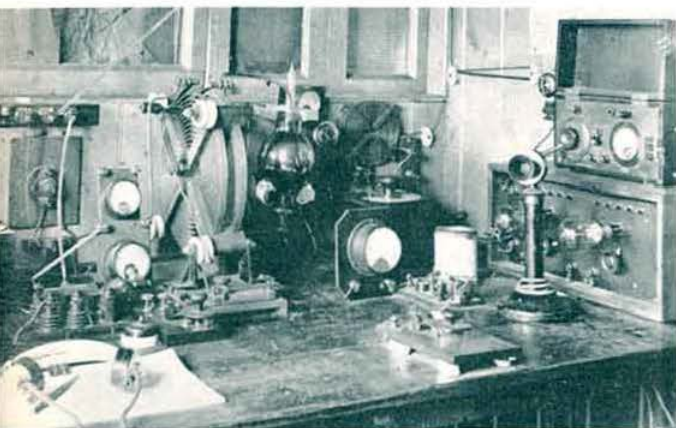


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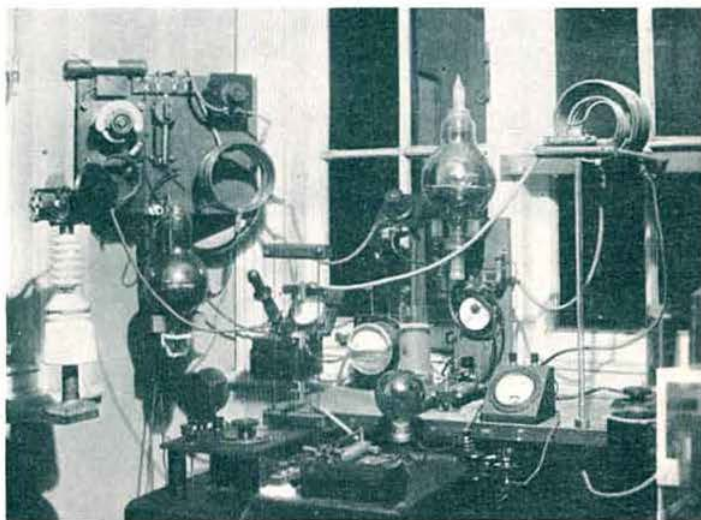
The 1920s – RSGB's second decade Trans-Atlantic and Trans-World pioneers



For the 1922 Transatlantic Tests the RSGB built a special station having a power of 1kW which operated under the callsign 5WS. This was the first UK amateur station heard in the USA.

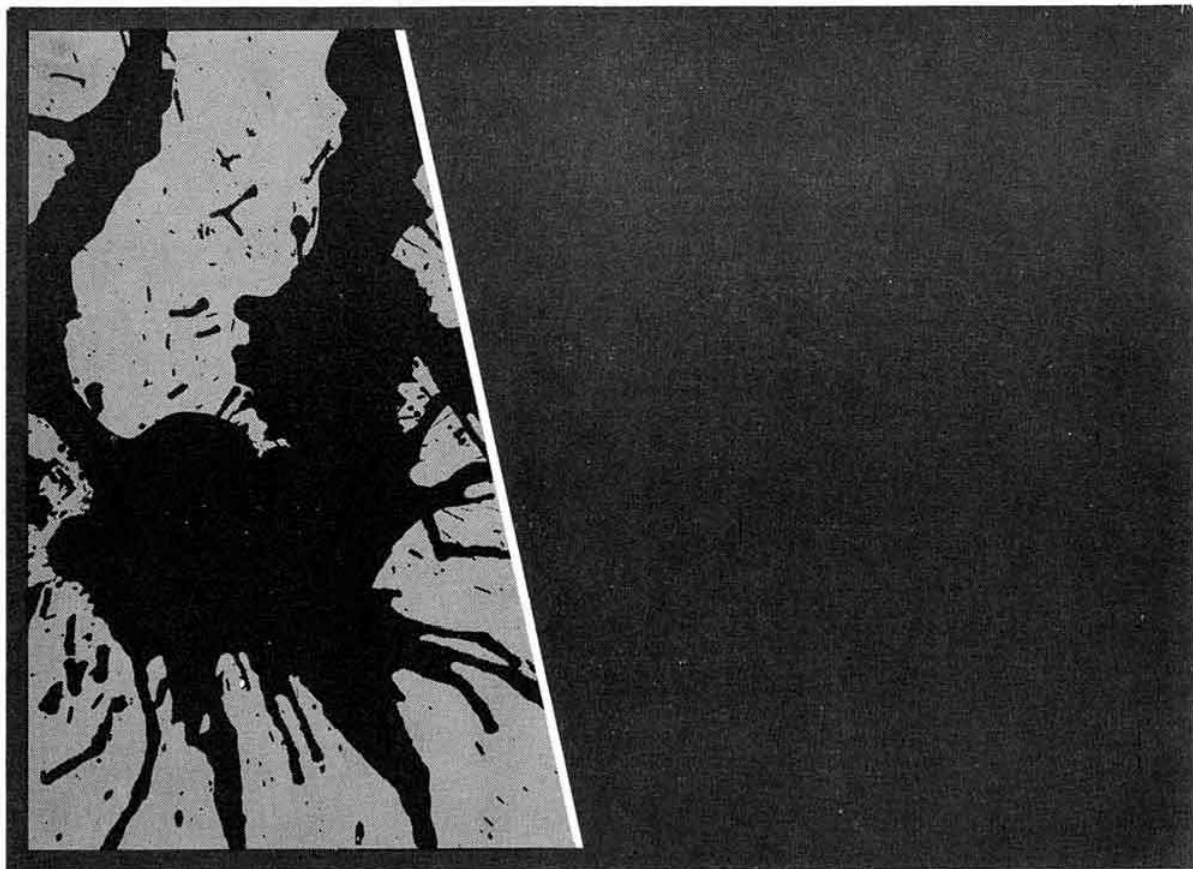
Jack Partridge, 2KF, made the first UK-USA two-way contact on short waves on 8 December 1923 with the equipment shown on left.

Ernest Simmonds, G2OD, effected the first daylight two-way telegraphy contact on 23m between the UK and Australia (A2CM) on 4 May 1925 using the master oscillator and power amplifier shown on right. The same equipment was also used to transmit telephony for the first time to Australia on 10 March 1926, A2CM replying on 44m.



1913 – 1973

Journal of the Radio Society of Great Britain



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Volume 49 No 3

Price 30p

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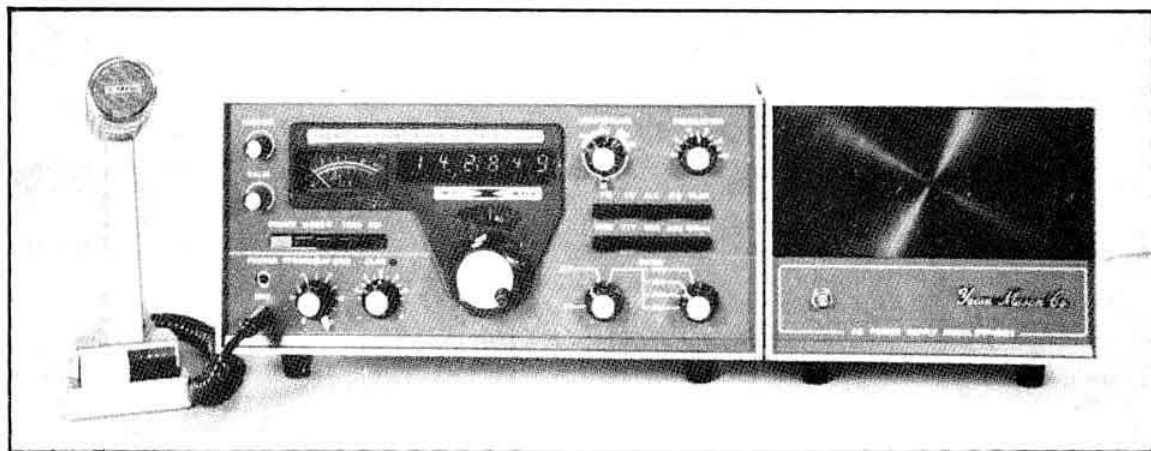
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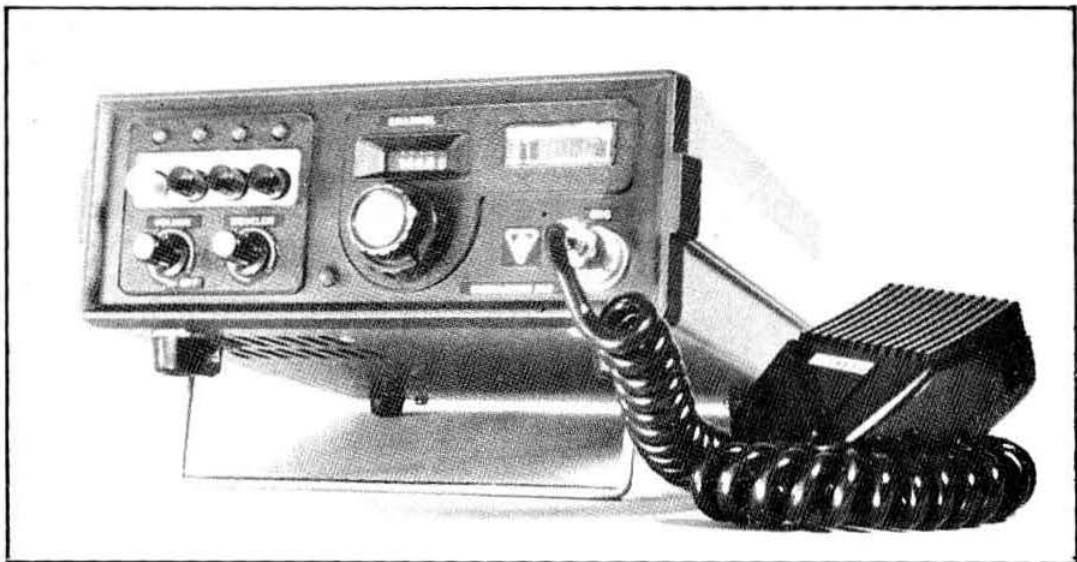
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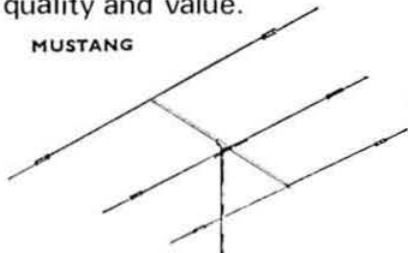
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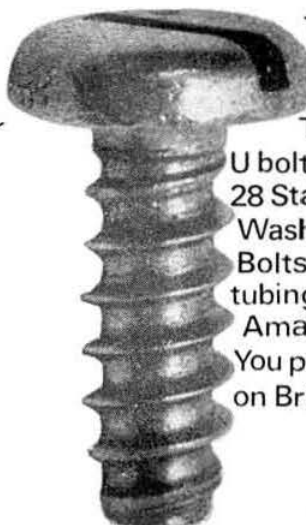
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2189 2194 2802 2805 2854 2905 2940 2945 2948 2951 2954 2957 2985 3023 3404 3411 3432 3467 3481 3495 4222 4404 4432 4467 4481
4654 4952 5506 5521 5524 5551 5589 5604 5611 5619 5649 5654 6480 6551 6552 6567 6589 6604 6611 6649 6657 6667 6677 6686 7171
7552 7567 7664 7685 8820 8837 8845 8854 8862 8871 8930 8953 8956 8978 9096 9266 9412 9413 9453 9461 9519 9558 9781 9815 9837
9845 9871 10437 12900kHz. Less 25% 10 or more. .. £1 each

CRYSTAL CONTROL UNITS with 34 x tals 13-54 to 19-87MHz 3 valves EF91 size 4 x 4 x 6" with circuit .. £4

CRYSTALS TYPE HC 6U £1 each

3232 3319 3333 3354 3375 3389 3403 3410 3431 3445 3452 3459 3466 3473 3876 3883 3697 3904 3911 3918 3925 3932 3939 3948 4320
4674 4688 4709 4730 4744 4751 4758 4765 4786 4800 4807 4814 4821 4822 4843 5092 5119 5133 5140 5147 5154 5161 5224 5231 5238
5252 5259 5266 5273 5280 5287 5294 5301 5320 5324 5328 5332 5337 5341 5345 5349 5354 5362 5366 5375 6379 5383 5388 5465 5910
5920 5934 5952 5956 5964 5971 5986 6084 6091 6106 6136 6488 6495 6502 6509 6516 6559 6607 6820 7311 7319 7326 7329 7341 7356
7364 7371 7379 7386 7394 7401 7409 7424 7431 7439 7446 7461 7491 7500 7542 7547 7552 7557 7562 7567 7572 7577 7582 7587 8349
8357 8360 8387 8402 8409 8410 8417 8432 8447 8454 8484 9285 9293 9302 9310 9319 9327 9356 9344 9353 9370 9376 9395 9404 9412
9421 9863 9868 9873 9883 9893 10465 10486 10513 11859 13729 13739 13749 13769 13779 13789 13799 13809 13819 15465 18431kHz.
1820 1930 3766 3795 4002 6001 6054 6076 7002 7005 7017 7032 7047 7054 7077 7092 7099 7129 8081 (WAB) 11750 12000 14000 14250
31200 31225 31250 31275 31300 31325 31350 31375 31400 31425 31450 31475 31500 31525 31550 31575 31600 31625 31650 31675kHz.
£1 each. 25% qty discount 10 or more.

MARCONI TX UNIT 100 watt output, 2-24MHz. 6A05 driver, 829B buffer 2 x 829 BPA, tuning 23 turn 2 inch dia. roller coil, 2 gang capacitor, coil and capacitor turret. Size 8 x 10 x 16. weight 26lb. WITH CIRCUIT .. £8

MARCONI ATU UNITS. Roller coils 30 turns, 3 inch dia, 20 turns, 2" inch dia., capacitor turret RF voltage and current sensing elements, Size 6 1/2 x 11 x 16, weight 27lb. WITH CIRCUIT .. £6

MARCONI MODULATORS. 90 watt output, transformer to match 2,000 ohms and screen winding speech clipper audio AGC, switched metering for: PA grid, Buffer grid, PA anode, Mod anodes and screens, 500 and 1,000 volts HT. Valves 12AX7, 12AT7, 6AL5, 6AU6, 12AX7, push pull pair 829Bs, 6A05, 6AU6, OA2 etc. HT required, 600 volts, 275 volts DC, 250 volts AC, room for PSU inside case, Size 8 x 12 x 16. WITH CIRCUIT. Weight 32lbs .. £10

MARCONI 7092 RX 150kHz-2MHz in 4 bands, 5-15kHz, 400Hz selectivity, 10µV sensitivity, 450mW output, RF stage, 2 IF 110kHz, crystal filter, needs 250V HT, 24 Volt, BFO, IF & AF gain control, size 8 x 5 x 12, circuit .. £10

PYE RANGER 2107, 5 watt output, ready modified for 2m or 4m, AM, 12 volt + or — earth, boot mounting with cables, control unit, mic and crystals for one channel (our choice). .. £29

PYE RANGER 15 2022 ready modified for 2m or 4m, AM, 12 volt + or — earth, boot mounting with cables, control unit, mic and crystals for one channel (our choice). Carr. £1.50 .. £30

100W MODULATORS PP Parallel min 807's 5 x 5 x 9. Circuit. .. £10

CRYSTALS type B7G, Q10, 4039, 10X etc. £1 each 25% disc, 10 or more.

6106 6140 6175 6433 6561 6605 6650 6616 6675 6856 7140 7380 7575
7588 9166 9191 9600 10634 10857 11418 12183 12350 13175 13266 13300
14750 14975 15060 15340 15380

7783 7800 7816 7833 7850

15012 15037 13062 15087 15112 15137 15162 15187 15212 15237 15262 15287 15337

15362 15437 15462 15475 15487 15512 15537 15562 15587 15612 15637 15687 15712

15737 15837 15887 15912 15937 15962 16087

2638 2854 2868 2875 2876 2889 2910 2931 2938 2945 2952 2954 2966 2980 2987 3008

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3460 3467 3481 3495 3800 3805 3950 3985 3993 3995 3997 4031 4195 4220 4516 4570

4575 4595 4654 4668 4675 4689 4703 4745 4781 4808 5010 5060 5105 5420 5480 5491

5499 5506 5514 5521 5548 5551 5566 5581 5584 5589 5604 5611 5619 5621 5625 5626

5630 5641 5642 5644 5649 5650 5659 5671 5680 5687 5690 5691 5692 5695 5697 5701

5710 5711 5714 5730 6210 6270 6337 6440 6500 6510 6537 6540 6552 6557 6563 6567

6577 6580 6582 6590 6597 6612 6627 6634 6637 6640 6642 6647 6649 6650 6652 6657

6659 6662 6667 6672 6677 6679 6720 6753 6810 7585 7770 7992 8160 8280 8364

8515 8545 8920 8837 8839 8841 8845 8854 8862 8864 8871 8879 8885 8888 8896 8913

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THE LAST CHANCE BEFORE VAT!

When this appears in print there will be approximately one month remaining before ALL Amateur equipment and accessories go up in price by perhaps 10%. What is not generally realised is that second-hand gear will also be affected so that this is the last time that our advertisement will show tax-free prices and, consequently, this is your very last opportunity to beat VAT. On the face of it, it seems only fair that Amateur gear should be taxed in line with everything else but it is conveniently overlooked that Amateur equipment is far too expensive in any event due, of course, to the relatively tiny market which does not permit mass production in the TV/BC Radio sense. Anyway the die is cast so presumably we must grin and bear it.

At the time of going to press we have a good variety of used equipment with other items en route, plus the full range of **TRIO**, **SOMMERKAMP/YAESU** and **K.W. EQUIPMENT**, together with an excellent range of Aerials, Rotators and accessories of every description.

IF YOU WOULD LIKE FULL ILLUSTRATED DETAILS OF ANYTHING BY THE ABOVE MANUFACTURERS LET US HAVE A REASONABLY LARGE STAMPED ADDRESSED ENVELOPE:

CREDIT TERMS: These are available on anything over £25 (10% deposit) and provided that you are able to give satisfactory proof of identity we are able to arrange an on-the-spot transaction which means you may have immediate possession of the goods without prior arrangement.

PART EXCHANGES: Thanks to our high turn-over in used equipment we welcome these and equally we buy outright for cash. If you have surplus or redundant gear please drop us a line stating condition etc. and price required.

YAESU FTDX-560 TRANSCEIVER. Absolutely mint condition ..	£160.00
SOMMERKAMP FTDX-150 TRANSCEIVER. Excellent ..	£145.00
COLLINS 75-A2 RECEIVER. Typically Collins in performance ..	£82.50
HAMMARLUND HQ145 RECEIVER. Double conv. General coverage ..	£67.50
HAMMARLUND HQ180AX RECEIVER. A superb general coverage set ..	£145.00
KW201 RECEIVER. Excellent condition and performance ..	£81.50
KW VESPA Mk 1 TRANSMITTER with excellent HB PSU ..	£81.50
SWAN 260 TRANSMITTER. Absolutely new throughout ..	£150.00
KW1000 LINEAR. Another excellent little-used item ..	£105.00
TRIO JR-310 RECEIVER. As new with full guarantee ..	£66.50
TRIO 9R59-DE RECEIVER. Excellent clean condition ..	£36.50
TRIO 9R59-DS RECEIVER. Indistinguishable from new ..	£41.50
TRIO JR-310 RECEIVER. An excellent buy at ..	£60.00
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PLEASE NOTE! Our used equipment stocks are continually changing, an S.A.E. will bring you our latest list.

NEW! We are pleased to announce a Home Demonstration Service for the serious enquirer on all items of **NEW** communications equipment advertised. For Southern customers this is available by arrangement with our Southern Representative Jeff Harris, G3LWM, Cricketfield Lane, Bishop's Stortford, Tel: 0279-56347. At the same time it will be of interest to Northern customers to hear of the appointment of John Rowley, G3KAE, as our Northern Representative. John is located at Castle Rise, West Ayton, Scarborough, Yorks., Tel: West Ayton 3339 and similarly he is equipped to home demonstrate all new gear if you are seriously contemplating purchasing and if you are within reasonable distance.

PLEASE NOTE—Both G3LWM and G3KAE are *NOT* part-timers, available only at certain hours of the day. **REMEMBER—THIS IS THE ONLY WAY TO BUY EXPENSIVE GEAR IF YOU CAN'T GET IN TO SEE IT IN THE SHOWROOM.**

ALL ITEMS OF EQUIPMENT AND ACCESSORIES ARE PRICED TO INCLUDE CARRIAGE/POSTAGE UNLESS OTHERWISE STATED.

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As announced last month we are now stocking the most popular items in the **MOSLEY ANTENNA RANGE** details as below. **FULL RANGE OF AERIALS, CABLE AND ACCESSORIES AS SHOWN BELOW.**

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FL50A & FL75A 50 ohm Belling Connectors ..	£6.00
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Amphenol PL259 connectors ..	30p ea
Belling coaxial connectors ..	10p ea
50 ohm Heavy Duty Coax ..	22p yd.
(Carriage extra)	
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LC-80Q loading coil ..	£7.50
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Standard pairs ..	£2.90
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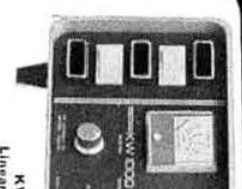
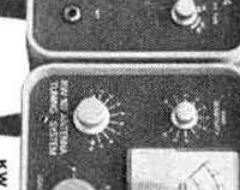
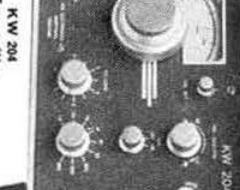
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Southampton; J and A Tweedy—Chesterfield; Reg Ward & Co Ltd—
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EASY TERMS ON EQUIPMENT AVAILABLE OVER 12, 18 OR 24 MONTHS

NEW HEATHKIT 2-METRE F.M. SOLID-STATE AMPLIFIER

An economy approach to boost mobile power—small in size and price but just look at this spec!

40 watts nominal out for 10 watts in—requires only 12 VDC supply.

Perfect match for the HW-202 Transceiver—also gives fully automatic operation with any 2-metre exciter delivering 5-15 watts drive.

Solid-state design—all components mount on single board for fast, easy assembly.

If you're regularly working from a fringe area, the new Heathkit HA-202 s-metre Amplifier can boost your mobile output to 40 watts (nominal), while pulling a maximum of 7 amps from your car's 12 volt battery.

You can mount the compact HA-202 wherever it's convenient—in the boot or under the dashboard. Use it with your HW-202 2-metre Transceiver, or with any 2-metre exciter delivering 5-15 watts drive.

Fully automatic operation—an internal antenna changeover relay and sensing circuitry provide automatic transmit/receive switching. The all solid-state design features rugged, emitter-ballasted transistors, combined with a highly efficient heat sink. This permits the HA-202 to withstand high VSWR loads, yet remain cool and continue to transmit without the need for complex sensing circuits.

Tuned input/output circuits provide a low spurious content, yet allow coverage of any 1.5MHz segment of the 2-metre band without re-adjustment.



Easy, 4-hour assembly—all components mount on one printed circuit board. Then you align your HA-202 with either a VOM or VVM. The manual shows you how, every step of the way. Installation is even faster!

Kit includes transceiver connecting cable as well as antenna connector. The HA-202 is designed for operation from a 12VDC system. Additional power supplies are not required.

HA-202 SPECIFICATION—Frequency Range: 143-149MHz. Power Output: 20W at 5W in, 30W at 7.5W in, 40W at 10W in, 50W at 15W in. Power Input (rf drive): 5-15W. Input/Output Impedance: 50 ohms, nominal. Input VSWR: 1.5 : 1 max. Power Supply Requirements: 12 to 16 VDC, 7 amps max. Operating Temperature Range: $\times 30^{\circ}\text{F}$ to $+140^{\circ}\text{F}$. Dimensions: $3^{\circ}\text{H} \times 5\frac{1}{2}^{\circ}\text{D} \times 4\frac{1}{4}^{\circ}\text{W}$ (excluding mounting flanges).

KIT K/HA-202 (3 lb).

(Mail order prices and specifications subject to change without notice)



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Financial Matters

The results for the Society's financial half-year to 31 December 1972 show a surplus of approximately £2,200. These figures are of course unaudited and unfortunately it is not expected to keep the figures at the same level for the whole year. For the six months ending 30 June 1973 there will be increased salaries, the usual increase in overheads and the VAT burden to meet, and once again the Society will be struggling to meet its expenses. The total expenditure for the half-year to 31 December is approximately £42,000 and this raises the problem as to what the figures are likely to be next year. Assuming total expenses for the year in the region of £83,500 and adding 10 per cent to cope with inflation this means we have to cover expenses of £92,000. There will, we hope, be the usual satisfactory gross profit on the sale of books and if this figure is estimated at £16,000 we are left with expenses of £72,000, which is about £5 per head. Unfortunately the problem does not end there as the Customs and Excise man is waiting for his share (VAT) and an adjustment will have to be made for this. This means that Council will be asked to approve subscription increases in the near future and nobody regrets this step more than the Hon Treasurer.

G3DVV, Hon Treasurer

QTC

AMATEUR
RADIO NEWS

Television broadcasting plans

To the few amateurs who are not concerned with the problems of interference to electronic entertainment equipment, the recently issued *Report of the Television Advisory Committee 1972* may be of little interest. To the majority the report contains many comments of interest concerning the future of television broadcasting. To attempt to summarize the report would be wrong, sufficient to mention two points about which there have been many wild statements. The vhf television broadcasting bands I and III will not be available to provide two additional national colour services before 1985. The date for the cessation of the existing 405-line monochrome transmissions in bands I and III will not be fixed before 1978.

Copies of the report may be obtained from HM Stationery Office or booksellers, price 14½p.

QSL Bureau

Mr E. C. Allen, G3DRN, sub-manager for G3, 4 and 5 two-letter calls, GC, G3SAA-TZZ, and G5AA series, has changed his address to 30 Bodnant Gardens, London, SW20.

Mrs A. J. Mathews, wife of G6QM, is now sub-manager for G8HAA upwards; her address is 62 Ashlands Road, Hesters Way, Cheltenham, GL51 0DE.

Mr R. E. Parkes, G3REP, 94 Canterbury Walk, Cheltenham, GL51 5HF, is now sub-manager for G8FAA-GZZ.

RSGB

It has been brought to our notice that the initials RSGB are being used by Research Surveys of Great Britain Limited. We cannot of course object to this as the initials are not a registered trade mark. As the name implies, the organization carries out surveys, both by mail and by personal interview. In the circumstances, and to avoid any confusion or embarrassment, it is suggested that any member who receives an enquiry should ascertain whether the enquiry has come from the Radio Society of Great Britain or from Research Surveys of Great Britain Limited.

We would emphasize that there is no legal objection to the use of the same initials by different concerns, although this may lead to confusion.

UK FM Group (Southern)

This group now meets regularly at Chichester House, Popley, Basingstoke, on the first Wednesday of each month. Membership is open to anyone interested in amateur fm operation and costs £1.50 per annum or 50p only for postal members. A newsletter is published once every two months. Membership enquiries to the secretary, J. Noakes, G8APC, QTHR.

Frank Robb, G16TK

G16TK has been known for many years as one of the most active of the blind amateurs in the UK. His many friends round the world will be pleased to know that following a spell in hospital, '6TK is now at home and making reasonable progress.

Licence figures

The Ministry of Posts and Telecommunications advises that the following numbers of amateur licences were in force at 31 December 1972:

Class A	14,464	Class B/M	826
Class B	3,714	Television	227
Class A/M	2,854		

Teleprinter news

G3VZV, BARTG hon sec, has changed his QTH to: 2 Orchard Close, Toddington, Dunstable, Beds, tel Toddington 2470. He will be pleased to help anyone requiring information on teleprinter topics.

RTTY enthusiasts are reminded that the BARTG Convention will take place at Meopham Village Hall on 30 June 1973. Full details will be given in a future issue.

Marconi Centenary Year—trip to Italy

The Barry College of Further Education Radio Society has organized a flight to Florence in 1974—Marconi's centenary year. The dates are 10 to 17 April, to coincide with the Bologna Radio Society's celebrations during April, and among the attractions will be excursions to Marconi's birthplace, to Siena and Pisa.

Anyone interested in joining the plane group, scheduled to leave from Glamorgan Airport, should write to the secretary, Barry College of Education RS, Colcot Road, Barry, CF6 8YJ.

VAT and the RAE

The MPT has notified the RSGB that fees charged to candidates for the RAE and Post Office Amateur Morse Test are exempt from VAT.

Unlicensed operation

The latest list received from the Ministry of Posts and Telecommunications shows more than 50 persons prosecuted for unlicensed use of wireless transmitting equipment. Penalties vary from conditional discharge to prison sentences of three months. In most cases, but not all, the equipment has been forfeited. Although presumably there were differences in the gravity of the offences, the list shows a considerable variation in the penalties inflicted by the various courts throughout the UK. The cost of locating and prosecuting the offenders must have been considerable. One wonders why a person risks a prosecution rather than obtain an amateur A or B licence.

ITU

Recent communications from the ITU at Geneva contain the texts of proposals made to the member countries that the *People's Republic of Bangladesh* and the *German Democratic Republic* shall be admitted to membership of the ITU. Results of the voting will not be known for several months.

The *People's Republic of China* has acceded to the International Telecommunication Convention, 1965, but has made three statements including one to the effect that China makes reservations on the articles concerning the assignment and utilization of radio frequencies in the Radio Regulations. In other words the RSGB Intruder Watch will still have no regulatory backing for its repeated requests for the removal of unwanted broadcast stations in the *amateur exclusive* band, 7 to 7.1 MHz.

Diamond Jubilee HF Contests

Now is the time, before the onset of those springtime gardening chores, to prepare for these two hf contests which, by kind courtesy of BOAC, offer valuable prizes not only to the outright winner of each event but also to eight entrants chosen at random by ballot.

Is your rig tvi-proof? If not, re-read Ian Jackson's excellent article in last November's *Radio Communication*, and tackle the problem without delay. Do you have the best aerial for inter-G working? If not, learn about aeriels and propagation from the *Radio Communication Handbook* (price £4.10, including postage, from RSGB HQ). Do you have an adequate supply of log sheets and an entry cover sheet? (The General Rules require you to use separate log sheets for each band). If not, send a *large* stamped-addressed envelope to RSGB HQ and ask for HF Contest Log Sheets (Form HFC1) and HF Contests Cover Sheets (Form HFC2).

These two contests are intended to give the average radio amateur a sporting chance to reap a top award. The large aerial arrays which prominent dxers use so successfully in world wide contests are not necessarily ideal for inter-G working, particularly on the higher frequency bands.

Book both weekends in your diary now, not forgetting to warn your family, and remember that all entrants making over 30 contacts will receive a commemorative certificate as well as being eligible for BOAC's airport visit ballot. Finally, read the rules (*Radio Communication* February 1973).

Affiliated Societies

Please add: Kingsway Technical College Amateur Radio Club (GM4AAF); hon sec F. Baxter, Old Glamis Road, Dundee, to the affiliated societies list in the 1973 edition of the *RSGB Amateur Radio Call Book*.

RAE instructors' weekend

It was the intention of the RSGB's Education Committee to arrange a residential weekend course for RAE instructors in the spring, but due to the lack of response to the notice which appeared in the October 1972 issue of *Radio Communication* it is not feasible to arrange such a course for the time being. However, the possibility of running a course in the early autumn is being considered, and anyone interested in attending is invited to write to chairman of the committee without delay: D. M. Pratt, G3KEP, 30 Lyndale Road, Eldwick, Bingley, Yorkshire BD16 3HE.

Can you help?

Di Pietro Corradino (Conrad), I0DP, wishes to contact a British amateur who shares his interest in home-brewing and ssb operation. He works in Rome as a guide for English-speaking tourists, and suggests he could assist any amateurs visiting Rome. His address is: Via Pandosia 43, 00183 Roma, Italy.

Any member who can provide information on radio-control experiments carried out on Lake Windermere by Mr J. G. Kitchen before the first world war is invited to write to Mr T. D. Walshaw, BRS23009, Low Sadgill, Longsleddale, nr Kendal, Westmorland.

Mr D. J. Druhan, EI7AR, seeks circuits or information on the Murphy HF Marine type transmitter AP100333, MR 301LC. Postage will be refunded and any documents safely returned. Write to Mr Druhan at Dunkitt, Kilmacow, Waterford, Ireland.

Mr C. B. Dowden, VE3TT, of Box 1381, 29 Pallan Cres, Kanata, Ontario, Canada, together with his wife and possibly two children, is proposing to visit the UK this summer. He would like to explore the possibility of exchanging houses for this period with a British family who may be visiting Canada at the same time, and invites suggestions.

New edition

A Guide to Amateur Radio

by Pat Hawker, G3VA

The many editions of this popular book testify to its long-established role as an indispensable aid to all who want to learn about the hobby.

This new (15th) edition includes information on recent trends in equipment, simple multi-band aeriels, and the ways in which vhf signals are received over hundreds of miles. It also takes into account the important changes introduced in recent years in the UK amateur regulations.

The extensive revision also includes guidance on developments in ssb techniques and semiconductor devices and associated constructional projects.

96 pages

90p post paid

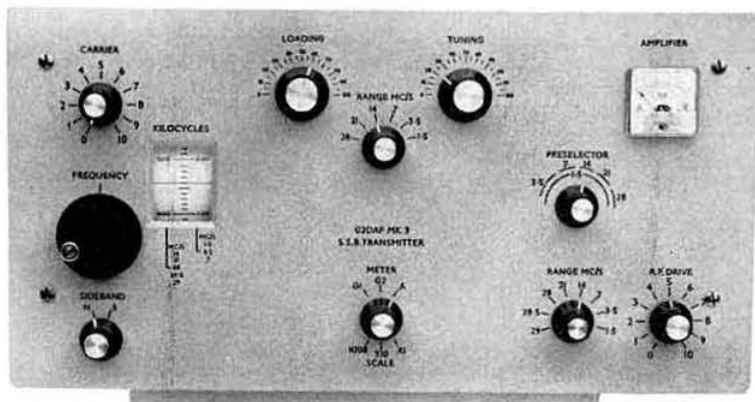
Obtainable from: RSGB, 35 Doughty Street, London WC1N 2AE

The G2DAF ssb transmitter Mark 3

Six amateur bands
with simplified
conversion.

180W p.e.p. input

by G. R. B. THORNLEY, G2DAF*



Part 2

Circuit description

Chassis Section A (Fig 2(a))

The audio stage V1 (EF86) and the first half of V2 (12AT7), have cathode resistors without bypass capacitors giving negative current feedback to each amplifying stage. The second half of V2 is connected as a cathode follower to present the correct impedance to the OA7 balanced diode modulator. Although the EF86 introduces an additional valve type, it has been specifically designed as a low-noise af voltage amplifier, with characteristics exhibiting low microphony and low cathode-heater leakage, and is well worthwhile as the first stage in a high-gain audio amplifier intended to be used with a crystal microphone.

Output from the carrier oscillator V3a is connected to the 12AT7, V3b, operating as a phase splitter to provide a push-pull drive to the OA7 diode balanced modulator, and the carrier balance potentiometer RV2.

The switch, S1, SIDE BAND, selects the required carrier crystal (X1 and X2) to obtain final transmitter output on either the "Normal" or the "Suppressed" sideband as required. A proportion of the carrier oscillator output is fed via the 47pF capacitor to the panel-mounted carrier insertion control RV3, and this enables an rf signal at carrier frequency to be fed round the sideband filter and be used for carrier insertion or netting purposes.

The double sideband suppressed carrier output from the balanced modulator is fed into the capacitor impedance-matching network of L1 to drive the Kokusai mechanical band-pass filter.

Chassis Section B

The low-level ssb output from the mechanical filter is amplified by V4 (EF85) operating in Class A, and fed into a 455kHz i.f. transformer T1 feeding a push-pull output into

the grids of the balanced converter V5 (12AT7). The heterodyning input from the vfo V6 (EF80) is fed to the two cathodes strapped in parallel.

Push-pull anode circuits of V5 are link coupled to push-pull grid input circuits of the final balanced converter V7 (12AT7).

Transformers T2 and T3 and the vfo coil L2 are the frequency-determining circuits tuned by a five-gang variable capacitor of 10-40pF each section, and make up the tunable i.f. covering the range 5-5.5MHz—this is the transmitter main tuning control FREQUENCY (KILOCYCLES).

Chassis Section C

The required injection frequency to convert the tunable i.f. to each of the six amateur bands is provided by a crystal-controlled switched oscillator V8 (EF80). Output circuit T10 is resonated to the correct frequency by a combination of fixed silver-mica capacitors and pre-set trimmers selected by S2 wafer of the five-bank range selector switch; the required crystal being selected by wafer S3.

The anode circuits of the final conversion valve V7 are tuned by the preselector capacitor (three-gang 75pF each section) together with the grid input of the pa valves. Transformers T4-T9 and coils L4-L9 are selected by the remaining banks (S4, S5, S6 and S7) of the range switch.

RF drive is controlled by varying the potential applied to the screen grid of the EF80 Class A amplifier V9.

Chassis Section D

The two 6146 pa valves are strapped in parallel and connected to a conventional pi tank circuit. Coil taps are selected by S8; resonance being obtained by the 400pF variable tuning, and the three 350pF loading capacitors.

Correct operation of the pa can only be obtained by using the correct value of anode load (R_L). The L and C values for each of the amateur bands have been calculated for an R_L of 2,000 Ω and an external load of 75 Ω , and these are given in Table 3.

* 5 Janice Drive, Fulwood, Preston, Lancashire

The VR150 stabilizer valve V12 provides 150V regulated for the vfo and the carrier oscillator, together with 200V regulated for the screens of the 6146 valves—obtained by tapping the ht feed made up with the 2.5k Ω and 1.5k Ω resistors in series.

All control functions for transmit-receive are controlled by the two-pole changeover relay having a high resistance coil energized by current obtained from the main 300V ht rail, and operated by a simple press-to-talk foot switch. The second pair of contacts marked AERIAL RELAY should be connected in series with the coil of an external low resistance relay of the GPO 600 type and an external 6-12V dc supply. The relay is shown in the non-energized receive position, the negative muting voltage to the receiver being short-circuited and the full 100V bias being fed to the grid return of V4 and, via the bias-setting potentiometer RV5, to the grids of the two 6146s; these three valves are therefore held at cut-off and there is no output from the transmitter. When the press-to-talk button is depressed the relay closes, allowing the 100V muting bias to cut off the receiver, and at the same moment of time to short-circuit the bias rail to earth, allowing V4 to conduct. The bias on the pa valves is now a proportion of the negative 100V supply, determined by the setting of the 5k Ω potentiometer RV5 which is now the centre part of a potential divider between the 100V bias rail and chassis earth. RV5 is adjusted until the two 6146 valves are taking a total of 50mA standing anode current.

Panel meter

A panel meter having a basic 5mA movement is provided to monitor the operating parameters of the pa. Grid, screen or anode current can be selected as required by the two-pole three-way meter switch S9, S10.

Shunts SH1 and SH2 are adjusted to obtain a full-scale current of 50mA in the G2 position and 500mA in the A position. The constructional details of the shunts given in the circuit diagram will only be correct for the type and make of meter used in the original transmitter. Any other meter having a different internal resistance will require adjustments to SH1 and SH2 to obtain the correct $\times 10$ and $\times 100$ multiplying ratio.[4]

Construction

The chassis is made up of four separate box sections of 16swg aluminium to give a total size of 16in by 12in by 2½in deep, with a 17½in by 9in front panel. This enables the transmitter to be constructed and wired in units; in fact each unit can be individually tested and aligned before final assembly should this be considered necessary. These box sections are machine pressings, are true to size, have sharp radius corners, and are available in the required sizes shown on Fig 3 from North West Electrics, 769 Stockport Road, Levenshulme, Manchester.

Table 1. Final conversion crystal frequencies

Band	Crystal Freq (MHz)	Mode	Output Freq (MHz)
160	7.0	Fundamental	7.0
80	9.0	Fundamental	9.0
40	6.25	2nd harmonic	12.5
20	9.0	Fundamental	9.0
15	8.0	2nd harmonic	16.0
10	11.5	2nd harmonic	23.0
10	11.75	2nd harmonic	23.5
10	12.0	2nd harmonic	24.0

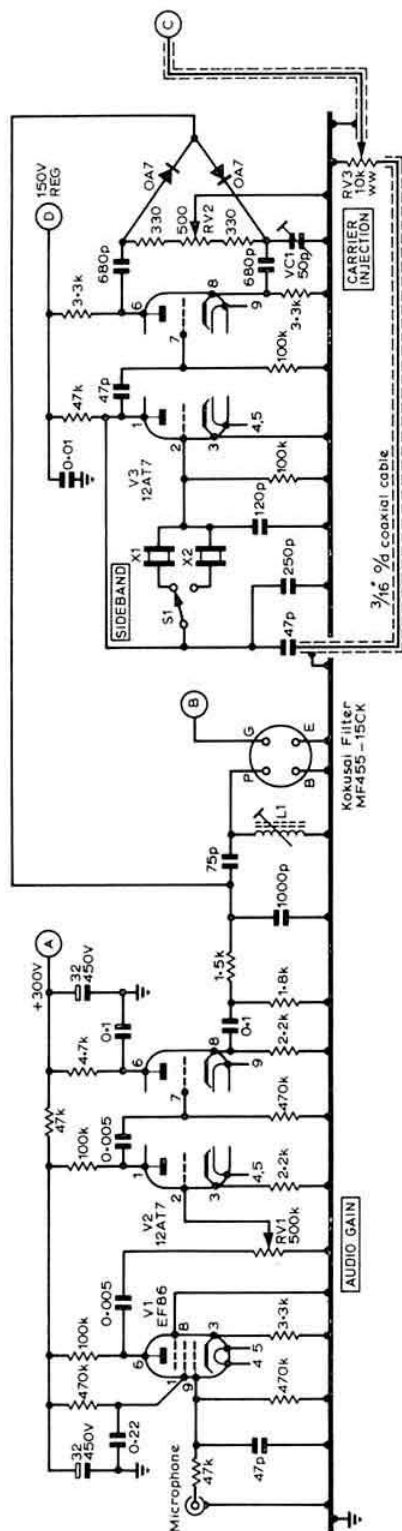


Fig 2(a) Circuit diagram, chassis Section A

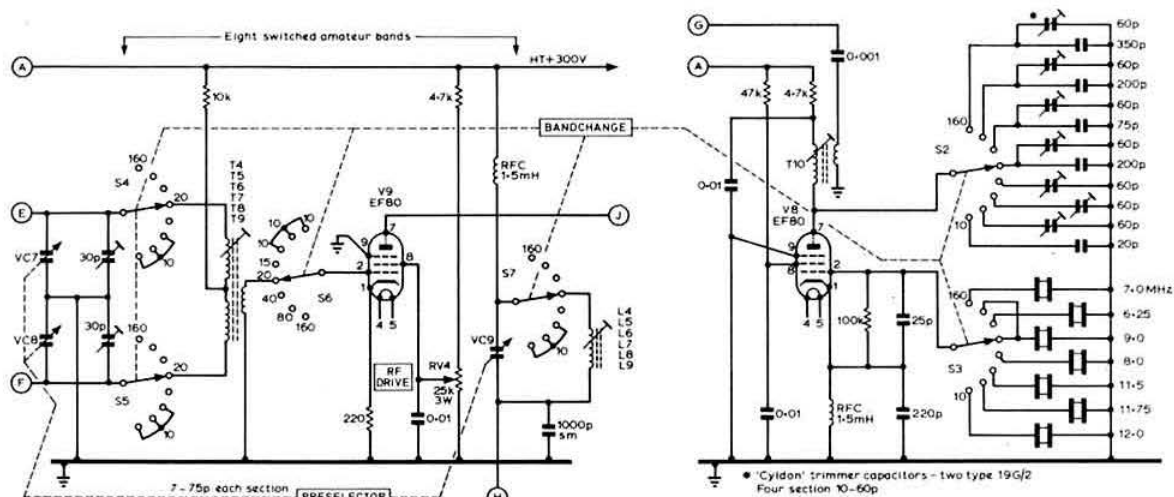


Fig 2(c) Circuit diagram, chassis Section C

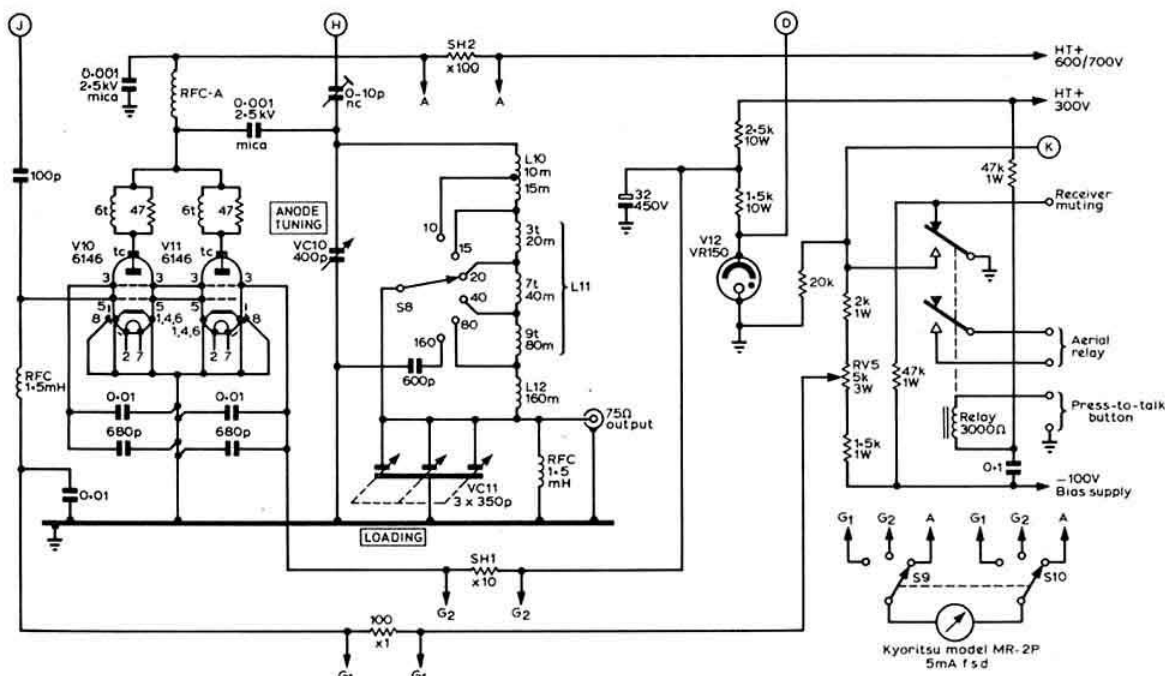


Fig 2(d) Circuit diagram, chassis Section D

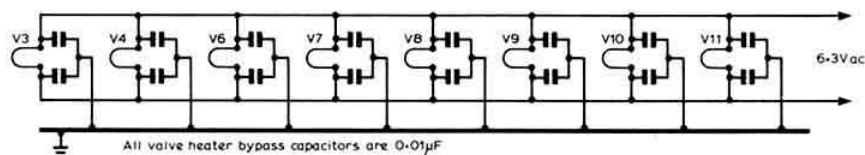


Fig 2(e) Valve heater bypass capacitors

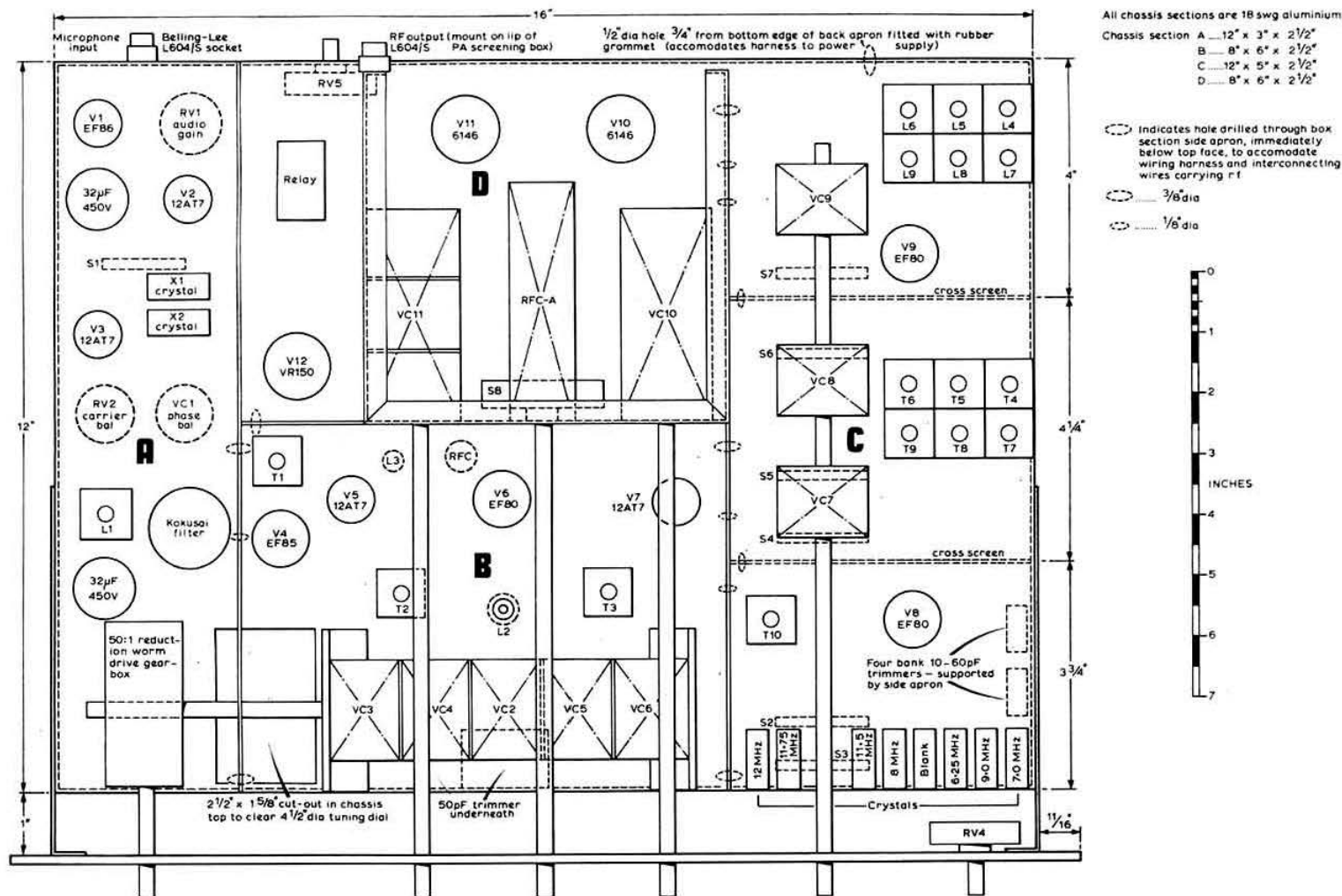


Fig 3. Chassis layout showing principal components

The chassis layout showing the principal components is given in Fig 3, and a panel layout with suggested positioning of the dial aperture and the control knobs in Fig 4. It is necessary to remember that the three $\frac{1}{4}$ in diameter shafts from the pa box to the front panel control knobs have to pass over the top of the five-gang main tuning capacitor. The height of this capacitor will therefore determine the final vertical positioning for the LOADING, TUNING and RANGE mc/s control knobs.

