minimum size I used were 2in long, and 1·75in wide for the main body of the capacitor—larger sizes would be even better—the size quoted is for a two-gang capacitor. Smaller sizes are considered unsuitable because the plate material is too thin and easily damaged. These capacitors are readily available but it might be advisable to enquire beforehand about the size before purchasing.

The modified capacitors have proved quite successful for P.E.P. powers up to the legal limit in the atu, and there is no reason why they cannot be used as plate tuning capacitors up to about 200W P.E.P. Their use is not recommended for higher powers, where problems may be encountered due to heating at the junction of the rotor plates and the shaft. The plates are a press fit on to the shaft, and a high circulating current may cause losses at these points. The fixed plates are riveted in and should not cause problems.

It should be borne in mind that the original capacitance will be reduced by a factor of four, but higher capacitance can be obtained by connecting two or more sections in parallel. Depending on the final capacitance required, the reader can purchase two-, three- or four-gang types.

Dismantling the capacitor

If the capacitor is of the type with an adjusting screw at the rear, remove the locknut, screw and ball-bearing and put in a safe place for use later. Unsolder and remove the earthing springs. Rotate the moving plates to minimum capacitance, and the complete rotor can then be eased backwards and removed. Remember to catch all the ball-bearings at the front, they will be required on re-assembly! If the capacitor does not have an adjusting screw at the back, do not worry, the modification can be carried out with the rotor in position. With the rotor out the fixed plates can now be removed by unsoldering from the ceramic pillars; I use a fairly large iron for this, 60 to 100W is suitable. I find that the easiest way to get rid of the excess solder is to quickly flick the work away from you after applying the iron. Make sure no one is in the way when doing this; hot solder is extremely painful, and dangerous if it enters the eye. The best place is in the workshop and definitely not in the house—the XYL will not take kindly to you cutting bits out of the carpet to get rid of the solder. Do not apply too much pressure with the soldering iron, the ceramic pillars are easily broken. It is also wise to keep hold of the fixed plates when carrying out this work, as they are liable to fly through the air with the last bits of solder. This will do them no good if they hit a solid object, such as a vice.

Removing the excess plates

Every other plate is removed in both rotor and fixed plates, and in each case start with the second plate from the front of the capacitor. Refer to Fig. 1; for clarity only a few plates are shown. Start with the moving plates, since these are the easiest to deal with and will give you confidence when dealing with the fixed plates! Grip the spindle of the capacitor in a vice, taking care not to damage it in the process. Refer to Fig. 2, which shows where the plate to be removed should be gripped by a pair of long-nosed pliers. A steady

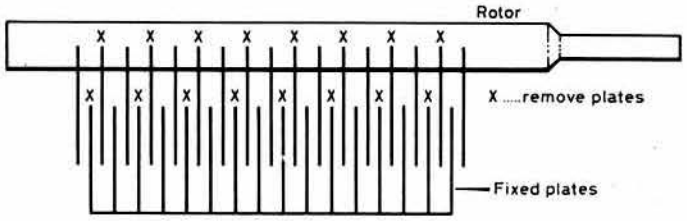

Fig 1. Illustration of plate removal

pull in the direction indicated should result in the plate coming free. Proceed with the other plates to be removed.

The fixed plates are usually riveted into two plates, and this riveting must be removed by filing before the required fixed plates can be pulled free. Position the group of plates in a vice so that one of the side plates is facing upwards and at a slight angle away from you. Only apply sufficient pressure by the vice to hold the group of plates firm, they are easily damaged. File away the riveting of the plate to be removed till it is flush with the end plate, and continue with the other plates. Turn the group of plates over and continue with the other end plate, but make sure than the correct plate to be removed is being filed. It is all too easy to start filing a plate which is to be left in.

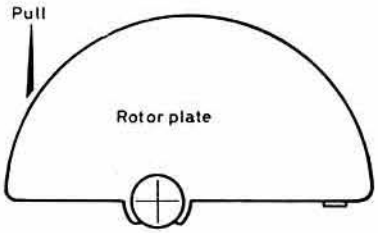

Fig 2. Gripping point on rotor plate

When all filing is completed grip the edges of the end plates in the vice, ie with the fixed plates lying parallel to the jaws of the vice and the top edge of the fixed plates facing upwards. Use only sufficient pressure by the vice to hold the assembly firm without distortion taking place. Starting with the inner plates, grip the plate near the end-plate with the long-nosed pliers and pull the plate upwards, at the same time giving some sideways movement to the pliers. If the plate does not come free, try at the other end, see Fig. 3 for details. Keep a close watch on the whole assembly for signs of distortion during the removal exercise, and adjust the vice pressure as necessary. If care is exercised there should be no problem. I have modified six capacitors to date, and so far there have been no failures.

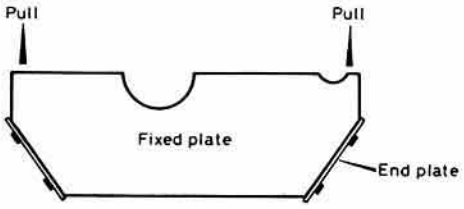

Fig 3. Gripping points on fixed plate

Reassembly of the capacitor

Before assembly, wash all the parts in warm, soapy water, using a soft brush to remove all traces of dust from between the plates, and use a hairdryer to dry all the components.

Place the fixed plates loosely into the framework and insert the moving plates, with the plates fully open, after fitting the ball bearings with a little petroleum jelly. Replace the rear ball bearing and screw, adjust the tension for ease of turning of the rotor and tighten the lock-nut. Position the fixed plates so that the moving plates correctly mesh and fully close the rotor.

From cardboard equal in thickness to the new distance between the plates, cut pieces about 0·25in wide and 0·75in long and insert one between the front rotor plate and the front fixed plate, and between the front rotor plate and the second fixed plate. This should be done at the edge of the plates and then at the other three corners. The plates will then be held at the correct distance apart.

(Continued on page 460)

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Technical Topics

by Pat Hawker, G3VA

THOSE OF US who do our best to provide technical information for the columns of journals and magazines seldom retain our youthful illusion that people read and remember everything they can lay their hands on, even about subjects of interest to them. Technical papers and articles on radical and innovatory topics seldom attract widespread attention—at least not immediately. It is left to the historians to pin-point (or argue about) just when a new idea was first published—and by whom.

THIS MONTH

The experimental tradition
Safety, mains equipment and high energy batteries
Crystal filters and the stenode receiver
Fishing rod antenna supports
RFI and home computers
Variable bandwidth ladder filter
Quartz crystals, holders and oscillator stability
Linear transmitters with cartesian feedback
Delightful dipoles?
Constant-k crystal filters
Reducing ultra-violet radiation damage
Getting on air with homebrew QRP
Monopoles, vertical dipoles and the five-eighths vertical
Adjusting vhf phasing lines
Noiseless negative-feedback on 144MHz
Hard-to-come-by components

The experimental tradition

Today, some members are much concerned at the apparent lack of curiosity into technical matters. How different it was, they say, in the old days of home-brew—or was it? Idly thumbing through some old copies of the *RSGB Bulletin* my eyes fell on an editorial I wrote for the June 1949 issue: *The experimental tradition*. To quote briefly from that 36-year-old piece:

"There can be few members who have not been assailed at times by the doubt that as Amateur Radio becomes technically more and more complicated, so the old experimental zest will recede further and further into the background.

"What was important, in the early days, was an alert, observant mind, backed by some mechanical skill and unlimited patience. Possessed of such assets, an amateur could, in a matter of months, assimilate current ideas and practices and pass rapidly to the stage where he was able to contribute usefully to work of a genuine experimental nature. Much good work was accomplished by amateurs while in their teens and even—as in the case of one of our notable pioneers, Cecil Goyder (2SZ Mill Hill School)—while still at school.

"What is the position nowadays? During and since the war, millions of pounds have been poured into radio research establishments. Techniques have advanced so far that the experts themselves can hope only to specialise in some relatively small section of the field of electronics.

"Does this mean that the experimental work of the amateur has become valueless? Or are there still opportunities for the average amateur who makes no claim to more than a moderate technical knowledge coupled with unbounded enthusiasm?

"We believe, most emphatically, that the amateur can and will continue to play an important role in experimental research and development . . . The history of science provides many examples to prove that it is a new approach towards, or a fresh outlook upon, a subject rather than profound learning that leads to far-reaching discoveries. There are many unexplained gaps in the science of radio . . .

"The amateur, today, should be ready to search amongst the accumulated mass of scientific data for ideas which are capable of application to our problems. By refusing to be overawed by the complexity of modern radio, by turning a receptive ear towards new ideas and by encouraging those who—whether they are new or old hands at the game—have something fresh to say, so shall we all ensure that the experimental tradition of Amateur Radio is fully maintained."

With the advantage of hindsight, it is possible to see that indeed the radio amateurs of 1949 to 1985, both young and old, have successfully maintained the experimental tradition; have still, despite the far greater complexity made possible by integrated circuits, contributed to the development and practical application of novel techniques. Perhaps one reason for this is that so much of the progress in radio communication is still based on the implementation (with modern components) of ideas first propounded many years ago.

Joshua Sieger, a noted innovator, puts it thus: "In my many years associated with television in the pre-war days, with radar during the war, and my gas detection company post-war, I have always found that looking backwards at the inventive genius of people in the latter part of the last century and the early part of this century exercises the mind to invent again with all the devices which have become available . . ."

Safety, mains equipment and high-energy batteries

The March *TT* included some items dealing with safety regulations, BS415, and also raised the question of mercury in high-energy batteries. This prompted Peter Poole, G3ENV, who is Electrical Adviser in the DTI's consumer safety unit, to send along some further useful comments. On mains equipment he wrote:

"Mains-powered equipment is subject to the Electrical Equipment (Safety) Regulations, 1975 as amended in 1976. These regulations apply at the point of sale irrespective of the source. If you find an item of electronic equipment which appears not to comply with BS415 it is highly likely that it will contravene the safety regulations and I would advise anyone to bring the matter to the attention of their local trading standards department. The regulations also apply to the sale of second-hand goods, although there are certain exemptions which relate to the supply of maintenance spares which might have been acceptable at the time of the original equipment sale."

This sounds a formidable barrier to the sale of a lot of imported equipment, but regulations are only effective in so far as they are fully enforceable and I suspect that a lot of equipment changes hands that would not meet all of the stringent provisions of BS415 as mentioned in the March *TT*.

On the question of mercury in alkaline-manganese batteries, G3ENV takes issue with my use of the phrase "significant amount". He recognizes that the Japanese public has become extremely sensitive to the issue of mercuric poisoning (my notes were based on a report in the scientific journal *Nature* from their Tokyo correspondent) but considers that the amount of mercury contained in alkaline batteries is so small as to be insignificant. He writes:

"What there is being in the form of amalgam on an electrode. They do, however, contain potassium hydroxide and have a much higher output power capability in that they can produce 15A on short-circuit and achieve surface temperatures of up to 120°C in the process—lithium and nickel cadmium cells even more so.

"Button-type mercury cells do, of course, contain a significant amount of mercury, and it is for this reason that the Japanese normally specify the much more expensive silver cells. Although mercury cells probably do not present a large hazard to public health, we are concerned at the number which are swallowed by young children. Although this only rarely leads to death it often does involve hospitalization and great distress to parents, and unnecessary expense to the Health Service. May I therefore ask for the hospitality of your column to ask people not to leave button cells lying about in places where they might be picked up and swallowed by infants.

"Modern high-performance batteries need to be treated with great respect, since they are a very potent source of energy and contain toxic materials. However, you may be pleased to know that the use of mercury in cells is likely to fall with the development of new technologies."

Chris Cheney, G3RSE, also takes up the question of the many toxic materials in common use in our shacks. He writes:

"In the 'Mercury is dangerous' item you seem to imply in the final paragraph that nicad batteries are comparatively safe. However, as you

have pointed out in past *TT* items, cadmium salts are toxic. I cannot comment on the relative safety of different types of battery but I am certain that we all assume that many common items are safe, when in fact they are not.

"I have been concerned for some time about the lead in solder—especially the fine powder which results from the use of a 'solder-sucker'. Yet I have not seen anything in any technical literature about the hazard of lead in solder."

In this connection it may be worth reminding readers of an item in *TT* some years ago about the danger of using cored solder over long periods without good extraction of the flux fumes which can lead to asthma-type coughs and wheezing.

Crystal filters and the stenode receiver

If I had to pick one single event in the development of communication receivers as of the greatest importance, without question I would opt for the *QST* articles in which James Lamb of ARRL staff advocated the use of a crystal-gate i.f. filter, so opening the way for high-performance superhet receivers. But Lamb, as he frankly admitted at the time, was not responsible for the initial development of the crystal filter. The credit for this belongs to the UK work of Dr J Robinson and Ernest Gardiner, G6GR, in connection with their development of the "stenode radiostat" principle. Yet I suspect that only a minority of readers will ever have heard of stenode reception, even though some elements of their work is found not only in communication receivers but in virtually all medium-wave broadcast receivers.

A stenode radiostat receiver was intended to have sufficiently high selectivity to permit the frequency separation between broadcast transmitters to be reduced to perhaps 5kHz without impairing the quality of reception; this was achieved by providing a high degree of compensation in the af section of the receiver. As noted in *TT, ART,* etc many years ago, a receiver fitted with the original form of sharply-peaked filter based on a single crystal can be used very successfully for ssb reception simply by incorporating a suitable form of high-rise coupling network within the af chain: Fig 1(c). This will turn muffled, boomy and virtually unintelligible speech into reasonable quality speech. The principle depends on the shape factor of a single-crystal filter not being as steep as we nowadays expect from a multi-pole bandpass crystal filter. The peaked filter passes the higher audio components of the sideband, although these are greatly reduced compared with the low audio frequencies.

In broadcasting, signal-processing with pre-emphasis of high audio frequencies is increasingly being used for medium-wave a.m. broadcasting to overcome the narrow bandwidth (2 to 3kHz at 6dB down) of most broadcast receivers. In fact, although the term stenode radiostat has passed into history, the principle is still very much alive, although broadcast transmitters still need to be spaced 9 or 10kHz apart.

I was reminded of the stenode principle by finding a detailed article "The stenode radiostat system of wireless reception and its application to television", by E L Gardiner, G6GR, in the June 1931 issue of the *Journal of the Television Society*. To be brutally frank, I do not think the stenode system ever did prove to have any direct application to television, but G6GR's article provides a survey of highly-selective receivers based either on the use of a crystal filter or alternatively on the use of an i.f. of the order of 20 to 50kHz (a technique which became popular in amateur radio in the 'fifties in the form of the old Q-5er/BC453 adapter). The 1931 article includes a diagram (Fig 1(b)) of the balanced-bridge crystal filter that was subsequently adopted by Lamb. Dr Robinson, accompanied by Ernest Gardiner, made a lecture-demonstration tour of the USA in 1930, and the idea was taken up by the Crosley Radio Corporation. It also came to the notice of James Lamb.

Some years later, G6GR wrote several excellent series of articles on crystal filters, including two-crystal bandpass units, for the *T & R Bulletin,* later incorporated into the war-time edition of the RSGB's *Amateur Radio Handbook*. G6GR is still active in retirement in the Torbay area. With Robinson and Lamb he was one of the founding fathers of the modern crystal filter.

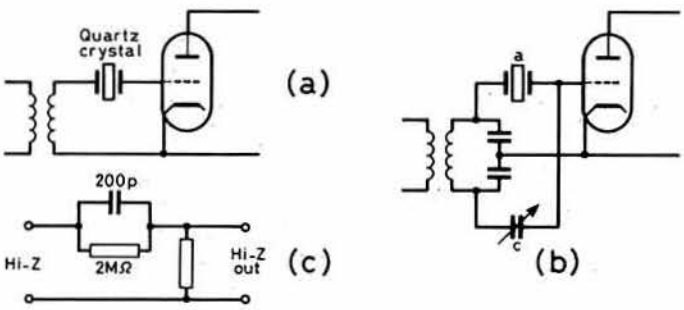

Fig 1. (a) Simple crystal filter, and (b) the well-known balanced crystal-gate filter with balancing (phasing) control as used in hf receivers over many years prior to the general adoption of multi-crystal bandpass filters. Both diagrams are from G6GR's 1931 paper on the stenode radiostat receiver principles devised by Dr J Robinson in 1929. (c) Simple tone correction network which enables ssb to be received through a crystal filter of the type shown in (b). Values are suitable for high-impedance (old-style phone output sockets) and require modification for low-impedance af circuits

Fishing rod antenna supports

Robin Greenwood, G3LBA/PA3ACQ, noted the use of glass-fibre fishing rod blanks by Les Moxen, G6XN, for his "poor man's log periodic" antenna arrays (*TT* March) and his comment that these are difficult to find. Writing from Holland, G3LBA reports that very long glass-fibre rods are available there at modest cost (hfl 100) and that he has found them superb for antenna use and apparently indestructable even in the high winds that sweep across Holland. He reports:

"I have a vertical antenna mounted on the end of the house. This is made of a combination of a faulty wind-surf mast (wind surfers are extremely fussy about any blemishes) and a 6·5m fishing rod. The overall length of the unguyed vertical is 9·5m, and it is crowned by a 1m-diameter capacitance hat made of stainless-steel welding rod. The antenna is used on 1·8 to 10·1MHz in conjunction with loaded counterpoises.

"During an equinox, winds here regularly peak up to 160km/h and yet these rods survive, presumably because they bend dramatically. After such a blow, I look and find the antenna is still there and absolutely vertical. Such rods would lend themselves well to the type of construction suggested by G6XN, particularly for those of us who operate on the lower portion of the hf spectrum.

"These very long fishing rods are available in the UK, but as usual the price is higher than over here: for the wealthy they are available also in carbon fibre. They are delivered in concentric form, each section plugging into the next. I bind each joint with self-amalgamating tape, and the joints do not work loose. The wire up the centre needs a light foam silencer to stop it from rattling, and for this I use central-heating pipe insulation which I cut for thin sections. The tubes must not be clamped but be a tight fit at the points of contact with the support, which should overlap about 1m."

RFI and home computers

Sources of rfi, or the many domestic electronic systems that are vulnerable to rfi, range from smoke detectors to burglar alarms to almost anything fitted with a cmos microprocessor. Similarly, weak-signal reception can be affected by almost any digital system that uses "clock" oscillators and has high-frequency pulses rushing around in unshielded, unbypassed circuits. This can include electronic telephones which often have pulse diallers with crystal-controlled "clocks". High-speed pulses can be quite a potent source of rfi (particularly on lf and mf) but fortunately the power involved in many devices, such as digital watches, is very low indeed. Home computers are a different kettle of fish, with many of the models on sale in the UK unlikely to pass the strict limits now laid down in the USA for maximum radiation levels.

Despite the tighter control exercised by the FCC in the USA, interference arising from electronic consumer equipment and from home computers is still recognized as a difficult problem. In *Ham Radio* September 1984, Dale Williams, K3PUR, discusses the whole question of "electromagnetic interference and the digital era", showing the importance of component selection, earthing and shielding in attempting to reduce interference. He notes that "digital electronics has overwhelmed the rf environment with binary clocks that produce harmonics into the gigahertz range, plastic equipment enclosures, wall-plug power supplies and unshielded ribbon cable that acts as an antenna". The shielding characteristics of coaxial cable, he points out, not only depends on the braid coverage, but also on the quality of the connectors used at both ends of the cable; it is pointless to use the best-quality double-shielded cable with connectors that are incapable of providing more than 60db attenuation to leaking signals. The bolting together of a shielding enclosure can reduce isolation by some 25dB when the hole spacing is increased from 1 to 5in. He suggests, as a general rule of thumb, that where rf gaskets are not used, or the enclosure contains discontinuities such as corner bend strain relief openings, multiple bolt-together sections, openings for switches, fuses, etc, maximum attenuation is likely to be limited to about 30dB. In most cases, fortunately, the provision of decoupling capacitors and some ferrite beads will at least minimize the problem.

Variable bandwidth ladder filter

The low-cost variable-bandwidth ladder crystal filter based on a handful of 4·43MHz PAL colour-tv crystals, a few capacitors and a multipole switch remains a useful and effective economy for anyone building or improving an ssb/cw transceiver. Although a number of designs have already appeared in *TT* and elsewhere, it was interesting to note a full constructional article, including pcb layout in a compartmentalized screening box appearing in the East German publication *Funkamateur* Nr 1/85 by H R Langer, Y27YO.

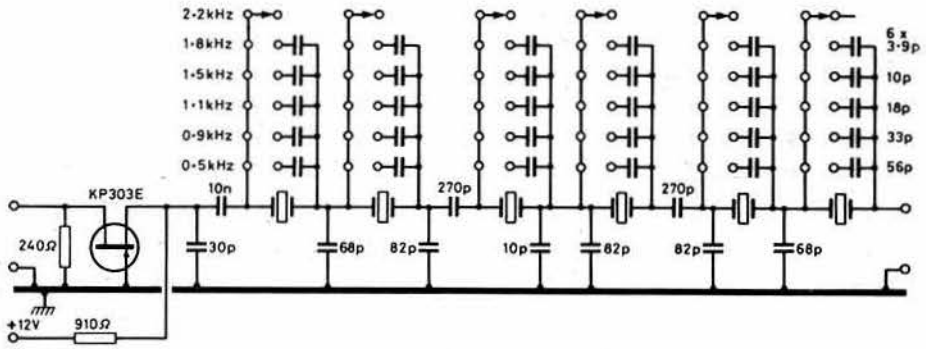

Fig 2. Y27YO's low-cost variable-bandwidth ladder crystal filter using PAL-tv 4·43MHz crystals. Careful layout and shielded construction are needed to achieve optimum results

While it has been made clear in earlier articles that there is more than one style of PAL crystal, requiring slightly different capacitances to achieve a stated bandwidth at a given impedence, the values suggested by Y27YO should prove a useful starting point: Fig 2.

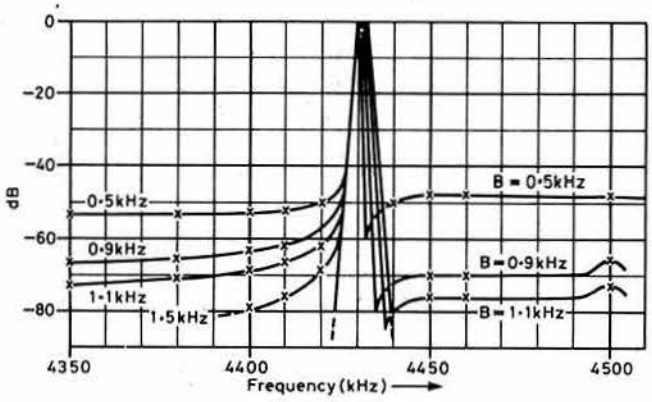

Fig 3. Response curves of the Y27YO filter. The reduced ultimate rejection of the narrower responses reflects the higher value of capacitors connected across the crystals

The slope of the filter on the high-frequency side will tend to be steeper than on the low-frequency side, and account should be taken of this when the filter is used in ssb receivers or exciters. The ultimate rejection of the filter decreases at narrow bandwidths but should always exceed about 50dB and may be considerably greater than this for ssb: Fig 3. The use of shielding plates and careful layout play an important part in any filter, but construction need not be unduly difficult.

Quartz crystals, holders and oscillator stability

Some basic notes on quartz crystals—emphasizing that these are one of the most vital, yet perhaps least understood, components used in amateur radio equipment—were given in *TT* (January 1984, and see also April 1984, p317). Useful additional information can be found in "Choosing quartz crystals" by Gordon Huyler of Cathodeon Crystals in *Electronics & Wireless World*, April 1985, pp51-3, 55). This shows that modern crystal holders are of four basic types: solder-seal holders, the least expensive but subject to significant long-term "ageing" drift; resistance-weld holders, currently the most popular type and suitable for the vast majority of applications; cold-weld holders that give a further improvement in long-term ageing but cost more; and glass holders for the most rigorous applications such as frequency standards.

Table 1 shows typical tolerances, ageing characteristics etc for these four types of holder.

Table 1. "Accuracy" of crystals in different holders

	Solder-seal	Resistance weld	Cold weld	Glass
Adjustment tolerance, ppm	± 15	± 10	± 7·5	± 5
Frequency/temperature tolerance ppm at −10°C to +60°C	± 15	± 10	± 10	± 10
ppm at −40°C to +90°C	± 40	± 30	± 30	± 30
Ageing at 85°C ppm/annum	± 10-15	± 3·5	± 2	± 1·2

(*Note:* These values are dependent also on other factors, particularly frequency).

Gordon Huyler similarly divides crystal oscillators into a series of increasingly accurate categories: simple "clock" oscillators; simple "packaged" oscillators (spxo) with frequency-trimming capability to permit use in voltage-controlled oscillators (vcxo); temperature-compensated oscillators (tcxo) having a temperature-dependent reactance in the frequency control loop (expensive although home-built versions have been described in the past in *TT*); and oven-compensated oscillators (ocxo) which can achieve stabilities of one part in 10^{10} per day when using a built-in double oven and vacuum flask in conjunction with careful circuit design and used in "secondary standards". A single-oven design can give stabilities of about one part in 10^7 in respect of temperature variations. These characteristics are summarized in Table 2.

Table 2. Stability of four main types of crystal oscillator

	Accuracy in ppm	Remarks
(1) Clock oscillators	50 to 2000	Low cost; logic compatible
(2) Simple package	5 to 100	Standard crystal oscillator Tuneable to frequency
(3) Temperature compensated	0·2 to 5	Low power consumption; instant warm up; modest cost
(4) Oven controlled	0·001 to 1	High precision; long warm-up; high power consumption; cost rises rapidly with stability

(*Notes:* The clock oscillator is the basic crystal oscillator. The distinction drawn between simple-package and clock oscillators is that clock oscillators often do not incorporate any means of frequency adjustment). Tables 1 and 2 from *Electronics & Wireless World* April 1985.

Linear transmitters with cartesian feedback

If you consider that the ssb sections of most amateur bands always seem crowded and noisy, it is interesting to speculate to what degree this situation is due to spurious emissions from transmitters of uncertain linearity. Unwanted intermodulation products cause transmitters to spread out over many kilohertz, and this may be inherent in their design or due to gradual deterioration as valves age and cause flat-topping or the circuits drift out of alignment.

The intermodulation characteristics regarded as acceptable for amateur radio transmitters are considerably more relaxed and less rigorous than those specified for military or professional equipment. The near-in noise output during a two-tone test may be only around 25-30dB down on the peak tones, compared with 40-50dB for high-grade professional communications.

It would significantly help to clean up our bands if spurious noise and unwanted sideband suppression could be reduced to around −60dB, though this would not really be possible without adopting new techniques —and only the public-spirited would rush to buy a new, sanitized rig!

For the past five years or so, V Petrovic and others at Bath University have been developing a special form of negative feedback (polar-loop or cartesian feedback) that offers not only extremely good linearity but also has other advantages, including high efficiency power amplification. These techniques have been discussed before in *TT* and have been implemented by the Bath team to provide hf and vhf transmitters at powers up to about 1kW.

At the recent hf communications conference, a paper by V Petrovic and A H Brown ("Application of cartesian feedback to hf ssb transmitters" *IEE Conference Publication No 245*, pp81-5) describes a 1·6 to 30MHz 100W p.e.p. transmitter in which feedback reduces the third-order products by a massive 37dB, with the products on a two-tone test a remarkable 67dB below the tones. Image sidebands are suppressed by 68dB: see Fig 4.

The use of cartesian feedback not only improves the spectral purity but also results in: (*1*) lower output noise, achieved by reducing the overall gain of the transmitter; (*2*) improved efficiency, obtained by operating the pa

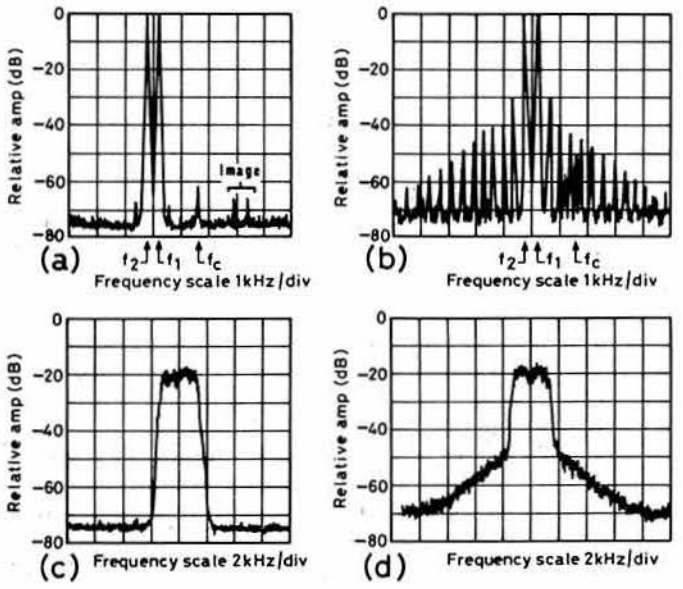

Fig 4. Output spectrum of the 100W p.e.p. hf transmitter developed at Bath University with and without the use of cartesian feedback loops: (*a*) and (*b*) are for two-tone input, (*c*) and (*d*) are with white noise input; (*a*) and (*c*) with feedback, (*b*) and (*d*) without feedback

with reduced bias and using an unregulated power supply; and (*3*) simplified design of the power amplifier, since neither its linearity nor frequency response need to be exceptionally good.

Basically, this cartesian loop transmitter employs phasing-type ssb generation (Weaver third-method) to which the *modulation information* obtained by synchronous demodulation of a sample of the output signal is fed back in quadrature form. In other words, audio signals at 90° to each other are recovered and used as negative feedback. Since the bandwidth of the af signals is much narrower than with rf negative feedback, as used on some ssb transmitters, much larger amounts of feedback can be applied.

The problem of obtaining af signals over the range 300 to 3,000Hz in accurate quadrature by means of phase-shift networks is well known and has been the reason why relatively few phasing-type ssb transmitters are used, particularly where they need to operate over a wide temperature range. The vast majority of amateurs continue to use filter-type ssb generation despite the attractions of third-method and polyphase networks.

The novel feature of this latest transmitter is to use a combination of third-method ssb generation with *filter-type* demodulation to supply the quadrature feedback, using 10·7MHz ssb crystal filters.

Delightful dipoles?

One of several papers presented by well-known radio amateurs (though usually in the professional *alter ego* guise) at the hf conference was one by Maurice Hately, GM3HAT, on the multiband dipole which he is currently marketing as a "dipole of delight". This antenna is based on a UK patent application made in September 1981 on his behalf by the National Research Development Corporation (UK Patent Application GB 2112579, published 20 July 1983).

In effect, GM3HAT claims that by inserting suitable-value capacitors at the feedpoint of a dipole element fed from coaxial cable, he achieves an efficient form of matching/balun that significantly reduces the effect of pick-up on the outer braid of the coaxial cable and thus provides not only an efficient radiator but also a receiving antenna that is much less susceptible to local rfi from tv sets, home computers, electrical appliances and the like. The insertion of capacitors involves a phase-shift that "stretches" the element so that its half-wave electrical resonance approximately equals a physical half-wave; in other words the usual five per cent end-correction does not apply.

The insertion of two capacitors in the element creates an electrical centre-point to which the braid of the coaxial feeder is connected, with also a low-impedance feedpoint (whose impedance can be made to match the cable) on the outer side of either of the two capacitors, and it is to one of these two points that the inner conductor of the cable is connected. It appears to me that this arrangement provides a form of gamma match that minimizes the age-old problem of joining an unbalanced feeder to a balanced element. In practice, GM3HAT then forms a multiband antenna by a series of resonant parallel wires in the accepted manner: Fig 5.

Provided that the capacitors are of the correct value for the frequency involved, the GM3HAT principle would seem to offer useful advantages in achieving a good match on each band over a reasonable bandwidth, and also minimizing pick-up of stray electrical interference on the feeder. Whether all of the advantages claimed by GM3HAT can be fully justified on theoretical grounds is a little more difficult to assess. As I mentioned at the conference, his paper seems to assume that the outer braid of a coaxial cable feeder, regardless of its length, represents an "electrical earth" point. To my mind, it doesn't.

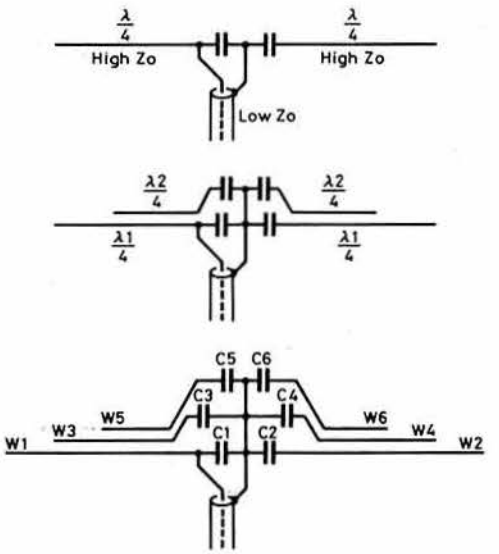

Fig 5. GM3HAT's patented "dipoles of delight" which use capacitors to improve the match between unbalanced coaxial feeders and the balanced elements. The capacitances should have a reactance at the frequency concerned equal to the impedance of the feeder. The incorporation of the capacitors "stretches" the element and at resonance the electrical length is roughly the same as the physical length

But perhaps more important than theory is practice. GM3HAT is enthusiastically convinced that his dipoles are a delight to use and that in time all dipoles will come to have phase-shifting capacitors at their feed points. Only time will tell, but at least full credit to GM3HAT for what is clearly a novel idea that has already won support from a number of those now using this antenna.

Constant-k crystal filters

In *TT* (November 1980, p1157) I drew attention to the symmetrical variable-selectivity crystal filters used by the Germans in a number of their high-grade military communications receivers during the second world war. This form of constant-k filter, the basis of the modern ladder filter, unlike the more usual half-lattice configuration, provided a substantially symmetrical passband which could be narrowed while retaining a reasonably good shape factor from about 10kHz to 200Hz, and could be further improved by using more than one such filter in separate mf i.f. stages.

The arrangement shown in Fig 6, as given in the 1980 *TT*, was taken from one of the articles by Dick Rollema, PA0SE, on German wartime receivers.

A more detailed description of this type of filter has appeared recently in *cq-DL* (March 1985, pp138–40) by Ulrich Fleischmann, DL9LX, together with a bibliography (mostly German text) of sources dating back to 1937, from which it is fairly clear that this type of mf filter was

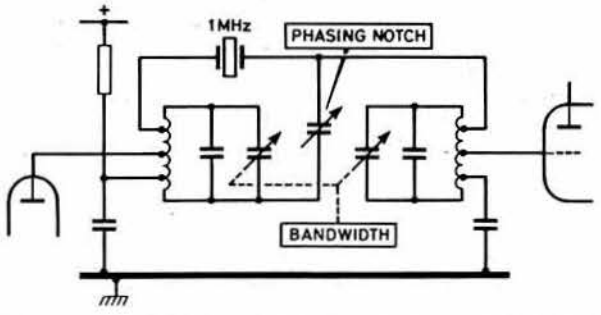

Fig 6. The constant-k 1MHz crystal filter as used in a number of German wartime communication receivers providing a variable-bandwidth symmetrical response plus a phasing notch control

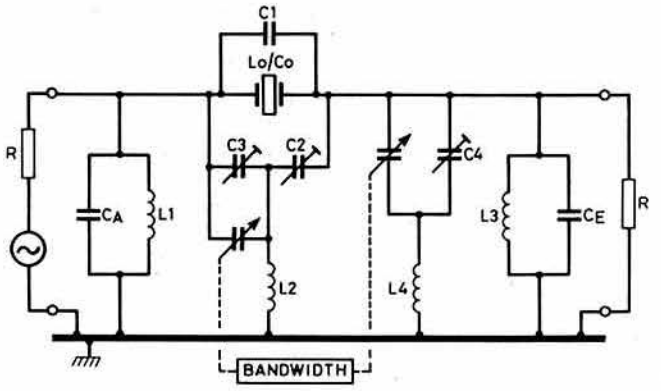

Fig 7. Filter circuit from DL9LX's article

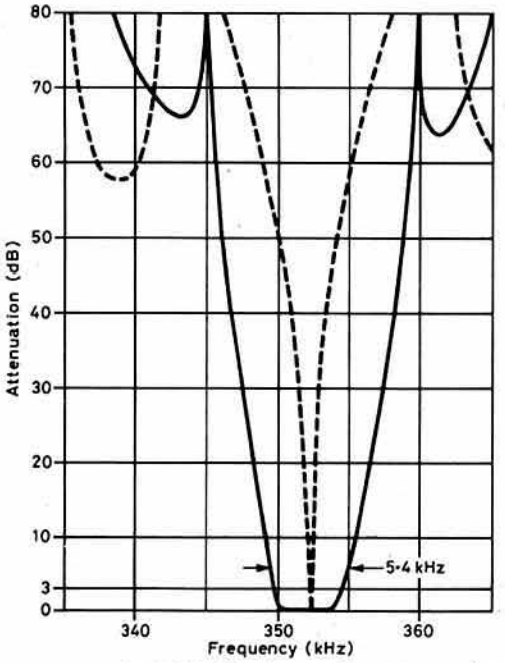

Fig 8. Response curve of a 352kHz filter in a medium-wave receiver possibly with similar filters in two i.f. stages

developed by Telefunken engineers. DL9LX provides information on the design, adjustment and performance of this type of filter. I have not tackled the German text, but Figs 7 and 8, taken from the article, show that for an intermediate frequency filter at mf (352kHz) this filter has much to offer.

Reducing ultra-violet radiation damage

Recent items in *TT* on 300Ω ribbon feeder and self-amalgamating rubber tape have noted the damage that can be caused to materials used outdoors in strong sunlight due to u-v radiation, as well as the better-known degradations brought about by wind, rain, humidity, moisture ingress, etc. Several informative comments have been received from readers.

Dr Constantino Feruglio, IV3VS writes:

"In order to avoid the deterioration of 300Ω ribbon feeders, I put my ribbon inside a length of plastic hosepipe. Since I leave the ends of the pipe open, no problem of condensation arises inside the pipe. I do, however, carefully bend the pipe over at the top to prevent the entry of rain. The weight of the ribbon and plastic pipe is no greater than many coaxial cables (eg RG8U), and rf losses appear to be insignificant. After *four years* in operation my ribbon is still practically 'new'!".

IV3VS does not mention any problems of u-v affecting the plastic hosepipe.

Mike Shepherd, G8YZW, who originally raised the subject of self-amalgamating tape (*TT* January, with comments about u-v from G3JDK in the March issue) comments further as follows:

"Deterioration caused by u-v has always to be taken into account with materials used in full sunlight, as shown by the deterioration of the outer covering of coaxial cables. Similarly, plastic rope often used for mast stays becomes hardened and brittle after exposure to sun and rain.

"In reply to G3JDK I cannot say how 'my' tape will perform, especially as, following my usual procedure, I gave the wrapped areas a good coat of outdoor-quality paint for added protection. Incidentally, I use marine varnish, 'u-v resistant' for all *metal* items, including antenna elements. But as a result of G3JDK's experience of his tape performing badly, I am making up a small test rig with short lengths of tube, coaxial cable and stranded wire all having *tape-only* wrapped joints, and will mount this out-of-doors to find out how it performs when unprotected by paint."

John Tye, G4BYV, also comments on RS self-amalgamating rubber tape as follows:

"I have used this for several years on the coaxial cables on my tower and for my mobile antenna loading coils without experiencing any water or u-v radiation problems. But I do spray it with Holt's damp-start ignition sealer."

Cliff Ranft, BRS1418 (ex-G5RF, VK3NR and VK7FG), notes that while working as a senior radio technical officer with the Australian Department of Civil Aviation in the 'fifties and 'sixties, he used what was called "Bi-seal tape" which he believes stemmed from the USA. This tape was also used by their lines section for outdoor use, including repeater stations located on mountains up to 4,600ft high in bright Australian sunshine. He does not remember any problem being experienced from u-v radiation. He recalls that the mechanism of applying the tape was to do so under a lot of "stretch", as this was said to change the molecular structure and the separate layers then merged to form a homogeneous solid. He writes:

"The problem of u-v is often called 'photo-degradation', and we had problems when using coaxial cables with a black or brown outer cover. We overcame these temporarily until the introduction of white-covered coaxial cable by covering significant lengths of cable with ordinary 'household' white adhesive tape. Until this was done the brown cable particularly used to come up in rough 'bubbles' and even sometimes crack. The white wrapping shaded the cable from direct sunlight and, more importantly, *reflected* it. The white adhesive tape, of course, contributed nothing to the actual waterproofing.

