OCTOBER 1968

Radio Communication

incorporating RSGB BULLETIN

JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

RADIO COMMUNICATION

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FRONT COVER:

In V.H.F. National Field Day, the Purley and District Radio Club successfully set up a 3cm (10,000 MHz) microwave station. Most of the equipment was constructed by G8ASV (operating the equipment behind the large dish), and runs a 723A/B klystron. The member on the right is G3WDY. We hope to publish the full report and results of V.H.F. NFD next month. *(Photo by Marjorie Pike)*

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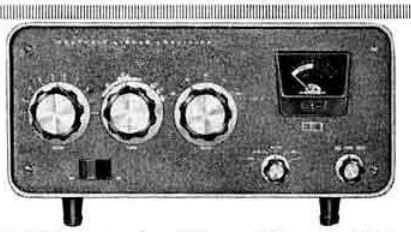

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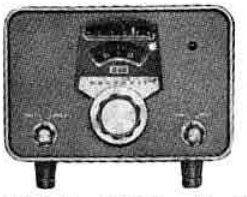

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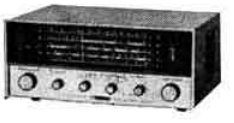

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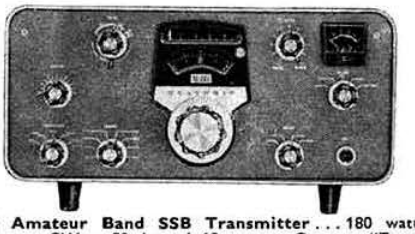

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Pair 1 W submin. 70cm amateur band radiotelephones, offers. E. E. Henderson, " Rydene," Moor End, Radwell, Bedfordshire. Tel. Sharnbrook 306.

G2DAF Mk2 tx Philpotts cabinet, 898 dial £20. HRO-M, 10 coils with twin metered p.s.u., spkr. in polished wood cabinet £15. BC221 with charts. £10, swop radio cntrl. gear or w.h.y. J. M. Bell, G3JLO, 45 Newlands Lane, Chichester, Sussex.

R107 rx, works well, £10 byr. cllcts. I. Elvins, G3WUG, 40 Willow Rd., Bromsgrove, Worcs.

Part built Mullard 7/7 W stereo amp., manual plus all prts excpt. vlvs., metalwork plus part wiring completed £14. N. J. Mayer, 32 Linden Rd., Muswell Hill, London N10. Tel. 01 883-1929.

Minimitter Q-multiplier £1. Manual for AR88D 15s. and Radiovision Commander 5s. P.s.u. for C52 15s. MN26L compass rx comp. £2 byr. cllcts. C. R. Smith, 19 Hyde Rd., Kenilworth, Warks. Tel. Kenilworth 54609.

Vanguard, Hallicrafters S36, CR100, Cossor 339 scope., Command tx 2·1-3 MHz, CKB74028 (similar BC221), Codar AT12 with trnsstr. p.s.u. and control unit, Labgear Top Band cnvrtr., etc., all cheap, s.a.e. full details. W. E. Thompson, G3MQT, " Y Grisiau," 8 Coventry Rd., St. Leonards-on-Sea, Sussex. Tel. Hastings 3681.

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B44 Mk2 Unmdfd. £5. J-Beam 2m. 6/6 slot £4. J-Beam 2m mtchng. hrnss. and bln. 30s. HRO 4 gang. cap. and gearbox £2. Twin coax aerial c/o switch. 15s. Pfr. byrs. cllct. or carrge. extra. H. Biltcliffe G5HB, "Longlands," Steeple Morden, Nr. Royston, Herts.

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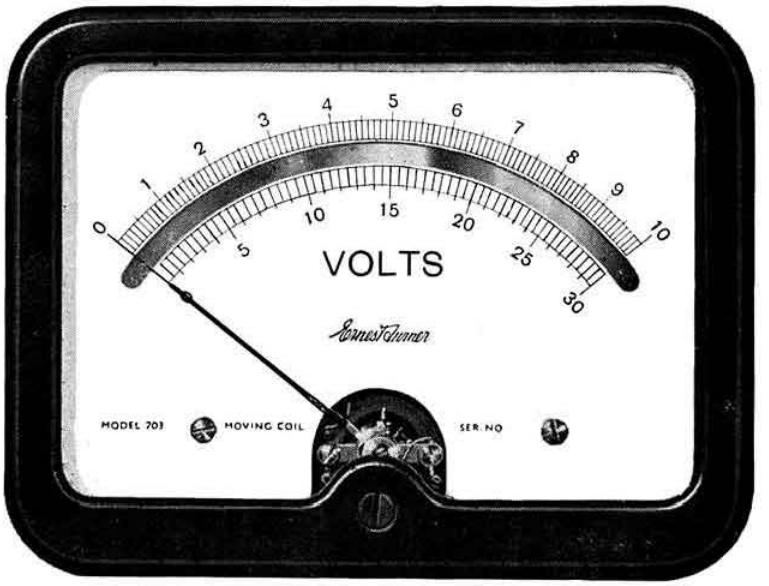

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Mobile complete outfit AT5, T28, 12MS p.s.u., 12RC control, FIF whip, /M mike., spkr, all as new, value £55, ask £40 o n.o. A. F. Walton, G3XBE, 39 Oakdale Drive, Wrose, Shipley, Yorkshire. Tel. 57490.

BC221 mains pwrd. £72. C.S.E. 2A10 trnsstr tx £30. C.S.E. 2AR trnsstr. rx £30. BCC base station tx with crystl. on 2m. £5. All fb cndtn. C. G. Fowler, G3UQY, 38 Overhill Way, Patcham, Brighton, BN 1 8WP. Tel. (day) Brighton 27438.

Original Scott Taggart ST900 rx. console model, byr. to inspect original manuals £1 ea. AR88D, CR100, U.S.N. BC640 tx, U.S.N. TBS7, IFF Mk 3 airborne equipment, covering rx 3067, 3090. Test set 74. G. P. Gaunt, 28 Laurel St., Middlesbrough, Tees-side.

HW32A, factory blt., brand new and immclte., owner bldng. HW100 and offers this transceiver to a discerning purchaser, best offer over £40 plus registered post secures. All letters answered. A. R. Osborne, G4OV, "Pucks Knoll," Marshwood, Bridport, Dorset. Tel. Hawkchurch 392.

Two DST100 rxs, excllt. wkg. order, 50 kHz to 30 MHz, continuous coverage, one less n.l., p.s.u., spkr. £15 o.n.o. Second with spkr. crystl. clbrtr., S-meter, panels hammer green finish, £20 o.n.o. K. Drinkwater, G3RHR, 43 Heath Drive Boston Spa, Yorks. Tel. Oglethorpe 262.

Pye Reporter, low band, gd. cond., wkg., ex. basis for high band model. Three phase motor, taps for 220–440V, with 3½ in. pulley, first practical offer. D. H. Phillips, G2BAT, Firdowne, Comeldon Hill, Salisbury, Wilts.

G3SJ xtals for s.s.b. convrtr., convert 80m. s.s.b. to other h.f. bands, 40m.–5500 kHz, 20m.–5250 kHz, 15m.–8750 kHz, 10m. (28–28·5) 8166·66 and (28·5–29) 8333·33 kHz. £4. M. A. Trundle, G3TCG, 16 Stephens Crescent, Horndon-on-the-Hill, Essex.

Bank of 5 digital display units 6V, £2 or ex. for 12V vibrator type SM 702/2Z for Blaupunkt Hamburg de-luxe car radio. Proop's m.w. radio mic. module, new with lapel mike and socket £2. B. R. Makowski, 66 Manor Ave., London, SE4.

Elbug paddle (Browns), as new, cost US $14.00. Twin lever £3, or ex. similar single lever. Yashica Minister D 35mm. 1965 2·8 lens, built in exposure meter, B-1/500th second, leather case £12. Wanted, 5200 kHz xtal. P. N. Pitt, G3ICH, 12 Summerlands Road, Eastleigh, Hants, SO5 7RT. Tel. Fairoak 1272.

Four B7G QCC xtals for half lattice. filt., l.s.b., carrier 464·4 kHz, £4. Pair Cathodeon FT243 sideband switching xtals for above for 2075 kHz i.f. 25s. Wanted MF 455-10-CK filter with or without carrier xtal. R. K. Webb, G3NDK, 30 Tedder Drive, Waddington, Lincoln, Lincs.

HRO with mains p.s.u. £15. 2m. Nuvistor cnvrtr. £6. 4m tx and rx, mains p.s.u., plus 2 mobiles £20 o.n.o. Command rxs 1·5 and 3 MHz £3 ea. crrge. extra, details s.a.e. R. J. Amblin, G3LYN, 23 Bloomsfield Ave., Bath, Somerset, BA2 3AB. Tel. Bath 22723.

TS184A/AP 70cm. wvmtr. new with hndbk. £4. TN18/APR4 r.f. unit, 300–1000 MHz £5. BC455 6–9 MHz mdfd. 12V £3, new. WS68P Top Band rx 35s. Byr. clicts. or pays crrge. F. W. Hattemore, G3WSH 94B High St., Staple Hill, Bristol.

Philips all trnsstr. car radio with mtchng. 5 in. spkr., covers l./m. and 50m. band. M. Pelham, Tresco House, Ogbourne St Andrew, Marlborough, Wilts.

Mosley V46 vert. 40–10m. £7. Exchange Minimitter MR44/2 amateur-band rx for best g.c. rx offered. Wanted beam for 20m. etc. F. Powell, G3SEL, "Wilts End," Lower Odcombe, Yeovil, Somerset, Tel. West Coker 712.

Modified R107, new case, £12. Gd. RG1U £33. Pair selsyns 230V 50 Hz series £3. Minimitter p.a. unit £4. Pair 100TH, several 35T compact paper smoothing cap. Components QRO supplies, request lists. D. Dickers, GW3HEU, 97 Ruabon Rd., Wrexham, Denbigh. Tel. 09784507.

Vanguard 160–10m. factory blt., fitted l.p.f. exlnt. cond. best offer over £25. Woden trnsfrmrs. UM2 40s. 750V 250 mA. c.t. 50s. Driver DT1 15s. Two 813's and fil. trnsfrmr. 75s. R1224 50s. B. J. Shaw, G3CRJ, The Green, Staveley, Kendal, Westmorland.

LOWE ELECTRONICS

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Telephone Matlock 2817 (2430 evenings)

Show time here again—as I write this it's still a long way off, but I had better start getting ready. No matter what I do, though, there'll be the last minute panic—"You packed it, didn't you?" "No, I thought you did." Happens every time. Ah well, the smiling, happy, easy-going Bill you see on the opening day bears little resemblance to the purple snarling hair-tearing Bill of the day before. Mind you, if you got stuck into the Royal Horticultural New Hall bar like me, you'd be smiling, happy and easy-going too. Anyway, you'll see my load of stuff and I think you'll like it. You'll get a chance to compare it price for price with what else is available. This I like—does my pocket a power of good!

I suppose I'll have to answer the usual daft questions —"My AR88 has a slight hiss when I switch the BFO on, what do you think is wrong with it?" "Nothing, sir, it has probably just taken a dislike to you." "I am next door to a teletype station and his frequency is the same as my I.F. Is there a mod. I can do so I don't hear him?" "Yes, sir. disconnect the loud-speaker." Any daft questions, chuck 'em at Alan Whitford, G3MME. He's the better looking one and has the patience of Job. I'm not too bad (the little fat one with glasses), but Mike Crowther-Watson, G3IAR, the bearded oaf, is likely to say "Don't be a Very Rude Word." I might just add at this point—don't take this drivel too seriously! Don't know whether John will be around—depends on how busy the Service Dept., is, but if he isn't and you want to delve into technicalities and niceties of design, Alan can hold his own with the best. Don't ask me—I'm stupid.

Anyway, Stand 18 will encircle as fine a bunch of Yobbos you'll meet—all of us snatching the folding stuff off you as fast as our hot greedy hands can move. You will see all the stuff I advertise—Sommerkamp, Star and Inoue in all their glory, keyers, CW monitors, converters, speech compressors, VTVM's, GDO's, SWR bridges, headsets, microphones, sundry bits and pieces and so on. I will also find room somehow for some nice secondhand stuff, small parts etc. In addition, said he, somewhat furtively. I shall have a surprise job—don't want to let the cat out of the bag, but it's a neat 80-10 transceiver with all the gubbins sporting a pair of 6146B's at a price which will cause many of you to dive for your wallets on the spot. Anyway—don't believe me, come along and see for yourselves on Stand 18. If you can't make the Show, you can of course, see it all at Matlock, or for those of you in the Deep South, honey chile, try Alan Whitford G3MME at 37, Chestnut Drive, Polegate, Sussex (just outside Eastbourne) Polegate 4659—he has a goodly load of my best stuff and is just as anxious to get your money as I am.

73,

The Bandit.

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Trnsstrs., ACY17, ACY20, OC76, from used equipment, with short leads, (¼ in.), 9d. ea. or 5s. per doz. (large quantities available). A. Bano, G3PCR, 28a North Audley St., Grosvenor Sq., London, W1.

Codar CR45, 3 vlve. t.r.f., factory blt., exlnt. cond. with all coils and coil rack £7 p. & p. 10s. V.h.f. radio mike model B4002 £1 plus pstge. of 5s. Tx/rx No. 38 plus p.s.u. £2 plus 10s. pstge. C. J. Coward, 48 College Rd., Ardingly, Sussex.

TMR5 £12. New Geloso 4–104 with vlvs., cabinet, chassis, p.a. coil, 5B254M and most parts to build 40 W A3/A1 rig. Hvy. duty p.s.u. in cabinet £15 o.n.o. S.a.e. details. D. J. Pratt, G3TJP, 28 Monmouth Place, Clayton, Newcastle, Staffs.

New Hallicrafters S120 4 band. rx, 1·6–30 MHz and m.w., b.f.o., b.s., offrs. C. F. Cole, GW3GEN, 18 Parklands View, Derwen Fawr, Swansea. Tel. Swansea 26921.

Operating console, 6 ft. long, 4 ft. high, 2 ft. deep, timber frame, plywood covered surface £4. Byr. cllcts. I. D. Spencer, G3ULO, 77a Westbury Rd., Brentwood, Essex.

Parmeko chokes and mains trnsfmrs. going to scrap unless someone takes them from me, 510V c.t., 375V c.t. numerous heater windings. Vlvs. by score at ridiculously low prices, 500 μA meter movements 2s. 6d., s.a.e. details. R. A. de Verteuil, G3UAK, 5 Mill Lane, Swaffham, Norfolk. Tel. Swaffham 606.

Eddystone EC10, one yr. old, no. 2770 mint, carton, manual £37 10s., also a.c. p.s.u. no. 924 £4 10s. TR1920 with cables plus control box £3 10s. Mica cap. at 5000V, 0·001 μF, 0·0004 μF, 0·0002 μF, 0·0001 μF, 0·00005 μF at 3s. ea. J. Casson, G2ACT, 14 Station Rd., Upper Poppleton, York, YO2 6PY. Tel. York 366.

BCC 4m base stn., tunable rx, tx xtals. and mains lead and plug, Offers. J. N. Headland, G3BFP, 13 Tollers Lane, Old Coulsdon, Surrey.

Going abroad, old friends need good homes for Pye PCT113 (convert 2 or 4m/M), VRC517 unit, TCS9 tx mdfd. 20/15, 144/432 MHz tx, 432 MHz cnvrtr. 24V rotator, 18 in. paraboloid, p.s.u.s, vlvs., payment not obligatory. J. A. Bladon, G3FDU, 11 Makins Rd., Henley-on-Thames, Oxford. Tel. Henley (OHY12) 2803.

HA350 rx new cond. £50 o.n.o. Hartley scope type 13A £18 o.n.o. Star rx SR700, brand new, brgn. £100. Helical fibreglass /M whip, whip, mk HW80 £4. Wanted 160m. /M rx on cnvrtr. D. Dumbleton, G3HCM, 11 Woodburn Close, Allesley Park, Coventry.

BC348 in gd. wkg. order with 6BA6 in r.f. stages £10 o.n.o. R1949 27-144 MHz, a.m., f.m., c.w., in gd. wkg. order less p.s.u., phones only £12 o.n.o. Sig. gen. type 106, 5·5–55 MHz in gd. wkg. order £8 o.n.o. R109 1·8–8 MHz £3. Byr. cllcts. or pay pstge. M. G. Bunce, 36 Burlington Rd., Burnham, Bucks. Tel. Burnham 61696.

Pye base stn. 2m, tx/rx PTC2702 £25. Ditto 4m. PTC723 £15. Marconi TF390G sig. gen., 10–150 MHz with manual £8 10s. Wanted modern scope. H. Sturdy, G3KAS, 73 Rawcliffe Lane, York.

Dekatrons (5) and trigger tubes £4. Rx type 1155 (2) 50s., ideal for spares. Portable scope, 2½ in., £5. Perfect 1155 rx with cnvrtr. for 1–32 MHz, fitted S-meter, blt.-in p.s.u., spkr., r.f. amp., a.f. amp., vrble. b.f.o. £6 10s. J. Rowlands, " Koti " 1 Linden Rd., Leatherhead, Surrey.

G2DAF tx, 160–10m., Philpotts case, Eddystone 898 dial, gd. DX record £30 for quick sale, p.s.u. included. Mk 2 r.f. amp. brand new, 4 807s in p.a. £2. N. C. Taylor, G3TOQ, 83 Stoneham Close, Reading, Berks.

Selling out, ZM15–20A Falcon £3. 3N7O cnvrtr. £14. Codar preselector £6. Yagi, 70cm, 14el. £14. Marconi 52 and coax. cable £9. Other spares etc., s.a.e. for lists. M. L. Sufit, G8ACK, 5 Worsley Rd., Hampstead, London, NW3. Tel. Ham 8236.

Lafayette KT320 rx £18 o.n.o., exclInt. cond., 550 kHz to 30 MHz in 4 bands, b.s. on amateur bands, a.g.c./m.v.c., Q-mult./b.f.o., a.n.l., s-meter, 1 r.f. stage, 2 i.f. stages, 2 a.f. stages. Byr. cllcts. Wanted, de luxe Joystick and gd. Joymatch. N. Mason, 60 St.Mary's Crescent, Ruddington, Notts.

Tx/rx TR1986 2m. with p.s.u. £10 o.n.o. Trnsfrmr. 500-0-500V at 1A plus 2 at 2-0-2V and 3-0-3V at 4 A. 30s. Gonset G33 rx £20 o.n.o. (gd. cond.), Untested 4X150A 15s. G2DD cnvrtr. kit for 70cm. £6. G8ACC 70cm cnvrtr. complete, not wkg. £5 Other items for u.h.f., s.a.e. list. P. M. Clarke, G8AYD, Hillside, Quickedge Rd., Mossley, Ashton under Lyne, Lancs. Tel. Mossley 2312.

Cossor ganging osc. model 3343. Taylor valve. tester model 45. Offers or exchange mobile gear. A. T. Spencer, G3SUP, April Cottage, Martinstown, Dorchester, Dorset.

Electroniques HB166T amateur bands trnsstrsd. Quoilpax, brand new in maker's packing £10, Manual for Heathkit HW32A, new 10s. R. Kay, G3OQF, 25 Maiden Lane, London, WC2.

R208 rx 10–60 MHz f.b. wkg. cond. £5. R. Coates, 23 Pinewood Ave., Brookhouse, Lancaster. Lancs.

H16 rx, 4m. complete except xtal. 30s. Control unit with mike 5s. Moving coil mike, low Z, metal case 7s. 6d. Valves QQV03-20A 5s., QQV03-10 4s , QQV02-6 3s. 6d., EF95, 6BJ6, 6BH6, 1s. 6d. ea. J. Burge, 6 Ashley Park, Bangor, Co. Down, N. Ireland.

Sommerkamp FR100B, mint £80 o.n.o. TZ40, DA41 new 12s. ea. 5R4GT 3s. KW500 1 in. amp. £45. Byr. collcts. C. V. Stead, G2UZ, 2 Cliff Rd. Gdns., Leeds 6.

Eddystone 888 £45. B44 mdfyd. 4m. £8. Elizabethan tx, A3 £16. Cnvrtr. 4m, £4. Other gear s.a.e. list, Wanted G2DAF tx and rx or parts. A. F.'White, G2FCI, 5 Glenmore Rd., St Loyes, Exeter, Devon.

Hamgear preselector, mains operated, as new £5 crrge. paid. T. F. Biddlecombe, G3WAD, 39 Portland Ave., Gravesend, Kent. Tel. Gravesend 2717.

Brand new 866As 12s. 6d., post paid. Sinclair Z12 £3. post paid. Binoculars no case £10. RRD–900–42 telegraph recorder 115 V a.c. £5 post paid or swap for gd. Class D wvmtr., or w.h.y. J. P. Evans, GW3UCJ, 4 Gower Cres., Baglan, Port Talbot, Glam.

Tape recorders almost new, Grundig EN3 pocket type with accssrs. £25 o.n.o. Ultra 4 track £18 o.n.o. TV 14 in. wkg. needs slight attntn., Offers (tube new). S. A. Gaunt, G3PXJ, 43 Appian Close, Kings Heath, Birmingham, 14.

LG300 complete with Silicon rect. p.s.u. and GEC 100 W modu. (with p.s.u.), in prfct., wkg. order £45 the lot. F. Finchley, G3AG, 11 Carnwath Rd., Sutton Coldfield, Warcs. Tel. 021-354 4642.

BC348 and spkr./p.s.u., wkg. £6 10s. C.b. walki-talki, 29 MHz, £3 10s. FT243 5675 to 8650 evry. 25 kHz, no 7000 to 7100 or 8000 to 8100, 3s. 6d. ea. S.a.e. enqurs. crrge./pstge. extra. J. H. Shankland, GM8FM, 28 Craigmont Crescent, Corstorphine, Edinburgh 12.