The Yaxley two-pole changeover switch bank S1 must be mounted reasonably close to the two carrier crystals X1 and X2, and the oscillator valve V3, and is supported by a small L-shaped bracket bolted to the chassis side apron. A clear space should be kept down the centre of this section to clear the switch control rod and support bearing before connection to the Eddystone flexible coupler and the shaft to the front panel control knob. In order to avoid the possibility of induced rf currents bypassing the balanced modulator and the filter it is important that the whole of the shaft length is insulated, and $\frac{1}{4}$ in diameter polystyrene rod is recommended.

The details of the assembly and the positioning of the main single-pole eight-way five-bank range switch assembly is shown clearly in the photograph of the underside of the chassis. These are standard Yaxley paxolin wafers. It will be noted that the use of individual coil cans on top of the chassis, and switch banks running underneath, gives a clean accessible layout together with very short connecting wires. Switch sections S2 and S3, together with the indexing mechanism, are supported by the chassis apron, sections S4 and S5 by the front cross screen, and S6 and S7 by the rear cross screen—these can conveniently be assembled before the screens are bolted in position in the main chassis, Section C.

Also shown in the under-chassis photograph is a 50pF air-spaced variable capacitor (Polar Type C28-141) fitted with a fine-toothed sprocket and spring-loaded "latch" as an indexing mechanism. This assembly is in a central position, bolted to the front chassis apron, and is the 50pF pre-set trimmer shown in the circuit diagram across the vfo coil L2.

A balanced bridge circuit is used for neutralization of the 6146 valves, and this requires that the cold ends of the six coils and the frame of the 75pF grid tuning capacitor are

taken to a common bus-bar which is insulated from the chassis and bypassed with a 1,000pF mica capacitor. The two remaining 75pF tuning capacitors have their frames at chassis earth. However, in order to keep the drive shafts in line, all three capacitors are mounted on an insulated plate made from dry hardwood, $\frac{1}{8}$ in thick—the mounting screws for the grid tuning section being well countersunk into the wood to guard against an inadvertent short circuit to the chassis—and the shaft coupled by a length of $\frac{1}{4}$ in internal diameter paxolin tubing. These three capacitors are Polar Type C28-141, (available in the surplus RF27 units). The frames of the two sections tuning the converter anode (V7) are connected to the chassis by short lengths of 18swg tinned copper wire.

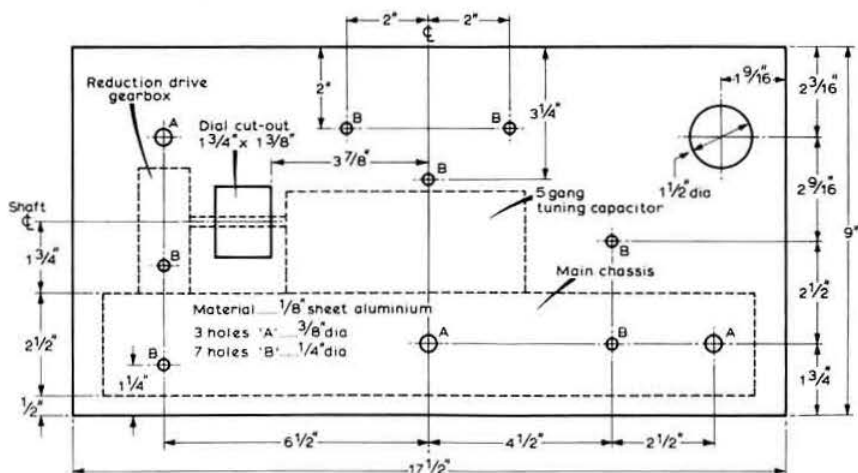
The pi tank inductance is made up of three separate units. The 160m coil L12 is on a separate ceramic former at right angles to the main winding L11 and adjacent to its "cold" end, with the self-supporting 10m coil L10 positioned at the "hot" end to form the connecting link between L11 and the stator plates of the anode tuning capacitor.

The 400pF anode tuning capacitor was obtained from surplus sources. Overall dimensions are $3\frac{1}{2}$ in long, $1\frac{1}{2}$ in wide and $1\frac{1}{8}$ in high—a convenient size to fit into the available space. The rotor vanes are semi-circular giving a straight-line capacitance law, and the air gap is 0.02in.

A standard pi-wound rf choke is unsuitable for use with a shunt-fed tank circuit and this component must be specially wound to have a low self-capacitance and no self-resonant points within the required amateur bands. There is insufficient space in the pa screening box for the full size pi tank choke described in the RSGB *Radio Communication Handbook*; however, the smaller version actually employed appears to give a satisfactory performance. This consists of 250 turns of 36swg enamelled wire wound in unequal sections of 150, 60, 30 and 10 turns on a ceramic former, $\frac{1}{4}$ in diameter and 4in long, with a $\frac{1}{8}$ in spacing between each of the sections.

It is convenient to use a standard broadcast type three-gang variable capacitor of 350pF each section for the aerial loading capacitor. As this would not have a large enough value for use on the lowest amateur band, the 1.5MHz position of the pi tank band-change switch is used to bring into circuit a further fixed loading capacitor of 600pF. A

Fig 4. Panel layout. Dotted line shows the relative position of the main chassis, the five-gang tuning capacitor and the reduction drive gearbox. The shaft centre-line of the five-gang capacitor used by the author is $1\frac{1}{2}$ in above the chassis top face; a different type of five-gang may require re-positioning of the dial cut-out and the drive gearbox tuning knob. Front panel material is $\frac{1}{8}$ in thick aluminium



standard single-pole, six-way, Yaxley ceramic switch S8 is supported by the front apron of the pa screening box and the switch in turn supports the coil L11 by means of the two ends and the three tapping connections. S8 and L11 are conveniently made up as a unit before fitting into position.

On the 160m band, power is reduced to the equivalent p.e.p. of a 100 per cent modulated 10W dc input A3 transmitter by switching the anode feed to the pa valves from the normal 700–750V line to the 275–300V rail feeding the remainder of the transmitter.

As the transmitter is controlled by a press-to-talk button (this may be a circular bell-push screwed to a block of wood and placed on the floor for foot operation) there is no relay clicking while the operator is actually talking. The type 3000 relay does not require a flexible rubber shock mount and may be screwed directly to the chassis.

The meter switch S9 and S10 is a single-pole, three-way, two-bank Yaxley type. This may be paxolin, but ceramic is preferred to eliminate any possibility of tracking. It is most important that this switch is the break-before-make type, otherwise ht would be momentarily connected to the 6146 grids as the switch poles moved over. If this type of Yaxley wafer is not available, standard make-before-break single-pole six-way banks can be used with each adjacent contact left blank (ie the three positions of the control knob would be at 60° instead of the customary 30°).

Any good quality moving coil meter of 5mA full scale deflection is suitable. However, the constructional details of the shunts SH1 and SH2—giving a multiplying ratio of $\times 10$ and $\times 100$ —are only correct for the type of meter used by the author: this is a Kyoritsu Model MR-2P. The 1W carbon resistors used as formers for the shunt windings may be any available value of 1k Ω or greater.

The calibrated tuning dial can be seen clearly in the chassis photographs. This is constructed in a simple manner by cutting a piece of 20swg aluminium 9in by 1½in, and cementing it with Araldite to the rim of a standard 4½in diameter cord drive drum (Jackson Part No 4029 or similar). The calibrated scale is hand printed with Indian ink on a piece of glazed drawing paper 8½in by 1½in held in position by self-adhesive tape along either end. This enables the calibration points to be initially marked up in pencil and the paper scale removed for the final hand printing, without having to upset the alignment by removing the drum from the five-gang capacitor.

A worm-drive gearbox with a ratio of 50:1 is very convenient, because with a tuning range of 500kHz, one turn of the FREQUENCY knob represents a tuning rate of 10kHz. This ratio allows precise frequency setting without being too tedious when it is desired to traverse completely across the band. The gearbox used by the author was obtained from a scrapped Collins CT12 transmitter. Equally suitable is the 50:1 worm drive used in the BC221 frequency meter. In the event that these items are no longer available from surplus

sources, a possible alternative is the 25:1 worm drive from a TU5B tuning unit, still available in many amateur junk boxes.

Alignment

An ambitious project such as the construction of an all-band ssb transmitter is only likely to be undertaken by an amateur with past constructional knowledge. For this reason it is felt that step by step detailed alignment instruction is not necessary.

In the interest of valve life the 6146s should be run with the power supply ht switch in the 275–300V position—at least until the anode and grid tuning has been checked and the valves correctly neutralized on all bands.

A serviceman's signal generator is really the minimum requirement, and, assuming that this is available, each chassis section can be individually aligned before final assembly. Assuming that this has not been done and that the signal generator is only available for a short space of time—after final construction is completed—the most satisfactory alignment procedure is to start at the back and finish at the front. That is from the pa tank coil back to the carrier oscillator, using the serviceman's generator as a signal source.

All oscillators should be checked for satisfactory operation. It is most important that the dust core of L2 is adjusted at the low end, and the trimmer VC1 at the high end to obtain the correct tuning of the vfo over the frequency range of 5.455–5.955kHz.

All coils are in screening cans and a grid dip oscillator cannot be brought up to the coil to check alignment, neither is it possible to use the usual pick-up loop feeding into an absorption wavemeter. This may cause difficulty when it is required to set each of the pre-set trimmers across the final conversion oscillator coil T10, because it is important on some ranges to know that the circuit is resonant on the correct harmonic. There are two ways to overcome this limitation;

1. A pick-up loop tucked into the wiring close to the valve anode will deflect a sensitive absorption wavemeter using a diode and 100 μ A meter; alternatively the "signal" can be fed into the station receiver via a length of coaxial cable.
2. A pick-up loop can be constructed by winding six turns of 24swg enamelled wire round the end of a 6in length of ½in diameter Systoflex sleeving, the loop connections then feeding back down the centre of the sleeving and terminating with a length of twin flex or coaxial cable. This "probe" can then be pushed down towards the dust core inside the former of the circuit to be checked.

The tunable i.f. must tune accurately over the range 5.0–5.5MHz. As it is relatively easy to inadvertently tune the frequency determining circuits to the strong vfo signal of 5.455–5.955MHz, it is advisable to disable the vfo by removing the oscillator valve V6 while the correct tunable i.f. alignment is being undertaken. The signal generator, set to 5.25MHz, should be connected to one of the grids of V5, the KILOCYCLES dial set to the centre band position, and the dust cores of T2 and T3 adjusted for maximum output. It will be found that the ganging holds quite accurately right across the 500kHz tuning range and that (assuming the five-gang variable capacitor has semi-circular rotor plates giving a straight-line capacitance law) the dial calibration is linear right across the scale.

It will be noted that there are eight positions of the main

Table 3. Pi network data—two 6146 valves

Band	$R_L = 2,000\Omega$		
	XC1 = 200 Ω	XL = 250 Ω	XC2 = 46 Ω
80m	220pF	11.0 μ H	900pF
40m	110pF	5.5 μ H	450pF
20m	56pF	2.7 μ H	225pF
15m	38pF	1.8 μ H	160pF
10m	28pF	1.4 μ H	115pF

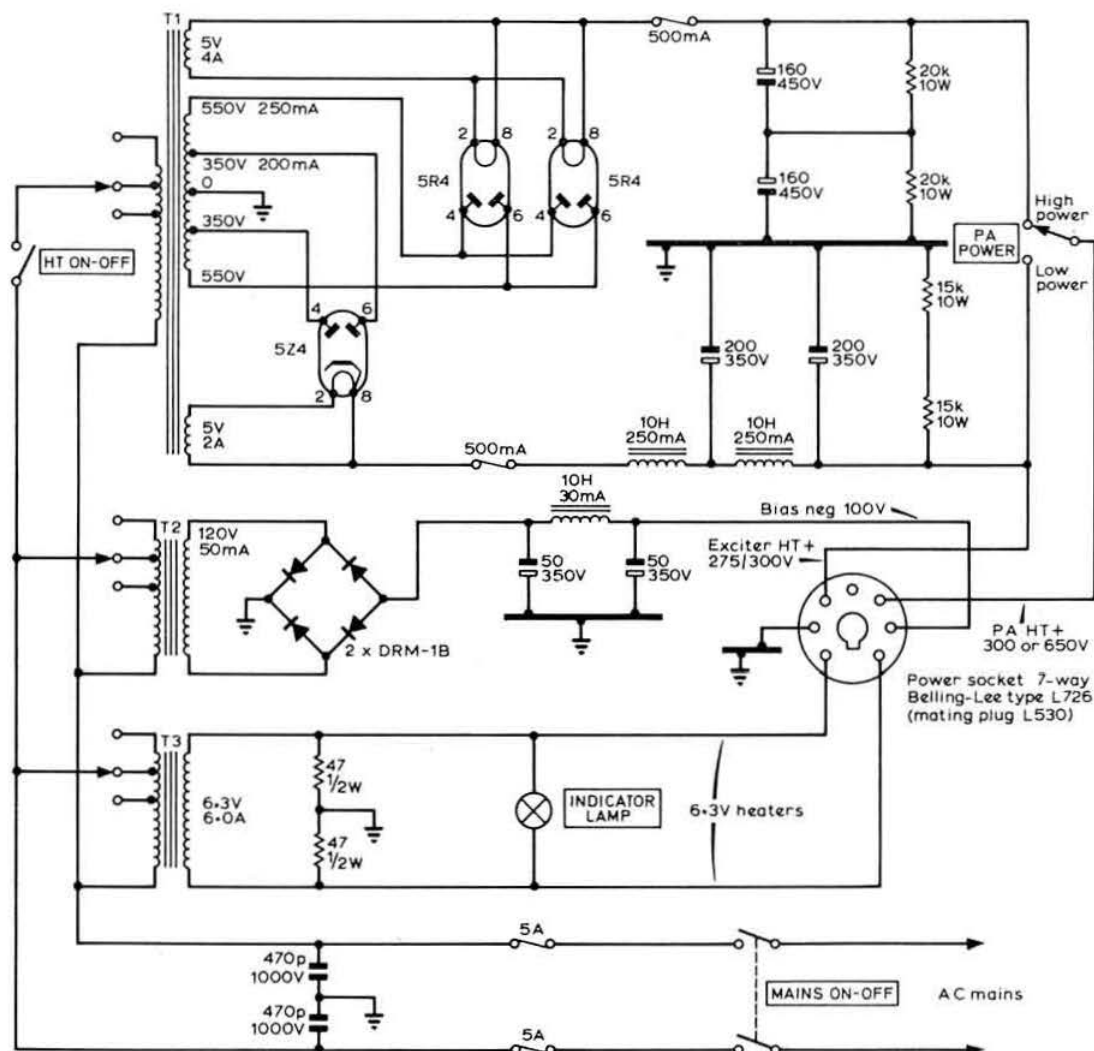


Fig 5. Power supply circuit. The two 160µF 450V capacitors are standard 100 + 60µF electrolytics, with the two sections strapped in parallel. T1 may be two separate transformers, operated from the common ht on/off switch

range switch, one each for the five bands from 160 to 15m and three for the 10m band to give a 28-29.5MHz coverage. A separate signal frequency coil is used for each of the six amateur bands, T4-T9 in the anode circuit of V7, and L4-L9 in the anode circuit of V9. As the 10m coils (T9 and L9) cover the three sections of the 10m band, the respective switch contacts of S4, S5, S6 and S7 are strapped together.

The two Philips pre-set capacitors of 2-8pF are soldered directly to the valve holder pins of V7 and can be seen in the chassis underside photograph. They are initially fully unmeshed and their capacitance increased equally until neutralization is complete and V7 fully stable at all settings of the preselector tuning control (range switch set to the 3.5 MHz or the 7MHz band).

Alignment of the conversion oscillator V8 is initially

undertaken with the range switch in the 29MHz position; the dust core of T10 is adjusted for maximum oscillator output at 24MHz. The range switch is then set to the 28.5 MHz position and the appropriate 60pF trimmer adjusted for maximum oscillator output at 23.5MHz. With the range switch in the 28MHz position the next 60pF trimmer is adjusted for maximum output at 23MHz... and so on throughout the eight amateur bands to 1.5MHz. On certain ranges the oscillator output is the second harmonic of the crystal frequency and it is important to ensure that the correct harmonic has been selected and that the oscillator is not inadvertently tuned to the fundamental or the third harmonic. At each adjustment the output signal frequency should be monitored using an absorption wavemeter or the station general coverage receiver.

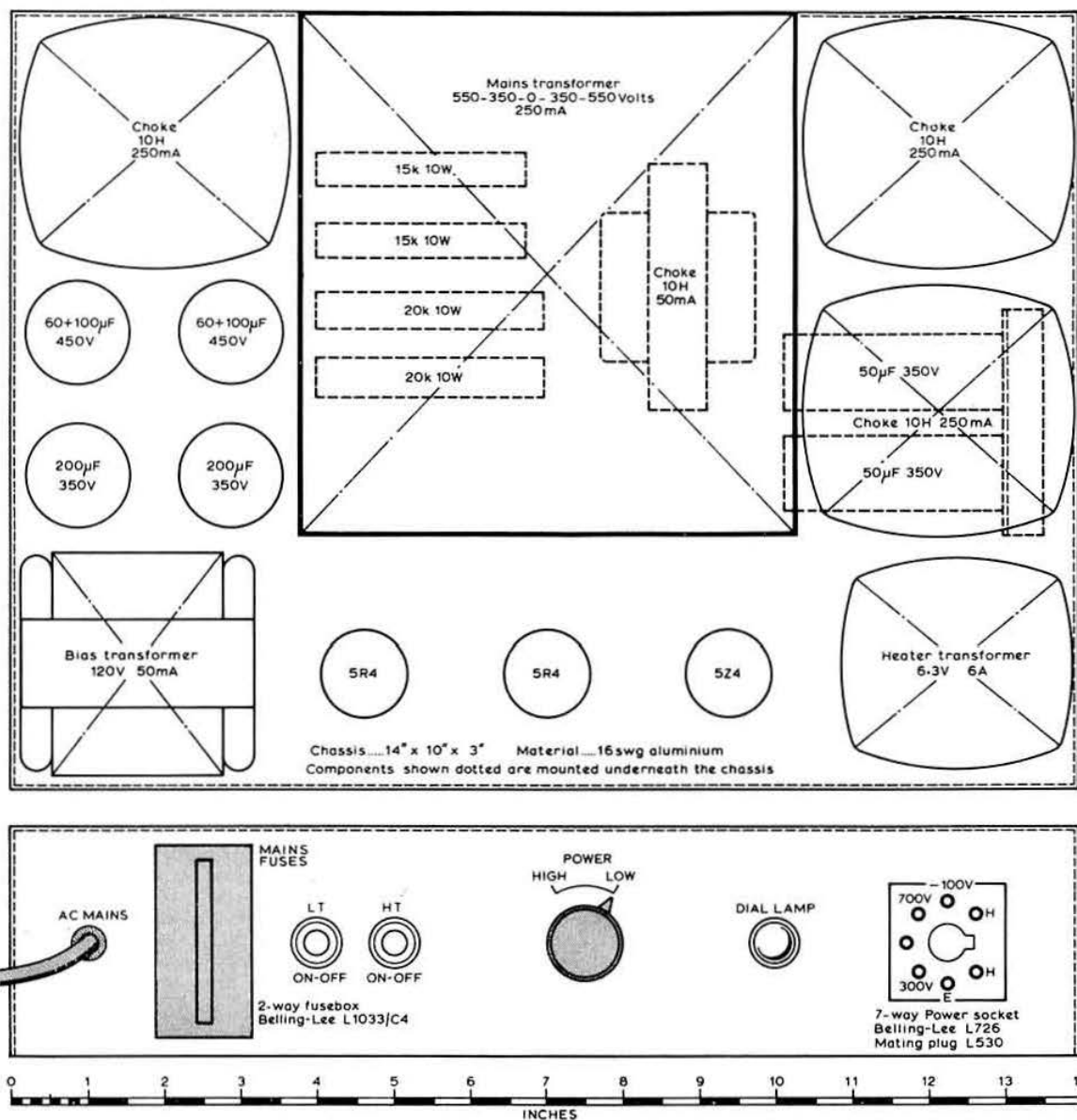


Fig 6. Power supply chassis and front apron layout showing the principal components. Material—16swg aluminium

The transformer T1 is a standard item purchased on the surplus market, believed to have been made originally by Parmeko and often referred to as a "table top" type. An alternative for T2 is a centre tapped secondary winding 125-0-125V at 50mA with one DRM-1B rectifier (or similar) in the usual full wave circuit. A suitable type may be obtained from *Radio Communication* advertisers, or from RS Components Ltd through local radio retailers.

Power supply

An rf power amplifier can only operate in a linear manner and give an undistorted output if it is provided with grid, screen and anode voltages that remain constant in potential and do not vary under differing load conditions. Additionally, the heavy anode current demand is at syllabic rate and the main ht power supply must have good regulation under dynamic conditions.

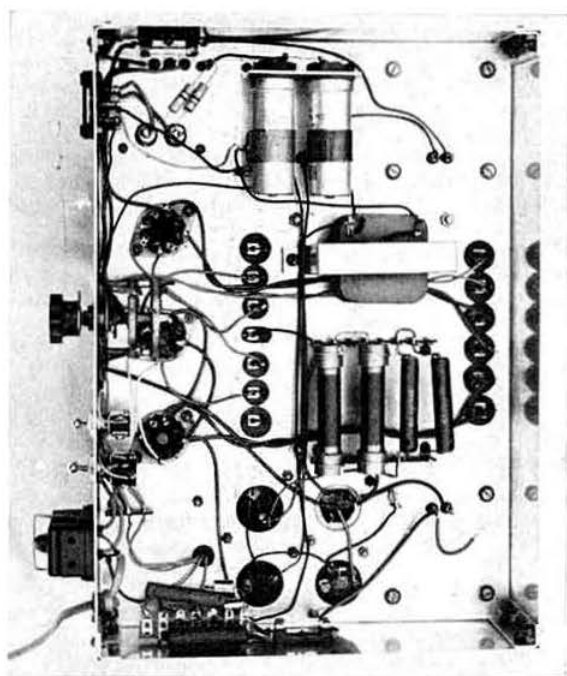
It will be appreciated that the carrier of an ssb transmitter is attenuated in the modulator by a process of balancing, and that normally the modulator will give an attenuation of 40dB or more. It will also be appreciated that any hum ripple, either on the ht supply to the carrier oscillator or to the audio valves, will unbalance the modulator and produce a hum-modulated carrier that cannot be removed by the balancing control RV2. A rough "carrier" will also be produced if there is any 50Hz mains ripple induced into the cathode of V2b from the 6.3V heater line. To overcome these difficulties it is good practice to provide (1) two-stage smoothing and a large value of reservoir capacity in the 275-300V power supply, (2) a two-wire heater circuit that is balanced to earth.

In regard to the high voltage supply to the pa valves, the conditions are different because the anode current of a tetrode is almost independent of small changes in anode potential and hum ripple will not "anode modulate" the signal. However, dynamic regulation over the range 50-250mA is important because a fall in anode voltage at the moment of peak current demand would prevent the pa handling the peak signal and could cause flat-topping and distortion. In the 650-700V supply the customary smoothing chokes are therefore omitted and a large value of reservoir capacitance is placed directly across the rectifier output.

The bias supply is made "stiff" by the use of a generously rated mains transformer and rectifier stack, together with ample capacitance and a relatively heavy bleed current of approximately 20mA through the resistive load network.

A circuit diagram of the power supply used at G2DAF is given in Fig 5. All components can be mounted on an aluminium chassis 14in by 10in by 3in deep. Points to note are:

(a) The heater voltage of 6.3V ac is balanced and "floating" above earth. This prevents hum being induced into the bias and ht lines in the cable harness between the power pack and



Under-chassis view of the power supply unit

the transmitter, and also ensures that the heavy heater current is not superimposing 50Hz ripple on the ht negative return connection.

(b) The bias supply is "stiff" and also provides a wide range of adjustment.

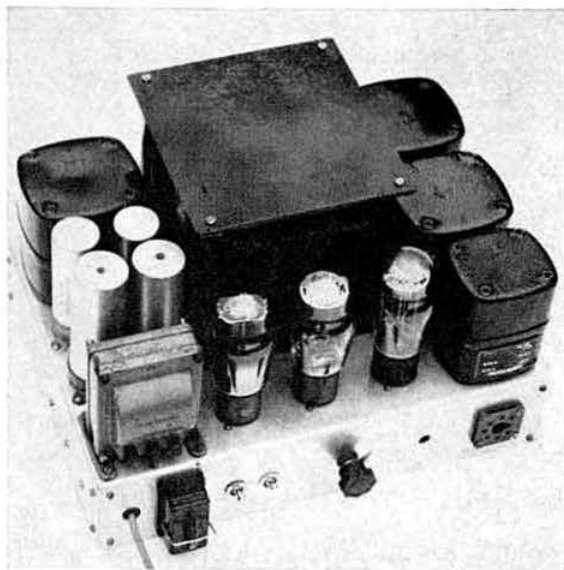
(c) The 32 μ F capacitor between the 200V rail and earth ensures, together with the bleed through the series resistors and the stabilizer valve, a "stiff" screen supply to the pa valves, with a low impedance to the demand that will vary at audio rate (see Fig 2(d)).

(d) The high value of effective capacitance of 80 μ F across the 5R4 rectifier valves gives an output voltage of 650-700V and ensures excellent dynamic regulation.

S1 is provided so that the anode ht can be reduced to permit operation on the 160m band without exceeding the licensed power limit. This switch must never be used for tuning and loading purposes on the other bands. A 6146 valve fully driven with a low voltage on the anode and normal voltage on the screen will take excessive screen current, the rated screen dissipation will be exceeded and the valve may be destroyed.

Conclusion

For cw operation the transmitter is best controlled by the press-to-talk foot switch. A key jack socket of the closed circuit type can conveniently be connected in the cathode return of the final balanced converter valve V7—between the 680 Ω resistor and chassis earth; this connecting point must be bypassed to rf by a 0.01 μ F capacitor. The keying characteristic is clean and free from chirp. The audio gain control should be turned to zero and the carrier control (RV3) advanced until the required amount of drive is available to the pa valves.



Power supply unit

For the benefit of those amateurs who have—or can borrow—a thermionic diode probe valve voltmeter, a table has been compiled of the rf voltage readings of the conversion oscillator, and the sideband voltage readings at the grid of the Class A amplifier V9 and the available drive to the 6146 grids. The values quoted are rms values and were measured with a Salford Instruments valve voltmeter Type BW 211B. When measuring the voltages at the grid of the EF80 amplifier V9, it should be remembered that the input capacitance of the diode probe will de-tune the anode circuit of the converter V7 and give a false low reading. When the probe is in position each circuit must be brought back to resonance by adjustment to the preselector tuning control until maximum reading is obtained. Similarly, when measuring the voltage at the grids of the 6146 valves the diode probe should be connected to the V9 anode side of the 100pF coupling capacitor and the capacitors should be temporarily disconnected from the grids of V10 and V11. This is essential, otherwise any peak rf drive that exceeds the negative bias potential (about 50V) will cause the pa valves to draw grid

current, the input impedance will fall to a few hundred ohms and severely damp the resonant circuit, thus giving a false low reading. Before taking the valve voltmeter reading the circuit must be correctly resonated, with the diode probe in position, by slightly unscrewing the dust core of the appropriate coil (L4 to L9) at the same time rocking the preselector tuning control to ensure that the anode circuit of V7 is also correctly resonated.

The various output voltages of conversion oscillator V8 are not particularly critical and are quite satisfactory if within ± 20 per cent. If the oscillator output is low on some bands re-check the alignment and examine the position of the rotor vanes of the appropriate trimmer. If the trimmer is either fully meshed or fully unmeshed the circuit may not have fully reached the peak of the resonance point; adjust the value of the parallel fixed silver mica capacitor as necessary. If all else fails suspect a faulty crystal.

This transmitter has greater overall sideband gain than the Mark 2 version; due partly to the greater conversion efficiency of the cathode injection balanced converters, and partly to the use of a continuously tuned circuit in the anode of V7. On the lower frequency bands the rf drive control is normally set half on, and only increased beyond this position for the 15m and 10m bands. There is also reserve of audio gain (sufficient for a low level microphone). The correct setting of the pre-set audio gain control (RV1) when using a normal crystal microphone is between half and two thirds of the maximum position.

In regard to performance, the unwanted sideband suppression at 1kHz (measured at the transmitter output terminal) is better than 55dB. The low-impedance diode modulator makes the carrier balance particularly stable. The carrier suppression is better than 60dB. Due to the use of double triode balanced converters in each of the frequency translation stages and negative rf feedback in the penultimate amplifier, the transmitter gives a clean output with a low level of distortion products.

References

- [1] *RSGB Bulletin*, March, April and May 1964.
- [2] *Radio Communication Handbook*, pages 10.17–10.19.
- [3] *Radio Communication Handbook*, chapter 10.
- [4] *Radio Communication Handbook*, page 19.1.

Table 4. Valve voltmeter rms check voltages

RF	Conversion oscillator injection	
160m	3.4V rms	20m 4.1V rms
80m	4.1V rms	15m 4.4V rms
40m	4.8V rms	10m 5.0V rms
Measured at output of T10		
SSB	Volts at grid of V9	
160m	3.4V rms	> 150V rms
80m	6.3V rms	> 150V rms
40m	9.8V rms	> 150V rms
20m	6.5V rms	120V rms
15m	7.4V rms	107V rms
10m	6.2V rms	92V rms
Measured with V9 removed from valve holder		Measured with 100pF grid capacitor to V10 and V11 removed

Note: For all readings, sideband signal obtained by adjusting carrier injection potentiometer to position giving maximum valve voltmeter reading. (Audio gain control set to zero). KILOCYCLES tuning at mid band position, PRE-SELECTOR correctly resonated for maximum output on each band.

Measuring instrument: Salford Instruments valve voltmeter Type BW211B. (Thermionic diode probe into 50M Ω input impedance).

Table 5. DC voltage check

Valve	Stage	Type	Pin No						
			1	2	3	4	5	6	7
V1	1st audio	EF86	135	—	3.3	H	H	170	—
V2	2nd audio	12AT7	150	—	2.6	H	H	300	—
V3	Carrier osc	12AT7	55	Neg 1.5	—	H	H	150	—
V4	i.f. amp	EF85	3.7	Nil or —105	3.7	H	H	—	270
V5	1st converter	12AT7	255	—	4.2	H	H	255	—
V6	VFO	EF80	—	Neg 0.12	—	H	H	—	150
V7	2nd converter	12AT7	255	—	4.6	H	H	255	—
V8	Conversion Oscillator	EF80	2	—	2	H	H	—	297
V9	RF amp	EF80	3*	—	3*	H	H	—	305
V10	PA	6146	—	H	205	—	Neg 45 or	—	H
V11	PA	6146	—	H	205	—	Neg 130	—	H
V12	Regulator	VR150	A	100 = 150	—	—	—	—	—

Main ht + 310V
PA ht + 670V at standing pa current of 50mA.
Bias —33 to —120 (limits of bias pot)
* DRIVE control at max position
1.5V DRIVE control at mid-way position.
H Denotes 6.3V ac heater connection.

RSGB Diamond Jubilee home-constructed equipment competition

In order to stimulate interest in home construction during its Diamond Jubilee year the RSGB is holding a competition for the design and construction of three types of equipment.

1. A cw and ssb transmitter designed for operation in the band 1.8 to 2MHz. The equipment shall be vfo controlled and comply with the current licence conditions.
2. A single-conversion vhf/uhf receiver covering any or all of the bands at 70, 144 and 432MHz. The receiver should be tunable over the selected band(s) and have a fixed hf or vhf i.f. (eg 10.7MHz). Provision should be made for selection of all or several of the usual operating modes.
3. An item of test equipment of unusual design with applications in the normal amateur station. Professional standards should not be required for calibration.

The following points should be noted:

- (a) Credit will be given for technical merit and ease of construction. The use of industrial methods and processes not readily available to the home-constructor may lead to a loss of marks.
- (b) Readily available components shall be used and attention shall be paid to the cost involved.
- (c) The Society may ask for loan of equipment for test and evaluation.
- (d) Any entrant shall supply, on request, a technical article on the equipment or sufficient information from which such an article for *Radio Communication* may be prepared.
- (e) Entries will be judged by nominated members of the Society's Technical and Publications Committee, whose decision shall be final.
- (f) The closing date for entries is 31 December 1973.

The method by which judging of entries from any part of the UK is to be made will be detailed later.

In each category of the competition there will be two prizes consisting of cash, publications or RSGB membership equivalent to the cost of a five-year and three-year subscription respectively.

It is hoped that many members will take part in this competition. We shall be pleased to receive a preliminary notification of the intention to submit an entry. Correspondence should be addressed to the chairman of the Technical and Publications Committee at RSGB headquarters.

RSGB Region 1 Diamond Jubilee Dinner

Friday 23 March
at
Strand Hotel, Brunswick Street
Liverpool

7.30 for 8pm Dress informal
Ladies welcome

Tickets £2 per person. Applications before 16 March, please, to G2AMV, "Tanglewood" Anthony's Way, Heswall Wirral Cheshire

Bristol '73 Mini-Convention

Saturday 26 May

at

Royal Hotel, Bristol

On the occasion of the Diamond Jubilee of the RSGB, the Bristol RSGB Group invites you to attend this mini-convention which will provide conversation, nostalgia, information, technical lectures, exhibition of home-brew and old-time equipment, eating, drinking, dancing, and an opportunity to meet your President and Society officials.

There will be talks and discussions on: **ship to shore radio; the ss "Great Britain"; vintage amateur radio; weather satellites; vhf radio observatory; and the work of the regional representative.**

Admission to the day's events by programme, price 25p.

Commencing at 8pm, there will be an informal dinner and dance, tickets for which will cost £2.50, and early booking is recommended.

Applications for programmes and dinner/dance tickets should be sent to Mr G. Mather, G3GKA, 8 Hills Close, Keynsham, Bristol, (Tel: Keynsham 2768) together with the appropriate remittance. Cheques and postal orders should be made payable to "RSGB Bristol '73 Account". SAE would be appreciated.

For this event the Royal Hotel is offering a substantial reduction in accommodation prices and anyone wishing to stay overnight should send bookings direct to: The Manager, The Royal Hotel, College Green, Bristol. Tel: Bristol (0272) 23591.

Mobile Rallies Calendar

- | | |
|------------------|---|
| 1 April | White Rose RS, Lawnswood Girls' High School, Ring Road, West Park, Leeds 16. |
| 15 April | North Midlands, Drayton Manor Park. |
| 6 May | Spalding Tulip-Time. |
| 13 May | South Leicestershire, at Westfield Activity Centre, Rosemary Way, Hinckley, Leics. |
| 20 May | RAIBC Picnic, with Southampton RSGB Group, at the Fairground, Broadlands Estate, Romsey, Hants. |
| 27 May | Hull & DARS, at Bishop Burton, near Beverley, Yorks. |
| 27 May | Maidstone, "Y" Sportscentre, Melrose Close, Maidstone. |
| 27 May | Northern, at Moorgrange Secondary School, West Park, Leeds. |
| 10 June | Elvaston Castle, Elvaston Castle Countryside Park, Nr Derby. |
| 24 June | Bristol City and County RSGB Group, at Longleat, Warminster, Wilts. |
| 1 July | South Shields and DARC, at Redwell School, Prince Edward Road, South Shields. |
| 7 July | Hanworth Carnival, Hanworth Air Park, Hanworth, Middlesex. |
| 8 July | Cornish RAC. |
| 8 July | Upton, Worcester & DARC. |
| 22 July | Anglian, Suffolk Showground, Bucklesham Road, Ipswich. |
| 5 August | RSGB Woburn Abbey Rally. |
| 19 August | Bristol Mobile Picnic, Ashton Court, Bristol. |
| 26 August | Preston ARS. |

Bilateral ssb

by V. AUMALA, OH2CD*

THIS article outlines the design considerations and practical approach to a bilateral ssb transceiver covering the 80m and 20m bands. Although this bilateral idea is not new, and professional manufacturers have produced versions using bipolar transistors, the possibility of instability problems has deterred most amateurs from attempting the construction of this type of equipment.

The development of the unipolar transistor, and in particular the dual-gate mosfet, has eased these stability problems to the point where the construction of amateur equipment using bilateral stages is now quite a practical proposition. An introduction to bilateral operation is given, followed by a look at techniques of achieving bilateral amplifying stages. Finally a detailed examination is made of the bilateral i.f. stage built by the author.

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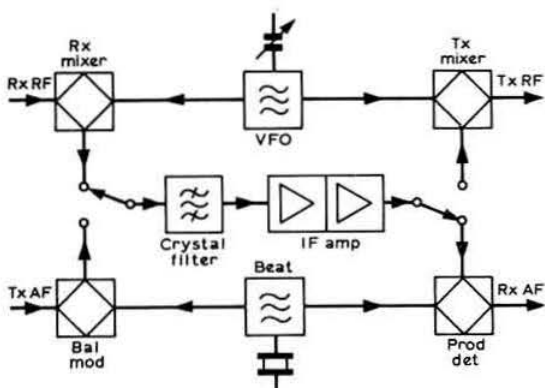


Fig 1. One way of economizing on components in a transceiver. In this circuit the crystal filter and i.f. amplifier are the shared circuits

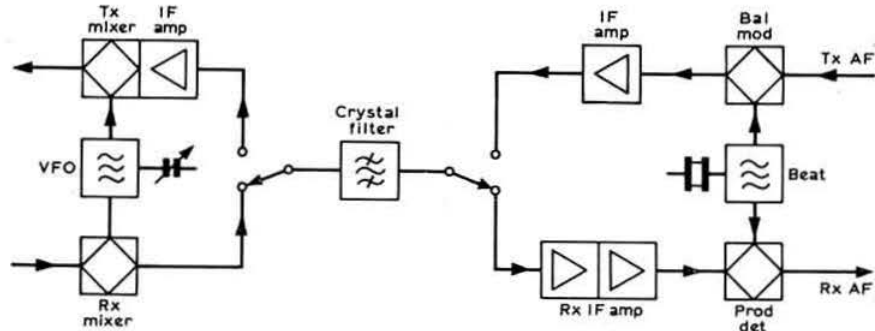


Fig 2. In this transceiver design the only shared circuit is the crystal filter, but duplication of i.f. amplifiers is necessary

Comparison of transceiver designs

In general, practical transceivers are designed round the following three parameters:

1. One channel operation—transmits and receives on the same frequency.
2. One box—transmitter and receiver should be in the same cabinet.
3. As many common circuits as possible, for economy of space and components.

The two most usual ways of combining these requirements in a practical transceiver are shown in Figs 1 and 2. Fig 1 shows an arrangement using a common crystal filter and i.f. amplifier, which are switched between the receive and transmit circuits as appropriate. One difficulty associated with this technique is the beat injection likely to be introduced in the sensitive front end of the crystal filter during receiving. Efficient screening is therefore vital.

If the beat injection could be kept, physically and electrically, away from the sensitive crystal filter input, this problem could be minimized, and this is the object of the circuit shown in Fig 2. However, in this case the only common circuit between the transmit and receive functions is the crystal filter, so duplication of the amplifying circuits is necessary.

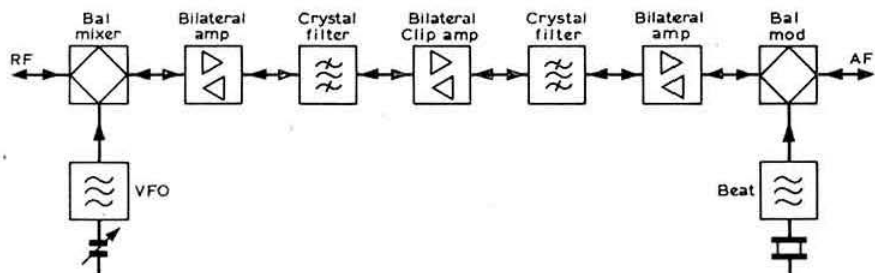
A third method is to use bilateral amplifiers, shown in Fig 3, which are capable of operating as amplifiers in both forward and reverse directions, depending on which is selected. Signal handling becomes straightforward and screening simple, while a maximum number of components common to both receive and transmit functions is achieved. Change of amplifier direction can be performed by switching bias voltages. In the SB33/34 series, where this technique was used, the active components were bipolar transistors, but for amateur construction unipolar transistors (FETs) are a better choice.

Basic bilateral stage

Fig 4(a) shows the basic bilateral stage using two dual-gate MOSFETs. Switching of the MOSFETs is performed by choice of voltage applied to gate 2. When this voltage is $-2V$ the mosfet is switched off, and when $+4V$ the mosfet is switched on. Hence, for receive amplification, the first mosfet has $+4V$ on gate 2, and the second $-2V$ on gate 2. These voltages are reversed for transmit amplification.

Gate 2 can also be used conveniently for compression purposes—for example, to apply a.c. during receiving and

Fig 3. The bilateral approach to transceiver design. Effective use is made of all components, and problems of beat injection to the crystal filter inputs during receiving are overcome



alc during transmitting. If one tuned circuit is double-ended and another single-ended, the small inter-electrode capacitances neutralize the amplifier automatically, making for easy construction and non-critical tuning.