"White adhesive tape might well overcome any u-v problems with self-amalgamating rubber tape. I am not sure if 'Bi-seal' tape is available in the UK. Personally, I use a good dollop of 'not-properly-stirred' gloss paint for sealing purposes. This is very effective for foam-type coaxial cables, but goodness knows what its electrical properties are!".

Finally on this topic, a note from T. A. Sear, G4MGD, a planning engineer with British Telecom, who has been professionally involved with life-expectancy tests on various sealing and weatherproofing techniques, including self-amalgamating tape. He writes:

"A self-amalgamating tape seal is expected to last several years even in exposed locations. However, it is important that the seal is performed correctly, as follows:

(1) As with any seal, the sheath must be clean, dry and grease-free.

(2) Do not use old self-amalgamating tape. One-year-old should be the maximum.

(3) Warm the tape by keeping it in an inside pocket prior to use.

(4) Stretch tape until it is about 75 per cent of its original width.

(5) Apply tape under tension and with 50 per cent overlap, ruck-free.

(6) Cover entire seal with pvc tape at 50 per cent overlap, and extend pvc tape, ruck free, overlapping ends of seal by approximately 2in."

Getting on air with homebrew QRP

It is always an unexpected pleasure to be the very first station contacted on-air by a newly-licensed amateur. Recently, I had this experience when working Peter Hall, G4ZPT, on 3·5MHz while he was using a home-built QRP transmitter.

In a subsequent letter G4ZPT wrote: "Surely you could impress upon your readers the extraordinary pleasure awaiting anyone who can establish radio contact for the first time on home-built equipment. It is so easy to take the whole of radio communication for granted. Yet if one only stops to think about it, with just a handful of components, a morse key, and a wire antenna strung up into a tree, it is possible for anyone to radiate tiny oscillating signals and converse with fellow human beings miles away. This is, by any reckoning, an extraordinary and wonderful thing—too often forgotten by the many who buy all their 'gear', plug it in, switch on and talk. The remarkable combination of natural phenomena and electronics makes possible what must be the most exciting and interesting part of amateur radio; there, waiting to be grappled with, experimented and understood.

"I realize my station is primitive and largely devoid of new features, but I defy anyone, with any equipment, to derive more enjoyment from the

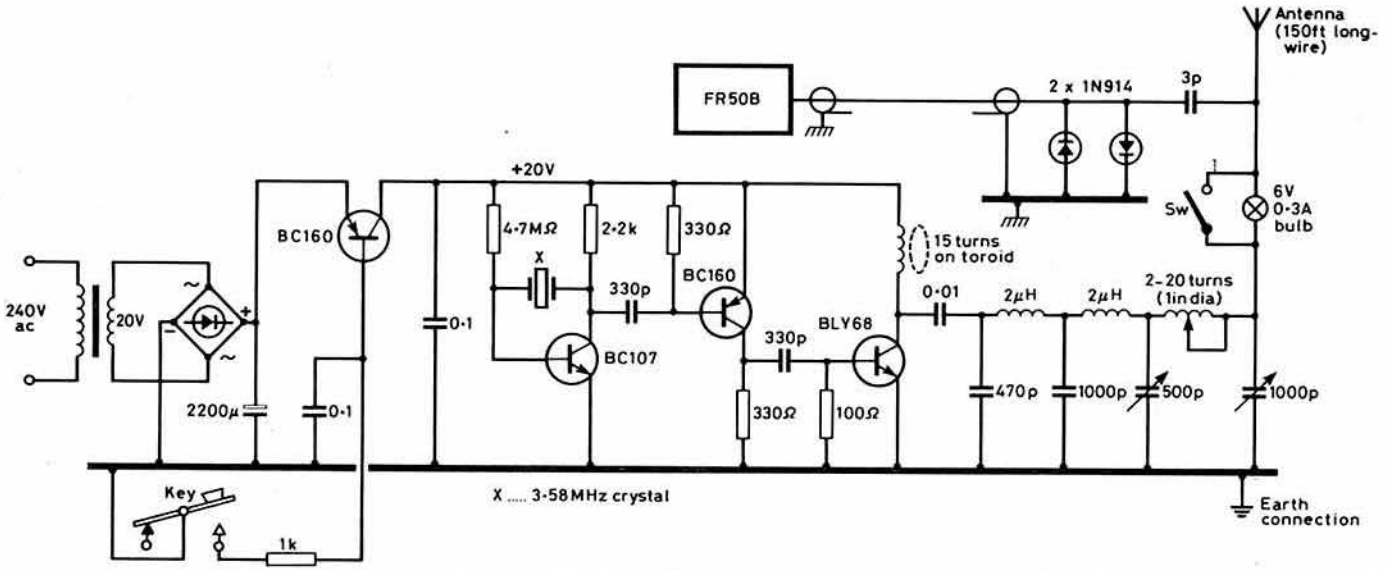

Fig 9. The "first contact" QRP home-brew transmitter of G4ZPT that emphasizes the miracle of radio communication with a handful of components. No transmitter/receiver switching necessary in view of the protective diodes across the input to the FR50B receiver. Tune the pi-network output circuit for maximum brilliance and then close switch

miraculous short waves. PS: I am not an old fuddy duddy, but a 23-year-old medical student."

Without wishing to trespass on G3RJV's domain, I cannot refrain from providing details of G4ZPT's simple rig: Fig 9, in the hope that it may encourage others to experience the pleasure of home-brew gear. Even though I still feel that most newcomers to cw operating would be happier with an input power of, say, 10 to 15W, although 5W can bring good contacts on 3·5 and 7MHz even with indifferent antennas.

Monopoles, vertical dipoles and the five-eighths vertical

A three-part article "The feed impedance of an elevated vertical antenna" by Guy Fletcher, VK2BBF, in *Amateur Radio* (VK) of August, September and October 1984, explores in some depth the facts and fallacies surrounding the effect on vertical antennas of its elevation above ground and its effect on antenna gain. While there are several nuggets of useful information (eg Fig 10) in all three parts, there is space here only to quote some of the points made in the final part:

"It should be clearly understood that the ground-level monopole, an elevated monopole and an elevated half-wave vertical dipole should all have approximately the same gain over an *unobstructed, good ground.* The magic 3dB gain sometimes claimed for a λ/4 monopole over a dipole never existed. The argument for it is based, I think, on the fact that the same power is radiated into only half of all space (above ground level) so the signal should be doubled. This is not a fair comparison, since a vertical dipole over a ground has exactly the same advantage, and in free space (interplanetary) neither antenna has this advantage.

"Finally the 5λ/8 monopole. It can be shown that over a perfect ground and for the same total radiated power, the field strength due to an antenna of height 0·64λ (which is close enough to 5λ/8) exceeds that due to a λ/4 monopole by a factor 1·43 due to the sharpening of the radiation pattern; 0·64λ is the optimum length, and the field falls quickly for longer monopoles. This corresponds to a power gain of $1{\cdot}43^2 = 2{\cdot}03$ or 3dB.

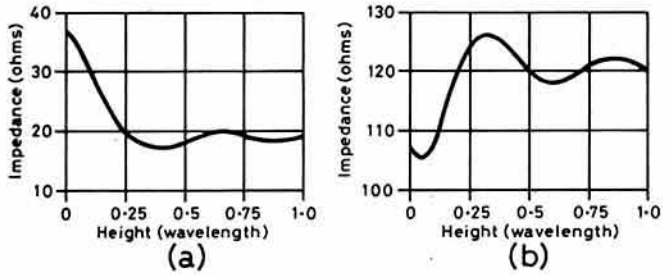

Fig 10. Base feed impedance of (a) λ/4 vertical monopole antenna; (b) base feed impedance (reactive) of 5λ/8 vertical monopole. Both as functions of height above ground

"Thus a vertical 5λ/8 antenna, whether elevated or not, has a built-in advantage for low-angle radiation of 3·07dB over a vertical λ/4 antenna, and presumably 3·07 − 0·26 = 2·81dB over a vertical half-wave dipole. If this advantage is not observed in practice, it is almost certainly due to incorrect matching of the antennas, and to different power levels delivered to each by the transmitter."

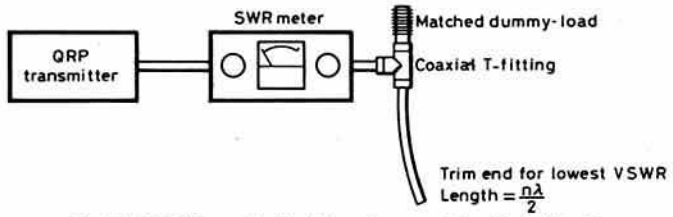

Fig 11. G3SEK's method of trimming coaxial cable to length

For hf operators who cannot reach 5λ/8 (225°) it is worth mentioning that the 110° vertical mentioned in the April *TT* (200Ω vertical) does show a useful sharpening of the vertical radiation pattern, though less than the optimum 5λ/8.

Adjusting vhf phasing lines

Several comments have been received in connection with G2RO's notes on "coaxial phasing lines" (*TT* February 1985, p114). Ian White, G3SEK writes:

"G2RQ's method of cutting coaxial cable to equal lengths is very interesting. I am sure it works, but I am uneasy about *how* it works. Any short length of unterminated low-loss cable should theoretically give an "infinity" (forward = reflected) indication on an swr meter, so G2RO is relying on his swr meter doing what it shouldn't! (A *lossy* cable, particularly a long one, does *not* result in an infinite swr reading, and this can mislead the operator who believes his antenna is far better matched to its feeder than is the case in practice—*G3VA*).

"If you use a T-adapter to connect a matched dummy load to the swr meter, as well as the length of coaxial cable (see Fig 11), this allows the swr meter to work properly. It will indicate a perfect match whenever the length of the coaxial cable is a whole number of half-wavelengths, if the trimmed end is left open-circuit. With a good swr meter the null in reflected power is very sharp and deep. This idea came from K1WHS, and I have used it to cut eight equal long lengths of coaxial cable for 432MHz within an accuracy of a few millimetres."

Noiseless negative-feedback on 144MHz

Apropos my notes in the February *TT* on "GaAs and computer-aided design", I must first apologise to Chris Bartram, G4GDU, of muTek, for mixing up both his call-letters and the name of his firm. He writes:

"It may be of interest to readers that we do now manufacture a GaAs pre-

amplifier for 144MHz (GFBA144e) using non-dissipative "noiseless" feedback circuitry. We are, to the best of my knowledge, the only company in the world to offer this level of performance to amateur vhf enthusiasts. As an amateur, it is possible to buy a standard of performance better than many professional users would believe possible . . . However, I fully endorse your comments regarding the misuse of computer modelling by amateurs. The computer is no substitute for a full understanding of the problem.

"The figures for spurious free dynamic range quoted by N6TX seem rather short of the state of the art. Using a silicon mosfet (BF981) with a standard level mixer we are achieving 90dB-plus sfdr (in ssb bandwidths) quite routinely in our production front-end boards. We are currently producing a transverter for 60MHz (also using BF981s) which has, typically, an input third-order intercept point of +4dBm with an associated noise figure of 2·2dB. This represents around 97dB sfdr in ssb bandwidths. It is possible to exceed this by some decibels, but at a cost unlikely to appeal to radio amateurs.

"I agree that our North American friends seem rather overwhelmed by the GaAsfet, and it seems that trendiness is sometimes replacing engineering. These devices have their uses, but good receiver design is not just a matter of choosing devices and throwing them together in a 'traditional' circuit . . . The environment that the receiver is to be used in is as important a parameter as the noise performance of the first stage—as being emphasized by Ian White, G3SEK . . . Once a suitable noise floor has been decided upon, the rest of the front-end can be optimized for dynamic range. Computers *are* useful here: by juggling with gain distribution within a suitable analysis program, it is possible to optimize dynamic performance within the constraints of the system components (amplifiers, mixer etc).

"It is very easy to waste money on system components, such as high-level mixers. With standard-level mixers such as the SBL-1 it is possible to obtain input third-order intercept points for a complete front-end of around +6dBm with an associated noise figure of 2dB. The limitation usually lies in the choice of the rf amplifier device. With a correctly-terminated mixer, modern mosfets, bipolar transistors or GaAsfets are all capable of a genuine noise figure of around 1dB but with input third-order intercept points of around 0dBm at best, even with the gain distribution properly optimized. Significantly better performance can *only* be achieved at the expense of more complex amplifier circuitry."

In the GFBA144e, a "noiseless" negative-feedback circuit is used around a MGF1202 GaAsfet. This can result in a low noise figure combined with excellent dynamic performance, so achieving an input third-order intercept of 10dBm and output intercept of 23dBm, still with a noise figure of under 1dB. The feedback adds only about 0·15dB to the noise figure but almost 10dB to the intercept point.

Hard-to-come-by components

The difficulty these days of obtaining small quantities of out-of-the-ordinary components is too well-known to need emphasizing. Distributors often are "trade-only" or have swingeing "minimum-order" charges. Firms catering for the home-constructor have, in the main, long gone over almost exclusively to low-voltage semiconductor-type components that are unsuitable for any valve-type equipment.

It is not usually the policy of *TT* to devote a whole section to promoting the services of a particular firm, but I feel that the following note from Nick Valentine, G3KWJ, in Avon, could prove the answer to many prayers. He writes:

"The G2DAF Mark 2 receiver which I am building has reached the stage of wiring. Despite our very good local electronic surplus stores, I had been unable to locate some 240pF 250V (or higher) close-tolerance capacitors. I remembered reading in *TT* that STC (formerly ITT) Components Ltd deal with the public, though having experience of working for a manufacturer I hesitated to get in touch with them, thinking of the usual £20-minimum invoice charges together with quantities I felt sure would apply.

"However, finally I phoned their Bristol number. A charming girl answered the phone and I gave her the Suflex part number from my 1980 catalogue. She said they had discontinued the range but her computer brought forth the equivalent Mullard one per cent tolerance components and the information that these were in stock. No question of a minimum invoice charge and (for capacitors) no minimum quantity, although some components such as resistors are supplied only in lots of 20. I simply gave her my credit card number. Three days later the capacitors arrived. The cost? £1.89 post free. I did not believe that such service still existed in this day and age.

"Each branch of STC Components has a copy of the STC Electronics catalogue. My 1980 catalogue runs to over 1,000 pages.

"I once built a digital clock from individual ics because I could not locate the National Semiconductor clock chip with bcd output. It is listed by STC and would have saved me weeks of work. I cannot recommend their services too highly."

Tips and topics

George May, G4RZF, draws attention to a useful and readable book *Noise in Receiving Systems* by Raoul Pettai of Raytheon (published by John Wiley & Sons, 1984) which he was recently able to borrow from the British Library at Boston Spa (and may also be found in some of the better technical libraries). He feels this book would be of interest to amateurs trying to get the most out of uhf and microwave equipment, even though some of the same topics are being covered in the current article by Ian White, G3SEK. There are 12 sections, three appendices and a useful general bibliography listing some 59 references, all in about 270 pages. It is perhaps not a book for the beginner, but enthusiastic uhf and microwave enthusiasts will find a lot of the information clear and useful and "bringing the entire subject of thermal noise, as encountered in engineering applications, under one roof". The sections are: introduction; overview of common noise sources; thermal noise; random variables and processes; single-port networks; two-port networks; distribution of gain; noise temperature; noise factor and noise figure; multi-response transducers; measurement of noise parameters; and signal and noise in crystal detectors.

Further to my notes on the trend towards surface-mounted miniature components (*TT* March), *Electronics Week* (8 April 1985)—in a detailed survey of this new technology—reports that currently 47 per cent of all electronic components in Japan are for surface mounting, compared with 5–6 per cent in the USA. It forecasts that by about 1990, the USA figure may grow to 70 per cent. Many new types of components are becoming available for surface mounting, including connectors, crystals, switches and relays. A variety of different "packages" and connecting leads are being used, with considerable need for rationalization. Some packages include: three small-outline transistor packages (SOT-23, SOT-89, SOT-143); plastic leaded chip carrier; plastic quad flat pack; metal-electrode face bonding (melf) as used by Yaesu; mini-melf small cylindrical leadless packages; small-outline integrated circuits (soic) including a miniaturized dual-in-line package); leadless chip resistors etc. There are also chip inductors and toroidal transformers for surface mounting.

Norman Burton, RS11494, writing from New South Wales, recalls with affection the high-impedance earphones of yesteryear. He owns a pair of Ericcsons from 1923, a pair of Gecophones from the same era, a pair of Brown Type A, and a year ago he bought very cheaply a pair of the once-famous Brown Type F that still works "damn well". He does all his serious listening on the Brown phones, mostly the Type A model. Although initially Brown "cans" seem uncomfortable, he believes that one's ears soon become bent to accommodate them and then they become extremely comfortable to wear. He recalls the sorbo sponge rubber ear caps that one could buy in the 'twenties—and an old *WW* tip of glueing a sponge rubber washer on to the ebonite of the caps. I must confess that after a decade of using fairly modern AKG lightweight phones, I have recently brought out of retirement a pair of Telefunken adjustable-diaphragm (4,000Ω) phones, and after an initial period of noticing the hardness of the ebonite caps, now find them comfortable to wear and sensitive to use. Maybe they bend my ears better than the heavier Brown Type A ever did when I had to wear them for eight hours at a stretch in the second world war!

It is often difficult to keep track of the many publications now aimed at the amateur radio market. Myron "Bud" Weisberg, K2YOF, recently sent along a detailed resumé of the long yet traceable path between the first publication of *Pacific Radio News* in January 1917 and the present day *CQ*. Mergers, changes in name, and the sale of titles from one firm to another are a common feature of publications on both sides of the Atlantic! *Pacific Radio News* became *Radio* in 1921. *Radio* merged with *R/9* in 1936 but continued as *Radio*, but with the entry of America into the second world war its direction changed away from amateur radio. However, "Sandy" Cowan, business manager of Radio Magazines, assumed control and in January 1945 launched *CQ—The Radio Amateurs' Journal*, roping in a number of the old *Radio* contributors. *CQ* has weathered several difficult periods and was taken over by its present management in 1979. *Radio* also spawned *Jones Radio Handbook* in the 'thirties, Jones being Frank Jones, W6AJF. This soon became the *Radio Handbook* and is up to its 21st edition, although *Editors and Engineers* is now an imprint of Howard W Sams, which is (or possibly was until recently) part of ITT, with Bill Orr, W6SAI, as editor.

STOP PRESS

There is a potential hazard in using the pcb etchant described in the May TT. Details next month. □

4-2-70

*by Ken Willis, G8VR**

RIGHT UP TO THE END OF APRIL the weather remained unsettled, having been that way for a five-week period. This meant that apart from one or two fairly localized tropo events, conditions remained fairly poor overall, though one or two auroras penetrated south of the Scottish border and yielded very good dx for those fortunate enough to catch them. At the National Convention at the NEC, I asked that experienced vhf old-timer G6GN to give a score out of 10 to recent conditions, and he rated it no higher than two. We agreed that it was a long time since such a protracted period of white noise emanating from the loudspeaker had occurred. However, this is June, the month when things start to happen on modes other than tropo, so hopefully reports will start to come in of impressive dx and interesting events. How about this one for a start?

Aurora

Although the huge auroras of 1981–3 are now just memories, these events have not entirely deserted us. In fact some Scottish observers say that they can detect some sort of auroral activity almost every day, though not usually of sufficient strength to penetrate far to the south. Charlie Newton, G2FKZ, predicts that the low point of this solar cycle will occur in 1987, and that we shall not see auroras of any real magnitude, nor very frequently, until 1992 or thereabouts, which is a gloomy prospect.

Nevertheless the occasional aurora will still occur, and I was lucky enough to catch one on 9 April when Scottish stations were very strong in Kent. During this event contacts between GM and SM1, SM2, DL, LA, OH and UQ2 were heard in progress in the south, but only the GM and GI stations were audible there. This was an interesting event, since I called GM4IPK using only 10W at my end, and he responded with a 55A report, using his 15-element antenna, not the 4×16 element which he also has available. Andy was beaming 060° when I worked him, and turning my antenna towards the spot which I assumed him to be aiming at produced almost no signal from him, whereas a beam heading from my end of almost due north resulted in Andy being S9-plus. No dx was audible in Kent over a range of beam headings from due north to due east. During this aurora it was noted that most stations were using the new Maidenhead locators, and also that they were transmitting their QTF figures which are so valuable in determining the location of the reflecting patch.

John Branegan, GM4IHJ, wrote commenting on the auroral monitoring information in the April *4–2–70*. He says that he is "pretty sure" that Wick radar on 153·213MHz will be heard in southern England when auroral activity is around and that it will be a good warning indicator of these events. I was told at the NEC Convention that the Leicester University team responsible for Wick radar can monitor it successfully in Leicester using a two-element beam; if so, it is encouraging for those proposing to build a converter tuned to Wick.

GM4IHJ also agrees that monitoring 48·25MHz plus or minus 20kHz is a sound scheme, but warns that several of these stations are due to shut down shortly, quoting arctic Norwegian tv due to close on vhf. He recommends Russian and Polish tv stations centred on 49·75MHz which can be sometimes heard aurorally during big events affecting southern England. I have mentioned these before as stations which provide excellent meteor reflections. John says that the best way to find Wick is to listen on the "breakfast with ms" club since it is an excellent performer in this mode.

Auroral activity noted by GM4IHJ occurred on 8, 9, 10, 17, 24, 25, 26 and 28 February, 2, 5, 7 March and 1, 5 April; not a bad haul for this point in the solar cycle. Wick was always "first up, last down" with him in Fife. So far he has heard nothing of the Greenland beacons by any mode.

John's interest in matters scientific is well known. He quotes an article in *Nature*, March, which says that the Cambridge four-acre 80MHz radio telescope which located the first pulsars is now well advanced with real-time studies of solar wind as it "races from sun to earth bringing us all these auroral goodies". The results so far from this study suggest to John that GB2RS newscasts may sometimes have to be re-phrased in giving auroral information. For example, the aurora of 28 February last was described as being caused by a break-up of a solar filament. How, asks John, can the almost instantaneous release of power such as that result in a sustained enhancement of solar wind? He suggests a rewording in the form "A disturbance on the sun, one symptom of which was the break-up of a solar filament, subsequently caused an aurora on 28 February". He comments that the original version reports an effect, not the cause. Incidentally the 28 February event tied in well with the Solar Max satellite findings indicating a 154-day periodicity in major solar activity, so count the days until the next one and put the date in your diary.

The Russian publication *Radio* (10/84), translated by W4KMM, mentions that UA9XEA uses signals from the RS series of satellites to detect the presence or imminence of radio auroras. When the satellites approach from the north, he has noticed a worsening in their signal quality (rapid fading and change of tone) when auroral activity was present. Have any UK operators noticed this?

From the same publication, UA3MBJ commented on his findings when monitoring the OH6VHF beacon (144·900MHz) which alternates between full power and half power in a switching sequence. During an aurora, instead of the signal falling by the expected 3dB, it often drops by 4 to 10dB when it switches to low power. UA3MBJ suggests that this indicates non-linearity in auroral propogation; that is, strong signals are reflected (propagated) better than weak ones. As if to support this theory, Andy, GM4IPK, commented on the recent success of OY9JD in "getting into auroras" and working much more dx since he installed a NAG amplifier which pushed up his power considerably. Whatever the reasons, I think most of us have known that a bit of power can be very useful in auroras, possibly more so than when using any of the other modes.

There was considerable auroral activity between 20 and 21 April; a two-phase event overnight being followed by an afternoon aurora. It was apparently quite intense, reaching the south of the country. Richard Crossley, G4CZP, was flying to London from New York overnight 19/20 April, and from a height of five miles witnessed a magnificent visual aurora lasting more than 3h. Even the captain of the aircraft had never seen a better one. During the same event, Michael George-Powell, G3NNO, listened on 50MHz and heard GI3RXV and beacons GB3SIX and GB3NHQ, all tone-A, from his North Yorkshire location.

Meteor scatter

Now that this mode of communication is being more widely used and not regarded as something very exotic, some information on showers, minor and major, may encourage even more activity in this mode. The Arietids shower which occurs between 21 May and 17 June should peak at around 1800gmt on 5 June with an hourly rate of 60. Over much the same period, the Zeta Perseids should be in evidence, peaking around 2000gmt on 7 June with a rate of 40. The peak times given are the anticipated visual maxima, but may be near enough to the radio maxima for practical purposes. There are three other minor showers in June, the Ophiuchids (19), 54 Perseids (25) and Beta Taurids (26), though these are not so favourable for radio communication. Soon we shall have the popular and useful Perseids shower (12 August peak), so dust off the memory keyer (ssb operators suck throat pastilles) to be ready to take advantage of these showers.

Johannes, LA6HL, will be going again to Iceland this year, signing /TF between 27 June and 26 July. On 144MHz he will use 2×9 elements and 200W out, plus 18 elements and 100W out on 432MHz. He will, as usual, operate ms as well as Oscar 10 and 50MHz. On ms, Johannes will always transmit *second* period, and all random operation will be on 144·083MHz. Operating times will be during evenings after 2000gmt and mornings between 0600 and 0900gmt. For skeds he will use 144·183MHz, but asks not to be called on that frequency unless a sked has been arranged. When sending final rogers, he will indicate his square, (old style) by sending, for example, rrrrrrSY or rrrrrrQZ etc. To conserve battery power he will tend to listen rather than call CQ. During 29–30 June he hopes to be QRV in the middle of the day, and on his way home to operate briefly from OY-land if time permits, so here is a chance to work two rare countries knowing there is a very experienced vhf operator at the far end.

For a long time I have felt that the procedures currently in use for ms communication need revision. I suspect that more than 90 per cent of all contacts made involve a 26 report, to the extent that it has become almost expected to receive such a report in a sked. This, coupled with the fact that

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the callsign of the station at the far end of the sked is already known, has resulted in opponents of ms saying that such contacts are "phoney", though in any sked, whatever the mode, much the same objections apply. Another aspect of ms reporting is that the report has little or no bearing on the way in which the sked or random contact is conducted. Most of us will have encountered situations where early in the sked or random QSO a report of, say, 37 is received. Unlike a tropo sked where a report of 59 would perhaps encourage the recipient to be brief and attempt to conclude the contact quickly, with ms whatever the report the same procedural system must usually be followed to the end. The exception is the use of "break" procedure which is usually reserved for major showers. Thus the system of reporting by length of burst and signal strength is, in my view, largely irrelevant, and could be replaced by another system whereby each station sends two randomly chosen numbers which would have to be repeated back correctly by the receiving station before the contact could be said to be complete. For example, G8VR trying to work YU3ES might send

YU3ES G8VR 64 64 64,

to which YU3ES might reply

G8VR YU3ES 29 29 29.

On receipt of the two numbers, G8VR would send

YU3ES G8VR 6429 6429,

to which the reply would be

G8VR YU3ES R2964 R2964

and eventually full rogers by both stations.

There could obviously be some confusion if, by chance, both stations chose the same random pairs of numbers, since in the example G8VR, on receipt of these from the other station, would have to send YU3ES G8VR 2929 2929, which would be indistinguishable from the original message content, ie YU3ES G8VR 29 29 29. However, readers may wish to submit their own ideas for a better reporting system for a mode which devotees know to be both reliable and full of excitement. The whole business of calling on the random channels needs further thought and suggestions, preferably before the next VHF Managers Conference, where this topic should be on the agenda, so let's hear from you on the subject.

Lyell Herdman, G6HD, said that the recent reports of the work of G3CCH (*4-2-70* February and March 1985) brought back old memories, especially the information on buried oscillators to achieve thermal stability. Lyell says that BBC Tatsfield had a buried frequency standard in the "good old days", it being in a concrete bunker outside the building. On my comments that it would take a long time to cut a disc to encode cw by this method, Lyell says that early in the war a disc about 10in diameter was made with slots milled above and below the circumference into which sliders were positioned which could quickly be set to a code configuration for keying. I seem to remember seeing something like this at the Wrotham beacon station GB3VHF years ago before the advent of micro-chips.

Lyell also worked the late TF3EA, G3CCH's old "sparring partner", on 70MHz back in July 1970, though he doesn't say whether the contact was via ms. Probably Es, considering the month.

Jerry Lefever, GM4CAZ (Edinburgh), hears "swishy" bursts most of the time from Gdansk on 70·310MHz. He also hears another station on 70·670MHz with prolonged bursts lasting 10–15s, especially between 0500 and 0700. Jerry is active on 70MHz, so no doubt he is using a beam on that frequency which would enhance his reception of broadcast station bursts from eastern Europe.

Bill Hodgson, G3BW, needs no introduction to dedicated ms operators but, until he told me, I was unaware that he is the only station in Cumbria active in this mode. Bill has now retired and has more time to spend chasing reflections.

Jeremy Whitfield, G3IMW (London), has anticipated things somewhat by having attempted to work OZ9QV crossband 50–28MHz using ms on 5 April between 0530 and 0630gmt. Using 5min periods and 10W input, OZ9QV received much copy from Jeremy with bursts up to 20s in length on 50MHz, while on 28MHz Jeremy was able to copy parts of both callsigns and a report, but says that the s:n was just not good enough to complete the contact although one 28MHz burst was of 25s duration.

Writing in *The World Above 50MHz, QST* May, Bill Tynan, W3XO, reckons that this may be a good year for meteors—even a year to remember. He bases this on predictions by W9IP who has developed a computer program which predicts optimum times and directions for most major showers, but the view that things may be exceptional comes from knowledge of cometary activity in the solar system, not from computer data. In the USA ms operators are known as "ping jockeys". Apart from the major showers which W9IP expects to be good, he recommends keeping an ear for the Draconids (3 October) and the Orionids (14 October). In 1966 a similar proximity of comets produced over 150,000 meteors an hour in the Leonids!

In *4-2-70* March I mentioned the possibility of using the 28MHz band for ms work. Although this band is not part of my "patch", many vhf operators use it for crossband working.

The comment provoked a response from Cliff Ranft (ex G5RF, VK3NR, VK7FG etc) of Cambridge, who these days carries out precision timing of aos and los on satellites for AMSAT-UK. Cliff says that although he cannot hear the beacon GB3SX on 28,215kHz directly, he receives about 50–60 pings an hour from it around dawn hours, and about one-third this figure during early afternoon and evening. he comments that if this can be achieved with a QRP transmitter and an "unsuitable" receiving antenna, this would seem to augur well for the use of this mode on 28MHz.

It was therefore quite a coincidence to meet John Pearce, G3IGP (Hatfield), recently and to be told that he regularly hears pings from beacon DL0PR on 28MHz, a band for which he has a good groundplane antenna. If any groups of amateurs would like to co-ordinate some tests using ms on this band, I suggest they write to me in the first instance so that I can put them in touch with one another.

Repeater news

Chris Young, G4CCC, vice-chairman of the Repeater Management Group, has drawn attention to the following news items related to repeaters.

RMG acknowledges that there is an area to the north of London, including a stretch of the M1 around Luton, which lacks adequate repeater coverage. As a result, RMG is studying three proposals for systems which would cover this general area. They are North London, Hemel Hempstead and "Luton & the M1" group proposals, and RMG is endeavouring to get all three to work together to ensure the best possible coverage from a single repeater. Finding a channel for this installation is another problem under consideration.

A proposal for a repeater in the Rossendale Valley in Lancashire has been accepted, it being intended that the group takes over the franchise of the West Pennine repeater GB3WP which did not come to fruition. The callsign for this repeater will be GB3RV, and operation will be on channel RB11.

The tv repeater experiment has been reviewed by RMG and, despite the fact that only three tv repeaters have been operational, the experiment is deemed to have been a success. The conclusions seem to be that fm tv repeaters work better than a.m. versions. Four tv repeater proposals have been dropped, since despite letters urging the groups concerned to meet the deadlines, no full proposals were submitted. The areas concerned were Bournemouth, Ipswich, Blackpool and Derby.

On the personnel front, Chris Goadby, G8HVV, who is the RMG technical librarian, has now become a corresponding member of the RMG, while Ian Wade G3NRW is the new corresponding member for liaison with BARTG. The RMG has a variety of technical papers in its library, so those wishing to have a list of papers available should send a large sae to G8HVV, QTHR. Since taking over as publicity officer for the RMG, G4CCC has initiated a newsheet (*Repeater Report*) which now goes to all repeater groups. It is mailed to all "contact men" listed in the RSGB repeater list.

Expeditions

The expedition to Foula Island (IP80, previously known as YU square) encountered severe weather problems which delayed the team's arrival on site until Saturday 13 April, some skeds being missed as a result. The word from Charlie, G3WDG, at the NEC was that the crossing from the Shetlands in a 30ft craft was at first aborted due to the engine overheating, and the expedition team were reported to have assisted in keeping things cool while they returned to safe harbour. Charlie had good reason to keep tabs on what was happening, since his wife Petra, G4KGC, was one of the crew. It is understood that there will be further activity from this rare square during the Perseids meteor shower. G3IMV was one station fortunate enough to work them on ms when they finally got going.

The Derbyshire Hills Contest Group, which has in the past activated several rare squares, plans this year to go to the Island of Ronaldsay in the Orkneys during the Perseids. Operation from IO89 (lately YT48f) is planned on 70, 144, 432 and 1,296MHz, with receive capability on 50MHz for crossband working. The 14MHz vhf net will also be used to make skeds; only a limited number of skeds will be accepted prior to the group's departure. Callsign on all bands will be GB3ZAP, and operation will be between 3 and 15 August. Frequencies will be 70·220, 144·220, 432·220 and 1,296·220MHz for tropo, plus 144·144 (cw) and 144·444MHz (ssb) on meteor scatter. For further information please contact David Hardy, G8ROU QTHR, telephone 0629 732620.

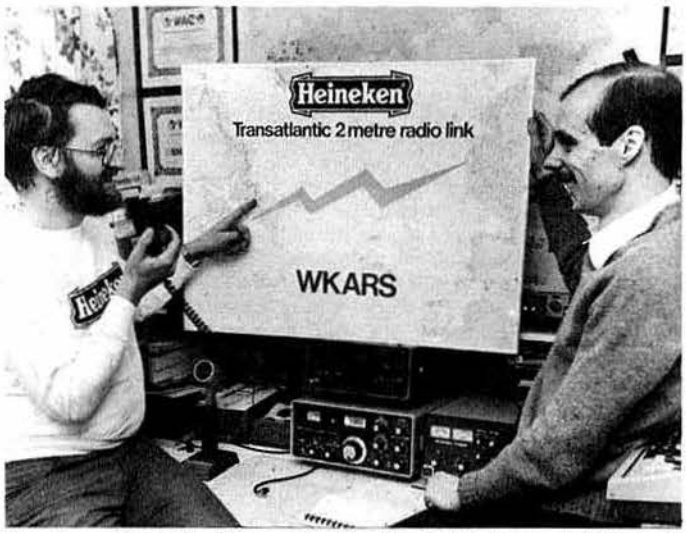
Peter Crosland, C30AKA, of the Worcester Moonbounce Society, says that this group will not be able to make an expedition to Andorra this year as planned, but hopefully will make a trip there next year.

The Telford & DARS plans to operate from the Isle of Islay (IO65) from 27 July using ssb and cw on 70·225 and 144·325MHz, with recourse to the calling frequencies when necessary; 7,050kHz will be monitored during

daytime for skeds and other arrangements. No prearranged skeds will be set up. The operators known to be going are G3UKV, G4AUY, G8VZT and G8UGL. Callsigns will be GM3ZME/P, GM3UKV/P and GM4AUY/P. Contact Martyn Vincent, G3UKV, for any further information, QTHR.

An attempt on a record

In their attempt to reach parts which other 144MHz signals cannot reach, the West Kent Amateur Radio Society has obtained the sponsorship of Heineken, of lager fame, for their proposed trip to western Ireland in August. The aim is to establish the first-ever *direct* transatlantic contact on the 144MHz band by transmitting entirely over a sea path towards the east coast of Canada and the USA. They will use high power to four stacked and bayed long Yagi antennas, and schedules have been arranged with several groups and stations on the far side. Working round the clock from 19 to 30 August (wot, no Perseids?) they propose to use cw, Amtor and ssb. HF band talkback will be used to assist the running of the operation. The site will be 1,500ft asl on a Galway mountainside.



Dave Green (l) and Nigel Peacock of West Kent ARS, who no doubt hope to be suitably refreshed come August

In *4-2-70* November 1984 I was uncharitable enough to suggest, when this trip was first mooted, that several text-books might have to be re-written should they succeed in their attempt. I, for one, would be leaping about in delight if they manage to do it. Looking at distances by the simple expedient of holding a piece of string around the surface of a globe, I came to the conclusion that for them to hit the eastern point of Nova Scotia would be about the same as a station in the south-east of England working into the Sahara, the Caspian Sea, to Cairo. Damascus, or the centre of Greenland. Then I measured the record-breaking QSO of G3VYF when he worked 4X4IX in Tel Aviv, and it was about the same distance and over a very much more difficult path. This was said to be by sporadic-E, though some have said that they can denote tropo-assisted sporadic-E in the tape recordings! Anyway, hopefully we shall get more information later and be able to listen for them off the back of those four Yagis. Wouldn't it be great to have a pile-up on VE1YX on 144MHz!

Sporadic-E

If your 144MHz receiver is not switched on by the time you read this you may be missing something. The *Es* "season" usually makes a point of starting in a big way during the first week in June. Although we may not be sure what causes sporadic-E, we know what super dx it offers us, and whether it is a scientific observation or not, it seems to crop up at very nearly the same time every year. Here are the dates of some of the "big" events during June in the past three "seasons", though there were no doubt others.

June	1982	1983	1984
5	9H1, I, IS0, FC, YU, EA6		
6		I, IS0 etc.	
7		9H1, I etc.	
8	CT1, CT4		I8, USSR!
10		CN8BA	
15		SV, 9H1, I etc.	
16		EA7	
17		SP, OK, YU	9H1, I etc.
22		YU, LZ, YO	
30			EA4, 5, 6, 7 CT

1984 was not a bumper year, although the Russian opening was so widespread that it more than compensated for the lack of other less exotic events. This year two contests are being staged during June which are of great interest to *Es* operators, since they more or less guarantee operation from good high sites by a larger than usual number of operators at the far end. The "far ends" this year are Malta and Hungary. From 1 to 15 June, the 9H1 VHF/UHF/SHF Group will be holding its annual 9H Falcon Contest. The rules are too lengthy to publish here, but if anyone works a clutch of 9H1 stations in the period of the contest—not as impossible as it sounds, since some UK amateurs have done so in the past—they should send me an sae and I will forward a copy of the relevant information. You can count the station more than once provided the contacts are on different days.

The second contest is one mounted by the Hungarian Radio Amateur Society from 1800 to 2400gmt on Saturday 15 June and 0600 to 1200gmt on Sunday 16 June. This one, exclusively on the 144MHz band, requires reports, serial number and QTH locator to be exchanged. Here again, write to me if you need all of the rules. Last year's results for this contest listed 31 HG stations, 20 YOs, 7 SPs, OK, LZ and YU, all active and making good scores, so let's hope the event coincides with a major *Es* opening in the right direction.

Martin Harrison, G3USF, wishes to draw attention to the fact that this year the 50MHz permit holders will be actively looking out for all possible sporadic-E contacts, notably from Norway, but asks others to monitor 28,885kHz for crossband contacts if not licensed for 50MHz. He makes the point that inter-G contacts over good ranges are to be expected when skip gets really short, and certainly the G–GM path should benefit from *Es*, the occurrence of which should be much more frequent on 50MHz than on the 144MHz band. So, if you have 50MHz receiving capability, keep a look-out on 28,885kHz also, and listen for crossband calls.

If you thought that you worked YU6ZA last August on 144MHz via *Es*, you probably were in contact with a pirate station. The real YU6ZA took the trouble to telephone Michael Morrissey, G6TUH (Northolt), to say that he had received more than 20 cards from UK stations who thought that they had worked YU6ZA/P, whereas the real operator has unfortunately never succeeded in being heard further from his QTH than mid-France. If you ever work the legitimate YU6ZA you will certainly receive a QSL, since he confirms all contacts.

On 24 April a station signing 12FHW appeared on 144MHz and worked several Gs. He actually took time to QSY from the calling channel, so whether this was the real 12FHW via *Es*, or a pirate, is uncertain. There was not much evidence of tropo at the time.

Beacon notes

Several sources have notified the fact that the Greenland beacon OX3VHF on 50·045MHz is no longer operating. OZ9QV plans to visit the area in July, and will then investigate the possibility of reactivating it from another site.

GB3RMK, the proposed Mounteagle beacon on 50·06MHz, is still under consideration by the licensing authority. There are hopes, according to G3NAQ, that a 50MHz beacon will be established at station 4U1ITU operated by the International Amateur Radio Club, United Nations, in Geneva.