R107 gd. cond., no mods., will work on 240 V a.c. and 12 V d.c., fully wkg. on all bnds. £15, byr. cllcts., callers wknds. and evnngs. only. Wanted, HRO coil pakcs, b.s. and g.c. P. Harman, G3WXO, 94 Brocket Rd., Stanborough, Welwyn Garden City, Herts.

Trnsstrs. 650 MHz, 2N2369, n.p.n. silicon, data, 1·2 W on heat sink, 5s. ea., 5 for £1 Marconi TF643A wavemeter, chrts. hndbk. 1 per cent 20–150 MHz, 2 per cent 150–300 MHz £4 15s. post free. M. Mann, G8ABR, 71 Quens Rd., Tewkesbury, Glos. Tel. (day) Tewkesbury 2476.

Rxs, SX28 £30, Geloso 209 £25, BC342 110 V £10, incldng. manuals. Txs, G2DAF Mk2 less cabinet £20, 150 W A3/A1 incldng. 1200 V p.s.u. £12, Vibroplex auto key £3. RA32 £8. W. J. Saunderson G3DKE, 54 Valley Rd., St Paul's Cray, Kent. Tel. 01-300 3213.

Minimitter 80–10m A1/A3 tx in fair cond. Offrs. P. B. Briscombe, " Roseacre " Irton, Scarborough.

Sommerkamp FL200B, 1 yr. old £110. G2DAF rx, QCC filt., Electroniques coils, Philpotts mtlwrk. £50. Teletype 15P/P, 14TD, DL6EQ t.u., p.s.u., double loop switching £35, split? Creed 7B less keyboard £7. CR100 £15. Offers. J. M. Copson, 51 Ellers Drive, Doncaster. Tel. Doncaster 55357.

KW6000 lin. amp., as new £85. OS/88U 3 in. scope., very compact in carrying case, mint £20. Brand new Jap. multimeter £2 10s. C.r.t. type 3RPI £2 10s. J. L. Barry, G3UFU, 15 Fairlawn Ct. London W4.

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KW Viceroy Mk3 recently overhauled and in exclint cond. £85, byr. cllcts or crrge. extra. G. P. Rigby, G3KTJ, 30A Pimbo Lane, Upholland, Nr. Wigan. Tel. Upholland 2601

CR100 rx perfect cond. £19. Eddystone 840A perfect £28. P.s.u., 250 V at 80 mA and 6·3 V £3 10s. P.s.u. 600 V at 140 mA and 6·3 V £5. R209 rx £12. Wanted amateur bands only rx. D. H. Wilkinson, 35 Street Lane, Leeds 8. Tel. Leeds 664823.

Lafayette (1968) HA700 in perfect wkg. order, little used, guaranteed immediate despatch in original case with manual £25 plus 10s. carriage. HA230 (1967) £15, needs tuning. New mech. fltr. £5. J. Gillett, P.O. Alorna Cres., Goring-by-Sea, Worthing, Sussex.

Heathkit RA1 rx covering amateur bands with Codar PR30X preselector, self powered, both in very gd. cond., little used due to v.h.f. work £32 10s. byr. arranges crrge. D. A. Poulter, G3WHK, 279 Aragon Rd., Morden, Surrey.

HRO 5R with g.c. 160-10m. and b.s. on 80, 40, 20 and 10m. Many mods inc. B7G vlvs. (HPX on simple aerial, 750) with p.s.u. £22 10s. Kokusai fltr. MF455–15CK, new and boxed £8 10s. P. D. Milloy, G8AZP, 23 Park Ave., Sprotborough, Doncaster, Yorks.

Home brew 1 in. amp. 800 W, solid state p.s.u., wkg. but needs attntn. £15. o.n.o. Panda PR120 V CC/6 A1/A3 tx in gd. wkg. order £25. Trnsfrmr. 250 V a.c. i/p, 2000-1500-0-1500-2000 o/p at 1 A £5 10s. G. McCullom, GM3UCI, 5 Lawhill Rd., Law Carluke, Lanark.

Star SR550 dble. conv. rx, 160-6m. Joystick standard aerial and type 4 tuner £52 10s. o.n.o., will split if necessary. A. R. Campbell, 6 Whitley Rd., Heaton Moor, Stockport, Cheshire. Tel. 061-432 6666.

RSGB and Radio Amateur's hndbk. May 1965 £1 or offers. Xtals FT243 5707, 5907, 6007, 6373, 6407, 7473, 7707, 7850, 8100, 8375, 8600, 3s. 6d. post paid. G. L. Fitton, G8AVG, 29 Okus Grove, Upper Stratton, Swindon, Wilts.

Free. Radio knobs, black ¼ in. spindle fitting, 1s. 9d. for 1 doz. to cover p. & p. J. H. Fish, G4MH, 28 Banks Ave., Golcar, Huddersfield. Tel. Huddersfield 54650.

Antique Mullard vlve. No. NR7 5427, ser. no. 17010, offers. Vlvs. guaranteed and post paid, QQVO6-40 35s., PM24A 3s. 6d., 5U4G 3s. 6d., 6J5G 2s., 6J5M 3s., 6AC7M 3s. 6d., 5Z4G 3s. 6d., VU39 3s. 6d., 717A 2s. 6d., 6J7M 3s. 6d., 6AC7M 3s. 6d., 6J7G 2s. 6d. J. Wordsworth, G3JGJ, "Rose Cottage," Pepperdon, Mortonhampstead, Newton Abbot, Devon.

Cal. Unit CT155, contains ref. cell £5. Advance sig. gen. type 71, 9–320 MHz £7. BC221, original book, phones, gen. book £18. All o.n.o. Wanted KW Ezematch. H. G. Newland, G5ND, 161 Penrose Ave., Blackpool.

Cossor 339 scope with hndbk. and spare vlvs. £8. Manuals, CR100 (2) £1 ea., 1035 scope 10s. AVO elec. testmeter 7s. 6d. All post or dlvry. extra. P. Knight, G3HER, 7 Meadowlands, Seal, Sevenoaks, Kent. Tel. Sevenoaks 62227.

Eddystone 840A plus isolation trnsfrmr., S-meter £25. Pye base stn. tx, 25 W i/p, wkg. on 2m, £15. BC221 freq. meter, p.s.u. and charts £15. Rsn. for sale, house purchase. D. F. Gorrill, G8BOV, 30 Ashburnham Rd., Furnace Green, Crawley, Sussex.

Garrard 2000 autochanger with Sonotone 9TA stereo cartridge (diamond). Teak plinth and perspex cover only six months old, in prfct. cond. £12 Byr. cllcts. Rsn. for sale byng. transcription unit. M. J. Atherton, 7 Wood Ride, Petts Wood, Orpington Kent, BR5 1PZ. Tel. Orpington 23558.

Panda Cub compact tx 160–10m, gd. cond., 25 W A3, 40 W A1, fttd. net sw. and aerial rly. £25. Free dlvry. Lincs. only. Panda l.p.f. £1 10s. C. A. Collins, G3THX, 32 Albany Rd., Skegness, Lincs.

TCS 12 tx, xtal. mike., p.s.u., £8. Tx 80–10m, home brew, very neat Geloso v.f.o., 807 p.a. with p.s.u. £8. Modulator with new UM2 trnsfrmr. £3. Geloso v.f.o. £2. Steel cabinet, suite G2DAF £1. J. H. Jones, G3TQL, 97 Ravenscroft Rd., Ashmore Lake,Willenhall, Staffs.

Heathkit RA1 with QPM16, Q-mult. £30 o.n.o. RSGB Morse course with practice osc. 30s. R. A. Schofield, 23 Alwyn Ave., Litherland, Liverpool 21.

Heathkit SB300E £124. SB400/401E £149. SB600 £9. Linear (1 KW) £39. TR44 plus cable £32. TA33jr beam USA (1 KW guaranteed) plus coax. £33. Eldico el-bug £11. Best offers secure or part exchange for KW2000 or KW2000A. Karl Geng, G5ACX, 77 Kelvinbrook, West Molesey, Surrey, Tel. (day) 01-568 9191 Ext. 625.

Minimitter 5 band cnvrtr., 1·5 MHz i.f., 230 V a.c. or 12 V d.c., fully b.s. £7. Dlvr. 20 mls. G. A. Swinnerton, G6AS, 120 Grange Rd., Olton, Solihull. Tel. 021-706 3709.

Labgear Triband quad at prsnt. rstng. on top of a Heathkit twr. It must be worth something, someone please take it away for, say £8 cash. M. G. Whitaker, G3IGW, "Rose-Dene," Wood Lane, Hipperholme, Halifax, Yorks. Tel. Halifax 22784.

QP166 coil pack £7 10s., 898 dial £3, FT241 xtals, 3CH326, 3CH327 35s. (lot) I.f. trnsfrmrs. and holders avlvle., Rx52 xtal. cal., 10,100,1000 kHz £2, pstge. extra. J. G. Wardhaugh, G4LA, 20 Hall Gates, Hexham, Northumberland.

Heathkit DX100 and SB10, both fctry. checked with 240 V a.c., aerial rly. £75. Heathkit UMC2 £4. Codar PR30X £3. L. G. Barlow, G3JMR, 15 Kinnerley St., Walsall, Staffs.

KW2000 G-line, as new, prfct., (have purchased KW2000A/KW1000) will air freight to nearest UK airport £155, Dlvry. J. Thompson, GI3ILV, Albany, Newry Rd., Armagh, Co. Armagh, N. Ireland. Tel. Armagh 2566.

KW2000A with p.s.u. (a.c.), 11 months old as new £180. Wanted DX40. D. E. Murgatroyd, G3PGX, 14 Raleigh Rd., Padstow, Cornwall

Taylor 50μA meter, 5 in. scale, unused £2. BC454 £2. "Green" trnsstr. p.s.u. 12 V i/p, 300 V at 200 mA o/p, unused £5. Crrge. extra or dlvr. locally. W. Farrar, G3ESP, 1 Wentwood View, Ackworth, Pontefract, Yorks. Tel. Ackworth 229.

Minimitter Q-mult. £1. Manual for AR88D 15s. and Radiovision Commander 5s. P.s.u. for C52 15s. MN26L compass rx, complete £2. Byr. cllcts. C. R. Smith, 19 Hyde Rd., Kenilworth, Warks. Tel. Kenilworth 54609.

Bendix BC221 with charts but no p.s.u. £10, offers or w.h.y. R. V. Hinchcliffe, G3KHA, 54 Pondsford Road, Knowle, Bristol 4.

DX40U gd. cond. £25 o.n.o. or swap for rx suit. as tntble. i.f. for v.h.f./u.h.f. convrtr. or w.h.y. v.h.f./u.h.f. gear. Soligor telephoto lens f 4·5, 250mm £25 o.n.o. Will dlvr. 50 mls. B. W. Evans, G8BGI, 147 Malcolm Rd., Tangmere, Chichester, Sussex.

Rxs and p.s.u., PCR3 £10, R1155 £5, CR100 £15, complete Marconi AD97/108 rx/tx, xtal cont., A1/A3, 24 V d.c. less cables £15. Xtals. B7G bases, various freqs. 8s. ea. M. K. Bacon, 36 Tanners Way, Hunsdon, Nr. Ware, Herts. Tel. 0279-84 2405.

Tannoy 75 W p.a. amp., fully metered, rdy. for use. Mixed mike./gram i/p. Snip £35. Panadaptor (genuine) model RCX, 4 in. tube, 100 kHz sweep, i/p 450–470 MHz, with manual. Accept £25. S. N. Bennet, G3HSC, 45 Green Lane, Purley, Surrey. Tel. 01-660 2896.

Constant vltge. trnsfrmr. 190–260 V i/p, 240 V at 500 mA and 0–60–70 V at 7 A o/p, made by Advance, £10 o.n.o. M. A. Trundle, G3TCG, 16 Stephens Cres., Horndon-on-the-Hill, Essex. Tel. Stan.-le-Hope 5409

WANTED

Loan of Denco DCR 19 rx crct. dgrm. for two or three weeks. S. Poole, "Tadge," Frolesworth Road, Ullesthorpe, Nr. Rugby. Tel. Leire 478.

Hndbk. for Panda Explorer tx, incldng. algnmnt. data and circt. Your price paid. D. MacLennan, G3KGM, 52 Pinewood Ave., Sidcup, Kent.

Douai School Radio Society begs unwanted vbrtr. p.s.u., BCC 69 type, for teaching project. Reasonably cmplte., 6 V, 12 V and 24 V units all suitable. Vbrtrs. not requrd. Offers to, Rev. P. W. Sollom, OSB., G3BGL, Douai Abbey, Woolhampton, Reading, Berks.

(*Continued on page 701*)

Eddystone

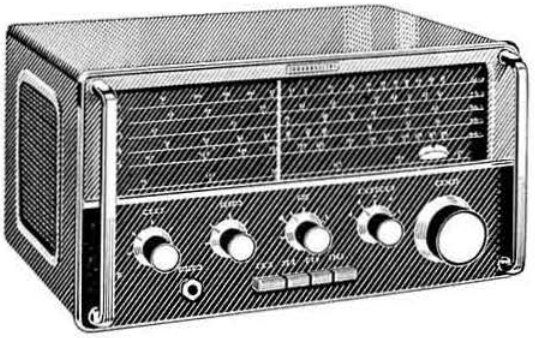
BRITISH MADE

Amateur communications receivers

EA12

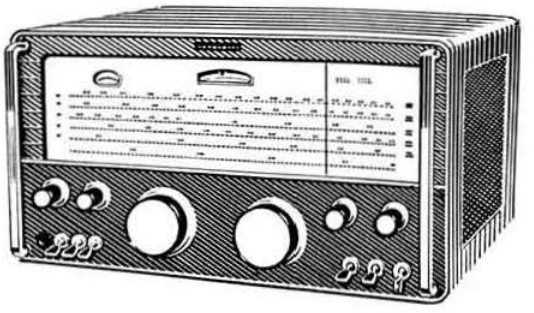
An amateur bands double-conversion superheterodyne receiver, for a.m, c.w, and s.s.b reception. For all amateur channels between 1.8 MHz and 30 MHz in nine 600 kHz bands with 28 MHz to 30 MHz in four bands.

Primary features. Crystal-controlled 1st oscillator, 2nd oscillator with continuously variable selectivity to 50 Hz, muting switched or by external relay, twin noise limiters, for a.m/c.w, and s.s.b, short-term drift better than 20 Hz and less than 100 Hz in any one hour, 'S' meter calibrated in nine levels of 6 dB and dB levels beyond 'S9', two a.g.c time constants, deep slot filter, independent r.f, i.f, and audio gain controls with outputs for f.s.k and panoramic adaptor.



EC10 communications receiver

The fully transistorized EC10 communications receiver, supreme in its class, covers both medium-wave broadcasting and all shortwave service to 30 MHz. Incorporating the famous Eddystone tuning drive, with logging scale and auxiliary vernier, shortwave reception is particularly simple. Battery-operated or from optional a.c mains unit.



940 H.F communications receiver

An outstanding 13-valve receiver with two r.f and two i.f stages, silicon diode noise limiter circuit and high quality push-pull output. Built to a professional specification, facilities include provision for c.w, a.m, and s.s.b reception over the range of 480 kHz to 30 MHz in five bands. Suitable for 110/125 V and 200/250 V. 40-60 Hz a.c mains.

Comprehensive information from your Eddystone distributor or: Eddystone Radio Limited, Eddystone Works, Alvechurch Road, Birmingham 31. Telephone: 021-475 2231. Telex: 33708

A MARCONI COMPANY

LTD/ED551

RADIO SOCIETY OF GREAT BRITAIN

FOUNDED 1913, INCORPORATED 1926

MEMBER SOCIETY INTERNATIONAL
AMATEUR RADIO UNION

PATRON: H.R.H. THE PRINCE PHILIP, DUKE OF EDINBURGH, KG

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QTC

LATE DELIVERY
MORE AERIALS FROM J-BEAM
NEW FILMS

We Can't Win

For as long as your Assistant Editor has been with the RSGB, he has been involved in dealing with complaints of late delivery of the *Bulletin* and *Radio Communication*. Now, of course, with the latest Post Office action of categorizing the post and introducing deliberate delays the situation is bound to become many times worse, and any hope of overcoming delays in delivery have ceased to become even a faint glimmer. *Radio Communication* is posted at the second class mail rate, and consequently we would not dare to try to predict its time of arrival on your doormat.

The outcome of this is that we are abandoning giving a specific publication date and you will see on the Contents Page at the front of this issue that it is replaced with a date of posting, i.e., the first Tuesday in each month. Naturally we regret having to make this move, especially in view of the fact that Members' Ads is now a very popular feature.

Of course, we welcome the idea of your complaining to the Post Office if *Radio Communication* regularly arrives very late, but we just ask you to avoid, if at all possible, barraging us with complaints of non-delivery unless you are absolutely certain that it will not be arriving.

GB3MFS

Under the call-sign, GB3MFS, South Manchester Radio Club organized and operated a special station at Manchester Flower Show on 26 and 27 July, 1968. So far as can be ascertained this is the first time in the 18-year life of the Show that Amateur Radio has been there. The equipment available enabled the club to operate two stations, one on the h.f. bands using an FR200B transmitter and FL100B receiver into a TA3 jr at 50 ft, and one on the l.f. bands using a Sphinx transmitter and a Mohican receiver. The aerial was a long wire.

The station was manned continuously during the two days of the Show, and 191 QSOs were logged by the h.f. station. Main operation on the l.f. station was on the Friday evening and Saturday when nearly 50 QSOs were logged, mainly on Top Band. 32 countries (excluding the British Isles) were worked by the h.f. station.

The " Shack " for this venture was the club's own caravan which has been modified for /P operation, although on this occasion mains electricity was available. Public interest was quite high, especially as on the Saturday the l.f. station was outside the caravan. As a direct result of this venture two new faces have appeared at the club. Maybe a few more will follow!

J-Beams Expand

The very familiar name of J-Beam Aerials Ltd will shortly be associated with the telecommunications field, as well as amongst TV and amateur users. J-Beam Engineering Ltd, an associate company of J-Beam Aerials Ltd., are in fact, re-entering this field (you may recall that they originally produced equipment for industry under the name Radio Telephone Aerial Systems Ltd.), but this time the range of aerials will cover applications for all types of base-station requirements, satellite and missile tracking, ship-to-shore, ground-to-air, point-to-point, video links, interference elimination, monitoring and oil rig telemetry. A new laboratory has been installed with special equipment to accurately test all parameters and air test every product before it leaves the factory.

A catalogue has been issued, which J-Beams will gladly send to interested firms and individuals on request. The address is J-Beam Engineering Ltd., Rothersthorpe Crescent, Northampton.

Film Library

As reported in Society Affairs, Council has approved an initial allocation of funds which has enabled the scheme for the re-stocking of the Film Library to get off the ground. Already one film is in production, " Radio News of 1968," and this is scheduled for release through the Film Library in December. It will include certain of the year's events which are of special interest. Some items have already been filmed. In addition a second film is under way, dealing with one topical aspect of modern Amateur Radio, which will be released early in 1969. A news-film is also planned for next year, together with another film of topical interest. The plan for future film production is long-term, and already links are being forged overseas which it is hoped will lead to a measure of international exchange of film material of Amateur Radio interest. More details next month.

December RAE

The Leicester College of Art and Technology, PO Box 143, Leicester, LE1 9BH, will be holding the Radio Amateurs' Examination in December. The closing date for applications is 31 October, 1968, and the fee payable is £2 10s. Cheques should be made payable to the City of Leicester Education Committee.

During the three weeks of the Edinburgh International Festival (17 August-7 September) the Lothians Radio Society operated for public demonstration an Amateur Radio Station with the call GB3EIF in the Mountbatten Building of the Heriot-Watt University. This was the first time such a station has appeared at the Festival and the venture proved to be a first-class publicity exercise. During the period that the station was open a large number of visitors, including licensed amateurs from home and abroad called at GB3EIF. Contacts with over 400 stations in 60 countries were achieved.

The Lothians Radio Society is naturally grateful to the University Authorities for their co-operation and to the numerous other supporting organizations including Eddystone Radio for the loan of an EA12, and GM3BMI for loaning a Sommerkamp FL200B/FR110B installation.

The photograph shows GM3BMI, GM8BJF and GM3TFY around the equipment, with GM3OWV operating.

(Photo by D. Hill)

More from Mullard

Mullard recently announced the production of 2N3823 FETs, and this was closely followed by a press release describing a MOS tetrode, type BFS28, intended for v.h.f. receiver front-ends. The gain of a single unit is some 18dB at 200 MHz, with a noise figure of 2·7dB. The characteristic is linear, for low cross-modulation and low level spurii, and the tetrode facility lends itself to use as a mixer.

Tentative data has been issued for an experimental MOST for broadband h.f. transmitters operating between 2 and 30 MHz. The power handling capability is 30 watts p.e.p. output, when used as a linear amplifier for s.s.b. It is still under development, present effort being to try and increase its power output by improving the breakdown voltage performance.

Uncle's Southend Do

Once again, G6NU's annual Southend " Do " turned out to be an unqualified success, over 102 turning up. The weather treated the event well, which no doubt helped to swell the numbers. The majority of visitors arrived at 12 noon, the remainder turning up at 3 p.m., in time to get to the hall where everyone sat down to tea. Coincidentally, the date happened to be the 21st birthday of Brian Parrish, an SWL and member of the RAIBC. He was presented with a travelling case, and then toasted with wine. Games followed, and at 8 p.m. the party dispersed.