It will be noted that this technique for switching the MOSFETs necessitates a $-2V$ and $+4V$ ht supply. In fact, the $-2V$ circuit consumes an extremely low current, so it is feasible to provide this supply from, for example, a nickel-cadmium cell. Mobile operators may consider this extra power pack a nuisance, so it is possible to obviate the need for a separate ht supply by using the circuit of Fig 4(b), which works in the following way.

The voltage reference used to switch the mosfet on and off is the gate 2/source voltage difference. To switch off the mosfet there is a choice of either holding the source at $0V$ and reducing gate 2 to $-2V$, or holding the source at $+2V$ and reducing the gate 2 voltage to $0V$. The three silicon diodes of Fig 4(b) provide a means of doing the latter, and reduce the ht requirements simply to a $0V/6V$ switchable supply. The voltage between gate 2 and source when this method is used is slightly below $2V$, and although this reduces the dynamic range it is not felt to be a serious drawback.

Fig 4(c) shows the gain characteristics of the MPF121 and MFE121 related to the gate 2/source voltage.

Practical design

The bilateral unit is shown in block diagram form in Fig 5. All the i.f. stages and mixers are on a single pc board. The vfo M71 is used without modification from the original design as in [6]. The minimum-loss bandpass filters are for $80m$ and $20m$ only, this simplifies the pre-mixer stages. The broadband linear amplifier is a push-pull Class AB type with a $12V$ ht and $10W$ output. For mobile/portable operation the round vfo dial should be adequate for frequency setting, although a separate counter may be an advantage for shack work. It is the author's intention to add a vhf transverter ($14/144MHz$) to the system at a later date.

When transmitting, the microphone signal is amplified and compressed, with or without pre-emphasis. Without pre-emphasis the rf clipping can be set to $0-23dB$. In bad working conditions pre-emphasis is added by the flick of a switch; the same switch turns the rf clipping to maximum. The compressor holds the peak af level constant for the balanced modulator and thus improves the linear operation of the microphone chain.

The balanced modulator is a ring mixer with hot-carrier diode quartet, dsb is amplified in one bilateral stage and one sideband then eliminated by a crystal filter. After the second

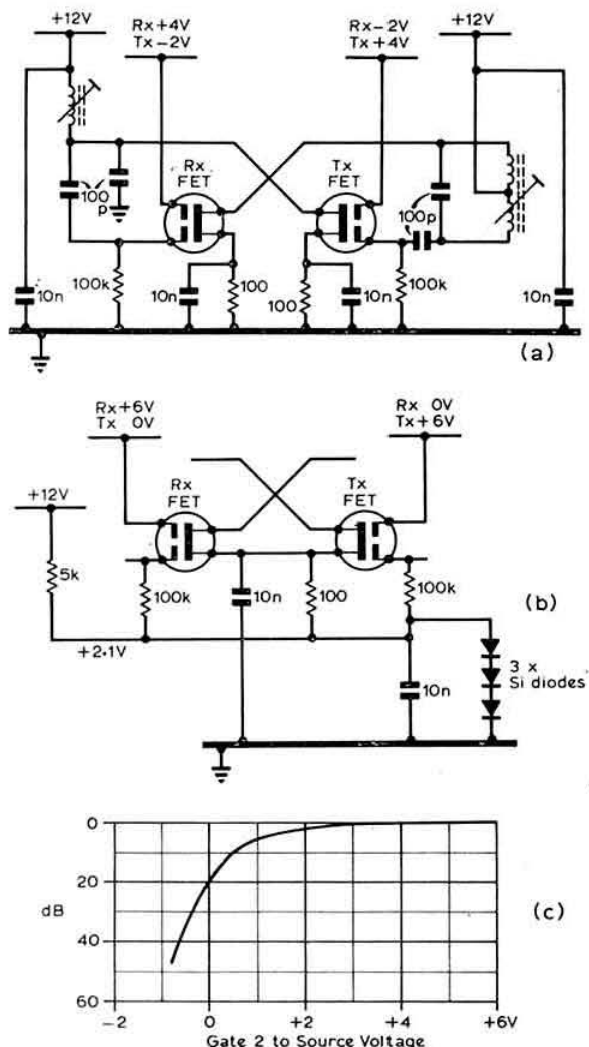


Fig 4. (a) The basic idea of operating two MOSFETs as a bilateral amplifier. Note that two ht supplies are needed: $+4V$ and $-2V$. (b) In this modification only one ht voltage is needed ($+6V$) as the source is held at $+2V$ by the three silicon diodes. (c) The gain characteristics of the MPF121 and MFE121 MOSFETs related to the voltage between gate 2 and source

Fig 5. Block diagram of the complete ssb transceiver

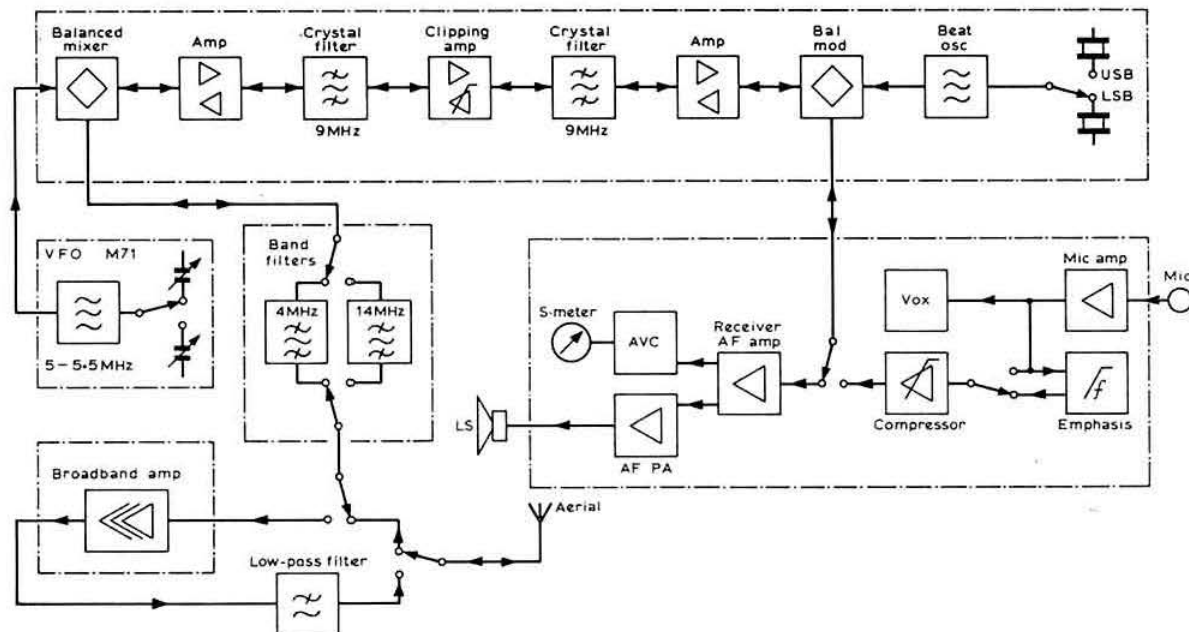
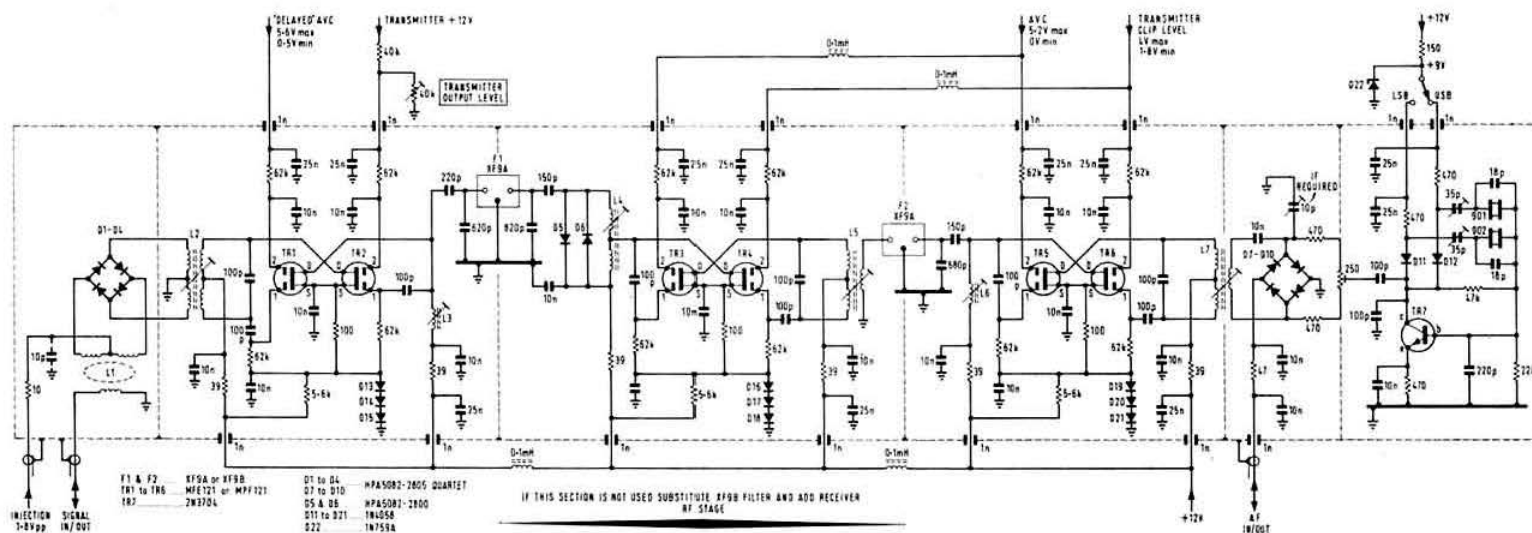


Fig 6. The i.f. strip



bilateral amplifier the signal is clipped and filtered again. The third amplifier feeds a proper level for the rf mixer. Transmitter output level is controlled in this amplifier. The signal is converted from i.f. to rf in a balanced mixer, also with a hcd quartet, which works equally in both directions. A very effective band filter takes care of desired signal purity. After this the signal is raised to the desired power level.

For receiving, the same band filter, mixers and i.f. stages are used. The bilateral amplifier in front of the filter is needed because of the noise figure—the hcd quad gives about 6dB, band filters add about 2dB. A low-noise amplifier here gives a total noise figure of about 8–10dB. This is sufficient for an hf receiver. If another filter and amplifier are not used, there seems to be a need for an rf amplifier to get enough overall gain. The clipping possibility in the transmitting circuit is also lost at the same time.

Circuit description

A schematic of the bilateral i.f. strip is shown in Fig 6. From right to left there is first the beat crystal oscillator. USB and LSB crystals are selected easily with a remote switch. Frequencies are adjusted with 35pF trimmers. Efficient shielding and bypassing restricts beat injection to its own compartment.

The balanced modulator uses a matched quad of hot-carrier diodes. With exact layout symmetry a simple resistive balance is needed, whereas normally pc layouts need a small corrective trimmer capacitor. More than 40dB carrier suppression is easy to achieve. A small amount will stay, because the crystal oscillator output is not a sine wave. Further suppression is obtained with crystal filters, about 20dB in each. The 47 Ω resistor in the af lead is to bypass the beat signal and to adjust the microphone channel output for balanced modulator requirements. This may be varied from 10 to 100 Ω , 47 Ω being a typical value.

Next is the first basic bilateral amplifier stage. The source resistor is common for both FETs. The conducting transistor's current in this 100 Ω resistor increases the gate 2/source voltage difference V_{gs} biasing it further off. Voltage across the diode chain is about 2V. Gate resistors do not need to be 62k Ω exactly, anywhere between 33k Ω and 330k Ω will

do. The 39 Ω resistors are for filtering purposes. The MFE121 is a low-priced, zener-protected device; however, any other dual-gate will do if the 100 Ω source resistor is adjusted for 5–10mA source current. Special care should be taken with non-protected FETs. Only 1nF feed-throughs were found; these must be shunted with 10nF or 25nF discs to give effective bypassing. TR5 drain circuit is double-ended and that of TR6 single-ended. Matching to crystal filter is done by capacitive tapping.

The second amplifier stage is almost identical to the first, the only difference being the clipping circuit. The circuit impedance has to be raised to get the desired degree of clipping. Hot-carrier diodes are ideal clippers, being very fast. Second choice is a pair of diode connected fast silicon transistors (base connected to collector). Usual signal diodes are not recommended. It is important not to amplify the clipped signal before the crystal filter, as the clipper output contains a large number of harmonics.

As all active elements are more or less non-linear, part of the amplification process works like a mixer and mixes harmonics back to the passband as intermodulation products. This is avoided by instant crystal filter selectivity straight after the clipping action. TR4 and TR6 are controlled transmitter amplifiers. Output as a function of gate 2 control voltage is seen in Fig 7. Modulator peak output is held constant by af compression, the clipper output increases 3dB with 25dB clipping, effective clipping degree being 22dB—a practical maximum value. TR3 and TR5 are avc-controlled receiver amplifiers.

The third amplifier is similar to the others. TR2 has a double-ended tank and TR1 a single-ended. When transmitting, the clipper output is constant; the transmitter output is controlled by the gate 2 voltage of TR2, whose maximum output is well within the balanced mixer's dynamic region. Note that excitation is foolproof; the clipper guarantees the peak value below a certain limit and no alc is required. TR1 is an agc-controlled receiver amplifier. AGC must be "delayed"; its amplification should always be slightly greater than that of others to keep noise figure and dynamic behaviour to an optimum.

The balanced mixer uses a hot-carrier diode quartet and does not seem to need trimmed balance. L1 is a high- μ toroid and of broadband construction. Better balance could be achieved with two cores, but this only has real effect above 40MHz. Injection is brought via a 10 Ω resistor, possibly bypassed with a 10pF capacitor, and used as switching voltage for hot-carrier diodes. This is a very fast device working well into the gigahertz region, thus high-order harmonics are generated in diodes, and the 10pF and 10 Ω are to prevent these harmonics from radiating through the injection lead.

Kristallverarbeitung (KVG) crystal ssb filters XF9A and XF9B are the only types to be chosen. The XF9B is a computer-controlled product with eight crystals in a very small package plus two additional oscillator crystals. It has 3dB insertion loss and about 100dB stop-band rejection.

Those amateurs who want a simple mobile rig could leave the clipping amplifier and another filter out. The loss of amplification may call for an rf amplifier with "delayed agc" applied to just this stage, the printed circuit board is easy to shorten for this use. Fig 8 shows the pc board layout, component layout is shown in Fig 9. The MOSFETs are installed upside down; 5mm holes are drilled in the pc board and the transistors are sunk down to the collar. One

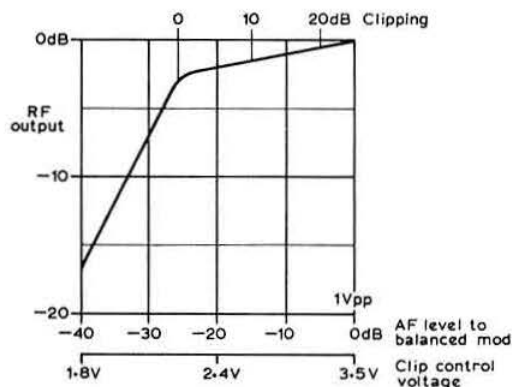


Fig 7. RF clipping level as a function of af level or clipping control voltage

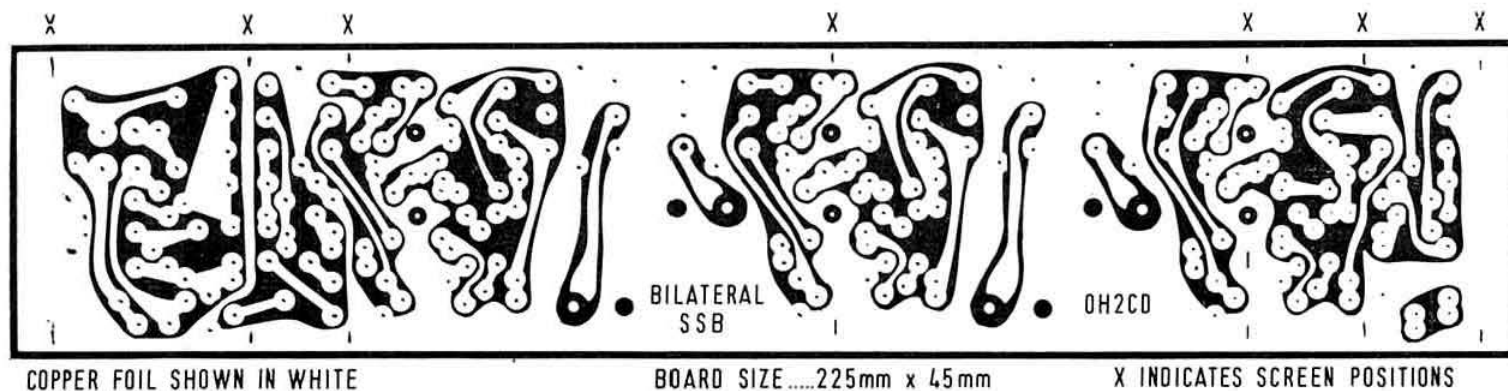


Fig 8. Printed circuit board of i.f. strip

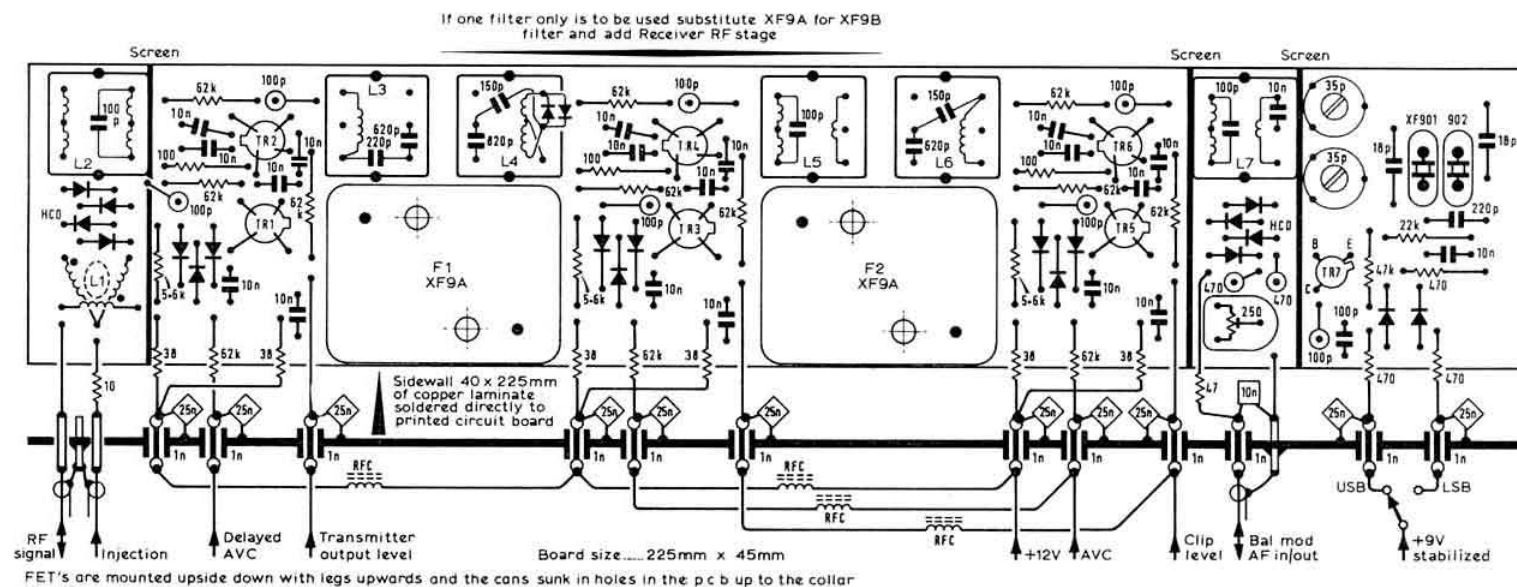
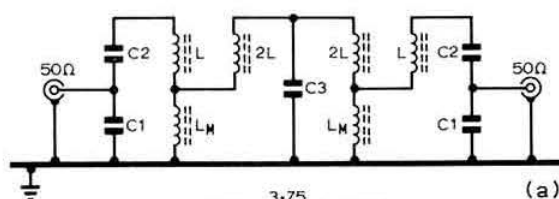
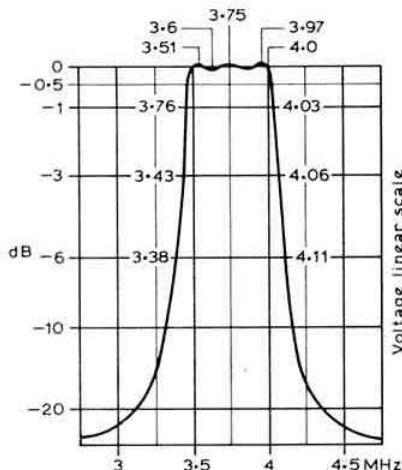


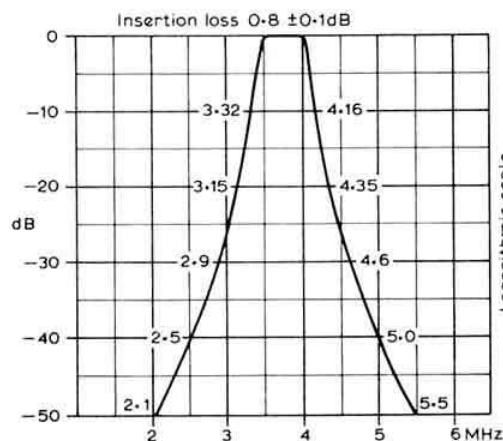
Fig 9. Component positions on i.f. strip



(a)

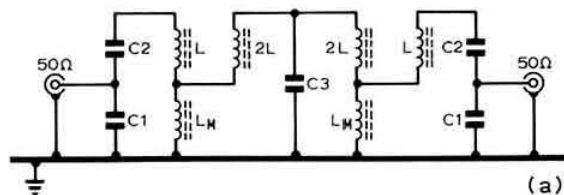


(b)

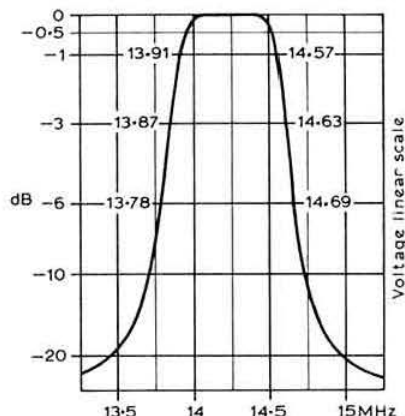


(c)

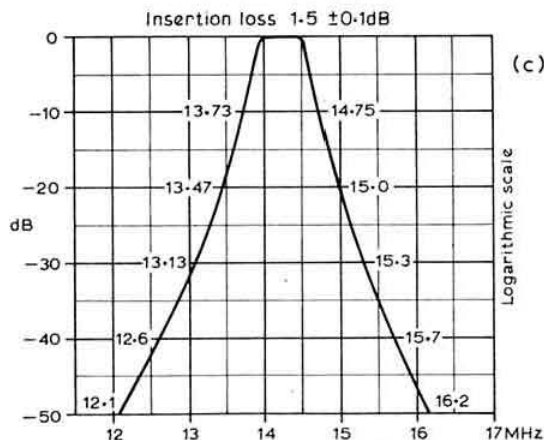
Fig 10. Response of 80m minimum loss filter



(a)



(b)



(c)

Fig 11. Response of 20m minimum loss filter

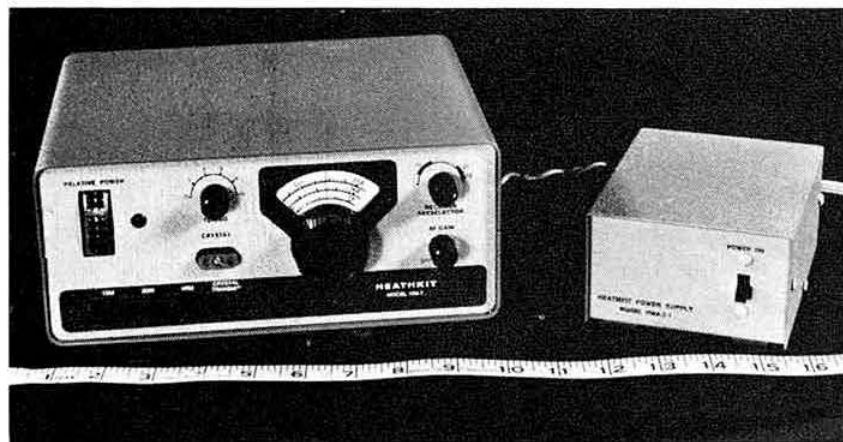
sidewall is made of copper-clad laminate containing feed-throughs, the other three shielding directions being chassis and cover.

Fig 10 shows the 80m filter curves.

The filter is tuned just once and switched in coaxial leads. With two sections a filter with almost ideal response is realized. The 20m filter response is shown in Fig 11. Comparison with the 80m filter shows the insertion loss to be greater, (due to the smaller relative bandwidth), and the skirts to be a bit wider. Because Figs 10 and 11 are self-explanatory, these may serve as a good starting point for other bands. L_m and $C1/C5$ both affect coupling and are used to widen or decrease the bandwidth. A sweep-generator is a big help when adjusting these filters.

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- [3] Taub and Bogner: "Design of three-resonator dissipative filter having minimum insertion loss" *Proceedings of the IRE* May 1957.
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- [5] Schreuer: "Speech clipping in ssb equipment" *Ham Radio* February 1971.
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The Heathkit HW-7 CW transceiver

In these days when high-power equipment and large aerials are on the increase, the wisdom of producing a low power cw transceiver may well be questioned. Notwithstanding the increasing popularity of ssb there are many operators who prefer cw as their method of communication. Indeed the practice of low power cw operation has many adherents and there are several clubs and numerous operating awards catering for this activity. To offset the advantage of higher power used by other stations, the low power operator must make full use of his operating skills if he is to obtain worthwhile results. The small and portable transceiver can be used from many locations where more complex equipment would be out of place. It is not dependent on a mains supply nor on a car battery and can be successfully used with lantern batteries as the power source. On reflection, therefore, it may well be that the HW-7 will prove to be a popular item of equipment.

Design features

The receiving section uses the direct conversion principle with a dual-gate mosfet product detector which produces an audio signal from mixing of the received signal and the vfo signal. Receiver selectivity is provided by a low-pass filter

between the detector and audio stages. The latter are contained in an integrated circuit providing about 100dB of gain. Output is intended for high impedance headphones. Apart from some early model receivers (for which modification kits are available) all units will have filters suitable for cw reception. RF tuning is accomplished by a control marked PRESELECTOR which is in fact a peaking control for each band.

A built-in vfo is used for both the transmitter and receiver operation. The oscillator and buffer stages use fet type MPF 105 with the latter capacitor-coupled to a doubler/tripler. The next stage may be a crystal oscillator or driver and this feeds the two paralleled output transistors. A pi-network output circuit is used for impedance matching. An external switch selects either crystal or vfo control, and in the former case the output frequency will be that of the crystal. The vfo operates on either 3.5 or 7MHz, and the final output on the 7, 14 and 21MHz bands is obtained in the following way:

Oscillator (TR2)	Buffer (TR3)	Doubler/tripler (TR4)	Driver/output (TR5) (TR6/7)
3.5	3.5	7.0	7.0MHz
7.0	7.0	14.0	14.0MHz
7.0	7.0	21.0	21.0MHz

The frequency coverage on each of the three bands is:
7.0 to 7.2, 14.0 to 14.2 and 21.0 to 21.3MHz.

Two transistors provide an adjustable delay circuit for aerial switching and a further two comprise a sidetone oscillator. Keying of these stages together with the transmitter driver stage and muting of the receiver is achieved by a further silicon bipolar transistor. The aerial changeover relay forms an integral part of the transceiver.

Performance

Transmitter operation presented no problems. The transmitted signal was clean and the vfo was electrically and mechanically stable. The vfo was set to read 7,050kHz on a counter and during the first 12min after switch-on drifted 20Hz low

Specification

Dimensions: 9½ in wide by 8½ in deep by 4½ in high.

Weight: 4½ lbs.

Power required: 13V dc, 35mA receive, 400mA transmit.

Frequency coverage: 7 to 7.2, 14 to 14.2 and 21 to 21.3MHz.

Power output: at least 2W on all bands.

Sensitivity: readable cw signal with 1µV (or less) input.

Price: kit HW-7 £35, 12V dc power supply for ac mains operation, kit/HWA-7-1 £7.50 (both prices plus carriage).

Manufacturer: Heath (Gloucester) Ltd, Gloucester, GL2 6EE.

and then returned to the initial frequency. After a further 18min the vfo frequency had moved 10Hz low. The dial is calibrated every 5kHz.

The specification provides for spurious and harmonics to be at least 25dB down on the fundamental. Under test this was achieved without difficulty but use of the TUNING control calls for some care. Due to the use of direct conversion circuitry the vfo must be offset and this can be automatically achieved by tuning from high to low frequency. This feature is at first somewhat disturbing but after some use presents no problems.

When correctly peaked the receiver is noticeably microphonic. The manual acknowledges this effect without stating its cause. One is tempted to believe that mechanical isolation of the appropriate part of the circuit might have had beneficial results.

The level of the sidetone signal is high, probably a good fault since it is easier to attenuate this rather than produce additional audio. A preset control would not cause any installation difficulties.

In keeping with the compact construction the front panel controls are small, particularly for those with other than delicate hands. The tuning rate on the PRESELECTOR control is fast and in the reviewer's opinion a slow-motion drive is essential to obtain best results. There is ample room for the manufacturer to accommodate a small variable capacitor with a built-in reduction arrangement.

Assembly

The cabinet and panels of the HW-7 are of heavy gauge aluminium finished in the usual Heath style. The majority of the components are mounted on the single circuit board. The equipment provided for review came assembled but a reasonable estimate of construction and alignment time would be seven to eight hours. As usual the assembly manual is a model of its type and provides the constructor with clear instruction on all relevant points.

Operation

After an initial period of familiarization no difficulties were experienced in handling the equipment. The physical problems

of the controls have already been mentioned. The selectivity provided is very suitable for cw operation and adequate audio is obtainable. However, operation on 7MHz presented some problems due to the existence of high-power broadcast stations (in an alleged amateur service exclusive band) which were audible as a background if the preselector was not very carefully adjusted. It is considered that an aerial tuning unit would provide benefits on both receive and transmit.

Care is also needed when adjusting the TUNING control prior to transmitting. A small maladjustment of this control can produce output on frequencies other than those in the three amateur bands. The relative power output meter is not an infallible guide when tuning up.

Best results on both transmit and receive were obtained when using a sharply resonant aerial such as a beam. On receive, the adjacent channel signals were attenuated and the gain on transmit was invaluable. Power output on all three bands was measured as fractionally exceeding 2W into a 50Ω load.

Conclusion

If you are a low-power enthusiast with a leaning to portable operation the HW-7 should appeal to you. Alternatively, when the linear gets hot and you feel able to accept the challenge of making some contacts the hard way then this transceiver will fill your requirement. The satisfaction will be your reward.

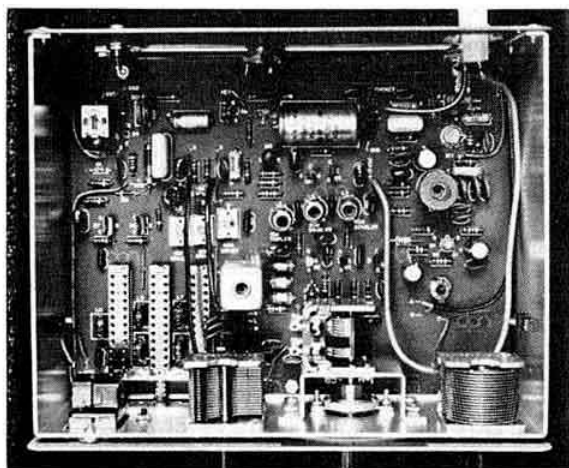
The several disadvantages mentioned are no greater in comparison than those experienced with equipment costing 10 times as much. Moreover, remedial action should not be difficult or expensive and it is hoped that Heath engineers will accept as constructive the comments that have been made.

Product News

Cordless soldering iron

The world's first cordless soldering iron is now available in the UK. The iron uses a power source which is automatically recharged from the mains when the iron is placed in the stand. The iron has a working light, push button operation and pilot light, all useful safety features. The iron heats up in three to five seconds and has heavy-duty iron-plated tips. As supplied the iron comes with recharging stand and fine point soldering tip at a cost of £9.25. Exclusive distributors of this unusual soldering iron are Pact International Electronics Ltd, PO Box 19, Royston, Herts, SG8 5HH.

Arrow Electronics Ltd, a subsidiary of LST Electronic Components Ltd, have recently produced a second edition of their 50-page catalogue. This lists a very complete range of semiconductors, capacitors and resistors together with a large variety of other items all useful to the home constructor. Orders under 50p are subject to a 10p handling charge and any order over £4 is subject to an automatic discount of 10 per cent. Packing and postage is free within the UK. Copies of the catalogue may be obtained by sending a remittance for 10p to Arrow Electronics Ltd, 7 Coptfold Road, Brentwood, Essex.



Component layout

Improved harmonic attenuation in hf amateur transmitters

by Dr A. Gschwindt, HA5WH*

FOR transmitters operating in the amateur bands the CCIR recommendations define the necessary harmonic attenuation. For a 100W output power level, the relative level of the harmonics must be a minimum of 40dB below the fundamental carrier level.

The usual configuration for the output of pa stages is the simple pi filter. The attenuation of the pi filter is sometimes lower than -40dB. This is true for the high current, low dc voltage tetrodes (line output valves) where the optimum load is only a few hundred ohms. The construction of the pi circuit is difficult, particularly for the 21 and 28MHz bands.

In the professional transmitter, having the same output power as before, the output circuit is a pi-L arrangement. This solution gives some advantages over the simple pi circuit, namely:

1. It gives practical values for the circuit elements in the case of low optimum valve loading resistance.
2. It has greater harmonic attenuation than a simple pi circuit.
3. It is possible to use lower value tuning capacitors for the 3.5MHz or 1.8MHz bands.

Some disadvantages of the pi-L circuit:

1. The circuit has lower flexibility for the greater values of vswr than the pi circuit, in the case of two-capacitor tuning.
2. The circuit complexity is larger for the pi-L circuit because of the two inductances.

The pi-L circuit gives some advantages for the suppression of television interference.

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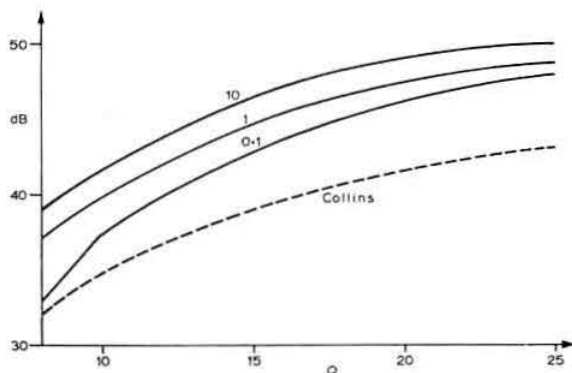


Fig 1. Comparison of attenuation between pi-L and pi (Collins) networks

Harmonic order	pi circuit attenuation (dB)	pi-L circuit attenuation (dB)	Improvement of the pi-L (dB)
2	41.4	47.3	5.9
3	53.4	62.8	9.4
4	61.4	73.3	11.9
5	67.4	81.3	13.9

Fig 1 shows the comparison between the second harmonic attenuation of the pi and pi-L circuits as a function of the loaded Q factor. It is clear that the pi-L circuit offers 6dB improvement over the pi.

To illustrate the attenuation differences between pi and pi-L, consider the two circuits in a simple example, assuming that the circuit transforms the 70Ω load resistance into 700Ω for the valve operating in the 28MHz band. The loaded Q factor is the same (20) for the two circuits. The Q factor is determined by:

$$Q = 2\pi \frac{W_m}{W_d}$$

where: W_m = maximum stored energy

W_d = dissipated energy during one period.

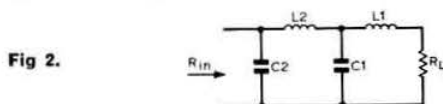
The efficiency of the matching circuit is approximately:

$$\eta \cong 1 - \frac{Q}{Q_0}$$

where Q_0 is the unloaded Q factor.

The choice of the value of loaded Q is based on a compromise between harmonic attenuation and circuit losses.

The calculation of the pi-L circuit is more complicated than in the case of a simple pi circuit. The elements of the pi circuit are determined by the desired input and load impedances and by the Q factor. For the pi-L circuit there is one more variable parameter. This could be, for example, a capacitor in the circuit. The circuit diagram with the element placing is seen in Fig 2.



Available literature gives methods for the calculation of pi-L circuits but they have a common failing, in that they do not use the Q factor as a basic parameter. In this method, however, the Q factor is an input factor. For the higher bands, in practice, C2 is determined by the output capacitance of the valve and stray capacitances. As a parameter, this capacitor is selected for the lower frequency bands only.

The value of C2 determines the maximum amount of harmonic attenuation. This fact could be interesting on the lower bands where C2 is a free parameter, and is illustrated in Table 2. C_{opt} was determined by a computer to give the pi-L circuit attenuation maximum for the 2nd harmonic.

Further data:

$$\begin{aligned} f &= 14.25\text{MHz} \\ R_L &= 50\Omega \\ R_{in} &= 1000\Omega \end{aligned}$$

It can be seen that in the case of the optimum C2 capacitors, there are not large differences in the 2nd harmonic attenuation. It has thus been proved that C2 is indeed a free parameter and its value would be as large as is convenient from other points of the pi-L circuit determination.

Q	Copt	TABLE 2	
		2nd harmonic attenuation if C2 = Copt	2nd harmonic attenuation if C2 = 40pF
15	56.6	46.2	46.1
20	70.1	48.6	48.4
25	82.2	50.4	50.1

To determine the values of the elements, there must be the following parameters:

R_L = load impedance
 R_{in} = input impedance of the pi-L circuit
 $C2$ = input capacitance
 f = working frequency
 Q = loaded Q factor

From the parameters the value of $L1$, $L2$ and $C1$ will be determined by the help of the following formulas:

$$\begin{aligned}\omega &= 2\pi f \\ R' &= \frac{R_{in}}{R_L} \\ Q3 &= \omega C2 R_{in} \\ n3 &= 1 + Q3^2 \\ a &= 1 - \frac{R}{R3} \\ s &= Q2 - Q3 \\ b &= 2s \\ c &= s^2 + a \\ Q2 &= \frac{b - \sqrt{b^2 - 4ac}}{2a} \quad \left(\text{if } a = 0 \text{ then } Q2 = \frac{c}{b} \right) \\ n2 &= 1 + Q2^2 \\ n1 &= R' \frac{n2}{n3} \\ Q1 &= \sqrt{n1 - 1}\end{aligned}$$

To check the calculation, it is useful to determine Q as

$$Q = Q1 + Q2 + Q3$$

Further

$$\begin{aligned}R1 &= R_L \times n1 \\ R2 &= \frac{R_{in}}{n3} \\ C1 &= \frac{Q1 + Q2}{\omega R1} \\ L1 &= \frac{R_L \times Q1}{\omega} \\ L2 &= \frac{R2(Q2 + Q3)}{\omega}\end{aligned}$$

The circuit elements are measured in ohms farads and henries respectively.

To conclude, the following example gives the variations of the pi-L circuit elements for two given C2 capacitor:

The starting conditions are:

$$\begin{aligned}R_L &= 70\Omega & \omega &= 2\pi f = 2 \times 3.14 \times 3 = 22.62 \text{ Mrad/sec} \\ R_{in} &= 700\Omega \\ Q &= 20 \\ f &= 3.6 \text{ MHz} & R' &= \frac{R_{in}}{R_L} = \frac{700}{70} = 10\end{aligned}$$

Let it be in the case (a) $C2 = 400\text{pF}$
 case (b) $C2 = 300\text{pF}$

For (a)

$$\begin{aligned}Q3 &= \omega C2 R_{in} = 22.62 \text{ M} \times 400 \text{ p} \times 700 = 6.33 \\ n3 &= 1 + Q3^2 = 1 + (6.33)^2 = 41.1\end{aligned}$$

TABLE 3. The value of capacitor C2 in the pi-L filter may be reduced to suit the high frequency bands—a distinct advantage over the simple pi filter

f (MHz)	C2(pF)
3.65	440
7.05	220
14.175	110
21.225	100
28.85	90

$$\begin{aligned}a &= 1 - \frac{R}{n3} = 1 - \frac{10}{41.1} = 0.757 \\ s &= Q - Q3 = 20 - 6.33 = 13.67 \\ b &= 2s = 2 \times 13.67 = 27.34 \\ c &= s^2 + a = 13.67^2 + 0.757 = 187.63 \\ Q2 &= \frac{b - \sqrt{b^2 - 4ac}}{2a} = \frac{27.34 - \sqrt{27.34^2 - 4 \times 0.757 \times 187.63}}{2 \times 0.757} = 9.21 \\ n2 &= 1 + Q2^2 = 85.82 \\ n1 &= R' \frac{n2}{n3} = 10 \frac{85.82}{41.1} = 20.88 \\ Q1 &= \sqrt{n1 - 1} = \sqrt{20.88 - 1} = 4.46\end{aligned}$$

Check:

$$Q1 + Q2 + Q3 = 4.46 + 9.21 + 6.33 = 20$$

so the previous data is correct

$$\begin{aligned}R1 &= R2 n1 = 70 \times 20.88 = 1,462\Omega \\ R2 &= \frac{R_{in}}{n3} = \frac{700}{41.1} = 17\Omega \\ C1 &= \frac{Q1 + Q2}{\omega R1} = \frac{4.46 + 9.21}{22.62 \text{ M} \times 1,462} = 413 \text{ pF} \\ L1 &= \frac{R_L Q1}{\omega} = \frac{70 \times 4.46}{22.62 \text{ M}} = 13.8 \mu\text{H} \\ L2 &= \frac{R2(Q2 + Q3)}{\omega} = \frac{17 \times (6.33 + 9.21)}{22.62 \text{ M}} = 11.7 \mu\text{H}\end{aligned}$$

For the case (b) where $C2 = 300\text{pF}$

$$C1 = 261 \text{ pF} \quad L1 = 18.5 \mu\text{H} \quad L2 = 18.4 \mu\text{H}$$

The method of improving the harmonic attenuation of hf transmitters described in this article should be encouraged for all amateur constructors. The improved performance thus obtained will be to the benefit of all users of the amateur bands.

Appendix

The design of a practical five-band matching configuration will now be considered. It is first necessary to evolve some pi-L calculation expressions, which is done in the following manner.

The pi-L circuit can be thought of as three separate parts, each one an L circuit, as shown in Fig 3. Furthermore this transformation can be arranged so that the input impedance to each section is real. Each section is practically a simple LC circuit.

If the Q of each circuit is denoted as $Q1$, $Q2$ and $Q3$, then the resultant Q is given by:

$$Q = Q1 + Q2 + Q3$$

f (MHz)	C1 (pF)	C2(pF)	L1 (μH)	L2 (μH)	R1(Ω)	R2(Ω)	Q1	Q2	Q3	$\frac{V_{C1}}{V_{Ap}}$
3.65	634	440	9.03	8.42	683	13.7	2.96	6.98	7.06	0.988
7.05	307	220	4.92	4.61	749	14.7	3.11	7.06	6.82	1.03
14.175	154	110	2.43	2.27	739	14.5	3.09	7.05	6.85	1.03
21.225	201	100	0.921	0.908	285	7.94	1.75	5.91	9.33	0.635
28.85	249	90	0.337	0.474	123	5.33	0.873	4.71	11.4	0.42

Table 4. Showing component values and circuit parameters for a five band pi-L filter

The transformation forms for the LC circuit are summarized in Fig 4. Using these step by step on the circuit of Fig 3, calculating first R1 and then R2, leads to the result:

$$R_{in} = \frac{(1 + Q1^2)(1 + Q3^2)}{1 + Q2^2} R_L$$

If C2 is given, Q3 is determined by

$$Q3 = R_{in} \omega C2$$

This expression can be used to determine the values of Q1 and Q2. From here the pi-L component values can be determined as in the article.

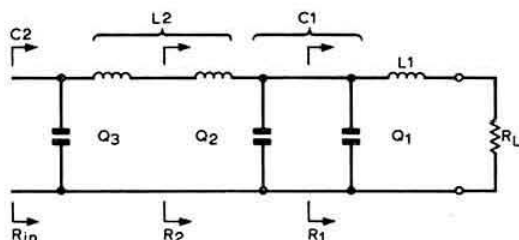


Fig 3. The pi-L circuit is most easily analysed by considering it to be composed of three separate L circuits. The division can be arranged so that each section has a real input impedance

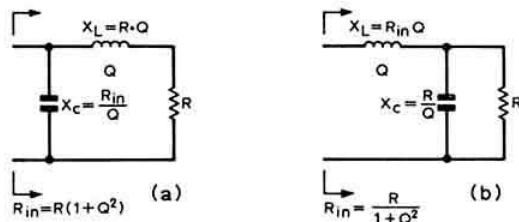


Fig 4. The overall input impedance (R_{in}) of the pi-L filter can be calculated step-by-step, considering each LC section in turn

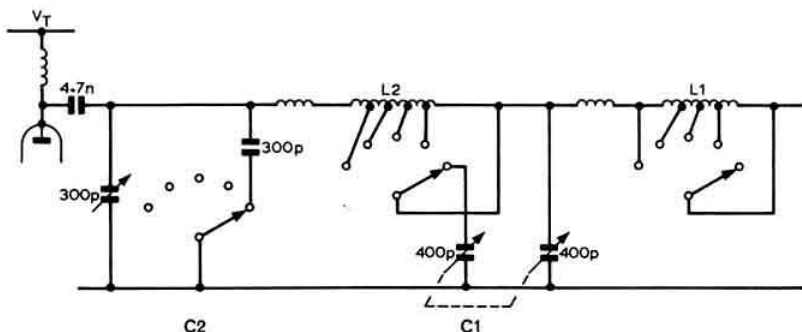


Fig 5. A practical circuit for a pi-L filter

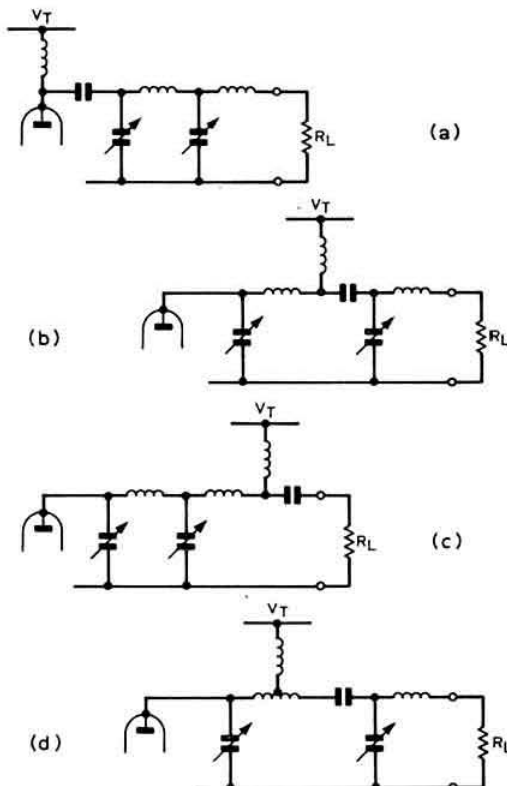


Fig 6. There are a number of alternative connecting points for the ht supply, as explained in the text

In a practical configuration, the currents and voltages for the inductors and capacitors must be known. The current in L1 is equal to the output current, the current in L2 is given by

$$I_{L2} = I_{a1} \cdot n3$$

where I_{a1} is the pa anode current fundamental component, and $n3 = 1 \div Q3^2$ as introduced in the article.