GB3SUT, which is still off the air, may be resuscitated on the same site at Sutton Coldfield when the new tv mast is completed. GB3WHA the 432MHz Kent beacon is in need of finance for site rental, and this matter is under consideration. There is no further news to report at this time on the status of GB3REB, the 70MHz beacon which is to be set up in the Medway towns (previously located in Crowborough, Sussex).

From here and there

Susan, GM4SGB, who is a keen and competent cw operator, has asked me to remind readers, especially new ones, that Monday night has for some years been an activity night for cw on 144MHz, quite apart from the fact that the VHF Committee is now encouraging operation on Mondays through the new 432MHz Monday Night Award. So those wanting cw contacts should come on to either band on the evening of that day, there being no set times or frequencies, simply the aim of encouraging more cw operation on the vhf bands. Susan also makes a very useful suggestion that a calling frequency be nominated for the Class B operators using cw under the terms of the Notices of Variation which were sent to over 6,000 applicants recently. Any suggestions for a suitable frequency will be given prompt attention by the VHF Committee, and publicity then given to any frequency selected.

Also from north of the border, Tommy, GM1GEQ, points out that in his area, Monday night is amateur television night, which clashes with cw activity. In view of the extended period over which cw on Mondays has held

sway, it would be difficult to switch this to another night, so perhaps the atv operators could choose another day if their activities are in any way being affected by cw operation.

At the NEC, the British Young Ladies Amateur Radio Association (BYLARA) held its annual general meeting at which officers for the year were elected. As a result, Angie, G5CCI, is chairperson; Denise, GM4COO, secretary, and Kay, GM6KAY, treasurer; so any ladies wishing to join this group should write to any of these officers, all of whom are QTHR.

Bob Mathews, G3ZNZ, holds the German DLD1000 Award, which means that he has made contact with 1,000 members of different German radio clubs. This was achieved back in 1973 using the hf bands, and the organizers thought that the feat would be impossible to repeat on vhf/uhf. To date, however, Bob has qualified for the DLD (VHF) 500 Award (ie he is half-way to his target), and has submitted cards which will bring his total to 600. If all contacts had been confirmed, however, Bob would be in the eight-hundreds.

GM4CAZ (Edinburgh) is active on 70MHz with a four-element antenna 70ft high and wants both skeds and reports QTHR or telephone 031-664 3891. He can work all modes, and was previously active on this band from Leicestershire before moving to Scotland, where he finds 70MHz very quiet indeed.

James Finnegan, GI4FFL, has a card from K1WHS in Maine, USA, which states that their moonbounce contact on 28 February 1983 at 0150gmt was a first GI-W contact on 144MHz. James was using equipment loaned by GI6EYO, finishing up with 4 × Cushcraft Junior Boomers. Anyone wishing to claim a prior contact between these two countries should please write to *4-2-70* giving details.

Peter Marcham, G3YXZ, is much in favour of the Monday Night Award on 432MHz, which has already increased the level of activity on that band. He is modifying his antenna system for both horizontal and vertical polarization, which is a good idea since there are many fm handhelds on the band used by those who mostly access repeaters. Peter finds operation on 432MHz very pleasurable "thanks to excellent operating standards plus very knowledgeable and pleasant people to be found there". He also uses tv on this band, and says that this mode is very popular in his area (Watford) due in large measure to the support of the Home Counties TV Group.

Three happy young ladies on the BYLARA stand

On another topic, G3YXZ complains of more and more cordless telephones in his area on 70MHz. He quotes the following frequencies on which they have been copied: 70·024, ·035, ·08, ·185, ·215, ·225, ·275, ·335, ·365, ·400, ·425 and ·450! It seems to be getting as bad as Syledis! □

MODIFYING RECEIVING-TYPE VARIABLE CAPACITORS FOR USE IN TRANSMITTING APPLICATIONS

(Continued from page 449

Adjust the height of the fixed plates till the top edge lines-up with top edge of the moving plates, and correct any sideways movement so that the sides are also level. The fixed plates can now be soldered in position, using only sufficient solder to make a good joint between the side plate and the pillar. Remove the cardboard spacers and check that the distance between the plates appears to be alright when the rotor is turned. Replace the earthing springs after cleaning and the job is completed.

Ganging two capacitors together

If a four-gang capacitor is required to obtain sufficient capacitance, this can be done by drilling and tapping the end of the rotor shaft to accept a short length of 4BA studding and soldering in place. The front end of the other capacitor spindle is drilled and tapped likewise. Both capacitors should be of the same size and make.Mount both capacitors on a baseplate of aluminium, or perspex if it is desired to insulate them from a chassis. Loosely mount both capacitors on the baseplate after screwing home the studding into the rear spindle, not forgetting to slip a locknut onto the studding beforehand. Carefully line up both capacitors with the aid of a straight-edge along the sides and bolt in place. Finally, tighten the locknut after fully closing both sets of moving plates (see Fig. 4).

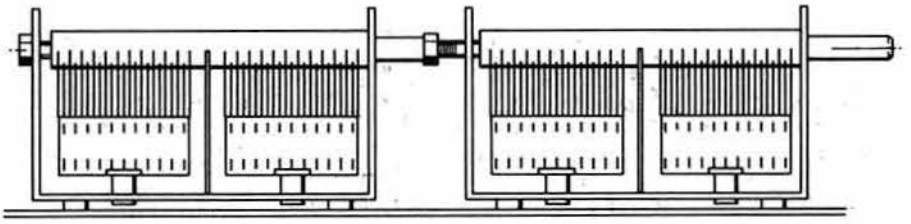


Fig 4. Twin-gang assemblies mounted on a common baseplate

Variations

Capacitors from which the rotors cannot be removed

After removing the solder from the side plates of the fixed vanes, fully open the moving plates and it should be possible to slide the fixed plates to one side. The unwanted moving plates can easily be removed when still in the main framework.

Conclusions

The foregoing procedure may seem complicated, but in practice it is fairly easy to carry out. The alteration to the fixed plates is the most difficult to do, since it requires a fair amount of filing. The removal of the plates is also rather more hazardous, but if one takes care and makes haste slowly the result will be rewarding, and cost-saving into the bargain. □

Microwaves

*by Mike Dixon, G3PFR**

Photospot

As promised, Adrian, G8PSF, duly sent some photographs of his dish and multiband feed. These items were the result of many hours of patient metal-bashing, the saga of which was mentioned in *Microwaves* February 1985. The Photo 1 shows the 1·5m dish and feed with some indication of the "take-off", which appears to be reasonably "in the clear".

The Photo 2 is a close-up of the DC8CE feed (originally published in *Dubus*) which after fabrication was measured by G3JVL as showing the following vswrs: 1·3GHz, 1·65; 2·3GHz, 2·5; 3·4GHz, 1·8 to 1. From these figures and the dish size/profile, Adrian predicts 20dB gain with a beamwidth of 15° on 1·3GHz; 28dB, 10° on 2·3GHz; and 33dB, 5° on 3·4GHz. Necessarily such a feed is something of a compromise, but overall the antenna appears to be highly "usable". The recommendation for weatherproofing (a plastic sweet-jar) is attributed to Simon, G3LQR. In due course it is hoped that news of dx worked will be forthcoming from Enfield.

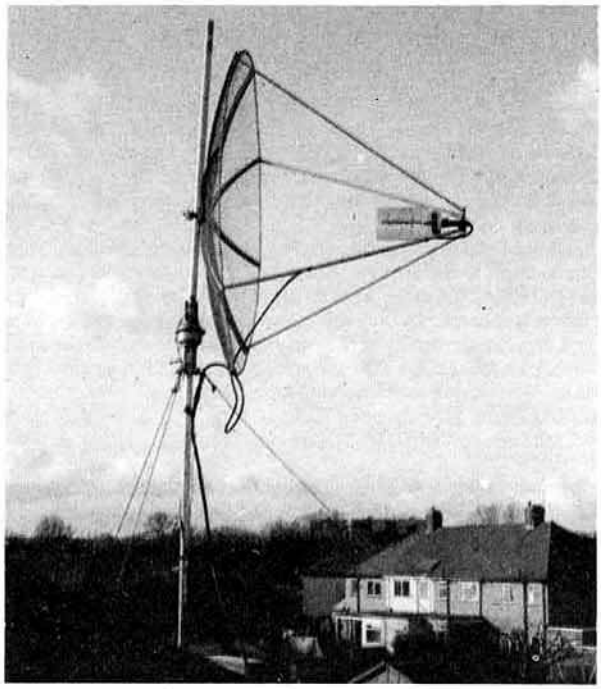


Photo 1. The G8PSF 1·5m dish and DC8CE feed

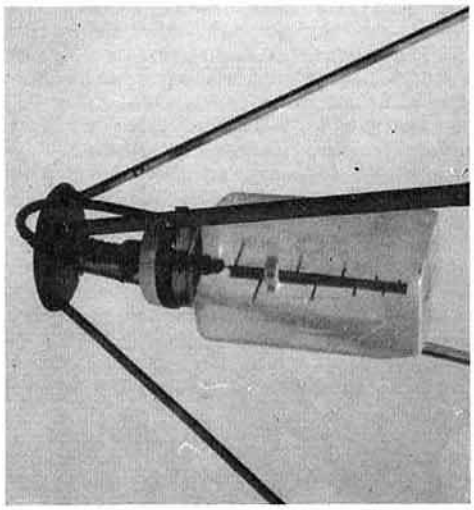


Photo 2. A close-up of the DC8CE feed constructed by G8PSF

Operating news

Frederick, G6FK, in his frequent "state-of-the-band" reports, has mentioned a total of 44 stations heard or worked on 1·3GHz during February and March. He reported a "mini-lift" on 4 and 5 February during which he was receiving both the Emley Moor and Martlesham beacons at many decibels above S9. Tests between GW8FKB and GI4CXH are still continuing, and Frederick reports that his signals are "still being received quite often by GI4CXH, who is still working with his 4ft indoor dish". Comments heard about 2·3GHz activity suggest that many stations are preparing to go onto that band, many of them using LMW Electronics pcbs. Fourteen callsigns were mentioned, including G6FK!

Tim, GI4OPH, wrote from Ballywalter, Co Down, to say that "by the time this information reaches you, I will be QRV on 23cm with an SSB Electronics transverter giving 10W output into 4×23-element Tonna antennas at 35ft agl. The QTH (XO33J/IO74GN) is only about 50ft asl but has a very good take-off to the UK. I will be looking on 2m for stations to work most evenings and weekends, and I would be pleased to accept "skeds" via telephone, which is 02477-58425". I have checked Tim's QTH on an OS map and can confirm that, at least on paper, he has what looks like an excellent microwave location while beaming east: it is directly across the Irish Sea and he should find, as many sea-level stations do, that conditions over water are often excellent and that the first few miles of "take-off" are vitally important, especially at microwave frequencies. Tim, incidentally is a blind operator: I wish him luck and success in this venture and look forward to hearing his results. His call, square and county should all be popular!

Arie, PA0EZ, sent some information regarding 10GHz operation in Holland and Germany, and said that "although there are some stations active with wide-band equipment, most activity in Holland is on narrowband, particularly during the IARU Contest weekends, (March, May, July and October). An interesting lift occurred in December when DL7QY was worked at 488km, and a few days later G3LQR worked DC8UG at 492km". Although there seems to be a small discrepancy in QRB between the figure quoted in *Microwaves* February 1985 and Arie's figure, the G/DL contact establishes a new German record on 10GHz, and his own contact with Claus is also very noteworthy. Arie goes on to say: "The beacons PA0DBQ and PA0EHG are audible in East Anglia rather frequently, and also PE1BLE once propagation is very good." Once again it was emphasized that few, if any, of the Dutch stations active on the microwave bands have talk-back equipment on 144MHz: when openings are apparent, the "rule of the road" is to call on or around 432·350MHz!

For the record, the 10GHz beacons currently operational in Holland are:

Callsign	QRA	Frequency	Beam heading	Power (mW)
PA0DBQ	CM72	10368·12MHz	270 deg	50
PE1BLE	CM55	10368·025	omni	50
PA0MSA	CL48	10368·045	0 to 45 deg	50
PA0EHG	DM65	10368·235	270 deg	80

Arie concluded his letter with: "3·5GHz will probably be lost in Holland after 1/1/86"—a cautionary note indeed.

John, G4BYV, wrote to say that he had been saddened to hear of the death of Sven Larsen, OZ9SL, at the untimely age of 49: John had worked Sven on 2·3GHz while the Danish station was running a mere 500mW (later 50W). On a slightly lighter note, he said: "I see in *Dubus* that the PA0s are still going to use the old QRA locators except for contests—good show!"

Too late for timely inclusion here (but published in timely fashion in the *Microwave Newsletter*) a letter from GM8TSI indicated that the Edinburgh VHF Group's expedition to YQ (IO86) would be to a coastal site instead of the usual mountain-top, and that operation would take place (on the weekend of 4/5 May) on 432MHz, 1·3GHz and 2·3GHz. News of the results will, no doubt, filter through due course: due to the "lead-time" for publication in *Rad Com*, notice of important microwave expeditions would be appreciated well in advance of the event—preferably not less than three months in order to ensure publicity. I will, however, undertake to pass information on to the *Newsletter* editors if received too late for inclusion here—their dead-line is shorter.

Static—you have been warned!

Apropos my comments on protection against static damage to sensitive microwave devices (*Microwaves* January 1985), a letter from Clive, G6DCL, confirms this information. He said: "I think a lot of people do not realize that Schottky barrier diodes are static sensitive and should be

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

handled and stored as for cmos. The trouble is that damage is not obvious as the diode may continue to work but with degraded performance. Most of this information came from the Mullard data sheet on their BAS 46 mixer/detector for doppler radars." He went on to suggest many of the precautions outlined earlier and concluded by saying that by following a few simple procedures "it may prevent people being disappointed after trying to improve their systems by changing to lower-noise mixers which are so easily damaged by mis-handling". These remarks were, of course, addressed to 10GHz Schottky diodes but, as I have found to my cost, seem to apply equally to the better versions of point-contact mixers also; on several occasions I have "lost" 1N23F diodes quite inexplicably and I can only put this down to static.

At the NEC

Unfortunately I was only able to be at the RSGB National Radio Convention for the first day of what has become a highly successful event covering most aspects of today's amateur radio scene in the UK. As far as microwave interest was concerned the event can only be described as "hectic"! The Microwave Committee stand was busier than I can recall in the three years that I have attended the NEC as an "official" representative. Many questions were asked and answered about simple microwave equipment (particularly 10GHz), the building and licensing of beacons, sources of information and components. The latter two subjects seem to have been successfully covered by good sales of both the *Microwave Newsletter* "Technical Collection" and the component service items. The items which sold to an "out-of-stock" situation were MGF1402 GaAsfets, 1N416E 10GHz mixer diodes and 16in spun aluminium dishes. The mixers for the JVL transverter were already out of stock and awaiting new arrivals. Non-Society, commercial interests were also seen to do a very brisk trade in whatever microwave components were available—the "flea-market" was almost impossible to get into!

Arising from this apparently intense interest, it would be very useful to the Microwave Committee if the readers of this column could indicate either to me, Steve Davies (who is manager of the component service) or to any member of the Committee, which components are in most demand or are most difficult to obtain—arrangements might then be made either to stock these or at least inform the prospective users of the best sources for their requirements.

The long-promised fm board for 10GHz transceivers was mentioned in the most recent issue of the *Microwave Newsletter*, and, indeed, the rather battered-looking but never-the-less functional prototype was on the Microwave Committee stand at the NEC. It has now reached the stage of preparation of the final artwork and should be available within a reasonable time, although the image in the crystal ball is none too clear as to what this might be. A recent purchase of components on a normal retail, "one-off" basis suggests that the complete receive and transmit circuit with board and all components should come out at somewhere between £15 and £20, possibly less than the lower figure with careful buying of good "surplus" components.

It is the intention of the component service to offer the board along with those components (mainly inductors and possibly ceramic filters) which the constructor is unlikely to be able to purchase at his or her neighbourhood component shop. It will be possible to offer full kits if there is sufficient demand. It may also prove possible to supply a Plessey "in-line" oscillator/mixer assembly at about £30: this unit, of course, would be prealigned to the new frequencies and be of guaranteed performance. With these possibilities in mind it would be very useful to the committee if interested readers would indicate their requirements as outlined above, preferably as soon as possible.

While on the subject of simple wideband 10GHz equipment, it is recommended that a board and microwave "head" be built into a substantial box such as a die-cast box: this not only confers mechanical stability but also a degree of thermal and weather protection as well. It is not proposed to stock such boxes, which are readily available from a number of retail outlets, unlike either the microwave unit of some or the small components which may only be available from one or two sources.

Postscript

The microwave fraternity, as well as the vhf/uhf fraternity, will be saddened to hear of the untimely death, as a result of a flying accident, of Terry Bittan, DJ0BQ/G3JVQ. For many years he was publisher, editor and general manager of the well-known and respected *VHF Communications*. It is understood that the accident occurred in Germany while he was returning home from a business trip to Microwave Modules in Liverpool. Let us hope that the publication will survive this tragic loss and will continue to provide the high-spectrum user with information, ideas and designs, as it has done since the early seventies. □

Computing

*by John Morris, GM4ANB**

Duplicate checking (2)

In the April issue we looked at the use of hashing for storing a list of callsigns in such a way that it could be very rapidly searched for a particular entry. The demonstration program was for the Spectrum, a computer chosen for the unusual—compared with most home computer Basics—method it uses to store string arrays, one which happens to be most suitable for a duplicate checking program.

You can transliterate that program into other dialects of Basic, but on most computers the performance will be disappointing. This is because of the way they handle string arrays internally. The details vary from one machine to another, but generally involve storing a list of pointers and using a routine to search for free memory every time one of the elements is changed. This is all very time consuming, and by the time there are lots of callsigns around the effort needed by the Basic interpreter can just about undo all the hard work that was put into writing a hashing routine for fast look-up.

The solution is to avoid string arrays and use something else instead; specifically numeric arrays. The sizes of these, and hence all the memory they use, are declared explicitly in DIM statements, and they do not involve the Basic interpreter in pointer arrays, dynamic memory allocation, garbage collection, or any of the other time-consuming things implied by string arrays.

What is needed is some way to code callsigns as numeric values. The most obvious is simply to declare a two dimensional array, using a statement such as DIM C(2500,6). Then the ASC function would be used to find the Ascii code for each character in the callsign, which would be stored in the array. The first array index would be the entry number, the second the character number within the callsign. Thus to store a callsign T$ in element N of the list the sequence would be something along these lines:

```
100 FOR J = 1 TO 6
110 C(N,J) = ASC(MID$(C$,J,1)
120 NEXT J
```

Unfortunately, such an array is larger than most home computers can handle. It has (2500*6) = 15,000 elements, each one taking typically five or six bytes, giving a total of 75 to 90 k-bytes. Using integers helps, as these need only two bytes on most computers (four on the BBC), but the size is still large, and a lot of memory is being wasted. Taking the BBC Model B as an example, using an integer array would only reduce the memory requirement to 60 k-bytes, still well beyond the capacity of the machine.

To improve matters the callsign characters must be packed together more tightly. Given that a single character takes one byte, while an integer uses four (staying with the BBC for a while), it is possible to pack four characters into a single integer, so reducing the memory needed by another factor of four.

Is it possible to do even better? Yes, it is. Consider amateur radio callsigns. They are made up of a very limited set of characters, the 10 digits, 26 letters, and "/". Thus all amateur callsigns can be represented in a set of only 37 characters, or 38 if trailing spaces are included to pad out short callsigns to a uniform length. By contrast, a byte can hold any of 256 different values, so in using a whole byte for each character less than 15 per cent of the possible values are ever used. This cannot be optimum.

Information theory says that for a character set of N characters the number of bits needed to represent the set is given by the logarithm, to base 2, of N. For the 38-character set needed for amateur callsigns this means we need just under 5·25 bits per character. All we need to do now is find some way of allocating that odd quarter of a bit.

It can be done by using numbers to base 38. Each callsign character is coded, using 0 for "0", 1 for "1", and so on, then 10 for "A", 11 for "B", up to 35 for "Z" plus 36 for "/" and 37 for a space. Each character code is used as one digit in a six-figure base 38 number. For example, GM4ANB is first coded as (16,22,4,10,23,11). Using these values as base 38 digits gives the coded callsign:

$16.38^5 + 22.38^4 + 4.38^3 + 10.38^2 + 23.38 + 11 = 1,313,870,493$

The largest number that could ever come out of this procedure is $38^6 - 1$ (3,010,936,383). By contrast, the biggest number that can be

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represented as an unsigned integer in 32 bits is $2^{32}-1$ (4,294,967,294), which is rather larger. In other words, any string of length six or less, so long as it contains only legal callsign characters, can be encoded to give a unique value which will fit into a single integer on the BBC.

There is one small complication. Integers in Basic are signed quantities, having values in the range -2^{31} to $2^{31}-1$. The upper limit is smaller than the largest value that can come out of the coding, so overflow may occur, crashing the program. To get round this it is sufficient to modify the code ever so slightly by subtracting 19 from each value, meaning that "0" is represented by −19, "A" by −9, "Z" by 16, and so on. (In theory it is sufficient merely to offset the highest order digit, but is is simpler to program if the same is done to them all.) We are now working with a rather unusual number system, one with base 38 but with digits running from −19 to +18. Even though negative digits are allowed, this works just like any other number base, such as decimal or binary, and allows us to do the required packing quite conveniently.

Program 1

```
 10 A0=ASC("0"): A9=A0+9: AA=ASC("A"): AZ=AA+25
 20 AX=ASC("/"): AS=2000: DIM N%(AS),C%(AS): CN=1
 30 O1=-A0-19: O2=-AA-9
 40 PRINT "Call for QSO ";CN;: INPUT T$
 50 IF T$="" THEN GOTO 40
 60 H=0: T%=0: T$=T$+"      "
 70 FOR J=1 TO 6: C=18: T=ASC(MID$(T$,J))
 80 IF T)=A0 AND T(=A9 THEN C=T+O1
 90 IF T)=AA AND T(=AZ THEN C=T+O2
100 IF T=AX THEN C=17
110 T%=T%*38+C: NEXT J
120 T=RND(-ABS(T%)): T=RND(1): H=RND(AS)
130 IF N%(H)=0 GOTO 180
140 IF T%()C%(H) GOTO 160
150 PRINT "Dup of QSO ";N%(H): GOTO 40
160 H=H+1: IF H)AS THEN H=1
170 GOTO 130
180 PRINT "Wanted ";CN;"/";T$;: INPUT "OK",Y$
190 IF Y$="N" THEN PRINT "Missed it!": GOTO 40
200 PRINT "QSO No ";CN
210 N%(H)=CN: C%(H)=T%: CN=CN+1: GOTO 40
```

The result of all this mathematical playing is Program 1, which is a skeleton duplicate checker for the BBC. It combines the use of hashing, described in *Computing* April, with the coding method above.

Two integer arrays are declared in line 20. C% is used for the coded callsigns, with the corresponding contact numbers in N%. O1 is the difference between the Ascii values of digits and their coded values. O2 is the same for letters. Note the minus signs in line 30. The callsign to be checked is INPUT in line 40. Line 60 initializes the coded value. T%, to zero. Callsigns of up to six characters will be handled, anything over being ignored. Six spaces are therefore appended to the callsign to make sure the string is long enough.

The coding takes place in lines 80 to 110. Each character is examined, and C set to the appropriate code value. (In this simple example any unrecognized characters are treated as spaces. A fully-fledged program should first check that the callsign is legal.) When line 110 is reached, C will have the code—in the range −19 to 18—for character number J of the callsign. This is introduced as the next digit in T% and the loop repeated until all six characters have been incorporated.

Program 2

```
 10 A0=ASC("0"): A9=A0+9: AA=ASC("A"): AZ=AA+25
 20 AX=ASC("/"): AS=2000: DIM N%(AS),C1%(AS),C2%(AS)
 30 CN=1: O1=-A0-19: O2=-AA-9
 40 PRINT "Call for QSO ";CN;: INPUT T$
 50 IF T$="" THEN GOTO 40
 60 H=0: T1%=0: T$=T$+"      "
 70 FOR J=1 TO 6: C=18: T=ASC(MID$(T$,J))
 75 IF J=4 THEN T2%=T1%: T1%=0
 80 IF T)=A0 AND T(=A9 THEN C=T+O1
 90 IF T)=AA AND T(=AZ THEN C=T+O2
100 IF T=AX THEN C=17
110 T1%=T1%*38+C: H=H+J*T: NEXT J
120 T=RND(-H): H=0*(RND(1)+RND(1))+INT(1+AS*RND(1))
130 IF N%(H)=0 GOTO 180
140 IF T1%()C1%(H) AND T2%()C2%(H) GOTO 160
150 PRINT "Dup of QSO ";N%(H): GOTO 40
160 H=H+1: IF H)AS THEN H=1
170 GOTO 130
180 PRINT "Wanted ";CN;"/";T$;: INPUT "OK";Y$
190 IF Y$="N" THEN PRINT "Missed it!": GOTO 40
200 PRINT "QSO No ";CN
210 N%(H)=CN: C1%(H)=T1%: C2%(H)=T2%: CN=CN+1: GOTO 40
```

Line 120 generates a hash value using the coded callsign. The use of "—ABS" ensures that a negative number is passed to the first RND on line 110, which is necessary to seed the random number generator. The first "random" value passed back is not quite good enough, so it is discarded, and RND called again to give the hash value. The rest of the program is much the same as the Spectrum program given in April, except that instead of comparing strings it compares integers.

The performance of this program is quite satisfactory. With 1,200 callsigns in the list, it takes about 0·15s to check for a duplicate. As with the Spectrum version, there is much that can be done to turn this skeleton into a fully-fledged duplicate checker, but I shall leave that for you to experiment with.

On most computers other than the BBC, integers are only 16 bits long, which means that each callsign code must be split into two. This is shown in program 2. Apart from the use of two integer arrays, C1% and C2%, each storing a half of the coded callsign with the consequent coding complications, and the different interface to the random number generator, it is just the same as the BBC version.

Oddbits

Peter Martinez, G3PLX, uses the following algorithm to establish the validity of a given callsign:

1. Strip off any "/" prefix or suffix.
2. If the callsign contains any characters other than 0-9 and A-Z reject it as invalid
3. Search backwards from the end of the callsign, looking for the first occurance of a digit. Mark this position.
4. Count the number of letters after the marked character. If it is more than three or less than one reject the callsign.
5. Count the number of letters, L, and the number of digits, N, before the marker. If (L,N) is (1,0), (2,0) or (1,1) then the callsign is valid.
6. Otherwise the callsign is invalid.

This algorithm will throw out all callsigns which are structurally incorrect, such as GPL3X or G3PL3X, but will pass structurally correct callsigns which do not actually exist, such as GP3LX or 3G3PLX. To do this would require a table of all valid prefixes, which is probably not worth the effort.

With increasing interest in amateur data communication, particularly rtty, Amtor and packet radio, a need has grown for speakers to give talks on these topics at radio clubs. BARTG has set up the "Datatalk register", which contains details of speakers, their specialist topics, and the geographical areas they can cover. For a copy of the register, club secretaries should send an sae to Ian Wade, G3NRW, QTHR. Speakers wishing to be included on the register should also write to G3NRW. □

EPHEMERIS

Satellite news and views

*by R. O. Phillips, G4IQQ**

Uosat

There is still a great deal of experimental work being carried out on both satellites, mainly by the University of Surrey itself. In addition, many individuals and groups are making good use of the downlink signals to learn more about radio communications, satellite orbital dynamics and various other related topics. Not all of the groups are radio amateurs; indeed, one school in particular has made quite a name for itself arising from its use of Uosat 1. The Jordanthorpe School, in Sheffield, embarked on a project several years ago to set up a station to receive and decode signals from Uosat 1. Stan Spencer has been co-ordinating these activities, and he has now produced a 40pp booklet describing in some detail how they went about it. The booklet includes design information on two simple antennas, and provides step-by-step guidance on how to calculate the necessary orbital data to be able to receive the satellite signals. A computer program written in Basic is also included, to allow accurate prediction of the times when the satellite will be in range. The booklet is very well presented and is ideal for

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

anyone wanting to get his or her feet wet with satellites, whether licensed or not. It is available from AMSAT-UK at a price of £3.29 including postage.

While on the subject of simple receiving equipment for Uosat satellites, Timestep Electronics of Newmarket, Suffolk, produce several items of interest. A fixed frequency receiver is available either as a kit or ready-built, which will provide demodulated audio output for feeding into a suitable data decoder, or an audio amplifier in the case of the digitalker signals. The company also supplies a crossed-dipole antenna and a rf preamplifier (kit or assembled) to go with the receiver.

Finally on this subject, it is now possible to obtain a pcb for a 1,200-baud-only version of the data demodulator designed by Jim Miller and described in *Wireless World* May 1983. The new board, which contains several enhancements over the earlier version, provides three types of output: RS232C; cmos level plus 1,200Hz clock: and regenerated two-tone audio in the Uosat 2 format. The board is single-sided (160 × 100mm) and all components including encapsulated power supply are available from RS Components Ltd. AMSAT-UK (London E12 5EQ) are distributing the board and the price is £10 UK, £11 Europe and £12 for the rest of the world.

One of the recent additions to the 1,200 baud bulletin on Uosat 1 is detailed information on some of the experiments carried on the satellite. The Whole Orbit Data (WOD) experiment was described during April, and provided a very good insight to the type of data being collected and its significance.

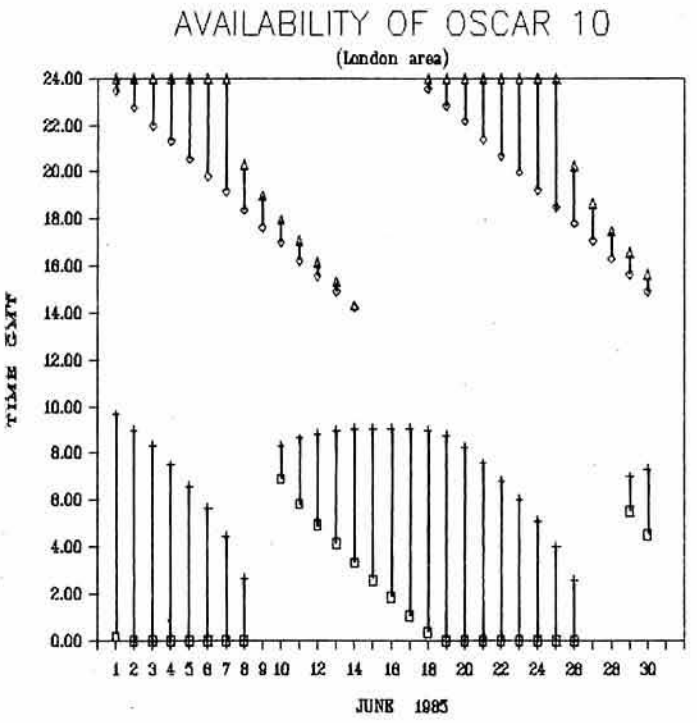
RS satellites

Reports of reduced up-link sensitivity on RS5, RS7 and RS8 during March were probably a result of the low battery voltage under eclipse conditions. The condition of the RS5 battery continues to deteriorate, but should now last until the next eclipse season later this year. It has been estimated that RS7 and RS8 should continue for at least another 12 months provided no major problems occur.

The testing of the new RS9 spacecraft has now been completed, and progress on the construction of RS10 continues. Two store and forward memory systems are being constructed for RS10, each with a capacity of 256 characters. As reported earlier, it is expected that the spacecraft will be launched separately, the first probably in December this year. Orbits very similar to those of the existing RS series are anticipated, ie inclination 82–83°, altitude 1,700km, period 120min.

Oscar 10

I must start this month with an apology for the fact that the diagram in the May issue giving the availability for Oscar 10 contained a number of errors. This was caused by taking double account of the precession of the orbit around the orbital plane; that is to say, the increase in the value of the argument of perigee. The offending part of the computer program has now been suitably modified, and at least that problem should not occur again. Turning to the information for the month of June, it will be seen that the gradual drift of the chart downwards continues. The early morning passes are now terminating at around 1000 or earlier, and the duration of the evening passes is increasing. The maximum elevation of the satellite starts off the month quite high, around 48°, decreasing to a minimum on the 12th, and then peaks again at around 47° on 19/20th June. For the record, the argument of the perigee for 1 June is approximately 16° and the orbit number 1,479.



Present indications are that there is likely to be a further modification to the transponder operating schedule around July. Until that time the schedule given last month will continue in operation.

Other news

A survey of its members by AMSAT-UK provided some very interesting and, on some topics, rather surprising results. The vast majority felt that the organization should take a leading role in the development of a satellite building project. Almost half favoured a 50/50 mix between transponders and research type payloads. There was a strong preference for geostationary orbits, with the high circular orbits of the RS satellites coming second. Support for the Oscar 10 orbit was only three per cent of those responding. Finally, on the choice of transponder types, there was a fairly even spread between those currently in use, and substantial support for a digital repeater.

The dx-pedition to the Isle of Man by G4CUO and G4ZHG appears to have been a great success, with many contacts via the active satellites using the callsign GB0AUK. I hope to carry a detailed report in the next issue.

Finally, a reminder to those who use computers to generate orbital prdeictions for satellites using the Kepler elements. Most programs use the 256-unit system for the mean anomaly; however, the data provided from a number of sources (including that given in the Uosat bulletin) is based on the 360-unit system. It is quite simple to convert from one system to the other, but if you get it wrong it can make quite a difference to the results. □

QRP

*by Rev George Dobbs, G3RJV**

Extension of CW Novice Award to Class B licensees

The CW Novice Award, an achievement certificate for cw operation during the first year of issue of a new licence, is now to be extended to include Class B licensees. The conditions are as follows: 50 different stations must be worked on cw within 12 months of the issue of the Letter of Variation held by the applicant. All contacts must be made by normal cw methods. Contacts made with the aid of machine morse readers, including computers, do not count towards the award. Full details of the award can be found in *QRP Rad Com* March 1985, and applications or requests for further details should be addressed to A D Taylor, G8PG, 37 Pickerill Road, Greasby, Merseyside L49 3ND, the communications manager of the G QRP Club.

QRP news

The Dayton Hamvention claims to be the largest amateur radio event in the world. This year it took place over the last weekend in April, and the American QRP club, the QRP QRCI, had a QRP forum. The panel of speakers included two representatives of the G QRP Club: Chris Page, G4BUE, and Colin Turner, G3VTT. *QRP* in future issues may contain further news of their visit and the state of QRP in the USA.

The Yeovil QRP Convention may not be as large as the Dayton Hamvention but was enjoyed last year by a considerable number of people. This individual club venture is to be repeated this year on 13 October. Further information will follow in *Rad Com*.

The QRP ARCI Transcontinental Net continues to operate each Sunday night at 2300gmt, controlled from Texas by W5LXS. It is some time since

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

UK QRP stations have been able to call into this net on 14,060kHz, but they are still there and worth checking from time to time if the band allows intercontinental QRP communication. The QRP ARCI welcomes UK members; the club is the main QRP organization in the USA, and the subscription for overseas members is $6 a year. For further information or membership applications write to William K Harding, K4AHK, 10923 Carters Oak Way, Burke, Virginia 22015, USA. The club publishes a quarterly magazine and organizes a range of QRP activities based upon the USA. The magazine has the distinction of a regular column from Wes Hayward, W7ZOI, who is perhaps one of the best-known technical authors on QRP subjects in the world.

Practical Wireless has produced a booklet called *Introduction to QRP* as part of its reprint series. The book contains several circuits of QRP transmitters and transceivers, as well as an atu, swr meter and wattmeter suitable for low power communication. The book is available by mail order for £1.50.

The G QRP Club Late Summer CW Activity Weekend

This event, which runs over the weekend 28-29 September, is not a contest but an opportunity for QRP operators to contact as many other QRP stations as possible on specified bands at specified times. Call, or listen for "CQ QRP" at the times and frequencies in the schedule. Log summaries, reports and comments would be welcomed by G8PG at the address above.

Time	CW QRG	Time	CW QRG
9099-1100	14,060/21,060/28,060	1700-1900	3,560/7,030
1100-1300	3,560/7,030	1900-2100	14,060
1300-1400	10,106	2100-2300	3,560/7,030
1400-1700	14,060/21,060/28,060		

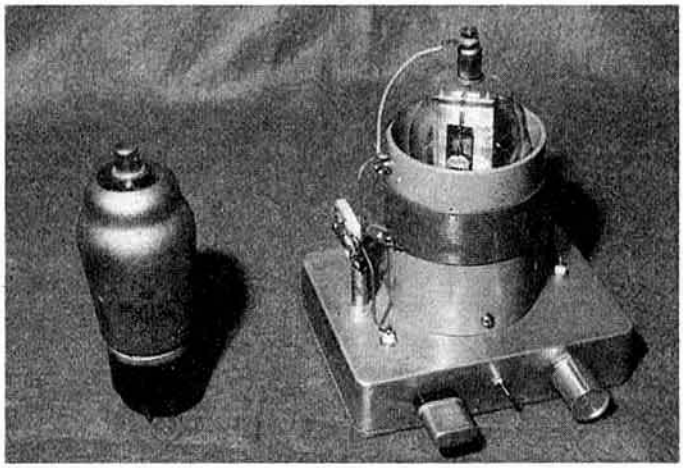
The RSGB Low Power Field Day is on 21 July 1985, see "Contest News" in this issue. The G QRP Club is to offer certificates of merit to the club members who achieve the first three places in each section of this contest, and to the station which achieves the highest placing in each section with completely homebuilt equipment.

Kits and QRP

Ever since the advent of solidstate QRP stations, building a kit has been a way of obtaining a QRP station. Solidstate circuitry lends itself to simple construction of QRP equipment, which in turn encourages manufacturers to produce kits of parts for the building of such equipment. The Heathkit HW7 provided many operators with their first taste of QRP operation, and became a widely used and modified piece of equipment. The first manufacturer to explore the field of diy QRP communication was Ten Tec, who originally produced their PM series of direct-conversion transceivers as individual boards for the amateur to build into his own station. The Heathkit HW8 followed the HW7, and now has been superseded by the HW9. Other manufacturers in the field have been Mizuho with transmitter boards for 7 and 21MHz, and their very rare (I have only ever seen one example) 7MHz direct-conversion transceiver kit, and MFJ who formerly sold single-band QRP transmitter kits.

This year has seen two UK companies enter the QRP kit market. C M Howes Communications (139 Highview, Vigo, Meopham, Kent) have sold a direct-conversion receiver kit for the 3·5 or 14MHz bands for some time. They have now produced a QRP transmitter board kit for 3·5MHz, called the CTX80. The basic board is crystal controlled and runs up to 5W of rf output. The basic board can be built into a complete transceiver with their direct-conversion receiver kit. Several of these transmitters have been heard on 3·5MHz during recent weeks.

WPO Communication (20 Fareham Ave, Hassocks, West Sussex BN6 8NS) have been making a range of cw/dsb transceiver kits for some time. The most popular have been the DSB80 and DSB160 kits, with the DSB2—a transceiver with an interesting pll vfo system and a range of single-band options, catching up quickly. WPO Communications have now produced the Micron six-band (3·5, 7, 10, 14, 21 and 28MHz) QRP transceiver in kit form. The transceiver is direct-conversion but has several new and interesting features. The vfo is pll controlled, the receiver has agc and a three-position passive LC audio filter. The transmitter output can be continuously varied from microwatts to 8 or 10W of rf output. The kit is sold in a number of options ranging from a two-band version of the basic board to a complete kit with case, digital readout, atu and power metering. The kit is very new and I have yet to use or hear one in use, but the quality of the circuitry and the kit seem to suggest that this will be a popular option for QRP operation. □



Could the valve stage a comeback? This fine valve transmitter by George Burt, GM3OXX, was one of the entries in a recent competition by the G QRP Club for transmitters built around single valves

SWL News

*by Bob Treacher, BRS 32525**

LF Challenge results

Where were all the European entries this year? That was the first question asked after the closing date for entries had passed. Last year 22 logs were received from overseas, but this year's event was only supported by our friends from Belgium who are very competition minded. Twelve logs from the British Isles were received—a slight decrease on 1984. This year's winner was Jean-Jacques Yergauian, ONL-383, with Andy Smith, BRS50134, (now GU1DWO), and Martin Parry, BRS52543, runners-up. An analysis of all the logs showed that during January 151 countries were heard on 7MHz, 153 on 3·5MHz and 75 on 1·8MHz. The 1·8MHz scores were particularly good, although better propagation to the Caribbean was experienced in February. Thirty-two dx countries were heard during the month: CP, D44, EA8, EA9, FM5, HC, HH, HK, HK0, HP, HZ, JA, PY, TG, UA9, UD6, UF6, UG6, UJ8, UL7, UM8, VE, VS6, W, XE, YV, ZL, 4X4, 5T5, 6Y5, 7X2 and 9Y4.