Silent Keys

We record with sorrow the passing of:

A. N. Simmons, G3AD, of Richmond, Surrey.
J. H. Greenwood, G3JHG, of Keighley, Yorks.
H. V. Custance, BRS23348, of Honiton, Devon.
F. D. Bowcock, BRS25613, of Colchester, Essex.
C. A. E. Hawkins, BRS26323, of Solihull, Warks.

RSGB Certificates and Awards

All claims for RSGB Four Metres and Down Certificates should be addressed to " Four Metres and Down Awards," c/o RSGB HQ, and not to the Hon. Certificates Manager, who deals only with awards for the h.f. bands.

RSGB Lecture Meeting
SINGLE SIDEBAND AT V.H.F.

Modern Transmitter and Receiver Techniques

By R. T. Greenwood, G3LBA. F. A. Griffiths, G3MED, R. G. Pett, G3SHK and G. M. C. Stone, G3FZL.

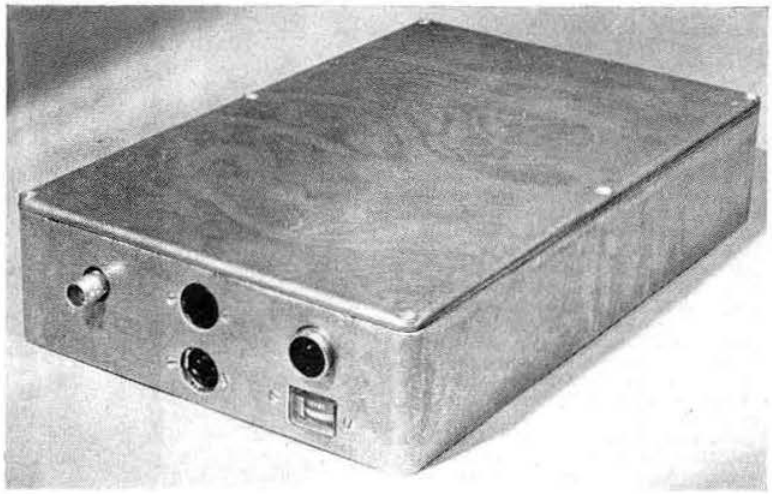
Friday, 15 November, 1968

INSTITUTION OF ELECTRICAL ENGINEERS, SAVOY PLACE, LONDON, WC2.

Buffet tea 6 p.m. Lecture 6.30 p.m.

Tickets may be obtained from Society Headquarters.

G8ACC Mk III 70 cm F.M. Solid State Transmitter



3 WATTS AERIAL POWER WITH LOW HARMONIC CONTENT

Construction of this equipment should only be attempted by amateurs familiar with r.f. power transistor techniques

By S. F. WEBER, B.Mus., A.R.A.M., G8ACC

TRANSISTORS which provide a reasonable amount of gain and power output for u.h.f. work have become available to the general public in the last few years. They are not cheap but neither are new valves. If these transistors can be designed into a stable transmitter circuit, the overall cost (transmitter, modulator and power unit) is comparable to a low-medium power valve design, assuming that new components have been used in both cases.

Unfortunately, transmitter circuits have a shocking reputation as "transistor slaughterers" and, to a certain extent, this is due to an unawareness of what transistors can and do get up to. Very often they get killed as a result of some instability and, as they are low resistance devices, they can pass several amperes in such circumstances. This, together with the fact that the silicon chip forming the transistor has a thermal constant reckoned in microseconds, explains why a transistor can blow up even when it is passing a reasonable current if some instability grips it: a transistor can die without even a flicker on the collector current meter. So to start with, if you are interested in using u.h.f. power transistors, a d.c. supply unit that can cut off in microseconds with an overload is vital [1]. I can't repeat that too strongly; it is easier to look for faults in circuits using live transistors rather than dead ones. And dead ones still have to be paid for.

Overlay Transistors

Now, in the old days, to make transistors which would work at u.h.f. as amplifiers—even in a receiver—wasn't easy. Basically, the emitter area (and thus capacity) and the transit time for the current carriers had both to be reduced, and for power transistors, the emitter periphery had to be increased. The small area necessary and the long perimeter are not easy to combine, but due to the techniques manufacturers had learnt when making integrated circuits, it was done by combining a whole matrix of tiny transistors in parallel by an overlay structure. In the 2N4012 transistor used in this design, a matrix of 156 minute transistors is connected in parallel in an area of a thousandth of a square inch. The capacitance is down to a few pico-farads and the series resistance has been greatly reduced (the resistance of the *n*-material provides for most of the collector series resistance). This transistor, and other transistors with the

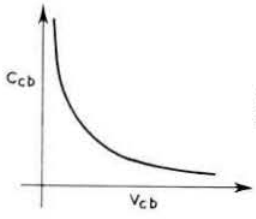
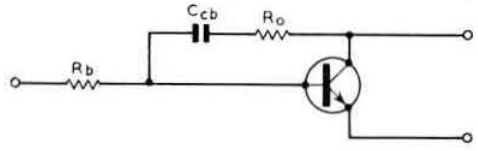


Fig. 1. Collector/base capacitance plotted against collector voltage.

Fig. 2.



* 8 Merton Hall Road, Wimbledon, London, SW19.

same structure, can run at about 70 per cent efficiency or higher at 430 MHz if properly tuned, as a straight through amplifier.

For multiplier action, use can be made of the capacitance from the collector to base, C_{eb}. This capacity which was mentioned earlier, depends on the voltage applied across it (Figs. 1 and 2) and consists essentially of two distinct parts: the inner capacitance (C_{in}) where the collector is directly opposite the emitter, and the outer capacitance (C_{out}) (Fig. 3). As the intrinsic base resistance (R_{bb}) and

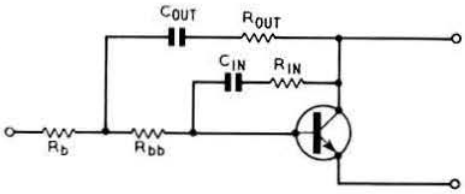


Fig. 3. Approximate distributed parameters in an overlay transistor.

the inner collector resistance are so much higher than the extrinsic base resistance (R_b) and outer collector resistance, and as C_{in} is made about one-tenth of C_{out}, R_b and R_{out} and C_{out} are by far the most important factors as far as we are concerned.

We can transform the curve given in Fig. 1 to a mathematical relationship: $C = a(V + b)^{-n}$ where a, b and n are constants for any one transistor. But capacitance is equal to the change in charge due to voltage: $C = \frac{dQ}{dV}$ so combining these two relationships and solving for Q (or else V):

$$Q = a\int(V + b)^{-n}dV$$
$$= \frac{a}{1-n}(V + b)^{1-n}$$

For an abrupt semiconductor junction, n is approximately 0·5 and b (the junction potential) can be effectively ignored for large collector voltages, so $Q = a'V^{\frac{1}{2}}$, where $a' = a/2$.

If an r.f. voltage is applied to this capacitance, a heavily distorted charge consisting mainly of the 2nd harmonic of the drive is produced (Fig. 4). A non-linear capacitance

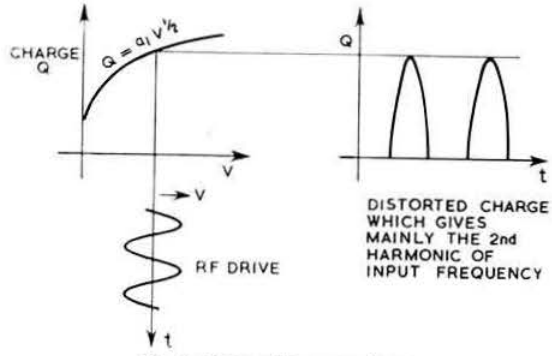


Fig. 4. Charge/time waveform.

operating like this will function up to a frequency where $f = 1/2\pi CR$ where R is the series resistance. With the 2N4012 transistor,

$R = R_b + R_{out} = 1{\cdot}8$ ohms
$C = C_{out} = 3{\cdot}5$ pF

so the maximum frequency would be 25 GHz. That is, for its collector-base capacity, *not* the transistor as a whole: with the 2N4012, F_{max} (Power gain = 1) is 800 MHz. With a transistor, however, even of the overlay type, you can't just pump power into the emitter or base and hope to get a whole lot of second harmonic out, because you won't. If the phase angle of the drive is right, it will only operate as a normal doubler. Fundamental current must flow through C_{eb}, and that won't be the case unless the transistor is used as a straight-through amplifier. A series tuned circuit (which is called an idler) is necessary to get current flowing at the fundamental frequency, so pushing it through the collector capacitance. Gain as a multiplier will not be produced unless the fundamental gain is bigger than the losses in the "varactor" capacitor from collector to base, which means driving the transistor with a frequency under F_{max}.

If the transistor is used in the common emitter mode, the base will have the reactance of the drive circuit between it and earth, so a second idler is used in the base circuit to provide a ground return for the harmonic current through C_{eb} (Fig. 5). This, then, is the main feature about transistor

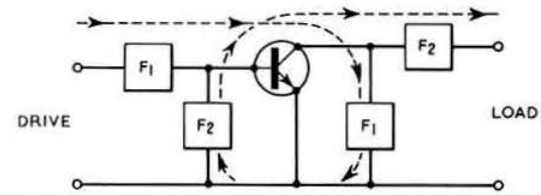


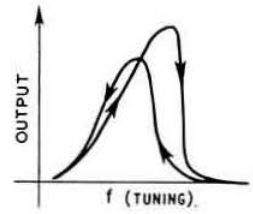
Fig. 5. R.f. current paths in an overlay-varactor doubler.

varactor multipliers, that they *must* have a series tuned circuit on the collector for the drive frequency to get gain at this frequency, and a series tuned circuit on the base (for common emitter configuration only) for the harmonic frequency to provide for a ground return for this current.

Instabilities with Transistor Circuits

From what was said earlier, transistors are prone to many instabilities of which hysteresis is by far the most troublesome: tuning up the output and the drive collapses. Most likely this is due to the average capacitance being

Fig. 6. Hysteresis curve.



detuned by the r.f. voltage (Fig. 6). If hysteresis does show its ugly face, detune the circuit on the shallow side by about 10 to 15 per cent. It seems most unwise to hang on to every last little bit of r.f. drive that you've got. Think of it this way: you would at the most lose about ¼ of an " S " point at the receiver end if the transmitter were detuned enough to take care of hysteresis. It is more than likely that if a transmitter tuned to maximum output were switched off, it wouldn't come on again until you retuned. This kind of thing can affect several stages, the output affecting the input all

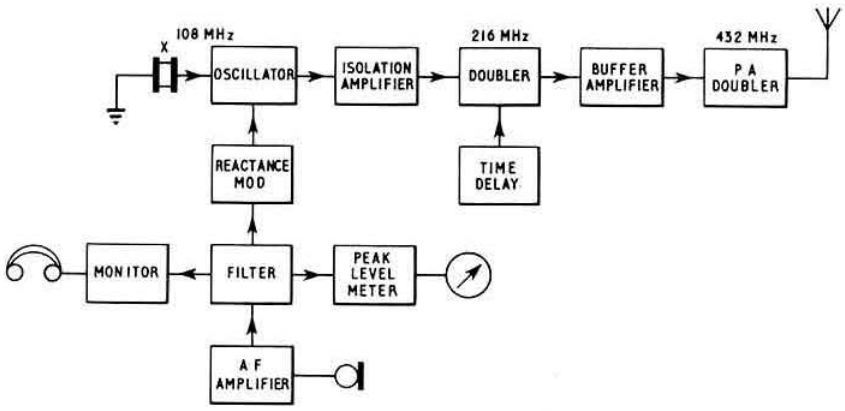


Fig. 7. Transmitter general layout.

along the line, so it is best to have plenty of drive in hand without maximizing it.

Oscillations, low and high frequency, can be a nuisance. Low frequency oscillations are nearly always caused by insufficient decoupling, and the fact that transistors work far better with a lower frequency. Low-F oscillations can build up to dangerous values very quickly and to avoid the kind of " switch-on, big-bang " situation, the l.f. decoupling capacitors should have a series resistance to lower the Q of any tuned circuit they might form with other components. Low impedance chokes should be used, made perhaps from resistance wire (certainly in power stages), with exactly the same purpose in view as the series resistance for the decoupling capacitors.

High frequency oscillations usually only appear with an insufficiently low impedance decoupling. They make their presence obvious when the drive power is removed. The shortest path from emitter (or base, as the case may be) to ground can still be too long. High-F oscillations sometimes appear with changes in load affecting the balance of the tuned circuits. Common base amplifiers and multipliers are only conditionally stable against such oscillations: it depends on how much drive is being pumped into them, and also the type of emitter circuitry and frequency of drive.

Parametric oscillations are an interaction between l.f. oscillations and the harmonic output and can be cured the same way as the low frequency type.

Thermal feedback can be caused with insufficient heat sinkage, and makes itself felt with very low frequency oscillations which can burn out a transistor just as efficiently as any other type of instability.

General Layout of the Transmitter

The crystal oscillator uses a GM290 germanium mesa transistor with a 5th overtone 108 MHz crystal. Fig. 23 is the only simple circuit for high overtone crystals that I have found which works with no trouble. The output is small, and the harmonic output is very low in comparison. It appears that the important thing for stable operation in the overtone mode is to tune out the capacity of the crystal—and also not to load the oscillator too heavily.

The oscillator is frequency modulated by a BA 110 varactor diode to produce 2·5 kHz (at 432 MHz) deviation with maximum audio frequency volume. The oscillator is very loosely coupled to a common base buffer amplifier with a very low harmonic output using a 2N3553 overlay transistor. The 2N3553 is a very lively transistor which can give up to 20dB gain at this frequency if it is held steady. These three stages are in continuous operation and are enclosed in a box for screening. The subsequent stages of the transmitter, therefore, make very little difference to the crystal frequency (max. 50 Hz at 432 MHz) when switched in as they would if this stage were tightly coupled to the oscillator and if they were exactly matched to this buffer. If the buffer, or isolation amplifier, output is checked with a sampling scope, the output waveform is as near to being a perfect sine as possible (Fig. 8), although low level harmonics can be heard on a receiver.

Fig. 8.

Fig. 9.

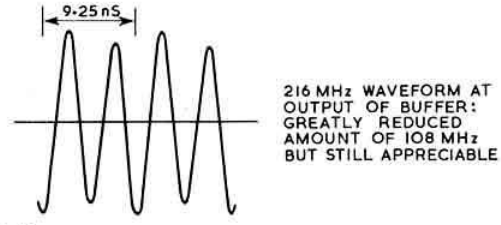


Fig. 10.

The output of the drive box is considerably undercoupled to an ordinary doubler stage (2N3553) to 216 MHz (Figs. 9 and 24) and then this in turn goes to a buffer (2N3553) with a double-pi output tank, with an output of approximately 1 watt. The double-pi circuit appears a lot less sensitive to output load variations and is easy to set up. The doubler and buffer are again enclosed in a box. The harmonic content in the output is very low but the sub-harmonic (initial drive) content is still appreciable (Fig. 10).

The 216 MHz drive is fed to the varactor doubler/p.a. stage (2N4012) and from this, the output power is about 3 watts across 70 ohms. The p.a. stage again uses a double-pi tank circuit and has a 432 MHz idler on the base, a 216 MHz idler on the collector and a 108 MHz series tuned circuit to short out any 108 MHz output which gets through. Harmonic content is low enough to produce a pretty well perfect sine wave on a sampling scope (Figs. 11a and b and 25).

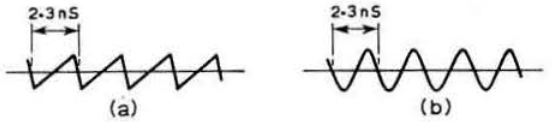


Fig. 11. (a) 432 MHz idler waveform: incorrectly adjusted. (b) correctly adjusted.

As there is almost too much drive available for each stage, it would have been perfectly possible to make do with one transistor less for the same 432 MHz output power. However this would have meant very tight coupling between all stages and maximizing the tuning: this kind of thing should be left to the professionals! It might have been all right except for the consequent heavy load on the oscillator stage, resulting in frequency drift and possibly other instabilities. The only instabilities which made themselves known during development of this design were hysteresis (from the drive box to the first doubler, and the input idler for the p.a. stage) which proved quite curable by slight detuning, and low frequency oscillations (around 1 MHz and low amplitude) in the final, which responded to better decoupling. All stages were aligned with very simple equipment and the results were checked afterwards on a Tektronix sampling 'scope with a rise-time of 0·5 nS.

Now this " simple equipment" can consist only of absorption wavemeters, a receiver, a reflectometer [2] and some small dummy loads [3], and, in fact, this equipment is *absolutely essential* for the bands the transmitter is working on: 100 to 500 MHz.

With this simple gear, provided a lot of care is taken (my wife can vouch for the time I took over it!), the transmitter can be quite successfully aligned. But patience is needed, because it *is* a long job. Once the transmitter is properly aligned, there should be no further need for re-adjustment for a very long time, unless the load impedance changes drastically.

Details of three simple absorption wavemeters are given in Figs. 12, 13 and 14. Fig. 12 gives details of two similar wavemeters covering from 100–180 MHz and 150–250 MHz; Figs. 13 and 14 give details of a stripline wavemeter covering from 300–500 MHz. They should all be calibrated against a g.d.o. or a reference oscillator.

Alignment could be carried out a good deal more effectively with more sophisticated test gear, such as a spectrum-analyser, but very few people have access to such

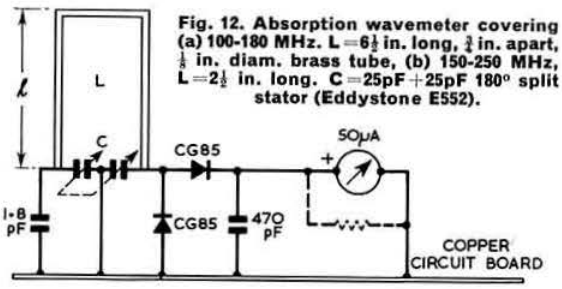


Fig. 12. Absorption wavemeter covering (a) 100-180 MHz. L = 6½ in. long, ¾ in. apart, ⅛ in. diam. brass tube, (b) 150-250 MHz, L = 2½ in. long. C = 25pF + 25pF 180° split stator (Eddystone E552).

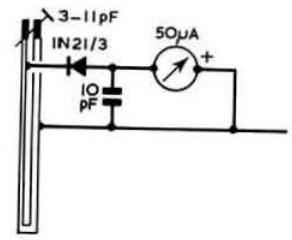


Fig. 13. 300-500 MHz wavemeter. Details of tuned circuit are given in Fig. 14.

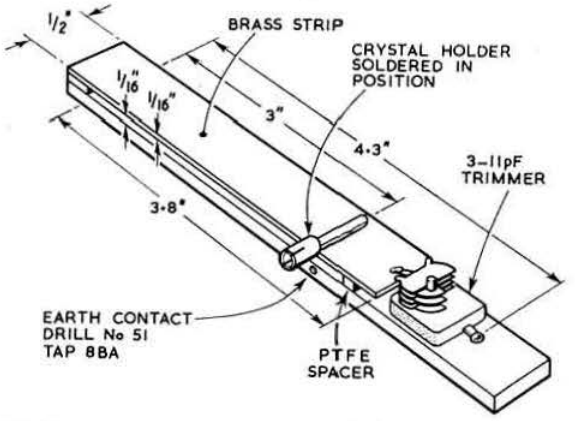


Fig. 14. Construction of the 300-500 MHz absorption wavemeter using a 1N21/3 crystal diode.

equipment covering these frequency bands, and unfortunately gear of this kind is not in any way cheap.

Having now made, borrowed or stolen the aligning instruments *and* a protected p.s.u., we can discuss the transmitter in more detail without incurring the risk of blowing transistors up.

Design of Tuned Circuits

The apparent simplicity of detail with the tuned circuits hides quite a lot of work. As in all transmitter circuits, the design of tuned circuits is of paramount importance to ensure good matching and spurious frequency rejection. In this transmitter, most of the tuned circuits were considered as pi-networks, taking the output capacitance as the first capacitance in the circuit.

The isolation amplifier uses a very high-Q circuit to give maximum attenuation of harmonics. The harmonics at the output can still be heard with a sensitive receiver, but they are of a very low level. The necessary d.c. blocking capacitor in this circuit was made variable for altering the effective

inductance of the coil, and extra inductance had to be added because of this capacity. The circuit was designed to feed into 47 ohms with the usual formulae (4) (Fig. 15):

$$X_{C_1} = \frac{R_g}{Q}\left(1 + \sqrt{\frac{R_l}{R_g}}\right) \text{ so } Q \text{ is approximately } \frac{R_g}{X_{C_1}}$$

(when $R_l \ll R_g$)

$$X_{C_2} = X_{C_1}\sqrt{\frac{R_l}{R_g}}$$

so $X_L = X_{C_1} + X_{C_2}$ at resonance

$$\left(\text{The generating resistance } R_g = \frac{V_{cc}^2}{2P}\right)$$

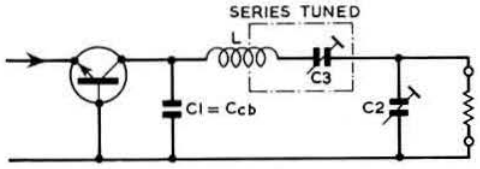


Fig. 15. Isolation amplifier pi-network.

(All calculations are approximate but are within experimental error.)

Now, assuming that there is 75 mW output at 28 volts h.t. (5 mA at 55 per cent eff.):

$R_g = 5$ kohms
and $C_1 = 15$ pF (at 100 MHz $= -j\,100$ ohms)
so $Q = 50$
and $X_{C_2} = 10$ ohms $= 150$ pF
Mid-capacitance of $C_3 = 25$ pF $= 65$ ohms
so $X_L = 100 + 10 + 65$ ohms $= 175$ ohms $= 0{\cdot}27\ \mu$H

The doubler collector is tuned by a pi-network connected to a series tuned circuit on the base of the buffer. This series tuned circuit tunes out any reactive impedance in the transistor (inductive at this frequency) (Fig. 16).