The voltage for the capacitor C1, located in the middle of the pi-L arrangement is given by

$$V_{C1} = V_{pa} \sqrt{\frac{R_1}{R_{in}}}$$

The calculation of the five-band matching circuit can now be considered.

The initial conditions are: $Q = 17$, $R_{in} = 700\Omega$, $R = 70\Omega$.

Reference to Table 3 shows that the value of capacitor C2 may be reduced freely in the case of the higher frequency bands (from 14 to 28MHz) by keeping the loaded Q to a constant value ($Q = 17$). This ability to use a very small value of C2 is, of course, a great advantage over the simple pi filter, where the valve output and stray capacitance determine the minimum value for C2. Component values and circuit parameters for the five bands are shown in Table 4.

Fig 5 shows one possible practical circuit for a pi-L filter. There are several possible ways for providing the dc supply, as illustrated in Fig 6. In the case of Fig 6(a) the

inductors and variable capacitors are effectively blocked to dc, however there is a disadvantage in that a high-reactance inductor must be used for the dc feeding, as the pa load impedance of the valve is generally high.

The circuit of Fig 6(b) could be used if the impedance is lower for the dc feeding point than the load impedance of the valve. However, this situation only exists for the 21 and 28MHz bands, so for the five-band filter this method would not be suitable.

Fig 6(c) shows an ideal solution for a low-impedance choke, bearing in mind that the capacitors are again subject to both dc and ac voltages.

Fig 6(d) shows an arrangement which has very good properties if the transmitter is used for one-band only operation. Connection is made to the low-impedance point (R2) on the inductor L2, but, of course, the location of this point varies from one band to another. Another disadvantage is that the capacitor at the anode must cope with both dc and ac voltages.

The optimum position for the dc decoupling capacitor is at a high-impedance point, where the value of the capacitor will be low. From this point of view the arrangement of Fig 6(e) is the worst.

References

- 1) *Radio Transmitters: RF Power Amplification*, by V. O. Stokes, Van Nostrand Reinhold Company, London, 1970.

RECIPROCAL LICENSING

Addresses of the licensing authorities (or agencies) in countries with which the UK has a reciprocal licensing agreement.

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TECHNICAL TOPICS

by PAT HAWKER, G3VA

WITH this month's notes, *Technical Topics* completes 15 years of existence—so I may be excused a brief look back in a personal "XV Jubilee" before getting down to the serious task of reviewing the latest news from the technical front. It seems a long time—and many, many words—since April 1958 when *TT* presented a transistorized cw monitor, an item on the then little-known bridge neutralizing circuit for tetrodes and a few brief notes on receiver trends. In the interim period, amateur equipment has changed a good deal—though perhaps less than some newcomers might suppose. Already in 1958 the future was with us: transistors had been creeping into amateur consciousness for several years despite their initial high cost—the first major solid state application had appeared in the form of transistorized power dc-dc converters for mobile operation—though the field effect devices and integrated circuits were hardly a shadow on the horizon. The day of the ssb transceiver was dawning—by coincidence a review of the first to make a real impact (the Collins KWM-1) was in the April 1958 issue of *QST*—but the era of the high-power audio modulator was still very much with us and a 150W amplifier featuring zero-bias operation of a pair of KT88s was in the April *RSGB Bulletin* (yes, it really was the *Bull* then!). Popular amateur receivers included the Hallicrafters SX101, the National NC300, the Gecoso G209 (and, as ever, the AR88 and HRO); the new Drake 1A had just appeared but the "ultimate" was undoubtedly the Collins 75A4. The main difference in the market place was that in all *QST*'s 176 pages or the *Bull*'s modest 48 pages there was nary a whisper of Japanese amateur-radio equipment.

Looking back over all the many changes in component practice that have come since then, I would (perhaps to my own surprise) plump for the silicon power diode as the single item which has had most practical impact on the average amateur station, improving so radically, and making it so much easier to obtain, dc supplies at all voltages. It may seem strange to pick a humble and normally unsung device with an operating frequency of 50Hz, rather than any of the more exotic digital, megahertz or even gigahertz wizardry, but I suspect that more present day stations are improved by silicon diodes than by any other single product of the great semiconductor revolution.

Double-balanced fet mixers—the ultimate in semiconductor mixers

Over the past few months we have drawn attention several times to the recent development of semiconductor mixers of extremely wide dynamic range based on power FETs of the Siliconix U310 or Crystalonics CP640-series type. At the same time it was suggested that the ultimate in semiconductor mixers—at least as of now—would seem to be the use of these devices to form double-balanced quad wideband mixers.

An early reference to this approach is to be found in the digest of a paper by R. P. Rafuse, "symmetric mosfet mixers of high dynamic range" presented at the 1968 International Solid-state Circuits Conference. Thanks to Ed Oxley of

Siliconix we recently obtained this digest which describes an experimental hf mixer with a log dynamic range of 115dB or roughly 40dB better than the mixer arrangement used in the famous R390 receiver, often described as one of the best hf receivers ever made. At 10MHz, the Rafuse mixer (developed at MIT research laboratories) could not be saturated with the maximum available signal power of +22dBm, whereas a +3dBm signal was enough to saturate completely the R390 mixer. In a practical arrangement, as a result of reciprocal mixing, the local oscillator noise conversion was the limiting factor, giving an overall dynamic range of about 130dB. This allowed signals of between 10 and 100 μ V to be received in the presence of unwanted aerial input signals, only 10kHz off tune, of 2 volts. The Rafuse mixer (see Fig 1) used four Fairchild 2N4067 devices. Note the very high local oscillator power of 2-3W.

Ed Oxley has been working on the development of a vhf wideband mixer (50 to 250MHz) using four U310 devices; the basic configuration is given in Fig 2. In a recent letter he reports that this project has now been successfully completed with most gratifying results—and will be written up in a forthcoming Siliconix application note. Table 1 shows the results he has achieved with a quad of U310 fet chips in a dual-in-line package (14-pin dip), from which it can be gathered that this is, indeed, a prince among mixers.

He also provides some "whys and wherefores" on his results. He writes: "Gain was somewhat low because the drain load used to hold the drain resistance to the values shown was the old classical pi-match network feeding a Relcom BT-9 16 : 1 transformer, which has an insertion loss of nearly 3dB (see my article in *Electronic Design News* 5 January 1973 pp 66 ff). The overall noise figure (single sideband) was a bit high because the input matching transformer network was a bit lossy. Because of the input impedance of the common-source quad it was necessary to design

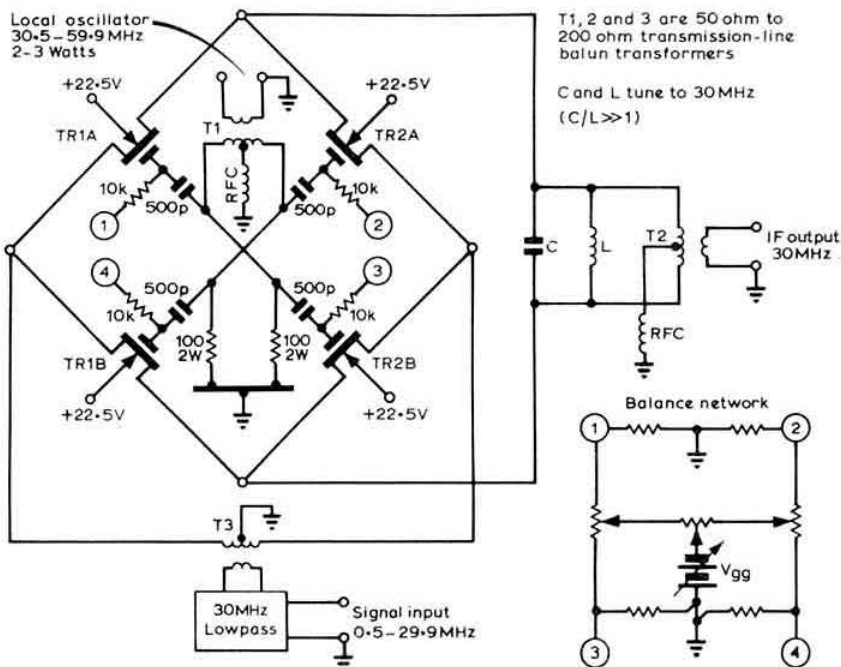
Table 1. Double-balanced jfet mixer specifications

Double-balanced mixer using jfet nzt quad (four U310s)

1. A.M. local oscillator noise rejection	45dB typical	
2. Interport isolation between signal and local oscillator ports	35dB typical	
3. Dynamic unbalance	0.15dB max	
4. Overall noise figure (ssb)	8dB	
5. Instantaneous bandwidth	50-250MHz	
6. Gain	Drain load (R)	7. IMD intercept
2-2dB	1200 Ω	+34dBm
4-2dB	1700 Ω	+32dBm
4-8dB	2500 Ω	—
7-5dB	5000 Ω	+30dBm
8. Desensitization (level of unwanted signal required to reduce desired signal by 1dB. Signals separated by 200kHz; desired signal input at -15dBm)		+13dBm
9. 1dB compression level		+14dBm
10. Isolation between local oscillator and i.f.		60dB min

Conditions: $V_{DD} = 20V$; $V_{GS} = 1V$; local oscillator power +15dBm

Fig 1. Broadband (0.5 to 29.9 MHz) mosfet mixer with high dynamic range as described by Rafuse



an unbalance-to-balance 50Ω to 25.0-25Ω phase-splitting input transformer with wide bandwidth and tight phase-tracking performance. Actually my design works better than the Rafuse!"

mixer. But it should be appreciated that what we are describing is a semiconductor mixer with the signal handling capabilities of a balanced beam-deflection mixer; this really is a significant breakthrough.

Setting nbfm deviation

In *TT* (October 1971) we included a phase modulator stemming from C. F. Robjohns, G8CBZ, and reported also his view that for the amateur with a standard hf communications receiver it was better to receive phase-modulated signals as though they were sideband, using a bfo or carrier re-insertion oscillator, rather than by tuning the receiver to provide relatively inefficient slope detection. This is possible because nbfm can be thought of as ssb with the carrier re-inserted 90° out of phase.

A further application of this same concept turns up in *QST* (December 1972) where D. Collins, K4GGI/1, notes that it provides a simple means of setting nbfm (6F3) deviation. He writes: "Use an ssb receiver with the exalted-carrier method of reception, that is, tune the nbfm signal as though it were ssb (zero beat with carrier), then adjust the transmitter modulation level to a point slightly below where the audio begins to get distorted—and the job is done. The theory behind this procedure is that the sidebands in an nbfm phase-modulated signal are indistinguishable from those in a dsb or a.m. signal. The only difference between the two is that in nbfm the sidebands and carrier are 90° out of phase; by, in effect, replacing the original carrier with the exalted carrier (ie by inserting a stronger, locally-generated carrier), the received signals will appear to be identical with a.m.-type transmissions if (and only if) the transmitted signal is truly narrow-band.

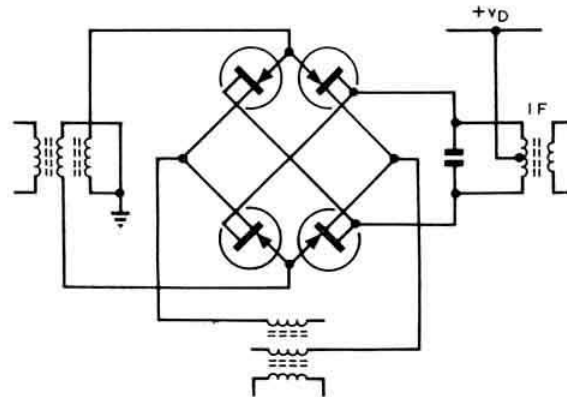


Fig 2. Basic configuration of the 50-250MHz mixer developed by Ed Oxley using four Siliconix U310 FETs

In presenting this latest information—which really points the way to hf and vhf receivers of exceptional performance—it is necessary to add the warning that four power fet devices of the U310 class represent a pretty high cost arrangement. A lower cost, but still quite effective, approach would be a single power fet in front of a Schottky-diode double-balanced

Crystal discriminator for nbfm

An article in *Tuned Lines* (the newsletter type journal of the vhf/tv group of the New South Wales division of the Wireless Institute of Australia) on crystal filters and discriminators draws attention to the use of quartz crystals in fm discriminators. We seem to recall (but cannot trace) that this idea has been mentioned before in *Radio Communication* but it is likely to be new to quite a few readers. The *Tuned Lines* article (author is not by-lined) states:

"A discriminator network provides a dc voltage output which, ideally, varies directly with the input frequency over a specified bandwidth. When used in an fm receiver it can recover (with low distortion) the audio signal from the incoming fm signal.

"In applications where high stability and sensitivity are particularly important, a discriminator network using a

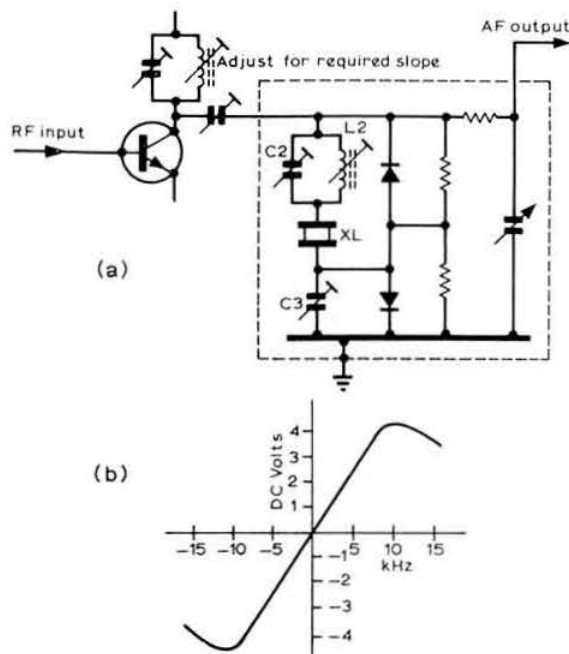


Fig 3. Narrow-band fm discriminator using quartz crystal. (a) Network (b) typical response

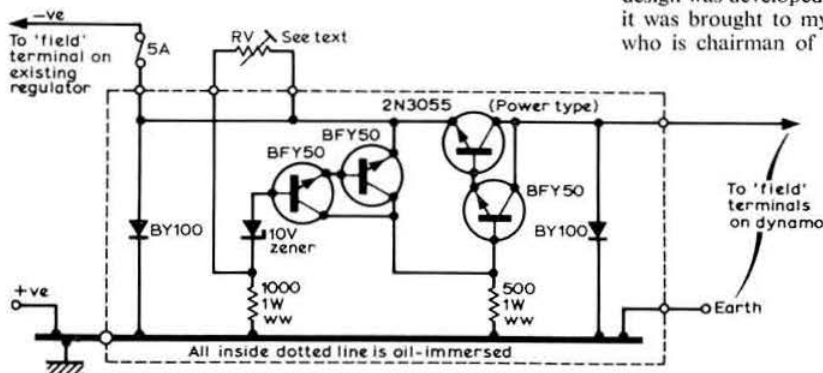


Fig 4. GW3XST's solid-state car regulator suitable for positive-earthed 12V systems

crystal is superior to the more conventional lumped-circuit LC type. The highly stable crystal is able to maintain the crossover frequency of the discriminator to within very close limits over the operating temperature range; by virtue of its rapid change in reactance as a function of frequency, the sensitivity is relatively high, which is especially desirable in the detection of narrow-band signals.

"Fig 3(a) shows a schematic diagram of a crystal discriminator network. The principle of this network lies in the voltage divider formed by capacitor C3 and the impedance comprising crystal XL, inductor L2 and capacitor C2. Capacitor C3 has a relatively constant impedance over the narrow band of frequency deviation, whereas the reactance of the combined impedance elements changes rapidly from one end of the frequency band to the other. Consequently, the voltage across the combined impedance elements depends on the instantaneous frequency of the incoming fm signal. The remainder of the discriminator network acts as a balanced rectifier, designed to provide a dc voltage output representative of the rf voltage difference across the two arms. Fig 3(b) shows a typical output voltage versus frequency response of a crystal discriminator."

The author points out that discriminator networks using crystals are not new but that until recently they have not been manufactured in Australia. He notes that AWA have now put on the market a unit with a centre frequency of 10.7MHz and frequency deviation of 10kHz. It is feasible, he adds, to custom-design to any centre frequency in the range 400kHz to 22MHz and for a frequency deviation from as low as 5kHz to more than 100kHz. Because crystals for lower frequencies tend to be larger and more expensive, he considers that centre frequencies should preferably be above 5MHz. However, it might well be that this technique could prove useful in the normal 450-470kHz i.f. range, since crystals for these frequencies abound; alternatively the technique could possibly prove a very useful means of making a single-conversion vhf/nbfm receiver with an i.f. of 10.7MHz. Possibly this idea has already been given a try out—it would be interesting to have comments on practical results.

Transistorized car regulator

Automobile electronic devices are normally rather outside the scope of *TT*, but the justification (if one is needed) for including details of a solid-state car regulator is that it can result in a reduction of electrical interference for mobile operation, provided that feed-through capacitors are used to connect it to a completely screened box. This particular design was developed by W. J. Pawson, GW3XST, although it was brought to my attention by D. R. Vizard, G3UKS, who is chairman of the Radio & Space Research Station

ARC. One of his friends has been using the system and reports that the diodes do not overheat, even on long journeys. His complete unit is immersed in oil and sealed in a sardine can!

If required for negative earth vehicles, the npn transistors should be changed to low-leakage silicon pnp types and the diodes reversed. As shown in Fig 4, it is suitable for the conventional 12V positive-earth systems. RV is shown as a preset resistor but it can be changed for a fixed resistor once the correct value has been found by experimentation; typically a value of about 5-6k Ω is needed for 13V.

Front panels and controls

Almost 10 years ago (7T August 1963) we discussed some of the findings of the ergonomics experts (*Ergonomics for Industry*: 2 published by DSIR) on the design of instrument panels for use by people. Research had shown that neglect of human factors led to inefficiency in using instruments and complex control consoles; instruments communicate with people, and the communication is two-way since the users often have to do something, like turning a switch or pressing a knob to obtain or to respond to the information.

This is a subject that is still often neglected, important though it is—and even within the last few years we have seen some curious examples in the field of professional communications equipment: for instance one very famous supplier of marine equipment who introduced a new operating console with the receiver tuning knob at a very awkward height, well above the desk level, and another system (admittedly for a submarine where space is at premium) where the receiver tuning knob was actually just inches above the deck.

A recent short article (*Electronics* 4 December 1972) by Roy Udolf and Irving Gilbert spells out some "guidelines for design of front panels". They stress that "laying out a display/control panel so that an operator can function efficiently requires more than just making sure that everything fits" and that "not only must the panel layout ensure a good man/machine interface, but often the location of certain controls and displays determines the layout of many critical internal components". Although many of us like to shy away from such terms as "man/machine interface" there is little doubt that a system which takes full account of "human engineering" as it is sometimes called can be much easier and more pleasant to operate than one that does not.

Some of the points made in these "guidelines" include:

• Panels should be designed so that they can be used effectively by a large number of different operators—there is no such person as the "average" operator.

• Such common symbols as red for "danger/stop" or green for "ok/go" should be used—but their meanings must never be reversed.

• Clutter, unnecessary labelling and abbreviations should be avoided to eliminate operator confusion due to sensory overload.

• Labels should be large enough to be read comfortably at the normal operating distance, and this should never be less than 20in.

• Unless the panel is to be viewed from below, labels should be placed above the devices or controls to which they refer, to eliminate hand interference and/or ambiguity.

• When an operator focuses his eyes on a fixed object he has maximum acuity only within $\pm 1^\circ$ of his centre of vision; he can no longer see reds and greens at $\pm 20^\circ$, and he loses

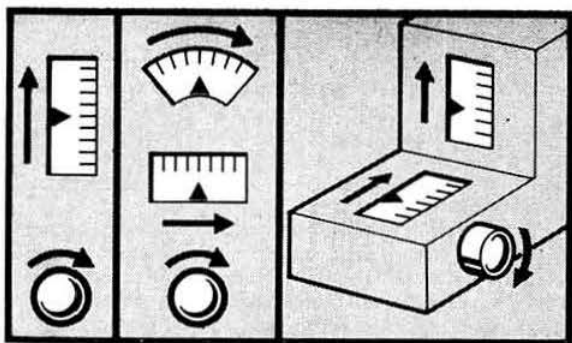


Fig 5. Expected relationships of movement between controls and displays—some examples from *Ergonomics for Industry*: 2 Instruments and People

blues and yellows at $\pm 40^\circ$. To read beyond these limits he must turn his head. Important colour displays that have to be observed beyond these limits require either flashing lights or auditory signals (auditory signals are often more successful in attracting attention).

To add a few more points from *Instruments and People*:

• If the operation always follows a fixed sequence, the controls and displays should be laid out in that order. In other cases controls and displays should be grouped according to their functions, with the most important and frequently used groups in the most convenient positions.

• People expect certain relationships between the movement of controls and their associated displays (see Fig 5 for some examples). Pointers should be designed to avoid ambiguity (and preferably provided with some simple form of "calibration" that allows one to see at a glance, for example, whether a gain control is almost fully advanced or nearly minimum). Controls should always operate in the expected manner: fully clockwise for maximum effect, a switch turned down for "on", etc.

For amateur operation there can be little doubt that the most important controls are the receiver tuning knob and the transmit/receive changeover system. Personally I like a tuning knob to be set at a height of about 4in from the desk, fairly substantial (2-3in diameter) and well clear of all other knobs. Operating controls and knobs, far from improving in recent years, seem to have become more fiddling to use; a real problem with miniaturized equipment is that fingers and thumbs have not been subjected to a similar process. One exception, however, to my mind, is the modern toggle switch that is slimmer and more elegant and easier to use. Operability seems to me to be more important than achieving perfect symmetry—although panels which are easy to use are often also visually very attractive. A lot of this is applied common-sense rather than specifically ergonomics.

Comments on the "vertical-tee" aerial

An interesting letter from R. C. Harris, G2BAB, provides some further comments on an aerial technique in which I tried to rekindle interest a couple of years ago—not only for the lower frequency bands but also for 14MHz and above—the tee or "vertical-tee" aerial (7T July 1970 or ART3/4). My hf version differed from the conventional mf tee aerial in having a voltage maximum point at the base of the vertical

section, and thus had some affinity to a ground-plane turned through 180°: Fig 6.

G2BAB writes: "To me this is not a new type of aerial, although until you mentioned it in *TT* I had never seen any reference to it in amateur magazines. I first experimented with it in 1932, when it gave excellent results, but later I started work on compressed dipoles and other types for comparison and then for many years was unable to proceed with my experimental work.

"Now that I have retired to South Devon, with restricted aerial space, I have again put up a vertical-tee. The results are outstanding. On 7MHz I often hear American amateurs working each other obviously not knowing they are getting out; it works well on all bands but 'goes to town' on 14MHz.

"I find that the angle of radiation appears to be much lower than that of a single vertical, and the way that distant stations bounce in has to be heard to be believed. I use 110W coupled to the aerial with a modified Collins coupler and get unity vswr on all bands including 3.5MHz when used against ground.

"With a 66ft top it is fine on 3.5MHz but on 28MHz its resonant frequency came out at 30.5MHz. To correct this for 28MHz and all the other bands I have found that a small tapped coil in the vertical section at the shack end enables me to resonate the aerial on each band, with slightly better results. Altering the length of the vertical also puts the length of the top section right: this is far easier than attempting to alter both the top and vertical elements."

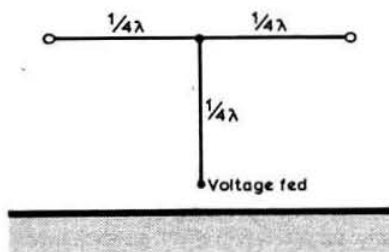


Fig 6. Basic arrangement of hf vertical-tee aerial as described in *TT* (July 1970) and *ART*

Even when not fed against ground the performance of this, like all other vertical radiators, is affected by the ground constants, and it is often well worth laying out some form of earth-mat all around the aerial. For anyone who is really prepared to put in an effective image plane of many, many wires, an interesting article on a three-element 14MHz vertical beam is the one by Jerry Sevic, W2FMI, in *QST* June 1972 or his earlier one on image planes (July 1971). The "beam" version of the vertical-tee is the Bobtail (*TT* July 1970, *ART* or many other reference sources).

QRP and all that

There remains a lively interest in low-power cw operation—for example the Swedish "Optimist" 3.5MHz transceiver (*TT* August 1972) continues to attract interest. And this is reflected in the spate of articles on low-power rigs that continue to appear in the American journals, even if sometimes in the land of the Californian kilowatt one finds the QRP label attached to anything less than 100W. But whether 500mW or 75W, there is no doubt that many hf operators find a simple cw rig a change from ssb. As B. H. Brunemeier,

G6XN 'Multiband Loop'—Important correction

Please note there should be **NO** insulator at the top of the loop (as wrongly shown in Fig 2 of February *TT*). The wire forms a continuous loop plus stub.

Apologies, G3VA.

W6FHM/DUI, put it recently: "Regression, perhaps—but fun, none-the-less! That was the essence of this creation (a simple 75W monoband 14MHz cw rig). Six years ago I decided to reach for the ultimate, and toiled over the agonies and ecstasies of a rock-crusher ssb rig, built from the ground up... curiously, the triumph once achieved began to wax a little less euphoric with each passing year. I had achieved the ultimate in sophisticated high-power speech equipment. Why not reach the other way, and strive for the ultimate in simple low-power cw equipment?"

The same issue of *QST* has a piece by Robert Stecker, W2DNJ, on "Some tips on successful QRP operation" which is worth studying by anyone about to pull the big switch occasionally in favour of QRP. His hints include: use an aerial at least a half-wave long, carefully resonated at the operating frequency and well-matched to the feed line; use a vfo as you must go looking for contacts; don't over-miniaturize transistorized circuits; use well-shaped keying and send well; pick your frequency carefully; it is important to use a stable receiver; batteries can be a useful power source for real QRP operation with transistorized transceivers."

It is interesting to see that Heathkit have now joined Ten-Tec in providing a low-power transceiver based on a direct-conversion receiver and transistor transmitter (Model HW7 "Mini-Rig").

One of the many recent QRP designs from across the Atlantic is "The Mountaineer—an ultra-portable cw station" by Wes Hayward, W7ZOI, and Terry White, K7TAU, (*QST* August 1972) which, including key and sidetone oscillator, fits into a standard 2 by 5 by 7in enclosed chassis and runs off a 12V battery, providing 650mW output for a total key-down drain of 100mA plus 14mA for the receiver: the only tuning control on the transmitter is for the crystal oscillator, with Amidon toroids: Fig 7.

Microtransmitter integrated-circuits and linears

Two members—Bill Bond, G3XGP, and Norman MacDonald, BRS33637, have drawn my attention to the first of a new series of special purpose integrated circuits that will form complete transmitter sub-systems. This is the Lithic System "Microtransmitter" LP2000. It is stated that ultimately the series will contain units that will satisfy vhf and hf, fm, a.m., ssb and pulse requirements. In effect, the LP2000 is a low-power a.m., cw or pulse transmitter which, used with external tuned elements, provides a stable modulated output sufficient for short-range applications up to 150MHz (one hesitates to name some of the applications implicit in such devices!). Features include: oscillator controlled by external crystal; buffers to isolate output from oscillator; controlled rf power output; a.m. or pulse modulator with pre-amplifier; zero stand-by power, triggered power supply; supply voltage from 3 to 15V.

The information comes from *New Electronics*, where the British agents are given as RDH Marketing, 2 Inwood Close, Cookham Dean, Maidenhead, Berks. G3XGP comments "I'm going to stop designing and making things"—now

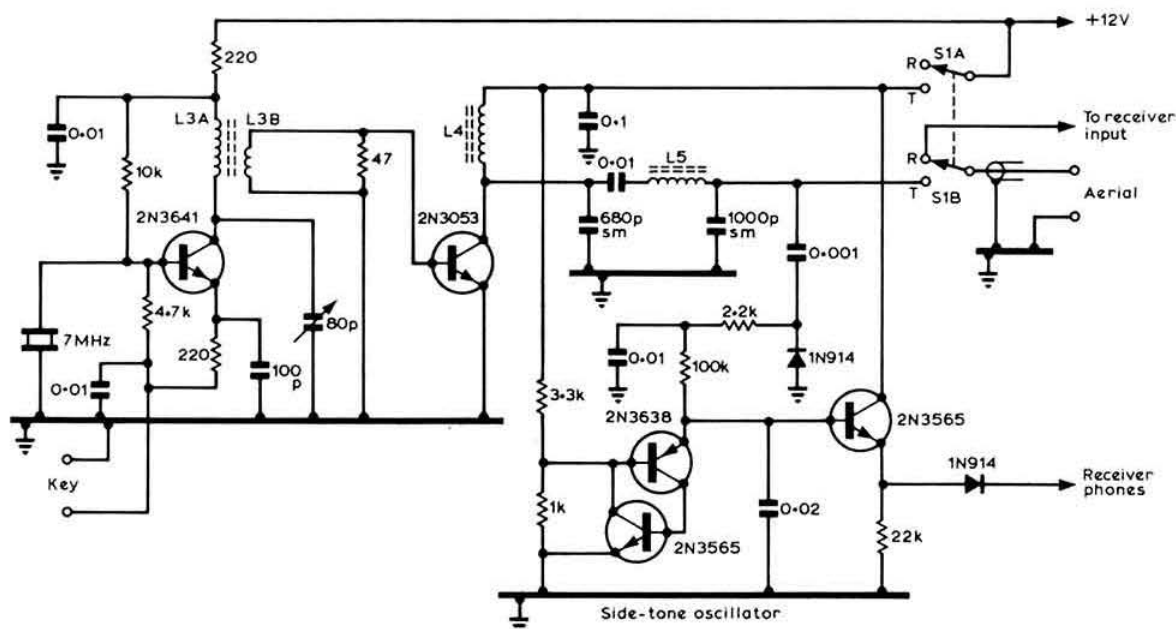


Fig 7. Transmitter section of "The Mountaineer" ultra-portable cw station (QST August 1972). L3A 44 turns No 28 enam on Amidon T50-2 core; L3B 4 turns over L3A; L4 60 turns No 28 enam on Amidon T50-2 core; L5 14 turns No 28 enam on Amidon T50-2 core

come on, even with an ic it is still possible to vary things round a bit!

A good deal higher up the power scale we note from *Electronic Design* (26 December 1972) the marketing of a broadband linear amplifier providing 100W output over the frequency range of a few hundred kilohertz up to over 100MHz without tuning. The amplifier combines the outputs of 32 rf power transistors and overall gain is 50dB. In fact, the ENI 3100L would be very nice to hook up to one of those QRP rigs to give a respectable solid-state transmitter, were it not for the price tag of \$5,690!

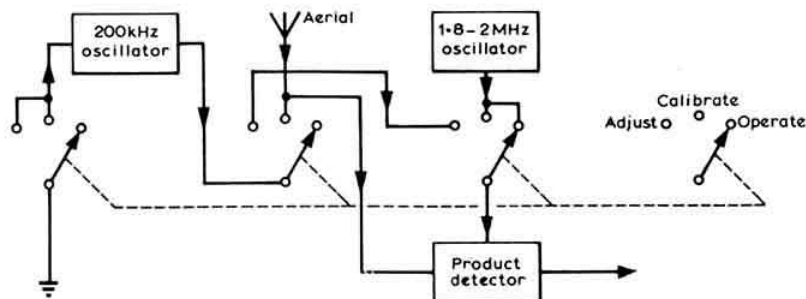
To my mind the lesson to be learned from the increasing appearance, for professional communications, of broadband transistorized techniques is that in future it looks as though it will become normal practice to think of rf linear amplifiers in much the same terms as af amplifiers; a pure signal (it must be pure since any spuri will be amplified) is put in one end and comes out the other without any question of resonating tuned circuits. Ferrites and transistors make this

approach more feasible for amateurs than the rather exotic distributed amplifiers based on valves.

Product detector calibrator

From Charles Bryant, GW3SB, comes a novel calibration arrangement developed for use with a top band transceiver but which might well have further applications: Fig 8. A three-position switch provides "adjust", "calibrate" and "operate" functions as follows. When the switch is in the "adjust" position the 1.8-2MHz oscillator is disconnected, and the 200kHz oscillator turned on and connected to the product detector; the 200kHz oscillator is then carefully tuned to receive Droitwich as a direct-conversion receiver, making it easy to obtain exact zero beat. The switch is then turned to "calibrate" and the main tuning dial adjusted so that the beats occur at 1.8 and 2MHz on the dial; the switch is then turned to "operate", turning off the 200MHz oscillator.

Fig. 8. GW3SB's arrangement for accurate calibration of top band transceiver



FOUR METRES AND DOWN

by JACK HUM, G5UM*

CONVENTION 19, 1973

Lectures, trade-show, M-I-M-show — and a new discussion session on Sunday morning

Metre-wave aficionados will agree that no VHF Convention is ever "just like the one before." Although the ground plan for the event preserves a distinct and recognizable shape year by year, there are always variations within it. This year, at "The Nineteenth," an important innovation stems from members' expressed views that past conventions have been so successful and provided so much to do and see that there never was enough time for person-to-person discussion.

This year time will be made. The convention is to be extended to Sunday morning, 8 April, 1000 to 1230, to provide a 150-minute discussion session as follows: "Microwaves" led by G3RPE; "Oscar 6" with G3COJ as the opener; "The 70MHz Band" by G3JHM; "Amateur Television" to be conducted by G3PSH and G8ACB. Each discussion opener is a member of the VHF Committee and a specialist in his particular area. It is hoped also to have a discussion about nbfm, to be started up by members of the UK FM Group.

All five discussions will go on concurrently in the big concourse at the Winning Post Hotel at Whitton, and visitors will have the opportunity to move from one group to another if they wish.

Here is the programme for the afternoon lecture session on Saturday 7 April:

1400-1420 Opening address by VHF Manager Geoff Stone, G3FZL.

1420-1520 "The GB3PI Story" by Barry Doel, G3SXX, from Cambridge.

1520-1540 Tea break.

1540-1640 Microwave session conducted by Dain Evans, G3RPE.

1645-1730 "Some Aspects of Television Broadcast Propagation" by Don Hayter, G3JHM.

Immediately after the lecture session comes the grand raffle (tickets on sale throughout the day from opening time 11am). After that just about an hour will remain for a last look at the Constructors' Competition and your final purchases at the trade stands, the bring-and-buy and the RSGB bookstall before assembling at 1900 for the dinner at 1930.

This year's guest of honour at the dinner will be Dr John Westhead, managing director of Pye Telecommunications Ltd, with RSGB President Dr J. A. Saxton also at the top table with other notabilities in the telecommunications world, particularly from the MPT.

Members who marked our comment that no VHF Convention is ever like the one before will have observed from the foregoing that a major change in the Saturday arrangements has been made: *there is to be only one lecture stream.* Having two in the past presented members with the Solomon's choice of which one to select. So this year one lecture stream will eliminate "the QRM factor" that existed when there were two, and will provide much more concourse room for exhibits outside the lecture area (do not miss the BATC tv demonstration to take place on the stage and organized by Malcolm Sparrow, G8ACB, VHF Committee-man and a BATC pioneer and office-holder for many years).

The "Made it Myself" Show (more mundanely, the Constructors' Competition): any item of vhf/uhf equipment which encourages good construction and/or advanced design should be brought along to the Winning Post as early as possible to give it maximum exposure time (if it is good this is the least it deserves—and it might win "The 1962 Committee Cup"). It will be judged in the late afternoon and the placings announced at the dinner. Furnish a short typed description of your exhibit.

Bring-and-Buy Stand: bring your items for sale to G8AXA, G3PSH or G3NUE, with everything listed and priced. Check back at the B-&B stand before 1900 to collect anything not sold.

Prices: All day Saturday, convention and dinner £2.25

Convention only (Saturday) 50p

Dinner only £2.00

Discussion session (Sunday) Free

Application for tickets: send cash and sae to Mr A. Wheeler, RSGB, 35 Doughty Street, London WC1N 2AE, marking envelope "Convention" in top left-hand corner.

"From the outside looking in . . ."

Overseas members surveying the UK metre-wave scene from a remove of a few thousand miles form their opinion of it from what they read in this journal. Looking at it from distant Penang, James Pershouse, 9M2DQ, is impressed by many things, notably "... the excellent RSGB beacon service, a readily available surplus ex-commercial market, and much test gear to be had," very different from the situation in Malaysia, he tells us.

Something which surprised him was the lack of AI facilities on most of the vhf transmitter designs which have appeared in this journal. Having counted up several published in the last year or two he feels impelled to ask: "Where is the key socket? And in transceivers: Where are the a.m. to fm facilities, and where the bfo? Why don't you publish circuits for less technical users to fit bfos and key outlets to all these ex-vehicle rigs I see advertised?"

Clearly, 'DQ is a supporter of the mixed-modes movement which has been enjoying increasing advocacy in *FMD*.

Looking nearer home at his own 9M2 vhf scene, 9M2DQ welcomes the imminent extension of 2m to 144-148MHz,

* Houghton-on-the-Hill, Leicester LE7 9JJ

but views with some dismay the increasing number of wide-band oriental talk boxes which in spite of high prices caused by import duties are getting into many amateur shacks. Noting the excessive deviation which they give, he adds: "I am told that in many areas of JA there is now absolute chaos on 2m, and I can well believe it."

* * *

To answer many members' enquiries about the dx potential of tropo-favoured warm climate areas, Bob Arnold, VK3ZBB, passes on to us the following Australian metre-wave records:

50-52MHz	VK3ALZ-XE1FU	1959	8,418 miles
144MHz	VK5BC-ZL2HP	1965	1,957 miles
432MHz	VK5ZDY-VK6WG	1972	1,179 miles
576MHz	VK5ZJL-VK5QZ	1969	195 miles
1,296MHz	VK3AKC-VK7ZAH	1971	273 miles
2,300MHz	VK3XA-VK3ANW	1950	9 miles
3,300MHz	VK3ZGT-VK3ZDQ	1963	63 miles
10,000MHz	VK5CU-VK5ZMW	1971	59 miles

"Don't shoot the columnist . . ."

Satisfied customers rarely write, complainants often—all columnists hear from them. So if your beautiful picture of your 6-over-6 never finds its way into print in *FMD* do not complain: just remember it has no news value, for there are a thousand like it.

And if your local net, 20-up and all using Pye "Cambridges", fails to rate a mention, remember there are 100 like it (but if it happened to be a 200mW net or an all-cw net that *would* be news). If you worked LA on sideband when 2m was open and half of Britain was doing the same the news value is minimal—but if you do it when the band is *not* open, or even better if you do it on 70cm or above, that is worth passing on through *FMD*. Any kind of unusual propagation phenomenon should be recorded here in case it should help advance the art of amateur radio communication. Tell us!

Even when a lot of news breaks (eg Oscar 6) it must be tailored to fit the finite space available, as extra pages cannot be allocated to *FMD* at the present time.

So savour the contents of this page, detect what makes news and decide what does not. Then keep us in touch!

Metre-wave meetings at . . .

. . . Meriden on 22 March, organized by the Mid-Midlands VHF Group. Subject: the new Liner 2 ssb transceiver, discussion to be opened by a member of Lowe Electronics, 8pm. Venue: "Heart of England" Social Club concert room, Berkeswell Road, Meriden. All welcome. Buffet supper at moderate charge.

. . . Leicester on 15 March by Leicestershire VHF Group. Subject: Veroboard for vhf by G8ELH, 7.30pm. Venue: Leicester Polytechnic. All welcome. Admission 10p.

. . . Welwyn on 12 April, organized by Mid-Herts ARS. Subject: VHF modes, by G3SXX (of GB3PI fame), 8pm. Civic Centre, Old Welwyn.

And now UT by m-s

As we remarked last month, through-Oscar dx on 2m is easy by comparison with via-meteor propagation. One of the pioneers of the m-s mode, G3CCH of Scunthorpe, brought his 2m country score up to 28 by working UT5DL in the Ukraine on 3 January. Overhearers of Johnny Stace's

machine-gun morse in the bottom few hertz of 2m were probably listening to the weeks of preparatory tests (fleeing signals both ways) that were crowned with success when the Quadrantids shower appeared. Is this the first G-to-UT contact?

Next m-s dates centre around 20 April for the Lyrids, a shower not noted for producing large radio returns.

Contest news

Results of last year's IARU autumn contests come in a 24-page booklet. The September vhf event coincided with our own VHF NFD, the October one was microwave-and-432.

Each year a different national society in Europe handles IARU contest entries. In 1972 it was the turn of the RSGB, placing much extra work on the shoulders of the Society's VHF Contests Committee "... in addition to their normal routine of organizing some 20 other national events throughout the year," in the words of G2HIF, chairman of the committee, and G3FZL, the Society's VHF Manager, in their preface to the IARU booklet.

The booklet reveals that 826 stations in 21 countries entered the September contest, the breakdown in respect of British activity (which will be the main interest to readers of *FMD*) being:

144MHz Fixed—leading British station G3OHH, 45th out of a field of 364; 144MHz Portable—GW3BA/P 13th in a field of 303; 432MHz Fixed—G8BKR 13th in 56 entries; 432MHz Portable—GW3LTF/P first in a field of 50; 1,296MHz Portable—GW3LTF/P first in a field of 49, of which 38 were British entries, far exceeding the UK participation on all other bands.

* * *

The breakdown of the October uhf/shf event shows British entry thus:

432 Fixed—G3LTF/A ninth in a total of 80; 432 Portable—G4ARD/P as 21st out of 53; 1,296 Fixed—G3LTF/A second out of 24; 1,296 Portable—G4ARD/P 10th in 23; 2-3GHz Fixed—G3LTF/A first in five; 2-3GHz Portable—G4ARD/P first out of two entries; 10GHz Fixed—G3THQ/A first and G3NHZ second in an entry of just these two; 10GHz Portable—G3ZGO/P and G3ZKR/P first and second, the only entrants; 21GHz Portable—again two entries, G3WDG/P and G8ADP/P, both securing three points.

From all this emerges a pattern of intense UK contest enthusiasm in the uhf/shf area but not much in the vhf. Perhaps after next VHF NFD more British logs will go in for the parallel IARU event than happened last year. All that need be done is to take a copy of the VHF NFD log and modify it as p 246 April, 1972, excluding 70MHz, which the Continentals do not have.

* * *

The daylight-hours 2m cw event last month (no precise equivalent last year) demonstrated its popularity among key-men by throwing up serials in excess of 60-plus worked by many contestants. "Did my heart good to hear so much cw activity at the bottom end of 2m," says G3DAO, but he then goes on to voice a viewpoint held by many "two-telegraphists", that is, where do they all go afterwards? Sheffield's G3NHE, although applauding the timing, feels that the contest could have started at 0600gmt to take advantage of the dawn lift. If contests are intended to foster the state of the communication art and the study of propagation, he certainly has a point.

Martin Dann adds his support to the suggestion to abolish combined 432/144MHz contests, and is much in favour of a cw event for 70cm *in toto*, to promote more weak-dx signal twinkling at uhf.

Parchment piece

Shortly after the appearance of the annual table of holders of Four Metres and Down Certificates (*FMD* January), the VHF Committee at its January meeting had before it the first claims for 1973. Now certificates have gone to the following:

70MHz Transmitting—96 G4BEG (lucky Mike Farrant collected the needful three plus 20 in only six months); 97 G3VPS/P (and in the getting of it Peter Lennard operated in many rare counties to help other would-be claimants along). To G3JHM/A a rare "Four Metre Senior": Don Hayter collects No 11. And to all metre-wave receiving men: do none of you listen on 70MHz? No BRS or "A" man has put in a claim for 18 months; yet the occupants of this less-used band are friendly and always ready to reply to listeners' worthwhile reports (an *sae* helps).

144MHz Transmitting—301 G8FAG (Nigel Hadley became G4BSW in January and may be heard below 144.1 on A1 most nights); 302 G8EOP (a double claim: Melvyn Jackson, the big signal from Dewsbury, earned his 70cm parchment the same day, see below); 303 G3CMH/P, the Yeovil Radio Society from many sites; 304 G8FVZ of Hitchin (input never exceeded 12W). John Haig applauds the "portableers", without whose help and QSLs "I would not be making this claim", as he puts it: 305 G8DVS (Rick Sterry is now G4BLT and was compelled to include one G4BLT card in his five-plus-30 claim on account of "... a disgraceful return rate"); 306 G8CDL/P from many Chiltern sites around his Luton QTH; 307 GW3ZTH, almost all of them on A3J; 308 G8EZF, and full marks for a determined effort by a popular operator whose physical difficulties are known to many of his friends around Cambridge and beyond; 309 to G8FBF, another Cambridge member; 310 to G8DKG from the home site at Sudbury, but domiciled far to the north at Lancaster University; and 311 to GW3-FEC/P, all ssb, all on 7 January, all QSLs in by 31 January.