On 3·5MHz, 100 dx countries were noted in the logs. Some of the better dx was: AP2, CE0, CY0, H44, JT, KC6, SU, TZ, VS6, YB0, 3B8, 3X4, 4S7, 9M2 and 9V1. 7MHz produced 98 dx countries. The quantity of the dx was slightly better, with the Pacific being well represented, mainly due to the ZL2AAG net which provided some good dx during the month. Some of the more exotic dx was A22, FH4, FT8X, KH2, KL7, S79, T2, YJ8, ZK1, ZK2, ZL7, 3B9, 4K1, 9U5 and 9V1.

The event provided most entrants with a number of new countries. Martin Parry, for example, added seven new ones on 1·8MHz, three on

LF CHALLENGE JANUARY 1985

Posn	Callsign	7MHz EU countries	7MHz DX	3·5MHz EU countries	3·5MHz DX	1·8MHz EU countries	1·8MHz DX	Total points
1	ONL-383	47	74	49	75	41	18	1018
2	BRS50134	48	57	47	61	41	21	969
3	BRS52543	47	54	47	70	34	13	831
4	BRS32525	30	21	48	53	29	14	644
	BRS48909	40	33	43	49	33	10	644
6	BRS31879	48	35	46	34	41	6	594
7	BRS8841	31	35	45	42	27	6	532
8	BRS28198	30	16	36	36	27	8	477
9	BRS44395	35	17	37	14	35	3	385
10	ONL-6945	27	14	33	33	13	4	326
11	BRS25429	0	0	0	0	34	16	274
12	BRS62088	10	4	24	12	12	4	178
13	ONL-03177	27	9	34	23	0	0	157
14	ONL-5668	25	8	23	25	0	0	147
15	BRS85124	13	0	30	5	14	0	128
16	BRS44984	23	4	35	13	0	0	105
Total countries heard in January		53	98	53	100	43	32	

* 79 Granby Road, Eltham, London SE9 1EH.

1985 HF COUNTRIES LIST

Station	DXCC	28	21	14	7	3·5	1·8	Total
BRS8841	198	5	85	159	105	131	39	524
BRS52543	170	12	58	93	113	131	61	468
BRS25429	143	7	44	93	103	131	67	445
BRS32525	166	5	37	85	86	129	73	415
BRS31879	132	1	46	76	85	85	51	344
BRS1066	133	1	48	89	88	67	50	343
BRS50134	119	0	0	0	105	108	62	275
BRS48909	112	0	0	0	73	92	43	214
BRS28198	84	0	0	0	46	72	35	153
BRS44395	71	0	0	0	52	51	38	141
BRS44083	68	0	7	45	6	46	4	108
BRS62088	54	0	0	31	14	36	16	97
BRS44984	47	0	0	0	27	48	0	75
BRS85124	52	0	0	0	13	35	14	62
FE8957	14	14	0	0	0	0	0	14

3·5MHz and seven on 7MHz. The number of gotaways were interesting too. Jean-Jacques reported no copy of a 7X2 or a UD6 on 1·8MHz, while ZK2 and T2 could not be copied on 3·5MHz. Andy Smith heard USA working KL7 on 1·8MHz but no copy of the KL7 on Guernsey, while an LU was just detectable, again working USA but was not claimed. Andy also noted the agonizing effect of hearing a JT on 3·5MHz 3min into February. Even more frustrating, was hearing VP2M, 9Y4 and J37 on 1·8MHz on the morning of 2 February. Perhaps someone will organize an If challenge for February 1986!

To sum up, conditions over the month were fairly good, although probably not so good as in 1984 (although the scores do not back this up). There were probably even more countries active than were logged, but to have over 150 active on both 7 and 3·5MHz was a boost. The ZL2AAG net and the Russian DX net obviously helped boost scores, as did the extra 1·8MHz activity. To those who failed to make the most of 1·8MHz: "there is always 1986". Think about improving your antenna system, and buy an alarm clock to get you out of bed in time to catch the best conditions on the band at around 0445–0700. My thanks to those who supported the event. Another If challenge will be held in January 1986, when we hope for as good a G entry and for a far better response from overseas. A plaque will be sent to Jean-Jacques in due course.

Contest participation

While on the subject of competition, it is worth noting that the results of the 1984 Listener championship show a marginal increase in the number of entries. What is pleasing, is that several Class B licensees have taken part too. For 1986 the number of contests to be included in the Listener Championship is to be increased; it is intended to add both the 28MHz phone and cw cumulatives and, depending on the response this year, the Society's SWL Contest.

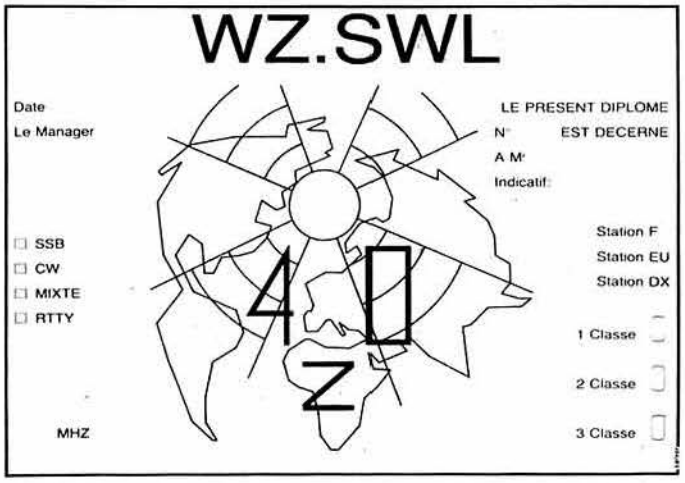
The HF Contests Committee was also delighted to have 10 listener entries in the Town & County Contest earlier in the year. It is hoped that this pleasing trend will be continued for the remainder of the listener contests in 1985.

The first-quarter scores of the UBA's All-year-round Contest are also encouraging after 1984's dismal showing from British listeners. The 1985 event is being supported by three swls in the cw category, and four in the ssb category. I wish all of them the very best of luck and a good placing at the end of the year.

In the White Rose RS fifth LF Contest, Don Piccirillo, BRS52868, was first in the cw section; while in the phone section, Arthur Miller was top again, and Norman Nenbry, BRS28198, second. However, the number of British entries was disappointingly low, and the organizers hope for a better response for their 1986 event. They also ask for ideas as to how the 1986 event could be improved. Comments to PO Box 73, Leeds LS1 5AR.

Midsummer Contest and slp

Dave Whitaker, BRS25429, now a corresponding member of the Society's HF Committee, is doing his bit this year to gauge propagation during the sunspot trough. To further his research, he has organized a "Midsummer Contest" on the 14, 21 and 28MHz bands, and a set listening period on the *new* 10, 18 and 24MHz bands for Sunday 23 June. Both events will run from 1400 to 2000gmt. One point can be claimed for each different station heard, with a multiplier for each country heard on *each* band. Final scores will be multipliers (from each band, added together) multiplied by the total number of different stations heard. These rules are the same for both the 14, 21 and 28MHz contest and the 10, 18 and 24MHz slp. Separate logs for each band should be sent to BRS25429, "Hillcourt", 57 Green Lane, Harrogate, North Yorkshire HG2 9LN. They should show: date, time, station heard, station worked/called, report of station heard at listener's QTH, multipliers and points claimed. Logs should be postmarked no later than Monday 22 July. Prizes will be awarded at Dave's discretion.



The WZ-SWL Award, details of which were published in "SWL News" in September 1984

DX chatter

The KP1, VK9X and FO0 dxpeditions all materialized, giving our reporters a number of new band countries. The VK9X trip was particularly well received on 7 and 3·5MHz, but the KP1 and FO0 expeditions brought back memories of that old saying "It's easier to hear them than to work them". This was due to the fact that the operators seemed content to work the USA on the lower frequency bands, even at European sunrise when both 7 and 3·5MHz were at their best. Indeed, FO0XX was 57 on 3,755kHz one morning just after sunrise. On the higher frequency bands, only 14MHz was reliable: Robert Small, BRS8841, caught the KP1 and VK9XG, and also added NA6T/KH4, 9M8EN and UW3HX/1 (Franz Josef Land). 9U5JB, operated by ON5NT, had just shown up at the time this was being penned. His signals had been reported on 14 and 3·5MHz. I still get the occasional mention of ZA! Robert heard ZA1BB on 14MHz, QSL via DL6UJ, but no prizes for guessing whether a card will materialize! Still on 14MHz, Martin Parry caught VK9XB, a PJ4 and P29 for three new ones. Joan, my xyl, had a look at the WPX Contest, and these went into the BRS62088 log: KL7IRT, NP4CC, TR1G (via TR8JLD), 5W1EJ, together with W6/7.

The 21 and 28MHz bands were poor, but the lower frequency bands continued to produce some good dx. Robert Small managed VK0GC, VK9XG, DL7AH/3X, OH2KI/ZB2 and the KP1 on 7MHz, while 3·5MHz provided YI0AY, PY0FG, J88BK/9Y4, NP4A (S9+20dB regularly at 2215), plus KP1 and VK9X. The 1·8MHz band cost me at least a few hours' lost sleep during the course of the KP1 trip. On four consecutive mornings the alarm was set for 0345, but signals were inaudible until the fourth day when they beefed up the power and 6Y5NR/KP1 was logged at 0400 at R5S6 for a much-deserved new one! During the month in review the following dx was reported: C6ANI, CT2DG, EA8AFS, HC1BI, HH7PV, HK3DDD, HK0HEU, PT7BZ, TI2J, VP2EW, RF6QAI, UJ8JMM, W0JX (South Dakota), YV2BYT, and 3V8PS.

Towards the end of April, hf conditions were quite poor but there were reports of significant activity from numerous ZC4 stations, while VQ9CK and 3B8CA were good signals on 21MHz. PY0FG had been heard on 7MHz ssb, but there was no copy of the latest XF4 dxpedition.

An interesting station to listen for during space shuttle flights will be WA3NAN, operating from the NASA Goddard Space Flight Centre in Maryland. The station has special authorization to retransmit live audio from the shuttle. The only frequency of interest to listeners in Europe is 14,275kHz ssb. Coverage starts 1h before lift-off and continues until after the landing. Any reports would be well received.

Here and there

Dave Whitaker reported a pleasant letter from ZL3GQ together with confirmation of Dave's report on ZL3GQ's 1·8MHz ssb signal; this brought Dave HAC on 1·8MHz. Another quick response was from ZL7PO for a 7MHz report. Brad Bradbury, BRS1066, received his 1A0KM QSL for a 1·8MHz report. Robert Small was pleased with TT8CW, BV0W, FK8FI, DJ6SI/5V, FT8XB, XX9AN, 4K0B (North Pole) and 4K1ANO (Antarctica).

Finale

News, views and table scores for inclusion in the August issue should reach your scribe by Tuesday 11 June, with late copy by Tuesday 19 June. □

The Month on The Air

*by John Allaway, G3FKM**

DX NEWS SHEET has drawn attention to something which was heard on 3·5MHz phone recently when a station with the prefix "FG4" was challenged as to his location and legality. The answer given was that he was really a G4 in France with a reciprocal licence and should strictly be using "F/G4" but found the "/" too much trouble. This raises two points: the first is the more important, and is that the G4 in France was behaving quite illegally by not giving his callsign properly; and the second, that the format "country of operation followed by home callsign" was agreed by member societies of IARU at their conference several years ago. The thinking behind the idea is that—particularly during contests—if the actual location of the station is given first there is no need to take time out to listen to the rest of what might be a long string of characters if a QSO with that area is not wanted.

A request has been received for George Schneider, formerly 5A2TR, to contact G8UVE via AMSAT-UK, London E12 5EQ.

Welcome

The following new overseas members joined the Society during March: EA6KZ, EI5FV, EI6EN, EI9BVB, I1BOC, K1KI, KV5E, OH1OC, ON1KCV, SV1JG, VE3DQB, WB2ONA, 9M8EN, and M Baptiste (9Y), J O'Donnell (EI) and J Brown (ON).

QRP Day

At the 1984 IARU Region 1 Conference there was a proposal put forward and adopted that "17 June will be proclaimed as a yearly hf QRP Day. Region 1 will take the steps needed to get this day proclaimed as a yearly international QRP Day, with the goal that all amateurs worldwide use low power on that day every year".

Low power can be fun—as the enthusiastic members of the G QRP Club can prove—and in the days of expensive and highly-sophisticated equipment it is refreshing to try to make a few QSOs in a different way! Readers are urged to "have a go" and they may be surprised at their results.

DX news

Jim Russell, G3OKQ, is en-route to Pitcairn Is with a team which is visiting the island to repair the damaged jetty. He is anxious for all to know that the callsign VR6IM has now been issued for use by any of the stations on the island when asking for medical advice or assistance, and asks particularly that when VR6IM is heard no interference be caused by other callers. Jim will be on the island for about six months using his TSR120S and an 18AVQ antenna with the callsign VR6JR, and QSLs will be answered when he returns home. He will be the fifth amateur on the island —Andrew Young, VR6AY, who is still around and in his upper eighties; Kari (a yl Norwegian) who has the callsign VR6KY; Nig, who is VR6KB; and Tom Christian, VR6TC, being the other four.

The Belgian Railways ARC has written to say that the Belgian PTT is allowing licensed amateurs who are affiliated to the club to use the prefix OT until 31 December this year on the occasion of the 150th anniversary of Belgian Railways.

According to *Informacion DX* it is possible to arrange skeds with JT1AO on 3·5 and 7MHz. Write to C Chadraawal, Box 844, Ulan Bator 13, Mongolia. BY1PK is now very often to be found on 14,190kHz from 0700, and lists are sometimes made by RF0FWW. BY5RA and BY1PK are also on cw, and BY4AA has been a good signal on ssb in the area of 14,200kHz between 0800 and 1300.

ZD9BV was expecting a new antenna and is active daily at 1700 on 21,265kHz. *DX News Sheet* reports that 3·5MHz operation is a problem due to interference with the local broadcast station.

TL8TX became a silent key recently, and his QSL manager reports that logs for the last six months of his activity are still in Africa. He (K0VZR) hopes to obtain them, otherwise some 250 QSLs will need to be returned. OZ2UT/A cards have started to arrive and it appears that the operation (from Mozambique) was during a demonstration of commercial equipment to the government; the DXCC status of the station is not yet known. DL5DAB/3X now has the callsign 3X0HAB, and 3X4EX's licence is

Andreas Bato, HA6NN, well-known hf operator, recently represented MRASZ at a meeting of hf managers in Germany (photo: G3ZAY)

believed to expire this month—it will not be renewed as he leaves Guinea very soon. *DX News Sheet* reports that the Radio Society of Kenya has negotiated the use of 1·8MHz, and in future all 5Z4s will be able to use the segment 1,830–1,859kHz. 5Z4ED is already active, and 5Z4MX was hoping to be on the band very soon.

All QSLs for NG84O have now been sent out, but QSL manager K6LAE still has a supply of cards should anyone not already have received one.

Stations in Canada may use the following prefixes to celebrate the centenary of Parks Canada between 29 June and 29 August: XO1 (VO1), XO2 (VO2), XJ1 (VE1), XJ2 (VE2), XJ3 (VE3), XJ4 (VE4), XJ5 (VE5), XJ6 (VE6), XJ7 (VE7), XJ8 (VE8) and XK1 (VY1).

According to *DX News Sheet* W0RAN (who is connected with Hy-Gain) has arranged for an Explorer 14 beam to be donated to ZC4MR, transport being paid for by W7PHO and team. ZC4MR now has a direct QSL address (see "QTH Corner").

Computerized DX Edge

A computerized version of the well-known DX Edge is now available on a disc ready to use in a Commodore 64. This illustrates the grey-line on the background of a world map with its position updated every 15min. It illustrates sunrise and sunset times for anywhere in the world and any area may be centred on the screen. More details are available from the DX Edge, PO Box 834, Madison Square Station, New York, NY, 10159, USA. The cost (by air) is US $38.95.

Dave Perry, ZS1SG, (left) vice-president of SARL, talking to Ron Eisenwagner, OE3REB (president of OeVSV) at the hf managers meeting (photo: G3ZAY)

*10 Knightlow Road, Birmingham B17 8QB

ALL-TIME—CURRENT COUNTRIES TABLE No 3

	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
G3KMA	**118**	**227**	**292**	**316**	**314**	**300**	1,567
G3MCS	49	203	252	312	312	294	1,422
G3GIQ	63	194	246	312	312	294	1,421
G4DYO	56	161	212	306	300	282	1,317
G3XTT	111	182	212	275	273	244	1,297
G3UML	29	204	217	314	283	243	1,290
G3HTA	61	164	223	308	284	244	1,284
G2DMR	48	158	169	294	291	257	1,218
G3ALI	2	198	204	297	267	230	1,198
G4FAM	51	148	211	262	260	240	1,172
G3RUV	6	148	178	298	291	236	1,157
GW4BLE	24	162	177	267	265	239	1,134
G3XQU	39	139	166	275	267	239	1,125
G3RUR	1	153	184	286	261	225	1,110
VK9NS	53	152	211	278	232	177	1,103
G3TXF	57	161	179	250	245	205	1,097
G3IGW	97	148	230	225	197	182	1,079
G3NOF	4	83	74	312	308	264	1,045
G4LJF	28	162	186	257	218	191	1,042
G4BWP	53	156	166	228	195	234	1,032
G3YMC	73	98	161	230	236	183	981
GM3YOR	61	102	145	197	188	175	868(all cw)
GM3PPE	45	120	142	181	167	138	793
GW4OFQ	31	151	108	151	157	107	705
G4JBR	54	126	105	131	150	136	702
9K2BE	41	67	78	125	166	178	655
Average	48	152	182	257	248	221	1,108

Next deadline: for all-time including deleted countries to reach G3GIQ by 18 July please. Band leaders printed in bold type.

10MHz TABLE

All time		1985
G3IGW	- 85	?
G4UZN	- 65	27
G5LP	- 36	?
G4UYR	- 33	?

28MHz TABLE

1985	
G3XQU	- 27
G4RAB	- 14 (ssb)
G4MUW	- 9 (ssb)
G4XAH	- 8
G4DXW	- 5

Expeditions

From 3 to 14 June Ole, OZ5DL, and Freben, OZ5UR, will operate from the Faeroe Is as OY/OZ5DL and OY/OZ5UR respectively. Though the operation will be mainly on cw, some rtty and occasional ssb can be expected. Check the following frequencies: (cw) 1,837, 3,510, 7,005, 10,105, 14,030, 18,070, 21,015, 24,900 and 28,015kHz; (rtty) 3,590, 7,040, 14,090, 21,090 and 28,090kHz; (ssb) 3,645, 7,045, 7,070, 14,210, 21,210 and 28,510kHz. QSLs should go to the operator's home calls. Last year's visit to OY produced 5,000 QSOs in average conditions.

Heard Is DX Association

An official report of the amateur radio and scientific study/mountaineering expedition to Heard Is in 1983 is now available from Jim Smith, P29JS. This costs $10 and is delivered by air-mail from Box 515, Konedobu, Papua New Guinea. It is an interesting book—in the words of P29JS it "reflects what was done in the name of amateur radio", and it also contains reports written about the island by the other expeditioners. Jim says that he believes that this report in due course opened the door for Kermadec. He also says that, two years on, neither Kirsti or he regret Heard Is and that the *Cheynes 2* let HIDXA down—not the reverse. It is believed that a court action would have been won but would have been costly. In the event all debts have been paid. Membership of the HIDXA costs $25 per annum,


Award No. _____

Arms of the Borough of Ipswich

IPSWICH RADIO CLUB

50th Anniversary Award

THIS is to certify that _____ has provided proof of having made _____ British contacts during 1985 including _____ contacts with members of IPSWICH RADIO CLUB, who in association with the BOROUGH OF IPSWICH (Recreation and Amenities Department) and ARROW ELECTRONICS have sponsored this award.

Date: _____

The Worshipful The Mayor of Ipswich — President, Ipswich Radio Club

IRC RSGB

Ipswich Radio Club Award—see March *MOTA*

and there are now more than 100 members scattered through 27 countries. It is open to all radio amateurs interested in dxing and assisting in dx activity from the more difficult of the DXCC countries. A newsletter is produced and more information can be obtained by joining the regular net on 14,220kHz.

USSR oblast list

Geoff Watts' *Radio Amateur Prefix-Country-Zone List* was referred to in April *MOTA*. Geoff also produces a most comprehensive *USSR Oblast List* which has now been extended to give the oblast and location of most USSR callsigns including the two-letter series. The price is £0.35 or two ircs from overseas (G Watts, 62 Belmore Rd, Norwich NR7 0PU).

Awards

Details of a number of awards issued by BFRA have recently arrived and they include the following:

Peoples Republic of Bulgaria Award
For valid QSOs/listener reports since 1 January 1965. Europeans need five with LZ1 and five with LZ2 on each of the 3·5 and 7MHz bands (a total of 20 different stations). Applicants from outside Europe need 20 also (10 with each area) but on any bands.

Five Bands LZ Award
Valid QSOs/listener reports since 1 January 1979—10 in all, consisting of one LZ1 and one LZ2 on each band 3·5, 7, 14, 21 and 28MHz.

W 100 LZ Award
Valid QSOs/listener reports after 31 January 1979. 100 different LZs during any one calendar year.

W 28Z ITU Award
Valid QSOs/listener reports after 1 January 1979 with the following countries in ITU zone 28: DL, DL(W.Berlin), FC/TK, HA, HB9, HB0, HV, I, IS, LZ, T7, OE, OK, SP, SV, SV5, SV9, SY, YO, YU, Y, ZA, 9H, 4U1ITU. There are three classes:

In March 1985 Richard Sterry, G4BLT, spent a month in Tula, USSR, with a colleague, giving training courses on British equipment to Soviet electronic engineers. One of the engineers on the course was UA9SJT, and he also met UA3PCC while he was there. L to r, seated: G4BLT, colleague Bill Mullins, UA9SJT and another Soviet engineer. Other Soviet engineers are standing behind

QTH CORNER

DP0GVN	via DJ4SO, K Behrndt, Bosser Str 8, D-2301 Brux, FR Germany.
FM4CT	via N7RO, R Moen, 2935 Plymouth Dr, Bellingham, Wash, 98225, USA.
FO8XX	YASME Foundation, Box 2025, Castro Valley, Cal, 94540, USA.
J6LNU	Box 611, Castries, St Lucia.
TA1D	PO Box 1167, Istanbul, Turkey.
TR8DR	via W2PD, S Slonim, 320 Rose St, Massapequa, NY, 11762, USA.
V2ACW	via WB4OSN, J Picier, 1486 NW 66th Av, Margate, Fla, 33063, USA.
VK9XB	via VK6IR, S Chamberlain, PO Box 260, Victoria Park, W Australia 6100.
VK9XG	via VK6DU, L Martin, PO Box 38, Kelmscott, W Australia 6100.
VK0GC	via P29JS, J Smith, Box 515, Konedobu, NCD, Papua New Guinea.
XX9UT	via JA1UT, T Hayashi, 4-20-2, Nishi-GotandAa, Shinagawa, Tokyo 141, Japan.
ZC4MR	(direct) ARS ZC4MR, c/o Joint Signal Board, Episcopi, BFPO 53. (or via G4SDJ, 2 Merriefield Close, Broadstone, Dorset).
ZD7XY	PO Box 25, St Helena.
VE3KFE/4U	via VE3PET, Box 4, Petawawa, Ont, K8H 1H1. Canada.
4X5DC	Israel ARC, PO Box 4099, Tel Aviv, Israel.
9U5JB	G Penny, ON5NT, Lindestraat 46, 0990 Aalter, Belgium.

Class 1 for 28 confirmations from different stations in 20 countries; Class 2 for 28 in 16 countries; and Class 3 for 28 with different stations in 10 countries. In all cases five LZ QSOs are also required.

Black Sea Award
Valid QSOs/listener reports after 1 January 1979 with 60 stations located in countries bordering the Black Sea, including at least one with LZ, TA, YO, UA6 and UB5.

Sofia Award
Valid QSOs/listener reports after 1 January 1979. 100 "points" needed by working Sofia stations. Europeans count one point for 14MHz contacts/reports, and two points on the other bands. Others count 15 points per QSO on 3·5MHz, five on 7MHz, one on 14MHz, two on 21MHz, and three on 28MHz. Each station may be represented once per band (irrespective of mode).

Each of the above awards will be endorsed for cw, phone or mixed-modes on request. Send list of claimed QSOs/reports certified by two licensed amateurs or a local club official, plus 10 ircs, to: PO Box 830, Sofia 1000, Bulgaria.

Sandwell Blanc Mesnil Award
Issued by the West Bromwich CRC, G4WBC, to commemorate the twinning of Sandwell with Blanc Mesnil, in France. UK stations need one QSO with a member of WBCRC, plus 19 others the last letters of whose callsigns spell "Sandwell Blanc Mesnil". Other applicants need only to do the spelling but not using callsigns with their own prefix. The fee is £1.25, eight ircs, or US $3. Apply to W E Ansell, 117 Oxhill Rd, Birmingham B21 8HB.

Victory-40 Award
This was referred to in the "DX news" section of March *MOTA* and seems to have become quite popular. The correct name is apparently "Pobeda 40" and applicants do not need to submit QSLs—send only a copy of log entries certified by a national radio society or two licensed amateurs—QSL cards are not required.

Contests

Results of the **1984 CQ M DX Contest** are as follows: Single-operator, single-band: (14MHz) GM4LKJ (3,250), G4SKI (2,520), G3NT (1,577), G3SGH (952), G4ACY (816), G2AJB (540), G4VDX (378), G3DCP (210), G4VEY (176), G4MTC (136). (21MHz) GM3YXJ/A (56), GI3HXH(9). Single-operator multi-band: G3TXF (132,750), G3ESF (70,060), G4OTU (45,010), G3LNC (20,139), G4OKN (10,696), GM4ELV (9,744), G3ICG (6,150), G4SDZ (5,502), G4XKR (5,425), G4IUF (3,567), G6QQ (2,626), G4MPI (2,575), G3WLO (2,040), G3IQF/M (1,325), G3JWY (1,260), G3URA (992), G3ZOH (864), G3VTY (792), G6TC (462), G3VDL (455), G4OBK (207), and G4WIJ (140).

In the **1983 LZ DX Contest** G3ESF scored 27,474 points, G3TXF 8,151, G4OKN 5,020, and G3HRY 3,312.

Edwin Chicken, G3BIK, of Morpeth, operating as JY8IK at the Royal Amateur Radio Society of Jordan HQ station during a recent visit to Amman

Angelika Voss, G5CCI, president of BYLARA (photo: G3ZAY)

World Wide S America CW Contest
1500 8 June to 1500 9 June
1·8-28MHz. Single-operator single- or multi-band, multi-operator single-transmitter, and listener sections. Call "CQ SA Test" and exchange RST and QSO number (from 001). QSOs with own country count for multiplier only, with others in same continent two, with others four, and with S America eight. The multiplier is the number of DXCC countries and S American prefixes worked on each band. Certificates will be awarded to the top three entrants in each class in each country ("reasonable score provided"). Provide separate log for each band and post entries before 31 August to: WWSA/1985 Contest Committee, PO Box 18003-20772 Rio de Janeiro, RJ, Brazil. No UK calls appear in the list of 1984 entrants.

Canada Day Contest
0000 to 2400 1 July
1·8 to 144MHz, cw and phone. Single-operator single- and multi-band, and multi-operator multi-band. Same station may be worked twice on each band but only once on each mode (no cross-mode QSOs allowed). Exchange RS/T, QSO number (from 001) and VE stations will also give province. Ten points are gained by working a Canadian station and four for others. 20 points are counted for QSOs with official stations using the suffixes TCA or VCA. The multiplier is the total of Canadian provinces and territories worked on each band on each mode—a total of 26 (VO1/VO2, VE1-NB, VE1-NS, VE1-PEI, VE2, VE3, VE4, VE5, VE6, VE7, VE8, VE0 and VY1). CARF recommends keeping near 1,601, 1,840, 3,525, 3,775, 7,025, 7,070, 14,025, 14,150, 21,025, 21,250, 28,025 and 28,500kHz. Phone on the hour and cw on the half-hour is also suggested. Logs must contain dupe sheets and a signed statement, and a summary sheet with claimed scores, QSOs, a list of multipliers and calculation of claimed score. Summary and multiplier sheets are available from the organizers (sae and ircs please). Send entry within one month of the contest to: CARF Contest, c/o N Waltho, VE6VW, Box 1890, Morinville, Alberta, T0G 1PO, Canada.

The All Asian DX Contest
0000 15 June to 2400 16 June (Phone section)
1·8 to 28MHz. Single-operator single- or multi-band, multi-operator multi-band. YL stations send RS plus 00, others RS plus their age. Non-Asian stations work Asians and count three points on 1·8MHz, two on 3·5MHz, and one on the other bands for each QSO. The multiplier is the number of different Asian prefixes worked on each band. Note that USA military stations and those in JD (Minamitorishima) do not count. Photocopies of summary and log sheet are available from G3FKM (saes please). All times must be given in gmt. Mark each new prefix as worked. Logs and summary sheets must reach JARL, PO Box 377, Tokyo Central, Japan, no later than 30 September.

Around the bands

The latest report from G8KG does not make very happy reading—he says—"By the end of March solar activity had fallen to only a little above its level at the last sunspot minimum year, 1976. The provisional sunspot number was only 11·9 and the quarterly mean of solar flux was down to 73 sfu. The trend of the longer-term averages is still steeply downwards, pointing to the possibility of the next minimum being as soon as the end of this year—which would make for a very short cycle. On the other hand, the 27-day average solar flux has been almost level for the past 180 days. The picture may become clearer in the next few months!" Smithy will not be able to give such up-to-date reports in future due to the cessation of ionospheric data from Paris via the Meudon Ursigram. This means that in future information will only reach him via monthly bulletins from Brussels or on the rare occasions when he is able to copy WWV.

In spite of the poor hf conditions, the following managed to hear or work some nice dx: G2HKU, G3YY, G5JL, G5LP, G3s GIQ, GVV, YRM, G4s EHQ, UOL, UYR, UZN, XAH, G0AGP and RS10906.

Callsigns listed in italics were those of stations using A1A.

1·8MHz. 0500 *EA9KQ, N4UB.* **0600** *VE3MFA, W1,2,8, 3A2GL.* **2200** *EA8AAU,* LX1PD, *OY6FRA, SP5INQ.*

3·5MHz. 0500 *CO, HK, KP2I, LU, OA, K3UOC/PJ5, K3UOC/PJ7, YV.* **0600** *AD3V/VP2M, ZLs 1AIZ, 3LP, 4IE.* **0700** *ZL2JJ, ZL3GQ.* **1800** VK9XG, OE3HGB/YK. **2000** 3D6AN. **2100** JY9CL, 9U5JB. **2200** J28EB, VK6AGW, W, 4X6AG, 5N3RTF, 9H1EU. **2300** CN2AQ, W1-W4.

7MHz. 0400 JY9CL. **0500** HH7PV, *5B4LE*. **0600** A35EA, *FO0OX, W7TSM/HK1*, TA1UH. **0700** *CO, JW5NM, LU, K3UOC/PJ5, W6–W7, ZL*. **0800** FK8FF, V2AZM, VK0GC, *6Y5SN*. **1700** VK9XB. **1800** *HV1SJ, TR8JLD*, VQ9CK. **2200** *ZC4CZ, 5X5BD*, 9U5JB. **2300** FM5CD, *TR8JLD, SM0AGD/3B8*.

10MHz. 0600 *VK4RF, VK7ME*. **0700** *VK2,3, ZL2,3,4*. **0800** *ZC4HA, ZL4FB*. **0900** *ZL3ADR*. **1200** *OX3OA*. **1700** *ZS5BH*. **1800** *5B4OG*. **1900** *SV0AH, VE1BB, 5X5BD, 9J2BO*. **2000** *G4ZWU/EA6, J73D, OZ1DBT/OX, VO, W1,4, 8Q7ZL*. **2100** *K2LTA/J7, 6Y5FS/KP1, LU2WM, NP4MO, TI2LK, W1–4,9,0*. **2200** *FG5AM, KP4II, TA1MX, W9, ZS5LB*. **2300** *4X4KT*.

14MHz. 0600 BY4AA, ZL. **0700** *5X5BD*. **0800** *A35EA, BY1PK, KL7*. **0900** *JA, VK6RU, T77C*. **1300** AP2ZA. **1400** FO0XX. **1500** JY9VQ, W6. **1600** VK9XB, VQ9DG, ZB2HX. **1700** KL7PJ, *VE7XM*, VP2EC, *VU2SA*, 5H3HM. **1800** KL7H, VE7, VP8BDC, VQ9CK, W7, YB4FU, 4S7VK. **1900** *DL8YR/IST2*, V2AZL, ZC4WW, 9U5JB. **2100** TR8DR, N2BA/VP2M, *6Y5FS*.

18MHz. 0800 *DL*. **1000** *DL, F, HB, I, OE*. **1500** *TR8SDP, 9J2BO*. **1700** *LUs, 1DOW, 5DJO*.

21MHz. 0900 *JA, OD5LX, 3B8FK*. **1000** VQ9CK, ZS6SARL. **1100** FT8XB, VU2BD, 3B8CA. **1200** ET3PS, YB, *YI1BGD, ZS3IL*, VE3KFE/4U. **1300** FR5DX, 5X5XR. **1400** *J28CL, 3D6AK*,5H3QM. **1500** *FM4CT, JY9WR*, VQ9YR, 7P8CI. **1600** *EL7L*. **1700** TR8LD, TU4BR. **1800** CE8EMM, ZD7BZ.

24MHz. No reports.

28MHz. 1200 6W1MC. **1600** ZS. **1700** LU2DGZ, PY1ACZ. **1800** CE4ETZ.

Acknowledgements to the authors of the following for items extracted: *The Lynx DX Group Bulletin* (EA2JG/EA3CBQ), *DX'press* (PA0GAM), *CQ Magazine* (W1WY), *DXNL* (DL3RK), *Long Island DX Bulletin* (W2IYX), *DX News Sheet* (G4DYO), the *Ex-G Radio Club Bulletin* (GI3OEN/W6), and *Long Skip* (VE3XN).

Please send everything for **August** issue **to reach G3FKM by 20 June.** Many thanks! □

HF propagation predictions for June 1985

Using the table

The time is presented vertically at two-hour intervals 00(00)gmt to 22(00)gmt for each band, ie ⅜ = 0000, ⅜ = 0200, ⅜ = 0400 etc.

The probability of signals being heard is given on a 0 (indicated by a dot) to 9 scale; the higher the number the greater the probability, with 1 meaning 10 to 19 per cent of days, and so on. Additionally 50MHz F-layer and 1·8MHz openings are indicated by a dagger (†) sign in the 28 and 3·5MHz columns respectively. The higher probability figures are printed in BLACK, lower probability in RED and lowest probability in GREEN type.

	28MHz				21MHz				14MHz				10MHz				7MHz				3·5MHz			
GMT	000	001	111	122	000	001	111	122	000	001	111	122	000	001	111	122	000	001	111	122	000	001	111	122
	024	680	246	802	024	680	246	802	024	680	246	802	024	680	246	802	024	680	246	802	024	680	246	802
EUROPE																								
Moscow	.	.	.	.	.	11	1	22	214	566	656	887	766	544	445	789	753	222	223	468	42	.	.	35
Malta	.	.	.	.	.	11	.	23	2.1	666	656	897	856	655	556	789	986	422	223	578	†† 3	.	.	23†
Gibraltar	.	.	.	.	.	.	.	2.	2.	265	444	786	733	665	556	789	986	543	333	578	†† 4	2.	.	24†
Iceland	.	.	.	.	.	.	.	.	1.	124	333	365	744	565	555	678	776	543	333	456	443	2.	.	23
ASIA																								
Osaka	.	.	.	.	.	1	.	.	112	243	334	354	1.	121	112	463	.	.	.	231	.	.	.	.
Hong Kong	.	.	.	.	.	11	1	1.	112	244	335	645	2.	11	112	475	.	.	.	243	.	.	.	2.
Bangkok	.	.	.	.	.	122	12	1.	212	234	335	654	31	1	112	477	1.	.	.	255	.	.	.	22
Singapore	.	.	.	.	.	122	11	.	212	234	332	.	41	11	112	32	2.	.	.	244	.	.	.	23
New Delhi	.	.	.	.	.	122	112	41	213	223	335	784	631	.	112	478	41	.	.	256	.	.	.	23
Teheran	.	.	.	.	.	223	113	55	224	333	335	787	753	1.	112	578	63	.	.	256	4	.	.	23
Colombo	.	.	.	.	.	223	113	.	13	223	335	21	431	1	112	465	51	.	.	256	2	.	.	23
Bahrain	.	.	.	1.	.	223	224	651	324	322	335	788	853	.	112	578	73	.	.	256	4	.	.	24
Cyprus	.	.	.	11	.	344	324	662	536	666	666	899	976	333	334	689	863	11	11	367	53	.	.	34
Aden	.	.	1	1.	.	213	335	611	524	322	345	787	864	1.	12	478	751	.	.	256	42	.	.	24
OCEANIA																								
Suva (S)	.	.	.	.	.	.	.	.	113	333	1.	253	13	421	11	441	.	1	.	11	.	.	.	.
Suva (L)	.	.	.	.	.	.	.	11	211	4.	.	64	113	411	1	242	1	1	.	12	.	.	.	.
Wellington (S)	.	.	.	.	.	.	.	.	223	3.	.	64	224	421	111	163	1	1	.	131	.	.	.	.
Wellington (L)	.	.	.	.	.	.	.	1	421	.	.	6	334	3.	.	43	12	2	.	131	.	.	.	.
Sydney (S)	.	.	.	.	.	11	.	.	114	541	1	215	212	421	12	455	.	1	.	252	.	.	.	2
Sydney (L)	.	.	.	.	1.	.	.	1	51	2.	.	6	322	41	.	44	.	2	.	142	.	.	.	.
Perth	.	.	.	.	.	231	.	.	213	453	.	.	521	221	1	34	2.	.	.	255	.	.	.	23
Honolulu	.	.	.	.	.	.	.	.	112	233	1	3 422	14	431	112	21	1	1	.	.	.	.	.	.
AFRICA																								
Seychelles	.	.	1	.	.	221	335	1	4	422	345	61	333	1.	112	463	741	.	.	256	42	.	.	24
Mauritius	.	.	.	.	.	223	334	.	4	434	335	511	4.4	2.1	112	456	732	.	.	257	43	.	.	24
Nairobi	.	.	1	1	.	222	346	6	4	522	335	751	525	2.	12	477	763	.	.	257	44	.	.	24
Harare	.	.	12	1	.	223	446	5	2.1	643	335	723	825	31	112	467	764	1	.	257	44	.	.	24
Capetown	.	.	1	.	.	132	352	.	.	554	335	3	22	421	12	422	761	1	.	246	54	.	.	24
Lagos	.	.	12	41	.	131	356	85	331	652	235	783	885	42	2	478	774	1	.	256	54	.	.	24
Ascension Is	.	.	1	31	.	32	135	86	.	54	335	785	2.	21	2	478	71	1	.	146	44	.	.	24
Dakar	.	.	1	32	.	42	235	782	731	553	233	688	985	431	1	378	774	2	.	146	44	.	.	3
Las Palmas	.	.	.	12	.	43	233	573	732	676	666	799	986	654	333	589	886	321	111	267	†53	.	.	35
S AMERICA																								
South Shetland	.	.	.	.	.	.	34	2	.	.	1	234	64	223	1	12	464	764	1	.	146	44	.	.	3
Falkland Is	.	.	.	1	.	.	234	54	.	1	2	335	78	235	2.1	112	464	764	2	.	146	44	.	.	3
Rio de Janeiro	.	.	.	12	.	2	233	683	51	.	4	333	589	862	11	111	268	774	1	.	36	442	.	.	3
Buenos Aires	.	.	.	12	1	.	234	674	831	.	3	334	579	985	1.1	111	258	774	2	.	26	442	.	.	3
Lima	.	.	.	1	1	.	122	254	821	231	333	357	874	431	11	25	774	2	.	2	44	.	.	.
Bogota	.	.	.	.	1	.	111	144	82	113	332	247	874	421	11	14	664	2	.	1	34	.	.	.
N AMERICA																								
Barbados	.	.	.	1	1	.	2	121	254	82	224	332	257	874	431	1	25	774	2	.	3	44	.	.	.
Jamaica	.	.	.	.	1	.	.	111	133	72	.	3	332	236	774	211	11	3	464	2	.	1	24	.	.	.
Bermuda	.	.	.	.	1	.	1	111	133	72	.	14	322	247	774	221	1	24	564	2	.	1	24	.	.	.
New York	.	.	.	.	.	.	11	12	621	.	3	332	246	674	221	11	13	364	2	.	1	3	.	.	.
Mexico	.	.	.	.	.	.	.	12	521	.	.	232	224	474	2.	11	1	154	2	.	.	2	.	.	.
Montreal	.	.	.	.	.	.	.	12	621	.	3	332	246	675	221	11	13	364	2	.	1	3	.	.	.
Denver	.	.	.	.	.	.	.	.	421	.	.	122	223	355	311	111	1	134	2	.	.	.	.	.	.
Los Angeles	.	.	.	.	.	.	.	.	321	1.	.	23	222	245	31	112	.	24	2	.	.	.	.	.	.
Vancouver	.	.	.	.	.	.	.	.	322	211	112	222	245	421	112	111	13	2	.	.	.	.	.	.	.
Fairbanks	.	.	.	.	.	.	.	.	223	232	212	222	123	431	112	211	1	1	.	.	.	.	.	.	.