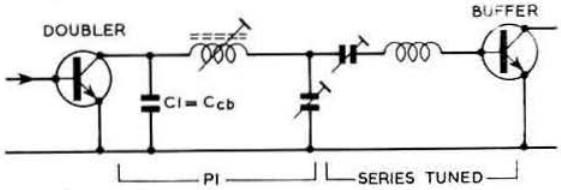


Fig. 16.

The collector of the buffer has a double-pi circuit to give more filtering of unwanted frequencies and make it easier to match into the next stage, which should present a resistive load of 50 ohms. A single pi circuit where any sort of power is involved at these frequencies becomes well nigh impossible because of the low impedances involved (resistive losses making the unloaded " Q " so low). A double-pi circuit can be designed to transform up to a high value of impedance and then back to a low impedance load. And on a purely practical point, they align very easily. If a reasonable " Q " is decided upon (say, 10 to 15) and the generator resistance (transistor output resistance) and capacitance are known, the first section can be designed the wrong way round (Fig. 17a):

$$X_{C_1} = \frac{R_g}{Q}\left(1 + \sqrt{\frac{R_l}{R_g}}\right)$$

so, therefore $R_l = \frac{1}{R_g}(QX_{C_1} - 1)^2$ and from this, the other

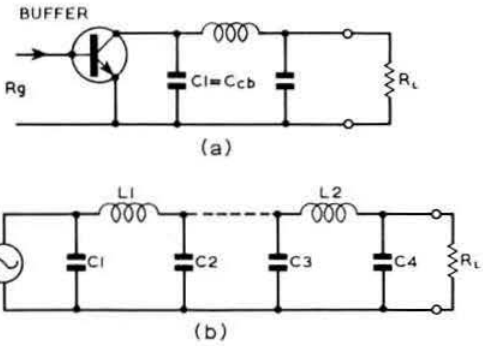


Fig. 17. (b) is a double pi circuit.

circuit constants can be found. When the first pi-section values are known, the second pi-section can be added on with the load resistance of the first becoming the generator resistance of the second; and the output capacity of the 1st and 2nd can then be combined (Fig. 17b).

$R_g = 300$ ohms
$C_1 = 15$pF $= -j\,55$ ohms at 200 MHz
$Q = 15$

So $R_{l1} = \frac{1}{300}(15 \times 55)^2$
$= 2250$ ohms

and $X_{C_2} = 55\sqrt{\frac{2250}{300}}$ ohms
$= 150$ ohms $= 5{\cdot}5$ pF

and $X_{L_1} = 150 + 55 = 205$ ohms $= 0{\cdot}17\ \mu$H

Second section: $R_g = 2250$ ohms

so $X_{C_3} = \frac{2250}{15}\left(1 + \sqrt{\frac{50}{2250}}\right)$ ohms
$= 150$ ohms $= 5{\cdot}5$ pF

$X_{C_4} = 150\sqrt{\frac{50}{2250}}$ ohms
$= 22\frac{1}{2}$ ohms $= 37$ pF

$X_{L_2} = 170$ ohms $= 0{\cdot}15\ \mu$H

A wrong way round " T " network is used to feed the doubler/p.a. stage (Fig. 18), that is, a series tuned circuit with impedance transformation effected through the ratio of the input capacity and the series tuned capacity [5].

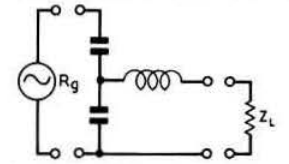


Fig. 18. T-network.

The 432 MHz idler in the base circuit is a high-Q series tuned circuit as is the 216 MHz idler on the collector. They both tune very sharply and the higher frequency one especially so. The p.a. tank circuit is again a double-pi network and the surprisingly large values of inductance keep the harmonic radiation to a very low level (Fig. 19).

$R_g = \frac{20^2}{6} = 66$ ohms

$X_{C_1} = -j\,40$ ohms at 430 MHz

$Q = 8$ (with higher values of " Q ", even the double-pi becomes almost impossible to realize practically):

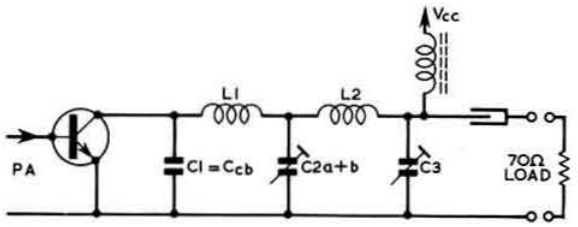


Fig. 19.

$$R_{l1} = 1/65(8\times40)^2 \text{ ohms}$$
$$= 1570 \text{ ohms}$$
$$X_{C_{2a}} = 40\sqrt{\frac{1570}{65}} \text{ ohms}$$
$$= 195 \text{ ohms} = 2 \text{ pF}$$
$$X_{L_1} = 195 + 40 = 235 \text{ ohms} = 90 \text{ nH}$$

Second section: As the final load resistance is very much of the same order as the transistor output resistance, this section will be more or less the first section turned back to front. However, if a 50 ohms load is decided upon,

X_{C_3} = 35 ohms = 11 pF
X_{L_2} = 230 ohms = 85 nH

which is within the range of adjustment for the pi circuit feeding 70 ohms.

A twin-pi circuit seems to have a spurious mode of resonance at about one quarter of the design frequency and for this reason, and due to the fact that the p.a. stage has a much greater gain at this lower frequency, a trap on 108 MHz is used to short out this component. However, a twin-pi circuit has several advantages over the more normal "T" output circuit: more effective suppression of harmonics, not so sensitive as far as its tuning is concerned to load variations although load variation can still be a problem (i.e.: the transistor will see a load which varies within limits at the same rate as the final load), and the very practical one of having the d.c. feed point at a low, stable impedance point so that the choke feeding in d.c. power would have great difficulty in forming a tuned circuit of any adequate Q with any other component.

General Points about the Transmitter

All r.f. stages have current limiting resistors in their collector supplies to guard against the transistor being shorted out. This is quite likely an unnecessary precaution with a protected power supply unit: there would be some power loss in output and slightly lower efficiency; but it was thought worth while. The p.a. stage has a 25 ohm series resistor in the collector supply chain: when this stage passes 300 mA with an h.t. of 28V, the collector voltage is about 20, which would make an input to this stage of 6 watts. But with over 15 volts r.m.s. across 70 ohms it is still running at a bit more than 50 per cent collector efficiency. With 28 volts on the collector with the same current, the output is around 5 watts which gives 60 per cent efficiency. The 2·2dB increase in power output had to be balanced against safety for the transistor and safety won: the 25 ohm resistor makes certain that the transistor can't pass enough current to harm itself in the trip time for the p.s.u. Obviously, it won't do anything about conditions of over-drive and punch-through from base to emitter.

The relay operating the first doubler is fed off the switched

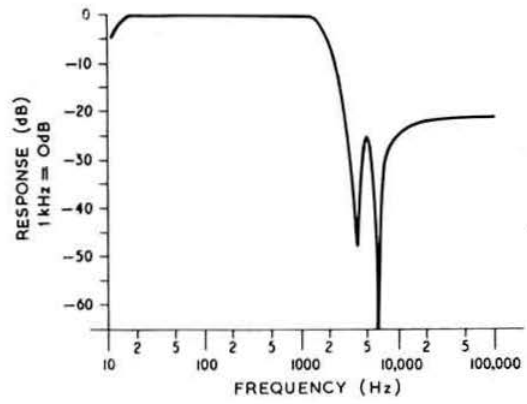


Fig. 20.

h.t. line and makes certain, with its 100 ms delay time, that drive is not applied to the final stage before the aerial relay has changed over to give the final its load. (It seems to me that it is worthwhile to have a fail-safe relay for the aerial circuit: that is, with the neutral side to the transmitter.)

The audio frequency side hasn't been mentioned at all yet with the exception of the frequency modulator. The merits or demerits of a.m. and f.m. as such are of no concern here. But with transistor a.m. designs, the drive has to be modulated as well as the p.a., and to get a reasonable linearity means having diode waveform shaping networks and lower power output to stop burning out the p.a. (6). F.m. is by far the simpler and, although in this design setting up requires some care, it works well and is stable (Fig. 22).

The output of the amplifier is fed into two m-derived filters giving a sharp cut-off at 3·8 kHz (Fig. 20). The a.f. load is 4·7 kohm, and the modulating voltage is tapped off this to the modulating diode. An emitter follower stage is used for monitoring with 800 ohm 'phones, and a d.c. coupled peak level meter circuit (with fast rise time and slow release characteristic) are coupled on to the load. A d.c. terminal is used to set both the meter for full-scale and the modulator for 2·5 kHz deviation.

The modulator diode is used in a tuned circuit of its own and is link coupled to the oscillator collector winding. The

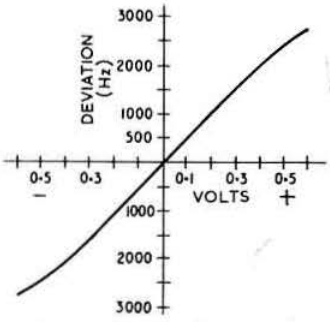


Fig. 21. Deviation at 432·9 MHz. Nominal diode voltage 3V.

deviation is reasonably linear but, unfortunately, not quite as good as the a.f. amplifier could do with. It gives adequate communication quality but no more (Fig. 21). I am still experimenting with other circuits of this kind to give better quality.

The power required for the transmitter is +28 volts at 400–450 mA and −12 volts at 15 mA for the modulator.

(To be concluded)

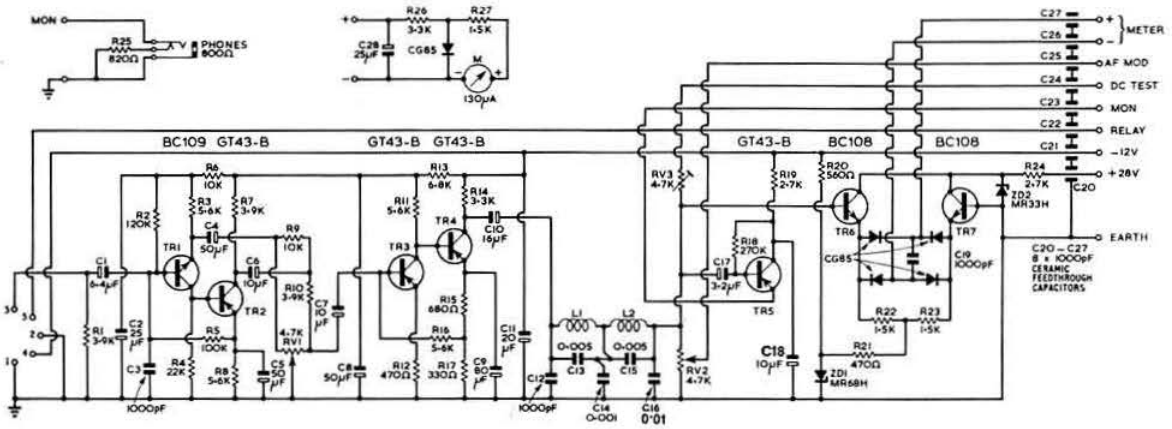


Fig. 22: A.f. amplifier, meter and monitor.

COMPONENTS LIST

A.F. Amplifier

R1 3·9 k ohm ¼ watt
R2 120 k ohm ¼ watt
R3 5·6 k ohm ¼ watt
R4 22 k ohm ¼ watt
R5 100 k ohm ¼ watt
R6 10 k ohm ¼ watt
R7 3·9 k ohm ¼ watt
R8 5·6 k ohm ¼ watt
R9 10 k ohm ¼ watt
R10 3·9 k ohm ¼ watt
R11 5·6 k ohm ¼ watt
R12 470 ohm ¼ watt
R13 6·8 k ohm ¼ watt
R14 3·3 k ohm ¼ watt
R15 680 ohm ¼ watt
R16 5·6 k ohm ¼ watt
R17 330 ohm ¼ watt
R18 270 k ohm ¼ watt
R19 2·7 k ohm ¼ watt
R20 560 ohm ¼ watt
R21 470 ohm ¼ watt
R22 1·5 k ohm ¼ watt
R23 1·5 k ohm ¼ watt
R24 2·7 k ohm ¼ watt
R25 820 ohm ¼ watt
R26 3·3 k ohm ¼ watt
R27 1·5 k ohm ¼ watt

RV1 4·7 k min. skeleton
RV2 4·7 k min. skeleton
RV3 4·7 k min. skeleton

C1 6·4 μF 6·4V Mullard Min. Electr.
C2 25 μF 6·4V Mullard Min. Electr.
C3 1000 pF 6·4V min. ceramic
C4 50 μF 6·4V Mullard Min. Electr.
C5 50 μF 6·4V Mullard Min. Electr.
C6 10 μF 16V Mullard Min. Electr.
C7 10 μF 16V Mullard Min. Electr.
C8 50 μF 6·4V Mullard Min. Electr.
C9 80 μF 2·5V Mullard Min. Electr.
C10 16 μF 10V Mullard Min. Electr.
C11 20 μF 16V Mullard Min. Electr.
C12 1000 pF min. ceramic
C13 0·005 μF 150 V metallized paper
C14 0·001 μF 150V metallized paper
C15 0·005 μF 150V metallized paper
C16 0·01 μF 150V metallized paper
C17 3·2 μF 6·4V Mullard Min. Electr.
C18 10 μF 16V Mullard Min. Electr.
C19 1000 pF min. ceramic

C20–27 1000 pF ceramic feed-through
C28 25 μF 4V Mullard Min. Electr.

L1 270 mH 400t 38 s.w.g. enam., SEI MM 106
L2 140 mH 290t 38 s.w.g. enam. SEI MM 106

M 130 μA 300 ohm

Drive Box

R1 47 k ohm ¼ watt
R2 6·8 k ohm ¼ watt
R3 6·8 k ohm ¼ watt
R4 1·2 k ohm ¼ watt
R5 1 k ohm ¼ watt
R6 100 ohm ¼ watt
VR 50 k min. skeleton
C1 470 pF min. ceramic
C2 470 pF min. ceramic
C3 470 pF min. ceramic
C4 10 pF min. silver mica
C5 470 pF min. ceramic
C6 25 pF ceramic trimmer (Electroniques ST/Cap/6/25/750)
C7 1000 pF ceramic lead through
C8 2·2 pF min. ceramic
C9 40 pF ceramic trimmer (Electroniques ST/Cap/10/40/750)
C10 40 pF ceramic trimmer
C11 20–250 pF mica trimmer
C12 1000 pF ceramic lead through
C13 0·02 μF 40V min. ceramic
C14 1000 pF ceramic lead through
C15 10 μF 16V Mullard Min. Electr.
RFC1 20t 24 s.w.g. enam. ⅛ in. ferrite former closewound
RFC2 8t 24 s.w.g. enam. ⅛ in. ferrite former closewound
L1 6½t 18 s.w.g. silver plated copper ¼ in. diam; sp. wire diam. Core.
L2 7t 18 s.w.g. silver plated copper ¼ in. diam; sp. wire diam. Core.
L3 3½t 18 s.w.g. silver plated copper ¼ in. diam; sp. wire diam. ½ Core.
L4 1t 24 s.w.g. insulated
L5 1t 24 s.w.g. insulated
L6 2½t 18 s.w.g. silver plated copper ¼ in. diam; sp. wire diam. Core.
L7 1t 24 s.w.g. insulated
L8 9t 18 s.w.g. silver plated copper ¼ in. diam; ⅜ in. long
All cores are Electroniqes FCQ5 (Pink)

Doubler and Buffer

C1 40 pF min. cer. trimmer
C2 20–150 pF min. trimmer
C3 25 pF mic. cer. trimmer
C4 1000 pF min. ceramic feed through
C5 0·02 μF 40V min. ceramic
C6 3–11 pF min. air trimmer
C7 60 pF mica trimmer
C8 470 pF min. ceramic
C9 0·02 μF 40V min. ceramic
C10 160 μF 10V Mullard Min. Electr.
C11 1000 pF ceramic lead through
L1 2½t 18 s.w.g. silver plated copper ¼ in. diam; sp wire diam. Core.
L1a 1t 24 s.w.g. insulated.
L2 1½t 18 s.w.g. silver plated copper ¼ in. diam.; sp wire diam. ½ core.
L3 1½t 18 s.w.g. silver plated copper ¼ in. diam.; sp wire diam. Core.
L4 4t 18 s.w.g. silver plated copper ¼ in. diam.; sp wire diam. Core.
L5 4t 18 s.w.g. silver plated copper ¼ in. diam.; sp wire diam. Core.
RFC 1 3t 24 s.w.g. enam, in ferrite bead.
RFC 2 5t 24 s.w.g. enam. on ⅛ in. ferrite former.
RFC 3 3t 24 s.w.g. enam. in ferrite bead.
RFC 4 5t 24 s.w.g. enam on ⅛ in. ferrite former.
RLA D.P.D.T. 12V at 700 ohm.

Power Amplifier

C1 4–30 pF min. cer. trimmer
C2 4–30 pF min. cer. trimmer
C3 2–5 pF min. air. trimmer
C4 3–11 pF min. air. trimmer
C5 ½–8 pF min. p.t.f.e. cyl. trimmer
C6 0·02 μF 40V min. ceramic
C7 1000pF ceramic lead through
C8 3–25pF min. cer. trimmer (cyl.)
C9 1000pF ceramic (see text)
C10 10–40 pF min. cer. trimmer
L1 3t 18 s.w.g. silver plated copper ¼ in. diam. ¼ in long.
L2 2t 18 s.w.g. silver plated copper ¼ in. diam. ¼ in. long.
L3 5t 18 s.w.g. silver plated copper ¼ in. diam. ½ in. long.
L4 3t 18 s.w.g. silver plated copper ¼ in. diam. ⅜ in. long.
L5 3t 18 s.w.g. silver plated copper ¼ in. diam. ¼ in. long.
L6 6t 18 s.w.g. silver plated copper ¼ in. diam. ½ in. long
RFC 1 8t 28 s.w.g. nichrome on ⅛ in. ferrite former
RFC 2 8t 24 s.w.g. nichrome on ⅛ in. ferrite former.

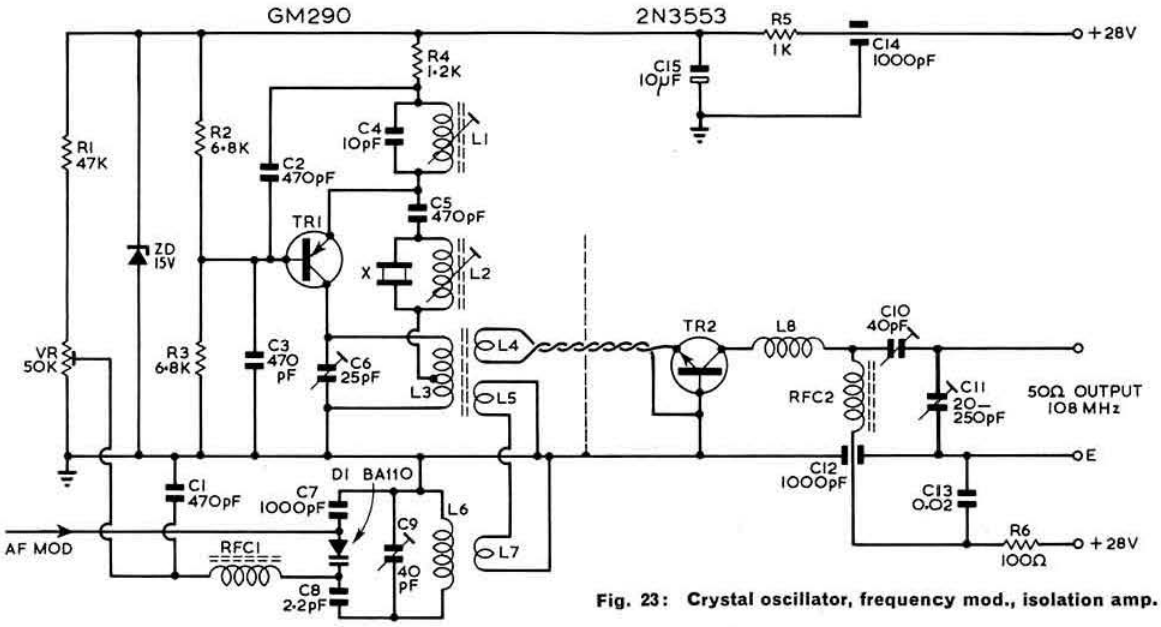


Fig. 23: Crystal oscillator, frequency mod., isolation amp.