144MHz Receiving—23 to Robin Box, A7683 (plenty of parchments awaiting other followers of Bob Treacher's swl column!)

144MHz Senior Transmitting—pretty difficult, this: you have to produce 15 plus 60 cards to claim it. Only one Class B man has ever managed it, and he has been Class A man G4BEL for a long time. So it is especially noteworthy to record that Senior Nos 43 and 44 have been earned by G8ENI and G8CUT. Mike Neville used 110W of a.m. helped by a 12MHz vfo for all contacts, Leslie Turner 75W of a.m. for all contacts except the last two, and much praise for many ssb men who gave him cross-mode QSOs exactly as advocated in *FMD*.

432MHz Transmitting—91 to G8EOP already mentioned; 92 to one of the early Class B "seventy centimentalists", one time G8AVC now G4AGE; 93 G8CUT (a double claim, like 'EOP).

Expeditionaries

The Plessey group from Swindon, GW3FEC/P, again put on a well-organized expedition during the 144MHz sideband event in January which collected them enough contacts (and

OVERSEAS BEACONS

Listed below are some overseas vhf beacons likely to be within range of the UK under lift conditions. Only those stated to give a 24-hour service are shown (Acknowledgement to *IARU Region 1 News*)

Beacon	MHz	Pwr	Mode	Aerial/Direction
TF3VHF	70-275	15W	AI	135°
EL4RF	70-325	2.5W	AI	NE
F3THF	144-009	35W	AI	E
LA1VHF	145-15	12W	AI	omni dipole
LA2VHF	145-20	20W	AI	8-over-8 NE
LA3VHF	145-25	16W	AI	omni dipole
SK4MPI	145-96	150W	AI	four 5-el 330°
F7THF	145-96	6W	am/fm	four 9-el omni
HB9HB	145-985	10W	fsk	2-el N
OY7VHF	145-99	10W	AI	dipole
YU2VHF	146-0	25W	AI	four 4-el omni

QSLs!) to permit a claim to be made for the 144MHz Standard Award. And for G3FEC/P general operations a Senior is in the pipeline. They offer apologies for delays in QSL dispatches: their QSL manager, Jean Comer, presented on G3ZVC with a daughter last November. Normal service has now been resumed, and a thousand QSLs hit the bureau in the following weeks to clear their outstandings from expeditions on 70cm, 2m and upwards.

Later this month a chance to work Wigtown on 4m and 2m (and 160m too as it happens). The Queens University Radio Club sends a team across the North Channel to operate as GM3LLQ/P and GM8FQB/P from the Mull of Galloway from 1800 Friday 16 March, continuous operation through to the early hours of 20 March. Teleprinter contacts can be laid on if any vhf rtty men wish: write quickly to G13XGI, Roger Adair, 16 Demesne Pk, Holywood, Co Down, to tell him it will be worthwhile packing his printer. He offers 50 bauds, 850 shift.

Tech corner

From G5AGX (Karl Kanalz of Hayes, Middlesex)

The useful note by G6OPB/T in *FMD* for December will help new owners of wide-band fm transmitters to get the deviation turned down *pro tem* until the rig can be properly set up with appropriate test equipment. As he explained, deviation with the FT2F can be reduced to a more "gentlemanly" level by setting the deviation control to a point where transmitted audio just appears (can be monitored in a local receiver). This setting produces ± 3.2 kHz deviation in some FT2Fs and in others not more than ± 4 kHz, which results in a spectrum occupancy quite comparable with much of the a.m. one hears (Why don't more a.m. operators use speech filters?).

In his note G6OPB/T mentioned a narrow filter. This refers to the significant improvement in the signal-to-noise ratio obtained through using a narrower filter than the one supplied with black boxes which at ± 15 kHz is much too wide for optimum s/n.

In connection with setting up fm gear with professional equipment I would like to point out that the London FM Group regularly provides such equipment for "alignment sessions" at which any and all comers are welcome, a service offered to all fm users to help keep the mode sociable. Also, the group will be happy to send details of modifications to FT2F and other "black boxes" to assist adjustment of deviation to lower and more acceptable levels and to improve

the speech limiting quality and receiver performance of some of these rigs as well. A large sac (9 by 4) should be sent for return of the info (G5AGX, 6 Wood End, Hayes).

The Oscar file

Writing from AMSAT headquarters in Washington, K2QBW tells us that the individual radio amateur can now join the corporation for a sub of only \$5 a year. For this he gets the AMSAT newsletter (a modest description of an excellent pocket-size magazine), and may vote in the annual election of directors by direct mail. A club (annual sub \$10) is entitled to nominate two candidates for directorship; such candidates need not be members of the society nominating them. Already AMSAT has 640 individual members and 52 member societies, representing 36 countries.

Then K2QBW adds: "I wish to second your remarks in FMD concerning power used in transmitting towards Oscar... anyone running 3kW to 96 elements is merely depriving others of their fair chance at the satellite." He quotes the voluminous weekly logs received at AMSAT from VE2BYG; they show hundreds of through-Oscar contacts coast to coast and transatlantic using but 50W to a groundplane.

In January AMSAT did a sampling of logs for the first six weeks of the satellite's life. Of 935 QSOs surveyed, 688 were A1, 214 on A3J and 33 cw-to-ssb. "More ssb stations should listen for cw replies and vice versa", the report continues. Other operating advice born of Oscar orbitings is:

Listen oftener, CQ less: if the average cw operator during a heavily loaded pass transmitted only 25 per cent of the time instead of the other way round, *everybody's* downlink signal would increase by 5dB and more QSOs would result.

If you have a vfo try to zero the other station, but if rock-bound tune several kilohertz either side of your channel before transmitting again.

If you must use high power stay on ssb, if low power stick to cw.

* * *

More about aeriels for Oscar 6; Hampshire's G3JVL after several puttings-up and takings-down settled for a rotary dipole for the 10m downlink and a 7-el Yagi aimed 40° above the horizon and producing superior results to the station 10-el flat top with its low angle of radiation.

Mike Walters reports an unusual propagation occurrence on Orbit 792. Leaving the receiver on the translator frequency after a QSO with W9YYF at 2250gmt, he was surprised to hear an hour later a 40s series of erratic dashes of the kind produced by an operator searching for his translated signal. At the time the satellite was south of Australia, "... a possible location for antipodal propagation of the type previously reported by myself and others during Oscar 5," observes JVL.

Another propagation quirk: G3IOR after LOS (Loss Of Signal), no longer able to hear his own 2m signal coming back to him, has frequently heard the Tacoma station K7BBO appear on 10m some 30s later. This may be a factor conditioned by the high performance downlink equipment at G3IOR: a 3-el beam for 10m at 50ft up and a specially hot receiver. With K7BBO at 4,752 miles, great circle, as his best Oscar dx, Patrick Gowen needs only W6 to have worked all American call areas. On the subject of anomalous AOS (Acquisition Of Signal) and LOS situations he writes:

"Early acquisition of one's 2m return-signal when Oscar 6 is beyond the anticipated great circle horizon occurs

because (1) Oscar's orbit is not quite circular, 905.5 miles at the Equator climbing to 910 miles at the North Pole and to 921.2 miles at the South Pole, with a minimum of 902 miles at N-S 10° N; and (2) ionization density increases towards the brighter, longer sunlit areas of the equatorial belt, producing quicker loss of the 2m signal but ionizing ducting for the 10m one during daylight passes at this time of the year. Minor solar flares and aurorae cause loss of satellite signal towards the NW Auroral Magnetic zone by multipath break up and attenuation." G3IOR has some pertinent comments to make about use of excessive power. These must await fuller treatment next month.

Generally, on this vexed question, G8CXJ of Bexley thinks too much of it made in the amateur radio press tends to condone its use, and that 80-100W actual *erp* *out* should be more than enough. At G3WPO, Sussex, the satellite can be accessed reliably with as little as 20W *erp* except when it is heavily loaded (29 countries, 200 contacts); Tony Bailey disagrees with operators who assert that they cannot raise the satellite unless high power senders are used. Often, their problem is just that they have inadequate 29MHz receivers and/or aeriels, and cannot hear their own translated signals coming back.

G3WPO adds that the offer he made to provide orbital predictions (RC, December) brought over 100 requests. He is still game! Send him a 9 by 4in sac and he will oblige (G3WPO, 5 Erin Way, Burgess Hill, Sussex RH15 9PN).

What they say

"A lot of harm was done to the radio amateur image in this country by a radio/tv comedian who created a farcical stupid type of 'ham' which stuck with the great silent majority. Oscar 6 has brought things back to a serious experimental level"—G3IOR.

"Why is it that our Oscar devotees will not use their cw down at the bottom end of 2m after Oscar has passed? There are times when they could have made contacts over quite long distances both in and outside the UK"—G3DAO.

"It seems that on 2m there is intolerance towards the users of modes other than those one favours oneself! Surely we can co-exist peaceably on a band 2MHz wide? By contrast with 7MHz, the problems we have to contend with at vhf are negligible, QRM-wise"—G3NHE.

"Oscar 6 the biggest non-event? Surely not. You know exactly when to switch on, and if it doesn't appear you switch off again, having wasted only a few minutes. You can always pop back a few minutes after mid-orbit time if the device is coming within range of the USA to see if it has been switched on"—G3WPO.

"Perhaps the most patient station on 2m is G3DAO of Sussex. He spent 1½ hours trying to work me on cw with my sigs *peaking* S2. And we did it in the end"—G3ZOD, Cheshire.

25 YEARS BACK

Five-Metre Hamfest. The first event of this nature which we can recollect took place at the Falstaff Hotel, Fleet Street, London, on February 21st... an attendance of 30 licensed amateurs, some accompanied by their ladies. ("Around the VHF's", *RSGB Bulletin*, March 1948).

SWL NEWS

by BOB TREACHER, BRS32525*

BY the time this piece is read the spring contest season will be with us and the bands will no doubt be full of rare and exotic callsigns and prefixes. The main contest during March is the CQ WW WPX SSB Contest which occurs on the 24-25th. There are also the REF Phone Contest and the second legs of the ARRL DX Contest both phone and cw. In all, March should be a lively month with various expeditions planned to rare spots such as Revilla Gigedo Is and PY2WH's expedition around the Brazilian Islands.

QSL Bureau

John Garrett, G3YOU, the sub-manager for BRS and A callsigns would like all those who use the bureau to understand that only self-addressed envelopes should be sent to him. Outgoing QSLs should be sent to G2MI as stated here in November.

DXCC

Those listeners interested in keeping track of the new DXCC countries may be interested to know that the expedition to Mount Athos in October has been allowed to count for DXCC credit. Swan Is (KS4) is to be deleted from the ARRL Countries list as the island has been handed back to Honduras. It has not yet been decided whether to allow the VK9JW operation from Mellish Reef to count for DXCC credit. It will be reported here as soon as anything definite is known.

While on the subject of dx credits, a net has been started on 80m which is designed to provide dx information for European dxers. The net meets on weekdays on a frequency between 3,780 and 3,790 at 2030 and information relating to dx heard/worked on 160m through to 10m is exchanged. Much can be gleaned from this net which usually runs for one hour.

80m dx

The conditions on 80m during the latter part of December and January proved exceptional as was suggested in the last *SWL News*. Openings occurred into the Far East, the west coast of the USA via the long path, and Oceania. Stations located in Scandinavia experienced the best conditions because of the all-darkness path but many stations in southern and western Europe were able to work some of the dx stations also. The following stations have been reported as heard in western Europe between 1500 and 1800 during this period: DU1EJ, DU1FE, DU1MG, EP2TW, MP4TDM, VK2AVA, VS6DO, VS6GM, YA1AH, ZL2BT, ZL4CJ, ZL4KE, ZL4LM and 9V1RE. HS4AGN, KC6SK, YB1KW and ZK2BD were worked by several Scandinavian stations but were not audible in western Europe.

Conditions to the west coast of the USA and Canada in the morning between 0700-0800 were excellent, particularly in G-land and the following stations were logged: W6ABT,

K6AHV, WA6GLD, W6NLZ, W6OAT, K6SEN, K6SSN, W6TSQ, K6UA, WB6UDC, WA6ZZK, W7YM, VE7EL, VE7SV, CE8AA, KB6CV, KL7HAM, LU8AJG, VR1PA, ZK2BD and ZL3KK/C. There were also the usual openings to the Caribbean area from 0200 to 0700 and the YV0AA (Aves Is) expedition was heard at S9 on 11 January. Evening dx conditions were also exceptional at times and some useful countries appeared on 80m for the first time, for example ST2SA and 5U7AX. Other dx heard included ET3DS, JY1, YA1DT, ZD8RR, ZS1MH, ZS3GH, 4W1AF, 5X5NK and 9M2DQ.

Views and comments

From the final placings in the 1972 Countries Table it will be seen that Chris Henderson, A7460, held on to his lead, with BRS25429, Dave Whitaker, the leading BRS.

Chris has got off to a superb start in the 1973 table and will take some catching, but no doubt there is someone, somewhere who will try. Unfortunately space does not permit us to include the 1973 table in this issue. Chris has recently put up an inverted-V for 80m which is aiding his reception of dx signals on that band. He was also looking forward to the Spratley Is expedition and to the advent of the contest season.

(continued on p 195)

Final placings 1972 Countries Table

	10	15	20	40	80	160	Total
A7460	150	222	216	118	109	17	832
BRS25429	144	166	207	103	132	9	761
BRS33823	136	194	188	92	114	13	737
BRS17567	141	213	218	58	90	7	727
A7780	125	165	140	72	80	8	590
BRS25901	78	141	201	69	78	3	570
BRS33558	94	136	208	40	54	2	534
A4483	111	136	140	58	58	4	507
A7139	94	111	120	77	66	15	483
BRS32524	59	135	148	47	79	4	472
BRS3364	54	149	165	47	52	3	470
A7531	99	111	105	26	38	1	390
BRS32457	54	106	121	44	44	0	369
A7545	45	93	107	46	54	20	365
BRS33211	56	73	123	46	61	4	363
A6220	47	86	116	49	49	7	353
BRS33370	60	86	108	22	38	4	318
A8037	66	92	89	23	41	1	312
A6686	49	96	96	17	20	6	284
A7159	42	55	78	27	46	3	251
A8054	4	29	143	26	31	7	240
A6265	38	55	81	29	25	2	230
A7784	52	56	69	21	26	2	226
A8094	51	38	66	15	41	7	218
A7785	0	0	123	33	57	5	218
BRS33243	46	38	36	22	64	0	206
BRS33231	15	53	80	15	29	2	194
A7768	0	96	70	6	19	1	192
BRS32635	0	62	80	12	24	3	181
BRS32359	0	22	81	35	35	2	175
A7681	1	34	52	27	44	13	177
A7254	12	50	63	8	30	1	164
ORS30694	4	40	70	22	12	3	151
A7511	10	37	45	14	39	4	149
A7925	7	47	64	5	10	2	135
A7757	27	18	51	11	24	2	133
BRS33210	11	30	33	14	33	8	129
A8178	2	56	44	5	14	3	124
A7920	0	0	61	19	35	4	119
A7732	11	21	31	11	30	0	104

*392 Rochester Way, Eltham, London SE9 6LH.

MICROWAVES—1,000MHz and up~~~~

by DAIN EVANS, G3RPE*

Operating in the new 24GHz (12mm) band

Readers will have observed in January's *Radio Communication* that written consent of the MPT is necessary before operation in the 24GHz band is permitted. The details required for each station are broadly:

- (a) **Site**: nearest large town, NGR, height of site and mast.
 (b) **Transmitter**: mean power, peak power, the corresponding effective radiated powers and type of emission.
 (c) **Aerial**: dimensions, beamwidth, type, gain, and direction of maximum radiation in azimuth and elevation.

A standard form is available from the MPT.

This control arises from the potential radiation hazard to persons within the range of the transmitter, and the danger of setting off detonators sensitive to rf currently in use in mining and quarrying.

A 30MHz wide-band fm discriminator with afc output

One of the attractions of microwaves is that there are a variety of techniques to be explored which are rarely used on the lower frequency amateur bands. One of these techniques is automatic frequency control, a common application of which is to lock a free-running local oscillator of a receiver on to a transmitter. A special case is where afc is fitted to one of two transceivers operating with a common i.f. Here, both transmitters/receivers will remain locked together, although both may drift in frequency, within the locking range of the afc system. In another application, the frequency stability of a transmitter may be greatly improved by using afc to lock it on to a low-power crystal-controlled source.

In the circuit given in Fig 1, a 1MHz bandwidth ratio detector/amplifier provides an audio output, an afc voltage and also operates a tuning meter. It was designed by G3ZGO as a companion unit to the psu for a 3cm Gunn diode

oscillator described in this column in March 1972. The action relies on the variation of frequency of oscillation as the applied voltage is changed. In various versions the detector has been preceded by a retuned tv i.f. strip, a three-stage amplifier using 40602 MOSFETs, or a two-stage amplifier fed from a 130-180MHz tunable i.f.

Ideally the frequency/voltage characteristics of the Gunn oscillator should be determined, from which the optimum operating conditions can be established. The normal form of the curve shows a broad peak in the region of 10V, which corresponds fairly closely with the maximum output of rf. At lower voltages the frequency falls at a rate depending on the Q of the cavity; for a high Q cavity it may reach 20MHz/V, and for a low Q cavity, such as described in the April 1971 column, about 3MHz/V. For an a/c tuning range of ± 1 MHz, therefore, it must be possible to vary the applied voltage by ± 0.1 or ± 0.5 V about a mean setting and produce this frequency change, and this should be checked. Not all Gunn oscillators are satisfactory in this respect; some tend to jump in frequency as the operating conditions are marginally changed.

A more empirical method is to adjust the applied voltage for maximum output as measured, for example, by mixer diode current, and then reduce the voltage until the mixer current falls by 30 per cent. Altering this voltage by $\pm 0.5V$ should produce none of the abrupt changes in mixer diode current which are usually observed as an oscillator jumps in frequency.

The setting up of the discriminator unit is straightforward: (a) Align the ratio detector using conventional techniques. (See for example, *The Radio Designers' Handbook*, F. Langford-Smith, Iliffe).

- (c) With no signal applied to the i.f. strip, switch on the afc line to the psu and adjust RVI to restore the optimum voltage.

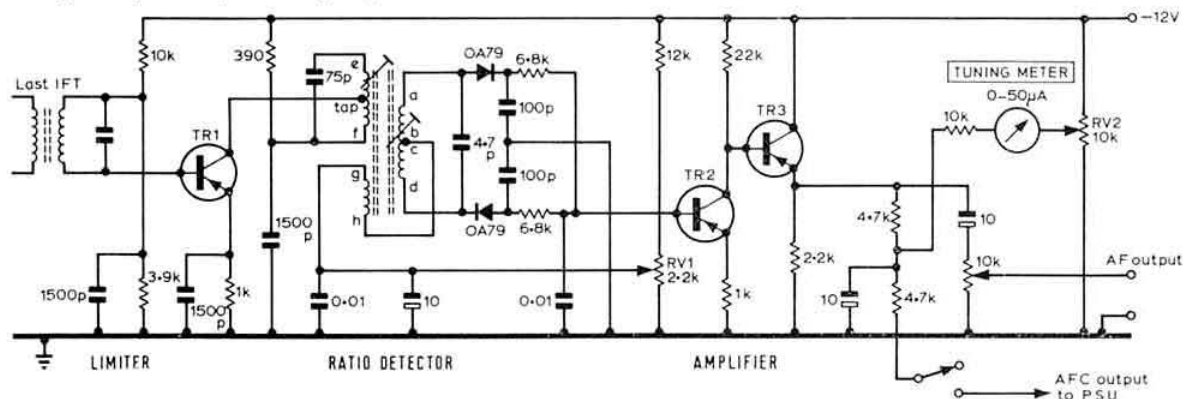
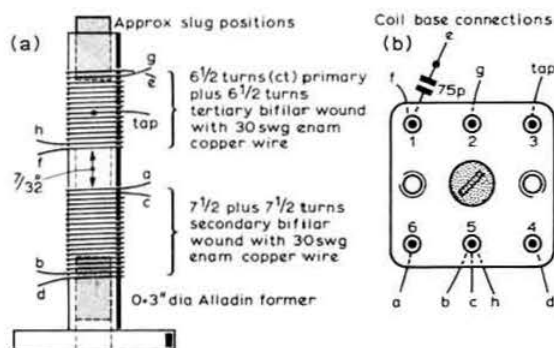


Fig 1. Circuit of 30MHz wide-band fm discriminator with audio and afc amplifier and tuning meter. TR1: AF115, AF116. TR2, TR3: OC45, BCY70

(d) Adjust RV2 for centre reading on the tuning meter.
 (e) With the afc switch off, tune in a signal. Switch in the afc, when the receiver should lock on to the signal. If the signal disappears immediately, then either tune the local oscillator to the other side of the signal, or reverse the polarity of the detector diodes.

If the afc/tuning meter facility is not required, then the transformer connection "g" should be taken directly to earth, and af taken from a 10kΩ potentiometer connected between earth and the junction of the two 6.8kΩ resistors. TR2 and TR3 etc are omitted.

Fig 2. (a) Construction of ratio detector transformer. (b) Coil former base connections



Oscar 6 predictions

Home-made predictions

by F. D. Roberts, G4HQ

This table is based on the Sunday morning Oscar predictions given over GB2RS and makes use of the fact that the longitude of the equatorial crossing repeats every other day with just a five-minute lag. Although the longitudes have been rounded off they do obey the 28.75° separation closely enough. The dodge of adding two hours and subtracting five minutes is also clear throughout the table. G2DD found that once he had established the longitude and first-day columns it was just a simple matter of knocking off fives.

Old orbits are shown in the example. New ones can be substituted from GB2RS information. Certain orbits are unattractive; users, according to where they live, will quickly discover which these are.

Orbit	EC °W	SUN	TUES	THUR	SAT
610	193	0936	0931	0926	0921
611	222	1131	1126	1121	1116
612	249	1326	1321	1316	1311
613	278	1521	1516	1511	1506
614	307	1716	1711	1706	1701
615	335	1911	1906	1901	1856
616	003	2106	2101	2056	2051
617	033	2301	2256	2251	2246

	MON	WEDS	FRI	SUN
618	062	0056	0051	0046
619	091	0251	0246	0241
620	119	0446	0441	0436
621	148	0641	0636	0631
622	177	0836	0831	0826
623	205	1031	1026	1021
624	234	1226	1221	1216
625	263	1421	1416	1411
626	292	1616	1611	1606
627	320	1811	1806	1801
628	349	2006	2001	1956

The G3WPO prediction table

by M. Hearsey, G8ATK and A. L. Bailey, G3WPO

Over the past few years, readers of *Radio Communication* have been introduced by the excellent articles of Bill Browning, G2AOX, to the problems involved in keeping track of Oscar, culminating in the April 1972 issue with a simple stereographic chart enabling amateurs to plot and time the varied orbits. Following the launch of Oscar 6, G3WPO and G8ATK each made up the chart and the results obtainable from both were comparable.

Predicting timed equatorial crossings far ahead was a little difficult, as different information sources provided conflicting data, which when taken over a short term do not contribute significant errors. However, when applied to a long-term prediction the errors become much more pronounced. G3WPO has, therefore, produced the following table which should provide the other information required for amateurs to track and communicate through Oscar 6. The table is written around 2° steps on the equator commencing at the Greenwich meridian, and the beam bearings are centred on London.

Column 1 gives the equatorial crossing point in 2° steps west of the Greenwich meridian, column 2 gives the approximate Acquisition Of Signal time at a range of 2,500 statute miles, column 3 gives the Loss Of Signal time at 2,500 statute miles. Columns 4 and 5 give the AOS and LOS beam headings respectively, while column

6 gives the satellite path, and column 7 the maximum aerial elevation.

Interpolation of the equatorial crossing points will have to be made (ie take the nearest on the table to the actual).

A typical example, given (a) Orbit number, (b) Time gmt of equatorial crossing and (c) Point of equatorial crossing, is shown below.

G3WPO can supply predictions for one month ahead on receipt of an aae.

Orbit No	Time gmt	Degrees west	AOS	LOS	AOS beam heading (4)	LOS beam heading (5)	Path (6)	Maxim aerial elevation (7)
1000	0900	0 00°	(1) + 5 = 0900 + 5 = 0905gmt	(2) + 22 = 0900 + 5 + 22 = 0927gmt	(3) 188°	340°	(4) S NNW Thro W	(5) 42°

RSRS orbit predictions for selected dates in March

Date	Orbit No	GMT	Eq crossing (°W)
10	1,824	0819	172
17	1,912	0858	182
24	1,999	0743	163
30	2,080	1857	332

1	2	3	4	5	6	7	1	2	3	4	5	6	7
000	+5	+22	188	340	S-NNW(W)	42	220	+27	+18	19	271	NNE-W(NW)	25
002	+5	+21	192	340	S-NNW(W)	38	222	+27	+18	19	274	NNE-W(NW)	24
004	+5	+21	197	340	SSW-NNW(W)	35	224	+27	+17	19	277	NNE-W(NW)	23
006	+5	+21	201	340	SSW-NNW(W)	31	226	+26	+17	20	280	NNE-W(NW)	22
008	+5	+21	207	338	SW-NNW(W)	28	228	+26	+17	21	284	NNE-WNW(NNW)	20
010	+6	+21	211	338	SW-NNW(WNW)	25	230	+26	+16	22	287	NNE-WNW(NNW)	20
012	+6	+19	216	337	SW-NNW(WNW)	23	232	+26	+16	22	289	NNE-WNW(NNW)	18
014	+6	+19	221	337	SW-NNW(WNW)	21	234	+25	+16	23	291	NNE-WNW(NNW)	17
016	+7	+18	226	336	SW-NNW(WNW)	18	236	+25	+16	24	294	NNE-WNW(NNW)	16
018	+7	+18	230	335	SW-NNW(WNW)	16	238	+25	+15	25	297	NNE-WNW(NNW)	15
020	+7	+17	236	335	WSW-NNW(WNW)	14	240	+25	+15	25	299	NNE-WNW(NNW)	15
022	+8	+16	240	334	WSW-NNW(WNW)	12	242	+25	+15	25	302	NNE-WNW(NNW)	14
024	+8	+15	247	333	WSW-NNW(WNW)	9	244	+25	+15	25	305	NNE-WNW(NNW)	14
026	+9	+15	252	331	WSW-NNW(WNW)	7	246	+24	+15	27	307	NNE-WNW(NNW)	13
028	+10	+13	259	329	W-NNW(NW)	6	248	+24	+14	28	309	NNE-WNW(NNW)	12
030	+11	+12	265	328	W-NNW(NW)	5	250	+24	+14	29	311	NNE-WNW(NNW)	12
032	+12	+10	272	325	W-NW	4	252	+24	+14	30	313	NNE-WNW(NNW)	12
033	+12	+9	275	323	W-NW	3	254	+23	+14	31	315	NNE-WNW(NNW)	12
034	+13	+9	280	321	W-NW	2	256	+23	+14	32	317	NE-NW(N)	12
035	+14	+7	283	319	NW	1	258	+23	+13	34	319	NE-NW(N)	12
036	+15	+5	290	318	NW	1	260	+22	+14	36	320	NE-NW(N)	12
037	+16	+4	295	313	NW	1	262	+22	+13	38	322	NE-NW(N)	12
038	+18	+1	305	—	NW	0	264	+21	+13	38	323	NE-NW(N)	12
Bearings 039 to 128 are out of range													
129	+37	+5	50	66	NE	1	268	+20	+14	42	327	NE-NW(N)	12
130	+36	+7	43	74	NE	1	270	+20	+14	43	328	NE-NW(N)	12
131	+36	+7	42	75	NE	2	272	+20	+14	45	329	NE-NW(N)	12
132	+35	+9	40	81	NE	2	274	+19	+14	48	330	NE-NW(N)	12
134	+35	+10	37	89	NE	3	276	+19	+14	49	332	NE-NW(NNE)	12
136	+34	+12	34	96	ENE	5	278	+19	+14	52	333	NE-NW(NNE)	13
138	+34	+13	31	102	ENE	6	280	+18	+15	54	334	NE-NW(NNE)	13
140	+33	+14	30	108	NNE-ESE(ENE)	7	282	+18	+15	56	335	NE-NW(NNE)	13
142	+33	+15	28	113	NNE-ESE(ENE)	9	284	+17	+15	58	336	NE-NW(NNE)	13
144	+33	+16	27	120	NNE-ESE(ENE)	11	286	+17	+15	61	337	NE-NW(NNE)	14
146	+32	+17	27	125	NNE-SE(E)	13	288	+16	+16	63	338	ENE-NNW(NNE)	15
148	+32	+18	26	130	NNE-SE(E)	16	290	+16	+16	67	339	ENE-NNW(NNE)	17
150	+32	+18	25	135	NNE-SE(E)	18	292	+15	+16	70	340	ENE-NNW(NNE)	18
152	+32	+19	23	140	NNE-SE(E)	20	294	+15	+16	72	341	ENE-NNW(NNE)	18
154	+31	+19	23	145	NNE-SE(E)	22	296	+14	+17	76	342	ENE-NNW(NNE)	19
156	+31	+20	22	150	NNE-SSE(E)	25	298	+14	+17	78	343	E-NNW(NE)	21
158	+31	+21	22	154	NNE-SSE(E)	28	300	+13	+17	81	344	E-NNW(NE)	22
160	+31	+21	21	158	NNE-SSE(E)	30	302	+13	+17	84	345	E-NNW(NE)	23
162	+31	+21	20	163	NNE-SSE(E)	33	304	+12	+18	88	346	E-NNW(NE)	24
164	+31	+22	20	167	NNE-SSE(E)	38	306	+12	+18	91	347	E-NNW(NE)	25
166	+30	+22	20	172	NNE-SSE(E)	42	308	+11	+19	93	348	E-NNW(NE)	26
168	+30	+23	20	176	NNE-SSE(E)	44	310	+11	+19	97	349	E-NNW(NE)	28
170	+30	+22	20	180	NNE-SSE(E)	48	312	+10	+20	100	350	E-NNW(NE)	30
172	+30	+22	19	184	NNE-SSE(E)	50	314	+10	+20	104	351	E-NNW(NE)	33
174	+30	+22	18	188	NNE-SSE(E)	58	316	+10	+20	107	352	ESE-NNW(NE)	35
176	+30	+22	18	192	NNE-SSE(E)	64	318	+9	+20	110	353	ESE-NNW(NE)	37
178	+30	+22	18	196	NNE-SSW(ESE)	70	320	+9	+20	113	354	ESE-NNW(NE)	40
180	+29	+23	18	200	NNE-SSW(ESE)	78	322	+8	+21	117	355	ESE-NNW(NE)	42
182	+29	+23	17	204	NNE-SSW(O'HEAD)	80+	324	+8	+21	120	356	SE-NNW(NE)	45
184	+29	+23	17	208	NNE-SSW(O'HEAD)	80+	326	+8	+21	123	357	SE-NNW(NE)	48
186	+29	+22	17	212	NNE-SSW(O'HEAD)	80+	328	+7	+22	127	358	SE-NNW(NE)	51
188	+29	+22	17	216	NNE-SSW(O'HEAD)	80+	330	+7	+22	131	359	SE-NNW(NE)	56
190	+29	+22	18	220	NNE-SW(NW)	75	332	+7	+22	134	360	SE-NNW(NE)	63
192	+29	+22	18	222	NNE-SW(NW)	71	334	+6	+22	138	361	SE-NNW(NE)	68
194	+29	+21	18	226	NNE-SW(NW)	65	336	+6	+22	142	362	SE-NNW(NE)	74
196	+28	+21	18	230	NNE-SW(NW)	57	338	+6	+22	146	363	SE-NNW(NE)	80
198	+28	+21	18	234	NNE-SW(NW)	51	340	+6	+22	148	364	SSE-NNW(ENE)	80+
200	+28	+21	18	237	NNE-WSW(NW)	49	342	+5	+23	153	365	SSE-NNW(O'HEAD)	90
202	+28	+21	18	240	NNE-WSW(NW)	46	344	+5	+23	157	366	SSE-NNW(O'HEAD)	80+
204	+28	+21	18	244	NNE-WSW(NW)	42	346	+5	+23	161	367	SSE-NNW(WSW)	78
206	+28	+21	18	248	NNE-WSW(NW)	39	348	+5	+23	165	368	SSE-NNW(WSW)	72
208	+28	+20	18	251	NNE-WSW(NW)	38	350	+5	+22	168	369	S-NNW(WSW)	65
210	+28	+19	18	255	NNE-WSW(NW)	36	352	+5	+22	173	370	S-NNW(WSW)	59
212	+28	+19	18	258	NNE-WSW(NW)	34	354	+5	+22	178	371	S-NNW(W)	52
214	+28	+19	18	261	NNE-W(NW)	30	356	+5	+22	182	372	S-NNW(W)	48
216	+28	+19	18	264	NNE-W(NW)	28	358	+5	+22	186	373	S-NNW(W)	44
218	+27	+18	18	268	NNE-W(NW)	27							

SWL NEWS

(Continued from page 192)

Dave Whitaker reflects that 1972 was a good year for him radiowise with 230 countries in 40 zones heard, which was easily his best performance. Dave comments on two "goodies" heard on 80m: VP8KL is thought to be ok, but the HZITA is doubtful even though he asked for QSLs via OD5FB.

An FRDX400S is now in the hands of Owen Cross, BRS33364, and his first impressions are that it is a fine piece

of equipment and a vast improvement on the receiver he was using previously. Gregory Cook, A8221, supplies a list of dx stations heard recently and also comments on the performance of his new Yaesu FR50B.

Gregory also mentions that he had been doing a large amount of studying in preparation for the May RAE, as has Lee Aldridge, A7780.

Your scribe acknowledges letters from A7139, A7700, A7908, A7951, A7999, A8054, A8085, A8210 and BRS33286. Updatings for the 1973 Countries table along with news, views and comment should reach him by 27 March 1973.

THE MONTH ON THE AIR.....

.....by JOHN ALLAWAY, G3FKM*

A RECENT article on the *DXers Magazine*, written by K3RLY, gives a number of hints on how to be helpful when applying for cards from a QSL manager. Bud makes the following suggestions: (1) When working an expedition make sure that the station clock is right and log the time of the contact accurately—only a few minutes out can make a big difference with a station who is making several contacts a minute. (2) Send one sac per station (when the QSL manager is acting for more than one dx station the time delay in receiving logs can vary very considerably and holding an envelope for the last card may cause a very long delay—as can one contact “not in the log”). (3) Put all the QSO information on one side of your QSL, including your own callsign—this simplifies matters considerably. Another point raised is the advisability of logging the calls of a few stations who were worked by the dx station before and after one's own contact. This evidence can be of great help in the event of a logging error. Other advice is to never use staples to secure things within an envelope or to seal it with tape, and not to use long thin airmail envelopes for return from INDXA as these do not respond too well to automatic cancelling machines.

DX news

VR1AA is reported to have issued the callsign VR7A to a New Zealand amateur for future operation from the Southern Line Is (Vostok, Caroline and Flint Is). These islands are inhabited and are administered from the Gilberts. VR1AA himself will be leaving Tarawa in April for a long leave during which he will visit the UK.

Stations on Prince Edward Is (VE1) are being permitted to use the CII prefix during 1973 to celebrate the 100th anniversary of their province's joining the Confederation of Canada.

A51TY left Bhutan recently and will not return until 1974, this leaves A51PN as the only active station in the country. It seems that the various expeditions which wish to operate from there will not be permitted to do so until after July when the period of mourning for the late king ends.

Steve, ex-ZC4MO, is now in Muscat and has the callsign A4FE. He is acting as QSL bureau for A4.

The *West Coast DX Bulletin* suggests that only the QSL cards sent out by WAIHAA for contacts made by SY1MA last October may be accepted by ARRL for Mt Athos credit. A number of cards have been sent out from sources in Europe.

There is now a South-East Asia DX Net operating on Tuesdays and Fridays at 1400 on 7,075kHz.

G4AMJ wishes readers to know that he is now acting as QSL manager for VP9GE for his contacts with Europe, Africa and Asia. (See *QTH Corner*)

The “JW8IL” who has been asking for QSLs via W3HNK appears to be a pirate. Rick, W4SVKJ (ex-EP2DX), left the USA in mid-January en route for SV, TA, JY, EP, 9K,

YA and VU, and expects to finish his journey with a three-year stay in Germany. QSLs for his contacts will be sent out via W3HNK.

CR9AK is now living in Vancouver. G3JAG reports receipt of a CR8AK QSL from CT1CY who does not speak any English. 9M8OEA and 9M8SPD are in the Philippine Is until August 1973 and are behind with their QSLing following their equipment being rifled on its way from Taiwan. They may be reached at the address given in *QTH Corner*.

There seems to be more activity appearing from the Kerguelen Is. FB8XA has been joined by FB8XB (Roger), and FB8XC (Jean-Louis—formerly F6AGR). All ask for QSLs via F2MO. There seems a possibility that the FB8XX call may be reserved for official use.

Garth, ex-5H3LV (5H1LV, 5H3LV/A, 5Z4LV), is now VE3EUP and may be reached at the address in *QTH Corner*. 5Z4KL has been heard using the callsign 5Y4XKL and the 5Y4X part of the call is being used to celebrate the 10th anniversary of Kenyan independence.

VK6CT is often to be found between 2100 and 2300 on Fridays, Saturdays and Sundays on 3,510kHz (cw) and 3,645 and 3,695kHz (ssb). Anyone still awaiting the arrival of a QSL from AX2BKM/LH will find Karl Kozlik, c/o Box 1734, GPO Sydney, 2001, the person to approach.

In addition to the dxpeditionary activity forecast from Palmyra Is there may be some temporary operation by a resident amateur for about one month during February or March.

Awards

The Diploma Guglielmo Marconi

This award is being issued free of charge by ARI for proof of contact with or reception of 40 of the localities listed as follows: CR4, Lisbon, CT3, CN8, Cadiz, EI, F, FC, London, Flatholm Is, Isle of Wight, GI, GM, HB, HV, Bologna, I5, Rome, IT9, IS0, JA, Buenos Aires, ON, Rio de Janeiro, Stockholm, Gotland (SM1), Leningrad, VE1, VO1, VO2, Sydney (VK2), VP9, Mass (W1), NY and NJ (W2), Missouri Illinois, VU, ZB2, YU, 5A. In addition special stations II4FGM and IP1TTM—if the former is worked and one other special station only 35 other cards are needed. A.M. ssb, cw, rty, sst, or mixed endorsements are available. All contacts must be after 31 December 1972, and full details, the cards, and return postage, should be sent to Franco Fanti, IILCF, Via Dallolio 19, Bologna, Italy. The diplomas will be issued in 1974 on the occasion of the 1974 Marconi celebrations.

The 73 Trophy

This is a sculpture of a child's head by Sten Fasthe and will be awarded to the amateur who scores the most points by working stations in SM3 and SM7 in 1973. Europeans score three points per contact, others five. Contacts with members of the Freebooters RC count five and 25 points respectively. Each station may be worked once per band.

* 10 Knightlow Road, Birmingham B17 8QB.

Send confirmed log extracts to PO Box 150, S-28101 Sweden, before 30 June 1974.

The Worked Reciprocal Operators

Issued by the International Reciprocal Operators Club for contact with 20 stations operating under reciprocal licences (eg F2BO/W1, W1AA/DL, G5ZZZ). In the case of stations holding reciprocal licence calls (G5ZZZ) the home call should be given on the application. Stickers are issued for 40, 60, 80 and 100 contacts and for working all six continents. Send logbook data (certified by two licensed amateurs) plus \$1 or 10 IRCs to IROC, Box 11, Medway, Mass, 02053, USA. Listeners may apply but must have QSLs in their possession from the stations claimed.

The Hunter Branch Award

Issued by the Hunter Branch of WIA for those having contacted five stations in Hunter Valley, NSW, during any 12-month period since 1 January 1970. Claims should include log data and a declaration that QSLs to confirm the contacts have been sent out. They should be sent (with the equivalent of 50c) to Hunter Branch, WIA Award Committee, Box 134, PO Charlestown, Australia, 2290. There are over 160 VK2 stations in the area.

Top Band news

VK3CZ managed to contact G3RGB and G3SZA during the CQ WW 160 contest. Arthur found that using the converter described in October 1968 *QST* ahead of his 75S1 was of great assistance. GW3YGH QSOd VK6HD at 2110 on 7 January, this is believed to be the first VK/GW contact on the band. He has also heard VK3CZ (at 1925). GM3IGW/A also contacted VK6HD—this was at 2200.

The latest *WIBB Bulletin* says that the transatlantic tests of 19 November, 24 December and 14 January were disappointing due to poor conditions. The weekend 6-7 January was particularly good with W6/Europe contacts being recorded. Stew reminds everyone of the importance of not forgetting the "DX window" (1,825-1,830kHz) when the band is open for dx working. Please try to avoid this segment of the band at these times unless taking part—in Europe it would also be of great help if the 1,800-1,810kHz sector could be left clear of local contacts during dx openings.

Dxpeditons

XE1IJ, XE1J and possibly others, will be on Revilla Gigedo Is from 15 to 20 March. All bands 160 to 10m will be used, the cw callsign being 4C4AA and the ssb XF4.

Gus Browning, W4BPD, and his wife Peggy, are planning to set out on a two-year expedition in spring 1974. This will be supported by the YL ISSB organization and contributions are being solicited and should be sent to K5LIL (E. J. Murta Jr, 4408 NW 47th St, Oklahoma City, Okla, 73112, USA). It is unlikely that this trip will include inaccessible areas.

A group of USA amateurs plan a visit to Ogasawara Is (formerly Iwo Jima) around the period 20-27 March. Their callsign will be KA1CQ and frequencies to be used are 1,900, 3,537, 7,080-7,090, 14,220, 21,270 and 28,520kHz. Round-the-clock operation is envisaged and there will be simultaneous working on four bands when conditions permit. The operators will be KA2s AS, BL, BW, DF, DX and WB6CGM.

K6GUY, W6GQU and KH6HET, following their successful VR3AC efforts, hope to make a return visit to Fanning Is later this year, and to include some Palmyra Is (KP6) action. Other rare Pacific areas are also under consideration for visits in the future.

Contests

Israel International Radio Contest

0001 10 March to 2400 11 March. Phone and cw but no mixed-mode QSOs. One contact per station per band, 3-5 to 28MHz. Single operator only. Twelve hours' rest must be taken in not more than three periods and indicated in the log. Exchange RS/T and QSO number (from 001). Contacts with own continent count one point, with others five points. Multiplier is sum of DXCC countries worked on each band added together. Own country contact counts only for multiplier credit. Each log must contain 25 different 4X or 4Z callsigns to qualify for first prize, which is a 10-day holiday in Israel including being guest of honour at a meeting of the International Symposium of Radio Hams in the Satellite Era at Netanya from 24 to 29 June. A special trophy will be presented at this meeting—if the overall winner is unable to visit Israel the holiday will be awarded to the second highest scorer. Winners will be notified by telegram on 22 May. Logs must have 40 QSOs per page, and have separate pages for each band, and they should indicate band, date, time, station worked, number sent, number received, mode, if multiplier, and points claimed. Summary sheet should indicate band by band analysis of points. A separate sheet showing the 25 4X or 4Z QSOs should be enclosed. Logs must reach the 25th Anniversary of Israel Contest, c/o 4Z4HF, J. Lieberman, Kibbutz SASA, Israel, no later than 30 April.

The CQ WW WPX SSB Contest

0000 24 March to 2400 25 March. All bands 1-8 to 28MHz—ssb only. Stations exchange report and serial QSO number (from 001). Contacts with own continent count one point, with others three, and one's own country for multiplier credit only. Contacts on 1-8, 3-5 and 7MHz count double points. Final score is QSO points multiplied by the number of different prefixes worked—each counts once only. Categories are single-operator, single- or multi-band, and multi-operator, single- and multi-transmitter (the latter may only transmit one signal at a time on any one band). Single operators may only operate for 36 hours and may take up to five breaks which must be shown in the log. Multi-transmitter stations must use separate serial numbers on each band. Separate log sheets must be used for each band. Summary sheets *but no log sheets* are available from G3FKM. Entries must be posted before 15 May to CQ WPX SSB Contest Committee, 14 Vandeventer Av, Port Washington, LI, NY, 11050, USA. Log sheets are available from the same address.

In the 1972 WPX SSB Contest UK scores were as follows:

Callsign	Band	Points	Callsign	Band	Points
G2AJB	All	50,061	G3FXB	14MHz	777,064
G4ACQ	All	44,407	G3NSY	14MHz	60,066
G3YWI	All	37,209	G3NLY	7MHz	177,288
G4APA	28MHz	35,150	G5AHE	3-5MHz	59,520
G3TXF	28MHz	31,494	G3NOB	3-5MHz	9,198
G3WJN	21MHz	396,528	G3WYX	Multi-op	1,791,536

Certificate winners are shown in bold type. Congratulations are extended especially to G3NLY, G3FXB and G3WJN who were world second, second and sixth on 7, 14 and 21MHz respectively.

The Bermuda Contest

0001 21 April—0200 22 April (phone). 0001 5 May to 0200 6 May (cw). Full details of this contest (the first prize in each section for UK entrants is an all-expense paid week's holiday in Bermuda) may be obtained from G3KTJ—G. P. Rigby, 30a Pimbo Lane, Upholland, Wigan, Lancs—who has a supply of official illustrated brochures concerning the event and will be pleased to send one to anyone in exchange for an sae.

Swiss H22 Contest

The 1973 dates for this contest are 1500 5 May to 1700 6 May. Logs postmarked not later than 30 days after the contest should be sent to TM USKA HB9AHA, in Moos, 5707 Seengen, Switzerland. Applicants for the H22 Award should send QSLs from each of the 22 cantons worked on cw or phone to Walter Blattner, HB9ALF, Post box 450, CH6601 Locarno, Switzerland.

DXCC

Official Bulletin No 409 from ARRL announced that Mt Athos has been added to the DXCC Countries List and that QSLs may be submitted for credit after 1 March 1973. Swan Is (KS4) has now been deleted and contacts made with the island since 31 August 1972 are counted as those with Honduras.