No new sunspot information for this issue has been received from SIDC.

Contest News

3·5MHz Hopscotch Contest rules

Participation in short, single-band contests continues to grow rapidly. Accordingly, the HF Contests Committee is introducing a new contest, one with a twist: please note Rule 4 on QSYing. As with anything new this is an experiment, so please pass any comments to the committee to help determine future direction.

1. Eligibility. Open to RSGB members, single operator only.

2. Where and when: 3,520–3,570kHz, cw only. 1300–1600gmt Sunday 4 August 1985.

3. Exchange and scoring. Send RST, serial number starting from 001, county code and name. Score 10 points per contact. Only contacts between UK stations count.

4. QSY rule. The station soliciting calls (by CQ, QRZ etc) may make only one contact on that frequency—he must then QSY at least 3kHz before making any other contact.

5. Logs. Sheets (preferably HFC1) to be headed: date/gmt; callsign of station worked; RST/serial sent; RST/serial received; county code received; name received; points. Cover sheet to show county code and name sent. Logs to be postmarked not later than 19 August to: Roger Western, G3SXW, HF Contests Committee, PO Box 73, Lichfield, Staffs WS13 6UJ, accompanied by the declaration: "I declare that this station was operated strictly in accordance with the rules and spirit of the contest and agree that decisions of RSGB shall be final".

6. Certificates. The winner and runner-up will receive certificates of merit, also the highest score from a UK prefix other than G.

7. Receiving section. A station may only appear in the "Station heard" column once. The callsign of the station being worked may only be repeated once in every three contacts. Logs should show callsign of station heard, RST/serial/county code/name sent and callsign of station being worked. Certificate of merit will be awarded to the highest score. Holders of Class B transmitting licences may also enter.

Affiliated Societies Team Contest 1985 results

Participation in AFS is ever increasing. With 415 (1983:352, 1984:375) individual entries, 115 (1983:97, 1984:91) club teams, and nearly 25,000 QSOs being made in four hours on cw on one band, AFS is a major cw operating success. The significant level of participation from newer Class A licensees is an encouraging sign that cw is not the dying art that many claim it to be!

Club team entries come in all sizes, ranging from the single team one-man-band entry up to mammoth entries like Stockport who sent in no less than 23 logs. Other clubs sending in over 10 logs were Leicester Poly (17), Farnborough (11) and Verulam (11). Although not counting as a single club as such, the RNARS package this year contained 66 logs!

A unique feature of AFS from the adjudication viewpoint, is that the majority of QSOs can be fully cross-checked because logs are received from a high proportion of all contact-making stations. The 415 logs received represented about 80 per cent of all the calls that showed at any time during AFS!

Full duplicate checking of all logs revealed 121 unmarked duplicates. At less than 0·3 of an unmarked duplicate per log, this indicates that the level of dupe-checking before submission of the logs in general is good. But those stations that did have unmarked duplicates in their logs will find their scores dramatically reduced. Each unmarked dupe costs the equivalent of 11 QSOs. In a contest such as AFS, where many claimed scores are similar, unmarked duplicates can make a significant difference between a station's position as based on his claimed score and his position in the final results table.

The top four claimed club scores were closely bunched together ahead of the rest of the pack. On claimed scores there was a tie between East Barnet and Three As A, but after thorough cross-checking, Three As A came out on top.

The top three individual stations all logged over 240 QSOs in the 4h, thereby breaking the "one-a-minute" barrier in AFS. G3VMW came out on top, closely pursued by G3RTE and G3PEK.

Club secretaries seem to be loath to take on their responsibilities for sending in coherent team entries. Only a few submitted meaningful separate club summary sheets showing the callsigns and claimed scores of each member of the teams, as well as the team score itself. Please help next year's adjudicator by submitting a scored club summary with your entries. This is in addition to the normal cover sheets (HFC2) that must accompany each individual log.

The AFS adjudication team, G3KKQ, G3SXW, G3TXF and BRS20249 between them spent several hundred hours sifting through logs and cross-checking QSOs. AFS has become one of the most highly supported contests in the RSGB HF contests calendar. Long may it continue that way!

We look forward to seeing you all again there next time with more clubs, more teams and more logs. *G3TXF*

TEAM SCORES

Posn	Society	Total points	Stations contributing to score				
1	Three As A	10,876	G3MXJ	G3FXB	G3SXW	G4BUO	G3TXF
2	Stockport A	10,787	G3PEK	G4MUL	G3NOM	G4OBK	G4MCC
3	East Barnet	10,552	G3RTE	G3RPB	G3RFS	G3POI	G6KQ
4	Leicester Poly A	10,450	G3SJJ	G3CWI	G3OAY	G4BCA	G3SDC
5	Leicester Poly B	8,965	G3ORY	G3RIR	G4FPH	G3XYC	G4ARI
6	Govt Comms A	8,485	G3SSO	G3NKS	G3SNN	G3FXA	G3JTG
7	Verulam A	8,330	G4DJX	G3VER/A	G4DUS	G3UJV	G4BOU
8	Addiscombe	8,268	G3UFY	G3ROZ	G3SJX	G4ALE	G3VYI
9	Wirral	7,215	G3UVR	G3CSG	G4EWJ	G4KPY	G2FOS
10	White Rose A	6,974	G3VMW	G3PSM	G4IUF	G4DXA	G4UZN
11	RNARS Portsmouth A	6,921	G3LIK	G3JFF	G3LPN	G3BZU	G4INI
12	Edgware A	6,880	G4IUZ	G3ASR	G4UMS	G3PSP	G3SHY
13	Stockport B	6,790	G3HQH	G4UML	G4GRU	G3KAF	G4FAS
14	Hereford A	6,591	G4CNY	G3FKH	GW3MPB	G4FFD	G4JSN
15	Guildford A	6,500	G5RS	G6GS	G5OD	G3PJX	G4BCY
16	Farnborough A	6,067	G3VAA	G4ISK	G4BJQ	G4HZV	G4JFN
17	Newark	6,007	G3TBK	G3ZOA	G4HVC	G4BPE	G3XWZ
18	Glenrothes A	5,940	GM3YOR	GM4GRC	GM3ZSP	GM4EJI	GM3PFQ
19	Grimsby A	5,860	G3RXP	G3RSD	G4EBK	G4HZF	G4PYD
20	Racal Reading A	5,857	G3RVM	G4PKE	G3PGM	G3SVD	G3ZTU
21	Leicester Poly C	5,798	G4EOF	G4KRS	G4CZB	G3AAQ	G4GLC
22	Crawley	5,729	G3GRO	G3JKF	G3YVR	G3KAU	
23	Preston A	5,620	G3SYA	G3AZI	G4RNF	G4RFA	G4OTN
24	Gloucester A	5,534	G4HFT	G5BM	G3LP	G3MA	G4CIB
25	Norfolk A	5,514	G4ODC	G4RKK	G4DYC	G4YFV	G4GVR
26	RNARS London A	5,404	G3LCS	G4LNA	G4SGL	G4FRN	G3AQM
27	IBA Crawley Court	5,327	G4DBL	G3OGY	G4IBA	G4DZS	G3LMH
28	West of Scotland	5,280	GM4LGM/A	GM4CXM	GM4LCP	GM3RAO	GM4FVQ
29	Maidenhead A	5,220	G3WYK	G3TWG	G3LVW	G3VCT	G3IQF
30	Worthing A	5,177	G4FNL	G2DPY	G3LOI	G4LGK	G4OAY
31	Torbay A	5,044	G3NJA/P	G3TIR	G3LHJ	G4OYC	G4EDG
32	Surrey Radio A	4,964	G3BFP	G6LX	G4GTO	G3MCX	G8TB
33	Stockport C	4,927	G4KRG	G4IXF	G3MUO	G4ECI	G4RHB
34	BBC Ariel London A	4,667	G3COJ	G3KKQ	G3TDL	G3UGX	G3CIK
35	Southgate	4,554	G3SFG	G3RWL	G3ZVW	G4GYP	G4KZD
36	Colchester A	4,427	G3YAJ	G3CCZ	G4WFR	G4LZB	G4KTI
37	Aberdeen A	4,410	GM3WTA	GM4SID	GM3DZB	GM4OBD	GM3VEY
38	Scunthorpe	4,394	G3PDL	G4ZMH	G4OGB	G4OCU	G4WZV
39	Yeovil	4,347	G3GC	G4JBH	G3ATK	G3CQR	G3BEC
40	RNARS Birmingham A	4,330	G3TZM	G4IP	G4SFO	G4PTX	G4MSR
41	RNARS Lowestoft	4,040	G3UOF	G4KDL	G4BUV	G4KLD	
42	Nene Valley	3,990	G5LP	G4XEN	G4RST	G4OMH	G4XJK
43	Hornsea	3,947	G4ODP	G4MWE	G4IGY	G3TLI	G4XBU
44	Verulam B	3,750	G4JKS	G4JBD	G4SUP	G4ZJS	G4WLG
45	West Kent A	3,597	G3WKS	G4OTV	G4RPQ	G3AIO	G3LMS
46	Three As B	3,577	G3WVG	G4FAM			
47	Thames Valley	3,567	G3JEQ	G3JNB	G3AIV		
48	RNARS Rosyth	3,480	GM3UM	GM3YTS	GM3HUN	GM4JHG	GM4GVJ
49	Reigate	3,341	G3BBR	G3ZRF	G3KAX	G3JRC	
50	Halifax A	3,260	G3IGW	G4GLL	G4SDX	G3ONQ	G4KIE
51	Cheltenham	3,134	G4PDQ	G4UAZ	G3ZKN		
52	RNARS Yeovilton	3,087	G4KJD	G2KV	G4MZL	G3HIS	
53	Sutton & Cheam	2,994	G4CWH/A	G2DMR	G4EOI	G3CWL	G4HSD
54	Conwy Valley A	2,967	GW3JI	GW3MDK	GW3HGL	GW3GWX	GW4GJI
55	Tyneside	2,961	G4ILW	G4SIE	G4UOE	G4MRT	G4KJN
56	Portsmouth	2,874	G3GFG	G3JZV	G3TVI	G3CNO	G4NKX
57	Farnborough B	2,860	G4IZB	G4VVF	G3CZM	G4FRS	G4XHA
58	RNARS Nottingham	2,800	G4ERT	G8AV	G4MQM	G3BOV	
59	Bury	2,794	G3BRS	G3IVG	G3VNQ	G4KWN	
60	RNARS Liverpool	2,690	G3SGQ	G3JZI	G4HWK	G4OKL	
61	Govt Comms B	2,670	G3COQ	G3IFB	G4MEM		
62	RNARS Harrogate	2,667	G4KNM	G4JRE	G4ODS	G3FBP	
63	Bromsgrove A	2,658	G4AAL	G3VGG	G4UIW	G4IVJ	G2CLN
64	Leicester Radio	2,630	G4IFB	G4OOS	G4XBY		
65	Echelford	2,580	G3MCK	G3DOR	G3HBZ	G4GSC	
66	Stockport D	2,328	G4TQM	G4FFW	G3GMM	G4HK	G4SSN
67	RNARS Stockton	2,327	G3UEN	G3AWR	G4FCH		
68	Shelford	2,307	G3DOT	G3WRJ	G3YLA		
69	Preston B	2,289	G3KCC	G4RPW	G4DBU	G3PVD	G4XNX
70	Plymouth	1,770	G3ULN	G4FJZ	G4KXZ		
71	Cheshunt	1,730	G4OAA	G3URA	G3WFM	G3OJI	G3TIK
72	South Manchester	1,711	G3SVW	G4HON	G3ZDM	G3VIW	G3HZM
73	Loughborough Falcon	1,690	G4KGG				
74	Worcester	1,567	G4RMV	G3NXQ			
75	RNARS London B	1,544	G4CJY	G8IB	G4PXA	G4PSA/A	G4TUO
76	RNARS Medway	1,520	G6SX	G4ZAW	G3WP		
77	Colchester B	1,494	G3FIJ	G4HKC	G4TZM	G4OFM	
78	Torbay B	1,478	G4VPM	G3UFZ			
79	RAFARS Locking	1,401	G8FC	G3GNS	G3YRM		
80	Stevenage	1,367	G3OVT	G4DDX			
81	Aberdeen B	1,340	GM3UU	GM4BKV	GM4YRI	GM4ZUK	GM4ZRR
82	Leicester Poly D	1,274	G0AKC	G4VVY/A			
83	Ainsdale	1,247	G4KGK				
84	RNARS Culerose	1,220	G4AMT				
85	Edgware B	1,137	G4HMD				
86	RNARS Plymouth	1,110	G4KKZ	G3VNG			
87	Maidenhead B	1,057	G4GGV	G4YDL/A			
88	RNARS Birmingham B	1,030	G4TNI	G4UMY			
89	Eden Valley	1,010	G4AFU				
90	RNARS Portsmouth B	990	G3KOJ	G4ZIY			
91	Worthing B	974	G4GPX	G4SLE			
92	Gloucester B	880	G4SHB	G4XOK			
93	BBC Ariel Pebble Mill	840	G3KTH				
94	White Rose B	834	G3KWT	G4OAT			
95	RNARS Copenhagen	750	OZ3QN	OZ1HET	OZ5IN		
96	Racal Reading B	740	G3ZVL				
97	Bangor	670	GI3SXG				
98	RNARS Cardiff	600	GW4HDB	GWKVJ			
99	Glenrothes B	597	GM3YBQ	GM4HBG			
100	Bromsgrove B	500	G4WZA	G4MBW			
101	Halifax B	490	G4LIW	G4XYS	G4XUK	G4RAW	
102	Guildford B	487	G3ZDD				
103	RNARS Belfast	450	GI3TNK				
104	BBC Ariel London B	440	G2BCI				
105	Grimsby B	410	G2AJB				
106	Norfolk B	397	G4WTD				
107	Stockport E	370	G2BUC				
108	West Kent B	364	G4DRV	G3XPX	G4XRN		
109	RNARS Faslane	300	GM4GIF				
110	Conwy Valley B	160	GW3QN	GW4VVW			
111	Verulam C	140	G4PUR				
112	Hereford B	104	G4OJP				
113	Surrey Radio B	51	G3YRB				
114	Stockport F	20	G4SYC	G3OWW			
115	Farnborough C	10	G4ZKJ				

INDIVIDUAL SCORES

Posn	Callsign	Score	Society
1	G3VMW	2,470	White Rose A
2	G3RTE	2,424	East Barnet
3	G3PEK	2,392	Stockport A
4	G3SSO	2,350	Govt Comms A
5	G3RPB	2,307	East Barnet
6	G3MXJ	2,294	Three As A
7	G3SJJ	2,238	Leicester Poly A
8	G3NOM	2,230	Stockport A
9	G4MUL	2,219	Stockport A
10	G3SXW	2,218	Three As A
11	G3GRO	2,208	Crawley
12	G4CNY	2,200	Hereford A
13	G3UVR	2,185	Wirral
14	G3FXB	2,165	Three As A
15	G4BUO	2,141	Three As A
16	G3WYK	2,120	Maidenhead A
17	G3POI	2,110	East Barnet
18	G3OAY	2,101	Leicester Poly A
19	G4OBK	2,085	Stockport A
20	G4BCA	2,080	Leicester Poly A
21	G3TXF	2,058	Three As A
22	G3SDC	2,047	Leicester Poly A
23	G3ORY	2,024	Leicester Poly B
24	G3UFY	2,014	Addiscombe
25	G3CWI	1,984	Leicester Poly A
	G3RIR	1,984	Leicester Poly B
27	G3NKS	1,981	Govt Comms A
28	G4DJX	1,960	Verulam A
29	G4FPH	1,947	Leicester Poly B
30	G6KQ	1,937	East Barnet
31	G3PSM	1,934	White Rose A
32	G3FKH	1,891	Hereford A
33	G3SYA	1,890	Preston A
	GM3YOR	1,890	Glenrothes A
35	G4MCC	1,861	Stockport A
36	G3WVG	1,817	Three As B
37	G4RKK	1,814	Norfolk A
38	GM4GRC	1,800	Glenrothes A
39	G3RVM	1,790	Racal Reading A
	G5RS	1,790	Guildford A
41	G3RFS	1,774	East Barnet
42	G4FAM	1,760	Three As B
43	G3CSG	1,740	Wirral
44	G3UOF	1,730	RNARS Lowestoft
45	G3BFP	1,720	Surrey Radio A
	G3LIK	1,720	RNARS Portsmouth A
47	G4KGG	1,690	Loughborough Falcon
48	G3VER/A	1,680	Verulam A
49	G4ROZ	1,670	Addiscombe
	G4ODC	1,670	Norfolk A
51	G3SNN	1,660	Govt Comms A
52	G3HQH	1,650	Stockport B
53	G3JKF	1,637	Crawley
54	G3SJX	1,630	Addiscombe
	G4IUZ	1,630	Edgware A
56	G3UJV	1,610	Verulam A
	G6GS	1,610	Guildford A
58	G3RXP	1,600	Grimsby A
	G4ALE	1,600	Addiscombe
	G4DUS	1,600	Verulam A
61	G3TBK	1,590	Newark
62	G3JFF	1,570	RNARS Portsmouth A
63	GM4LGM/A	1,560	West of Scotland
64	G3JEQ	1,567	Thames Valley
65	G3YAJ	1,530	Colchester A
66	G3XYC	1,520	Leicester Poly B
67	G3PDL	1,510	Scunthorpe
	G3RSD	1,510	Grimsby A
	G4EWJ	1,510	Wirral
70	G3ASR	1,490	Edgware A
	G3VAA	1,490	Farnborough A
	G4ARI	1,490	Leicester Poly B
73	G4BOU	1,480	Verulam A
	G4PKE	1,480	Racal Reading A
75	G4FNL	1,450	Worthing A
	G4JKS	1,450	Verulam B
77	G3YVR	1,447	Crawley
78	G3KAF	1,440	Stockport B
	G5LP	1,440	Nene Valley
80	G4ERT	1,430	RNARS Nottingham
	G4IFB	1,430	Leicester Radio
82	G4HFT	1,420	Gloucester A
	G4UML	1,420	Stockport B
84	G3ZOA	1,410	Newark
85	G3JNB	1,400	Thames Valley
	G4HVC	1,400	Newark
87	G4ISK	1,380	Farnborough A
	G5LX	1,380	Surrey Radio A
89	G4CWH/A	1,370	Sutton & Cheam
	G4EOF	1,370	Leicester Poly C
91	G3LPN	1,377	RNARS Portsmouth A
92	G3FXA	1,360	Govt Comms A
	G3GC	1,360	Yeovil
94	G3VYI	1,354	Addiscombe
95	G3COJ	1,350	BBC Ariel London A
96	G3NJA/P	1,337	Torbay A
97	G3RWL	1,330	Southgate
98	G3PSP	1,310	Edgware A
99	G4KJD	1,300	RNARS Yeovilton
100	G4DBL	1,290	IBA Crawley Court
101	G3WKS	1,280	West Kent A
	G4ILW	1,280	Tyneside
	G4KRS	1,280	Leicester Poly C
104	G3SHY	1,270	Edgware A
	G4PDQ	1,270	Cheltenham
	GM4CXM	1,270	West of Scotland
107	G3UEN	1,257	RNARS Stockton
108	G3AZI	1,250	Preston A
	G3LCS	1,250	RNARS London A
110	G4KGK	1,247	Ainsdale
111	G5BM	1,244	Gloucester A
112	G3BZU	1,234	RNARS Portsmouth A
113	G3BBR	1,230	Reigate
	G3MCK	1,230	Echelford
	G4IUF	1,230	White Rose A
116	G3ULN	1,220	Plymouth
	G4AMT	1,220	RNARS Culerose
118	G3OGY	1,210	IBA Crawley Court
	G4EBK	1,210	Grimsby A
	G4FAS	1,210	Stockport B
	G4UZN	1,210	White Rose A
122	G4IBA	1,200	IBA Crawley Court
	G4LNA	1,200	RNARS London A
124	G3SFG	1,190	Southgate
	G4CZB	1,190	Leicester Poly C
126	G4UMS	1,180	Edgware A
127	G3PGM	1,170	Racal Reading A
	G4KNM	1,170	RNARS Harrogate
129	G4KRG	1,167	Stockport C
130	G3IGW	1,160	Halifax A
131	G3COO	1,140	Govt Comms B
132	GW3MPB	1,140	Hereford A
133	G4HMD	1,137	Edgware B
134	G3JTG	1,134	Govt Comms A
135	G4AAL	1,130	Bromsgrove A
	GM4SID	1,130	Aberdeen A
137	G2DPY	1,127	Worthing A
138	G3LOI	1,120	Worthing A
	G3TZM	1,120	RNARS Birmingham A
	G4IXF	1,120	Stockport C
	G5OD	1,120	Guildford A
142	G3PJX	1,110	Guildford A
	G4JBH	1,110	Yeovil
	G4MWE	1,110	Hornsea
145	G3TIR	1,100	Torbay A
	G4HZV	1,100	Farnborough A
147	G4UAZ	1,094	Cheltenham
148	G3CCZ	1,090	Colchester A
	G4GLL	1,090	Halifax A
	G4IP	1,090	RNARS Birmingham A
	G4KDL	1,090	RNARS Lowestoft
152	G3MUO	1,080	Stockport C
	G4OGB	1,080	Scunthorpe
154	G4BJQ	1,077	Farnborough A
155	G3LP	1,070	Gloucester A
	G3TWG	1,070	Maidenhead A
	G4GRU	1,070	Stockport B
158	G3KKQ	1,060	BBC Ariel London A
159	GW3JI	1,047	Conwy Valley
160	G3GFG	1,040	Portsmouth
	G4KPY	1,040	Wirral
162	G3AAQ	1,037	Leicester Poly C
163	G3DOT	1,030	Shelford
	G4FRN	1,030	RNARS London A
165	G4SGL	1,024	RNARS London A
166	G4INI	1,020	RNARS Portsmouth
	G4JFN	1,020	Farnborough A
168	G4AFU	1,010	Eden Valley
169	G4RMV	1,000	Worcester
	GM3WTA	1,000	Aberdeen A
171	G4FFD	990	Hereford A
172	G4XEN	980	Nene Valley
173	G3SGQ	970	RNARS Liverpool
	GM3UM	970	RNARS Rosyth
175	G3LHJ	940	Torbay A
	G4OOS	940	Leicester Radio
177	G4IGY	930	Hornsea
	GM4LCP	930	West of Scotland
179	G3BRS	927	Bury
180	G4GLC	921	Leicester Poly C
181	G3TDL	910	BBC Ariel London A
182	G3AQM	900	RNARS London A
	G3IVG	900	Bury
	G3MA	900	Gloucester A
	G4CIB	900	Gloucester A
186	G4GTO	890	Surrey Radio A
	G4KKZ	890	RNARS Plymouth
	GM3DZB	890	Aberdeen A
	GM3RAO	890	West of Scotland
190	G2KV	887	RNARS Yeovilton
191	G3ZVW	880	Southgate
	G4EDG	880	Torbay A
	G4RNF	880	Preston A
	G4VPM	880	Torbay B
195	G4JRE	877	RNARS Harrogate
196	G2DMR	870	Sutton & Cheam
	G4BCY	870	Guildford A
	G4RFA	870	Preston A
199	G3KOJ	860	RNARS Portsmouth B
	G3OVT	860	Stevenage
	G3VNO	860	Bury
	G4RHB	860	Stockport C
	GM3YTS	860	RNARS Rosyth
204	G4SIE	847	Tyneside
205	G3KTH	840	BBC Ariel Pebble Mill
	G4BUV	840	RNARS Lowestoft
	G4LGK	840	Worthing A
	GM3HUN	840	RNARS Rosyth
209	G3UGX	837	BBC Ariel London A
210	G4BPE	830	Newark
	G4DZS	830	IBA Crawley Court
212	GOAKC	824	Leicester Poly D
213	G3MCX	820	Surrey Radio A
	G4SFO	820	RNARS Birmingham A
	GM3ZSP	820	Glenrothes A
	GM4EJI	820	Glenrothes A
217	G4ODP	817	Hornsea
218	G4HZF	810	Grimsby A
	G4TOM	810	Stockport D
220	G3ATK	800	Yeovil
	G4DYC	800	Norfolk A
	G4MEM	800	Govt Comms B
223	G3LMH	797	IBA Crawley Court
224	G3ZTU	790	Racal Reading A
	G4IZB	790	Farnborough B
	G4ZMH	790	Scunthorpe
227	G4OYC	787	Torbay A
228	G3XWZ	777	Newark
229	G3ZRF	774	Reigate
230	G3ZKN	770	Cheltenham
	G4GSC	770	Echelford
	G4JBD	770	Verulam B
	G4PTX	770	RNARS Birmingham A
234	G3TLI	760	Hornsea
	G4OTV	760	West Kent A
236	G3LVW	750	Maidenhead A
237	G2FOS	740	Wirral
	G3JZI	740	RNARS Liverpool
	G3ZVL	740	Racal Reading B
240	G3KAX	737	Reigate
241	G3IFB	730	Govt Comms B
	G3IOF	730	Maidenhead A
	G4OTN	730	Preston A
	G4PYD	730	Grimsby A
	G4RST	730	Nene Valley
	GW3MDK	730	Conwy Valley
247	G3AWR	720	RNARS Stockton
	G3SVW	720	South Manchester
	G4SHB	720	Gloucester B
250	GM3VEY	710	Aberdeen A
251	G4ECI	700	Stockport C
	G4SUP	700	Verulam B
253	G3WRJ	690	Shelford
254	G4UOE	684	Tyneside
255	GM4OBD	680	Aberdeen A
256	GI3SXG	670	Bangor, N Ireland
257	G3GMM	660	Stockport D
258	G4SDX	650	Halifax A
259	G3KCC	648	Preston B
260	G4GGV	640	Maidenhead B
	G4OAY	640	Worthing A
	G4VVF	640	Farnborough B
	G4YFV	640	Norfolk A
264	GM4FVQ	630	West of Scotland
265	G3SVD	627	Racal Reading A
266	G4LZB	620	Colchester A
	G4RPW	620	Preston B
268	G4CJY	617	RNARS London B
	G4FFW	617	Stockport D
270	GM3PFQ	610	Glenrothes A
271	G3AIV	600	Thames Valley
272	G3JRC	600	Reigate
273	G3UFZ	598	Torbay B
274	G4GYP	597	Southgate
	G4WFR	597	Colchester A
276	G4GPX	590	Worthing B
	G4GVR	590	Norfolk A
	G4KTI	590	Colchester A
	G8AV	590	Nottingham
280	G3YLA	587	Shelford
281	G4RPQ	577	West Kent A
282	G3NXQ	567	Worcester
283	G4OAA	560	Cheshunt
	G6SX	560	RNARS Medway
285	G4KZD	557	Southgate
286	G3KWT	554	White Rose B
287	G3CZM	550	Farnborough B
	G3JZV	550	Portsmouth
	G3VCT	550	Maidenhead A
	G3VGG	550	Bromsgrove A
	G4FRS	550	Farnborough B
292	G3COR	547	Yeovil
293	G8FC	544	RAFARS Locking
294	G4HWK	540	RNARS Liverpool
	G4TNI	540	RNARS Birmingham B
	GM4JHG	540	RNARS Rosyth
297	G3BEC	530	Yeovil
	G4MSR	530	RNARS Birmingham A
299	G4OCU	527	Scunthorpe
300	G3CIK	510	BBC Ariel London A
	G3FIJ	510	Colchester B
	G3URA	510	Cheshunt
303	G3TVI	507	Portsmouth
	G4DDX	507	Stevenage
305	G3LMS	500	West Kent A
	GW3HGL	500	Conwy Valley
307	G4HKC	490	Colchester B
	G4UMY	490	RNARS Birmingham
	G4ZAW	490	RNARS Medway
310	G3ZDD	487	Guildford B
	G4WZV	487	Scunthorpe
312	G3AIO	480	West Kent A
313	G3HIS	470	RNARS Yeovilton
	G3WP	470	RNARS Medway
	G4OMH	470	Nene Valley
316	G3CNO	467	Portsmouth
317	G4KODS	460	RNARS Harrogate
318	G3YRM	450	RAFARS Locking
	G4VVY/A	450	Leicester Poly D
	GI3TNK	450	RNARS Belfast
	GM3YBO	450	Glenrothes B
322	G2BCI	440	BBC Ariel London B
	G4OKL	440	RNARS Liverpool
	G4ZJS	440	Verulam B
	GM3UU	440	Aberdeen B
326	G3KAU	437	Crawley
327	G4HON	434	South Manchester
328	G4MOM	430	RNARS Nottingham
	G4MZL	430	RNARS Yeovilton
330	G4DBU	424	Preston B
331	GW4HDB	420	RNARS Cardiff
332	G4YOL/A	417	Maidenhead B
333	G2AJB	410	Grimsby B
	OZ3QN	410	RNARS Copenhagen
335	G3GNS	407	RAFARS Locking
336	G4WTD	397	Norfolk B
337	G4FJZ	390	Plymouth
	G4UIW	390	Bromsgrove A
	G4WLG	390	Verulam B
340	G4SLE	384	Worthing B
341	G3DOR	380	Echelford
	G4KLD	380	RNARS Lowestoft
	GW3GWX	380	Conwy Valley
344	G2BUC	370	Stockport (Cirencester) E
	G4JSN	370	Hereford A
	G4XJK	370	Nene Valley
347	G3BOV	350	RNARS Nottingham
	G4FCH	350	RNARS Stockton
349	G4IVJ	344	Bromsgrove A
350	GM4BKV	340	Aberdeen B
351	G3ZDM	337	South Manchester
352	G4XBU	330	Hornsea
	G4XHA	330	Farnborough B
354	G4PXA	320	RNARS London B
355	G4TZM	314	Colchester B
356	G3OJI	310	Cheshunt
	G4NKX	310	Portsmouth
	G4XNX	310	Preston B
	GW4GJI	310	Conwy Valley A
360	G4EOI	304	Sutton & Cheam
361	G3WFM	300	Cheshunt
	GM4GIF	300	RNARS Faslane
363	G3PVD	287	Preston B
364	G3CWL	280	Sutton & Cheam
	G4OAT	280	White Rose B
366	G4WZA	270	Bromsgrove B
	GM4GVJ	270	RNARS Rosyth
368	G4PSA/A	260	RNARS London B
	G4XBY	260	Leicester Radio
	G8IB	260	RNARS London B
	OZ1HET	260	RNARS Copenhagen
372	G2CLN	244	Bromsgrove A
373	G4MBW	230	Bromsgrove B
374	G4HK	221	Stockport D
375	G3VNG	220	RNARS Plymouth
	G4LIW	220	Halifax B
	GM4YRI	220	Aberdeen B
	GM4ZUK	220	Aberdeen B
379	G3HBZ	200	Echelford
	G3ONO	180	Halifax A
	G4DRV	180	West Kent B
380	G4KIE	180	Halifax A
	G4OFM	180	Colchester B
	GW4KVJ	180	RNARS Cardiff
385	G4HSD	170	Sutton & Cheam
386	G3FBP	160	RNARS Harrogate
	G4KXZ	160	Plymouth
	G4XQK	160	Gloucester B
389	G8TB	154	Surrey Radio A
390	GM4HBG	147	Glenrothes B
391	G4PUR	140	Verulam C
	G4XYS	140	Halifax B
393	G4DXA	130	White Rose A
	G4ZIY	130	RNARS Portsmouth B
395	G3VIW	120	South Manchester
	GM4ZRR	120	Aberdeen B
397	G4XUK	110	Halifax
398	G4KWN	107	Bury
399	G3XPX	104	West Kent B
	G4OJP	104	Hereford B
	G3HZM	100	South Manchester
401	G4MRT	100	Tyneside
	GW3QN	100	Conwy Valley B
404	G4TUO	87	RNARS London B
405	G4XRN	80	West Kent B
	OZ5IN	80	RNARS Copenhagen
407	GW4VVW	60	Conwy Valley B
408	G3YRB	51	Surrey Radio B
409	G3TIK	50	Cheshunt
	G4KJN	50	Tyneside
411	G4RAW	20	Halifax B
	G4SSN	20	Stockport D
413	G3OWW	10	Stockport F
	G4SYC	10	Stockport F
	G4ZKJ	10	Farnborough C

Check logs: G3BPM, GM4LHM.

VHF/UHF Listeners Championship 1984 results

Once again, 1984 saw an increase in the number of entrants for the Listeners Championship, and RS52543 and 28198 are to be particularly congratulated on submitting an entry in every eligible event. Martin Parry from Blackpool (RS52543) wins the Hansen trophy by a good margin, once again showing that good results can be obtained from the NW of England.

The increasing number of different scoring systems in contests presents a difficulty in calculating scores for the trophy. For the 1984 trophy, the contests using multipliers have been rescored by dividing the claimed score

by the number of multipliers so that the scores are compatible with the other contests, and in multiband events the points scored on each band have been used as claimed. These are obvious imperfections in this system, and in 1985 a better system involving normalization to the band leaders score will be adopted (see "*Rad Com* Operating Guide" January 1985).

Thanks to every listener who took part in 1984. G4JLG.

Posn	RS No	Mar 144/ 432	May 144	June 432	June 70	VHF NFD	Aug 144	Aug 432	Sept 144	Sept 70	Total
1	52543	675	859	121	229	1,810	594	86	1,416	296	6,086
2	28198	362	576	147	131	393	172	37	1,140	140	3,098
3	32525	—	129	231	—	1,318	469	112	646	—	2,905
4	25429	491	771	—	—	97	—	—	1,272	—	2,631
5	31976	—	—	—	—	—	368	—	1,831	—	2,199
6	26003	—	675	—	—	675	—	—	—	—	1,350
7	46296	245	197	—	—	467	—	—	—	—	909
8	54203	—	—	—	—	603	204	—	—	—	807
9	44984	—	—	—	59	—	—	—	—	—	59
10	62088	—	—	—	—	—	—	—	18	—	18

February 1985 144MHz CW Contest results

This contest was well supported in spite of only average conditions and was enjoyed by all. Timing and duration proved to be about right. A few cases of stations radiating poor quality transmissions, especially wide band noise, were reported but insufficient evidence is available for action to be taken. However, it is appropriate to remind members of the Code of Practice items 5 and 6 (see *Rad Com* January).

The new locator system was used for the first time in a cw contest, and there were several complaints about its adoption—mainly because of the additional digit—but no doubt lack of familiarity was another reason which will soon be overcome. As usual in obtaining opinion by sample, views can differ widely. For example: "The locator is a disaster", *G4WAD* on behalf of *G4WET/P*; "Good to see 99 per cent of all stations using new locator system", *G4ARI*. A large majority made no comment. Some stations made small errors in calculating their new locator, but they have not been penalised as the errors were too small to make a significant difference. The power column in the table should only be regarded as nominal, as some entrants declared power input and others output.

This year there was only one section, but the number of entries was such that a split of, say, "single operator" and "all other" categories would have been possible. This will be taken into account when planning the 1986 contests calendar.

Congratulations to GW4MGR/P and G4BSW/A, both of whom receive certificates. Thanks for check logs to G3GC, G3NNK and G3URA.

G3FZL

Posn	Callsign	Points	QSOs	Loc	Best dx	Km	Pwr
1	GW4MGR/P	1,377	146	IO83JA	FE6DJB	662	100
2	G4BSW/A	1,035	117	JO01QD	DL6BAB	576	100
3	G4NUT	877	123	IO92PC	G4FDX/LX	542	100
4	G4WET/P	807	115	IO92CA	DF5KE	623	100
5	GM4YXI	774	69	IO84KX	FE6FLB	545	100
6	G4ARI	704	104	IO92IQ	G4FDX/LX	609	100
7	G4VXE/A	681	95	IO81UQ	PA0XMA	615	100
8	G4NOK	669	101	IO93FR	FE6FTI	459	100
9	G4SFY	663	73	JO02QT	G3TIR	443	100
10	G3WKS/A	632	91	JO01FC	GM4YXI	493	100
11	G5ECD/P	583	60	IO84KF	G4BSW/A	455	10
12	G4XEN	553	75	IO92PH	GM3WTA	557	100
13	G3ZME	534	78	IO82SQ	ON7GB	431	100
14	G3TBK	503	78	IO93OB	ON4YZ	481	100
15	G3TIR	502	55	IO80BM	G4SFY	455	70
16	G4HVC	491	76	IO93QA	PA0XMA	491	100
17	G4NDG	451	68	IO80GV	PA0RU	573	100
18	G4RST	449	81	IO92QG	ON6GP	409	100
19	G4WUS/P	419	49	IO94PL	PA3CCT	509	1
20	G4HZF/P	416	52	IO93XJ	ON7EH	413	50
21	G3KZR	404	70	IO91SE	GM4YXI	458	80
22	G4EZA	402	68	JO01KU	GW3KJW	370	80
23	G4OAD	374	71	JO01GO	PA3CII	350	80
24	G4RAM	368	52	IO80VQ	PA0RDY	527	100
25	G4IWP/P	339	57	IO91JL	G4LAD	353	100
26	G4ULS	308	56	IO82TI	ON7EH	480	100
27	G3ISL	233	29	IO94SH	ON7EH	504	100
28	G3CCZ	214	36	JO01JV	G4FDX/LX	442	80
29	G2VJ	212	38	IO92CK	GM4CXM	423	75
30	G5UM	198	48	IO92MP	GM4RTN	422	12
31	GM4RTN	179	19	IO86BD	G3NNG	532	80
32	G4ZTR	174	43	JO01FS	G4NDG	289	20
33	G4WRW	157	35	IO81SJ	G5ECD/P	158	25
34	G4UWW	136	24	JO01LW	GW4MGR/P	299	25
35	G2DHV	129	33	JO01BK	GW4MGR/P	275	30
	G4CIB	129	33	IO81VX	G4MDZ	255	60

Low Power Field Day July 1985 rules

Operation will again be on a dual band basis, using 3·5MHz in the morning period and 7MHz in the afternoon. Please note that serial numbers are continuous. The second period does not start again at 001 as in previous years.

1. The general rules for RSGB hf contests, published in the "Operating Guide" supplement, *Rad Com* January 1985, will apply.
2. **Eligible entrants.** RSGB members resident in the British Isles. Multi-operator entries will be accepted.
3. **Date, Operating periods:** Sunday, 21 July 1985.
   1) 0900–1200gmt on 3·5MHz between 3·520 and 3·570MHz only.
   2) 1300–1600gmt on 7MHz between 7·010 and 7·040MHz only.
4. **Sections:** A) 15W dc input maximum
   B) 5W dc input maximum
5. **Contest call and exchange.** Call CQ FD. Exchange RST plus serial number, starting at 001, together with location (defined by a place name) and county code (see "Operating Guide").
6. **Scoring.**
   Portable or mobile stations.....15 points per QSO
   Fixed stations.....5 points per QSO

A station may be worked once on each band.