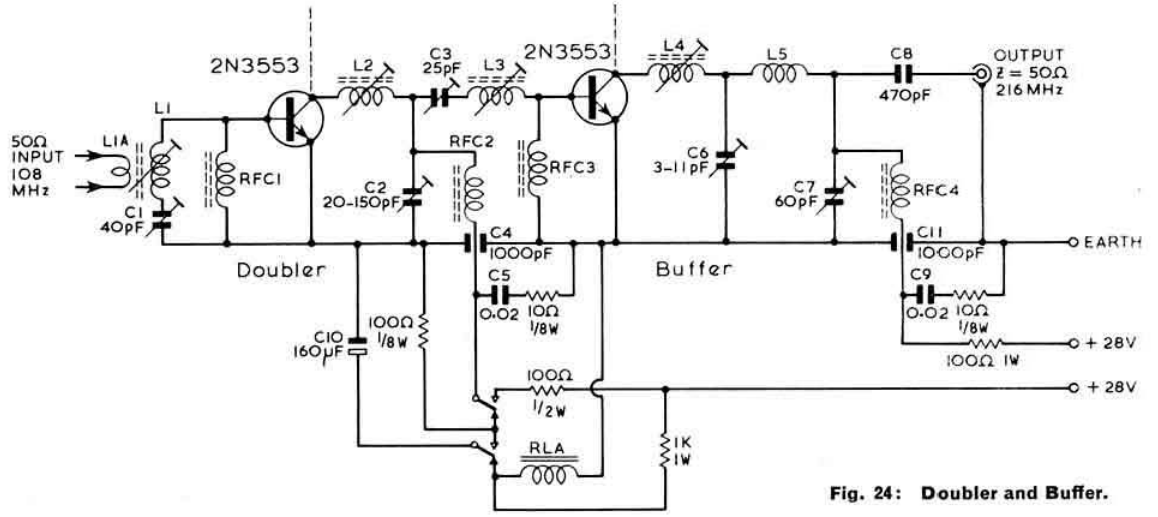


Fig. 24: Doubler and Buffer.

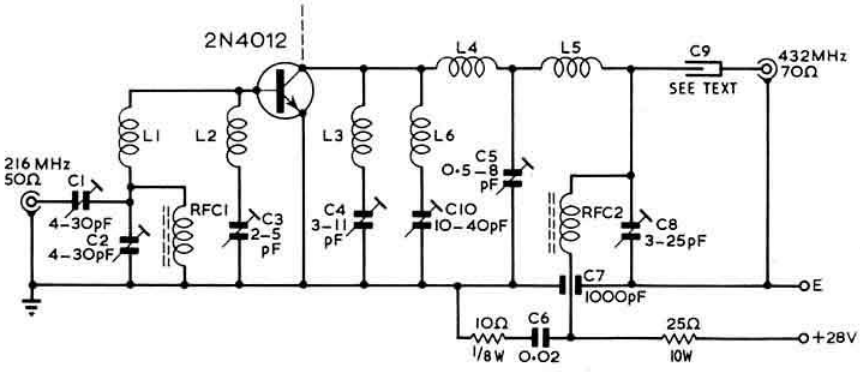


Fig. 25: P.A. and Doubler.

TECHNICAL TOPICS

By PAT HAWKER, G3VA

IT would surely be unfortunate if any deep-seated pro- or anti-semiconductor movement developed among amateurs. Most of us still depend primarily upon valves in both transmitters and receivers; yet there can be little doubt that the future lies increasingly with semiconductors, except perhaps for r.f. power amplification. Thus much of what is new, and hence "news," falls today in the semiconductor field, although many of the applications fit conveniently into hybrid semiconductor/valve equipments.

Certainly, as far as *TT* is concerned, there is no question of any "editorial policy" directed at pushing one approach rather than another. But, as we have noted before, *new* valves and/or valve applications are becoming thin on the ground, whereas every month seems to bring into the world's technical press a goodly quota of novel techniques for using semiconductors to simplify construction and to provide facilities and test instruments which would often be far more expensive with valves. For instance, although still in the future, we believe that the high-gain LIC (linear integrated circuit) will before long make it possible to build communications receivers more simply, and probably more cheaply than at present. This does not mean that valves are finished—far from it.

What is important is that, as amateurs, we should be aware of what is happening, what reasonably-priced devices are available, and the advantages and constraints imposed by the various approaches; rather than be presented with variations of basic valve-only circuits which have appeared in every *Handbook* for years. Perhaps, in an ideal world, all of our journals (like the Japanese *CQ-ham radio*) could run to some 300 pages a month, with circuits aplenty, new and old, to suit all tastes!

Hoop and Thin-wire Aerials

The September article by G6NA has shown clearly and expertly that low-resistance loops can be successfully used on 1·8, and probably on 3·5 MHz. But what of "thin-wire" loops and hoops for h.f. and v.h.f.? There seems increasing evidence—certainly enough to justify some further investigations—that there may be equally interesting possibilities that such loops could be used in a variety of ways, in situations where space and high supports are at a premium.

For instance, the description of the "2PL Special" (*TT* July, 1968—a normal quad operated with the reflector just off ground and shooting upwards) brought in a supporting comment from Ian Mitchell, G3MQY who notes that as VS1KY in Singapore in 1961 and using 60 watts series-gate a.m. the feedpoint of his 21 MHz quad was normally only 3 ft. above ground (though providing good world-wide contacts), On one occasion, the rig was operated with the reflector actually on the ground and the radiator firing straight up. This arrangement, as for G2PL, resulted in useful contacts, in this case to JA6, JA4 and VS9. Admittedly, it is difficult to evaluate a 21 or 28 MHz aerial on the basis of a few contacts, since when conditions are good the proverbial "wet string" can produce good DX. Still, this is encouraging. It should be made clear that we are not suggesting that people with quads should normally operate them in this way—rather, as 2PL pointed out, that this might form the basis of a simply constructed aerial using four short posts to give results akin to a dipole at normal height.

The quad "hoop" is basically one wavelength in perimeter. The original Boyer (W6UYH) DDRR hula hoop was resonated to $\frac{1}{4}$-λ by the capacitor at the free end. This immediately suggests that there might be an intermediate $\frac{1}{2}$-λ form of hoop—and sure enough some intensive delving into the literature has produced evidence (*Electronics Letters*, September, 1965) that this has indeed been recognized. A group of Italian research people then pointed out that, compared with the Boyer $\frac{1}{4}$-λ, "less known is the $\frac{1}{2}$-λ closed-loop aerial which had a quite different and, in some ways, better performance." Fig. 1, derived from their letter shows the basic differences between the hula-hoop and the $\frac{1}{2}$-λ closed loop.

The useful information given by the Italians (including various plots of impedance and radiation characteristics) all seems to indicate that the $\frac{1}{2}$-λ system may have considerable advantages for amateur experimentation: the bandwidth of the $\frac{1}{2}$-λ system can be up to ten times that of the $\frac{1}{4}$-λ system

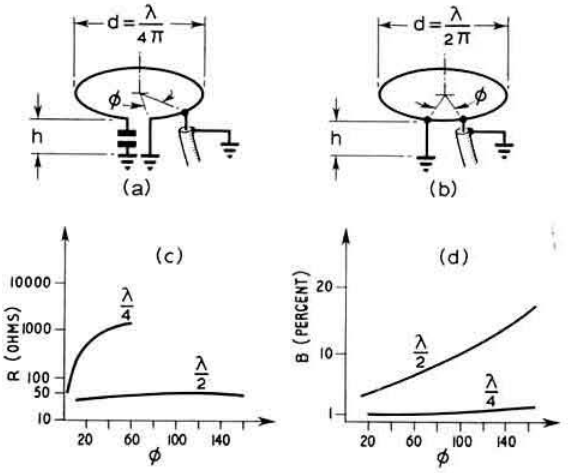


Fig. 1. (a) The $\frac{1}{4}\lambda$ hula hoop DDRR aerial; (b) $\frac{1}{2}\lambda$ closed loop; (c) resonance impedance versus feed-point angle; (d) bandwidth versus feed-point angle.

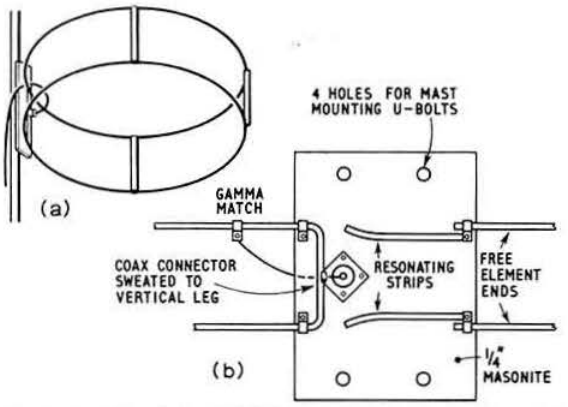


Fig. 2. Details of the K2ICF "double hula." (a) Complete vertical polarization system clamped on a vertical mast; (b) detail of mounting assembly and resonating strip "capacitors." Details of hula hoop dimensions (*TT*, September 1964, *TTf/RA* or *Amateur Radio Techniques*), basically loop + height ($\frac{1}{2}$ of double hoop spacing) is $\frac{1}{4}\lambda$ at highest frequency.

thus allowing a band to be covered without retuning; the feedpoint impedance remains roughly 50 ohms for ϕ angles from about 20° to 160° (making for easy matching and providing a simple means of finally resonating the loop to the required centre frequency); feedpoint impedance and resonance frequency can also be varied by changing *h*.

Altogether one has the impression that the $\frac{1}{2}$-λ closed-loop should prove far less critical in adjustment, and—with a good ground plane—should give excellent omni-directional radiation at reasonable vertical angles. A suggested value for ϕ for 50-ohm coax would be roughly 100° and h/λ about 5 per cent. The letter suggests that there could be many applications, particularly for mobile work, of such loops (the original work appears to have been done at 400 MHz), but surprisingly, I have seen little subsequent reference to this system, though I seem to recall an article by an Italian amateur on the subject. There is obviously scope for further experimental work from h.f. to u.h.f. And, from the following section, arises the important question of whether this form of loop could be used in a double-loop arrangement to eliminate the need for an extensive ground plane. Those with very long memories may recall the Reinhartz $\frac{1}{2}$-λ double open-loop rotary beams that were used successfully in the 'thirties on 56 MHz (e.g. *T. & R. Bulletin*, September 1938, G5NG). Single $\frac{1}{2}$-λ open loops are also being currently offered by J-Beams for Band I television reception, and are claimed to facilitate nulling out "ghosts."

Balanced Double-hoops and Arrays

The note on 5Z4FB's 144 MHz DDRR (*TT*, August) resulted in correspondence from Brian Rose, G3ULR who has been doing a good deal of work on various forms of 21 MHz balanced loops turned on their side to give horizontal polarization. Among other points, he has come to the conclusion (hinted at in my note on 5Z4FB's planned Yagi-type loop array) that placing additional tuned loops parallel to one another is unlikely to result in high-gain beam arrays; but he is now looking into the question of using pairs of double loops in a form of "ZL-special" arrangement, with the loops spaced co-planar rather as in the EMI-Cossor "active" array of aperiodic loops for receiving (*TT*, July).

Soon afterwards, I came across an article (*73 Magazine*, April 1965) on the DDRR by Peter Lovelock, K2ICF/6. This pointed out that one of the main problems of the vertical polarization $\frac{1}{4}$-λ DDRR is the requirement for an extremely good ground plane. This led K2ICF to investigate a double hula in which the ground plane is replaced by a second "image" hula hoop to provide a complete "doublet" structure. This, he found, could be mounted parallel to ground for vertical polarization (Fig. 2) or turned on its side, like a thick wheel, to give horizontal polarization. There are some significant differences between the K2ICF and G3ULR double hoops; for example the 'ICF spacing is 5·6 electrical degrees (i.e. twice the original 2·8°) whereas 'ULR uses 2·8°. 'ICF uses resonating strips (in lieu of high voltage capacitors) tuned about the "earth" point represented by the coax feed outer, while 'ULR simply puts a ganged capacitor in series across his open ends, and he feeds with balanced 300 ohm line.

Both 'ICF and 'ULR note that results can be affected when loops are mounted on metal supports (a result to be expected with vertical polarization). Loops are high-*Q* and must be accurately tuned. 'ICF uses $\frac{3}{8}$-in. copper tubing. Although ICF had to abandon work before he could try out any ideas on double-loop arrays he felt that "at least it had been proved that vertical or horizontal, the double hula works and offers lots of opportunity for the experimentally minded, as well as practical joy for those who are underprivileged in space."

To sum up. At present all these hula-hoop-type systems still seem to be at the stage of being experimental concepts rather than cut and dried designs. But somewhere, still buried in this work, must surely be some really useful new aerials for those amateurs not blessed with acres of space, or tall masts. Remember, a good vertically polarized system benefits rather than the opposite from being close to its ground-plane.

The VE2IB S.S.S.B. Mk1

Some ideas on how to simplify h.f. receiver construction can be gleaned from VE2IB's description (*QST*, August 1968) of a two-band 3·5 and 14 MHz transistorized receiver for sideband signals. This brings the signals straight into the mixer via switched input circuits—with almost all coils in toroid form to eliminate the need for any shielding—and hence through a 9 MHz crystal filter. The oscillator tunes

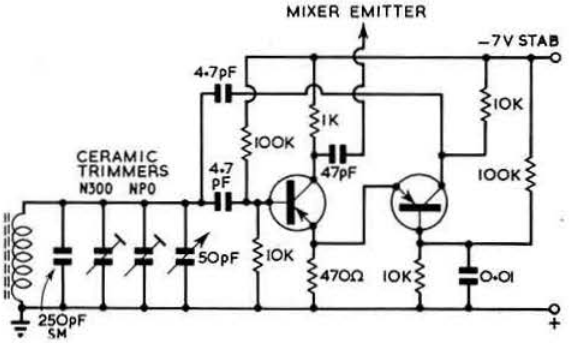


Fig. 3. V.f.o. (5-5.4 MHz) as local oscillator of VE2IB's S.S.S.B. Mk. 1 receiver. Transistors in original 2N1396 or SK3006 (RCA). The N300 padder is 16pF, and the NPO is 25pF.

only over 5 to 5·4 MHz (no ganged tuning, no oscillator switching) using a two-transistor form of emitter-coupled Franklin: see Fig. 3. Oscillator injection is to the mixer emitter from which its i.f. output is also taken. Construction is further simplified by using a proprietary a.f. module.

It is not suggested that the set in this form is equivalent to a high-performance receiver (even with 9 MHz i.f. there is some image without an r.f. stage) and, of course, without converters it covers only two bands. But the design does suggest that a workable s.s.b. receiver can be home-built without involving a twelve months project.

IGFET Super-regen

Also in the August *QST* is W1CER's compact low-power (250 mW transmitter) 144 MHz transceiver built in a metal "bond box." The receiver portion of this little rig has an MPF102 JFET common-gate r.f. amplifier followed by an MPF157 IGFET super-regenerative detector, a.f. stage and then another a.f. module. Despite the use of super-regen on the signal frequency it is claimed that there is practically no radiation from the receiver (the old objection to valve super-regens) and that the receiver will cope with 0·3 μV signals. Fig. 4 shows the super-regen detector stage.

Aerial Protection against Metal Fatigue

Metal fatigue is a term which has come to be associated with aircraft, but one has only to glance at the rooftops to spot that many television aerials have been damaged by the elements being flexed continually in resonant modes by wind vibration. This problem applies to any aerial array using rod-like elements, and can be serious in exposed areas or where winds are continuously blowing for a large part of the time.

A technique used to overcome this problem on Yagi and log-periodic h.f. arrays at Washington State University was put forward some time ago (*Electronic Design*, 2 August, 1966) but is likely to be new to many. This item suggested that flat rubber sheets, or sheets fashioned by splitting a length of rubber garden hose, can be used as energy absorbers to prevent rupturing of aerial elements. It was pointed out that the mechanical impedance of any rod-like element is high at a free end, regardless of the number of modes along the elements. This means that placing an energy-absorbent device at the ends can reduce the amplitude of vibration and minimize the chance of breakage.

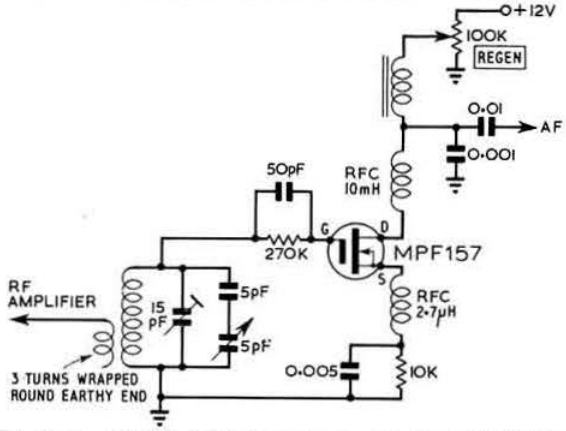


Fig. 4. The 144 MHz IGFET super-regen detector of W1CER's "Connecticut Bond Box" transceiver. Coil is four turns of bare no. 10 copper, 1 in. long, 6 in. inner diam. The drain should be decoupled to earth with a 0·05 in. parallel with a 0·001μF capacitor.

The protective device could be made from a short section of lightweight garden hose, split lengthwise every 90°, and held in place on the end of the elements by a hose clamp: Fig. 5. The writer pointed out that a more efficient and durable protection can be made from a sheet of flat rubber or pliable plastic material, $\frac{1}{8}$ to $\frac{1}{4}$-in. thick by 5 to 6 in. long. If this is made just wide enough to wrap once round the element, the damping will be matched to the size of the element. The material is cut lengthwise to make four tabs. Ideally, they would be more effective if clamped at the very end, but in practice they are positioned so that the free ends of the tabs are about 2 in. from the ends, to prevent changes in the electrical length of the elements and impedance.

It was pointed out that the system had been used on Yagi and log-periodic aerials for over three years. Element diameters ranged from $\frac{3}{8}$ to 1 in., and not a single breakage occurred.

P.V.C. Masts

H. Moore, G3WVD is another advocate of quasi-complementary transformerless a.f. output stages using transistors for receivers (one advantage over valves is that they help keep the heat down) and both he and GM3SAN have submitted useful circuits, but for the moment we are noting here that he also sends along a useful aerial tip.

He and members of the Otley Radio Society have been experimenting with p.v.c. rainwater pipes as guyed masts. This material, he suggests, is excellent for this purpose, being easy to work, light to carry and not as expensive as aluminium. For some time he has been using a 21 MHz ground plane made from 2-inch p.v.c. pipe using two 12 ft. lengths. There are six vertical conductors taped to the pipe and terminated at the top by soldering to an inverted tin can, and at the bottom by a Jubilee clip.

The radials are held in a similar manner and the feeder joint waterproofed by an upturned polythene bucket (junior's beach bucket if you can get it away from him). A two-inch hole is made in the bottom of the bucket and it is slid over the mast. The entire structure sits on G3WVD's

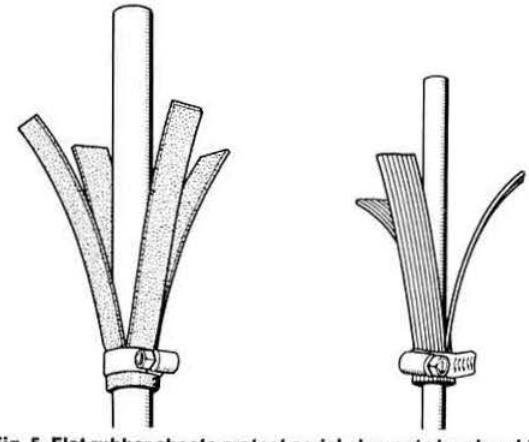


Fig. 5. Flat rubber sheets protect aerial elements by absorbing and dissipating mechanical energy due to wind.

roof and appears to have much the same bandwidth as a solid 2-in. diameter radiator. A 30-ft. version of this type of aerial support has been used by GB2NI for carrying v.h.f. beams. If the p.v.c. pipes are bought without preformed joints, they can be made by warming one pipe end and pushing another into it; this makes a tight joint which can be pulled apart over and over again. The ground plane has guy ropes to the top section, but since the aerial is so easy to build and is rustless, G3WVD feels a couple of guys is a small price to pay.

More on Narrow-band Reception

The belief that there is still room for useful progress in h..f and v.h.f. c.w. operation (*TT*, July 1968) by more drastic restriction of receiver noise bandwidths brought a note from Dick Halls, 9VLIK (G3EIW) who restricts his bandwidth to about 50 Hz. He points out that this means he hears a lot of British stations on 7 MHz, but relatively few of them seem to have suitable receivers to hear him calling them.

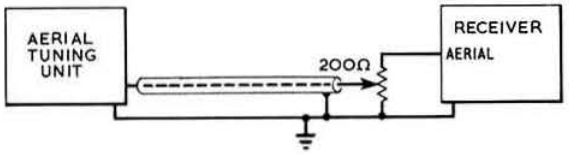


Fig. 6. Simple attenuator that 9V1LK finds useful in reducing cross-modulation.

He adds that the main complaint on 7 MHz tends always to be " heavy QRM." While a narrow bandwidth can help, 9V1LK considers that interference is often made very much worse by receiver cross-modulation and blocking (a sentiment that has been echoed on many occasions in *TT*). He finds that a very simple attenuator fitted at the receiver input can often remove much of the trouble. Several fairly simple constant impedance attenuators have been described before, but 9V1LK suggests that even just a simple 200-ohm potentiometer across the input (Fig. 6), though it may not appeal to the purists, can often be quite satisfactory, and is well worth trying—particularly if the receiver has no separate r.f. gain control acting on the first stage.

With the signal/noise improvement achieved by reducing bandwidth, it becomes possible to reduce the signals put into the receiver and so reduce blocking. A related point made by Dick Halls is that he confirms my suggestion that to permit better narrow-band operation, both transmitters and receivers must have more stable oscillators. " Many of the stations I hear on c.w. have bad drift of one sort or another which makes them unreadable with narrow bandwidth," he writes.

One or two other matters may be worth considering. First, it should be noted that noise bandwidth is not the same as nose bandwidth (nor skirt bandwidth). It is determined theoretically by finding the area under the signal bandwidth selectivity curve and constructing a rectangle of equal area. Noise bandwidth thus approaches nose bandwidth with filters having a good shape factor.

Our No-cost Filters

In pressing the benefits of narrow-band reception, one aspect—which in a few cases could lead to disappointment—should not be overlooked. For here we must consider both receiver and operator as a complete system, with, to use the modern jargon, all the implications of a man-machine interface. The final " receiver " bandpass filter is effectively the amateur's own auditory system, and this is by no means fully understood yet. Some operators have a remarkable ability to concentrate upon signals which to others appear smothered in noise.