9H3WPD

On the occasion of World Peace Day (1 January 1973), the Pope John The XXIII Peace Laboratory, Hal Far, Malta, operated an amateur radio station. Activity also covered 31 December and in the 48 hours 1,318 QSOs were made using 21, 14 and 7MHz, and 140 different countries were contacted. Equipment consisted of KW2000B and KW1000 running 600W p.e.p. to a ground plane and G8KW dipole. The station was open to the public, was operated by Ron Meachen, 9H1R, for the entire period, and was featured on local tv newscasts. QSLs have been sent out via the bureaux. Further activity by 9H3WPD is expected each year.



9H3WPD being operated by Ron Meachen, 9H1R, and Roger Scotto, 9H1BZ, logging, on the occasion of World Peace Day

80m interference

The Northumbria RC have decided to organize a drive to locate and eradicate the sources of the deliberate interference which has been so much in evidence on the dx segment of 80m. They ask all amateurs and listeners to make notes of (1) df bearings (which do not need to be very accurate if sufficient data is received), (2) time, (3) frequency, and (4) type of interference (carrier, microphone scratching etc). These should be sent to G4ADD, W. A. Ricalton, 4 South Road, Longhorsley, Morpeth, Northumberland. All information will be passed on to the authorities.

News from overseas

Mick O'Donnell, G8CCV, is in Hong Kong and has the callsign VS6CV. He has an FT101, FV101, SP101 and 14AVQ aerial, and will be found mostly on 21MHz although 14 and 28MHz will also be used. UK contacts are sought for.

The RAF Masirah Radio Club, formerly MP4MBC, is now licensed as A4FD, and QSLs may be sent via G3XEC or to the address in *QTH Corner*.

Apologies to A2CJP (ex-G3JPE/ZD3K/VS9AJP etc) for incorrectly quoting VE4SW as his QSL manager in January *MOTA*. In fact Phil deals with his own requests for cards via Box 52, Gaberone, and says that he still has a few ZD3K QSLs left if anyone still needs one (sae and postage please)—all requests received to date have been answered. The A2CJP station consists of a Courier CTR-1 transceiver (180W p.e.p.) with a TA33 at 33ft and top-loaded 30ft vertical mounted on the metal bungalow roof. Phil is usually on 21MHz around 21,400kHz at 1500, and on 14,180kHz at 1600. He can operate on 7 and 3.5MHz and is looking for UK contacts, the best months for these should be in April or May.

ZD8TS left Ascension Is on 11 January for the UK and will be back at his G3ZST location by now. He reports the arrival of QSLs for "ZD8AV" for 160m contacts but points out that this callsign does not exist and that there is no current 160m activity from the island.

During a recent visit to Rome, G3WET (J. G. Evans, 104 Stonnall Rd, Aldridge, Walsall, Staffs) spoke to Brother Ed, HV3SJ. It seems that the latter's equipment is in need of repair and funds are required. G3WET offers to forward any contributions received to HV3SJ.

Band reports

A very poor month indeed on the hf bands—as prophesied in the *West Coast DX Bulletin* which noted one small sunspot visible during the first week, two during the second, one during the third, and none at all during the fourth week of January.

Many thanks to the following for supplying logs from which this section was compiled: G5JL, G6GH, G2s BJY, CDT, HKU, G3s GVV, IGW, JAG, KDB, LPS, RFG, UOL, XWZ, ZPW, GW3YGH, GW4BLE, G8HAW, BRSS 2098, 17567, 31301, As 7056, 7511, 7785, 7951 and 7999.

Stations listed in italics were using cw, all others ssb.
1-8MHz 0000 *EP2BQ*, 0100 *PY1DVG*, *YV5CKR*. 0200 *KV4FZ*, *4W1AE*. 0300 *W9DL*. 0400 *K8HKB*. 0700 *KP4AST*, *KV4AZ*, *W1BB/1*. 2000 *VK3CZ*. 2200 *VK6HD*, *UB5WBN*, *5Z4KL*.

3-5MHz. 0000 CO2AA, 9Y4VT. 0100 VPs 2LI, 2SQ, 9GD, YV7RX, ZF1GC. 0200 HPIJS, PJ2CW, VPs 1BH, 2DWY, 2GN, 8P6AY, 9Y4EH. 0300 HK0BKX, PZ1BK, TI2NA.

QTH Corner

A7CCY via K4CDZ, F. W. Ashworth, RFD2-Box 353, Lewisville IC, 27023, USA.
A2CJP P. Johnson, PO Box 52, Gaberone, Botswana.
A4FE PO Box 981, Muscat.
FP8DH via VE6AYU, A. Michaud, 4416 Bulyea Rd NW, T2L 2H3, Al, Canada.
PJ7ARI via PJ2ARI, PO Box 659, Curacao, Neth Antilles.
PJ7VD via PJ2VD, PO Box 879, Curacao, Neth Antilles.
PJ8DX via K2FJ, K. R. Palmer, RFD 3—Williston Rd, E Aurora NY, #4352, USA.
SQ5Z (Stn in Poland) via SP5PMT.
TU2DF BP 112, Bouafle, Ivory Coast.
TU2DR F. Bibeau, BP 4058, Abidjan, Ivory Coast.
VP1KD via K4ELK, W. E. Morris, 814 W. 64th St, Hialeah, Fla 33012, USA.
VP2KH PO Box 184, Basseterre, St Kitts, BWI.
VP2VAN via K2FJ (see PJ8DX).
VP5LD via W1HAA, W. B. de Lage, 238 Slater St, Attleboro, Mass, 02703, USA.
VP9GE via D. R. Evans, "Sunlea", Wheel Speed, Carbis Bay, St Ives, Cornwall.
VK0WW via VK3FF, 45 Mt Pleasant Rd, Belmont, Vic, 3216, Australia.
VR1PA via W6AHF, R. L. Hughes, 17494 Via Alamitos, San Lorenzo, Cal, 94580, USA.
WC4SFF W4HAW, Box 6834, Southboro Stn, W Palm Beach, Fla, 33405, USA.
ex-ZD3TS T. K. Surges, 198 Trowell Rd, Wollaton, Nottingham.
IS1A (Spratly Is) via W1YRC, 30 Rocky Crest Rd, Cumberland, RI, 02864, USA.
3D2DI via VE6TK, 1108 Trafalgar Drive NW, Calgary, T2K 2T8, Al, Canada.
ex-5H3LV G. A. Hamilton, 123 Glencairn Ave, Toronto 310, Ont, Canada.
5H3MT via LA9PF, Kokerudaaen 22, 1322 Hovik, Norway.
ex-9M8OE C. E. Schaub, Regional Relay Facility, PSC 2, Box 19047, APO San Francisco, 96274, USA.

RSGB QSL Bureau, Bromley, Kent, BR7 2NH.

0400 EP2TW, YV0AA. 0500 KZ5BB. 0600 CE5 2AA, 3AQW, WB0FCY, ZF1FOC. 0700 CN8BB, KG4CB, KV4AM, YV1AD, ZL3KK/C, 6W8DY. 0800 KH6AQ, M11, PJ2CW, ZL1BKX. 0900 YV0AA. 1700 EP2TW, ZL5. 1800 JA1NEC, ST2SA. 1900 DU1EJ, OH0MA (Market Reef), ZS1MH, ZS3GH, 5U7AX. 2000 JY1, MP4TDM, 5X5NK. 2100 JY9GR, KC6SK. 2200 JFL8OM, 4W1AF, K3WEU/6Y5. 2300 PJ8HR, VP2LL, VP9GR, YA1DT, ZB2CO, 9M2s DQ, PV.

7MHz. 0000 CR7IZ, YAIOS. 0100 PJ2VD, ZS6ZE. 0200 FL8DS. 0300 VE8JM, ZE2JS. 0600 HPIAH. 0700 EL0R, HPIRV, ZL3VM, 9LIGC. 0800 FK8KAA, TG9AI, VE8RE, VK3ZL, ZL5. 0900 JA5. 1800 FB8XX, VU2IN, 9K2XZ. 1900 CR7IZ, TA1MB, VK3MR, 3D6AX. 2000 JA4FHE, MP4BIE. 2100 CR6AL, 8P6BU. 2200 ET3USA, PYs, TJ1BG. 2300 CX9BT, EL2DK, WA7SJS/KP4, ZS6ZE.

14MHz. 0000 YV0AA. 0700 ST2SA, SUIIM, YK1AA. 0800 IV5VEC (QSL to ISDOF), JD1ACF, KC6SK. 0900 JT1KA, KC4USA, M11. 5B4AU. 1200 5B4AO. 1300 JX9XM, VS6ARC. 1500 VK0WW, YB0AB, 4W1BF. 1700 VE8YE, 9H5D, 9L1VW. 1800 KH6BB, ZB2S, ZD8US. 1900 ZD7SD. 2100 OA9JKI, 5Y4XLW, 8RIUCS. 2200 YN1AZ. 2300 VP2SBH.

21MHz. 0800 VS6s CY, DO. 1000 A2CEW, 5H3MT, 5N2s AAN, ESH, 5T5CJ. 1100 VQ9HCS, VS6CV, YK1AA. 1200 FR7AK (QSL to CN8CG), EY7AE, MP4TDM, TY3ABF, UK30SB, ZD3D. 1300 CE3AQW, CVICH (Uruguay), JX3PV, ZB2CO. 1400 TJ1BG. 1500 CE8AA, TR8PB, VP1BH, 3E1KC (Panama). 1700 YV0AA.

28MHz. 1100 CR7, EA8, EL, FL8, 7Q7, 9J2. 1200 ET3DS, ST2SA, 4W1BC. 1400 ZE4JW.

Many thanks to all correspondents, and especially to the authors of the following for information obtained from their publications: NARS Newsletter (5N2ABG), Long Skip (Nick Sawchuk), the West Coast DX Bulletin (WA6AUD), the Ex-G Radio Club Bulletin (W3HQQ), DXpress (PA0INA/PA0TO), DX News Sheet (Geoff Watts), the 29 DX Club Newsletter (VK6JR), QUAX (G3DME) and the DX'ers Magazine (W4BPD).

Please send all items for April issue to reach G3FKM no later than 7 March, and for May issue by 2 April.

Propagation Predictions

The seasonal fall of the F2 MUFs in the northern hemisphere starts slowly in March. This, together with the declining phase in the sunspot cycle, will lead to a worsening of conditions on 28MHz. Contacts will be possible now and again with South America and Africa. Under normal conditions communication with North America will not usually be possible during the present solar activity.

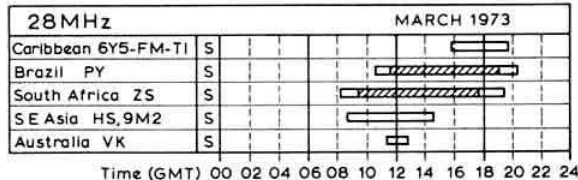
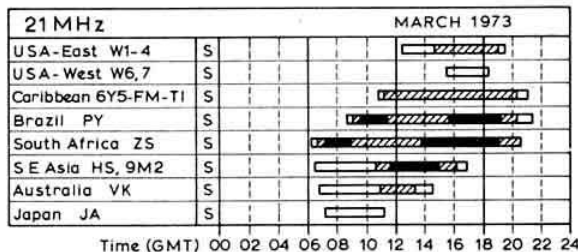
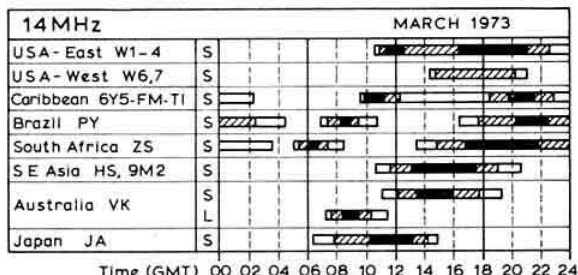
On 21MHz the decline in F2 MUFs will be noticed as a deterioration of dx conditions; only Africa and Asia will be heard with certainty.

The decline in solar activity will not be as noticeable on 14MHz as on 21 and 28MHz. All continents will be heard with certainty during the coming years of sunspot minimum. During the months of the equinox (March-April, September-October) it will be almost impossible to work on the indirect path. An exception is communication with Australia, for which this path is often better than the direct one. Contact with Hawaii will be possible from about 0700 to 0900gmt and from 1700 to 2000gmt. As the path lies over the pole and through the auroral zone, contacts will be interrupted.

The 7MHz band will provide dx opportunities during March, when most of the path lies in darkness. The east coast of North America will be heard on this band about 2200gmt, about the same time as 14MHz closes in this direction, and will be open again shortly after sunrise. Favourable conditions will occur from 0000 to 0500gmt. It will be possible to hear western North America on 7MHz between 0330 and 0600gmt, and under favourable conditions Alaska and Hawaii from 0430 to 0600gmt.

It will be possible to hear the east coast of the USA from about 0030 to 0500gmt on 3.5MHz. During the latter half of the night this band will be interrupted for local traffic by the dead zone. This can only be favourable for dx traffic with North America at this time.

The provisional sunspot number for January 1973 from the Swiss Federal Observatory was 42-2 with the period of greatest solar activity occurring during the first half of the month. The predicted smoothed sunspot numbers for May, June and July are respectively 39, 37 and 36.



S..... Short path 1-5 days [Hatched bar] 6-20 days
 L..... Long path [Solid bar] Openings on more than 20 days in the month

COUNCIL PROCEEDINGS

A brief report of the Council meeting held on 28 November 1972

Present: Mr R. J. Hughes (President, in the Chair), Dr E. J. Allaway, Messrs W. J. Green, E. G. Ingram, G. R. Jessop, W. F. McGonigle, C. H. Parsons, J. R. Petty, A. W. Smith, R. F. Stevens, G. M. C. Stone, F. C. Ward and E. W. Yeomanson (members of Council), Dr J. A. Saxton (President designate), D. A. Findlay (general manager), A. W. Hutchinson (editor).

Apologies for absence had been received from Messrs B. D. Armstrong, J. O. Brown, L. E. Newnham and W. A. Scarr.

The President extended a welcome to Dr J. A. Saxton, who in reply expressed his appreciation of the Council's invitation to be President in 1973 and thanked Mr Hughes for the invitation to attend this meeting.

Mr Hughes pointed out that this was the last Council meeting of 1972 and he therefore wished to thank all members of the Council, the general manager and the editor for their assistance during the year. Mr Hughes also pointed out that Mr Yeomanson was retiring from Council after being a Council member for 15 years, and he wished to thank him particularly for his services to the Society both as a Council and committee member during that period.

The President reported that he and Mr Stevens attended the VERON "Day of the Amateur" at Hilversum in November.

The President stated that he considered that one of the most urgent problems was to ensure that members' correspondence was handled expeditiously.

Diamond Jubilee Contests

It was reported that discussions had taken place with BOAC and that two main prizes and eight subsidiary prizes would be made available for the Diamond Jubilee Contests. The rules were acceptable to BOAC, and Mr John Graham, G3TR, chairman of the HF Contests Committee, had been present at the discussion.

Diamond Jubilee

After discussion the following points were noted:

There seemed to be no demand for a series of special events to take place over a whole week.

There are several events planned at provincial centres, such as the North-West Amateur Radio Convention at Manchester, the Scottish VHF Convention, and Bristol '73, and it seemed reasonable to make the organization and/or co-ordination of events a zonal responsibility. Council members representing Zones should therefore be asked to report back to the January meeting of Council with details of events planned for their zones.

The Mobile and Exhibition Committee would be organizing the Woburn Rally and the Diamond Jubilee Committee should liaise with that committee.

There was likely to be an exhibition in 1973 organized by the Amateur Radio Retailers Association (ARRA) and the Mobile and Exhibition Committee would be asked to obtain details with the possibility in mind of having a convention at this exhibition.

Membership and affiliation

Council noted the current membership figures. It was resolved:

- to accept reduced subscriptions from seven members
- to waive the subscriptions of three members on the grounds of blindness or other disability
- to grant affiliation to the Radio and Space Research Station Amateur Radio Club, Slough; Spalding and District Amateur Radio Society, and Martlesham Radio Society.

Honoraria

Council approved honoraria to 37 members in recognition of their services to the QSL Bureau, Intruder Watch, Beacon Service and other Society activities.

Honorary officers

Council confirmed that invitations should be extended to the honorary officers listed on page 155 of this issue of *Radio Communication* to continue in their respective offices in 1973.

2m band plan

Mr Stone explained the background to the 2m band plan and said that the original plan had proved satisfactory for many years but

there had recently been suggestions that conditions had now changed and that a new plan was necessary. A special meeting of the VHF Committee had been held in October to discuss proposals and a modified plan had subsequently been submitted to Council for approval.

After discussion it was agreed that the 2m band plan as published in the November issue of *Radio Communications* should be ratified. There would be no footnotes indicating the allocation of any particular frequencies.

Proposed RSGB Award

D. Allaway explained that it was becoming increasingly difficult to qualify for the Commonwealth DX Certificate due to the dwindling number of Commonwealth countries.

It had therefore been suggested that an alternative certificate should be available and that the terms of reference should require contacts with cities which were now in, or which had been in, the Commonwealth. Council agreed in principle to the institution of an additional award, and that this matter would be progressed by means of a specific proposal to Council.

Representation on external bodies

Council confirmed that invitations to represent the Society on various external bodies as listed should be extended to the following:

CCIR Study Group 5
CCIR UK General Purpose Committee
C & G RAE Advisory Board

R. Flavell
R. F. Stevens
R. J. Hughes, L. E. Newnham, W. A. Scarr
R. F. Stevens
D. A. S. Drybrough
D. A. S. Drybrough
D. A. S. Drybrough
R. S. Roberts
R. S. Roberts
R. S. Roberts
R. S. Roberts
D. A. Findlay

BSI Tele 25/1
BSI Tele 23/1
BSI Tele 25/3
BSI Tele 25/6
BSI Tele 1/5 Terminology
BSI Tele 1/30 Terminology
BSI Tele 25/4 Aerials
BSI Tele 25/6 Domestic Hi-fi Equipment
Frequency Advisory Committee

Dates of Council meetings in 1973

The following dates were agreed:

Thursday 4 January	Monday 3 September
Monday 5 March	Tuesday 6 November
Tuesday 8 May	Thursday 6 December
Monday 9 July	

In addition, dates of provisional meetings were agreed as follows:

Monday 5 February	Monday 4 June
Monday 2 April	Monday 8 October

Provisional meetings will only be called if Society matters require urgent attention.

Committee minutes and recommendations

Council received the minutes of the following committee meetings: Interference (15.9.72), Finance & Staff (18.9.72), HF Contests (21.9.72), Mobile & Exhibitions (3.10.72), Membership & Representation (10.10.72), VHF (11.10.72), VHF Contests (12.10.72), Education (14.10.72), Scientific Studies (16.10.72), Technical & Publications (17.10.72), HF Contests (19.10.72), Membership & Representation (14.11.72).

Council accepted recommendations of the following meetings: Finance & Staff Committee of 18.9.72, VHF Committee of 11.10.72, Education Committee of 14.10.72, Technical & Publications Committee of 17.10.72, M & R Committee of 14.11.72.

Correspondence

The President stated that he had been notified by Mr J. Bazley, G3HCT, that he wished to resign from Council. The resignation had been accepted and arrangements would be made at the January Council meeting to fill the casual vacancy.

The President had received a letter from Mr C. Emary, G5GH, in connection with signatures on certificates. It was agreed that the President for the time being would sign certificates if practicable, particularly the CDX Certificates, but otherwise they should be signed by the awards manager.

R. J. Hughes, President 1972

Before concluding the evening's business Council expressed appreciation of the service rendered by Mr Hughes in his capacity as President during the year.

Mr Hughes, in thanking Council, said that he had enjoyed his Presidential year.

Constitution of committees for 1973

The President is an *ex-officio* member of all committees.

Contests (hf)

Council member: Dr E. J. Allaway.

Other members: D. Andrews, R. S. Biggs, A. V. H. Davis, R. L. Glaisher, J. C. Graham, M. Harrington, S. V. Knowles, G. T. Peck, R. Polley, D. Thom.

Contests (vhf)

Council member: G. M. C. Stone.

Other members: R. G. Brade*, M. T. Deacon, L. N. G. Hawyard, F. Mathews, W. J. McClintock, C. Sharpe, R. G. Skegg, L. V. G. Turner, I. F. White.

Diamond Jubilee

Council members: R. J. Hughes, G. R. Jessop, W. A. Scarr.

Education

Council members: R. J. Hughes, L. E. Newnham, F. C. Ward.

Other members: G. L. Benbow, F. N. Kendrick, D. M. Pratt, R. Wallwork.

Finance & Staff

Council members: J. O. Brown, G. R. Jessop, L. E. Newnham, F. C. Ward, R. F. Stevens.

Other members: D. A. Findlay, C. G. Powell.

Interference

Council member: (None)

Other members: J. W. Hill, A. M. B. Holloway, I. Jackson, P. F. Jobson, D. G. Pinnock, G. Slaughter, E. Swayne*, J. W. Swinerton, D. M. Thomas, P. W. Waters.

MPT Liaison

Council members: Dr E. J. Allaway, B. D. Armstrong, R. J. Hughes, G. R. Jessop, L. E. Newnham, R. F. Stevens, F. C. Ward.

Other members: P. Balestrini, D. A. Findlay.

Membership & Representation

Council members: R. W. Fisher, W. J. Green, E. G. Ingram, G. R. Jessop, W. F. McGonigle, C. H. Parsons, J. R. Petty, W. A. Scarr, A. W. Smith, F. C. Ward.

Mobile & Exhibition

Council members: J. R. Petty*, L. E. Newnham.

Other members: P. Balestrini, T. I. Lundegard, M. A. C. McBrayne, W. J. McClintock, N. O. Miller, G. W. Norris, G. P. Shirville, M. G. Wallace.

Raynet

Council member: (None)

Other members: P. Balestrini, Mrs J. Balestrini, E. R. L. Bassett, R. Ferguson*, Dr A. C. Gee, S. W. Law, R. A. Ledgerton, T. I. Lundegard, S. J. Scarborough, E. W. Yeomanson.

Scientific studies

Council members: R. J. Hughes, G. M. C. Stone.

Other members: R. G. Flavell, R. A. Ham*, M. Harrison, D. Hayter, C. E. Newton, A. J. Oliphant, G. C. Roast*, H. Spence, J. Spurling*, A. Taylor.

Technical & Publications

Council members: B. D. A. Armstrong, G. R. Jessop, R. F. Stevens. Other members: R. J. Baker, G. C. Fox, J. P. Hawker, T. L. Herdman, P. J. Horwood, A. W. Hutchinson, J. W. Mathews, R. O. Phillips, H. W. Rees, D. M. Thomas.

VHF

Council member: G. M. C. Stone.

Other members: P. Balestrini, A. H. Bower, J. Coffey, B. R. Coleman, Dr D. S. Evans, D. Hayter, J. Hum, A. L. Mynett*, M. J. Sparrow, G. W. Tibbetts, M. Wallace.

IARU Working Group

Council members: R. J. Hughes, E. G. Ingram, R. F. Stevens, G. M. C. Stone.

Other members: D. Andrews, R. J. Baker, D. A. Findlay, J. C. Graham, C. Squires*.

* Corresponding members

RAYNET

by S. W. LAW, G3PAZ*

Last month we ran over a few of the more obscure points which puzzle the newcomer to Raynet. Let us now illustrate with an example, a general rule which applies to transmitting amateurs and SWLs alike. Recently a mobile station was in contact with a European station who said there was an urgent need for a kidney transplant in his town and could anything be done from the UK. Now the fact that the mobile in South London happened to be a Raynet controller has no bearing whatever on the matter. The ruling is clear that any message of this nature may only be communicated to a duly authorized person since the regulations in force on all types of licence make this quite clear. The controller in question therefore did what any radio listener should do when such a message is heard. He telephoned the HQ of the British Red Cross Society giving the particulars, made a note in case of an enquiry from the authorities and took no further steps in the matter. So remember, no heroic or panic measures in such cases and if in doubt telephone the MPT and ask for advice. Rest assured there is adequate machinery to deal with matters of the nature we have mentioned as you will note if you have followed the reports of the mass media.

We expect a certain amount of criticism of the foregoing but until the regulations under which we are permitted to operate undergo any change that is how we see the matter.

"Safety and Rescue"

It is not normally within our province to provide publicity for journals outside our sphere but we feel that the expenditure of 4p monthly on the paper which bears the above title is money well spent. It is published by the British Safety Council and covers a very wide range of safety hazards in industry and the daily life of us all. Raynet controllers may well discover much useful information which will enrich the knowledge of their group when called upon to deal with unfamiliar situations and bring an understanding attitude to bear on how best to use our services.

Raynet Committee

At the meeting at RSGB HQ on 20 January it was reported that there had been 29 new registrations and 99 re-registrations since the last meeting in November 1972. The committee would like to remind members that the new cards have now been in use for over 12 months and that any member holding the old type of card is not registered as a current member of Raynet. So please ensure that your card is up-to-date now.

You are also asked to note in your diary that Raynet will be at Woburn on 5 August and that on 22-23 September there will be a special Raynet project in honour of the RSGB Diamond Jubilee year. Details to be announced later, so keep the dates free. Two other events which will carry Raynet representation are the Maidstone rally at the Y Centre on 27 May and the BARTG convention at the Meopham Village Hall on 30 June.

There are some changes in West Glamorgan and in Pembroke of which more later. There are rumours of group formation in Lichfield and we are sure that G3CNV, QTHR, would like to hear more. We hear that there has been quite a bit of activity around Sutton Coldfield. It would be welcome to have news of Rugby, however; there are some tiny rumours, as also a hint of something afloat at Leamington. No need to worry about Liverpool, Cumbria, Deeside, Pendle or Chester and Mid-Cheshire all of whom seem very active. Perhaps we could have a little from GM soon; news seems scarce these days. Thanks to all who keep the committee well informed; it is much appreciated.

Honorary registrations secretary: Mrs Jane Balestrini, "Merrivale", Willow Walk, Culverstone, Gravesend, Kent.

VHF/microwave records

The table given below is an attempt to bring together current dx records on all the amateur bands above 50MHz. It has been compiled from the records of G5UM, G3RPE and G3JHM, and relies heavily also on information summarized in QST (to December 1972). The table is obviously incomplete, and is probably inaccurate. As dx records are a useful measure of progress, the writers welcome corrections and amendments to keep them up to date.

G5UM and G3RPE

Band	UK	Europe
50MHz	G5BY-ZS1P, 6,000 miles, Nov 1947	E12W-XE1PFE, 4,200 miles, 16 Nov 1958
70MHz	GM3EGW-ZB2VHF, 1,430 miles, 11 June 1967	GM3EGW-ZB2VHF, 1,430 miles, 11 June 1967
144MHz	—	G12V-Y11EXY, 1,387 miles, 4 July 1967
432MHz	GD2HDZ-OE2OML, 856 miles, 13 Oct 1972	GD2HDZ-OE2OML, 856 miles, 13 Oct 1972
1,296MHz	G3LTF-QZ7SP, 440 miles, 1972	G3LTF-QZ7SP, 440 miles, 1972
2.3GHz	G8AGM-F1J, 124 miles, 1 July 1969	F9B5-F9XG, 155 miles, 1972
3.4GHz	G3BNL-G3EEZ, 54 miles, 11 Sept 1969	—
5.6GHz	G3BNL-G3EEZ, 45 miles, 11 June 1972	—
10GHz	GW3RPE-G3ZGO, 98 miles, 25 Sept 1971	—
21GHz	G3BNL-G3EEZ, 45 miles, 12 Nov 1972	G3BNL-G3EEZ, 45 miles, 12 Nov 1972

Band	World	E-M-E
50MHz	LU3EX-J *FR, 9,200 miles, 24 March 1956	—
70MHz	GM3EGW-ZB2VHF, 1,430 miles, 11 June 1967	—
144MHz	W6NLZ-KH6UK, 2,540 miles, 8 July 1957	SM7BAE-ZL1AZR, 11,055 miles, 4 March 1969
432MHz	W0DRL-K1PXE, 1,205 miles, 17 August 1971	W6HXXV-VK2AMW, 7,500 miles, 19 April 1972
1,296MHz	W8YIO-K4QIF, 551 miles, 21 August 1972	WB8IOM-G3LTF, 5,492 miles, 27 April 1969
2.3GHz	W4HHK-WA4HGN/4, 249 miles, 11 July 1970	W3GKP-W4HHK, 810 miles, 19 October 1970
3.4GHz	W6IFE/6-K6HJ/6, 214 miles, 18 June 1970	—
5.6GHz	W6OYJ/6-K6HJ/6, 214 miles, 18 June 1970	—
10GHz	W7JIP/7-W7LH/7, 265 miles, 31 July 1960	—
21GHz	G3BNL-G3EEZ, 45 miles, 12 Nov 1972	—

OBITUARIES

Mr J. Tiptaft, G3MVT

Jim Tiptaft died suddenly on 3 January. A holder of several certificates, including WAC and 200DOK, he was in demand as a lecturer, and his last engagement before his death was a talk to Shrewsbury ARC on his newly-completed ssb transceiver.

Mr W. A. Clemenson, G6KQ

Bill Clemenson's death was mentioned in last month's *Radio Communication*. He died on 30 December 1972, aged 59. First licensed in the 'thirties, he was a keen hf cw operator, and latterly had taken a great interest in NFD work with the East Barnet Amateur Radio Contest Club.

Mr W. R. McConkie, GM5VI

Bill McConkie died recently at the age of 82. His life-long interest in radio embraced work in Special Communications during both world wars, and an active interest in amateur radio right up until his death.

We have also been advised of the death of Mr R. J. Lill, G3JQX, of Winton, Bournemouth.

YOUR OPINION

The Editor
Radio Communication

FACTS WANTED

Sir—Although there have been several articles in *Radio Communication*, on the production and detection of fm, there has been little information on the performance of fm as a system. Perhaps this is why some remarkable claims have been made and contested! Since business mobile fm and a.m. has been in existence for many years, we can use some of their experience to explode any myths, and so the following points are offered, from various sources. No doubt there are amateurs intimately connected with the business mobile field who can add considerably more data.

1. FM yields a somewhat higher detected signal/noise ratio than a.m. of the same carrier power, provided the received signal is well above the noise. If the received signal/noise decreases due to, say, increasing distance, there is a point where the fm detector is "captured" by noise and the detected signal/noise ratio rapidly deteriorates to an unusable level. A.M. (with or without carrier) always gives an output signal/noise ratio proportional to the input signal/noise, so that it continues to work when the fm system has been captured by noise. This assumes that each mode is received with the appropriate detector. The conclusion seems to be that fm is not a dx mode, but it may offer easier copy in the semi-dx region. When signals are well above the noise there will be little to choose.

2. FM is not a cure-all for audio interference. Firstly, a transistor grossly overdriven with rf will hardly perform with the same gain and distortion as normally, even if there is no modulation envelope on the rf. Secondly, there is amplitude modulation of the carrier in the form of the start and finish of transmission, and this can produce a thunderous bang on a hifi if no click filter is used. Push-to-talk operation is of course worse in this respect. Incidentally I have heard the claim that fm is the only mode suitable for push-to-talk! As there are many ptt a.m. and ssb transmitters, this does not hold water.

3. It is claimed that the use of fm eliminates the effects of multi-path flutter due to mobile operation or aircraft reflections. My own observations do not agree with this and from the Proceedings of the IERE conference on radio receivers, I find no support for this superiority of fm; indeed, apparently a considerable amount of effort is going into diversity systems to reduce flutter in business mobile service. It seems highly unlikely that this work was put in hand without considering other modulation systems!

Yours faithfully,

B. Priestley, G3JGO

The Editor
Radio Communication

Sir—I should like to add my comments to the letter from G3USF in the December *Radio Communication*.

Latest results here on reception of the 10m beacons have shown:

Month	No of days beacons received here
	GB3SX DL0IGI
October 1972	27 31
November 1972	16 27
December (to 11th) 1972	Nil 1

To explain the comparison I would point out that DL0IGI operates with considerably more power and is located at exceptionally high altitude on a mountain top. Further, 10m conditions are usually such that southern Europe provides an easier path to Malaysia than from the UK.

The best conditions during 1972, G—9M2, were during the month of October. The RSGB 21/28MHz Contest was just at the right time and during it the writer worked no less than 82 UK stations in spite of operating hours here at that time being severely restricted due to a bc1 problem. Conditions on 10m were also excellent during the CQ World Wide DX Contest. Indeed at that time the QRM here on the 10m band equalled anything ever heard on 20m!

It should not be thought that the propagation forecasts are always on the low side. The forecast for 10m for December for path G—9M2 predicted openings around 0700-1200gmt on 6-20 days. In fact conditions out here during December were the worst for any time during 1972. Almost no stations were heard from any direction

during these first days of December and the BBC on 21,470kHz faded badly as early as 1100z.

Personally the writer would prefer the predictions to be shown in MUF chart form as given in *Wireless World*, as this would provide also for the IF bands. But I presume it would take up more space and many amateurs are satisfied with the present form.

But to be able to use the predictions efficiently it is necessary that we be informed on what factors these predictions are based such as out power, ssb or cw, aerial gain (if any). Could this be quoted, please?

As regards the IF bands the writer has always found over many years that the summer period in the northern hemisphere is best for working UK—Malaysia.

I am sure many members would be interested to know when it is now predicted the present sunspot cycle will be at minimum?

Yours faithfully,
J. C. Pershouse, 9M2DQ

The Editor

Radio Communication

Sir—In your December issue G3USF draws attention to discrepancies between propagation predictions and performances.

An equally dramatic illustration of this is provided by conditions over the long path to VK on 14MHz. In my experience over the last 26 years the reliability of this path is almost 100 per cent except for periods of a year or so near the sunspot minima when it is often necessary to QSY down to 7MHz. In 1972 propagation was usually forecast for less than five days per month but out of more than 200 observation days there were only two on which no VK signals were audible over the long path, and these coincided with severe ionospheric disturbances.

Contact was established with VK on 258 out of 264 observation days and the best of the signal reports given or received was S8 or better on 75 per cent of days. There are many amateur stations with a better long-path performance than mine, and it seems a pity that the forecasters, whoever they may be, have not been able to benefit from amateur experience.

G3USF queries whether the forecasts take into account all the factors governing propagation at these frequencies, and it may be worth noting that transequatorial propagation is involved in both his case and mine. The absence of propagation to intermediate distances when the long path to VK is in good shape, and the very high signal levels, has convinced me that layer tilts and chordal hop propagation are involved, and I suspect this to be true of north-south paths also.

Yours faithfully,
Leslie Moxon, G6XN

PS. I have omitted from the above analysis 17 days for which my log indicates that all or most of the operating time was occupied by contacts with ZL, so that there are no VK entries. It is possible, though unlikely, that there was no propagation to VK on some of these occasions.

The Editor

Radio Communication

Sir—We refer to Mr Sharpe's comments in *FMD* (19 November 1972) regarding the ethics of working several stations in parallel during vhf contests.

This we believe is the next logical step in the furtherance of contest expertise. We have surely reached a stage (especially on 2m) where the limiting factor during a contest is not the equipment or the site (as this is usually the best available) but only the speed at which stations can be contacted. The reason for this limit is that many stations often call after one CQ. Under these conditions surely it is better manners to work as many stations as possible in the shortest possible time rather than keeping many people queueing for contacts.

As for it being "bad operating procedure", we would have thought that any system which gains many contacts (as this one does!) must have some merits as most stations with poor operating procedure find great difficulty in finding new contacts during hectic contest conditions.

This system, however, has one major drawback, the station requires a disciplined team of operators which is well organized with a functional set of equipment...however, isn't this what contests are all about?

Yours faithfully,
D. R. Lax, G4AHN
N. D. Curzon, G8CKZ

The Editor

Radio Communication

Sir—Mr B. Priestley, by placing together all the information on the subject of television interference (*Television Interference Manual*), has done a service to the newcomers to our hobby of amateur radio.

Much has been printed on the subject, some helpful, some not. Once again, thanks for the great deal of detail under one cover.

Yours faithfully,
F. S. G. Rose, O2DRT

INTERFERENCE PROBLEMS

Members accused of causing interference or who suffer interference from external sources are invited to seek the assistance of the Interference Committee in solving their problems.

Enquiries should be addressed to: The Chairman, Interference Committee, RSGB, 35 Doughty Street, London WC1N 2AE.

MOBILE RALLY NEWS

Anglian Mobile Rally, 22 July

This rally will once again be held at the Suffolk Showground, Bucklesham Road, Ipswich. Traders and dealers are asked to book space well in advance, to which end they should contact C. J. Wantling, G3TNE, on Ipswich 75241. The rally is organized by the Ipswich and Colchester Radio Clubs.

Maidstone Mobile Rally, 27 May

This third biennial rally, held by the Maidstone YMCA ARS, will be held at the "Y" Sportscentre, Melrose Close, Maidstone, Kent. Doors open at 11am, and features include a talk-in on 160, 80, 4 and 2m (call sign GB3YSC), large trade show and buffet facilities. The entire proceedings will be under cover.

Northern Mobile Rally, 27 May

OTLEY RS is organizing this rally, to take place at the Moorgrange School, Ring Road, West Park, Leeds. Apart from the usual trade attractions there will be film shows for the children and a disco for older children, plus a "home-constructed" display. Further details obtainable from Mr D. G. Mott, G8BZY, 17 Newall Carr Road, Otley.

South Leics Mobile Rally, 13 May

Organized by Hinckley ARC, this rally will be held at Westfield Activity centre, Rosemary Way, Hinckley, Leics, commencing at 11am. Further details may be obtained from G8CGW, QTHR.

SPECIAL EVENT STATION

Hanworth Carnival, 7 July

GB3HCW will be operated by Echelford ARS from the site of Hanworth Carnival, Hanworth Air Park, Hanworth, Middlesex. Three stations will be operative, covering all bands 160-2m. This station coincides with the mobile rally to be held on 7 July—see *Mobile Rallies Calendar*.

Looking ahead

7 April—RSGB VHF/UHF Convention, Winning Post Hotel, Whitton, Middlesex.

6 May—Northern Radio Societies Association Convention Belle Vue, Manchester.

CONTEST NEWS

Rules for VHF NFD 1973

Contestants are urged to read these rules carefully, both now and just before the contest. Following the 1972 IARU Region 1 conference, it has at last become possible to bring forward the starting and finishing times to 1600gmt. The concurrent international contest will in future take place on 144MHz only, and VHF NFD entrants who wish their 144MHz logs to be forwarded should note Rule 19. Similarly, entrants for the Fixed Station section of the IARU event should send their logs to the address given in Rule 20.

In response to many requests, the new Rule 10 forbids the working of more than one station concurrently; this does not preclude asking other callers to stand by while stations are contacted one at a time.

1. **Duration**
From 1600gmt 1 September to 1600gmt 2 September.
2. **Bands**
The 70MHz, 144MHz, 432MHz and 1,296MHz bands only will be used.
3. **Eligible entrants**
Any RSGB member or group of members operating within the British Isles may take part.
4. **Operators**
 - (a) Operators of stations taking part in the contest must each hold a current British Isles amateur (sound) licence and must be fully paid up corporate members of the RSGB at the time of the contest.
 - (b) Points may not be claimed for contacts with stations operated by, or using the call signs of, operators of the competing station or group of stations.
5. **Power supplies**
Stations may not use public supply mains. Power for all equipment must be derived from an on-site portable generator or battery.
6. **Stations**
Each competing group will be permitted a maximum of four stations, each using a different callsign. Only one station may score points on a given band. There is no restriction on the way in which the bands are divided between the stations (eg 70MHz and 432MHz on one station, 144MHz on another, to form a two station entry). Special event callsigns (eg GB) may not be used.
7. **Sites**
All the stations forming one entry must operate from the same site. The Field Day site is defined as a circle of 1km radius centred on the operating position of any of the stations.
8. **Groups**
Any two groups may combine their score to form one entry, subject to the requirements of Rules 6 and 7.
9. **Setting-up time**
All equipment, including aerials, must be installed on the site (as defined in Rule 7) during the 24 hours preceding the contest or during the contest. The site may not be used for any transmitting activities by the group or member during the five days before this time.
10. **Concurrent working**
A station may not engage in more than one contact concurrently.
11. **Scoring**
 - (a) On the 70, 144 and 432MHz bands, contacts will be scored as follows:

km	points	km	points
0-50	1	200-250	9
50-100	3	250-300	11
100-150	5	300-350	13
150-200	7	and pro rata	

Contacts on boundaries between scoring rings score low.
 - (b) Band multipliers will be as follows: 70MHz-2, 144MHz-1, 432MHz-6.
 - (c) On 1,296MHz scoring will be one point per kilometre.

12. Contest exchanges

- (a) Contestants must exchange RS or RST reports followed by a serial number. Serial numbers start at 001 on each band and advance by one for each contact.
- (b) Contestants must send and log both QTH and QRA Locator. The QTH must be a point which is identifiable on the Ordnance Survey ten-mile map, or a distance in kilometres and a bearing from such a point. The distance must not exceed 25km and should be given to the nearest kilometre. The QRA Locator is the standard location fixing system.
- (c) The QTH given on 1,296MHz must differ in form from that given on the other bands, eg a location given as "10km north of Marlborough" on 432MHz could be given as "8km south-east of Swindon" on 1,296MHz.

13. Contacts

- (a) Only one contact may be made with a given station (ie call signs that are fixed, /P, /A or /M, or the same set of equipment used under a different callsign, all count as one station). If a station that has moved location is contacted a second time, only the higher scoring contact may be claimed.
- (b) Repeat contacts must be clearly marked as such and the points column left blank.
- (c) The 1,296MHz station may operate on any other band for the purposes of arranging a contact, but the exchange of contest information must take place on 1,296MHz only and may not be interrupted by recourse to another band.

14. Calling CQ

Contestants are asked to indicate on which band they are calling CQ and are strongly urged to state their tuning intentions, and to call CQ in the correct frequency zone. 1,296MHz stations operating on another band (Rule 13c) should call "CQ for 23cm only".

15. CW segments

Any station operating on modes other than A1 or F1 in the segments 70-025-70.1, 144-144.15, 432-432.1 or 1,296-1,296.15MHz is liable to be disqualified.

16. Defective signals

Stations that persistently overmodulate, radiate key clicks or poor quality signals, or transmit excessive harmonics, are liable to disqualification or loss of points. Monitoring stations will be in operation.

17. Proof

Proof of contacts may be required.

18. Disputes

The decision of the Council of the RSGB is final in any cases of dispute.

19. Logs

- (a) Logs must be submitted on RSGB Contest Log Sheets. Separate logs must be submitted for each band. Groups wishing to have their 144MHz logs forwarded to the IARU Region 1 VHF Contest should enter the distance in kilometres in the points column and the score as Rule 11 on the rear of the sheet.
- (b) Entrants must keep their own log records in accordance with the licence requirements.

20. Entries

- (a) Entries must be postmarked not later than 17 September 1973.
- (b) Entries must be marked VHF NFD in the top left-hand corner of the envelope and addressed to: The Chairman, VHF Contests Committee, 20 Harcourt Road, Wantage, Berks.
- (c) A cover sheet (Form 427) must be made out for each band and must show the callsigns of all operators.
- (d) In addition to the Forms 427, a special summary sheet must be forwarded, even by single-band entries. The declaration must be signed by one member of the group, who will be considered responsible for the entry.

21. Awards

At the discretion of the Council, the Surrey Trophy will be awarded to the overall winners, and Certificates of Merit will be awarded to the overall runner-up, the leading entry from each country and the highest scoring station on each band.

October 1972 UHF/VHF Contest results

(In conjunction with the Region 1 UHF/SHF Contest)

Although five bands were used by entrants to this contest, entries were lower than last year. Conditions were poor to just above average, with an occasional opening. Many did not like the points per

kilometre, but it is suggested that a clear piece of Perspex sheet marked with 50km radials, used in conjunction with a QTH locator map simplifies the calculation. There were still quite a varied selection of log and 427 sheets used, a large sea to an adjudicator or HQ will bring back the correct ones. For the first and last time the 21GHz band was used.

Subject to Council confirmation a Certificate of Merit will be awarded to the band leader and to the Mid-Essex VHF Contest Group who had the highest overall score.

432MHz Portable									
Posn	Callsign	Score	Cnty	QSOs	Best dx	km	Pwr	Ae	
1	G4ARD/P	5,515	BD	62	PA0ZAZ/P	362	35	14el	
2	G3SHY/P	4,319	NM	30	PA0MS/P	467	25	M	
3	G3WOS/P	4,279	BD	53	G3SMV?	?	30	2 x M	
4	G3ZGO/P	423	BE	7	G3SHY/P	201	7	4S	

432MHz Fixed									
Posn	Callsign	Score	Cnty	QSOs	Best dx	km	Pwr	Ae	
1	G3LTF/A	9,309	EX	71	DJ9DL/A	455	25	13el	
2	G4BEL	9,123	CE	61	DJ9DL/A	485	150	M	
3	G3PRM	6,829	LE	60	PA0EZ	458	40	P	
4	G8DQO	4,652	—	40	G3JHM/A	243	20	8S	
5	G8CRN	3,861	CE	34	F3LP	203	30	M	
6	G3OXD/A	3,019	WR	36	G3LTF/A	200	?	10el	
7	G8BYV	2,635	NK	18	PA0EZ	278	25	M	
8	G5UM	2,319	LE	25	PA0EZ	405	15	14el	
9	G3COJ	2,122	BS	20	ON4HN	435	150	14el	
10	G8COT	1,508	MX	27	G8ANZ	169	25	P	
11	G8AQZ	550	ST	11	G3PRM	163	25	8S	
12	G8BKR	361	GR	9	G8DQO	135	8	M	
13	G2WS	230	ST	7	G8AFA/P	53	68	11el	

G8FJG Disqualified—no reports entered with serial numbers
M = Multibeam S = Slot P = Parabeam el = element (Yagi)

1,296MHz Portable									
Posn	Callsign	Score	Cnty	QSOs	Best dx	km	Pwr	Ae	
1	G4ARD/P	625	BD	11	G3OXD/A	130	20	4ft dish	
2	G3WOS/P	69	BD	2	G3RPE/P	50	30	6ft dish	

1,296MHz Fixed									
Posn	Callsign	Score	Cnty	QSOs	Best dx	km	Pwr	Ae	
1	G3LTF/A	1,546	EX	31	PA0HVA	272	6	4ft dish	
2	G4BEL	1,023	CE	11	PA0HVA	280	60	4ft dish	
3	G3OXD/A	750	?	6	G3LTF/A	200	?	?	
4	G3THQ/A	567	MX	10	G3LTF/A	115	20	4ft dish	
5	G3COJ	349	BS	6	G4BEL	102	1½	Colinear	
6	G8BYV	323	NK	3	PA0HVA	155	10	4ft dish	
7	G8CIT	136	MX	5	G3THQ/A	52	20	34ft dish	
8	G2WS	111	ST	3	G8AFA/P	53	24	11S	

2.3GHz Portable									
Posn	Callsign	Score	Cnty	QSOs	Best dx (km)	Pwr	Rx	Ae	
1	G4ARD/P	75	BD	1	G3LTF/A, 75	2	CV2154	4ft dish	

2.3GHz Fixed									
Posn	Callsign	Score	Cnty	QSOs	Best dx (km)	Pwr	Rx	Ae	
1	G3LTF/A	116	EX	2	G4ARD/P, 75	1.5	IN23E	4ft dish	
2	G3THQ/A	33	MX	1	G3RPE/P, 33	5	S1M2	4ft dish	

10GHz Portable									
Posn	Callsign	Score	Cnty	QSOs	Best dx (km)	Tx	Rx	Ae	
1	G3ZGO/P	116	BE	3	G3RPE/P, 61	Klys	1N23WE	2ft dish	
2	G3ZKR/P	20	BE	1	G3ZGO/P, 20	Gunn	S1M2	Horn	

10GHz Fixed									
Posn	Callsign	Score	Cnty	QSOs	Best dx (km)	Tx	Rx	Ae	
1	G3THQ/A	139	MX	3	G3NHZ, 58	Klys	Gunn	2ft dish	
2	G3NHZ	61	LN	2	G3THQ/A, 58	Klys	1N23		

21GHz Portable									
Posn	Callsign	Score	Cnty	QSOs	Best dx (km)	Tx	Rx	Ae	
1	G3WOG/P	3	GR	1	G8ADP/P	3	Klys	1N26	1ft dish
	G8ADP/P	3	GR	1	G3WOG/P	3	1N26	1N26	1ft dish

January 144MHz SSB Contest results

Well over 150 UK stations were active for this contest, which effectively marked the coming-of-age of ssb on 144MHz. The weather and conditions were better than average for January, and some entrants accordingly took to the hills. One such was GW3FEC/P on the Carneddys in North Wales, who achieved a fairly narrow victory over G3JLJ/P, near Settle. The highest-scoring fixed station was G4BEL.