Contests Calendar

May–September	10GHz Cumulatives *(Rules in April issue)*
May–September	Microwave Cumulatives *(Rules in April issue)*
1, 2 June	HF NFD *(Rules in February issue)*
8 June	GARTG-RTTY 1985 *(Rules in April* MOTA)
8 June	1,296MHz Trophy *(Rules in April issue)*
8, 9 June	Worldwide S America CW *(Rules in June MOTA)*
9 June	432MHz Trophy *(Rules in April issue)*
9 June	DF Qualifying Event, Dartford Heath *(Details in June issue)*
15, 16 June	All-Asian DX Phone *(Rules in June MOTA)*
16 June	BATC Summer fun ATV *(Rules in* CQTV129)
22, 23 June	Summer 1·8MHz *(Rules in May issue)*
23 June	DF Qualifying Event, South Manchester *(Details in June issue)*
1 July	Canada Day *(Rules in June MOTA)*
6, 7 July	VHF NFD *(Rules in April issue)*
13, 14 July	SWL *(Rules in May issue)*
14 July	DF Qualifying Event, Mid-Thames *(Details in June issue)*
21 July	Low Power Field Day *(Rules in June issue)*
27 July	432MHz Low Power *(Rules in June issue)*
28 July	144MHz Low Power *(Rules in June issue)*
4 August	3·5 Hopscotch *(Rules in June issue)*
4 August	DF Qualifying Event, Salisbury
18 August	1,296/2,320MHz *(Rules in June issue)*
18 August	DF Qualifying Event, Coventry
25 August	ROPOCO 2
25 August	GARTG-RTTY 1985 *(Rules in April* MOTA)
7, 8 September	IARU Region 1 FD
7, 8 September	144MHz Trophy and IARU
8 September	DF Qualifying Event, Slade
2, 10, 18, 26 September	28MHz Phone Cumulative
14/15 September	International ATV *(Rules in April issue)*
22 September	70MHz Trophy
29 September	DF National Final, Northampton
5, 6 October	432MHz–24GHz and IARU
5, 6 October	GARTG-SSTV 1985 *(Rules in April* MOTA)
8 October	432MHz Cumulative
12 October	GARTG-RTTY 1985 *(Rules in April* MOTA)
12 October	DF Double Night Event, Slade
13 October	21/28MHz Phone *(Rules in May issue)*
16 October	1,296/2,320MHz Cumulative
20 October	21MHz CW *(Rules in May issue)*
24 October	432MHz Cumulative
26 October	DF Treble Night Event, Mid-Thames
27 October	70MHz Fixed
1, 17 November	1,296/2,320MHz Cumulative
2, 3 November	144MHz CW
3 November	WAB CW *(Rules in February* MOTA)
9, 25 November	432MHz Cumulative
9, 10 November	2nd 1·8MHz
11, 19, 27 November / 5, 13 December	28MHz CW Cumulative
1 December	144MHz Fixed
3, 19 December	1,296/2,320MHz Cumulatives
11 December	432MHz Cumulative
15 December	70MHz CW

7. **Special conditions.**
a) Power. The power for all parts of the station must be derived from dry batteries, accumulators, or "natural" sources (eg solar cells or wind-driven generators). The practice of float charging batteries from petrol, gas, or diesel driven generators is not permitted.
b) Equipment. Entrants using equipment capable of running more power than the specified input power for the section entered must specify how the power limit was adhered to.
c) Antennas. The maximum height must not exceed 35ft (10·66m) above ground level.
8. **Logs.** Standard RSGB hf contest log sheets (HFC1) must be used, with column (5) headed "Location and county code received".
9. **Declaration.** The log sheets must be accompanied by the standard RSGB hf contest summary sheet (HFC2) with the declaration signed by the operator responsible for the contest entry.
10. **Address for logs.** Logs should be postmarked not later than Monday 5 August 1985 and sent to RSGB HF Contests Committee, c/o C. Burbanks, G3SJJ, 16 Cotgrave Road, Plumtree, Nottingham NG12 5NX.
11. **Awards**
a) The Houston-Fergus Trophy will be awarded to the leading station in the 15W section.
b) Certificates of merit will be sent to the first three stations in each section.
c) A certificate of merit will be awarded to the fixed station, irrespective of power, who gives most points to portable stations, and who submits a check log.

432MHz Low Power Contest rules

1700–2300gmt 27 July 1985

A multiplier system will be used in this contest. Contacts should be scored as per general rule 7a, and the final score multiplied by the total number of counties and countries worked. County code letters shown on Page 4 of the *Rad Com* Operating Guide 1985, or the full county name, should be included in the contest exchange and recorded in column vi (QTH received) in the log

Each new multiplier claimed should be clearly marked in the log and listed on a check sheet. Transmitter output must not exceed 10W p.e.p. The following general rules, published in the "Operating Guide" supplement, *Rad Com* January 1985, will apply: 1, 2, 3, 4e, 5a, 6a, 7a, 9, 10a, 11a, 12b (see above), 13-24. All entries and check logs to: VHF Contests Committee, c/o Mrs P Suckling, G4KGC, 46 Windsor Close, Towcester, Northants NN12 7JB.

144MHz Low Power Contest rules

0900-1700gmt 28 July 1985

A multiplier system will be used in this contest. Contacts should be scored as per general rule 7a, and the final score multiplied by the total number of counties and countries worked. County code letters shown on page 4 of the *Rad Com* Operating Guide 1985, or the full country name, should be included in the contest exchange and recorded in column vi (QTH received) in the log. Each new multiplier claimed should be clearly marked in the log and listed on a check sheet. Transmitter output must not exceed 25w p.e.p. The following general rules, published in the "Operating Guide" supplement, *Rad Com* January 1985, will apply: 1, 2, 3, 4e, 5a, 6a, 7a, 9, 10a, 11a, 12b (see above), 13-24. All entries and check logs to: VHF Contest Committee, c/o Mr C J Easton, G8TFI, Highlands, Townsend, Nympsfield, Glos.

1,296/2,320MHz Contest 1985 rules

0700-1300gmt 18 August 1985

The following general rules, published in the "Operating Guide" supplement, *Rad Com* January 1985, will apply: 1, 2, 3, 4e, 5a, 6a, 7b, 8b, 9, 10b, 11a, 12b, 13-24. All entries and checklogs to: D A Yorke, G4JLG, 40 Edge Fold Road, Worsley, Manchester M28 4QF.

DF Qualifying Event—Dartford Heath

Date. 9 June 1985.
Map. OS Sheet 188 1:50000 series, Maidstone and The Weald of Kent.
Assembly. 1300bst for start at 1320bst.
Location. Shipbourne, just east of A227 approx. 6km N of Tonbridge. NGR 593523.

The tea place will be on OS Sheet 177, East London. Competitors requiring tea should notify Mr C Merry, 19 Faesten Way, Joydens Wood, Bexley, Kent, tel 03225 23729 by 6 June.

DF Qualifying Event—Mid-Thames

Date. 14 July 1985.
Map. OS Sheet 175 1:50000 series, Reading and Windsor.
Assembly. 1300 BST for start at 1320bst.
Location. Maidenhead Thicket. NGR 853815.

Competitors requiring tea should notify Mr C Boyce, 228 Totteridge Road, High Wycombe, Bucks HP13 7LF, tel 0494 33647, not later than 7 July 1985.

DF Qualifying Event—South Manchester

Date. 23 June 1985.
Map. OS Sheet 118, 1:50 000 series (The Potteries).
Assembly. 1300bst for start at 1320bst.
Location. Large lay-by on A536, approximately 4·5km NE of junction with A34 at Congleton. Please do not confuse with small earlier lay-bys. NGR 877682.

Competitors requiring tea should notify Mr D C Holland, 32 Woodville Drive, Sale, Cheshire M33 1NF, tel 061-973 1837 (home), 061-485 8505 (office), not later than 16 June.

Club News

REGION 1—RR B Donn, G3XSN, 7 Thurne Way, Liverpool L25 4SQ. Tel 051-722 3644.

Ainsdale AARC—4, 18 June (Normal meetings, 8pm, Scout HQ, Marine Drive). 11 June (Normal df hunt, 7.30pm start), 25 June (Special df hunt, 7.30pm start, see sec for details of this df with a difference), 1/2 June (HF NFD, Woodvale Farm, includes social evening—members are expected to support this event as much as possible). Sec G4TUP, tel 35947.

Barnoldswick (Rolls-Royce ARC)—5 June (Computer night). 8pm Sports & Social Club. Rally for 30 June cancelled. New rally date August 1986, details later. Sec G4ILG, tel 0282 812288.

Barrow (South Lakeland ARS)—4 June ("Acrylics", Dave G4RWO), 20 June (Foxhunt), 22 June (Barbeque at QTH of G3KQH/G1BFZ). 8pm. NORWEB Sports & Social Club. Sec G6LKB, tel 0229 54982.

Blackburn (ELARC)—4 June (Computer/rtty night), 25 June (Japanese morse) 2 July (Official club foxhunt). 7.30pm. Conservative Club, Cliffe Street, Rishton. On Tuesdays when no meeting, a club net operates on 145·400MHz at 7.30pm. PRO G6LXU, tel Great Harwood 887385.

Bury (BRS)—Every Tuesday, 8pm. Mosses Centre, Cecil St, Bury, New sec G6SPM.

Chester (C&DRS)—11 June ("Design and construction of a 15m converter", Derick, G3EON), 18 June (Bar-B-Q and rig on the air, bring your own steaks etc), 25 June ("PCB photo-etching", Alan, G8OJQ). Morse classes 7.15pm before main meetings by Adrian, G4MOU. Contact G4EZO, tel Chester 40055.

Darwen (DARC)—New club meets second Tuesday in each month, 7.30pm, Albion Hotel, Railway Road, Darwen Contact G2AKK. (Congratulations on your formation and affiliation to the RSGB—RR1).

Ellesmere Port (EP&DARS)—New club, contact G4STZ. (Congratulations on your affiliation to RSGB, I will be visiting you on Monday 9 Sept. Thank you for your invitation RR1.)

Fylde (FARS)—4 June ("Gliding as a hobby", John Gibson, Blackpool & Fylde Gliding Club), 18 June (Informal with morse class). 7.45pm. Kite Club. Blackpool Airport. G8GG, tel 725717.

Isle of Man (IoMARS)—Mondays, 8pm. Howstrake Hotel, Harbour Road, Onchan, in addition, local amateurs meet on Tuesdays at Peveril Court Hotel, Ramsey; Thursdays at Tynwald Inn, St Johns and Fridays at Perwick Bay Hotel, Port St Mary. Visitors most welcome. The Calf of Man expedition is scheduled for June, depending on weather etc; details on GB2RS news bulletin. It is a bird sanctuary and special permission to operate has been obtained. Sec GD4GWQ, tel 0624-22295.

Liverpool (L&DARS)—4 June (Open night), 11 June ("Workshop practice", Bill, G8CFM, and Joe, G4AMX), 18 June ("Guess the face behind the callsign"), 25 June (Radio problems from members). 8.15pm. Churchill Conservative Club, Church Road, Wavertree, Liverpool. Sec G6XBK, tel 051-427 8557.

Manchester (SMRC)—7 June (Lecture tba), 14 June (Midsummer df), 21 June (Mini-lecture), 28 June (Visit by Bert Donn, G3XSN RSGB Region 1 representative). 8pm. Sale Moor Community Centre, Norris Road, Sale. Sec G3WFT, tel 061-973 1837.

Manchester (West MRC)—Wednesdays, 8pm. Astley & Tyldesley Miners Welfare, Meanley Road, Gin Pit Village, Astley, Tyldesley, Manchester. 18 August (Mobile rally) Hadock Park Racecourse), 24 November (Mobile rally, Pemboke Halls, Walkden, Worsley, Greater Manchester) Contact G6YIO.

Oldham (OARC)—Mondays 8.30pm. Wheatsheaf Hotel, Derker St, Oldham. Sec G3SAO, tel 061-652 6529.

Preston (PARS)—6 June "Amtext, an intro to packet radio", Paul Brown, G3WRI), 20 June ("Receiving satellite pictures," Peter Dunne). 8pm. Lonsdale Club, Fulwood Hall Lane, Fulwood, Preston. Sec G3ZXC, tel 0772 718175.

Skelmersdale (S&DARS)—Thursdays, 8pm. Beacon Park Golf Club. Natter nights alternative weeks. Sec G4ZPY, tel 0704 894299.

Thornton Cleveleys (TCARS)—The club QTH is closed for the whole of June for building work. External visits arranged as follows: 3 June (Blackpool Airport. 7pm, Airport Fire Station. Fully booked), 12 June (Wireless workshops, Police HQ, Hutton. 2pm prompt. Fully booked), 17 June (Wireless workshops, Police HQ, Hutton. 2pm prompt. places available). Further details sec G4WIC, tel 0253 821827.

Wigan (DVARS)—First and third Thursdays in each month 8pm. Shevington Conservative Club, Shevington, Wigan. Sec G4XMG.

Wirral (WARS)—5 June ("Amtor", George Metcalfe, G6VS), 19 June (Technical talk), 3 July (Sale of surplus equipment). 8pm. Heswall Parish Church Hall, Heswall. Sec G4KPY, tel 051 625 7311.

Wirral (W&DARC)—2 June (Heswall lay-by 2.30pm, df hunt No 3), 5 June (D&W, The Greave Dunning, Greasby), 8, 9 June (1296 and 432MHz Trophy Contest), 12 June (Visit by Bert Donn, G3XSN, RSGB Region 1 Representative), 19 June (D&W, at The Telegraph, Mount Pleasant Rd, Wallasey; new venue for D&W, bring the wife and kids), 26 June (The Eileen Medley Challenge Cup, df hunt. Book in by 7.50pm for 8pm start from Heswall lay-by), 3 July (Bar-B-Que on Heswall Shore, from 8pm till late). Irby Cricket Club, Mill Hill Rd, Irby. Sec G8TRY, tel 051-630 1393 or 227 1018.

Wirral Raynet—First Thursday in each month, 7.30pm. YMCA, Whetstone Lane, Birkenhead. Net nights on 10/20/30 of each month on S8 from 8pm. Contact G4EFP controller, or PRO G6FNF, tel 051-653 4067.

Welcome Darwen ARC and Ellesmere Port DARS; please send me your programmes and news/info for publication. Many thanks to Ainsdale ARC on the good turn-out for my visit and especially to George, your chairman for his hospitality. Thanks also to David Norris, sec, for his encouraging letter. Due to the shortage of helpers on the RSGB stand at Belle Vue, I was unable to visit the club stands which I had every intention of doing. Please accept my apologies. *RR1*

REGION 2—(RR to be elected)

Denby Dale (DD&DARS)—5 June (Rally committee meeting), 12 June (Rally open meeting), 16 June (Rally), 19 June (Noggin and natter night), 23 June (VHF contest), 26 June (Provisional visit—Leeds AR), 3 July (Noggin and natter night). Pie Hall, Denby Dale. Sec G3SDY, tel Huddersfield 602905.

Goole (GR&ES)—4 June (Natter night), 11 June (Contest planning evening), 18 June (Treasure hunt, arrive before 8pm), 25 June (Secret talk by Mr X). 7.30pm. Goole Junior Chamber, Boothferry Road, Goole. Details G8VHL, or G8IOH, tel Reedness 462.

Hornsea (HARC)—1-2 June (HF NFD), 5 June (Natter night), 12 June ("Data transmissions", G4EEV), 19 June (RSGB film), 26 June (Contest operating and logging), 3 July (Preparation for VHF NFD). The Mill, Atwick Road, Hornsea. Details G4NJP, tel 0262 673635.

Scarborough (SARS)—1-2 June (HF NFD, Wykeham), 3 June (Surplus equipment sale), 10 June ("ZNZ special", G4ZNZ). 7.30pm. Cricket Club, North Marine Road, Scarborough. Sec G4YWR, tel 0723 360587.

Todmorden (T&DARS)—3 June (Car treasure hunt for G4HYY Trophy), 17 June (Informal chat night). 8pm. Queen Hotel, Todmorden. Sec G6MDB, tel Todmorden 2494.

REGION 3—RR G. Ross, G8MWR, 81 Ringwood Highway, Coventry CV2 2GT. Tel 0203 616941.

Bromsgrove (BARS)—15 June (Tour of Severn Valley Railways). 8pm. Avoncroft Arts Centre, Bromsgrove. Club net Wednesdays 144·050MHz. Sec G6EAM, tel Kingswinford 298580.

Coventry (CARS)—7 June (Visit to IBM at Warwick), 14 June (Night on the air), 21 June (1·8MHz df demo), 28 June (Night on the air). 8pm. Scout HQ, 121 St Nicholas St, Radford, Coventry. Sec G4JDO, tel 73999.

Droitwich (DARC)—Second and fourth Mondays in each month, 8pm. Scout HQ, Droitwich. Sec G4HFP, tel 02993 3818. GB3PWB will operate during June to celebrate Prince William's birthday. A special award is available. Details from G4HFP.

Halesowen (MEB Sports & Social Club RC)—11 June (Raynet West Mids Group), 25 June (General meeting). 8pm. MEB Social Club, Mucklow Hill, Halesowen. Sec G4RWH, tel 021-747 8784.

Rugby (RATS)—11 June ("DF", G8TWH), 18, 25 June (DF antenna construction nights). 7.30pm. Cricket Pavilion, "B" entrance. Rugby radio station. Sec G4TWH.

Stafford (S&DARS)—1 June (Boat trip), 4 June (Open meeting), 18 June (Night on the air). 8pm. Coach & Horses, Pasturefields, Staffs. Sec G4RWQ, tel 0785 714963.

Stourbridge (SARS)—3 June (Construction night), 17 June (Surplus sale). 8pm. Robin Woods Centre, School St, off Enville St, Stourbridge, Sec G8JTL, tel Lye 4013.

Stratford-upon-Avon (SuA & DARC)—10 June ("Radio interference"), 25 (not 24) June (Visit to BBC Training Centre). 7.30pm. The control tower, The radio station, Bearley, Nr Stratford, Sec G8OVC, tel S-u-A 750584.

Sutton Coldfield (SCARS)—10 June (Computers in action), 24 June (Problem sorting evening). 7.30pm. Public Library, Sainsbury Centre, Sutton Coldfield, New sec G3CNV, tel 021-354 4369.

Warwick (Mid-WARS)—11 June (Fox hunt), 25 June ("RSGB awards", G5UM). 8pm. 61 Emscote Rd, Warwick. Sec G8MFP, tel 0203 542877.

Wolverhampton (WARS)—1 June (Special event station GB2WM), 4 June (Junk sale), 11 June ("How I came into amateur radio"), 18 June ("RTTY and Amtor", G1DIL), 25 June (Night on the air), 8pm. Electricity Sports Club, St Marks Rd, Chapel Ash, Wolverhampton. Sec K Jenkinson, tel 0902 24870.

Worcester W&DARC—3 June (Test your specs), 17 June (Informal night). 8pm. Oddfellows Club. New St, Worcester. Informal meetings held at the Old Pheasant, New Street, Sec G4RBD, 14 Oakleigh Heath, Hallow, Worcester.

REGION 4—RR M. Shardlow, G3SZJ, 19 Portreath Drive, Darley Abbey DE3 2BJ. Tel Derby (0332) 556875.

Bolsover (BARS)—5 June (Angel Pub natter night), 12 June (DF hunt), 19 June (Natter night) 26 June (VHF Field Day, talk), 7.30pm. The Angel Hotel, Bolsover, Sec N Herrington, c/o G4AGE.

Buxton (BARS)—11 June (Martin Shardlow, G3SZJ, RR4), 25 June (Open forum and rally briefing), 30 June (Buxton Radio Rally, Pavilion Gardens). 8pm. Haddon Hall Hotel, London Road, Buxton. Sec G6MIF, tel Buxton 6174.

Derby (DADARS)—5 June (Junk sale), 12 June (Feeders—the missing link), 19 June (Night on the air), 26 June (BAR-B-QUE at Drum Hill), 3 July (Junk sale). 7.30pm. 119 Green Lane, Derby Sec G4EYM, tel Derby 556875.

Derby (NHARG)—7 June (Rally preparation), 9 June (16th Elvaston Castle Mobile Radio Rally), 14 June (Mobile atv-treasure hunt), 21 June (Rally round-up) 28 June (Prep for top band df hunt) 30 June (Top band df hunt). 7.45pm. Nunsfield House, Bolton Lane, Alvaston, Derby. Sec G4PZY, tel Derby 767994.

Grantham (GRC)—18 June (Natter and noggin night). 8pm. Shirley Croft Hotel, Harrowby Road, Grantham. Sec G8WWJ, tel Grantham 65743.

Grimsby (GARS)—13 June (Natter night and df organization), 27 June ("Guide dogs", Tony, G1EMS). 7.30pm. Cromwell Social Club, Cromwell Road, Grimsby. Sec G4EBK, tel Grimsby 887720.

Lincoln (LSWC)—5 June (CW/RAE/hamfest meeting), 12 June (Activity night/night on the air). 7.30pm. City Engineers Club, Waterside South, Lincoln. Sec G4STO, tel Gainsborough 788356.

Louth (LARC)—5 June (Sort junk), 6 June (Junk sale), 30 June (Big day out). Sec G1IZB, tel Marshchapel 595.

Loughborough (L Falcon ARC)—4 June (Constructors group), 7 June (Junk sale), 11 June (Constructors group), 14 June (HF night on air), 18 June (Constructors group), 21 June (3rd 1·8MHz df, 8pm), 25 June (Constructors group), 28 June (Contest organization). 8.30pm. Top Floor, Brush Social Club, 19 Fennel Street, Loughborough. Sec G4RVW, tel 0509 412043.

Mansfield (MARS)—7 June ("Amtor" G3XTL). 7.30pm. Victoria Social Club, Princes Street, Mansfield. Sec G1DZH.

Newark (N&DARC)—6 June ("DF techniques" G3TBK, 23 June (DF hunt/picnic). 7.30pm. Palace Theatre, Appleton Gate Newark. Sec G4SDZ.

Nottingham (Plessey (Beeston) ARS)—22 June (GB0FGO, Plessey Gala Day). Thursdays, 8pm. Sec G4VFK, tel Nottingham 226321.

Spalding (SASARS)—14 June (Rally report and old timers reminiscences). 7.30pm. The Ship Albion, Albion Street, Spalding. Sec G4ZGT, tel Spalding 2781.

REGION 5—RR J S Allen, G3DOT, 77 Rosslyn Crescent, Luton LU3 2AT. Tel 0582 508515 or at work on 0582 21151.

Dunstable (D Downs RC)—7 June (DF hunt on 1·8 and 144MHz), 21 June (NFD planning), 30 June (Visit to Mullard Observatory), Room 3, Chews House, High Street South, Dunstable, Beds. Details G6EES, tel Dunstable 607623.

Leighton Buzzard (L Linsdale RC)—3 June (TBA), 9 June (RSGB 432MHz Trophy Contest), 16 June (*PW* 144MHz QRP Contest), 17 June (TBA). Vandyke Community Centre, Vandyke Road, Leighton Buzzard. Sec G1ACQ.

Milton Keynes (MK&DRS)—10 June ("Amateur radio and a holiday in Norway", G3DOT). Community Centre, Hodge Lea Lane, Hodge Lea, nr Wolverhampton, Milton Keynes.

Northampton (NRC)—6 June (Visit to Express Lifts Tower (members only) arranged by Keith, G4YKE), 13 June (Tulip rally. 0730 at the club). 20 June (Visit by RSGB regional rep John, G3DOT), 27 June ("Computers and their use for amateur radio", Rev Peter Butcher, G4NWH), 29/30 June Nether Heyford Silver Jubilee, NRC club station will be active on hf and 144MHz). Kingsthorpe Community Centre. Sec G4YJP.

Shefford (S&DARS)—1/2 June (NFD weekend), 6 June (Planning for *PW* QRP 144MHz Contest), 13 June ("Photographic techniques", Bob Silverston, G3GDH), 16 June (*PW* QRP 144MHz Contest). 20 June (Pedestrian df hunt with G4JLP and G4YRF as the fox), 27 June (VHF Field Day planning). Details G4PSO.

Wellingborough (Nene Valley RC)—5 June (Natter night), 12 June ("Packet radio", Peter Robinson, G3MRX), 19 June (Technical topic night), 26 June (TBA). The Dolben Arms, Finedon. Sec G4XEN.

May we suggest that secretaries of clubs in the region not mentioned here, make use of the GB2RS News service to publicise their club's programme. *RR5*

REGION 6—RR F S G Rose, G2DRT, 84 Cock Lane, High Wycombe, Bucks HA3 7EA. Tel Penn (049481) 4240.

Maidenhead (M&DARC)—6 June (Lecture). 7.30pm. Red Cross Hall, The Crescent, Maidenhead. Sec G8RYW, tel Maidenhead 28463.

Vale of White Horse ARS—4 June (Talk by Jim Bacon on the weather and radio propagation. Other clubs will be invited. date to be confirmed), 6 June (planning VHF, NFD). Details G3SEK, tel Abingdon 831600 extn 359 (day), Abingdon 31559 (evengs).

HF Convention, Belfry Hotel, Oxford, 29 September. Clubs in Region 6 interested in becoming involved in this convention please contact Martin Atherton, G3ZAY, chairman HF Committee. *RR6*

REGION 7—RR R Sykes, G3NFV, 16 The Ridgeway, Leatherhead, Surrey. KT22 9AZ. Tel 0372 372587.

Ashford (Echelford ARS)—10 June (Surplus equipment sale), 27 June ("Receivers"). 8pm. The Hall St Martin's Court, Kingston Crescent, Ashford, Middx. Sec G4PHS, tel 01-977 4157.

Biggin Hill (BHARC)—18 June ("Performance and measurement of hf receivers", G3SJX). 8.30pm. St Mark's Church Hall, Church Rd, Biggin Hill, Kent. Sec Ian Mitchell, tel 09598 376.

Coulsdon (CATS)—10 June (Open evening. More info on GB2RS). 8pm. St Swithin's Church Hall, Grovelands Road, Purley, Surrey. Sec G6HC, tel 01-684 0610.

Redhill (RATS)—18 June (Junk sale). 8pm. Constitutional and Conservative Club, Warwick Road, Redhill. Sec G8JXV.

Sutton (S&CRS)—21 June (Inter-club quiz with Coulsdon). 8pm. Downs Lawn Tennis Club, Holland Avenue, Cheam, Surrey. Sec G4BOX.

Wimbledon (W&DRS)—14 June (Junk Sale) 8pm. St John Ambulance HQ, 124 Kingston Road, Wimbledon SW19. Sec G3DWW.

REGION 8—RR M Elliott, G4VEC, 20 Haysel, Sittingbourne, Kent ME10 4QE. Tel 0795 70132.

Chichester (CARC)—4 June ("HF wire antennas", Louis Varney, G5RV, in the Green Room), 20 June (Goodwood evening rally). 7.30pm. Fernleigh Centre, 40 North Street, Chichester. Details G4EHG, tel Chichester 789587.

Eastbourne (Southdown ARS)—3 June ("Kits for radio amateurs"). First Monday in the month, 7.30 for 8pm. Chaseley Home, South Cliff, Eastbourne. Meetings also held on Tuesdays and Fridays of each week at Wealden District Council Offices, Vicarage Fields, Hailsham. Details G4XNL, tel Eastbourne 638653.

Gillingham (BRATS)—6 June (Construction night), 13 June (Application of computers in amateur radio), 20 June (Construction night), 22 June (Bar-B-Que at the Bredhurst Shelter, courtesy of Eileen and Keith Brooker, G3OXH). 8pm. Parkwood Community Centre, Parkwood Green, Wigmore, Gillingham. Details G4ZTF, tel Medway 374670.

Horsham (HARC)—6 June (TBA). 8pm. Guide HQ, Denne Road, Horsham. Details G4LKW, tel Horsham 64580.

Kent Repeater Group—7 June (AGM, Electronics Building, University of Kent, Canterbury). 8pm. Details G4RVV, tel (business hours) Orpington 27050, ext 91.

Hastings (HERC)—19 June ("Radio interference", Trevor Allison, G3XZT). West Hill Community Centre. Other meetings held. Sec G4NVQ, tel Hastings 420608.

Tunbridge Wells (West Kent ARS)—7 June (Informal), 14 June (Surplus equipment sale), 21 June (Informal), 28 June (TBA). 8pm. Adult Education Centre Annexe, Quarry Road, Tunbridge Wells. Details G4MXL, tel (after 7pm) 0892 32877.

REGION 10—RR E J Case, GW4HWR, 2 Abbey Close, Tyrhiw, Taffswell, Mid-Glam CF5 7RS. Tel 0222 810368.

Cardiff (CRSGBG)—10 June ("Clandestine radio", Rod Belcher, GW4PCJ) 7.30pm. Pantmawr Hotel, Tyla Teg, Pantmawr Estate, Whitchurch, Cardiff. Sec GW6ZHP, tel Cowbridge 3212.

Lougher (LRA&EC GW4HVJ)—Note change of meetings day: every other Thursday, 7.45pm. Lougher Scout Hall, Lougher, Gorseinon. Next meeting 6 June. Sec GW8TYS, tel 0792 893392, or chairman GW4JPN, tel 0792 863031, for details.

REGION 11—RR B H Green, GW2FLZ, 1 Clwyd Court, Tan-y-Bryn Road, Colwyn Bay, Clwyd LL28 4AH. Tel 0492 49288.

Caernarfon (Arfon Repeater Group)—13 June (AGM). 8pm. Royal Hotel, Caernarfon. New members welcome. Sec C W Owen, 13 Brynffynnon, Star, Gaewen, Anglesey LL60 6BA, tel 0248 714571.

Colwyn Bay (Conwy Valley ARC GW6TM)—13 June (AGM). 8pm. Green Lawns Hotel, Bay View Rd, Colwyn Bay. Sec GW4KGI, tel 0745 823674.

Deeside (Alyn & Deeside ARS)—3 June (D&W), 10 June (Treasure hunt), 17 June (Committee meeting), 24 June (Surplus equipment sale). 8pm. Shotton Social Club, Shotton Lane, Deeside. Sec GW4RKX, tel 0244 660066.

Porthmadog (P&DARC)—20 June (Video on frequency measurement, Ralph, GW2HCJ, filmed by Ray, GW6CGR). 8pm. Harbour Cafe, Ffestiniog Railway, Porthmadog. Sec GW4WKQ, tel 0758 740445.

Rhyl (R&DARC)—3 June (Visit to communications room at NW Police HQ, Colwyn Bay), 17 June (At 7pm "Operating QRP", Rev G Dobbs, G3RJV). 7.30pm. Mona Hotel, Market St, Rhyl. Sec GW1AKT, tel Nantglyn 469.

REGION 12—RR M R Hobson, GM8KPH, 17 Well Brae, Pitlochry, Perthshire PH16 5HH. Tel 0796 2140.

Aberdeen (AARS)—1/2 June (HF NFD), 7 June (Junk sale), 14 June (Building competition, seniors and juniors), 21 June (Building competition results), 27 June (Committee meeting), 28 June ("Practical antennas", Alec Allen, GM3ZBE), 5 July (VHF NFD preparations). 7.30pm. 35 Thistle Lane, Aberdeen. Details GM4GXD, tel Pitcapple 251.

Caithness (CARS)—Second Wednesday in each month, 7.30pm. Loch Watten Hotel, Watten. Details GM1AHC, tel 0847 63638.

Elgin (Moray Firth ARS)—AGM in June at Spey Bay Hotel, Spey Bay, Fochabers. Details of date and time from GM4IZY, tel Elgin 41549.

Forfar (F&D ARC)—1/2 June (HF NFD), 3 June (Jaysee Electronics), 17 June (Interference), 1 July ("Bee keeping", David Norrie), 6/7 July (VHF NFD), 15 July ("J Operator", GM4BAG). 7.30pm. 91B West Street, Forfar. Visitors call S20. Details GM4WMN, tel 0575 81222.

Inverness (ARC)—7.30pm. Cameron Youth Club, Planefield Road, Inverness. New sec GM1GFX, tel Inverness 242463.

Sarcon 85, Scottish Amateur Radio Convention, Dundee, 21 September. Due to a political party convention during the same week as SARCON, accommodation will be in short supply. A limited number of reservations have been made for bed and breakfast, for those wishing to stay before or after the convention, available on a first-come first served basis. A dinner has been arranged after the event, tickets now available at £10 per head. Further information from RR12.

REGION 14—RR T G Wylie, GM4FDM, 3 Kings Crescent, Elderslie, Strathclyde PA5 9AD. Tel Johnstone (0505) 22749.

Dumfries (D&Galloway REC, GM4HAA)—23 June (Dumfries Radio Rally). Cargenholm Hotel, New Abbey Road, Dumfries). Details GM8RSC, tel 0387 54056.

Glasgow (West of Scotland ARS, GM4AGG)—New club premises have been found at 154 Ingram Street, Glasgow. Alterations and improvements will have to be made to them but the club will continue to meet every Friday at 7.30pm. Now that the premises are twice as large, new members will be more than welcome.

Motherwell (Mid-Lanark ARS, GM3PXK)—9 June ("Open day". Traders, raffles, displays etc. Lecture by David Anderson, GM4JJJ on 144MHz moonbounce. Presentation of GM3EHI Award. Cafeteria open. Entrance £1 (includes programme and raffle tickets), xyl/yl and children free). Wranghall Hall Community Centre. Details GM4UXX.

Stranraer (Wigtownshire ARC, GM4RIV)—27 July (Proposed barbeque—Ballentrae members and friends welcome. Details GM4WEW). Community Centre, Lewis St, Stranraer. Sec Gerry Maxwell, "Lochryan", Stair Drive, Stranraer.

REGION 15—RR R Parsons, GI3HXV, 45 Erinvale Avenue, Belfast BT10 0FP. Tel 0232 612322.

Antrim (A&D ARC GI4SIW)—20, 21, 22 June. (Antrim Festival special event station GB4AAD). Sec GI4KIS.

Ballyclare (E Antrim ARC GI4KKK)—11 June (144MHz df hunt). 8pm. Fairview Primary School, Ballyclare. Sec GI4PRH.

Larne (L&D ARS GI4PHA)—First and third Wednesday in each month, 8pm. 100 Glenarm Road, Larne. RAE class each Thursday by GI4UUC. Programme not finalized. Sec GI4CPP.

Londonderry (North West of Ireland ARC GI3CFH)—3 June (Satellite demonstration and RSGB Oscar 10 video), 1 July (Amateur tv demo), 7.30pm. Prehen Municipal Boathouse, Victoria Road, Londonderry. Sec GI4OUN. GB3LY Repeater Group—contact GI2DHB.

REGION 17—RR T Emery, Wilverley, Old Lyndhurst Road, Cadnam, Southampton SO4 2NL. Tel 0703 812435.

Basingstoke (BARC)—3 June ("Antennas", G8CKN). 8pm. Forest Ring Community Centre, Sycamore Way, Basingstoke. Sec G4WIZ, tel Tadley 5158.

Blackmore Vale—11 June (DF hunt). 7.45pm. Bell and Crown, Zeals, (on the A303). Sec M Bailey, tel 0963 70969.

Eastleigh (Itchen Valley ARS)—7 June ("Fibre optics" a member of Southampton University), 21 June ("Test equipment"). 7.30pm. Scout Hut, Brickfield Lane, Chandlers Ford. Sec G6DIA, tel 0703 863039.

Farnborough (F&DARS)—12 June ("VHF/UHF antennas", G8CKN), 26 June (VHF Field Day preview). 7.30pm. Railway Enthusiasts Club, Access Road, off Hawley Lane, Farnborough. PRO G4MBZ, tel Farnborough 837581.

Fareham (F&DARS)—5 June ("The oscilloscope and its operation"), 19 June ("Planning permission for antennas"), 12, 26 June (On air/natter nights). 7.30pm. Portchester Community Centre, Portchester. Sec G4ITG, tel Fareham 234904.

Gosport (Rowners&DARS)—5 June and every alternate Wednesday. 7.30-8pm. Morse tuition followed by meeting at Scout Headquarters, off Grange Road, Rowners. Talk-in on S22 or nearest available fm channel. Sec G6OTY, tel Locks Heath 2541.

Horndean (H&DARC)—3 June ("Raynet", G4JXO). 8pm. Merchiston Hall, London Road, Horndean. PRO G4BEQ.

Liphook (Three Counties ARC)—12 June ("Amateur radio insurance", N Gibson), 26 June (On air on hf and vhf). 8pm. Railway Hotel, Liphook. Sec G3TBT, tel Passfield 368.

Wimborne (FRARS)—2 June (Video of dx visit to St Pierre et Miquelon), 9 June ("Integrated circuits", Peter Chadwick), 16 June ("The RNLI"), 23 June ("JARL video"), 30 June ("Blow the dust off your df rig"). 7.30pm. Flight Refuelling Social Club, Merley, Wimborne. Sec G8ZLH, tel 0202 570894.

Winchester (WARC)—15 June ("Antennas", G4CEW). 8pm. The Log Cabin, Stockbridge Road, Winchester. Sec G4FPC, tel 0962 64747.

Please do not forget the RAIBC Picnic on 2 June at Broadlands, Romsey, Hants. Talk-in from 10.30am on S22. Details from G4COM, tel Southampton 693017.

REGION 18—RR Ian Gibbs, G4GWB, 61 The Gables, Widdrington, Morpeth NE61 5QZ. Tel 0670 790090.

Berwick (Borders ARS)—7 June ("Function of the Royal Observer Corps"). Tweed View Hotel, Berwick on Tweed. Sec G1IUK, tel 0289 305465.

Blyth (BARC)—Wednesdays, 7pm. Community Centre, Warwick St, Blyth. Club membership is limited. Sec G1JFW.

Consett (Derwentside ARS)—3 June (DF round-up and presentation), 10 June ("1·8MHz homebrew transceiver", G4TTC), 17 June ("PCB manufacture", G1GAD), 24 June (Junk sale). Consett AFC, Belle Vue Park, Consett. Sec G1AJT.

Durham (DARS)—Fridays. Rowing Club, Green Lane, Durham City. Sec G4WJV, tel 0783 853552.

Durham (U&D R&ES)—Dunelm House, Durham University.

Great Lumley (GLAR&ES)—Wednesdays. Community Centre, Great Lumley. Sec G4OCQ, tel 0385 40827.

Hazelrigg (NER&CC)—Mondays. Hazelrigg village hall. RAE tuition now in summer recess. Morse classes in progress. Sec G1HDV, tel 0632 2742413.

Hetton le Hole (Houghton le Spring ARC)—Wednesdays. Hettondown Hotel, Hetton le Hole. Morse and computer class in progress. HF and vhf stations operated on club nights. Contestants welcome to call and operate in hf and vhf contests taking place in June and July. Sec G4ULJ, tel 0783 841897.

Morpeth (Northumbria ARC)—9 June (Junk sale, Hagg House Farm, Ellington), 29 June (G4KHC's coffee morning, QTHR, all visitors welcome). Thursdays. Old Telephone Exchange, Ellington, Morpeth. Sec G6IIA, tel 0670 513026.

Middlesbrough (Post Office ARC)—Thursdays. 6 Lytton St, Middlesbrough. HF station operational on club nights, Contact G4ZML, tel 0642 59044.

Redcar (East Cleveland, G4CRS)—Fridays. RAFA Club, Newcomen Tce, Redcar. RAE and morse classes, talks demonstrations etc. Club net Sunday evenings 145·350MHz. Sec G1GMF, tel 0642 474769.

Prudhoe (Tynedale ARC)—First Friday in each month, 8pm. Scout & Guide HQ, Station Bank, Prudhoe, Northumberland. Sec G6RRT, tel 0434 602718.

Sunderland (SARS)—Mondays and Thursdays, 7pm. Sundays 11.30am-1pm. The Brewery, Westbourne Rd, Sunderland. HF and vhf station operational on club nights. Sec G4WMW, tel 0783 343295.

Washington (W&D ARC)—Sundays. Oval Community Centre, District 12, Washington, Tyne & Wear. RAE and computer classes. Sec G6EPS, tel 091 416 8648.

Whitley Bay (Tyneside ARS)—Wednesdays. Community Centre, Earsdon, Whitley Bay. Morse instruction, basic and advanced. Sec G4KOT, tel 0632 2340170.

REGION 19—RR R J C Broadbent, G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQ. Tel 01-989 6741.

Cheshunt (C&DARC)—1/2 June (HF NFD and barbecue), 5 June (Natter night), 8/9 June (Special event station, Great Amwell traction engine rally), 12 June (144MHz portable on Bass Hill Common), 19 June (Natter night), 26 June (Club project report). The Church Rooms, Church Lane, Wormley, Herts. Sec R Frisby, tel Hoddeston 464795.

Chiswick (ABCARC)—18 June (Demonstration of members' equipment). 7.30pm. Chiswick Town Hall, High Road, Chiswick, London W4. Sec G3GEM, tel 01-992 3778.

Edgware (E&DRS)—13 June ("RTTY on the BBC computer", G4RMD), 27 June (Informal—VHF NFD briefing). 145 Grange Hill Road, Burnt Oak, Edgware. Club station, G3ASR. Slow morse at meetings and on air. Sec G4RMD, tel Hatfield 64342.

Harrow (RSH)—7 June ("Clandestine radio", G3VA), 14 June (Activity night). 8pm. The Harrow Arts Centre, High Road, Harrow Weald. Sec G6NDJ, tel 0923 53642.

Havering (H&DARC)—5 June (Informal), 12 June ("HF wire antennas", Louis Varney, G5RV), entry by ticket only. 8pm. Fairkytes Arts Centre, Hornchurch, Essex. Sec G1HGQ, tel 04024 41532.