An interesting example of this was noted during a recent visit to a Ministry radio station where one operator was using a 300 Hz filter so that signals stood out, whereas another had the receiver in a much wider bandwidth position with the signal masked in noise; yet he was copying the message as accurately as the first. The human ear can in fact provide a " filter " bandwidth of around 50 Hz, with a remarkably large dynamic range (well over 100 dB) and the ability to tune from about 200 to over 1000 Hz without introducing " ringing "—desirable characteristics indeed when it is recalled that a pair comes free with every user.

For those who think that the workings of the human ear must surely be completely understood by now, reference could be made to the recent book " Correlation Techniques " (F. H. Lange, Iliffe Books Ltd) with its fascinating section on physiological sound analysis and the " cocktail party " effect, and the suggestion that our ears may in fact be functioning as sophisticated correlation signal detectors (another technique which may one day be used for weak signal operation.) This book quotes a physiologist as follows:

" Because of its smallness, the ear presents some of the most disputed problems of human physiology. While the mode of operation of the eye is quite clear and its basic principles have been imitated and evaluated in the photographic camera, the mechanism of hearing is still a matter of dispute. In spite of the small size and complicated structure the ear compares roughly with a modern radio receiver and, regarded purely technically, is of comparatively simple construction, so that one might hold the view that an accurate examination would immediately expose the purpose and function of each individual constitutent part. Exactly the opposite is the case—and all theories are still full of contradictions."

In practice, most of us can benefit from the rather poor imitations of natural filters that electronics permits. Though it is an interesting thought that we might do equally well by developing natural abilities to the fullest possible extent!

Here and There

A high-performance 144 MHz convertor using dual and single-gate IGFETs with bipolar oscillator chain—claimed to rival valves in cross modulation and to excell them in noise figure and gain—is described by WB2EGZ in *Ham Radio* (August 1968). This includes a good deal of useful advice on the difference between JFETs and IGFETs and uses the 3N140 as first r.f. stage.

Another tip from G3WVD is for mounting printed and other circuit boards such as those in Printset equipments. He uses the Harrison " No Pelmet " curtain rail fasteners which are available in straight or right angle fitting. These are nylon mouldings and only take up about $\frac{1}{8}$ in. on the edge of the circuit board. They certainly seem a useful way of mounting almost any small boards.

P. SIMPSON, G3GGK and B. ARMSTRONG, G3EDD

THE HEATHKIT SB101 S.S.B. TRANSCEIVER

JUDGING by the increasing number of amateurs using the SB101 S.S.B. Transceiver, Heathkit have again produced a winner. Just how well this equipment stands up to a searching investigation with professional test equipment will be shown in this review. Even in kit form, the SB101 is not the lowest cost transceiver available to the UK amateurs but this is only by a small margin. Daystrom of Gloucester supply the kit for £185 12s. or the assembled version for £225 12s.

General Description

The receiver circuit is what is now conventional using a crystal controlled oscillator to mix the signal frequency to a fixed broadband i.f. A band pass filter of 8·395 to 8·895 MHz is between the first and second mixers. The L.M.O. (Linear Master Oscillator) tunes from 5 to 5·5 MHz to produce a second i.f. of 3·395 MHz. The main selectivity at the second i.f. is provided by a crystal filter with a 6dB bandwidth of 2·1 kHz. An optional extra crystal filter is available for c.w. working with a 6dB bandwidth of 400 Hz. A triode product detector is used.

The transmitter uses much of the receiver circuitry. The balanced modulator is a diode bridge. Sideband switching is obtained by switching carrier crystals and the L.M.O. is side stepped with a variable capacitance diode to maintain calibration. Since the c.w. crystal filter is in circuit on transmit, a third carrier crystal is provided to put the carrier in the centre of the pass band. The transmitter driver anode r.f. circuit is also used as the receiver r.f. amplifier grid circuit. The 100 kHz calibrator is fed in at this point via the diode multiplier.

A.l.c. from the p.a. grid is fed back to the first i.f. amplifier. The heater rail is wired for 12·6 volts to allow for mobile use.

Mechanical Construction

The SB101 kit consists of the following basic units:

1. Seven printed circuit board assemblies.
2. Aluminium Chassis and Panel Assembly.
3. Pre-assembled and Tested V.F.O. Unit.
4. Preformed cable assembly.
5. Preformed Screened cable assembly.
6. Aluminium Cabinet.

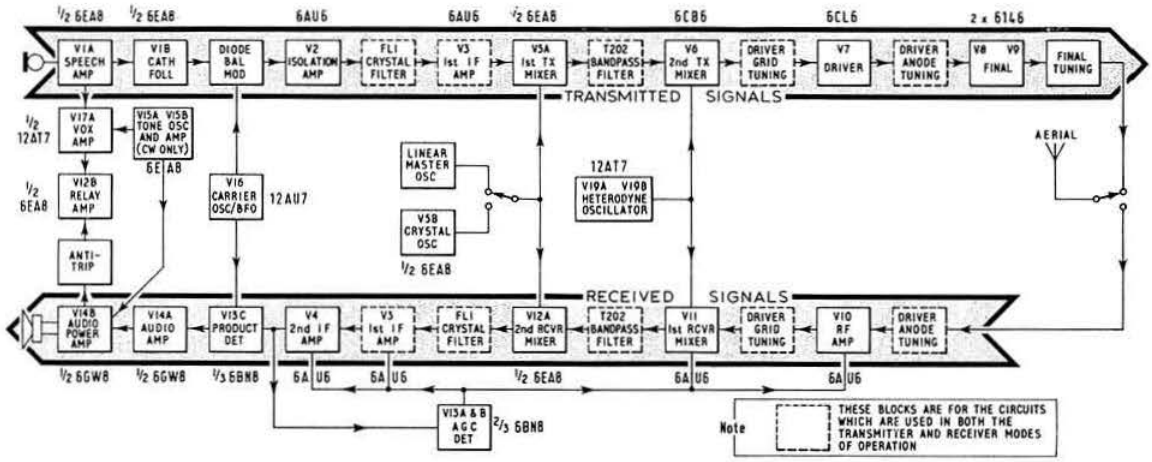
When received, the kit is packed into a box little bigger than the cabinet and the packing system itself is a work of art. Certainly the authors would not like to have the job of re-packing a kit.

The boards are wired first and then assembled onto the chassis together with the v.f.o. and cableforms. After this, the front panel is fitted together with the various controls. Finally the remaining chassis mounting components are fitted and the wiring completed. The preselector and p.a. loading controls are operated by rubber belts driving pressed steel drums and whilst one might consider this to be a " cheap and cheerful " form of drive it is never-the-less adequate and has as yet shown no tendency to unreliability.

Assembly

The handbook is written with the usual Heathkit thoroughness and provided this is followed carefully, no difficulty should be encountered. A skilled constructor will have to spend at least 40 hours building the SB101 and for those less experienced the time would probably be about 60 hours. The task is a very rewarding one which enables a person to know the equipment he is operating and this should help with any fault tracing when a breakdown occurs.

Before starting construction it is advisable to check off all parts against the list in the handbook. To help with this,



Block diagram of the complete transceiver.

many parts are drawn to assist identification and even experienced constructors are advised to study the details carefully to avoid using the wrong components; it can be very frustrating when a wanted part is not to hand.

Only a few tools are needed and a small spanner, nutstarter and two Allen keys are provided. The usual screwdriver, pliers, cutters, and a light soldering iron are all that is required except for a suitable spanner to fit the control nuts.

The handbook explains the operation of every stage of the transceiver and voltage charts together with tables of resistance measurements enable thorough testing to be carried out. The handbook becomes a superb servicing manual for later use.

The only test equipment likely to be needed are a receiver tuned to Droitwich or MSF to which the 100 kHz calibrator can be adjusted, and a general purpose test meter.

Constructors who have no experience of printed circuit work would be well advised to practice with a few components and a piece of Veroboard in order to assess the amount of heat required to make a good joint. Too much heat for too long will lift the copper from the board. In this respect Heathkit provide a useful " Guide to the Kit Builder " and this point is made.

The Tests

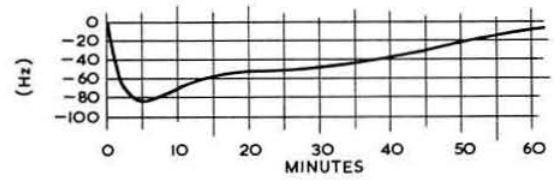
The V.F.O.

In advertisements, the v.f.o., or Linear Master Oscillator as Heathkit call it, has been the subject of extensive claims, which it has been very interesting to be able to investigate.

The L.M.O. is understandably supplied as a complete assembly. Although this means a higher kit cost, the L.M.O. is probably the most important and critical part of the transceiver and thus deserves professional skilled labour in its assembly.

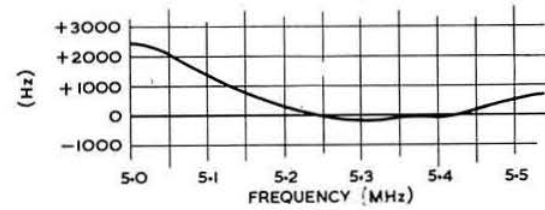
The drift from switch on was quite remarkable and the best of the equipments so far tested in this series of reviews.

The maximum excursions from the first readable count after switch on was 86 Hz after 5 minutes. The full results are as follows:



Time from Switch On (minutes)	Frequency Drift (Hz)
1 minute	−25
2 minute	−64
3 minute	−72
5 minute	−86
10 minute	−72
15 minute	−58
30 minute	−49
45 minute	−30
1 hour	− 8

For the linearity test, the l.m.o. frequency was set to 5·250 MHz and the scale aligned to agree. The frequency was then checked at 50 kHz intervals.



Nominal frequency (MHz)	Error (Hz)
5·000	+ 2478
5·050	+ 2038
5·100	+ 1369
5·150	+ 850
5·200	+ 256
5·250	+ 12
5·300	− 108
5·350	− 9
5·400	− 42
5·450	+ 290
5·500	+ 554

The Heathkit claim for electrical dial accuracy is within 400 Hz after calibration at the nearest 100 kHz point. The

results show that this claim is not met (see " Manufacturer's Comments ") but it is better than some other equipments tested.

Tests for backlash and resettability showed better than 20 Hz, an excellent figure and an order better than the 200 Hz visual dial accuracy claimed by Heathkit.

The frequency variation with ± 10 per cent change in mains input voltage was ± 40 Hz.

A test which has not been done in this series of reviews before is the measurement of transmit to receive frequency shift. This is an omission which will be rectified in the future. Attention was drawn to the need for this test by critical on the air tests with another station where a slight shift was suspected. The test showed a shift of about 40 Hz which is close to the limit of perception.

The Crystal Oscillator

No trimming is provided on any of the crystals except the 100 kHz calibration oscillator.

Nominal frequency (MHz)	Error (Hz)
3·3936	+ 3
3·3954	+ 47
3·3964	− 47
12·395	− 1784
15·895	− 1440
22·895	− 338
29·895	− 455
36·895	+ 11
37·395	Crystal Faulty
37·895	− 684
38·395	− 875

Apart from the 12·395 and 15·895 MHz crystals where the error was acceptable, the results were very good.

THE RECEIVER

Signal to Noise Ratio and Sensitivity

The following results were recorded at 1 μV p.d. input.

Frequency (MHz)	Signal-to-Noise ratio (dB)	Audio Output (mW)
3·750	27	200
7·100	25	60
14·100	28	200
21·100	28	300
28·600	26	130

The maximum audio output for no visible distortion on an oscilloscope was 2 watts.

Strong Unwanted Signal Handling

Blocking was measured by two signal generators. One was set to the receiver tune frequency such as to produce 14dB signal-to-noise ratio. The second signal generator was set 20 kHz from the tune frequency and its level increased until the signal-to-noise was degraded by 3dB. The unwanted signal necessary was 94dB above the wanted—a very good figure.

Inter-modulation was measured by feeding two strong signals 10 kHz apart and looking for inter-modulation products 10 kHz above the upper frequency and 10 kHz below the lower frequency. The unwanted signals were + 64dB rel. 1 μV p.d. to produce the equivalent of 1 μV at the aerial input. This is also very good.

A.G.C.

The a.g.c. performance was not very good:

Signal Input relative to 1 μV p.d.	Audio output rel. Test Level
+ 20dB	+ 16dB
+ 40dB	+ 22·5dB
+ 60dB	+ 24·5dB
+ 80dB	+ 26dB

S-Meter

The S meter zero was not very stable. Its variation was not great in terms of percentage scale reading but was never-theless annoying.

Meter reading	db. rel. 1 μV p.d. 14 MHz
S 1	5
S 2	12
S 3	15
S 4	18
S 5	21
S 6	23
S 7	25
S 8	28
S 9	31
S 9 + 20	44
S 9 + 40	65
S 9 + 60	100

The variation with band showed:

Frequency (MHz)	dB rel. 1 μV p.d. to show S9
3·75	31
7·1	36
14·1	31
21·1	31
28·6	31

Apart from 7·1 MHz where the gain was lower than the other bands, and this confirmed the sensitivity measurements, the variation with band was extremely consistent. Heathkit appear to accept 3dB per S point.

Birdies

The receiver was tuned across all bands, and all the birdies noted. The only real birdy was at 21·200 kHz and this was equivalent to 1 μV p.d. input. All others were well below this level.

Spurious Responses

The spurious attenuation was on the whole quite good—60dB or better. Only on the 7·0 MHz band was first i.f. breakthrough on the bare side with only 44dB attenuation. This was not noted on the air.

Selectivity

This was measured with the receiver tuned to the 3·5 MHz band. On s.s.b. the bandwidth is 2·4 kHz at 6dB, and 4·8 kHz at 60dB, a shape factor of 2 : 1.

On c.w. the 6dB bandwidth is 400 Hz and at 60dB it is 1·64 kHz, a shape factor of 4·1. In both cases the claimed specification is met.

THE TRANSMITTER

Power Output

The transmitter was tuned for maximum power on c.w. and for 26dB i.p.s on the two tone test.

MANUFACTURER'S SPECIFICATION—SB-101 AND POWER SUPPLIES

RECEIVER SECTION

Sensitivity	Less than 1 microvolt for 15dB signal-plus-noise to noise ratio for s.s.b. operation.
S.S.B. selectivity	2·1 kHz minimum at 6dB down, 5 kHz maximum at 60dB down—2 : 1 nominal shape factor—60 : 6dB.
C.w. selectivity	(With optional c.w. filter SBA-301-2 installed) 400 Hz minimum at 6dB down, 2·0 kHz maximum at 60dB down.
Input impedance	Low impedance for unbalanced coaxial input.
Output impedance	Unbalanced 8 and 600 ohm speaker, and high impedance headphone.
Power output	2 watts with less than 10 per cent distortion.
Spurious response	Image and i.f. rejection better than 50dB. Internal spurious signals below equivalent aerial input of 1 μV.

TRANSMITTER SECTION

D.c. power input	S.s.b. 180 watts p.e.p. continuous voice. C.w. 170 watts—50 per cent duty cycle.
R.F. power output	100 watts on 80 through 15m; 80 watts on 10m (50 ohm nonreactive load).
Output impedance	50 ohms to 75 ohms with less than 2 : 1 s.w.r.
Oscillator feedthrough or mixer products	55dB below rated output.
Harmonic radiations	45dB below rated output.
Transmit - receive operation	S.s.b. Push-to-talk or VOX. C.w. Provided by operating VOX from a keyed tone, using grid-block keying.
C.w. side-tone	Internally switched to speaker or headphones in c.w. mode. Approx. 1000 Hz tone.
Microphone input impedance	High impedance.
Carrier suppression	50dB down from single-tone output.
Unwanted sideband suppression	55dB down from single-tone output at 1000 Hz reference.
Third order distortion	30dB down two-tone output.
R.F. Compression TALC)	10dB or greater at 0·1 mA final grid current.

GENERAL

Frequency coverage	3·5 to 4·0; 7·0 to 7·5; 14·0 to 14·5; 21·0 to 21·5; 28·0 to 28·5; 28·5 to 29·0; 29·0 to 29·5; 29·5 to 30·0 MHz.
Frequency stability	Less than 100 Hz per hour after 20 minutes warm-up from normal ambient conditions. Less than 100 Hz for ± 10 per cent line voltage variations.
Modes of operation	Selectable upper or lower sideband (suppressed carrier) and c.w.
Visual dial accuracy	Within 200 Hz on all bands.
Electrical dial accuracy	Within 400 Hz after calibration at nearest 100 kHz point.
Dial mechanism backlash	Less than 50 Hz.
Calibration	100 kHz crystal.
Audio frequency response	350 to 2450 Hz.
Power requirements	700 to 850 volts at 250 mA; 300 volts at 150 mA; 115 volts at 10 mA; 12 volts at 4·76 amps.
Cabinet dimensions	14⅞ in. W. × 6⅜ in. H. × 13⅜ in. D.
Net Weight	17½ lb.

HP-23 E SPECIFICATIONS

Power requirements	120/240 volts a.c., 50-60 Hz, 350 watts maximum.
High Voltage output	820 volts d.c. no load; 700 volts d.c. at 250 mA ± 10 per cent. A.c. ripple: Less than 1 per cent at 250 mA. Duty cycle: 150 mA continuous, to 300 mA at 50 per cent.
Low voltage output	(High tap) 350 volts d.c., no load; 300 volts d.c. at 150 mA ± 10 per cent (low tap) 275 volts d.c., no load; 250 volts d.c. at 100 mA ± 10 per cent. Less than 0·05 per cent a.c. ripple at 150 mA, continuous duty to 175 mA.
Fixed bias	−130 volts d.c., ± 10 per cent, no load; −100 volts d.c. at 20 mA.
Adjustable bias	−40 to −80 volts d.c. at 1 mA maximum. Less than 0·5 per cent a.c. ripple.
Filament voltage	6·3 V a.c. at 11 amps; 12·6 V a.c. at 5·5 amps.
Dimensions	9 in. L. × 4¾ in. W. × 6¾ in. H.

Band (MHz)	C.w. power output (Watts)	P.e.p. with 26dB I.P.S (Watts)
3·5	140	144
7	140	126
14	200	54
21	170	88
28	150	42

The c.w. power output was obtained with loading figures beyond those recommended, but the results show that the specification claim is easily met.

On the two tone test, the results were disappointing on 14 and 28 MHz. An unsuccessful attempt was made to improve these figures by slight tuning adjustments whilst observing the Spectrum Analyser display.

Carrier and Unwanted Sideband Suppression

The carrier suppression, like several of the transmitters previously reviewed, varied with audio input. The audio on-off method gave 46dB; the level relative to each tone on the two tone test was 30dB.

The unwanted sideband suppression was 60dB—an excellent figure.

Audio Response

The −3dB points of the audio response were at 700 and 2530 Hz. The ripple was less than 1dB.

A.L.C.

The transmitter was set up to give full two tone output on 3·5 MHz. Increasing the audio input by 10dB produced very little distortion.

Keying

The 14 MHz transmission was monitored on a separate receiver, keying was clean, free from chirp and had a slightly " hard sounding " leading edge. The inbuilt monitor tone is very useful and the level can be adjusted by a preset control.

TVI

When the equipment was first operated, it was noticed that channel 1 interference occurred with the receiver operating on 14 MHz. This was found to be caused by radiation of second harmonic from the first local oscillator

on 22·895 MHz. At the test site Channel 1 is a very weak signal and in all probability there would be no trouble in a normal service area. However, the radiation was eliminated by fitting a 0·01 disc capacitor to each of the pins on the 11-way power plug. The only exception was the 800 volt pin which has a bypass capacitor on a tag strip in the p.a. compartment. After this modification the results were as follows:

7 MHz – clear on CHs 1, 5, 6, 11.
14 MHz – clear on CHs 1, 5, 6, 11.
21 MHz – clear on CHs 5, 6, 11. – needs l.p.f. on CH1.
28 MHz – clear on CHs 6, 11. – needs l.p.f. on CH1.
– needs l.p.f. and h.p.f. on CH5.

Provided a low pass filter is used with the SB101, there should be no real problems in a normal service area.

On the Air

The equipment has been used for some months and reports have indicated speech quality is good and reports on c.w. confirm our own results when making keying tests.

The ability to tune to a precise frequency, within a few hundred cycles, is a very useful feature. The v.f.o. tuning control is smooth and precise but like many modern equipments it does not sport a flywheel on the tuning shaft, hence the rather " dead " feel to the control. This could be an advantage for mobile working.

The VOX attack is fast and the VOX delay adjustment is sufficient for most operators. On c.w. the audio tone oscillator is keyed and this operates the VOX system giving a semi break-in system, although of course it is not possible to read through the spaces of the keying.

Metering is comprehensive giving the following facilities: p.a. grid current, p.a. cathode current, a.l.c. or S-meter, relative output power and high voltage supply. The a.l.c. metering enables one to avoid using too much microphone gain and ensures a clean signal at all times.

The preselector tuning control is arranged so that the coverage is very little more than the band in use, which avoids the possibility of tuning on a spurious frequency, and means that adjustment of the control is not sharp or critical.

The action of the crystal filter switch was a little rough on the early model which was tested, but later models have an improved slider bearing system, this roughness has been overcome. The optional c.w. filter is really worthwhile for anyone who enjoys c.w. on the h.f. bands, particularly 7 MHz.

Audio quality and balance are excellent using the SB600 loudspeaker and cabinet, and the hum level was noticeably lower than on several other equipments tested. Crystal control of the transmit or receive functions is provided for. Generally speaking the SB101 is delightfully easy to use and should give the operator much pleasure.