Although QRM was often considerable, dx could still be worked by avoiding 145.41MHz, and very few complaints of poor quality signals were received. The level of activity is now sufficient to

support separate sections for fixed and portable stations, and in response to several requests the rule for the August contests will be amended accordingly.

I.F.W.

Posn	Callsign	County	QSOs	County	Best dx	km	Power
1	GW3FEC/P	1,386	143	CV	ON5GF	694	15*
2	G3JLJ/P	1,315	132	YS	FIKAW	675	10*
3	G3MME/P	1,021	162	DY	F1BVK	525	10*
4	G4BEL	1,020	151	CE	ON5EW	435	400*
5	G3YSG/P	1,004	156	WR	PA0JGX	572	75
6	G8DBX/P	887	121	HE	G3BW	425	160*
7	G3UBX/P	832	138	SE	ON5GF		10*
8	G3UDA	761	121	SE	PA0GX	610	350*
9	G3XFA	745	99	SZ	DJ3CN	470	100
10	GD2HDZ	722	68	IM	F1BQP	700+	120
11	G3XIX	697	103	SF	GD2HDZ	456	500
12	G3NHE	685	113	YS	F6BCK	405	100
13	G3BW	671	61	CD	F6BCK	618	100*
14	G8BXC/P	635	118	EX	GD2HDZ	410	100
15	G3TCG	564	87	KT	GD2HDZ	505	100
16	G4AWO	562	106	HF	G3BW	320	
17	G4AJC	515	63	KT	DJ3CN	410	100
18	G3ZIG	460	74	NK	PA0GX	375	90
19	G8AMD	440	92	WK	FIAGY	411	100*
20	GW8FHB/P	422	80	MG	G3XIX	325	10*
21	G4AGE	419	76	DY	FIAGY	410	25*
22	G4AXS	415	57	KT	GD2HDZ	495	180
23	G8BWW	407	65	LE	G3DAH	380	90*
24	G8DCA	405	63	SX	G3BW	452	180
25	GW3ZTH	402	60	GN	FIAGY	345	200
26	G3XBY	372	82	WK	G3BW	245	150
27	G3MDG/A	369	84	BS	GD2HDZ	380	100
28	G4APL	367	65	SY	GD2HDZ	440	10*
29	G8CUT	362	64	EX	G3JLJ/P	255	94*
	G3UHF	362	75	LE	FIAGY	485	80*
	G8BHH	362	85	SD	G3BHW	274	150
32	G3SEM	357	53	NK	GW3FEC/P	365	100
33	G3USF	352	79	SD	G3DAH	305	10*
34	G8FQM/A	323	75	HF	ON5GF	375	100
35	G3XDY	308	48	LN	FIAGY	380	400
36	G8CRN	307	59	CE	PA0GES	300	50*
37	G3BPM	292	63	MX	G3BW	365	50
38	G4AJE	279	55	NR	PA0DMT	360	100
39	G3OZT	277	45	HE	G3JLJ/P	365	100
40	G8CEX	250	46	EX	GW3FEC/P	370	50*
41	G3YXR	223	41	HE	G3JLJ/P	343	7*
42	G3VNO	211	41	LE	G3DAH	377	30*
43	G3ZKH	155	33	YS			50
44	G8EON	137	34	HF	GW3FEC/P	285	2.5*

* Power output

Disqualified: G8FQE/P, Rules 13, 14.
Check logs are gratefully acknowledged from F5JY, G3NAS, BRS33823, BRS22550 A7866 and A7883.

DF Qualifying Round—Rugby

Date: 29 April 1973.

Map: OS Sheet 146 (Buckingham).

Assembly: 1300bst for start at 1320bst.

Location: Lay-by ½ km north of Whittlebury, NGR693446. Frequencies and callsigns will be announced at the start.

Intending competitors are asked to notify Mr D. E. Newman, Haynes House, 78 High Street, Whittlebury, Towcester Northants, of the numbers in their parties requiring tea as soon as possible and in any case not later than 15 April.

70MHz Portable Contest rules

Date: 15 April.

Times: 0900-1700gmt.

All entries and checklogs must be sent to: VHF Contests Committee, c/o 59 Harewood Road, Chelmsford, Essex CM1 3DH.

The following General Rules, published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8d, 9a, 10a 11-24.

144/432MHz Open Contest rules

Date: 5-6 May.

Times: 1600-1600gmt.

All entries and checklogs must be sent to: VHF Contests Committee, c/o "Easedale", Woodway, Merrow, Guildford, Surrey.

The following General Rules, published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8a, 9a, 10a, 11-24.

A multiplier of 6 should be applied to the 432MHz score.

80m Low Power Contest rules

- The General Rules for RSGB HF Contests**, published in the January 1973 issue of *Radio Communication*, will apply.
- When.** 0900gmt to 1600gmt on Sunday 8 April 1973.
- Contacts.** CW (A1) only in the 3.5-3.6MHz band. The location, or the WAB area code, of the station must be sent.
- Scoring.**
Max power to pa 0.5 1 2 3 4 5 Watts
Points 100 50 25 15 10 5
- Logs.** Column (5) must be headed "Location as received", and (6) "My power". Entries must be sent to RSGB HF Contests Committee, c/o R. Polley, G3PYC, 81 Beech Road, Horsham, Sussex.
- Trophy.** The 1930 Committee Cup will be awarded to the winner.

432MHz Fixed Station Contest rules

Date: 6 May.
Times: 0800-1600gmt.
All entries and checklogs must be sent to VHF Contests Committee, c/o 100 Shirley High Street, Southampton.
The following General Rules, published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8c, 9a, 10a, 11-24.

SSB Field Day 1973 rules

In view of the comments sent in with the logs for last year's event, and to promote dx working on all five bands, the HF Contests Committee has decided to modify the scoring system for SSB Field Day 1973. The attention of entrants is directed to Rule 7. It should be emphasized that this contest is still of an experimental nature, and hence its future depends upon the support which it receives.

- The General Rules for HF Contests**, published in the January 1973 issue of *Radio Communication*, will apply.
- When.** From 1700gmt Saturday 14 July to 1700gmt Sunday 15 July 1973.
- Eligible entrants.** Any group of RSGB members resident in the British Isles, or any affiliated society in the British Isles or overseas. This is a multi-operator contest as provided for in General Rule 5b.
- Stations.** Each group may operate one portable station, as defined in General Rule 4b, on any or all of the 3.5, 7, 14, 21 and 28MHz bands. Simultaneous operation on two or more bands is not permitted.
- Power.** The rf peak envelope power output must not exceed 400W.
- Contacts.** SSB (A3A or A3J) only.
- Scoring.** Three points for each completed contact with a fixed station, and six points for each completed contact with a portable or mobile station. In addition, a bonus of 30 points may be claimed for the first contact with each prefix (eg W1, WA1, WB1, K1 etc) worked on each band. Column 5 of the log should be headed—Bonus Points Claimed.
- Awards.** Certificates of merit will be awarded to the three leading groups, and to the fixed station whose check log shows that it gave the highest number of contacts to entrants.
- Entries** must be addressed to the HF Contests Committee, c/o S. V. Knowles, G3UFY, 32 Nursery Road, Thornton Heath, Surrey CR4 8RF.

Grafton Annual G2AAN Top Band Contest rules

When. Phone a.m. only, 2130-2400gmt 24 March 1973
CW only, 2130-2400gmt 31 March 1973
Phone ssb only, 2130-2400gmt 7 April 1973

Rules. As in previous contests one point per contact, any station may be worked only once in each section of the contest. RST (or RS) reports shall be exchanged, followed by a serial number starting anywhere between 001, and 100, increasing by one throughout the whole contest. All reports to be acknowledged. Competing stations shall call "CQ GRS" on cw, "CQ Grafton A.M. Contest" on a.m. phone, and "CQ Grafton SSB Contest" on ssb phone. Logs bearing the usual signed declaration should be sent to B. C. Bond, G3ZKE, 86 Agar Grove, London NW1, and must be postmarked not later than 20 April 1973. Blank log sheets and copies of the rules are available from G3ZKE on receipt of an s.a.e. Please enclose your address with your entry.

Certificates will be awarded to the two highest scores in the whole contest, with further certificates for the winners of each section.

Contests calendar

- | | |
|------------------|--|
| 10-11 March | — BERU (Rules in November issue) |
| 11 March | — WAB HF Phone |
| 17-18 March | — ARRL DX CW |
| 24 March | — Grafton Top Band (Rules in this issue) |
| 24-25 March | — CQ WW WPX SSB |
| 25 March | — WAB HF CW |
| 24-26 March | — BARTG Spring RTTY (Rules in January issue) |
| 31 March | — Grafton Top Band (Rules in this issue) |
| 31 March-1 April | — 432MHz Open (Rules in February issue) |
| 1 April | — WAB LF Phone |
| 7-8 April | — SP DX CW |
| 8 April | — Grafton Top Band (Rules in this issue) |
| 8 April | — WAB LF CW |
| 8 April | — 80m Low Power |
| 14-15 April | — Helvetia-22 CW/Phone |
| 15 April | — 70MHz Portable (Rules in this issue) |
| 21-22 April | — Bermuda Phone |
| 28-29 April | — PACC CW/Phone |
| 29 April | — DF Qualifying, Rugby (Rules in this issue) |
| 5-6 May | — 144/432MHz Open (Rules in this issue) |
| 5-6 May | — Bermuda CW |
| 5-6 May | — OZ-CCA CW |
| 6 May | — 432MHz Fixed (Rules in this issue) |
| 12-13 May | — Jubilee Phone (Rules in February issue) |
| 12-13 May | — CQ-M (USSR) CW |
| 19-20 May | — Jubilee CW (Rules in February issue) |
| 20 May | — DF Qualifying, S Manchester |
| 27 May | — 144MHz Portable |
| 2-3 June | — NFD (Rules in February issue) |
| 2-3 June | — NFD (Rules in this issue) |
| 9-10 June | — 70MHz Open |
| 10 June | — DF Qualifying, High Wycombe |
| 16-17 June | — Microwave FD |
| 17 June | — WAB VHF Phone |
| 23-24 June | — Summer 1-8MHz |
| 24 June | — DF Qualifying, Chelmsford |
| 7-8 July | — Jubilee VHF/UHF |
| 14-15 July | — SSB FD |
| 15 July | — DF Qualifying, Coventry |
| 22 July | — 432MHz Portable |
| 4-5 August | — YO DX CW/Phone |
| 5 August | — DF Qualifying, Slade |
| 11-12 August | — WAE DX CW |
| 12 August | — 70MHz Fixed and Portable |
| 18 August | — 144MHz QRP |
| 19 August | — 144MHz SSB Open |
| 1-2 September | — LZ DX CW/Phone |
| 1-2 September | — VHF NFD (Rules in this issue) |
| 9 September | — IARU 144MHz |
| 9 September | — 80m FD |
| 9 September | — DF Qualifying, Dartford Heath |
| 8-9 September | — WAE DX Phone |
| 15-16 September | — SAC CW |
| 22-23 September | — SAC Phone |
| 23 September | — DF Final, to be organized by Stratford Group |
| 6-7 October | — VK-ZL-Oceania Phone |
| 6-7 October | — UHF NFD |
| 6-7 October | — IARU 432/1,296MHz |
| 13-14 October | — VK-ZL-Oceania CW |
| 13-14 October | — 21/28MHz |
| 20-21 October | — WADM CW |
| 20-21 October | — 7MHz CW |
| 3-4 November | — 7MHz Phone |
| 3-4 November | — 144/432MHz CW |
| 10-11 November | — OK DX CW/Phone |
| 10-11 November | — 2nd 1-8MHz |
| 11 November | — 70MHz Cumulative |
| 9 December | — 144MHz Fixed |

Colchester VHF/UHF Contest results

We have been asked to point out that the winning entry was submitted on behalf of Swindon & District ARC, G3FEC/A, of which G3ZVC is a member.

RSGB SLOW MORSE PRACTICE TRANSMISSIONS

These slow morse practice transmissions are sponsored by the RSGB. Alterations and additions to this list should be sent to the honorary organizer, Mr M. A. C. MacBrayne, G3KGU, 25 Purlieu Way, Theydon Bois, Essex.

Clock time Sundays		Callsign			MHz		Town
0900	..	G3KEP	..	..	1-910	..	Bingley, Yorks
0930	..	G3YZZ	..	..	3-590	..	Maidenhead, Berks
0950	..	G3HZL	..	..	1-930	..	Isleworth, Middlesex
0945	..	G3YRO	..	..	1-860	..	Fareham, Hants
0945	..	G3USK	..	..	1-975	..	Mablethorpe, Lincs
1000	..	G2FXA	..	..	437-000	..	Stockton-on-Tees
					to north		
1015	..	G3CGD	..	..	1-875	..	Cheltenham
1030	..	G2FXA	..	..	437-000	..	Stockton-on-Tees
					to south		
1030	..	G3NPB	..	..	1-875	..	St Ives, Cornwall
1030	..	G3ZNW	..	..	144-520	..	West Molesey, Surrey
					to east		
1100	..	G2FXA	..	..	1-900	..	Stockton-on-Tees
1100	..	GW3UMB	..	..	1-880	..	Colwyn Bay
1115	..	G3ZNW	..	..	144-520	..	West Molesey
					to north		
1200	..	G3HVI	..	..	1-890	..	Stoke-on-Trent
1330	..	G3FWW	..	..	1-880	..	Burnham-on-Sea, Soms
1330	..	G3XDV	..	..	1-190	..	Canterbury, Kent
1400	..	G3XWQ	..	..	1-975	..	Canterbury Kent
1400	..	G3XGJ	..	..	1-830	..	Huddersfield, Yorks
1930	..	G3YFO	..	..	144-19	..	Burnham, Bucks
					to south		

Mondays

1800	..	G3SWR	..	..	1:980	..	Birmingham
1830	..	G3NCZ	..	..	145:800	..	Blackburn, Lancs
1830	..	G3VBI	..	..	1:910	..	Goole, Yorks.
						omni-directional	
1830	..	G3RXH	..	..	1:910	..	Skipton, Yorks
1845	..	G4AIV	..	..	1:860	..	Kettering, Northants.
1900	..	G3WGU	..	..	1:880	..	Bispham, Lancs
1900	..	GC2FMV	..	..	3:600	..	Jersey, CI
1900	..	G3YJA	..	..	1:920	..	Coventry, Warks
1900	..	G3YEI	..	..	1:850	..	Fleetwood, Lancs
1900	..	G3YED	..	..	145:640	..	Leeds, Yorks
	†	G3YEE	..	..		..	Bradford, Yorks
					{ 1:910		
					3:590		
1930	..	G3RAF	..	..	144:050	..	Locking, Somerset
					1:980	..	
2000	..	G3YQB	..	..	1:980	..	Aylesbury, Bucks
2000	..	G3XWZ	..	..	1:910	..	Mansfield, Notts
2000	..	G3KAN	..	..	1:990	..	Northampton
2000	..	G3IBJ	..	..	1:910	..	Southampton, Hants
2000	..	G3BLP	..	..	144:645	..	Dunstable, Beds
						to south west	
2015	..	G3HZL	..	..	1:845	..	Isleworth, Middlesex
2030	..	G3JHM	..	..	70:050	..	Worthing, Sussex
2200	..	GM4AJH	..	..	144:900	..	Aberdeen
† Alternately						to north-west	

Tuesdays

1100	..	G3EBU	..	..	1-952	..	South Woodham, Essex
1800	..	G3XDV	..	..	1-910	..	Canterbury, Kent
1900	..	G3UFO	..	..	1-980	..	Wirral, Cheshire
1900	..	G3XAM	..	..	
1900	..	G3XWQ	..	..	1-975	..	Canterbury, Kent
1930	..	G3SWP	..	..	1-850	..	Doncaster, Yorks
1930	..	G3WGU	..	..	433-500	..	Bispham, Lancs
							to south-east
1930	..	G3XUD	..	..	1-910	..	Leeds, Yorks
	..	G3YEE	..	..			Bradford, Yorks
1930	..	G3RAF	..	..	1-910	..	
					3-590	..	
					144-050	..	Locking, Somerset
2000	..	G3ZFE	..	..	144-896	..	Hailsham, Sussex
							omni-directional
2000	..	G3TUW	..	..	145-200	..	Banbury, Oxon
							to south-east
2000	..	G3UPA	..	..	1-850	..	Meriden, Warks
2000	..	G3TIK	..	..	1-880	..	Stevenage, Herts
	..	G3KSS	..	..	
	..	G3OVT	..	..	
2000	..	G3FWW	..	..	1-880	..	Burnham-on-Sea, Soms
2000	..	G3WGD	..	..	1-860	..	Leicester
2000	..	GM3PIP	..	..	3-590	..	Milllaw, Aberdeen
2030	..	G3ROE	..	..	1-915	..	Harlow, Essex
2030	..	G3RBR	..	..	1-975	..	Whitley Bay, Nth'land
2045	..	GM2CRY	..	..	3-590	..	St Andrews, Fife
2100	..	G4RS	..	..	1-865	..	Blandford, Dorset
2200	..	G3HZM	..	..	1-925	..	Manchester
2230	..	GM4AJH	..	..	144-900	..	Aberdeen
	†	Alternately					to north-west

Clock time		Callsign		MHz	Town
Wednesdays					
1830	..	G3FXA	.. ..	1-900 ..	Stockton-on-Tees
1900	..	G3YPZ	.. ..	28-700 ..	Harlow, Essex
1930	..	G3WGU	.. ..	433-500 ..	Bispham, Lancs
				to south-east	
1930	..	G3YFO	.. ..	144-19 ..	Burnham, Bucks
				to north	
2000	..†	{ G3AJX G3TWP G3YSK }	.. ..	1-925 ..	Winchester, Hants
1930	..	G3RAF	.. ..	{ 1-910 3-590 144-050 }	Locking, Somerset
2000	..	G8QU	.. ..	1-970 ..	London, N22
2000	..	G3JHM	.. ..	70-050 ..	Worthing, Sussex
2000	..†	{ G3VCV G4BEL }	.. ..	145-020 ..	Wyton, Hants.
				to north-west	
2015	..	G3WVJ	.. ..	1-845 ..	Haddenham, Cambs
2030	..	G3KGU	.. ..	1-915 ..	Staines, Middlesex
2100	..	G3HVI	.. ..	1-890 ..	Theydon Bois, Essex
					Stoke-on-Trent

Thursdays

1800	..	G3SWVR	..	1-980	..	Birmingham
1830	..	GW3VBP	..	3-590	..	Barry, Glam
1830	..	GW3JUMB	..	1-880	..	Colwyn Bay
1830	..	G3NC	..	1-968	..	Swindon, Wilts
1845	..	G4AIV	..	1-860	..	Kettering, Northants.
1900	..†	G3ZBO	..	1-850	..	Preston, Lancs.
		G3WFY	..			Thornton Cleveleys
		G3YEI	..			Fleetwood, Lancs
1900	..	G3WGU	..	1-880	..	Blispham, Lancs
1915	..	G3ZNW	..	144-520	..	West Molesey, Surrey
1930	..	G3RAF	..	to north		Locking, Somerset
				1-910		
				3-590		
				144-050		
2030	..†	G3SJE	..	1-875	..	Harrow, Middlesex
		G3SC	..			
		G3YMJ	..	1-915	..	
2100	..	G4RS	..	1-865	..	Harlow, Essex
2100	..	GW3XNI	..	1-930	..	Blandford, Dorset
2200	..	GM4AJH	..	144-900		Crosskeys, Mon
				to north-west		

Fridays

1800	..	G3XDV	..	..	1-910	..	Canterbury, Kent
1830	..	G3NCZ	..	..	145-800	..	Blackburn, Lancs
							omni-directional
1900	..	G3IQF	..	..	1-980	..	Marlow, Bucks
1900	..	G3NPB	..	..	1-875	..	St Ives, Cornwall
1900	..	G3ZOD	..	..	145-510	..	Stockport, Cheshire
							to north
1930	..	G3PQF	..	..	1-825	..	Farnborough, Hants
					1-910	..	
1930	..	G3RAF	..	..	3-590	..	Locking, Somerset
					144-050	..	
2000	..	G3EEL	..	..	1-980	..	Peterborough
2000	..	G3WGD	..	..	1-860	..	Leicester
2000	..	G3ZOD	..	..	1-928	..	Stockport, Cheshire
2015	..	G3SAZ	..	..	1-845	..	Ashford, Middlesex
2030	..	G3JHM	..	..	70-050	..	Worthing, Sussex

Saturdays

0930	..	G2FNK	..	..	1-930	..	Staines, Middlesex
1000	..	G3PLE	..	..	1-820	..	Stourbridge,Worcs
1100	..†	G3ZOO	..	..	28-350	..	Leyland, Lancs
		G3ZRE	..	..	
1300	..	G2FXA	..	..	1-900	..	Stockton-on-Tees
1400	..	GC2FMV	..	..	3-600	..	Jersey, CI
1600	..	G3ZOD	..	..	1-925	..	Stockport- Cheshire
1730	..	G3TNF	..	..	1-980	..	Gateshead
2000	..	G3KPO	..	..	1-980	..	Peterborough

†Alternatively

G3BZU Morse proficiency transmissions at 20, 25, 30, 35 and 40wpm are made at 1900 gmt on the first Tuesday of each month on a frequency of 3-520MHz. For 100 per cent copy at 20wpm a certificate is awarded, and endorsement stickers are available for 100 per cent copy at the higher speeds. A charge of 10p or two IRCs is made for the basic certificate, and 24p or one IRC for each endorsement sticker claimed. All claims should be sent to—The QRQ Manager, RNARS, HMS *Mercury*, Leydene, Petersfield, Hants.

CLUB NEWS

REGION 1

RR B. O'Brien, G2AMV

Ainsdale ARC—Members should contact N. Horrocks, G2CUZ, for details of meetings.

Blackburn (ELARC)—First Thursday each month, 7.30pm, Edinburgh House, Shearbank Road, Blackburn. Sec: W. E. Baxendale, G8FDG, "Juvena", Westland Avenue, Darwen, Lancs.

Blackpool (B & DARS)—Mondays, 8pm, Pontins Holiday Camp, Squires Gate, morse tuition 7.30pm.

Bolton (B & DARS)—Please note new meeting arrangements—they are at the White Lion Hotel, Moor Lane, 8pm on the 3rd Tuesday in each month. Topband net 1200gmt on Sundays. Please note new sec: S. Macdonald, G4AQB, 8 Archer Avenue, Bolton.

Bury (B & RRS)—Second Tuesday each month, 8pm, George Hotel, Market Street, Bury. 13 March (Tape & slide lecture) 10 April ("HF band aerials" by G3JAG).

Carlisle (C & DARS)—Mondays, 7.30pm, Currock House, Lediard Avenue, Currock. Sec: G8GSE, 6 Carlton Gardens, Stanwix, Carlisle G43 9NP.

Cheshire (Mid Cheshire ARC)—Wednesdays, 7pm, Technical Activities Centre, Winsford Verdin Comprehensive School, Grange Lane, Winsford. Nets on 160m 7pm Mondays; on 2m 7pm Tuesdays. Details from G3JWK.

Chester (C & DARS)—Tuesday, 8pm, YMCA, Chester, except the 1st Tuesday in each month which is a net night on 145-08MHz and 433-15MHz. Further details from G8AYW or G6AHC/T, QTHR. The AGM was held on 2 January 1973, and the following officers were elected: E. Girdler—president, D. Wardle, G3EWZ—chairman, A. Russell, G8AWS—vice-chairman, A. S. Warne, G8AYW—hon sec, H. Morris, G3ATZ—hon treasurer, P. White, G8DOF—hon auditor. Four ordinary Committee Members: I. Jolly, G8EOO, B. Poole, GW3JAZ; D. Ollerhead, G8ALA; B. Shaw.

Society dinner: Friday 13 April 1973, Queen Hotel, Chester. Tickets from G8AYW, QTHR.

Douglas IOM (D & DARS)—Sec: GD3YUM, will be pleased to hear from any member who intends to visit the island.

Eccles (E & DARC)—Tuesdays, 8pm, Bridgewater School, Worsley, Manchester. Club 2m net, 1100am, on Sundays on 145-65MHz. Sec: G4AEQ, QTHR.

Lancaster University (UCLARS)—Prospective members should write to Phil Jones, Department of Environmental Sciences. The society's vhf station, G8DOU, is operational on 144MHz rty and would welcome enquiries about skeds.

Leyland Hundred (ARG)—Second Monday each month, 7.30pm, Rose & Crown, Ulnes Walton, Leyland. Net night Saturdays 2000gmt on 145-8MHz. Details from F. Harrison, G3XII, 78 Lancaster Lane, Leyland, Lancs.

Liverpool (L & DARS)—Tuesdays, 8pm, Conservative Association Rooms, Church Road, Wavertree. Sec: G3WCS.

Liverpool (NLRC)—Tuesdays, 8.30pm, informal meeting at the "Nags Head" Thornton, Crosby, Liverpool 23. Visitors welcome. Sec: Alan L. Hart, G4BLI, 50 Strawberry Road, Liverpool, L11 7AD.

Liverpool University (M & DARS)—Liverpool University Radio Club meet every lunchtime in the Radio Room, Students' Union. G3OUL will be active in the next 2m contest, either mobile or from the top of the physics tower, and visitors are welcome. Please arrange visits with the secretary, Nigel Pope, G4AXA, c/o Students' Union, 2 Bedford Street North, Liverpool 7.

Manchester (M & DARS)—Wednesdays, 7.30pm, all meetings include morse classes. 23 Droylesden Road, Newton Heath, Manchester 10. Sec: G3IOA.

Manchester (SMRC)—Meets Fridays, 8pm, at the Sale Moor Community Centre, Norris Road, Sale, Cheshire. The vhf lads meet at the club "shack", on Mondays at 8pm, at "Greeba", Shady Lane, Manchester 23. 2 March ("Safety in the shack" by W. R. Parkinson, G3FNM), 9 March ("The Pye Cambridge" by T. W. Cannell and friends), 16 March ("VHF & uhf" a talk presented by Microwave Modules), 23 March (Review of club project (QRP transmitter)), 30 March (Mystery lecture by M. Barnley, G3H2M), 6 April ("Home brew mini hi-fi" demonstration by D. Holland, G3WFT), 13 April ("Satellite working on 2m" by J. P. Fletcher, G8DMJ), 20 April

(Easter—Club closed), 27 April (Home-built equipment competition), 18 May (AGM). Visitors welcome on both nights.

Manchester University (ARS)—G3VUM is active on all hf bands and now also on 2m. Details may be obtained from G4AZA, G3ZNS or G3XDY. The programme of lectures, visits, RAE and morse tuition continues as previously. Enquiries may be addressed to any of the above at the University Union, Oxford Road, Manchester.

Preston (PARS)—1, 15 and 29 March: 12 and 26 April, 7.30pm, Windsor Castle (private room), St Paul's Square, Preston. Sec: G. Earnshaw, G3ZXC. Morse practice 7.30pm, main feature 8pm.

Stockport (SRS)—14 March ("Sound recording techniques" by Dave Harris, G3XBX, of Radio Manchester), 28 March ("My 2m transverter" by Des Alimundo, G4HK), 11 April ("Natter night (Discussion of proposed club construction projects)", 25 April (To be announced). 8pm, Blossoms Hotel, Buxton Road, Stockport. Please note new secretary, G. R. Phillips, G3FYE, 6 Ross Avenue, Davenport, Stockport.

Thornton Cleveleys (ARS)—First and third Wednesdays, 8pm, St John Ambulance Brigade HQ, off Fleetwood Road North (behind Police Station), Thornton, Lancs. Project group meets on Fridays, 7.15-9pm, at the Project Laboratory, Rossall School, Fleetwood. Work in hand includes 160 and 2m transmitters and receivers. Further details from G3ZYE.

Warrington (W & DARS)—Tuesdays at Thames Board Mills Social Club, Alford Hall, Manchester Road, Warrington. Sec: G3ZRN. Alternate meetings are devoted to beginners.

Westmorland (WRA)—First Monday each month at New Allen Technical College; acting sec is: N. Stanley, G3UEC, 9 Castle View, Sedgwick, Westmorland.

Wirral (WARS)—First and third Wednesdays each month, 7.45pm, Sports & Recreation Centre (Old Drill Hall), Grange Road West, Cloughton, Birkenhead. Sec: G3WSD.

Wirral (Wirral DX Association)—Last Thursday each month at members' homes. Visitors are welcome. Please inform the sec beforehand. March at QTH of G3VUY, April at G2SB and May at G4AHC. Please note new sec, G4AHC, T. O'Neill, 41 Willoughby Road, Wallasey.

REGION 2

RR J. E. Agar, G4AZA

Barnsley (B & DRC)—Meets at King George Hotel, Peel Street, Barnsley, on Fridays at 7.30pm. Details from G3LRP, QTHR.

Bradford (BRS)—Meets at club hq, 10 Southbrook Terrace, Bradford N7. Hon sec: R. Harker, A7585, 65 Whitby Road, Bradford BD8 9JN. Tel Bradford 43971.

Doncaster (DC of TARC)—Meets Mondays, 7pm, at the College of Technology (refectory), club callsign: G3UER. Details from hon sec: G. Boothroyd, 38 Ascot Avenue, Cantley, Doncaster. G4AWT.

Easington (EAR & EC)—Meets Tuesday and Thursday, 7.30pm, in the Easington Village, Workmen's Club. A nightly net on 28-750 at 1930, G3NSI, G3ZUX or G3VSS as control; anyone interested in a chat or report please break in. Details from G3VSS, QTHR.

Fulford (FARS)—Meets Tuesdays, 7.30pm, at Scout hq, 31 George Street, York. Hon sec: G5KC, QTHR.

Halifax (NHARS)—13 March (Visit to Bradford University (prov), 21 March (Committee meeting), 28 March ("Fire prevention in the shack"). Hon sec: G3MDW, QTHR.

Harrogate (H & KRS)—Meets second and third Mondays each month. Details hon sec: G4AZJ, QTHR.

Hull (H & DARS)—2 March ("Aerials" by G3RDM), 9 March (Visit to Hull Power Station), 16 March ("Old times" by G2ABR), 23 March (Members modifications to Pye equipment). Hon sec: Mary Longson, 4 Chester Road, Hull.

North Riding (NRARG)—Meets fortnightly at Alma Inn, Scarborough. Details from hon sec: G8AZA, QTHR.

Northumberland Morpeth (NRC)—Northumbria Radio Club meets at 3 Wheatshafel Yard, Morpeth. Details G3XAI, QTHR.

Otley (ORS)—27 March ("Mechanical construction of radio and electronic equipment" by G3WVD). Details of the society from hon sec: D. G. Mott, 17 Newall Carr Road, Otley.

Scarborough (SARS)—Meets 7.30pm at Technical College, Scalby Road, Scarborough every Friday. Hon sec: G3VAN. AR: G8KU, QTHR. At the 1973 AGM the following officers were elected: chairman, E. Mappin; vice-chairman, G3RTN; hon sec, G3VAN; hon treasurer, G8EEI; committee, G3JBR, G3XHA, G8KU, D. Mappin, A7700, QSL manager, BR518461.

Spen Valley (SVARS)—8 March ("4m and down" by P. Billingham G4AGQ), 15 March ("Modern aerials" by I. Lamb, MBE, AMIERE, G6LD), 22 March ("Braille" by J. Inness, MCSP, SRP, G4AJF),



Every year the Scarborough Amateur Radio Society offers two trophies to promote and encourage home-constructed equipment. Entries are anonymous and are judged by a panel of two, one an electrical and the other a mechanical expert. This year the awards were unique in that they were won by a father and son, Mr E. Mappin and Mr D. Mappin, both SWLs. They are shown above (l & r respectively) with the society's chairman, G3JBR, at the society's annual dinner.

Also at the dinner Mr P. B. Briscoe, G8KU, received a digital clock in recognition of many years of devoted service to the society and amateur radio. He is seen below being presented with the clock by G3TKX (left), the society's treasurer.

Photos: G3RTN



28 March, Wed 7.15pm (Visit to "Mintex" Cleckheaton). Hon sec: G8DSB, 19 Cliffe Street, Staincliffe, Batley.

Sunderland (SARS)—Tuesday, 6 March ("WIBB Mk 2" Tape and slide lecture at Sunderland Polytechnic). Hon sec: G3XID, QTHR.

Tyneside (TARS)—Meets Mondays, 7.30pm, at the Community Centre, Vine Street, Wallsend-upon-Tyne. Visitors always welcome. Hon sec: G. Lowden, 21 Winefred Gardens, Wallsend. Tel 627878.

Wakefield (WRS)—Meets alternate Tuesdays, 7.30pm, at Youth Centre, Ings Road, Wakefield. Details G3XVU, QTHR.

York (YARS)—At the recent AGM, Jim Rainbow, G8BOK, relinquished the post of hon sec and thanks were expressed for the efforts he made on behalf of the society over a number of years. Officers elected: hon sec, G3WVO; chairman, G8BNE. Meetings held Thursdays, 7.30pm, at 61 Micklegate, York. Visitors always welcome. G3WVO, 4 Heworth Village, York.

REGION 3

RR R. W. Fisher, G3PWJ

Birmingham (MARS)—20 March ("Raynet" by G3CNV), 15 April (Mobile Rally), 17 April ("A-Z vhf" by G3BA), The Birmingham & Midland Institute, Margaret Street.

(Slade)—9 March (VHF inquest led by G3JZF), 23 March ("A camera in the Alps" by Mr Evans), 6, 20 April, 8pm, The Church House, High Street, Erdington, Birmingham 23. G4BRT.

(South)—7 March (The Bermuda Cup, lecture and film G3LNS), 8pm, Hampstead House, Fairfax Road, West Heath, Birmingham 31.

Coventry (CARS)—2 March (Film show), 9 March (Night on the air), 16 March (Space lecture), 23 March (Night on the air), 30 March (Talk/demo by J. B. Lowe), 8pm, Baden Powell House, St Nicholas Street, Radford Road, Coventry. G3TFA.

Cannock (CCARS)—1 March, 5 April ("RTTY" by G3PWJ), 8pm, Bridgtown Social Club. G8EHY.

Dudley (DARC)—6, 20 March, 3, 17 April, 8pm, Central Library, St James's Street, Dudley. G3PWJ.

Hereford (HARS)—16 March. First and third Friday of each month, 7.30pm, Civil Defence Hq, Gaol Street, Hereford.

Shrewsbury (SARS)—12 April (Construction contest), 7-7.30pm, Harlestone Youth Centre. G3UQH.

Solihull (SARS)—20 March ("Wireless in Wolverhampton" by G3CAQ), 17 April ("Homebrew equipment" by G3XGP), 7.30pm, The Manor House, High Street. G4ABV.

Sutton Coldfield (SCRS)—12 March (Annual surplus sale), 8pm, Sutton Coldfield, Town Football Club Social Centre, Coles Lane. G8ALO.

Wolverhampton (WARS)—5 March ("Digital ic techniques" by G8ACB, G6KQJ/T), 12 March (Natter nite), 19 March ("Frequency measurement" by G3UBX), 2 April ("Current vhf techniques" by G3BA), 9 April (Natter nite), 16 April ("Demo, FT200" by G3SOE), 7 May (Home built equipment competition), also a morse class every evening, 7.30pm, Neachells Cottage, Stockwell End, Tettenhall. G3UBX.

Telford (WARS)—7 March (Films), Walker Tech College, Wellington, Room L9, 8pm, 14 March (Portable operation this summer), 21 March (G8DQ "ICs part 2"), 28 March (AGM), 4 April (Films), Walker Tech College, Wellington, Room L9, 8pm, 11 April (Natter nite), 18 April (Radio quiz), 25 April (RSGB Tape "Radio Sigs"), 8pm Kettle Bank.

Worcester (W & DARC)—5 March (VHF propagation), 17 March (Films), 2 April (VHF techniques), 14 April (Construction contest), 7 May, 7.30pm, Shakespeare Hotel, Angel Street, Worcester. G8ASO (Worcester 29208).

REGION 4

RR T. Darn, G3FGY

Derby (DADARS)—7 March (Surplus Sale), 14 March ("Quiz", Ladies Evening), 21 March (AGM), 28 March (Film show). All meetings are held in the clubroom, 119 Green Lane, Derby and commence at 7.30pm. Visitors are very welcome. Monday evening continues as an Activity Night and members are invited to come along and assist with future projects. G2CVV.

Grimsby (GARS)—The club have moved to a new clubroom at the Community Centre, Duncombe Street, Grimsby (Room No 3). These are more comfortable premises and there is also room for a shack, which is in the process of being fitted out. The club call sign, G3CNX, should soon be heard on the air. 14 March ("Fault Finding"), 28 March (Visit of Region 4 Rep, Tom Darn, G3FGY). Meetings are on alternate Wednesdays at 8pm. Anyone interested in amateur radio is welcome. G3WEK.

Lincoln (LSWC)—7 March (Open night), 14 March (Club project evening), 21 March ("Amateur tv" by Joe Rose, G8CTG/G6STO/T), 28 March (Film show). Visitors are always welcome at the Club which meets every Wednesday, 7.30pm at Lincoln Astronomical Society Lecture Room, Westcliffe Street, off Burton Road, Lincoln. F. Day.

Mansfield (MARS)—The club was visited at the February Meeting by Past President F. C. Ward, G2CVV, along with Tom Darn, G3FGY, Region 4 Rep. About 28 members were present to welcome the visitors. Meetings are now held on the first Friday of the month at the New Inn, Westgate, Mansfield, commencing at 7.30pm. Visitors and prospective members are invited to attend. G3XWZ.

Melton Mowbray (MMARS)—16 March ("vhf generally" a discussion after hearing the RSGB tape on this subject). All meetings at St John Ambulance Hall, Asfordby Hill, Melton Mowbray, 7.30pm.

Nottingham (ARCON)—The Crystal Calibrator using ICs, which started as a club project last month, has proved very popular and everyone is anxious to make one. 8 March ("Bring your gear night"), 15 March (Activity Night), 22 March (Talk on arrangements for taking

part in the World-Wide Prefix Contest, 25 and 25 March (World-Wide Prefix Contest, participation by the club station). 29 March (Junk sale). All meetings at the Sherwood Community Centre, Mansfield Road, Nottingham, commencing at 7.30pm. Visitors welcome. **G4AFJ**.

Scunthorpe ARC—11 March, "Ham Fest" to be held at Grange Farm Hobbies Centre, Franklin Crescent, Scunthorpe, Lincs: "Meteor scatter" by G3CCH, "Beacon at TF6VHF" by G3KMX, films, teas, licensed bar; all-in price, 50p. Open from 2pm.

Spalding (SADARS)—The March club meeting will be on Friday 23 March at Holland Teacher's Centre, Knight Street, Pinchbeck, starting at 7.30pm. The subject will be "Improving your receiver". Visitors always very welcome. **G3VBR**.



Wedding of Derby & District ARS members Richard Buckley, G3VGV, (QSL sub-manager for G4 plus three letters series) and Ann Woollerton, the club's Social Secretary, at All Saints Church, Wigston, Leicester, on 9 February 1973. Both are BBC employees; Richard an engineer at BBC Radio Derby and Ann a technician at Radio Nottingham. Fred Ward, G2CVV; Geoff Miles, G3TOV, Ken Griffin, BR531618, and an swl formed the guard of honour using top-band mobile whips. Richard is a keen top-band mobileer.

REGION 5

RR P. J. Simpson, G3GGK

Bedford (B & DARC)—8 March ("Your problems solved" by G2CLP), 15 March ("Simple and interesting projects" by G8FMG), 22 March (To be announced later), 29 March ("The visiting van of goodies" by G4AAA), 5 April ("The twisted pair" by G8FMG), 12 April ("Expedition to GM" a report by G4ACP and G4ABQ), 19 April ("Radio control" by G5AGU), 22 April (Easter holiday net, 3.675kHz at 10.30am), 26 April (Down under—visit from VK4KS), 3 May (Junk sale, G3XKB). Meetings 7.30pm "The Dolphin". The Broadway, Bedford. Hon sec: John Bennett, G3FWA, 47 Ibbett Close, Kempston, Bedford.

Cambridge (C & DARC)—9 March (AGM and election of officers), 16 March ("Amateur radio USA" by WN5ERL), 23 March (Informal), 30 March ("Oscillators and counters" by G8AVR), 6 April (Informal), 13 April ("Filters" by G3YFZ), 20 April (Informal), 27 April (World on a bicycle, part 2), 4 May (Informal). Meetings 7.30pm at club hq, Corporation Yard, Victoria Road, Cambridge.

Dunstable Downs (DDRC)—The annual dinner and dance held on 19 January was attended by 119 members and guests. After an excellent meal, the club awards were presented. The VHF Trophy went to Graham Shirville, G3VZV, and the SWL section award to Nigel Beasley. The chairman's prize was awarded to John Hale, G8ADC. Roger Bryant, G3WBC, reviewed the club's many contest successes during the past 12 months. 2 March ("GB3PI repeater" by G3SXX), 9 March (Between week), 16 March (Vero Electronics Ltd, T. Rolfe), 23 March (Between week), 30 March (John Speak, G3URX), 6 April (Between week), 13 April (Film show), 20 April (No meeting), 27 April ("Yaesu equipment" by Ian Partridge, G3PRR), 8pm, at Chews House, 77 High Street South, Dunstable, Beds.

Shefford (S & DRS)—1 March (RTTY demonstration by G8AEL), 8 March (Workshop practice, circuits and layout), 15 March ("Maps for the radio amateur" by G8DUY), 22 March (RAE questions and answers), 29 March ("Phone and cw operating procedures" by G3VMI), 5 April ("First aid refresher" by G4BHO), 12 April ("Club project, 2m tx/rx" by G8EKU), 19 April (No meeting), 26 April (Junk sale), 7.30pm, Shefford Church Hall, Amphil Road. Hon sec: C. Davies, G8DUY, 17 Brigham Gardens, Biggleswade, Beds.

Stevenage (S & DARS)—1 March (Talk by J. Speak, G3URX), 15 March (AGM). Meetings first and third Thursdays each month, 7.30pm in senior staff canteen, Hawker Siddeley Dynamics Ltd, Gunns Wood Road, Stevenage. Hon sec: F. Collett, G3OVT, 8 Silam Road, Stevenage, Herts.

REGION 6

RR L. W. Lewis, G8ML

Banbury (ARS)—Meetings at Woodgreen Hall, 7.30-10pm, 9 and 23 March, other Fridays at Fairhaven, Hanwell. Details from G3LTN. Tel Banbury 710623.

Cheltenham (RSGB Group)—First Thursday in each month, 8pm, Royal Crescent Hotel, Clarence Street, Cheltenham. **G2FWA**.

Gloucester (ARS)—First Thursday of each month at the Oddfellows Club, Barton Street, Gloucester, 7.30pm. Also each remaining Thursday of each month at the Drill Hall, Education and Leisure Centre, Chequers Road, Gloucester. **G3MA**.

North Bucks (ARS)—Monday 12 March ("Design of transistor ssb transmitters"—Texas Instruments). Monday 19 April, (Do's and don'ts of dxpeditions" by G3BA), Monday 16 April, (Visit to Bedford telephone exchange). All club meetings at Wolverton Youth Club, second Monday of each month. **G8AAT**.

Oxford (O & DARS)—14 March, ("Basic transistor theory"), 28 March (Swindon club projects), 11 April ("Licence regulations" by G4AOQ), 25 April ("Printed circuit board construction" by G3JLE). All at 7.30pm in the Mansfield Road Club. **G4AOQ**.

REGION 7

RR R. S. Hewes, G3TDR

Acton, Brentford & Chiswick (ABCRC)—20 March ("Collins 75A4" by G. G. Muir), 17 April (Members' problems—discussion), 7.30pm, Chiswick Trades & Social Club, 66 High Road, Chiswick W4. Hon sec: W. G. Dyer, G3GEH, QTHR.

Addiscombe (AARC)—Every Tuesday from 9pm, "Prince George" High Street, Thornton Heath. Hon sec: S. V. Knowles, G3UFY, QTHR.

Ashford, Middlesex (Echford ARS)—12 March ("Amateur tv" by G6AHO/T with 've demonstration), 29 March (AGM), 9, 26 April (To be announced), 7.30 for 8pm, St Martins Court, Kingston Crescent, Ashford, Middlesex. Visitors welcome. Hon sec: Vic Higgs, G3WVJ, QTHR.