London (CSARS)—3 June (Lunch-time natter), 17 June ("Expedition to Jersey", G3TXF). 12.30pm. Civil Service Recreation Centre, Monck Street, London SW1. Sec C P Wooley, 195 Conisborough Crescent, London SE6 2SF. Tuesday net, 144·575MHz, evenings 8pm.

St Albans (Verulam ARC)—11 June (Informal/activity night), 26 June ("Contesting", A C Slater, G3FXB). 7.45 for 8pm. RAFA HQ, New Kent Road, St Albans. Sec G4JKS, tel St Albans 59318.

REGION 20—RR N F O'Brien, G3LP, 26 Southfield Road, Gloucester GL4 9UD. Tel 0452 34890.

Bristol (South Bristol ARC)—5 June ("Bristol 70cm Repeater Group", G4KUQ/G4MCQ), 12 June ("CW operation", Cyril, G3XED), 19 June ("United States/County Squares", Ellis GW3CDH), 23 June (GB2WFH Whitchurch Folk House Open Day special event), 26 June (Briefing for VHF NFD, G4WRW/G4XPH), 30 June Longleat Rally, G4RZY/G4KUQ), 3 July ("QRP equipment construction", G4SQQ/G4TSS). 7.30pm. Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol BS14 0LN. Details, G4RZY, tel 0272 834282.

Cheltenham (CARA)—7 June ("Moonbounce operation", G4ASR), 21 June (Natter night). 7.30pm. Stanton Room, Charlton Kings Library, Cheltenham. Details G4VXE, tel 36723.

Cheltenham (Smiths Industries RS)—13, 27 June, 8pm. Club House, Newlands, Bishops Cleeve. Details G8UJG, tel Bishops Cleeve 2175 or Bishops Cleeve 3333 ext 2511.

Gloucester (GARS)—5 June (NFD postmortem), 19 June (Natter night). 7.30pm. St John Ambulance Headquarters, Heathville Road, Gloucester. Details Nick Negus, G6AWT.

Portishead (Gordano ARG)—26 June (Fox hunt). 7.30pm. Ship Hotel, Down Road, Portishead. Details G3LJD.

Shepton Mallet (Mid-Somerset RC)—2, 16, 30 June (Natter nights). 7.30pm. The Kings Arms, Shepton Mallet. Details G4WZF, tel Chilton-Polden 722946.

South Cotswold (SCARS)—12, 26 June (Natter nights). 7.30pm. Nelson School, Stratford Lodge, Stroud. Sec G1DCT.

Street (S&DARS)—4 June ("The work of RAIBC", Mrs F E Woolley), 2 July (Natter night). 7.30pm. Wessex Hotel. Details G4SCD.

Yeovil (Y&DARC)—6 June (Video "The Space Shuttle"), 13 June ("Cosmic radio noise", G3MYM), 20 June ("Computers—3, Programmes", G3GC), 27 June (Natter night), 4 July ("Sines & Cosines", G3MYM). 7.30pm. Recreation Centre, Chilton Grove, Yeovil. G3GC, tel 0935 75533.

Members' Ads

CONDITIONS OF ACCEPTANCE

These subsidized flat-rate advertisements are accepted as a service to members of the RSGB only. They must be submitted on the Members' Ad form printed on the back of a *recent* address label carrier used to mail *Rad Com* to the advertiser: this will automatically provide proof of membership and should not be more than two months old. No acknowledgement of receipt will be sent, and advertisements not clearly worded or punctuated, or which do not comply with the conditions of acceptance, will be returned. No correspondence concerning this service will be entered into.

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 £2.30 for 40 words or less: advertisements containing more than 40 words will cost an additional £2.30 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 **August 1985** issue is **Thursday 13 June**

Post to: MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS
Do not post to RSGB HQ or Advertising officer.

FOR SALE

RXs Nems Clarke 1302, vhf/uhf, 50-900MHz, £125. R390A/URR, £185. Eddystone 688A, £65. Eddystone 640, £55. Tuning units TN28 APR1, TN16 APR4, £15ea. TA33JR antenna, £45. *Wanted* Handbook for coil comparator LC100C British Physical Lab. R Davey, 53 Stalham Road, Hoveton, Norwich, Norfolk. Tel Wroxham 3153.

All-band hf linear FL110 solid state designed to match FT301S and FT7 tx/rx, 10W i/p, 100W o/p, boxed, as new, £100. Tel George, 0292 268055.

Trio PS10 psu, mint cond, £20. Kenpro KP200 memory keyer, £120. Hi-Mound bug key, with marble base, £22. Tel Peter Crosland, 0905 620041 evenings/weekends.

Linear 400W p.e.p. 3W in homebrew, 80-10 TT100 valves, fan, psu, data, £70. QRP? Build 200W linear with TT100 full constructional details valve, £20. ATV? U321 tuner, £4. ELC1043, £3. G11 detector and selectivity modules, £5. G3XKA, QTHR. Tel Woking 73620.

Burndept uhf 3-ch hand portable, RB2, RB10 and SU8, exc cond, base charger, spare nicad, mobile mount, manual, 0·25 wave, helical ants, best offer secures. G4LTI, QTHR. Tel 0695 78326.

Sony ICF2001 digital comms rx, covers 150kHz to 30MHz a.m./cw/ssb and 76-108MHz fm, plus AC122 power adapter, £85. Tel Mike, Medway 571537.

Westower telescopic and tiltover 13m tower, framed base plate type, with auto braked winches, unused, buyer arranges transport, £598 ono. G4IJE, QTHR. Tel 027989 482.

Icom IC251E, plus Mutek, £435. TR2300, nicads charger PS1200, £110. PRO30 handheld scanner rx, nicads charger, £175. G8VHG, QTHR. Tel 0482 855436.

Trio TS930S and Trio 430S, new cond, Drake L4B linear amp, very nice cond, new tubes. *Wanted* Collins KWM380, must be gd cond and, Alpha linear amp. Tel Derby 557705.

Trio JR310 amateur bands rx, £90. American 10/15/20M car antenna, needs base, (not whip antenna), £28. Broad-band preamplifier. 0-30MHz, £5. Tel Wood Clochen 378.

Valves from shack clearance, TT15s, £15. 829B's, £8. 813's, £10. 3B28s, £6. 5R4GYs, £2. All new unused, limited number of ea. Jim, GM4CXF, QTHR. Tel 0870 2051 ext 25 day, 0870 2413 evenings.

G3PLX Mk2 board, converts rtty to amtor, £80 ono. Parabolic dish, (PW EXE), unused, £6. Philips Nisoi video recorder with two tapes, £55 ono. Heathkit RA-1 rx, £15. Five level tape punch, Creed, offers. G4VFT, QTHR. Tel Horndean 591853.

Yaesu FT726R v/uhf all mode 2m fitted, untouched and mint cond, £600. G1CQA, QTHR. Tel Cambs 892677.

Westrex 2741 ASR33 teletype with plinth, £25. Labgear 7026 teletext adapter, plugs into antenna socket, decodes ceefax and oracle, £90. Hi-Mound Mk701 single paddle keyer, £16. 30ft telomast, £25. *Radcom* 1960-1985 complete, offers. G3OHC, QTHR. Tel 01-352 0199.

Yaesu FL50 tx, with instruction book, £50. 10/15/20 trapped antenna, £15. G4JFE. Tel Newbury 41613.

Microprocessors and product design, a course for engineers. This course was supplied by the open university at a cost of £395, and includes a fully assembled microcomputer development system, a prototype development board, user manual, experiment book, a file of manufacturers data sheets etc. The course describes the basic principles of microcomputer hardware and software that are used in the design of microprocessor based products, the complete course, as new is for sale at £250. Tel 051 426 3251 evenings.

Shack power control panels, contains two Zenith 2kVA variacs, two ac 0/300V panel meters, ammeter, several 10A flush switches, dial lights etc, mounted 0·25in alum panels, bargain, £49. Buyer collects. G5FH, QTHR. Tel 04252 5974.

Racal RA17L, vgc, £150. AR88LF, gc, manual, smeter, spare valves, £35. Datong FL1 audio filter, £45. 9502 rotator HB top bearing, £25. 10m UR6Y 2XPL259, £5. Ekco valve clock radio, offers. G4IDF, QTHR. Tel Worcester (0905) 351568 evenings/weekends.

Kenwood R2000 rx, £285 ono. Tandy PRO30 handheld scanner, £155 ono. Both in mint cond, with original packing and instructions. Prefer buyer to collect, but carriage arranged. John, G6IBC, QTHR. Tel 01-790 8163 after 5pm.

Yaesu FRG7 rx, mint cond, manual, orig packing, no mods, £125. Tel Weymouth 0305 786362.

FT101E, vgc, £350. Westower 60ft standard wall mounted telescopic tiltover, with winch, £250. 2 × 4CX250B, £10. 2 × 4X150As, £6. Transformer 500-0-500, 500-0-500, 200mA each winding, £10. Transformer 375-0-375, 6·3V, 3·5A, 4V, 2·5A, £5. G4JMX, QTHR. Tel 061 766 7403.

AOR AR22 2m fm handheld rx, 140-149·995MHz, with batts, charger and flexible antenna, c/w instructions and box, £45. (Cost £99). Buyer collects or pays carriage. *Wanted:* rtty software for Atari 800 computer. Tel Ian, Lincoln 46145.

Tower 30ft heavy duty telescope with winch, ready for pick-up, near Bath, £190. 30W linear MML144/30 1/3W i/p with preamp, as new, £40. Advanced morse trainer MMS2 talk back 1-5-50 groups numbers letter, words per minute 6-32 etc, £100. G1KAM. Tel 0761 415746.

AR240 2m synthesized handheld 140-150MHz, nicads charger with 10W homebrew amp, £90 ono. Anyone else out there own an NEC PC8201A? Exch programs etc. G4GYO, QTHR. Tel 09274 21732.

Robot 400 sstv scan converter, fitted professionally with three memories by an interface 3000c expansion, enabling colour and b/w sstv transmit and receive details for 4 × 3 aspect and line sequential incl, but not fitted, £450 ono. G3CDK, QTHR. Tel 01-647 1866.

Robot 800 dedicated com computer, complete unit for rtty 60-132 wpm (45·45 – 100 bauds), and Ascii 110 bauds, morse 1-99wpm, all transmit, receive and sstv character generator, £250 ono. G3CDK, QTHR. Tel 01-647 1866.

Icom 751 gen cov tx/rx, Icom AT100 atu, Icom PS20, Icom SM6 base mic, Icom HM12 hand mic, £1,375. No splits. TET HB23M Triband minibeam 10-15-20m, £100. G4YYD, QTHR. Tel Bury Lancs 061-764 7623.

Liner 2, 2m ssb, 144·00-144·35MHz, VXO controlled, 10W o/p, preamp fitted, new mic insert, recently aligned and PA replaced at ARE (cost £50), wkg much better than new, £79. G4XFV. Tel Reading (0734) 872366.

Test equipment: Marconi TF995A sig gen, 1·5-220MHz, wkg, £60. Advance counter timer, 50MHz, gwo, £40. Advac 77 voltmeter 1mV-300V, 4MHz, gwo, £20. AVO valve tester VCM163, gwo, £75. G8YMR, QTHR. Tel 0684 295189.

Yaesu FT290R unmodified, with charger, nicads and carrying case, all in vgc, £210. G4RHR, QTHR. Tel Felixstowe (0394) 272045.

FDK multi 750, handbook, mic, extended to 148MHz by agents, used little, Jaybeam 5XY, homebrew swr, £170. May split or ech for hf linear. G3KPW, QTHR. Tel Camborne 717612.

Complete stn, KW204 tx, KW202 rx, KW atu mic, all gd cond, £200. G3WP, QTHR. Tel Chelmsford (0245) 83914.

QRP tx/rc DSB80, complete, gd performer, £50. PSU, £5. QRP swr bridge, £2. 10A homebrew psu, 13·5V, £10. Homebrew valve 160 tx, and psu, gd cond, £20. G4XSM. Tel Bury St Edmunds 68084.

Microwave Modules 432-28MHz, i.f. with 1·6MHz repeater shift, used little, £98. SSM Europa 28/144, £30. FT101 fm adapter tx/rx, £29. G0AHT. Tel Chesterfield (0246) 824972.

RSGB bulletins 1964, 1965, 1966, *Radcom* 1967 to 1972 incl, all in Easibinders, *Radcom* 1973 to 1979 incl, unbound, all in first class cond, offers. Buyer pays carriage. GM3LCP, QTHR. Tel Dundee (0382) 79665.

TET HB23M mini beam 10-20m, unboxed, never used, stored indoors, mint cond, £100. Buyer collects. Chris, G4PDJ, QTHR. Tel Warrington (0925) 573740 evenings.

FT480R 143-148 tx/rx, FP80A psu, Daiwa CN630 swr/pr meter, SEM tranzmatch, Jaybeam 5-ele × Yagi, two slim Jims, three way coaxial switch, as new, less than 10min use, £450. FT290R, charger, batts, case, never used, one week old, £300. Tel 061-976 1463 evenings.

Creed 7E with reperfor, 6S6M auto tape reader, PAG term unit, silence cover, rolls paper tape, absolutely first class cond, can be delivered to Staffordshire last week June, £65 ono. GM4AGS, QTHR. Tel 0382 543113.

Swan 100MX, Yaesu FP707, YD148, 10-40m vertical, £400. Sony CV2100 VTR, Shibaden cctv, Shiba monitor, £100. Digital RGB computer monitor, £30. Portable monochrome tv, £15. (Offers). Philip, G4LIR, QTHR. Tel 0283 814528.

Exch or sell, Stan Pike 25·5in framed professional racing cycle, used once, cost over £525, accept £350. Exch for hf or vhf base stn, or model B BBC computer. G1MBW, QTHR. Tel 01-529 4657.

QRP/QRO, Ten-Tec Argosy analogue 500Hz xtal and AF filters psu, Icom 751, 250Hz, 455kHz filter, R4C 4NB 250Hz filter, Trio VFO120, Icom 215 fm portable charger nicads, UC1 converter, G3IBB morse keyboard. Sensible offers. G3YRQ, QTHR. Tel 0942 679948.

Rotator 9502A unused, boxed, £30. Jaybeam antennas, as new, 5Y/2M, £10. UGP/2M, £5. 28 air-spaced variable capacitors, £5. G3HSC morse courses, £3. Buyer collect. Collection books, radio/computer subjects, mint cond, sell individually. G3SEV. Tel 09278 3625.

PM Electronics Spitfire, 1KW i/p, hf linear, covers 80-10m revalved March 85, vgc, brand new, Welz

SP250 power/swr meter, reads up to 2KW power, both, £250. Martin, G4VKR. Tel Flitwick 712743 after 5.30pm.

Generator Briggs and Stration engine, Andrews industrial alternator, 240V, 2·25kVA, gd starter, reliable runner, £125. TI99/4A computer 16k basic, lots of software, morse programs etc, £50. Daiwa 70cm masthead, preamp, boxed, unused, £20. Pocketfone rx RB15, £10. Dave, G8PQG. Tel Oxford 67165.

RTTY, Vic 20, cassette, technical software program and interface, Commodore printer, approx 1000 sheets of fanfold paper, 8k and 32k switchable rampacks, QRA and Maidenhead locator program cassette, Vicwriter word processor cassette and manual, programmers aid cartridge and manual, Sargon chess cartridge and joystick, guide to basic manual and explanatory cassettes etc. Would like to exch for Standard 7900, or other synthesized 70cm rig, or sell, £175. Will not split. GOANX. Tel West Hanney (Oxon) 498.

Koss headphones PRO/4AAA, £20. 23cm corner reflector CR2/23CM Jaybeam, unused, £22. EXIDY Sorcerer 48k computer, plus green screen monitor, £285. Drake rx R7A, superb, £850. Drae 4A psu, fb cond, £22. Sabtronics 2037A, touch hold, thermometer, £23. Carriage extra. G8ESK, QTHR. Tel 0274 497438.

Alu-mast 40ft, complete with hinge base, electric and hand winches, guys etc, all aluminium, four 10ft sections easily transported on roof rack, £250 ono. Tel West Kingsdown (near Brands Hatch) 047-485 2801.

FT225RD 2m all mode tx/rx, mint cond, unmarked, boxed, mic and manual, £495. Datong D70 morse tutor, gd cond, £35. G6DEL, QTHR. Tel Chandlers Ford 63232.

Hammond X5 portable electric organ, two manuals, bass pedals etc, £300 ono. W.H.Y? G3HZX, 3 Ivinson Road, Tweedmouth, Berwick upon Tweed. Tel 306824.

Eddystone 850/4 lf/mf comm rx, 10-600kHz in six bands a.m./cw, two xtal filters and 1,000Hz audio filter, service manual, exc cond, £65. Carriage extra. GM3NIG, QTHR. Tel 041-639 7700.

QRT sale, Trio TS180S, SP180 and psu, £450. Dentron atu, £150. Daiwa auto atu, £70. Trio TR3500, £175. Three-band vertical antenna, unused, £20. Teleprinter, £15. Buyer collect. G4JYW not QTHR. Tel Hull (0482) 802074.

FT202R 6-ch 2m tx/rx, fully xtalled and complete with carrying case and helical antenna etc, new nicads recently fitted, unmodified and in immac cond, £65 ovno. Mike, GM4OKG, QTHR. Tel 0383 416688.

Worldwide countries check list, keep an easy check of countries worked on hf, vhf, uhf and satellites, full countries index, £2.50. p/p, 50p. A Goodier, 35 Rose Lane, Marple, Stockport, Cheshire SK6 6DS.

Trio JR310 rx, gd cond, £90. LAR modules swl omni match, £30. Codar PR30 preselector, mains, £10. Tel Wood Clochen 378.

Cossor dual beam scope CDU150 solid state dc-30MHz, access to XY plates, 10 × 8 screen, hood and probe, £140 ono. Samwell and Hutton wobbulator CT501 16-215MHz in 14 ranges for alignment and sensitivity testing of rxs. RF filters etc, esp RA117 series, £60. Microwave Modules 432/600 atv converter, £10. Drae 4A psu, £20. G4PXW. Tel Maidstone 51844 after 8pm.

Invitation for offers for antenna installation of 2 × 4 ways guyed 56ft Western 3HD base bolted tower, supporting Hy-Gain 205BA, Moseley 10/15 Elan and 2 × 16 Tonna beams, rotated by heavy duty Emoto, complete with separate coaxial and Emoto feedlines 70ft to shack. Two 240AC motors with gearboxes raise and tiltover tower, also 56ft by 4in ali mast in two sections guyed 2 × 3. G3WW, QTHR. Tel 0354 740255.

Three bedroom semi-detached pre-war house, Wembley area, with gas central heating, fitted kitchen, modern bathroom, close to all amenities, 60ft Versatower and hf/vhf antennas, with planning permission. Watson, G3WMQ, QTHR. Tel 01-903 4363 day, 01-211 6278 evening.

TS120S super compact 200W p.e.p. tx/rx, £310. PS30, £65. All boxed and exc cond. Datong RF clipper, £25. *Wanted* Large HD tower, TL922, GEM Quad, bencher paddle. Tel 0565 873205.

Silent key, property of the late G8AB, Vespa Mk2, plus psu, mic, manual, some spare valves incl 6-ch6, £75. KW202 rx with spkr, manual and spare valves, £110. Buyer inspect and collect. G3OPA, QTHR. Tel 01-508 6700.

Aluminium Parabola antenna 12ft dia, f/c 0·25, wt 200lbs, £50. Ex US Army BC221, unmodified, £15. G3OBD, QTHR. Tel 0202 511267.

Wireless World vol 54/1948 to vol 74/1968, in bound volumes, individual copies vol 75 to vol 80/1974, offers. G4CGR, QTHR. Tel Henley-in-Arden 2904.

RTTY MM4000 with keyboard and 12in monitor, £150. No offers. G4DQS, QTHR. Tel Brighton 37992.

Rad Com, complete years 1972-1984, offers. Lafayette HA700 gen com rx (somewhat deaf), £25 ono. KW2000 mobile psu, £25 ono. Pioneer mw/lw car radio, with eight track stereo, £15. Digital optical tachometer, model D20, £20. Telequipment serviscope minor, £20 ono. G3UXH, QTHR. Tel Medway 250562.

Yaesu FT101ZD, fan, mic, manual, mint cond, £475. Yaesu FC902 atu, £95. G8ZQB, QTHR. Tel Leicester (0533) 776335.

KW1000 linear, £195. Burns xtal calibrator, £20. Eddystone rx 940, £85. Heathkit HD1250 gdo, £20. Rigonda 6in television, £10. Classical guitar Alhambra 9C, with carrying case, £175. Prepared to exch this item. W.H.Y? G3ZYQ, QTHR. Tel Enfield 01-363 3363.

Hitachi 6500 portable VHS video recorder, 600E camera, tuner, psu, nicads etc, used little, cost £1500, will demonstrate, £850 ono. Adonis MM202FX swan-neck mobile mic, new, £20. Maplin modem with separate CBM64, Vic 20 RS232 interface, £50. G6UPQ. Tel 0993 75241 evenings/weekends.

Icom IC2E, charger, manual, £140. 8in disc drive SS/DD, as new, complete with circuit diags, psu, £65. CCTV camera with lens, perfect, £40. Alec, G8YCI. Tel Royston (0763) 44038.

Yaesu FT221, plus Mutek, £300. FT780R 70cm multimode, £250. Datong ASP speech clipper, £50. Microwave Modules MML144/30LS, 3W i/p, 30W o/p, £40. G4XUZ not QTHR. Tel Nantwich (0270) 626351.

Kenwood TS530S hf, 160-10 nine bands tx/rx, mic, handbook, original packing, mint cond, £445. G3CDC, QTHR. Tel Binham (Norfolk) 415.

Transverter Microwave Modules, 144/28MHz linear transverter, 10W o/p for 0·5W of drive, as new, £70. G4TBQ, QTHR. Tel Burton-on-Trent 34559 after 6pm.

FT290R, £240. FT790R, £240. FT230R, £230. FT102, £550. TS430S, psu and spkr, £695. SX2000N, £185. MML432/30L, £90. C58, £240. *Wanted* Telescopic P60 tower. GW3XCR, QTHR. Tel 0792 401058.

KW2000B and ext, VFO4B, gd cond, some spare valves and two xtals, £220. KW600 linear, £110. KW107 atu swr bridge, £70. Stan, G3RRL, QTHR. Tel 0724 710464.

Antennas, Sun KG 144GP, 5λ8 over 5λ8 over 5λ8 vertical, with radials, never used, still in orig wrappings, cost £36, sell, £20. MET 2m 144/19T 19-ele Yagi, never been assembled, cost £53, sell, £40. Both are absolutely as new. Reason for sale, have decided to concentrate on hf. G4XIO. Tel Hailsham (East Sussex 0323) 846016.

Drake TR7 tx/rx, Drake MN7 atu, both mint, BNOS 25A psu, brand new, £725. Will not split, no offers please. G1DES, QTHR. Tel Ruislip 33118.

Icom IC745 plus fm, with matching IC-PS15 psu, IC-SP3 spkr, few mins use only, £775. Kenwood AT230 atu, £85. Icom ICO2E handheld, with spkr/mic, s/case, mobile charging cord, hardly used, £195. All as new, boxed and ono. Tel 0582 606983, 9-12am.

HF linear 2 × 4CX250, 400W o/p, 80-10m with built-in psu, gwc, £75. ICL termiprinter, 120 column 30CPS printer, with full qwerty keyboard, RS232 interfaces, operating and service manuals, vgc, £75. Buyer collect. G3RXQ not QTHR. Tel 0525 220617.

Quick sale, Heathkit rx, any offers. Bob, RS86066. Tel Keynsham 67737.

Dream QTH, work into Europe direct from GW land on vhf. Superb four bedroomed detached, stone built, Welsh long house, two garages, plus 3·5 acres of land and outbuildings, 1200ft ASL, £59,500 ono. Tel Wrexham 755618.

FDK2M multi 2700 all modes vfo amd switched synthesizer, vox etc, £250 or exch gen cov rx. Pye monochrome tv camera with uhf modulator for domestic tv, £25. G8PRP, QTHR. Tel Weston-super-Mare 516357.

Computer video Genie 2 EG3008, 16k with numeric pad, EG3014 32k expansion unit, 48k total, EG401AT dual track disc unit, TEAC drives, DOS small DOS, wordprocessor, Ajedit, all connectors, offers. G4ERT, QTHR. Tel Markfield 242079.

Shack clearout, ATV MTV435 TV-tx, MMC435/600 converter, MML432/100 linear modified by Microwave Modules for video, gives 60W with MTV435, Ikegami VR622 camera incl lens, Manor supplies pattern gen, Fortop TVD100 demodulator, SSB Elect MV432A mesfet masthead preamp with control unit, Rigonda tv, JVC 14PSN multi-std monitor, Drae psus 1 × 24A, 2 × 6A, RS591-269 10-20V psu, Power/swr meters Welz SP200, SP400 plus cheap twin-meter unit. Yaesu YD846 mic, unused, CH20N coaxial switches (2). Daiwa rotator DR7600X/DC7055 control unit. Kenpro KS065, stay bearing, unused. Morse key, Antennas Jaybeam 8XY/2m, MBM88/70cm, Tonna 20209 9-ele/2m portable, unused, 20419 19-ele/70cm used twice only for contests, 50442 4 × 2m portable mast with guys virtually new. GP144/2m, GPV7/70cm colinear. Delivery extra at cost, no reasonable offer refused. GM4BVU, QTHR. Tel 0698 423121.

Trio R1000 hf rx, as new, boxed, £165. G8GEF, QTHR. Tel Didcot (0235) 818584.

FT101A 10-160m, gwo, gd first hf rig, cw filter, fan, desk mic, buyer inspects and collects, £250 no offers. G4TLY, QTHR. Tel Malmesbury (Wilts) 2935 evenings/weekends.

Icom 211E with ICRM 3 remote key pad, ICSM 2 desk mic, and Icom fist mic, as new, unmodified with boxes and books, £350 or exch solid state hf mobile equipment same value. W.H.Y? Keith, G4NPY, QTHR. Tel (05436) 76101/5737.

Liner 2 extra xtals, preamp, mic and handbook, £55. Pye Europa MF25FM 3-ch, wkg 4m fitted 70·260 power lead and mic, £55. Pye PFI tx/rx on RB0 with nightcall charger and tx/rx for spares, £25. KW2000B psu, book, mic, spare valves, works but could be improved, hence, £110. Marconi sig gen TF801B 12/485 meg, handbook, £50. TF995A 1·5/220 meg, not wkg, offers. *Wanted* HF mobile gear. Keith, G4NPY, QTHR. Tel (05436) 5737/76101.

Free to gd home, rx R1155, rx 62H (100-150MHz) matching psu type 234A, Class D wavemeter. All in wkg order, must be collected from QTH (near Northwich). G6PGG, QTHR. Tel 0606 891942 evenings.

FT101ZD fm, with fan cw (600) filter, used little, boxed with handbook, £440. You see, collect or carriage insurance etc your risk. GW3ASW, QTHR.

Heathkit HW8 QRP tx/rx, exc cond with manual, £110. CW active audio filter (similar to MFJ CWF3), built-in mains psu, neat, £12. G3KZU, QTHR. Tel Oxford (0865) 63000.

Complete 2m stn, FT290R, nicads, charger, helical Yaesu headset/boom mic, MM30LS, 5A psu, rotator, 16-ele ZL special, 8-ele beam, SMC colinear, H100 cables (25m total), gd cond throughout, £350 ono. Worner, G6WVR, QTHR. Tel Thorngumbald (Hull) 09644 2733.

Eddystone EC10 rx, covers amateur bands 1·8-30MHz including new 10, 18 and 24MHz bands, compact, attractive rx in lovely cond, £55 ono. *Wanted* Tektronix 545B EHT transformer, also plug-in type TU7, probe. G3AZI, QTHR. Tel Preston (0772) 37815.

Yaesu FT290R with nicads, charger, carrying case, all in gd cond, £210. 144/30LS linear, £45. Would consider exch and cash adjustment for hf linear. GU4YBW. Tel 0481 49144.

Pineapple 64K CPM, printer 80 col cards single disc drive, fully Apple compatible, genuine reason for sale, £450. FT221R no mods, £250. G3ZCD, QTHR. Tel Windsor 58299.

934MHz stn, Reftec tx/rx, 7·5dBi base colinear, swr/power meter, additional s/meter, noise cancelling additional mic, magnetic mount 3dBi antenna, £209. Carriage extra or exch for Icom IC120 23cm tx/rx in vgc. Mr Lancaster, Tel Ruislip 01-845 4008.

Trio TR2300 2m fm portable tx/rx, reverse repeater mod complete nicads charger, case etc, orig box, £105. Trio Kenwood 9000 2m multimode complete, £275. G6XDC, QTHR. Tel 061 437 3952.

Yaesu FT780R 1·6 shift SC1 stn console, takes 480/780, includes psu, £340 ono, or exch for IC451, cash adjustment. Julian Tether, G6LOH, Highview, Culworth OX17 2AX. Tel 0295 768152.

KW2000B with ac psu, £150 ono. Buyer collects, may p/exch 2m fm tx/rx or DSB160. G3TXA, QTHR. Tel 01-882 5292.

Trio TR9000 complete with psu, base unit, spkr, boxed, £300. Channel Master HD9850 rotator, £45. MML144/40 linear, £35. Mobile mic Adonis, £20. Daiwa infra-red, £20. MMA144V preamp, £15. Buyer collects. G8HPD, QTHR. Tel 058283 3307 after 6.30pm.

Collins R278/GB uhf aircraft rx, 200-400MHz in 100kHz steps, very heavy, gwo, extensive manual and circuit diagrams, circa 1952, £100 or p/exch FRG7 or similar. G4GKX, QTHR. Tel Dorset (0202) 690599.

Pye Pocketfones xtal on SU18, nightcall, two sets

of nicads, service info and spare xtals, £35. Transtel dot matrix printer, 50 and 75 baud baudot, £55. Post Office modem 2B (V21), bomb proof, £30. Creed 6S6 tape reader, offers. G4VFT, QTHR. Tel Horndean 591853.

TS820S immac, £485. EeZee match, £45. Mizuho KX2 rx atu, £25. Palm IV, £75. Palm 2, £60. *Wanted* Tribander rotator, FT208R, FT708R. Ian, G8SDN, QTHR. Tel 0525 714128.

Trio TW4000 2m 70cm dual bander, mint cond, boxed any demo, £400. G8TPR, QTHR. Tel 01-864 8261.

Trio 430S fitted fm, used receive only, £630. Trio 2500 2m handheld with ST2 base charger, SMC25 spkr, mic, RA5 antenna, soft case, £260. FT790R 70cm multimode portable, soft case, nicads, £220. AOR 2001 scanning rx, £260. FS603M power/swr meter, £40. Daiwa 606K audio filter, £40. 12AVQ vertical antenna 10-20, £40. All items mint, except 12AVQ used eight months. G6SFD, QTHR. Tel Dronfield 413413 evenings/weekends.

Standard C8800 2m mobile, £130. Trio TR7800 2m mobile, £150. Also for the BBC computer C/C graphics rom, £15. Acorns view rom, £25. Home accounts and database discs also available, £12 ea. Tel Mike, 0992 32114 after 6pm.

Sony ICF2001 rx, fm, 76-108 a.m./ssb, 150-26·9 PLL synthesizing system, six memories, digital. Autoscan manual AC122 and DC127A power packs, exc performer on own telescopic world broadcast handbook, £90. Wyatt, G3BRW, 17 Harbour View Road, Parkstone, Poole. Tel Dorset 747756.

Yaesu FRG7700 rx, mint cond, boxed, manual plus Amtech 200 atu, £265. 2m, fm, rx kit and pcb by WPO Comm, still boxed, no xtals, £20. Tel Weymouth (0305) 786362.

Cossor double-beam oscilloscope model 1035 Mk3, with manual, £40. Wavemeter class D No2, 240ac and 12V dc, with manual, exc cond, £25. G3XFB, QTHR. Tel 0902 850033.

Yaesu FT227R, mic, 16W fm mobile, £150. Mizuho SB2M, mic, charger, nicads, all xtals, cw/ssb, £50. Eddystone 840C, £75. All gd cond and ono, buyer collects. Alan, G4MMG, QTHR. Tel Bexhill 0424 216516 evenings/weekends.

TS120V, 270Hz, cw filter, service manual, exc, £310. DFC 230 digital vfo, four memories matches TS120/130, TS830S, inc up-down mic, mint, £75. Sem Tranzmatch 160-10, mint, £60. FT221 RF board PC1456B, £10. MM15dB attenuator, £6. All boxed ono, carriage extra. G4ABF, QTHR. Tel Malvern 66202.

Linear amplifiers BNOS LPM144 10-180, £175. Two Pye 50W vhf linears with service sheet, easily modified anywhere, 68MHz-174MHz (50MHz?), £45 pair. Buyer pays carriage or £210 job lot inclusive. All wkg. G4RNI, QTHR. Tel 0632 281441.

Trio 9000 2m multimode with BO9 base, £265. MML144/50S linear, £55. Drae 12A psu, £45. Daiwa 620A swr/power meter, £35. MC30S mic, all mint cond, boxed £9 ono. Tel 0582 606983 9am-10am.

Linear amplifier hf 80-10m using 2×4-400 in grounded grid with 4kV at 500mA psu in 19in homebrew cabinet, running a cool 2kW, £200. G4SSX. Tel Ruislip 30627.

BC348 ACPU mods, £10. W/meter class D 6V ac, £5. B2 rx, no plug, fair, £5. Woden TFR UM2, £5. TFR 600-0-600 200VA, £10. TFR power AR88, £10. Tuning drive assy AR88LF, £5. Three valves 805, used, £5 ea. G3CZG, QTHR.

Scopes GEC, £20. Telequipment, £25. Rxs R475, £25. HRO, £20. No coils. Valve/volt Dawes, £15. Small scope h/made, £5. Counters, faulty, £5. VCR 139A, £5. Tape recorders, £5 ea. Heathkit distortion meter, £15. VCR 97, £5. Valve SP61, new, £4. KT66, £5 ea. G6DDZ, QTHR. Tel 01-883 3474.

Trio VFO240, mint cond, £40. Lowe rtty tx/rx package and 32K colour Genie, unused, £130 ono. G3HCQ, QTHR. Tel Stamford (0780) 83278.

FT290R, FL2010, MMB11, nicads case, charger, mint cond, £300. FT790R, FL7010, MMB11 nicads case, charger, mint cond, £300. IC AT100, as new, £220. GLA1000 as new, £300. *Wanted* 60ft tiltover mast. G4VON. Tel 0780 720543 evenings.

Dressler 2m preamp VV200, GaAs plus VV interface, £60. 40m LDF, £4.50. Coaxial with Andrew N-plugs fitted, both ends, £80. Jaybeam 14-ele PMB14/2M, £30. All items never used. G4TAM, QTHR. Tel 0634 250408.

FDK750E and expander 430, dual band 2 and 70, all mode, as new, serviced, boxed with diplexer (HS770) and Sun dual band mobile whip, £350. G1EJE, QTHR. Tel Burntwood (05436) 72275.

FRG 7 exc cond, £125. Creed 444 perforator, reader, £30 ono. Amstrad CPC 464 GT64 monitor, software, cables, covers, guaranteed, £195 or exch. W.H.Y? Dymars and chargers (various). *Wanted* Memory unit for FRG7700 atu 15A psu, Einstein computer projects. Tel 0952 616611.

Yaesu FTV107R transverter fitted with 2m and wired to work with FT1, as new, with instructions and box, £90 plus carriage. G4RYO, QTHR. Tel Kingsbridge (Devon) 6331 evenings.

Quad 9HIGL version for 20, 15, 10, 8 resin-coated bamboos, 8ft boom cast alloy X end pieces four tuned traps, £50 ono or exch eg psu. G4SQA, QTHR. Tel 0733 232211.

Microwave Modules 14/23cm (1268) Oscar 10 mode L up converter 2W o/p, £110 ono. 23cm brass 3 pole interdigital filter N sockets, £25. 23cm 2C39 PA brass cavity, £60. Possible p/exch for FT790 and accessories. G4XHF. Tel 0293 515201.

18AVT/WB vertical 80, 10, £25. NEC2200P 144MHz tx/rx, mobile/portable, 12-ch complete with linear 30W o/p, £60 ono. G4SVX not QTHR. Tel 0923 720757.

Icom 720 with narrow cw and a.m. xtal filters, mint cond, £495. IC251E with Mutek front-end plus IC271E, mint with separate Mutek masthead SBLA144E preamp. GW3FKO, QTHR. Tel 0874 2772 8am-10pm.

QTH with 60ft Versatower. Bungalow with third bedroom as shack, long garden, ok for 0·5 top band, double garage, 8ft by 24ft greenhouse, freehold, £51,500. G4DYP, QTHR. Tel Burntwood (05436) 6139.

Mizuho 2m ssb/cw handheld MX2 tx/rx, £35. Brother EP22 electronic typewriter with RS232 interface, £65. Currah micro-speech for Commodore 64, £15. Will also consider uhf exch. Paul, GM1GUJ. Tel Glasgow 637 0808.

Trio TS130V with narrow filters, £350. AT130 atu, £60. MC50 mic, £20. LPF, £15. Icom IC2E with accessories, £120. All in exc cond. G4SYB, QTHR. Tel Farnborough (0252) 549852.

Jupiter Ace (fourth) computer, 16K ram interface, and Sanyo DM2112 CV monitor, six cassettes, manuals, used little, £100. G3MIZ, QTHR. Tel 0749 812473.

Yaesu FT707 hf rig and mic, Yaesu FP700 psu, £420. Daiwa CNA2002 2·5kW p.e.p. automatic atu, £140. All boxed and used little, no offers. Jack, G4TSV. Tel 0282 64236 evenings.

Icom IC290H multimode, boxed, £275. BNOS 12V 6A psu, £25. Yaesu FT200 80-10m tx/rx, £175. Sem-Tranzmatch 80-10m, as new, £40. All in mint cond. G6USO not QTHR. Tel 01-660 1640.

Welz SP15M swr power meter, hf/2m 200W, used four times, orig box and instructions, genuine reason for sale, £30. G6WDF, QTHR. Tel 0869 244798.

Trio TS780 dual bander, as new, £700 ono. Microwave Modules MMT1296/144 transverter, later model with GaAsfet preamp, £180 ono. Wood & Douglas atv tx/rx, built from kits 500mW o/p, £50 ono. Pye Pocketfone with two nicad packs, spkr, mic, fitted with SU8, RB4, RB14, £50 ono. Two Jaybeam 10-ele Yagis for 2m, £15 ea. Four MBM48S, £25 ea. Two 2-way phasing harnesses for 70cm, £6 ea. 4-way phasing harness for 70cm, £12. G6MSI, QTHR. Tel 0553 773065.

Realistic DX302 with frequency readout, covers 0·01-30MHz, mint cond in orig box, £100. Trio rx 9R-59DS, £40. G4ZTP. Tel Bournemouth (0202) 432610.

Icom IC2E synthesized 2m fm handheld, complete with charger and nicads, vgc, £110. G8YTI not QTHR. Tel 01-551 1418.

Icom IC271E 2m base stn multimode, with Mutek front-end (fitted by Mutek Ltd), first class cond, £550. Tel Stoke-on-Trent (0782) 328561.

TR9000 2m mobile multimode, as new cond, orig packing and fittings, reason for sale, going hf. Also 9-ele portable Tonna and 2x5λ/8 Welz base stn colinear, £315. Complete or will split. G0AYC. Tel Swindon (0793) 727369.

Oscillator Trio AG203 10Hz-1MHz, never used, £75. HF5 vertical hf antenna with radial kit, never assembled, £70. Q6 and 5Y 2m antennas, never used, £15 and £8. G6CHM not QTHR. Tel West Midlands 0384 296541.

Valves HL13C, C30B, five pin versions of SP4, AC/HL, AC/HLDD, SV4B, AC/VPI, VP4. Also PA20, PX4 etc. Early radio rxs up to late 30s. Books on radio and wholesalers catalogues of radios up to 1939. G4OOW, QTHR. Tel Hinckley (0455) 612091 after 7pm.

Eddystone rxs 770R, 19MHz-165MHz, £85. 854/4 rx 10kHz-600kHz, £75. Both gd cond. ITT3300 telex b/rates 1/2/300 (1200 rx), BBC m/code prog listing rtty etc, £50. Manuals. *Wanted* G2DAF rx and tx, need not be wkg if complete. John. Tel Orpington (Kent) 37955.

Eddystone rack and panel unit cat No 873/874, three units plus rack, similar standard rack but only 14in wide, height 22·5in, unused, as new, £19 including post. Send sae for details and illustration. G2ARU, QTHR. Tel Eastergate 3488.