The Handbook

The 152 page Assembly Manual is well up to the usual excellent Heathkit standard. The main circuit is also on a separate sheet 21 in. × 23 in.—a useful feature.

THE HP23E POWER SUPPLY AND SB600 SPEAKER UNIT

The HP23E Power Supply is available to supply all the necessary voltages for the SB101. The simple but effective case is designed for functional purposes rather than appearance, but the HP23E can be mounted inside the SB600 speaker cabinet which matches the SB101. The price of the HP23E is £30 18s. as a kit or £36 8s. assembled. The HP23E transformer has only two mains input taps—110 and 230 volts. The following measurements were made with 240V input:

800V Line	860V Off load.	780V at 250 mA.
300V Line	330V On Receive	
−150V Bias Line	−120V	
12·6V a.c. heater line	12·5V	

The 800V bridge rectifier has only two 450V electrolytics in series across the output. They are well balanced with 430V across each on no load.

The loudspeaker is an 8 in. × 5 in. elliptical and produces very good quality.

Conclusions

Provided one has the construction time to spare, for £185 12s. one can have a transceiver with a lot of facilities and full coverage of the bands provided. The SB101 is one of the few transceivers to provide for the c.w. man in terms of the optional 400 Hz crystal filter. Even at £225 12s. the SB101 is still reasonably competitive but most buyers would prefer to save £40 and build the kit themselves. A great advantage of kit building is that subsequent fault finding is that much easier. The only facility that is missing is incremental receiver tuning, but a separate L.M.O., the matching SB640 is available at £51 6s. for a kit or £56 6s. assembled.

* * *

Guarantee

Daystrom Ltd., of Gloucester, honour the terms of the guarantee given by the Heath Co. Full details of the guarantee are enclosed with each kit.

" The Heath Co. warrants that the parts supplied in its kits (except batteries) shall be free from defects in materials and workmanship under normal conditions of use and service. The obligation of Heath under this warranty is limited to replacing or repairing any such parts upon verification that it is defective in this manner. This obligation is further limited to such defective parts for which Heath is notified of the defects within a period of ninety (90) days from the original date of shipment of the kits."

Full service and spares facilities are available at the Gloucester factory.

Manufacturer's Comment

Daystrom appreciate that for comparison purposes the total scale error of the l.m.o. was checked. We wish to point out, as stated in the text, that read-out error should be checked and corrected at 100 kHz intervals. Considering visual accuracy claims, it appears from the table of total errors quoted in the text that the specification would be met. In the event of this not being so a normal claim under the warranty should be made.

RSGB INTERNATIONAL RADIO ENGINEERING AND COMMUNICATIONS EXHIBITION

Royal Horticultural New Hall, Greycoat St. Westminster, SW1

On Wednesday, 2 October, at noon, the Exhibition will be formally opened by W. J. Sharpe, C.B.E. the Director of Communications, Diplomatic Wireless Services, Foreign Office (instead of the PMG who is unable to be present due to pressure of engagements), in the presence of Directors and Officials of Government Services, Presidents and Directors in the Radio Industry, and the President and Council Members of the Radio Society of Great Britain. The President of the Radio Society, J. C. Graham, G3TR will then escort Mr Sharpe round the Exhibition.

This year's innovation will be a presentation and equipment display by the Diplomatic Wireless Service, which was formed in 1947 as a Civil Service Department under the Foreign Office, with W. J. Sharpe, C.B.E., as Director of Communications, this being a rank equivalent to Under-Secretary. The Diplomatic Wireless Service will exhibit some of the modern radio communications equipment used in conjunction with the " Piccolo " Radio Telegraph System, also a new type Marconi Receiver with a stability of ·2 Hz. It will also show older equipment used in the past on hand Morse circuits and exhibits illustrating the Department's field in broadcasting. 1968 is the 21st year of its existence and for the first time visitors will be able to make enquiries regarding posts available in the United Kingdom in the Engineering and Communication sections of the Diplomatic Wireless Service.

During the four days of the Exhibition two will be devoted to Lectures on Radio Communications, viz:

Thursday, 3 October:

11 a.m. " H.F. COMMUNICATIONS " by D. E. Watt-Carter, M.I.E.E. Post Office Planning & Operations.

2.30 p.m. " S.S.B. RECEIVERS & TRANSMITTERS," by B. A. Watling, G3RNL of Marconi Ltd.

Friday, 4 October:

11 a.m. " THE MEDIUM IS THE MOTIVE—The work of the Radio and Space Research Station and its contributions to Radio Communications," by G. W. Gardiner of Radio & Space Research Station.

2.30 p.m. " S.H.F. SYSTEMS FOR COMMUNICATIONS " by D. M. Thomas, GW3RWX of the British Broadcasting Corporation.

The other two days will be for meetings of the Radio Societies of the Royal Navy, Royal Signals Royal Air Force, Short Wave League, WAMRAC and the British Amateur Radio Teleprinter Group.

Friday, 4 October, will be International Day. The President of the RSGB will receive visitors from abroad, and in the evening a reception has been arranged for overseas visitors, including a group of American amateurs League, who have chartered a plane specially for the event. Last year visitors from over 25 countries supported the Exhibition and International Day.

Visitors to the Exhibition will have an opportunity of seeing the largest ever Radio Society stand, which is over 100-ft. long, and to see the latest Radio Amateur Emergency Network Mobile Operations Caravan which has assisted the police in the Manchester area recently. They will also see the biggest display of entries of home-constructed radio equipment made in 1968, which has been entered for the 1968 Silver Plaque and other Awards and Certificates. Many new technical books and a new edition of the Radio Communications Handbook will be on view.

The live Transmitting Station will again be talking-in mobile visitors and European visitors to the show.

The Radio Amateurs Invalid and Bedfast Club will be demonstrating for the first time the Communication aid " Possum," which will help severely disabled and speechless persons to operate a transmitter or receiver thus allowing them to contact any other radio station in any part of the world. The Club already has over 300 members, 100 of whom are fully licensed in four continents.

Among new exhibits will be the S.S.B. Transceiver " Atlanta " which is designed for export, and a new linear amplifier as well as many new Receivers from America and Japan. The Royal Navy and Royal Signals will be demonstrating new equipment. and the Post Office will show their latest communications equipment with demonstrations.

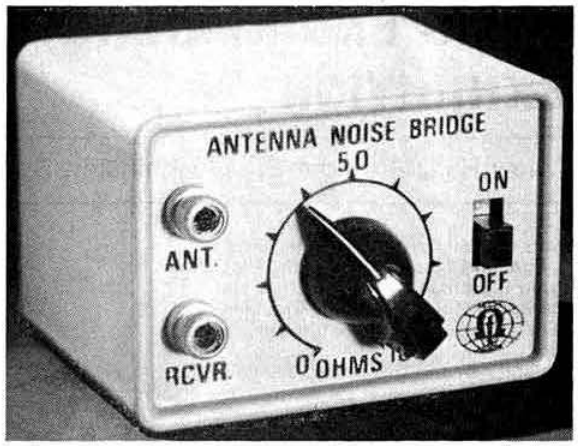
New designs of Printed Circuit Boards with complete kits of parts will be on show, and also an improved range of aerials for transmitting and television. Hi-Fi equipment will be displayed on several stands, and the latest models of Transistor Transceivers will be shown for the first time.

Included in the Exhibition will be a comprehensive display of the finest literature in Britain by many Societies, Associations and Publishers on technical, radio and electronic subjects, and last year's turnover record could be exceeded by several thousands of pounds at the close of the Exhibition.

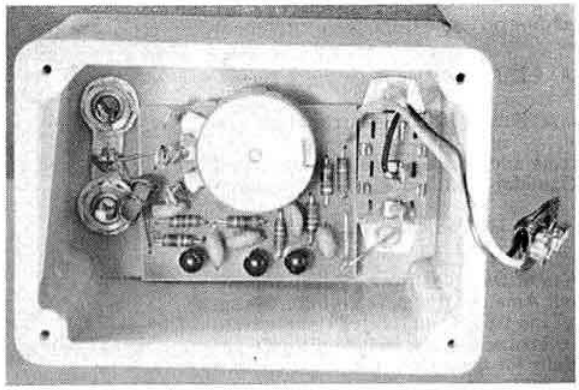
The Exhibition will be open from 10 am.. to 9 p.m. from Wednesday, 2 October, until Saturday, 5 October, at an admission price of 3s. 6d.

2 to 5 October, 1968

3/6



Front panel view of the Noise Bridge.



View of the Noise Bridge with the back cover removed.

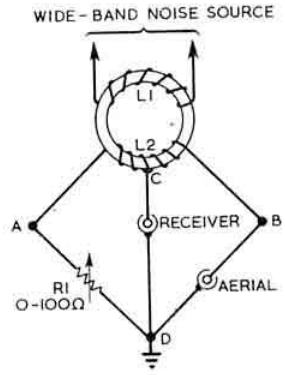


Fig. 1. The bridge configuration of the Antenna Noise Bridge. The two bifilar windings L1 and L2 are interwound on a toroid core.

EQUIPMENT REVIEW

The Omega-T Antenna Noise Bridge

BY R. F. STEVENS, G2BVN

DURING the last 15 years a number of devices have been described the basic purposes of which have been to measure (i) the resonant frequency and (ii) the resistive impedance, of an aerial. These have appeared under names such as Antennascope[1] Impedance Bridge[2] and Z-bridge[3]. Whilst the complexity and flexibility of the various pieces of equipment have varied considerably they have always been of great interest to the radio amateur as they have provided a relatively easy way of improving the aerial efficiency which, as a natural consequence, has helped with any interference problems that may have existed.

A new instrument which differs considerably from those previously used for aerial adjustment and similar tasks is the Omega-T Systems Antenna Noise Bridge, Model TE7-01. This is a self-contained (and powered) device built in a small grey plastic case with access from the rear for a 9V battery. The useful frequency range is 1-100 MHz with the variable control on the front panel calibrated in 10 ohm steps from 0 to 100 ohms. US " phono " type jacks are provided on the front panel for connection to a receiver and the aerial under test. There is also an On-Off slide switch.

Circuit

The noise bridge does not use an external source of r.f. but has an internal wideband noise source followed by a three transistor amplifier. The noise output is applied to a quadrafilar wound toroid providing two arms of a bridge circuit. A variable resistor is used in the third arm to obtain a balance against the aerial in the fourth arm as shown in Fig. 1. When the noise across the resistance arm equals the noise across the aerial the bridge is balanced. A receiver which tunes the design frequency of the aerial under test is used as the indicating device and the impedance and resonant frequency coincide with the point of minimum noise from the receiver which may be determined either aurally or, by an S meter or a.f. voltmeter. The frequency is obtained from the receiver setting and the impedance is read off the noise bridge dial.

As with other devices of the type the noise bridge should be connected directly across the terminals of the aerial under test. Where this is inconvenient and it is necessary to operate the bridge from a point where a receiver can be set up then the instrument should be connected to the aerial by coaxial cable, the length of which should be a multiple of an electrical half-wave. The adjustment of mobile and vertical aerials with accessible feed points will obviously be a simple and single handed task in contrast to the cumbersome combination of g.d.o. and impedance bridge used in the past.

Applications

In addition to the primary tasks already outlined the noise

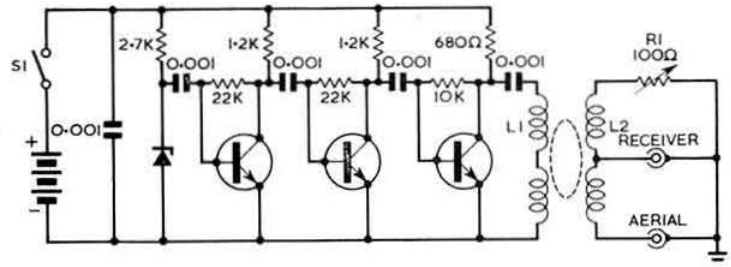


Fig. 4. Basic circuit diagram of the Noise Bridge. Suggested equivalents for the diode and transistors are 2F6.8 and 2N708 respectively.

bridge may be used to determine the electrical length of coaxial cable $\frac{1}{2}$ or $\frac{1}{4}$ wavelength long or multiple thereof. The resonant frequency and transformation ratio of a balun may also be readily ascertained and aerial matching systems can be adjusted. The standing wave ratio of an aerial at a certain frequency or frequencies can be determined by comparing the impedance figure obtained at these points with the impedance at the resonant frequency. In a different field the device is a convenient source of wideband noise for the alignment of receiver circuits and the checking of relative r.f. gain.

There will be occasions when the noise output is too great and the use of a pad or attenuator will be necessary in these cases.

Results

The noise bridge performed in accordance with expectations but some little initial practice is necessary in order to obtain best results. Co-incident adjustment of the receiver and the impedance control is desirable in order to discover the point of minimum noise. Some experiment using a resistor (not of wire wound type) of suitable value (50 or 75 ohms) connected to the aerial jack on the bridge will provide the user with an idea of the degree of noise attenuation that will be experienced at resonance. It will be noted that in the region of the resonance point rotation of the impedance control may sound noisy.

This is a versatile and simple device which will prove to be an asset to many amateur stations. It is a product of Omega-T Systems Inc., 516 W. Belt Line Road, Richardson, Texas 75080, USA, and is available in the UK from Radio Shack Ltd. of 182 Broadhurst Gardens, London, NW6, price £13.

Acknowledgement

The writer is indebted to Maurice Margolis, G3NMR, for the loan of an Antenna Noise Bridge for review purposes.

References

[1] The Antennascope, *Beam Antenna Handbook*, W. I. Orr, W6SAI.
[2] *ARRL Handbook* 1968, p. 559.
[3] *Use Your G.D.O. and Z-Meter* 73, Feb 1966, W0BMW.

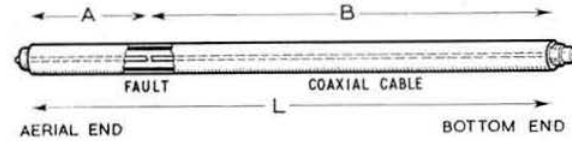
Fault Finding on Coaxial Cable

by W. BROWNING, G2AOX*

A COAXIAL feeder cable in use at G2AOX recently developed a fault. A new length of feeder was fitted but not wishing to scrap the entire faulty length a method of locating the break was used which may be of interest to members faced with a similar problem.

When the cable was removed it was found that the centre conductor was broken but that the braiding was sound. The cable was coiled loosely on the floor with the ends adjacent. Plugs and other terminations were removed. The centre conductor was tested with an ohmmeter and was moved around until the break was clearly indicated by the ohmmeter. After this the cable was not moved.

With a capacity bridge a measurement was made at each end of the cable of the capacitance between the centre conductor and the sheath. The position of the break was then determined in accordance with the following example:



capacity of length A = 350 pF
capacity of length B = 1400 pF
Total length of cable = 97 ft.

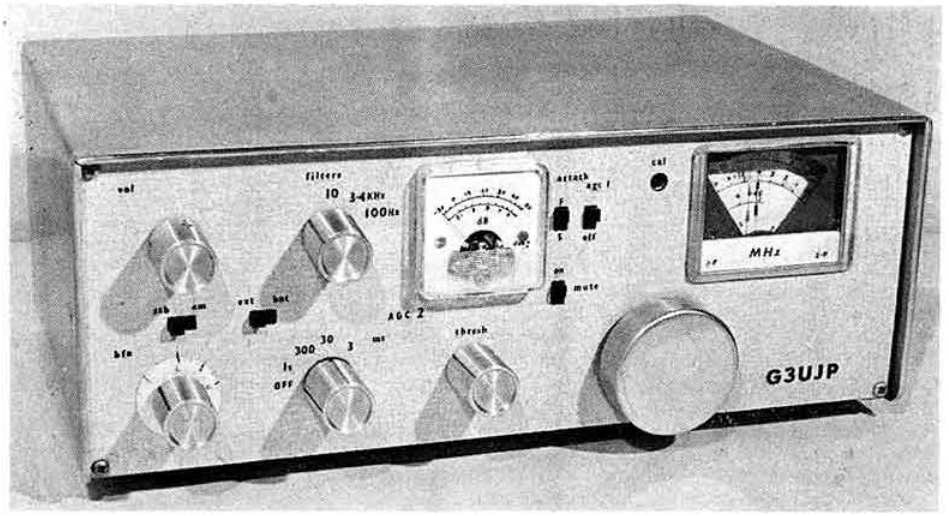
Using the formula $\frac{A}{A+B} \times L$ = Distance (in feet) of fault from aerial end of cable

$\frac{350}{1750} \times 97 = 19{\cdot}4$ ft. (distance from aerial end).

The cable should be cut some 6 in. short of this length from the aerial end. The centre conductor in each portion should be tested with the ohmmeter and it should be found that the break will be very near the end of the longer length. The exact position can then be determined by cutting back a few inches at a time until the break is located.

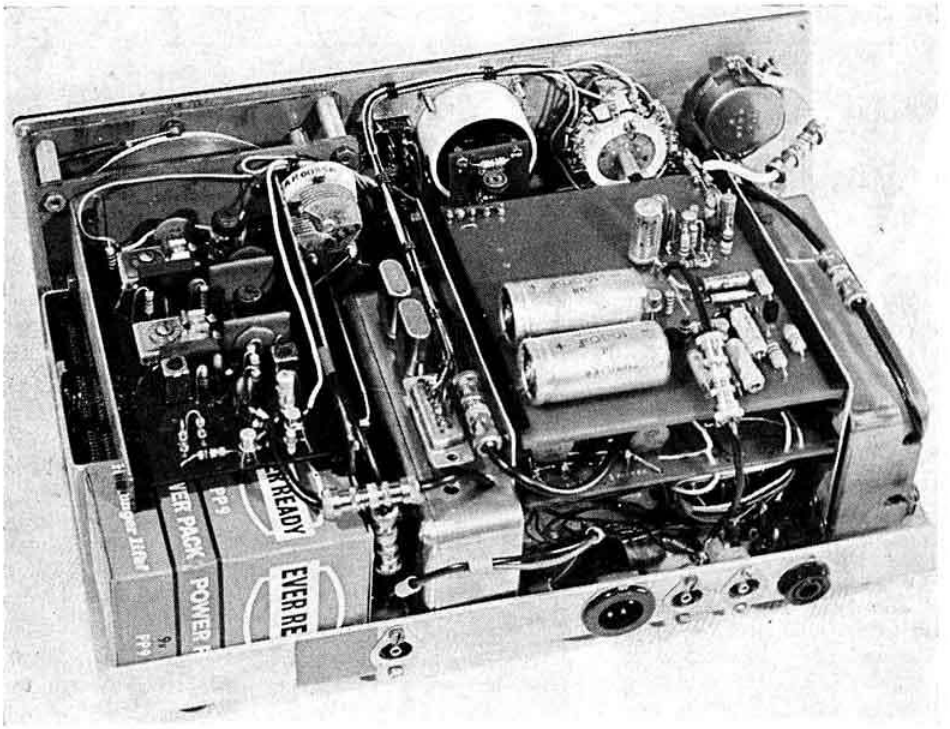
Application of this fault finding procedure will enable a good proportion of the original cable to be salvaged for future use.

* 47 Brampton Grove, Hendon, London, NW4.



Miniature High Performance Tunable I.F.

P. J. SKIRROW, B.Sc. (Electron.Eng.) G3UJP*



SECTION 1

THE original intention was to build a tunable i.f. for a general coverage receiver, using a frequency synthesizer as the first local oscillator. Although the complete front end is not yet finished, the basic receiver has been built as a separate unit tuning 1·5–2·0 MHz and has aroused considerable interest, both as a Top Band receiver and as the basis for an amateur bands receiver using a crystal controlled front end.

Fig. 1 shows the block diagram. 1·5–2·0 MHz coverage was chosen as it allows very high stability, with comparative freedom from " birdies." The front end comprises a low gain r.f. amplifier followed by a FET mixer for conversion to 455 kHz, allowing a wide range of commercial i.f. filters to be used. The i.f. strip is a major part of the unit, designed to provide exceptional a.g.c. performance and accurate S meter readings, manual r.f. and i.f. gain controls being dispensed with.

Unit construction is used throughout for ease of construction and modification and many of the units could be employed separately with existing equipment.

The I.F. Strip

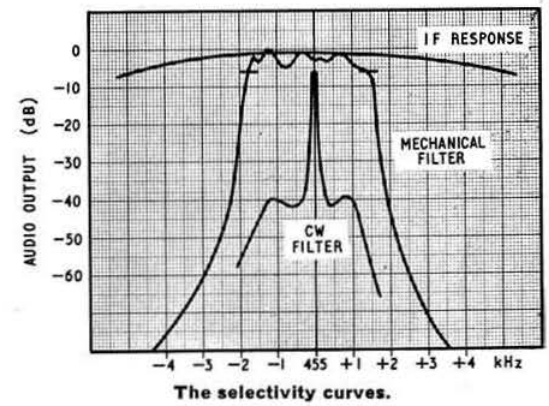
The circuit diagram of the 455 kHz i.f. amplifier is shown in Fig. 2 and it will be noticed that no filters are included, these being built into a separate unit which precedes the amplifier for minimum cross modulation. Such an arrangement has two advantages: firstly it simplifies filter switching if the filters can be treated as self contained units, and secondly, detuning of the i.f. tuned circuits by the a.g.c. action, inevitable in most transistor receivers, is of less importance when these are operated at low Q values.