Barking (BR & ES)—Every Thursday in each month, 15 March (Raynet lecture by T. I. Lundegard, G3GJW), 5 April (Tape/slide lecture), Slow Morse classes every Tuesday, 7.30 to 9.30pm. Meetings held at new hq at 8pm, Westbury Recreation Centre, Westbury School, Ripple Road, Barking. Further details from hon sec: H. G. Davidson, G3FZP, QTHR.

Bexley Heath (North Kent RS)—Second and fourth Tuesdays in each month, 7.30 for 8pm, Congregational Church Hall, Chapel Road, Bexley Heath. Hon sec: Maurice Lee, G4BAL, QTHR.

Burnham Beeches (BBARC)—Thursday 1 March (Talk on tv), meetings then changed to first and third Mondays in each month, 19 March (Film show), 2 April (AGM), 16 April (Nina's natter nite), 8pm, Hedgerley Scout Hut, Hedgerley, nr Slough, Bucks. All visitors welcome. Hon sec: Nina Appleby, G8ENX, QTHR.

Cheshunt (CDRC)—First Friday in each month, 8pm, Methodist Church Hall, opposite Theobalds Stations. Hon sec: Richard Ludwell, G3ZZQ, QTHR.

Chingford (Silverthorn RC)—Every Friday in each month, 7.30pm, Friday Hill House, Simmonds Lane, Chingford, E4. Hon sec: M. Higgins, G8BUE.

Cray Valley (CVRS)—1 March ("VAT and the radio amateur" by P. F. Vella, G3WVP, and "Contest operating procedure" by members of CVRS), 15 March (Natter nite), 5 April (AGM), 19 April (Natter nite), 8pm, United Reformed Church Hall, Court Road, Eltham, SE9. Hon sec: P. F. Vella, G3WVP, QTHR.

Croydon (Surrey Radio Contact Club)—20 March (Sale of members' surplus gear), 17 April (32nd AGM), 8pm, "Swan and Sugarloaf" Brighton Road, South Croydon. Hon sec: Sid Morley, G3FWR, QTHR.

Crystal Palace (CP & DRC)—17 March ("Component applications—semiconductors and stabilized power supply units" by G3OOU & G3FZL), 21 April (To be announced), 8pm, Emmanuel

Church Hall, Barry Road, SE22. Hon sec: Geoff Stone, G3FZL, 11 Liphook Crescent, SE23. Tel 699 6940.

Dartford Heath (DF Club)—2 March (Club night), 16 March (Tape lecture "Anthology of radio signals"), 24 March (Dinner and dance "Greenway"), 6, 20 April (To be announced), 8pm, The Scout Hut, Broomhill Road, Dartford. Hon sec: Maureen Worby, G3XVC, QTHR.

Dorking (DR & DRS)—Second and fourth Tuesdays in each month, 8pm, "Surrey Yeoman", Dorking. Hon sec: P. B. Gilby, 6 Hawkwood Rise, Gt Bookham, Surrey.

Ealing (E & DRS)—Every Tuesday, 7.30pm, Northfields Community Centre, Northcroft Road, Ealing, W13. Details from hon sec: S. E. Alban, G3JEA, QTHR.

East London RSGB Group—Third Sunday of each month, 2.30pm, Wanstead House, The Green, Wanstead, E11 (200yd from Wanstead Underground Station). Details from hon sec: Cyril E. Lumley, 48 Latchingdon Gardens, Woodford Bridge, Essex.

Edware (E & DRS)—8 March ("Sound studio techniques" by A. Askew, G4BPC, of the BBC), 22 March (Informal), 12, 26 April (To be arranged), 8pm, Watling Community Centre Association, 145 Orange Hill Road, Edware. Hon sec: Alan Masson, G3PSP, QTHR.

Gravesend (GRS)—Mondays at 7.30pm, "Windmill Tavern", Shrubbery Road, Gravesend, Kent. Area representative P. F. Jobson, G3HLF, QTHR.

Guildford (G & DRS)—Second and fourth Fridays of each month, 8pm, Model Engineering hq, Stoke Park, Guildford, Surrey. Further details from hon sec: Peter Hopwood, G8CQM, QTHR.

Hampton Court (Thames Valley ARTS)—7 March (To be announced), 3 April ("Varicaps" by Robin Hewes, G3TDR). Meetings held at new QTH, 8pm, St Georges Hall, Esher, Surrey. PRO: Rob Muir, G3LHN, QTHR. Committee for 1973: president: Les Cooper, G5LC, chairman: Alan Mears, G8SM, secretary: Larry Seaman, G3ATF, treasurer: Roy Stevenson, G3JEQ, and four ordinary members.

Harrow (RSH)—Every Friday in each month. 2 March (Junk sale), 8pm, Harrow Sea Cadets hq, Woodlands Road, Harrow, Middlesex. Refreshments available during evening. Hon sec: Leslie Light, G3KDL, QTHR.

Haverling (H & DARC)—7 March ("Impedance measurements" by G8CDB), 21 March ("AF measurements" by G3KFW), 4 April (Business meeting and NFD discussion), 18 April ("RF measurements/df meters" by G3KFW), 8pm, British Legion House, Western Road, Romford. Hon sec: Sam Hobday, G3SKV, QTHR.

Holloway (Grafton RS)—2 March ("Club 160m rig" G2CJN), 9 March (RSGB tape/slides) 16 March (To be advised), 23 March ("Binding your bulbs" etc by G8AYU), 30 March (RSGB tape "Rx's—G2IG"), 6 April ("VFOs for 2m" by G3ZKE), 13 April (To be advised), 20, 27 April (Closed for Easter), 7.30pm, Archway School Annex, Whittington School, Highgate Hill, N19. Hon sec: H. D. Ashcroft, G8AYU, QTHR.

Ilford (ARS)—Every Thursday, 8pm, Mortlake Road (off Ilford Lane), Ilford. Hon sec: F. G. Jarvis, G3HIW, QTHR.

Kingston (K & DARS)—14 March ("Improving communication RXs" by Andy Martin, G3ZYS), 11 April ("Circuit board techniques"). Meeting held at 8pm at new QTH, 3rd Tolworth Scout Troop hq, Stirling Walk, Raeburn Avenue, Surbiton, Surrey (near of Surbiton Lagoon). Further details from hon sec: R. S. Babbs, G3GVU, QTHR.

Loughton (L & DRS)—2, 16 March (To be announced), 30 March (AGM), 6, 20 April (To be announced), 8pm, Loughton Hall, nr Debden Station. Hon sec: David Bowers, 12 Theydon Park Road, Theydon Bois, Epping, Essex.

New Cross (Cliffon ARS)—Every Friday, 8pm, 225 New Cross Road, London SE14. Details from hon sec: R. A. Hinton, 58 Camilla Road, Bermondsey, SE16.

Northolt (BEAARS)—First Thursday in each month, BEA Trident Club, Western Avenue, Northolt, Middlesex. (This club is open to non-BEA employees by invitation. Contact David Evans, G3OUF, tel Amersham 21573 for details).

Paddington (P & DRS)—Every Wednesday, 8pm, Beauchamp Lodge, Warwick Crescent, W2. Further details from hon sec: Mike Pawley, G8AWV, QTHR.

Purley (P & DRS)—2, 16 March (To be announced), 6, 20 April (To be announced), 8pm, Lansdowne Hall, Lansdowne Road, Purley, Surrey. Hon sec: Alan Frost, G3FTQ, QTHR.

Reigate (RATS)—6 March ("Russian tour" by G8AMU), 17 April (AGM), 8pm, St Marks Hall, Alma Road, Reigate, 20 March, 3 April (Natter nites), Marquis of Granby, Hooley Lane, Redhill. Hon sec: G3XSZ, QTHR.

Scouts (Baden Powell House ARG)—Third Thursday in each month, 8pm Baden Powell House, Queensgate, South Kensington,

SW7. Hon sec: Alf Watts, G3FXC, QTHR.

Southgate (SRC)—Second Thursday in each month, 8pm, Civil Defence Hut, Bowes Road, N11 (nr Arnos Grove Underground Station). All visitors welcome. PRO Steve White, G3ZVW, QTHR. **St Albans (Verulam ARC)**—Third Wednesday in each month, 8pm, Market Hall, St Albans, Herts. All visitors very welcome. Hon sec: Hugh Young, G3YHY, QTHR.

Sutton & Cheam (SCRS)—20 March (Surplus equipment sale), 17 April (AGM), "The Harrow Inn", Cheam, Surrey. Hon sec: Jack Korndorffer, G2DMR, QTHR.

UK FM Group (London)—13 March ("FM operation in Europe" by Kris Partridge, G8AUU), 10 April (To be arranged), 8pm, Scout Hut, Hayes Road, Southall, Middlesex. Details from pro: Mike Tooley, G8CKT, QTHR.

Welwyn (Mid-Herts ARS)—Second Thursday in each month, 8pm, Welwyn Civic Centre, Welwyn, Herts. Further details from hon sec: Peter Wilcocks, G8AIE, QTHR.

Wembley (GECARS)—Every Thursday in each month, 7pm, Sports Club, Preston Road, North Wembley. (This club is open to non GEC employees by invitation. Tel Dain Evans G3RPE at 01-904 1262 during business hours for details).

Wimbledon (W & DRS)—9, 23 March (To be arranged), 13, 27 April (To be arranged), 8pm, St John Ambulance hq, 124 Kingston Road, Wimbledon, SW19. Hon sec: F. W. Hill, G3WDO, QTHR.

REGION 9

RR H. W. Leonard, G4U2

Bristol (City & County RSGB Group)—26 March ("An sbs transceiver" by G3GKA), 30 April ("Guess what" by G3XOD), 7pm, Becket Hall, St Thomas St, Bristol 1, G3ULJ.

Bristol (BARC)—Every Tuesday, 7.45pm, 24 Bright Street, Barton Hill, Bristol 5, G3XEL.

Bristol (Shirehampton)—Every Friday, 7.30pm, Twyford House, Shirehampton, G5AQZ.

Bristol (University ARS)—Most Saturdays during term time, 2.30pm, Dept of Physics, Royal Fort, Tyndalls Park Road, Bristol 8, G8CVS.

Cornish (CRAC)—First Thursday each month. 1 March ("The Newquay Group" by G3THT), 5 April (AGM), 7.30pm, SWEB Clubroom, Pool, Camborne, G3XTF.

Newquay Group (CRAC)—Fortnightly on Wednesdays. 7 March ("VHF aerials" by G3XC), 21 March ("Etching printed circuit boards" by G8DZE), 4 April ("The diode probe" by G3THT), 18 April ("Receiver alignment") morse instruction at each meeting. 7.30pm, Treviglas School, Newquay, G3THT. Further details of Cornish and Newquay Group gladly supplied by G3NKE, QTHR.

Exeter (EARS)—Every Tuesday, 7.30pm, Community Centre, St Davids Hill, Exeter. Hon sec: K. Fitzgerald, 12 Lethbridge Road, Exeter.

North Devon (NDRC)—14 March (Talk), 28 March (Ragchew), 11 April (Talk), 25 April (Ragchew). 7.30pm, "Grinnis", High Wall, Sticklepath, Barnstaple, G4CG.

Plymouth (PRC)—6 March ("Oscar" by G5ZT), 20 March (Open meeting), 3 April (Film show), 17 April (Open meeting). G4BCX.

Saltash (S & DARS)—First and third Fridays of month, 7.30pm, Burraton Toc H Hall, Saltash. Further details from G3ZHM.

South Dorset (SDRS)—First Friday of month. 2 March (Aerials), 7.30pm, Alma Road section of Weymouth Technical College, G3VPF.

Taunton (T & DARS)—Every Friday, 7.30pm, Jelalabad Barracks, The Mount, Taunton. Hon sec: G. Swetman, "Little Copse", Monkton Heathfield, Taunton. Tel West Monkton 298.

Torbay (TARS)—Every Tuesday with a special meeting on last Saturday of month. 10 March (Annual dinner), 31 March ("Marine biology in East Africa" by L. A. Jackman), 28 April (AGM), 7.30pm, rear of 94 Belgrave Road, Torquay. Visitors always welcome. G3NQD.

Weston-super-Mare (WsMRS)—Second Friday of month, 7.30pm, Room Lewis M2, Worle School, New Bristol Road, Worle, G3PQE. **Yeovil (YARS)**—Every Thursday, 7.30pm, The Youth Centre, 31 The Park, Yeovil. G3NOF.

REGION 10

RR D. M. Thomas, GW3RWX

Blackwood (ARC)—Fridays, 7.30pm, Oakdale Community Centre, Oakdale, Blackwood, Mon. GW3TUG.

Barry College of Further Education (ARS)—Thursdays, 7pm, College of Further Education, Colcot Rd, Barry, Glam. GW3VKL. Marconi celebrations by transmission from Flat Holm Island will take place in May, of which further details later, and an ambitious programme for a visit by air to Bologna next year are being planned.



Glenrothes & District ARC members who won the Scottish NFD Trophy in 1972. Back row: Ian Sharp, GM3YBQ, GM4BFQ, Bill Donaldson, GM3OLK, GM4AQO, Gavin Lucas, GM3YOR. Front row: GM3ZAP, GM3PFQ, GM3FXM, GM4ALK

Cardiff (RSGB Group)—Monday 12 March and Monday 9 April, 7.30pm, BBC Club Llandaff, nr Cardiff. GW3GHC. The annual mobile picnic will be held in May, details later.

Haverfordwest (ARS)—Tuesdays, 7.30pm, hq, Rosemary Lane, Haverfordwest, Pembro. GW3YBB.

Hoover (ARC)—Mondays, 7.30pm, Hoover Social Club, Hoover Works, Pentrebach, Nr Merthyr, Glam. Details from sec, c/o Hoover Social Club.

Pembroke & District (RSGB Group)—Last Friday of each month at the Defensible Barracks, Pembroke Dock, 7.30pm.

Pontypool (RSGB Group)—Tuesdays, 7.30pm, during school terms at the Educational Settlement, Rockhill Road, Pontypool, Mon. GW3JBH.

Port Talbot (ARS)—Second Tuesday of each month, 7.30pm, at the Rail & Transport Club, Station Road, Port Talbot, Glam. The club will hold its annual social, open to all radio amateurs, XYLs and friends in the South Wales area on Tuesday 10 April, GW4BIQ.

Sully & District Short Wave Club—Tuesdays at the Annexe, Sully Bowls & Social Club, 59 Port Road, Sully, Glam. at 7pm. GW4AMV.

Rhondda (ARS)—Meets at Rhondda Transport Employees Club & Institute, Porth, Rhondda, Glam. GW3PHH. The Society are holding a Dinner to celebrate the RSGB Diamond Jubilee Year on Thursday 26 April at 8 for 8.15pm at the RAFA Club, Treorchy, Glam. Tickets cost £1.50 and are obtainable from GW3PHH, QTHR. Ticket applications with cash must be received by 1 April. There will be a bar extension until 11.30pm.

Swansea Radio Society—Meets at 7.30pm at the Palace Bar, High Street, Swansea on first and third Tuesday of each month. Also meets same venue on second and fourth Tuesdays for RAE and Morse classes. Further details from Mr D. E. Connor, 54 Talley Road, Penlan, Swansea SA5 7EU.

South East Wales Raynet Group—Details from GW3ZFG. Tel Cardiff 62411.

University College of Wales, Cardiff—Details from sec: Mr Simon Northeast, c/o Students Union, Dumphries Place, Cardiff.

University College of Wales, Aberystwyth Radio & Electronics Society—Details from the sec, c/o Students Union, University College of Wales, Aberystwyth.

REGION 11

RR P. Hudson, GW3IEQ

Conway Valley (CVARC)—8 March ("Counters" by Frank Wiseman, GW3GRY, and "Simple Field Day rig" by Brian Clarke, GW3HGL), 12 April ("The dipole" by Fred McFarlane, GW3YR, and "Power supplies" by John Lawrence, GW3JGA). All meetings commence at 1930 at The Quarries, Llanddulas, Abergele.

Rhyl (R & DRC)—13 March ("Aerials & matching" by Frank Parry, GW3DZJ) 10 April (Junk sale, auctioneer P. F. Jones, GW3PFF), 8 May ("Electro-optical communication" by M. Theaker). Meetings take place at the Mona Hotel, Market Street, Rhyl.

Bangor (UCNWARS)—8 March (Hi-fi lecture & demonstration),

22 March (Presidential address, Dr J. D. Last, GW3MZY). UCNW. Meetings 1710 Thursdays in the Small Lecture Theatre of the School of Engineering Science.

REGION 12

RR A. J. Oliphant, GM3SFH

Aberdeen (AARS)—Fridays, 7.30pm. GM3HGA. Tel Aberdeen 33838 for venue.

Dundee (Kingsway Technical College ARC)—Wednesdays, 7pm, (Morse practice 6.30pm), Kingsway Technical College, Old Glamis Road, Dundee. Visitors always welcome.

Inverness (IRS)—Fortnightly on Fridays at 7.30pm, next meeting 9 March. Cameron Highlander's Memorial Youth Club, Planefield Road, Inverness. Mr L. Bell, 114 Glenurquhart Road, Inverness.

Lerwick (LRS)—Every Tuesday, 7pm, clubrooms, Abbsbrae House, Lerwick. GM4BBL. Tel Lerwick 1238.

Lhanbryde (MFARS)—Wednesdays, 8pm, St Andrews School, nr Lhanbryde, Elgin, Morayshire. GM3UKG. Tel Clochan 225.

Queen's Own Cameron Highlander's Memorial Youth Club Radio Section—Tuesdays, 7.30pm, Planefield Road, Inverness. Section caters for all young people from 13 years interested in learning, and obtaining practice in, elements of radio techniques. Mr Bill Begg, 68 Tomnahurich Street, Inverness.

Thurso (CARS)—Second Tuesday in each month, 7.30pm, Scapa House, Thurso. GM4BKO. Tel Thurso 3704. Visitors always welcome.

REGION 13

RR V. W. Stewart, GM3OWU

Berwick (BARS)—Last Sunday in each month, 3pm, Tweed View Hotel. Further details from C. H. Crook, G3YOG, 19 Hatters Lane, Berwick-upon-Tweed or from the AR, G. Shankie, GM3WIG, 8 Ettrick Terrace, Hawick, Roxburghshire.

Dunfermline (DRS)—Second Wednesday in each month, 7.30pm, Annot House, Dunfermline. Further details from G. Martin, GM3NVQ, 42 Rose Street, Dunfermline.

Edinburgh (LRS)—Second and fourth Thursdays, 7.30pm, 66 Hanover Street, Edinburgh. Further details from K. C. Henderson, 97 Ganton Road, EH5 3NH. (Phone 552 2147).

Glenrothes (GDARC)—First Sunday in each month, 7.30pm, Old Nursery Buildings, Leslie, Fife. Details from A. B. Givens, GM3YOR, 41 Veronica Crescent, Kircaldy, Fife. 4 March ("VHF portable" by GM3OXX).

St Andrews (USIAARS)—No meetings in March. 18 April ("Space electronics"), 25 April (Visit), 2 May ("Radio over the years"), 5pm, Dept of Physics, North Haugh, St Andrews. Further details from R. Marchant, GM3ZCQ, as above.

REGION 14

RR M. A. Comrie, GM3YRK

Ayrshire (AARG)—11, 25 March, 7.30pm, YMCA, Howard Street, Kilmarnock.

Ardeer (ARCARS)—Thursdays at 7.30pm, Ardeer Recreation Club, Stevenston, Ayrshire.

Falkirk & District (RSGB)—Temperance Cafe, Lint Riggs, Falkirk. Date and time from J. Ramsay, 78 Wheatlands Avenue, Bonnybridge, Stirlingshire.

Greenock & District (ARC)—Tuesdays and Fridays at 7.30pm, Watt Library, Union Street, Greenock. Visitors welcome. All enquiries to hon sec, N. C. Henderson, GM3LYI. Club callsign GM3ZRC.

Glasgow University Radio Club (GURC)—George Service House, University Gardens, Glasgow. Details from hon sec, c/o Dept of Electrical Engineering.

West of Scotland Amateur Radio Society (WOSARS)—Each Wednesday, 8pm, (Construction and social night). Friday meeting takes place at 8pm with Jim Stirling, GM3UWX in the chair. Further details obtainable from hon sec, Mike Parks, 6 Stamperland Hill, Clarkston, Glasgow G76 8AE. All meetings take place in the spacious club rooms at 81 Virginia Street, Glasgow, (second floor). Club callsign GM4AGG.

REGION 15

RR J. Thompson, G13LV

Belfast (B & D RSGB Group)—21 March ("Contest techniques" by Mr L. M. Lyske, G13CDF), 8pm, 90 Belmont Road, Belfast 4.

REGION 16

RR D. F. Beattie, G3OZF

Chelmsford (CARS)—First Tuesday of each month, 7.30pm, at Marconi College, Arbour Lane, Springfield, Chelmsford. 6 March (DF hunting), 3 April ("RTTY"—talk and demonstration). Details from G3YNV.

Colchester (CRA)—Every Wednesday, 7.30pm, North-East Essex Technical College, Sheepen Road, Colchester, Essex. Details from E. T. Jacobs, 26 Pondfield Road, Colchester, Essex.

Gt Yarmouth (GYRC)—Last Tuesday of the month, 7.30pm, at the Central Library, Gt Yarmouth. Details from A. D. Besford, 49 Blake Road, Gt Yarmouth.

Ipswich (IRC)—Whenever possible, two meetings each month, at Handford House, corner of Ranelagh Road, and the main London road (A12) at 7.30pm. 14 March ("Diagnostic X-ray equipment" by D. A. Godfrey), 28 March (Informal), 11 April ("RTTY" by G8CJL and G3NYK). No second meeting in April. Details from G3YWM.

Norfolk (NARC)—Every Wednesday, 7.45pm, at Crome Community Centre, Telegraph Lane East, Norwich. 7 March ("A multiplex communications system by microwave" by David Borrell), 14 March (Informal & morse practice), 21 March ("Radio fundamentals 2"), 28 March (Informal & morse practice), 4 April (AGM). Details from G4AUV.

Southend (S & DRS)—Every other Thursday, 7.30pm, at the Flarepath Canteen, Southend Airport. Next meetings 15 & 29 March, 12 & 26 April. Details from G3AXN.

University of East Anglia (UEAREC)—Meetings are held during term time—details from Mike Wade, School of Biological Sciences, or from G3IOR.

REGION 17

RR L. N. G. Hawkyard, G5HD

Basingstoke (ARC)—17 March (Talk by G3JHM on vhf equipment), 7.30pm, at Chineham House, Popley.

Harwell (AERE ARC)—Meetings on the third Tuesday of each month, also informal gatherings and junk sales every Friday lunch time. Social Club, AERE, Harwell, Berks. G3NNG.

Southampton (RSGB Group)—10 March (VHF manager, G.M.C. Stone, G3FZL, talking on vhf operation). All welcome, 7.30pm, at the Lancaster Building, Southampton University. Every Wednesday evening at the clubroom, Kent Road. G5HD. Tel 773378.

Swindon (SDARC)—7 March ("Design of 160m—10m ssb, ic, rx/tx" by G3JAP), 21 March (Social evening with Bristol & Chippenham Clubs at Chippenham).

The world of amateur radio—A Science Museum Lecture

by D. M. PRATT, G3KEP*

By far the most significant work of the RSGB's Education Committee during the latter part of 1972 was the organization of the Christmas lecture for young people at the Science Museum in London on 6 January. Following the success of a similar lecture in 1969, an approach was made by the Science Museum for a repeat performance, and in August the previous lecture team pooled their ideas to prepare an even better presentation.

* Chairman, RSGB Education Committee



The author explaining "How to get started"

The lecture was given in two sessions, each lasting about 1½ hours, morning and afternoon, the whole allocation of tickets being claimed by schools and colleges. Despite the lecture theatre being full almost to capacity, the array of demonstrations captured the attention of the audience so much that hardly a cough or murmur was to be heard throughout the duration of each session. The lecture was aimed primarily at sixth-formers and other young people with only a casual interest in radio, and for this reason little publicity of the lecture was given in other circles. It is hoped that as a result of the lecture we may have attracted many budding young amateurs of the future.

Following a short introduction by John Freeborn of the museum staff and the author, Len Newnham, G6NZ, opened the programme by answering the question *Why Amateur Radio?* Norman Kendrick, G3CSG, explained *How We Communicate* in his usual dynamic way with no fewer than 14 demonstrations: the closed circuit tv was useful in magnifying the field strength meter and other small components so that all could see them. John Swinnerton, G2YS, followed with a simple explanation of what is meant by ssb.

The RSGB headquarters station, GB3RS, provided a vital contribution to the live QSO which formed an integral part of the session by the author, who discussed *How to Get Started*. This was accompanied by a range of colour slides of typical amateur stations. QSL cards were explained by Ron Wallwork, G3JNK, and each member of the audience sent a special SWL card to headquarters.

Each programme closed with a short question time, after which the visitors went to the Science Museum station, GB2SM, on the top floor for a further demonstration—this time, dx with full power and a rotary beam.

There is no doubt that much of the success of the lecture was directly attributed to the facilities available at the Science Museum. The lecture theatre, for example, is equipped with the most modern visual aids, including closed circuit tv and a most elaborate lighting system. Tremendous assistance was given by Mr Keith Geddes and Mr John Van Riemsdijk and their teams of enthusiastic staff who provided valuable help during every stage of the presentation.

MEMBERS' ADS

These low-cost flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed on the last page of each issue of *Radio Communication*, or on a postcard similarly laid out. Each must be accompanied by a recent *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 25p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No other correspondence concerning this service can be entered into.

The closing date for each issue is the 4th of the preceding month

but no guarantee of inclusion in a specific issue can be given. Valid advertisements not published in the issue following receipt will be held over until the next issue.

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. 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.

Members are advised to enclose a stamped addressed envelope when replying to advertisements.

See the current order form on the last page for further details.

FOR SALE

KW2000A + ac psu £120, gd cond. J. H. Parham, 22 Church St, Dunster, Minehead, Somerset. Tel Dunster 361.

KW2000A as new, with KW matching psu, £140 ono. G3LBA, QTHR. Tel Cobham 2628.

Evershed Vignoles 250V Megger, little used, £25 or will exch for gd communications rx. P. M. Cleaver, 86 Main Rd, Dovercourt, Harwich, Essex. Tel Harwich 2195.

Aveley dc/ac cnvtr, 12V i/p, 425V 300mA, 235V 125mA o/p, £10; h/brew battery charger, 24V-12V 4A, £2 (buyer coll); h/brew 2m tx, 25W i/p, 10W o/p (buyer coll); FV401 £25 (buyer insp & coll). G3RFG, QTHR.

Codan CR70A, with manual, £15. T. Kirkham, 32 Lynton Gdns, Arnold, Notts. Tel 0602 268794.

AT5, ac psu, mic, stand and hndbk, £16; KW Eze match £9; Class D wmttr (mains psu) £4; SWL atu £1; 24V pa blower £1; 4 track 2 speed tape rcrdr £25. G3ZPF, QTHR.

2m Pye Ranger, tunable rx, gd cond but needs mic, Panadaptor 1P-69/ALA2 power supply, needs rebuilding, both with cct diags, offers. **Wanted** A28-14W 11in television tube in wkg cond. G4AMH, QTHR. Tel Epsom 24800.

Mains battery pulse stn tx and rx with osc cavities and rx heads for 13 and 9cm, and double inverter battery supply, £35; hybrid 70cm cnvtr with power supply, 25-27MHz i.f., £6.50. G3EEZ, QTHR. Tel Wolverhampton 751378.

Self supporting 50ft tower, strong cnstrctn; eht, psu 0-3,000V dc, switched 100µF smoothing at 1A, 300V stab/400/800V dc, -85 stab/-200V dc, bias +6-3V ac metered in 19in rack, all offers cnstrd. J. F. R. Weston, 44 Old Newbridge Hill, Bath, Somerset, BA1 3LU.

Complete stn comprising DX100U, SB10U, RA1, Q mult, preselector and relay control system, with all cables, hndbks, etc, all exc cond, £100. G3FSN, QTHR. Tel High Wycombe 24835.

Crystals, HC6U, 1MHz and 5MHz, HC18U, 8-950MHz, all 75p ea, any three for £1-85, send 3p sae with remittance and order. R. Howell, 16 Margarite Way, Wickford, Essex.

Complete ssb stn, G2DAF MkII rx, 898 dial, £45; tx 80/20/15/10, mech fltr, 898 dial, vox/ptt, 180W p.e.p. i/p, £45, both unmarked, prof appearance; BC221J, int psu, £20; BC348L, int psu, £10. Tel Alderley Edge (Cheshire) 2421.

Heathkit gdo, all coils, hndbk, vgc, £8; 4ft wingspan r/c plane, 2-5cc engine, escapement less r/c gear, £5; large colln valves, about 500, offers? *Bulletin* since 1962, offers? G3NXX, QTHR. Tel Tiptree (0621) 816265.

AR88 LF £25; S27 27-143MHz £15; psu RA34F, 1,000V dc, variac-controlled, £15, manual; buyer coll. G3GNC, QTHR. Tel 061-445 9245.

Radionic set no 4 with many extras, mech engineer set, clearing spares box, selling large range of components, ICs, transistors, capacitors, pc boards, nixies, trnsfmrs, sae for list; coll from Birmingham or Manchester. Kevin Roche, Owens Park, Little Court, 293 Wilmslow Rd, Manchester M14 6HD.

FM walkie-talkie, Cossor 102D, wkg cond, mics, headsets, xtals on 145-60 and 145-80MHz, spkr, audio o/p added, one other unmodified, £18; pr Ni-Cd batteries extra. GM3OFT, QTHR. Tel 041-956 4333.

CR100 £20; B40 £20 ono; S1392 £8. **Wanted** Good Pye eqpmnt base stn or dash mount, converted to 2m (tunable rx a must), or gd h/brew rx as above with cct. G. Webb, 91 Galloway Hill Lane, Abbots Langley, Watford, Herts. Tel Kings Langley 64172.

Pair new QY3125 with bases £8; new 75Ω BNC plugs, 7ip, 10 65p, 25 £1.50; new PT31981 (BLY33) 35p + p & p; psu 320V + 300V + 1-25kV +, 700V-, 300V-, mains in, £8; buyer coll. G8BYL, QTHR.

Disposal of complete all-band ssb stn of the late G3MVT, inc remote steerable beam and lattice tower, sae for full details to G3PVT, QTHR.

R155, not wkg, psu, o/p stage, £3; TMK500 multitr £3; TE20 rf sig gen £8, carr extra. J. Keymer, Kevockbank, Lasswade, Midlothian. Tel Lasswade 3205.

Pye Ranger 2202 tx/rx, 15W, with xtals leads, mic, all recently factory overhauled, variable rx, ideal /M, worth £20, offers; CR100 exc cond, noise elim, S-mtr, £18, buyers coll. G8FRE, QTHR. Tel 01-894 5090.

Rty creed 3x teleprinter, 160V dc, £4; type 44 perforator £3; am/cw tx 160-10m, 40W, £15. G3YKR, QTHR. Tel Emsworth 5612.

Pye Lynx camera with lens, tripod, hndbk, £45; Pye Westminster dash mount, fm on 145MHz with cradle, as new cond, £70; Mk1 Vespa, 160-10m £55; Hammarlund SP600JXG with case, hndbk, £65 ono. G8CVD, QTHR.

Pye Ranger 2m a.m. tx/rx, mains model, QQVO310 final, exc cond, £15. G3RK QTHR. Tel Wangford (Suffolk) 619.

CR100 £10; RA1 + xtal clbrtr £27; Garex 2m tx + 3 xtals, £10; 25W mod £5; psu for tx + mod £3; 2m dual fet pre-amp £1; 2m Japanese valve cnvtr, i.f. 28-30MHz, £5. G3ZGO, QTHR. Tel 01-452 3376 (ext 6372).

Cathodeon BP4129 £9.50; xtals 10-700, 9-000, 12-145, 24-300MHz, £1 ea; QQVO3-20A 50p ea; RCA6973 50p ea; mod trans, 20W 6,000Ω, £1.25. J. Kelly, 7 Hazeldean Ave, Boness, West Lothian.

Cossor CC701 /M tx/rx, 12-5kHz, 6-channel, 172MHz 5W a.m. manual, £48, ovno, poss pt exch rx 1475 AR88D, Lafayette HE80, 9R59DS, selling Unica Uria transistor rx, £16 ovno, buyers coll. G8FHN, QTHR. Tel Medway 63365.

KW Atlanta tx/rx, still in packing case, with psu, £150; Atlanta vfo, brand new, £25, must be sold. G3YQE, QTHR.

HW32A, gd cond, £45; Pye AM10BS6, boot mounting Cambridge, 6-channel, high band 12-5kHz spacing, plus control box spkr and cables, xtalled for 145MHz, vgc. J. P. Barker, 8 Strathmore Rd, Worthing, Sussex, BN13 1PH. Tel Worthing 40513.

2m tx with psu, 30W i/p, QQVO3-20A p.a., only needs xtal and aerial to go, mic supplied, buyer coll, £15 ono. G8FBL, QTHR. Tel Lichfield 3919.

DB scopes, Solartron CD711S.2 with delay £39; Cossor 1049 MkIII £25; TF144G £12; BC221B with inbuilt psu £18; Taylor 92V tv wobulator, 10-250MHz, £20; Marconi VTVM TF428B £5; Philips EL3302 cassette rcrdr, £12; B. S. Homer, 32 Iron Mill Lane, Crayford, Kent, DA1 4RR. Tel Crayford 24625.

Codan AT5 with 240V psu control unit £20; low band Pye Ranger, exc cond, offers? G3XJS, QTHR. Tel Holmer Green 2344.

Ferrograph 631, 3 speeds, 3 motors, 1 track, mint cond, £75, buyer coll. G3WYU, 3 Church View, Broxbourne, Herts. Tel 09-924 62180.

Mint FTDX401/FV 401, remote vfo, 6 mths old and little used, £240 carr paid or buyer coll; mint 9R-59D with stblzr fitted, £35, carr paid. Write G3VTE, QTHR.

KW2000 with ac/dc PSU /M aerial, G2DAF lin (QY3-125s) with int psu, £150; Cambridge AM10B rx, tunable 2m, £20. **Wanted** 2m a.m./f.m./ssb tx/rx sim DC6HL or tx only. G3NPZ, 35 Iron Mill Close, Fareham, Hants.

Going QRT KW2000A (6146Bs), overhauled KWs Dec 72, ac/psu KW103, E-Zee match, swr bridge, 3-way switches, Q-Mult, BC221, Class D wvmtr fltrs, 201 mc, Heathkit signal gntr, all new cond, view appt only pse. G3WXT, QTHR.

Heathkit 301 rx, factory built and recent Heathkit £30 overhaul, mint, £95; Trio 9R59D with reg clbrtr and SP5D spkr; Heathkit sig gntr RF1-U unused, £19; Eagle swr power mtr 75/50Ω, perf, £9. L. H. Lee, 18 Kilmington Way, Highcliffe, Hants. Tel 0425-2 5974.

Avo 8 MkIII, as new, £25; BC221 with psu, charts, £15; HRO 7MHz bndsprd coil (set 4-6MHz) £3; 2 pr Selsyn type motors, £3 pr. G3LCS, QTHR. Tel Wolverton 3379.

Eddystone EC10, batt psu, mains psu, JXK 2m transistor cnvrtr, gd cond, carr paid, manuals, £46; Griffin Andec 1.8-200MHz, transistor gdo, plug-in coils, £5. **Wanted** Heath SB640 vfo. A. L. Taylor, 8 Heythrop Drive, Middlesborough.

Minimitter tx, 10-80m, 150W, a.m.-cw with spare valves, £15; diamond KB105, 10-80m trap vertical, £22 or nearest offer, del up to 25 miles. G3ZQL, 7 Osborne Rd, Wallasey, Cheshire, L45 1HZ.

Heathkit electronic keyer £10; new KW lpf £4; Bauer keying lever £1.50; KW Jnr traps, 40/20/10m, £1.50; Admiralty morse key £1.50; Labgear WBM unit £1.50; Ten-Tec El-bug £13. **Wanted** Vibroplex presentation model. B. M. Stone, 26 Crayford Way, Crayford, Dartford, Kent, DA1 4LQ. Tel Crayford 22489.

Spy set B2, tx wkg, rx requires attn, no psu, £6.50, orig G8VB universal aerial coupler (rf mtr req attn), exc loaded Z-match, £6.50; Marconi electronic keyer psu £5, carr extra. J. R. M. Hewitt, 114 Canterbury Rd, Kennington, Ashford, Kent. Tel Ashford 21158.

FT-75 and dc psu £100. J. Elsworth, 2A Steele House, High St, Dovercourt, Essex.

Stereo Viscount 2m fm 12/24V /M, with control box, harness and xtals for 144-48 and 144-80, very clean cond, £35, buyer coll. G8AKA QTHR. Tel Mortimer 332582.

Swan 350 ac psu and spkr in matching cab, dynamic ptt mic, exc cond, £130. G6MRXU, QTHR. Tel 041-884 5365.

Drakeline RM4, T4X psu, Shure mic, KW E-Zee match, swr bridge twin mtrs, all in exc wkg cond, rsnlb offers only, reason for selling going cw h/brew. Tel Cleehillstone 586.

KW Valiant, 10-160m a.m. cw, no psu, £16. G3ZYT QTHR. Tel Wombourne 3298.

KW2000A, ac + dc psu, £110; SB220 £130; FM208, wkg 2m, £15; FM208 low band £15; AM108, low band, £6; huge 1in tape transport, six motors, umpteen relays, solenoids etc. G3ROZ, QTHR. Tel 01-807 0140.

Heath RA1 £25; Codar PR30 £5; Heath QPM1.6 £6; psu 346A, £4; Joystick vfa £4; QQVO2.6 £1; part built Spacemarc 2m tx/rx £6. G8BEI, QTHR.

Partridge trnsfmtr, new, 500V ct 2A, varnish impreg, £5; another 150V 4A, £2.50; both with waxoline panels and turret tags, several 8uF 1,000V dc oil-filled, as new cond, 60p ea, carr extra. J. H. Lepper, 128 Sheephousehill, Fauldhouse, West Lothian, Scotland, EH47 9EL. Tel Fauldhouse 433.

Codar AT5, mchrg ac psu, £15; /M whip Duobander, 160 and 80, £5. G3WBA, QTHR. Tel Clevedon 3691.

IC-2F 3-chann, hndbk, orig pkg, exc cond, £65 ono; Pye a.m. Westminster, wkg, 2m, less xtals, £42 ono; pr 4 x 150A bases + chimneys, £4; Pye a.m. base stn, transistor rx 2m, £35. G3VFO, QTHR. Tel Brighton 684 659.

Trio JR500SE rx, mint cond, £50. C. J. Kitchener, 19 Chestnut Close, Haverhill, Suffolk, CB9 9HX. Tel Haverhill 2852.

CR100, S-mtr manual, has some mod. Richards, 52 Church Rd, Baglan, Port Talbot, Glam.

KW Geloso front end, serviced KW, £10; auto key Cheltenham Electronics, £8.50; Labgear 300 xmtr £10; ccts, nr London, all clean, buyer coll, cash, going ssb. G3IZH, 42 Gordon Road, Westwood, Margate, Kent. Tel Thanet 24949.

Scrapping gear on changing QTH. LG300 tx, 100/1,000V pu, 1.5kV, 110V/250V trnsfmtr, monimatch/Z-match, £20; CR100 £8; Joystick £2; G56 wvmtr £1; Woden UM3 £3; SWM 1946/66, *Bulletins* 1946/66, offers: PUs, meters etc. G3FMN, QTHR. Tel Fleet 025-14 3980.

KW Vespa MKII (160-10m, ssb tx) with mchrg psu/spkr, vgc, £80; HRO ST rx, psu and nine coils in box, 50kHz to 30MHz, £20. Stephen Braidwood, 34A Mountview Road, London, N4. Tel 01-340 0743.

Labgear tx, 240V, ac mains operation, coverage 80-10m in five switched bands, o/p 40W a.m., 50W cw, vfo-controlled, exc cond, £30 ono. C/o C. Tranter, 197 Baron Rd, Dagenham, Essex. Tel 01-590 3993.

KW2000, ac psu, exc cond, £120; dc psu for KW2000 or KW2000A, £20; Codar T28 rx £11. G3ITH, QTHR. Tel Kingswinford 3879.

Eddystone EC10 MkI £36; Class D wvmtr, 240V ac, £5; both ono, exc cond, carr extra. G3VXY, 24 Broomground, Winsley, nr Bradford-on-Avon, Wilts. Tel BoA 2220.

EM1 WM16 scope, dc-40MHz, 2 alternative plug-ins, gd wkg order, with manuals and probe kit, £60; 150W 10-80m a.m./cw tx, rack-mntng, needs attn, £5; buyer coll. Tel Luton 25595.

Receiver CV253/ALR 38-1,000MHz in four bands, with Panadapter IP69A/ALA 2, £100 pr; BC696A tx, 3-4MHz, 55W, £4; EMI wideband amp, new, 19in rack version, £16; new crt 6EP1 £4. **Wanted** rtty eqpmnt, rotator, why. G2AXO, QTHR. Tel Northampton 43832.

RTTY crt type 3, 10Q/16156, £6.50; tu, FSY 1-1 10P/16142 £6.50, buyer coll; EK9X keyer £5.50. **Wanted** 12AVQ transistor, tu and afsk, gc rx transistor with bndsprd, h/brew considered, exch considered. G3DCS, QTHR.

Trio 9R59DS rx, SP5D spkr, stblzr 500kHz calbrtr, £37.50; Shure 444T mic, built-in pre-amp, £11; EMI gdo £3.50; TTC swr bridge, field-strength mtr £3; buyer to arr carr or coll. D. A. R. Poulter, 279 Aragon Rd, Morden, Surrey. Tel 01-337 0117.

R209 MkII 12V, a.m./fm/cw, £15; Heathkit vfo £5; exch pr for HRO or 358X Eddystone. J. W. Woods, 1 Baker Ave, RAF Benson, Oxon.

NCX-5 Mk2 and NCX/A psu, as new, £175 ono, PTC-2007, mod per RC Nov 67, £10; Solartron D-300 scope £15; 4m tx/rx tx 3 channel, rx tunable, small, sep psu, ideal /M £15, all ono. G3MOE, QTHR. Tel Cheltenham 24217.

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Trio TR7100 2m fm tx/rx £75; IC20 2m fm tx/rx, £80; Ten-tec squeeze keyer KR 40, £25; Racal 9520 10MHz freq/period digital counter, £105; Solartron 1240 DVM £65; Coutant 24V 5A and 2A stab PSUs £25, and £17; Sony 1in VTR CV2 100ACE £200; Taylor VTVM 172A with rf probe, £25; Uher 4200 portable tape rcdrr £125. Tel/write J. Yu, 8 Basing St, London, W11. Tel 01-221 6067.

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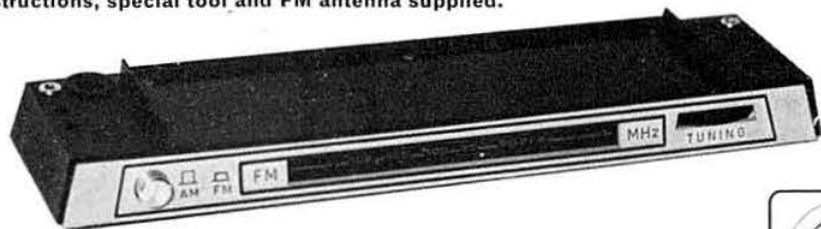
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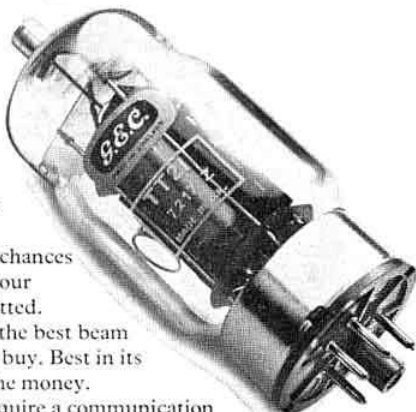
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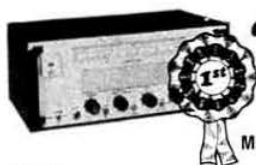
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Orders for this equipment have been so good that at the moment (January) we cannot assure an ex-stock supply at press time. But we can say that orders received during this month will save the 10% VAT which will be added to all our products next month.

The unit plugs straight into YAESU/SOMMERKAMP gear. The receive converter specification is the same as below. The transmitter converter uses valves, two 6QV03/10 and 6QV06/40 P.A. and is rated at 200W P.E.P. input. Size: 9" x 4 1/2". Price £58.50 less valves—we find that many people have the valves available but we can supply them at £1.25 each, 6QV03/10 and £10.00 6QV06/40.

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By far the most popular converters. Stock IFs for 2 metres: 2-4MHz, 4-6MHz, 9-11MHz, 14-16MHz, 18-20MHz, 23-25MHz, 24-26MHz, 27-29MHz, 28-30MHz.

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THE SENTINEL M.F.

Receives 2 metres on a conventional M.W. B.C. receiver, particularly useful for use with a car radio. IF output 0.5 to 1.5MHz for 144-145 and 145-146MHz in two switched bands. Double conversion design with two switched crystal oscillators. No frequency multiplication. Size: 5" x 1 1/2" front panel 4" deep. Price £18.75.

Want to improve your present 2 metre receive system?

THE SENTINEL LOW NOISE FET 2 METRE PRE-AMPLIFIER

- ★ Low noise figure 1dB. Transistors selected for low noise figures.
- ★ Gain 18dB. 12V D.C. at 5mA. Isolated supply lines.
- ★ Very good for bringing converted business gear up to scratch. Also helps IF breakthrough by increasing the wanted 2 metre signals and gives greater selectivity. Price: £6.50.

Want to receive 70cms cheaply but well?

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- ★ Low noise figure 4.5dB.
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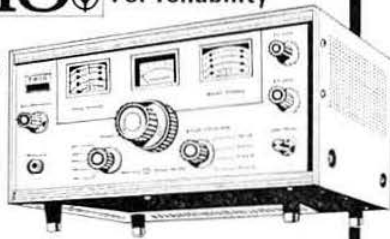
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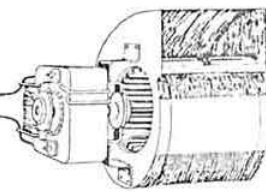
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