Trio TR2400 handheld ST1 base, 12V quick charger, spkr/mic, hard case, service manual, mint cond, £195. 12V dc/240V ac 150W inverter, £20. Collectors Ekcovision pre 1953 tv, offers. *Wanted* Datong FL3 filter, consider part exch TR2400. Shaw, G4GAS. Tel 0793 750130.

Wood & Douglas ATV2 3W video tx/rx, £65 ovno. Pye 2m 70cm tripler, £15. Wood & Douglas 70cm rx converter, 2m i.f. not wkg or boxed, £5. Pye Pocketfone battery charger, £5. Carriage extra. Tel Atherton (0942) 891140.

Silent key G4NHV, FT101ZDFM, £400. FR50B, £50. Moseley VBE1 vertical, £55. Scope 535A, £50. Lowe FX1 wavemeter, £15. MC50 mic, £15. Datong morse tutor, £30. Marconi TF144G sig gen, £20. SSM Z-match, £25. Yaesu LPF, £12. Tel Dann, 0635 44388.

Atlas 210X mobile tx/rx, 10-80m 200W p.e.p. i/p (7lb), used little, recently serviced, vgc, £200. Coutant stabilized psu ASC1000 syle, 5-30V 10A, remote sensing, £40. Delivery extra or buyer collects. G3WDF, QTHR. Tel Chelmsford (0245) 440429.

FL2100Z hf linear, 1200W nine bands, mint cond with orig packing, £495 ono. 4m Europa transverter, 100W p.e.p. o/p, incl matching CPS10 PU, could be modified to 6m, £85. 4m, 4-ele Jaybeam, £15. Mutek SLNA144S 2m preamp, £25. Tel 01-578 4484.

FT230R, 25W 2m fm, works well but case scratched, £180. G4SDZ, QTHR. Tel 0636 702076.

FT101ZD Mk3 with fm and dc converter, £450. FV101Z, £80. Kenwood AT230, £100. Yaesu spkr unit SP980, £25. HD5 vertical, £45. The lot £650, or will trade for 70cm rig. Gordon, G4YXM. Tel 0934 812157.

Lattice tower 4 × 10ft sections, top section 6in sq, bottom section 18in sq, steel, homebrew, free standing, will carry hf beam plus 2m beam, requires 1m cube concrete, £65 ono. Buyer collects. Two swr/power meters, 200W p.e.p. max, £8 ea. G4GWF, QTHR. Tel 0942 607019.

Yaesu FT221R and Mutek, mint, £295. Trio TS820, SP820, VF0820, 600Hz cw filter and workshop manual, mint, £450. P/exch for FT757GX or TS430. G4UDG. Tel Kidsgrove 72100.

Heathkit SB401 tx, SB301 rx, SB600 spkr with manuals, £200. Creed 444 teleprinter with stand, £20. Icom IC2SIE 2m multimode base stn, or 12V, £400. Microwave Modules MML144/100S linear, 10W i/p, 100W o/p, switchable preamp, £100. G4RWY, QTHR. Tel 021-421 3316.

FRG7000, perfect cond, £150, no offers. Icom 1050B, all mods incl 100kHz shift, £45. Bremi BRL200, 10m linear (mains), a.m./fm or ssb, £50. All seen wkg. Tony, G4KDZ, QTHR. Tel 0375 78783.

Thanks to time wasters, my Icom IC27IE still available, boxed, used little, £565. Icom PS15 psu, 20A, £95. Both items, £650. P/exch possible, want active antenna, 70cm, M/H preamp. Tel Rayleigh (0268) 774089 after 3pm.

VHF/UHF Yaesu FT720RV/RU complete 2m/70cm mobile fm rig, incl switching unit and all connecting cables, as new, boxed with manual, £249. Tono MR150W, 150W 2m linear, £95. SMC Oscar 2 10fm rig, £30. The lot, £350. G4WVX, QTHR. Tel 06286 64415.

Siemens 745E 1·5/30MHz rx, 1964, p/exch smaller gen cov rx, no memories vfo tuning. Deliver up to 50 miles only. 23cm interdigital filter, BNCs, £20. *Wanted* PF1s, red nicads, 70cm PFs for 10GHz talkback, 23cm gear. G3VVB, QTHR. Tel Mevagissey 842368.

FDK750E 2m multimode, EXP430 matching 70cm transverter, PS750 matching psu, £450. Tel Nick, Luton (0582) 571944.

SX200N scanning rx and ssb unit, exc cond, £180. FRG7 and fm, £150. Complete darkroom outfit b/w, £40. All ono, must sell. Tel Plymouth 880674 or arrange carriage.

Telereader CWR685E, mint cond with service manual and handbook, £550. Would consider exch for 70cm fm/mobile rig plus cash difference. Geoff, G4AJJ, QTHR.

Ex-WD, 88 set AFV with psu/lf amp No2, gwc, will exch for anything of ex-WD interest. I am looking for BC611 walkie-talkie, psu/lf amp No3 (12V). Keith, G4MSF, QTHR. Tel 0632 693955.

Exch Kenwood R600 gen cov rx, for TR7730, Yaesu FT230R, or similar compact 2m fm mobile, possible cash adjustment. G4VFT, QTHR. Tel Horndean (0705) 591853.

Pye h/b fm Westminster 10-ch ex-PO radiophone,

complete and in perfect order, £50. L/B a.m. W30, £30. W15, £25. Cambridge, £18. All bootmount complete, gd cond. Tel Weybridge (Surrey 0932) 52128.

TRS80 32K level 2, £75. Disc interface, gives parallel printer interface, £75. Software and manuals available. Himound paddle key and keyer, £30 ono. Jeff, G4WAX. Tel 091 4875973.

Trio TR9000 2m multimode plus mobile mount mic, and PS20 psu, handbook and orig packing, exc cond, unmarked, never used mobile, £350. G6RNP, QTHR. Tel 06755 2342.

Ancient and modern valves, most £1.50 ea, many types, also a few collectors items, I will test before you buy. GW4BZD, 8 Blaen y Wawr, Bangor, Gwynedd LL57 4TR. Tel 0248 361315 after 6pm.

Star SR200 rx, amateur bands only, £20. Heathkit DX40V (vfo slight fault), £20. G4AIH, QTHR.

Trio 930S atu fitted, SP930 spkr, M60 desk mic, boxes and handbook, Sept 83, £900. G4BXR, QTHR. Tel 0908 566266.

R1000, S1 Mk2 top, £185. IC4E, vgc, £135. No offers. G3XQP. Tel 01-722 1072 between 7–10pm.

Prestel/videotex GEC decoder, cw, full keyboard, £20. MMT432/28, £95. MML144/40, £30. G-whip coils, various MM flexi selecta, £3. Bantex magnetic bases, £3. New 2102-2 ram chips, 20p ea. 74S262 char gens, £1.50. Various C mount tv lenses. G8AYN. Tel 04555 57790.

TS780 2m/70cm all modes, as new, £750 ono. FDK Quarty-16 fm mobile tx/rx, cw, two mobile mounts, xtals R0 to R7, S0, S12 to S23. KP202 2m handheld fm tx/rx, charger, case, helical antenna, xtals S20, S22, S0, R5, R6, R7. GM4BVU, QTHR. Tel 0698 423121.

High power 144MHz linear amp, using single 4CX250B tube, less psu, £125. G4WGS, QTHR via G6KGO. Tel 0925 574652.

Liner 2, exc cond, £55. 2m 250B linear, £60. Xtals for FT202, R4/2/6, offers, high power coaxial UR74, 80p per metre. G4MAP not QTHR. Tel 26-73988.

Exch YO901 for FL2100Z. *Wanted* Mini beam, must be gwc. G4NKO, QTHR. Tel 0481 61112, before 10 June.

Admiralty mains transformer 1240/1100V, secondary 250mA and 5VLT, weight 25lb, Bendix LM model hetrodyne frequency meter, type CRR74028, power unit type 254A, 19in panel mounting, 300V, 150mA, very heavy. All items £10 ea. G2AFB, QTHR. Tel 01-776 0676.

AR88LF, some spare valves, buyer collects, £40. PSU, o/p 450V and 350V, 6·3V, 4A, 3A, 1A, 5V, 3A, £10. Xtals 40meg/32V, £2.50. 72·506 wire ended, £2.50. 6022·575K/cs, £3. Postage extra. G4LEA, QTHR. Tel Bristol (0272) 772435.

Mast sections, galvanised, heavy duty, triangular, 12ft 6in long, 1ft 2·5in sides, with connecting angles and bolts, up to six available. Buyer collects. G6FXM, QTHR. Tel Chelmsford (0245) 353196.

WANTED

B2 or A Mk 3 would be interested in any of the suitcase or resistance sets, spares, manuals, in any cond. G4OFO. Tel 01 949 2317.

KW2000B, or Heathkit SB102, complete with psu and in gwo. GM4LBN, QTHR.

Books, on wireless telegraphy and telephony, pre 1939. Journals and mags dating from earliest days of wireless and radio broadcasting. G3PSY, QTHR. Tel 05806 4531 weekends.

3·5 cw xtals, prefer about five HC16U, also, three T50-2 Ferrite cores. G3ICB, QTHR. Tel 0635 64345.

Linear FL2100B, FL2100Z, Collins, W.H.Y. Must be first class cond, cash waiting, also HQ1 mini beam. G4ZOY not QTHR. Tel 0670 811950.

FRG 7, R600, R1000 or similar rx, gd cond. G6PAS, QTHR. Tel 01-422 2100.

IC451, Have Yaesu FT780R with Yaesu stn console, to sell or exch for IC451, with cash adjustment. Julian Tether, G6LCH, Highview, Culworth OX17 2AX. Tel 029576 8152.

Trio 700G or FT221R, cash waiting, also swr/power meter, for 2m and 70cm, valve TH316 plus base, any details of mods for IC402, cheap 23cm dish. Haydn Barker, G6XVV, QTHR. Tel Rotherham (0709) 813042.

FT225RD, BC342, BC348 and R1155, details for DST100, manual or copy, other types of ex-WD rx. Peter Quested, G6ZCV. 252 Bartons Hill Drive, Minster, Sheerness, Kent ME12 3LZ.

EHT transformer for Tektronix 515A oscilloscope. GM3ZMA. Tel 07716 301.

Connectors, WW2 plugs, etc, BC224, BC375 or BC191, have exchanges BC342, two WS38 Mk2, all canvas and accessories. *For sale* or exch, R1224A, TR1196 with transit case and control. BC433F with control. Parsonage, 52 Bramble Lane, Mansfield, Notts.

Icom IC120 23cm fm tx/rx, Fortop 23cm atv tx and rx, 23cm linear and antennas for 23cm, Handhelds for 2m and 70cm with nicads and charger. G6MSI, QTHR. Tel 0553 773065, 5.30pm–7.30pm.

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Yaesu FT101ZD or Trio TS530S and Trio 120V or 120S. G3XFB, QTHR. Tel 0902 850033.

Drake TR7 line up tx/rx, number to be in excess of 2500, must be unmarked, pristine cond. Stuart, G4OOK, QTHR. Tel 0642 211685.

Trio 130V in gwo. G4IMI, QTHR. Tel (Birmingham) 021 422 4217.

10m multimode mobile rig, or 11m cb box to convert. G4UYR, QTHR. Tel Framingham Earl 3200.

HQ1 or similar mini beam, also consider 2-ele tribander, if the price is right. Julian, G4VBO. Tel Somerset (0823) 85897 mornings/weekends.

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2C39A or equivalent valves, for linear amp project, ex-equipment items at reasonable cost preferred. Bill, G4ZDK. Tel 01-680 2674 evenings.

Ultra CUB IP4B7 PH walkie-talkie, buy or borrow circuit manual, Stolle rotator, type 20/0 automatic, Mutek board for FT225. Mike, G8EVG, QTHR. Tel 0602 820517.

Information, How to use VDU ITT model ITT110019 as BBC monitor b/rates parity, etc, also infor Redifon twinplex converter type AFS12 rtty. Expenses gladly refunded. Tel John, Orpington (Kent) 37955 evenings.

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DGI DIG readout for TS820 new or perfect cond. Stuart, GM4GUL, QTHR. Tel Aberdour (0383) 860435 evenings/weekends.

Service manual for a National video monitor, model WV411N/B, any reasonable price paid. Alan, GM4TXN, QTHR. Tel Kelso (0573) 23742 after 4pm.

Desperate of West Wickham requires info on wavemeter type W1191A, exam, Solartron CT316, Scope circa 1955, Heathkit valve voltmeter IM18U. G6XNC, QTHR. Tel 01-462 4461.

Amtor/rtty terminal unit for use with BBC microcomputer, must include software, to be used /MM in 1986. Has anyone a wkg kit or bright ideas? Lt J E Body, DA1BY/G6FPC. 16 Signal Regt, BFPO 35.

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Racal RA117 manual to buy or borrow, any cond. G4JXI, QTHR.

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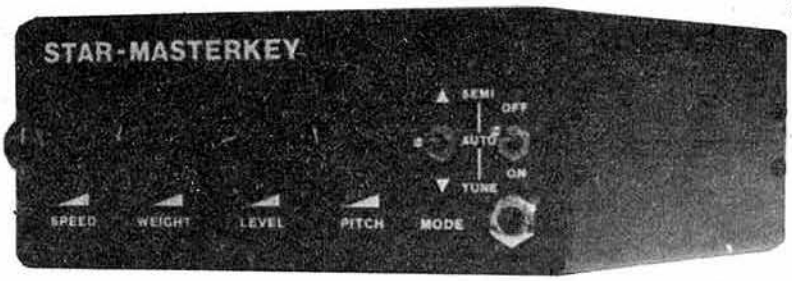

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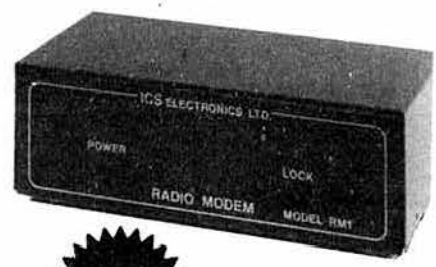

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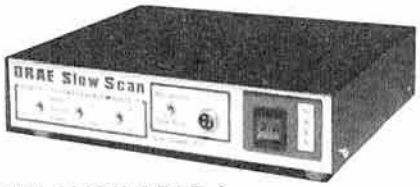

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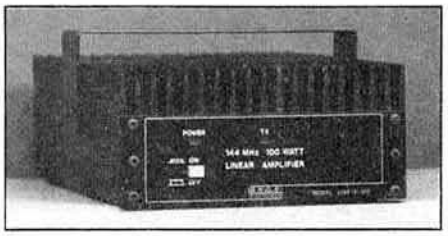

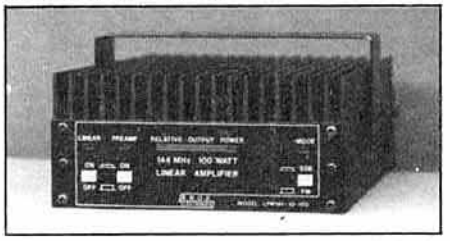

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SELF-CATERING CHALETS. Explore by day, DX by night. My aerials, your rig. £15-£120 per chalet per week. Green, G0ATS, 'Chylean' Tintagel, Cornwall PL34 0HH. Tel. (0840) 212262.

BOURNEMOUTH "DOLBADARN" PRIVATE HOTEL, 8 Grand Avenue, Southbourne BH6 3SU. Between sea and shops. Residential licence, room radio, call and teamaking facilities. Excellent food. Dinner, Bed and Breakfast from £11.00 daily. Bed and Breakfast from £7.50 daily. (0202) 424826. E. W. & J. W. Batten (G3BKN).

TEIGNMOUTH. ANDREA COURT HOTEL, Second Drive, Landscore Road, Teignmouth TQ14 9JS. Dinner, bed and breakfast from £55.00. Use shack. HF and VHF gear and antennas. Write or telephone for brochure and special discounts. (062 67) 2007. K & S Phillips G8IAW.

SHANKLIN, ISLE OF WIGHT. Small private hotel close all amenities. Superb food and accomodation. Most rooms en suite. Details with pleasure. Gill & Tony Perez (G4SVY), Kenbury Hotel, Clarence Road, Shanklin. (0983) 862085.

SEAFRONT WHITSTABLE KENT. Safe swimming, private seawall patio. High Street walking distance. Share G4LQI HF/VHF aerials. Pet, child OK. One unit suits couple, another sleeps 3. (0227) 266480. If no reply 01-852 3594.

HOLIDAY SRI LANKA? WHY NOT? Of our own tourists last year 16 were hams, 6 of them obtained licence and operated. Write to Mrs Antoinette Perera, Spangles, 84 Templer Road, Mount Lavinia plus £1 or 5 IRCs.

TORQUAY (0803) 607333. Self-contained holiday flats. Detached Victorian residence. Quiet surroundings. Only ten minutes walk Torre Abbey Sands. G4NOA, Linden House, Ruckamore Road, Chelston, Torquay.

W/DEVON-N/CORNWALL. IO70UQ, 600ft asl. Mobile Home, 6 berth. Mains electric, TV. Your licence, my rigs. £50.00 pw. G4WDI. Ashwater 219.

SOUTH NORWAY. New camp/caravan site with 4 huts. Next to beautiful lake. Very quiet, safe beach, fishing and canoe hire. Also HF antennas. LB4QB, Voje Camping, 3750 Drangedal, Telemark, Norway.

MISCELLANEOUS

COURSE FOR CITY & GUILDS, Radio Amateurs Examination. Pass this important examination and obtain your licence, with an RRC Home Study Course. For details of this and other courses (GCE, Career and professional examinations, etc) write or phone—THE RAPID RESULTS COLLEGE, Dept JT5, Tuition House, London SW19 4DS. Tel: 01-947 7272 (9am-5pm) or use our 24hr Recordacall service 01-946 1102 quoting JT5.

GB NEWS 1985—packed with information for your Continental Holiday, 2 x 13p stamps. GB Car Club, FREEPOST 1, Romsey, Hants SO5 8ZT.

HEATHKIT. UK SPARES & SERVICE centre. Cedar Electronics, Unit 12, Station Drive, Bredon, Tewkesbury, Gloucestershire. Telephone (0684) 73127.

PATENTS, TRADE MARKS and DESIGN—Booklets on request, Kings Patent Agency Ltd, Established 1886 (B. T. King MIMech, E. J. B. King, regd. Patents Agents)—146a Queen Victoria Street, London EC4V 5AT. Tel 01-246 6161. Telex 883805.

AMATEUR RADIO INSURANCE SCHEME

"ALL RISKS" INSURANCE for portable/mobile/base station amateur radio and ancillary equipment. A service for RSGB members only. Also public liability and equipment insurance for affiliated clubs and societies. Details and leaflets from Nick Gibson, Amateur Radio Insurance Services Ltd, 19 Quarry Street, Guildford, Surrey. Tel: 0483 33771.

SITUATIONS VACANT

SERVICE TECHNICIANS REQUIRED

Due to further expansion within our Service Department as a result of the introduction of cellular radio we require two additional Service Engineers to work on PMR and cellular requipment. Experience is considered more important than formal qualifications. Consideration may be given to keen radio amateurs without PMR experience.

London Car Telephones, Croydon 01-680 4444

RSGB MAIL-ORDER PRICE LIST

RSGB books

	Non-members' price	Members' price
A Guide to Amateur Radio (19th edn)	£3.91	£3.52
Amateur Radio Awards (2nd edn)	£3.68	£3.31
Amateur Radio Operating Manual (3rd edn)	£6.15	£5.54
Amateur Radio Software	£6.73	£7.48
HF Antennas for All Locations	£7.35	£6.62
How to Pass the Radio Amateurs' Examination	£3.42	£3.08
Microwave Newsletter Technical Collection	£6.83	£6.15
Morse Code for Radio Amateurs	£1.64	£1.48
RSGB Amateur Radio Call Book (1985 edn)	£6.92	£6.23
Radio Amateurs' Examination Manual (10th edn)	£3.84	£3.46
Radio Communication Handbook (5th edn) Vol 2	£8.46	£7.61
Radio Communication Handbook (Vols 1 and 2 combined, paperback)	£11.79	£10.61
Raynet Manual (1984 edn)	£2.78	£2.50
Teleprinter Handbook (2nd edn)	£12.72	£11.45
Television Interference Manual (2nd edn)	£2.31	£2.08
Test Equipment for the Radio Amateur	£6.41	£5.77
VHF/UHF Manual (4th edn)	£10.58	£9.52
World at Their Fingertips (paperback)	£7.75	£6.98

RSGB logbooks

Amateur Radio Logbook	£2.77	£2.49
Mobile Logbook	£1.23	£1.11
Receiving Station Logbook	£2.87	£2.58

RSGB maps, charts and lists

HF Awards List and Countries List	48p	43p
Great Circle DX Map (wall)	£2.43	£2.19
IARU Region 1 Beacon List	40p	36p
Locator Map of Europe (wall)	£1.95	£1.76
Locator Map of Europe (card for desk)	70p	63p
UK Beacon List	40p	36p
UK Repeater List and maps	50p	45p
Western Europe (new) Locator Map (wall)	£3.06	£2.75
World Prefix Map in full colour (wall)	£2.53	£2.28
Meteor Scatter Data	£3.51	£3.16

RSGB members' sundries (members only)

Radio Communication Easibinder	—	£6.71
RSGB badge car sticker	—	49p
RSGB belt (real leather)	—	£7.57
RSGB coffee mugs (sold in pairs) price for two	—	£3.67
RSGB hf contest log sheets (100)	—	£3.13
RSGB vhf contest log sheets (100)	—	£3.13
RSGB tie (coffee, maroon, green or blue)	—	£3.18
RSGB callsign cap	—	£4.98
RSGB logo rubber stamp	—	£3.16
RSGB station callsign plaque*	—	£9.50
RSGB teeshirts (med, large, exl)	—	£4.90
Standard callsign lapel badge*	—	£1.96
De-luxe callsign lapel badge*	—	£2.80
Lapel badge (RSGB emblem, pin fitting)	—	59p
Mini lapel badge (RSGB emblem, pin fitting)	—	68p
Members' headed notepaper (50 sheets) quarto	—	£1.20
Members' headed notepaper (50 sheets) octavo	—	75p

**Delivery approximately five weeks*

Miscellaneous

"Amateur radio" (two colours) car sticker	73p	66p
DX Edge (HF propagation prediction aid)	£14.09	£12.68
"I'm on the air with amateur radio" (four colours) car sticker	84p	76p
"I'm monitoring ·5 are you?" (two colours) car sticker	73p	66p
QSL card holders	£1.23	£1.11
Radio Communication back issues *(As available)*	£1.32	£1.19
Radio Communication bound volume, 1982	£15.93	£14.34
Radio Communication bound volume, 1983	£16.90	£15.21
Radio Communication bound volume, 1984	£16.90	£15.21
Smith charts, pad of 25 (Chartwell D7510)	£2.23	£2.01

Other publications

	Non-members' price	Members' price
Active-filter Cookbook (Sams)	£12.71	£11.44
All About Cubical Quad Antennas (RPI)	£5.83	£5.25
Amateur Single Sideband (Ham Radio)	£5.46	£4.91
Amateur Television Handbook (revised) (BATC)	£2.94	£2.65
Amateur Television Handbook Vol 2 (BATC)	£2.77	£2.49
Antenna Anthology (ARRL)	£6.00	£5.40
ARRL Electronics Data Book (ARRL)	£4.47	£4.02
AX25 Amateur Pocket Radio Link-layer Protocol (ARRL)	£4.44	£4.00
Beam Antenna Handbook (RPI)	£6.83	£6.15
Better Short Wave Reception (RPI)	£6.83	£6.15
Care and Feeding of Power Grid Tubes (Varian)	£6.99	£6.29
CMOS Cookbook (Sams)	£13.07	£11.76
Complete DX'er (W9KNI)	£7.77	£6.99
Complete Shortwave Listener's Handbook (Tab)	£12.21	£10.99
Design of VMOS Circuits with experiments (Sams)	£8.50	£7.65
FET Principles, Experiments and Projects (Sams)	£8.04	£7.24
FM and Repeaters for the Radio Amateur (ARRL)	£4.30	£3.87
G-QRP Club Circuit Book	£4.52	£4.07
Guide to Oscar Operation (AMSAT)	£1.78	£1.60
Hints and Kinks for the Radio Amateur (ARRL)	£4.47	£4.02
How to Troubleshoot and Repair AR Equipment	£10.47	£9.42
IC Op-amp Cookbook (Sams)	£11.76	£10.58
International VHF FM Guide	£2.45	£2.21
Newcomer's Guide to Simplex and Repeaters on 2m (UK FM Group)	£1.24	£1.12
**Power Supply Handbook* (Tab)	£10.99	£9.89
Radio Amateurs Antenna Handbook (RPI)	£7.88	£7.08
Radio Amateurs Callbook (1985) (DX listings) (ARC1)	£18.35	£16.52
Radio Amateur Callbook (1985 USA listings) (ARCI)	£18.87	£16.98
Radio Amateurs Handbook (1984) (ARRL)	£6.66	£5.99
Radio Amateurs Handbook (1985) (Softback) (ARRL)	£15.80	£14.22
Radio Amateurs Handbook (1985) (Hardback) (ARRL)	£21.90	£19.71
RTTY Today (UEI) (A modern guide to rtty)	£7.19	£6.47
Radio Frequency Interference (ARRL)	£4.18	£3.76
Satellite Experimenters Handbook (ARRL)	£10.11	£9.10
Satellite Tracking Software for the Radio Amateur (AMSAT-UK)	£4.47	£4.02
**Secrets of Ham Radio DXing* (Tab)	£7.92	£7.13
Semiconductor Data Book (Newnes)	£7.97	£7.17
**Shortwave Listeners' Antenna Handbook*	£10.10	£9.09
Shortwave Propagation Handbook (Cowan)	£7.79	£7.01
Simple Low-cost Wire Antennas (RPI)	£6.83	£6.15
Solid State Design for the Radio Amateur (ARRL)	£7.87	£7.08
Television for Amateurs (BATC)	£2.23	£2.01
Towers International Transistor Selector	£13.95	£12.56
Towers International MOS Power & FET Selector	£10.95	£9.86
Towers Op-Amp Selector	£9.50	£8.55
**UHF-Compendium Parts 1 and 2*	£14.93	£13.44
Understanding Amateur Radio (ARRL)	£4.73	£4.26
Understanding the Oscilloscope	£10.10	£9.09
VHF Propagation Handbook (Nampa)	£3.75	£3.38
Weekend Projects for the Radio Amateur (ARRL)	£4.95	£4.46
World Atlas (RACI)	£3.35	£3.02
World Radio TV Handbook 1985	£19.81	£17.83
**99 Test Equipment Projects You Can Build*	£8.00	£7.20

***Items marked with an asterisk may not be available immediately. Please telephone before ordering to confirm availability.**

RSGB kits

Morseman (*Rad Com* December 1984)		
Kit 1	£12.78	£11.50
Kit 2	£19.52	£17.57
Kit 3	£36.11	£32.50
CMOS Z80 ic	£8.17	£7.35

MORSE INSTRUCTION AID

RSGB morse course Stage 1 (to 5wpm)	£4.54	£4.09

MAGAZINE SUBSCRIPTIONS

QST (including ARRL membership). One year	£31.53	£28.38
Two years	£60.00	£54.00
Three years	£89.74	£80.77
By air via KLM (to W Europe only) one year	£44.81	£40.33
Ham Radio Magazine (per annum) (incl air delivery)	£25.35	£22.81

NEWSLETTER SUBSCRIPTIONS

Microwave Newsletter, VHF Newsletter, DX Newsletter. For details contact the membership services department at RSGB headquarters.

ORDERING INFORMATION

NON-MEMBERS. Use left-hand price columns. Note that members' sundries are only available to members of RSGB.

MEMBERS. Use right-hand price columns. It is essential that you quote your call sign or BRS number so that you can be recognised as a member.

PRICES. These include postage, packing and VAT where applicable. For airmail despatch, please ask for price before ordering. Goods are obtainable, less p & p, at RSGB headquarters between 10am and 4pm, Monday to Friday.

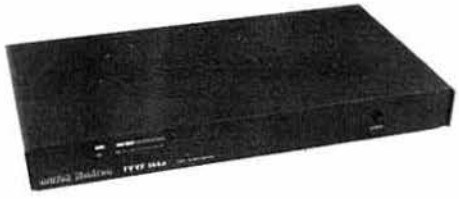
POSTAL TERMS. Cash with order. **Stamps and book tokens cannot be accepted.** Cheques and postal orders should be crossed and made payable to "Radio Society of Great Britain". Our Giro account number is 5335256. Please write your name and address clearly on the order, and allow up to 28 days for delivery.

ORDER FROM: RSGB Publications (Sales), Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JW

(Raynet supplies should be obtained from Mrs J. Balestrini, Merrivale, Willow Walk, Culverstone, Gravesend, Kent)

No gimmicks . . . no frills . . . — JUST PERFORMANCE!

The New muTek TVVF 144a 28Mhz to 144MHz transverter



Anyone who has taken more than a passing interest in the way that Amateur Radio equipment has changed in the past few years, would surely agree that many so-called advances in design have largely been involved in saturating the front panel with as many controls and displays as possible, whilst often ignoring serious engineering deficiences. As experienced operators know, no number of gimmicks will help in working a distant station which is weak or swamped by receiver distortion products—or both! The demands upon receiver performance, in particular on today's crowded 2m band, are severe. It's not just a matter of sensitivity. Low noise figures are nowadays easy to achieve, but the combination of low noise figure with excellent strong signal performance achieved by the TVVF 144a has only been realised as a result of our unique experience in the design and manufacture of very high performance replacement front-ends. The innovative receive signal path circuitry of the TVVF 144a is a result of careful system analysis combined with a great deal of patient development work over several years.

The TVVF 144a won't boil a kettle and take a dog for a walk whilst you're trying to work the dx. If you have a good hf transceiver the TVVF 144a will enable you to hear the weak dx amongst strong locals. In fact, the potential system performance available with a really high performance hf rig is such that we'd not be surprised to see the top vhf dxer's and contest groups pensioning-off their (muTeked!) vhf transceivers and investing in a TVVF 144a. . . .

For the technically minded . . .

On receive, a balanced mosfet pair rf stage is used for its impressive large signal performance when compared with single device stages. This feeds a very carefully terminated HLRM 200g high-level double-balanced mixer which is followed by an IF amplifier consisting of a pair of rf power transistors combined between 90 degree hybrids. The result is a typical 2.2dB noise figure (ensuring that external noise limits system sensitivity with all but the longest of feeder runs), a remarkable +3dBm third order INPUT intercept (and we measure each one to make sure it is!), and a conversion gain adjustable up to about 20dB.

On transmit, the 0.1 to 300mW permissible drive level is filtered, and mixed with the buffered output of a low-noise J-fet local oscillator. After further extensive filtering the 144MHz band signal is finally amplified to provide 10W pep output. A seven element low-pass filter is built-in, which should please your local 70cm users, not to mention the RIS! We have taken a great deal of trouble to ensure that the transmit performance of the TVVF 144a lives-up to its receiver. In this context, it's worth noting that the transverter is quite capable of running up to 25W pep output, but those with access to a good spectrum analyser will quickly realise why we have chosen not to follow the current 25W craze when they compare OUR transmitter intermodulation levels with those of the competition!

muTek originated the idea of employing an alc loop in transverters—we've been intrigued to see our competitors rush to copy the idea. In our 28MHz if transverters, we go one step further. An output is available from the transverter to feed a conventional, negative-going alc signal back to the hf transceiver. This will prevent distortion due to transceiver overdrive, an often unrecognised cause of poor signals from transceiver/transverter combinations.

Interfacing to the HF transceiver is made as straightforward as possible, given the multitude of transverter interface facilities provided by various rig manufacturers. The transverter provides and accepts various forms of switching control, including rf switching.

The rf interface may be accomplished by either a single transmit-receive cable, or by means of separate transmit and receive lines, ensuring full compatibility with the vast majority of modern (and not so modern) HF transceivers.

The TVVF is housed in the same attractive low-profile enclosure as the rest of our transverter family, measuring approximately 315 × 165 × 35mm, and comes with all necessary connectors.

The range

		£
TVHF 230c	Very high performance 2m to 9 hf bands transverter	334.90
TVVF 50a	Very high performance 10m to 6m transverter	239.90
TVVF 50c	Very high performance (again!) 2m to 6m transverter	199.90
TVVF 144a	Ultra-high performance 10m to 2m transverter	239.90
SLNA 144s	2m low-noise rf-switched preamplifier 0·9dB typical noise figure	39.95
SLNA 144u	Unswitched version of the SLNA 144s	22.40
SLNA 144ub	Unboxed version of the SLNA 144u	13.70
SLNA 145sb	Transceiver optimised preamplifier for the FT 290	29.90
SBLA 144e	Masthead-mounting 2m low-noise high dynamic range preamplifier. 250W through-power	89.90
GFBA 144e	Ultra-high performance masthead-mounting GaAsFet 2m preamplifier using advanced noiseless negative feedback for low noise figure and superb dynamic performance. 1000W pep (ssb) through-power. Supplied with ATCS 500 sequencer-controller	149.90
GLNA 432e	Masthead-mounting 430-440MHz high performance GaAsFet preamplifier. 0·9dB typical noise figure, 250W through-power. Supplied with ATCS 500 sequencer-controller	149.90
GLNA 433e	Masthead-mounting 430-440MHz high performance GaAsFet preamplifier. 1dB typical noise figure. Rf switching, 50W through-power	79.90
TLNA 432u	Unswitched bipolar 430-440MHz preamplifier. 1·5dB typical noise figure	29.90
TLNA 432ub	Unboxed version of the TLNA 432u	22.40

		£
BLNA 432ub	Sub-miniature 430-440MHz preamplifier. 1·3dB typical noise figure. Requires external filtering.	13.70
BBBA 500u	20-500MHz high dynamic range broadband preamplifier. Ideal for scanners	34.90
RPCB 144ub	Complete replacement front-end for the FT221 and FT225	79.90
RPCB 251ub	Complete replacement front-end for the IC211 and IC251	84.90
RPCB 271ub	Complete replacement front-end for the IC271 (e and h)	89.90
GDIF 107ub	Gunn diode WBFM back-end processing board	49.65
LBPF 144u	Low-loss 144-148MHz two-pole bandpass filter. 0·3dB typical insertion loss, 120W power handling	22.40
LBPF 432u	Low-loss 430-440MHz two-pole bandpass filter. 0·3dB typical insertion loss, 100W power handling	22.40
XBPF 700ub	Microstripline bandpass tvi filter	2.95
ATCS 500	Sequencer-controller	33.90
VFAT 206	25W 6dB attenuator suitable for use with the TVHF 230c	19.65

Carriage/postage rates

GFBA 144e, SBLA 144e, GLNA 432e, GLNA 433e	2.50
TVHF 230c, TVVF 50a, TVVF 50c	5.00
All other products above	1.50

ALL PRICES INCLUDE 15% VAT E. & O.E.

muTek limited —the rf technology company

Dept. RC, Bradworthy, Holsworthy, Devon EX22 7TU (0409 24) 543)

Access

BARCLAYCARD VISA

YAESU

GENERAL COVERAGE RECEIVER

AUTHORISED YAESU

FRG-8800

General Coverage
Continuous coverage from 150KHz to 30MHz. Two speed spin tuned VFO plus keyboard plus computer interface control.

All Mode
The FRG-8800 demodulates SSB (USB & LSB) CW, AM (Wide and Narrow) and FM narrow as standard. This, complemented by an all mode squelch, produces the most practical receiver available. The FM narrow is useful for 10M, CB and for VHF with the optional VHF convertor.

Memory
The FRG-8800 comes fully equipped with twelve memories programmed and scanned at the touch of a single button. Any of the memory channels will accept a frequency within the whole range of the receiver including the VHF range (with the optional VHF unit). The mode is also stored in the memory eliminating the need for inconvenient manual mode change, when hopping from one memory to the next.

Selectivity & Sensitivity
Four filters are fitted as standard (SSB/CW, AM, AM-NAR and FM-NAR) with bandwidths chosen for optimum performance, these combined with switchable AGC and variable tone control provides maximum enjoyment despite todays crowded bands.

High input sensitivities are obtained by the latest in RF stages, making the most of inefficient aerials and difficult locations, and a continuously variable RF attenuator control overcomes problems encountered with very powerful stations.

LCD Display
The back-lit green LCD display incorporates easy to read "any angle" 10mm digits.

A twelve function display indicates the transceiver's status at a glance. It includes memory channel number, mode, and frequency to a resolution of 100Hz. Also included is a two dimensional LCD, graphical SIMPO and 'S' meter, which is conventionally calibrated at 1-5 and 0-9, +20dB, +40dB, +60dB respectively.

Keyboard
A 12 button keyboard is fitted as standard allowing quick accurate changes of frequency and band, (MHz and KHz programmed individually). The keyboard also has nine control buttons to allow rapid changes from memory to VFO, memory to memory and VFO to memory. Memory channels can also be recalled at the turn of a knob, ideal for storing calling/working channels or broadcast reception.

The keyboard is complemented by a opto-coupled two speed, VFO drive fast for rapid tuning of a band or slow for accurately tuning in a signal. In addition a fine tune control compensates for drift in the received signal.

Clock/time
Dual accurate 12 hour clocks, with AM/PM indicators are ideal for log keeping (GMT/Local). The clock uses the main digital display and features full back-up facilities in the event of a mains failure or disconnection. The timer can activate the receiver or tape recorder via the relay contacts provided. A snooze facility allows up to 59 minutes of listening.

VHF Convertor (optional)
The FRV-8800, extends coverage to include 118-174MHz all within the main frame, thereby allowing monitoring of, PMR, marine and air bands, as well as 2M.

The FRG-8800 is operated as before via the keyboard or VFO, and the memory still holds any frequency and mode. The *actual* VHF frequency is displayed on the main LCD to a resolution of 100Hz.

Worldwide
At 6·1Kg (excluding convertor) the FRG-8800 is ideal for taking on any trip. The power supply is easily adjustable from 240-220VAC to 110-120V, 50/60Hz mains and 12VDC operation is optional.

SPECIFICATION

Frequency coverage:
150KHz-29·999MHz
118MHz-173·999MHz*

Frequency resolution:
100Hz (Digital Readout)

Frequency stability:
< ±300Hz in 30 mins after 1 min on
< 50Hz in 30 mins after warm up

Modes of reception:
AM, CW, NBFM SSB (LSB/USB) A3E, A1A, G3E, J3E

Selectivity
SSB/CW (J3E/A1A):
2·7KHz @ −6dB, 8·0KHz @ −50dB
FM(G3E) narrow:
12·5KHz @ −6dB, 30KHz @ −40dB
AM (A3EH3E) (standard/narrow):
6·0KHz @ −6dB, 15KHz @ −50dB
2·7KHz @ −6dB, 8KHz @ −50dB

Sensitivity:
SSB/CW (J3E/A1A) @ 10dB S+N/N:
< 0·4μV into 50 ohms, 1·50-30MHz
< 3·0μV into 500 ohms, 0·15-1·6MHz
< 1·0μV into 50 ohms, 118-174MHz*
FM (G3E) @ 20dB S+N/N:
< 1·0μV into 50 ohms, 1·60-30MHz
< 2·0μV into 50 ohms, 118-174MHz*
AM (A3E) @ 10dB S+N/N:
< 4·0μV into 50 ohms 1·60-30MHz
< 3·0μV into 500 ohms, 0·15-1·6MHz
< 10μV into 50 ohms 118-174MHz*

Squelch sensitivity:
SSB/CW (J3E/A1A):
< 2μV, 1·60-30·0MHz
< 4μV, 118-174MHz*
FM(G3E):
< 0·5μV, 1·6-30·0MHz
< 1·0μV, 118-174MHz*
AM (A3E):
< 2μV, 1·60-30·0MHz
< 4μV, 118-174MHz*

Audio output:
1·4W in 8 ohms internal @ 10% T.H.D.
4-16 ohms external speaker/phones
Constant level line output (recorder)

Power requirements:
100/120 220/240V @ 50/60Hz
35VA Rx, 5VA standby
12VDC (nominal)*
1A Rx, 0·020A standby

Dimensions (Ex/Inc projections)
335/350 W, 120/130 H, 235/270 D, mm
Weight 6.1/6.3 Kg (w/o, c/w VHF unit)

*OPTIONAL UNIT

SMC

South Midlands Comms Ltd
Rumbridge Street
Totton
Hants SO4 4DP

YAESU MUSENS ONLY AUTHORISED DISTRIBUTORS

AMATEUR ELECTRONICS AE LIMITED
510-512 Alum Rock Road
Alum Rock
Birmingham B8 3HX

AE

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