Transistors TR1, TR2 and TR3 form the basic amplifier stages and a.g.c. is applied in a somewhat unconventional manner, using the diodes D2, D3, D4 as control elements. The usual method of employing a.g.c. to bias off the transistors and so reduce their gain was rejected because transistors operated in this manner are highly non-linear and introduce intermodulation on large signals. Intermodulation causes distortion of wanted signals, and moreover, it reduces the effectiveness of audio filters. Several other methods of applying a.g.c. were considered—forward a.g.c., as it is sometimes called, is limited in range and demands heavy battery consumption. FETs are ideal but wide parameter spreads and high cost are disadvantages at present. Diodes,

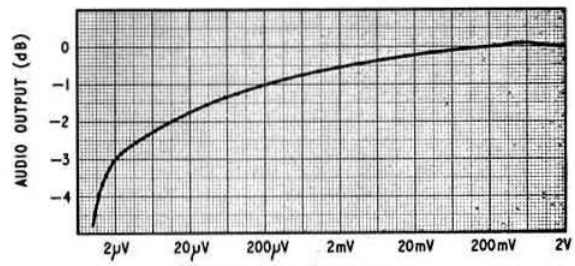
* 33 Rowditch Avenue, Derby, DE3 3LE.

SPECIFICATION

Sensitivity:	0·2μV for full output.
Input impedance:	80 ohms approx.
Sig + noise/noise ratio:	18dB for 1μV behind 80 ohms (s.s.b. 3·4 kHz bandwidth).
Selectivity:	10, 3·4, 0·1 kHz @ −6dB (see graph).
Image rejection:	60dB.
Power output:	0·5 watts 8 ohm. 1V 1k ohm.
A.g.c.:	3dB change in output for 100dB change in input. Attack time (fast) Decay time 10 ms 1S hang 0·5ms 300 ms " 30ms " 3ms For 60dB input change, approx.
Threshold:	2μV–20mV variable. 10μV at i.f.
Max input:	200mV
Pulling:	not detectable.
Drift:	less than 10 Hz for 2V drop in supply.
Battery consumption:	26mA @ 9V (zero output).



The selectivity curves.



The a.g.c. performance.

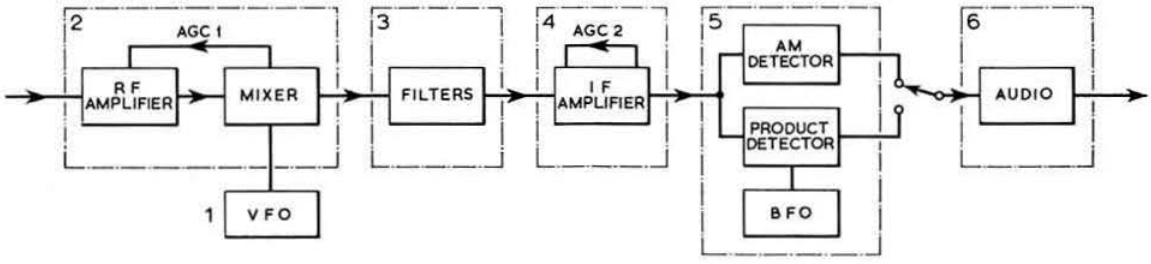


Fig. 1. The tunable i.f. block diagram.

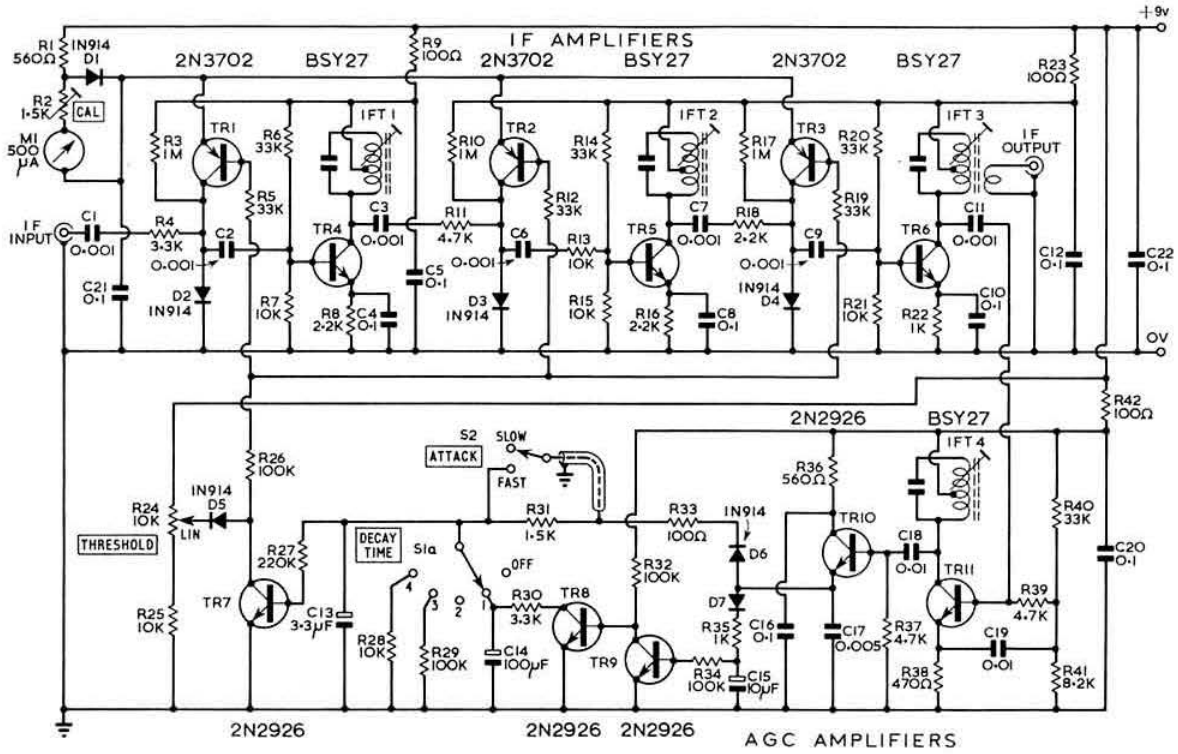


Fig. 2. The i.f. amplifier.

when forward biased behave as variable resistors with a small signal resistance given by

$$R = \frac{25}{I} \quad I \text{ in mA}$$

I ≫ reverse saturation current.

Diodes D2, D3, D4 are fed with direct current by TR1, TR2, TR3 which operate as a.g.c. controlled current sources. They also present a high impedance to signal frequencies where chokes would be impracticable. Each diode forms a potential divider to the signal, and since the d.c. bias increases on large signals (the opposite of the transistor case) the permissible current swing for low cross modulation also increases. By careful choice of gain distribution it has been arranged that no diode ever experiences a voltage swing greater than a few millivolts, and distortion is kept to a low level.

The A.G.C. Amplifier

Turning now to a.g.c. detection, part of the output from TR6 collector is further amplified by TR11 (bootstrapped to minimize loading on TR6) and is fed to TR10 which acts as a half wave rectifier, conducting only on positive half cycles. The inherent emitter follower action provides the low output impedance needed for fast-attack a.g.c. The a.g.c. voltage is developed across C17 and fed via D6 to C13 which, in conjunction with R28 and R29, provides a variable decay time. R33 controls the phase response of the a.g.c. loop to prevent overshoot whilst R31 enables fast or slow attack to be selected. TR7 completes the feedback path onto the a.g.c. line and the high knee potential of silicon transistors is utilized to provide a delay voltage.

Although no manual gain control is provided, R24 enables the a.g.c. threshold to be set to any desired value—a useful facility since the S meter reads the threshold level and is still accurate for signals above this level. As the S meter measures the combined current of TR1, TR2 and TR3 it tends to follow a cube-root law and D1 provides further compression enabling a fairly linear dB calibration to be achieved over a range of approximately 100dB.

In addition to the usual a.g.c. time constants a " hang " circuit has been incorporated which provides a one second delay with fast rise and decay. This is particularly useful on S.S.B. and C.W. signals because the gain is held very constant without the penalty of prolonged desensitization. C15 and R34 control the delay time, charged by D7 (which must be germanium). When the potential of C15 falls below the knee voltage of TR9 the a.g.c. circuit is discharged rapidly, thus on a steadily decreasing signal the effect is to sample the input approximately every second.

Construction

The prototype i.f. strip was constructed on an open printed circuit board 4 in. × 4·8 in. and provided large signal points are kept clear of the input no instability is experienced with such a layout. In later versions the a.g.c. and i.f. amplifiers have been accommodated on separate p.c. boards 4·1 in. × 2·2 in. in two small diecast boxes bolted back to back, this being recommended as it provides excellent screening. Miniature components should be used throughout

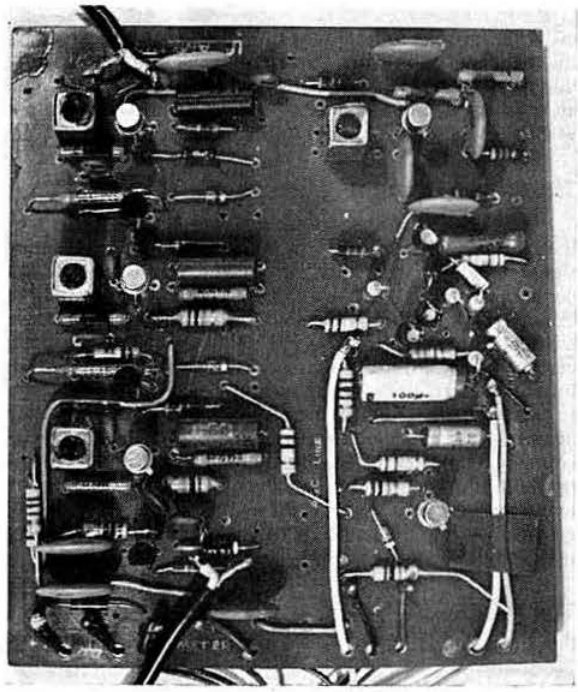
and the i.f. transformers deserve special mention as they were of the miniature Japanese type, obtainable for around one and six each.

It is not proposed to give full details of the layout for any of the circuits in this article as this would require a great deal of space. Printed circuits are recommended, unless the units are considerably scaled up in size, and a good method with these is to follow the general pattern of the circuit diagrams where possible—the photographs should act as a guide.

The author's boards were of $\frac{1}{16}$in. copper laminate etched in ammonium persulphate[1], the circuit being first laid out in strips of " Fablon " cut to the required width. Final touches were added with a brush and cellulose paint and the board was etched directly, the plastic film acting as a resist. No undercutting was experienced with this method which produces neat one-off boards very quickly.

Alignment

Very little need be said about alignment as the tuned circuits are all fairly broad and easily peaked. R2 will require adjustment and this may be carried out either by injecting a suitable signal (100 mV) into the final receiver and setting full scale, or by inserting a meter in series with R1 and setting 2mA using the threshold control. R2 is again set for full scale deflection.



The i.f. amplifier (left) and a g.c. amplifier.

SECTION 2

The Front End

In designing the front end of the receiver the main requirements were for low cross modulation, good signal-to-noise ratio and high stability. These factors will be discussed before explaining the final circuit.

Cross Modulation

Cross modulation does not occur in devices for which the output is proportional to the square of the input voltage, and field effect transistors obey this law very closely. The junction gate FET is also capable of giving very low noise figures, although usually a compromise has to be achieved between noise and cross modulation. Experiments were carried out on both single transistor and balanced types of mixer employing bipolar and field effect devices, and the FET proved to be superior by far. FETs do however suffer from blocking as the input signal (peak-peak) approaches the pinchoff voltage of the FET, since at low drain currents the square law is no longer obeyed and at high currents gate conduction damps the input tuned circuit. The onset of serious cross modulation is thus quite sudden, and owing to its dependence on pinchoff voltage it was found almost impossible to build an effective balanced mixer.

It has been claimed that the use of common gate circuits automatically reduces cross modulation by reducing the input voltage for a given power input. Observing that dynamic range is the important criterion, the author tried this configuration and found that an increased noise level more than offset the increase in maximum signal level. This is explained by the fact that much of the mixer noise is generated at i.f. and is not dependent on the way the device is fed. For common gate connection power gain is reduced and so the noise is more significant when referred back to the input of the device. Based on this reasoning a common source mixer was chosen.

Stability

A great deal of work went into the choice of a stable v.f.o., the final circuit being basically of the Clapp type. Causes of drift may be divided into three main categories, tuned circuit drift, transistor capacitance variation and transistor phase shift variation. The latter is a small effect for high frequency transistors used at 2 MHz. Tuned circuit variations are commonly due to poor coil construction, but the use of a coil tightly wound on a pyrex former and anchored at the ends reduced inductive drift to negligible proportions. Transistor collector capacitance is a function of collector voltage and so excellent stabilization is the best answer here. Variations in transistor loading with collector current, however, were found to be insignificant and so diode compensation of the bias supply was omitted[2]. Table 1 summarizes the measurements made on the final v.f.o. circuit, and it is

TABLE 1

Oscillator drift (measured on prototype)	
cause	*p.p.m. /°C*
collector c	6·2
base-emitter c	4·8
change in $I_c I$ due to 30°C rise	3 per cent
drift caused by simulating this change	20 p.p.m. i.e. 0·7 /°C
s.m. capacitors	30 typical
coil	1 to 2

rather surprising to note that the silver-mica capacitors are the main source of drift. By careful temperature compensation using an NTC trimmer, drift was reduced to 6 p.p.m./°C, an excellent figure, and although many amateurs would not wish to go to such lengths it indicates what can be achieved.

The Circuit Diagram

Fig. 3 shows the final circuit diagram and it will be seen that the r.f. stage operates in common gate for maximum signal handling capability, whilst the mixer operates in common source. Since the dynamic range of the r.f. stage exceeds that of the mixer the use of wideband a.g.c. is advantageous and is achieved by controlling the drain current of TR201 from the rectified mixer output. T201 is heavily damped so that the bandwidth over which a.g.c. acts is similar to that of the preselectors and good protection against cross modulation is obtained. The method is of course a compromise because it reduces sensitivity in the neighbourhood of very strong signals but it is still better in many respects than the use of a manual attenuator. TR204 also defines the bias current of TR201 and eliminates the usual adjust-on-test resistor.

The V.F.O.

As mentioned, the v.f.o. is basically a Clapp circuit with the addition of a cascode buffer stage TR207 which provides excellent immunity to pulling and also serves as a series regulator for the oscillator. TR208, TR209 and the zener diode provide a reference voltage for both the v.f.o. and b.f.o., feedback being used to stabilize the zener current despite supply voltage variation[3]. R218 is necessary to start the circuit by ensuring that some current flows in the zener at switch-on.

With FET mixers oscillator noise can be a serious problem and T202 has been inserted in the oscillator output as a rejector at i.f. Oscillator noise can still be injected at input or image frequencies but is less important as its effect is lessened by mixer conversion gain.

The Filter Unit

The circuit diagram of the filter unit is shown in Fig. 4. Three selectivity positions were provided on the original with a choice of a mechanical filter, a twin crystal filter, or a straight through position. Whilst this wideband position is not normally used it can be very useful for broadcast reception, rapid tuning or v.h.f. use.

A 3·4 kHz mechanical filter was chosen as it was felt to be the minimum bandwidth acceptable for good speech quality, the increase in noise over a 2 kHz filter being quite small and largely offset by improved intelligibility. For c.w. two crystals are used in cascade, slightly staggered in frequency to

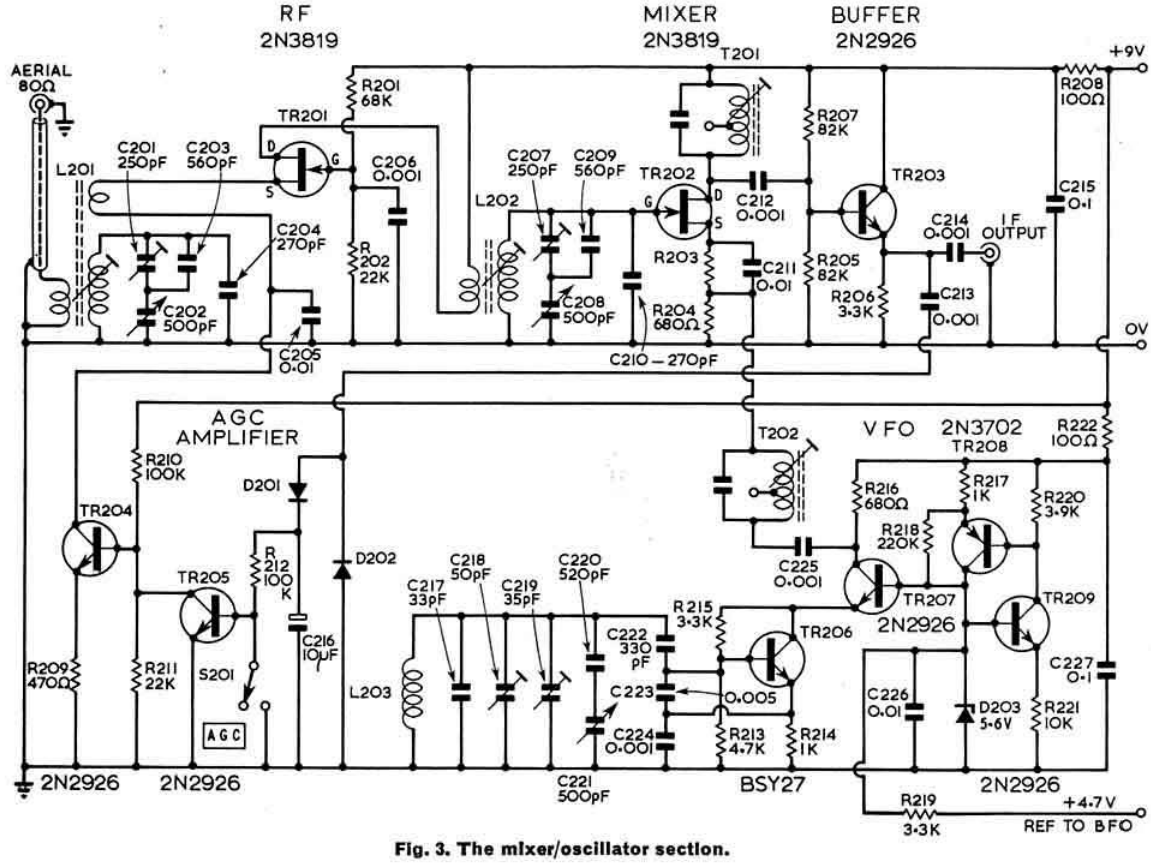


Fig. 3. The mixer/oscillator section.

produce a flat-topped response curve. The arrangement is superior to a half lattice filter for this purpose as it gives better skirt attenuation.

TR101 provides approximately 10dB of gain in order to make up the insertion loss of the mechanical filter, and has an input impedance of 10k ohms. With this arrangement the voltage gain remains close to unity for all bandwidth settings. TR101 has also been used as a phase splitter, the neutralizing capacitors C109 and C112 being connected to its emitter. D104 is a diode switch permitting the crystals to be switched in or out according to the direction of bias applied to it, and C112 neutralizes the junction capacity plus any strays while C109 neutralizes the parallel capacity of the first crystal. To avoid the complexity of a second phase splitter or transformer the second crystal is not neutralized.

Diode switching has again been used to by-pass the mechanical filter as it is convenient and reduces the amount of screening necessary as the switch passes only d.c. Three diodes are necessary to reduce leakage sufficiently; D101 and D103 behave as series switches, normally reverse biased, and D102 is normally forward biased to shunt to earth signal leakage. Reversal of the supplies enables the signal to pass unattenuated.

Constructional Notes

The r.f. and mixer stages are in no way critical, provided the coil winding details are followed and R204 is adjusted on test for around 3mA collector current. The v.f.o. of course requires exceptional mechanical rigidity and it is recommended that the circuit be mounted directly onto the side of the three-gang capacitor with a rigid metal screen

COMPONENT

I.F. Amp. (All resistors 1/8 watt 5 per cent)

R1, 36	560
R2	1·5k lin. preset.
R3 10, 17	1M
R4, 30	3·3k
R5, 6, 12, 14, 19, 20, 40	33k
R7, 13 15, 21, 25, 28	10k
R8, 16, 18	2·2k
R9, 23, 33, 42	100
R11, 37, 39	4·7 k
R22, 35	1·0 k
R24	10 k lin. pot.
R26, 29, 32, 34	100 k
R27	220 k
R31	1·5 k
R38	470
R41	8·2 k

C1, 2, 3, 6, 7, 9, 11	0·001 ceramic
C4, 5, 8, 10, 12, 16, 20, 21, 22	0·1 ,,
C13	3·3 μF elect.
C14	100 μF ,,
C15	10 μF ,,
C17	0·005 ceramic
C18, 19	0·01 ,,

TR1, 2, 3,	2N3702	
TR4, 5, 6, 11	BSY27	The cheaper ME4103 is suggested
TR7, 8, 9, 10	2N2926	as a possible substitute for all npn transistors in this article, except TR405.

D1, 2, 3, 4, 5, 6	Silicon (1N914)
D7	Germanium

IFT1, 2, 4,	min. 7 mm. IFTs (any ratio)
IFT3	,, ,, 3rd i.f. (20 k/5 k)
S1a, b	2p5w Radiospares A.G.C./On, Off
S2	1p On-Off slide switch.

Filter Unit (Prefix 1)

R101, 2, 4, 5	10 k
R3, 14	22 k
R6, 7	1 k
R8	56 k
R9	15 k
R10	2·7 k
R11, 13	330
R12	680
R15	15 k
R16	100

C101, 2, 3, 4, 7	0·001 ceramic
C5, 6, 8, 10, 11	0·1 ,,
C9, 12	30 pF ,, trim.

TR101	2N2926
D101, 2, 3, 4,	1N914, etc.

Mechanical filter, Kokusai type MF455–150 k
2 crystals 455·0 kHz HC6U

S101a, b, c, d	Radiospares, 2 wafers each 2p 6w plus extra as required.

Mixer/Oscillator (Prefix 2)

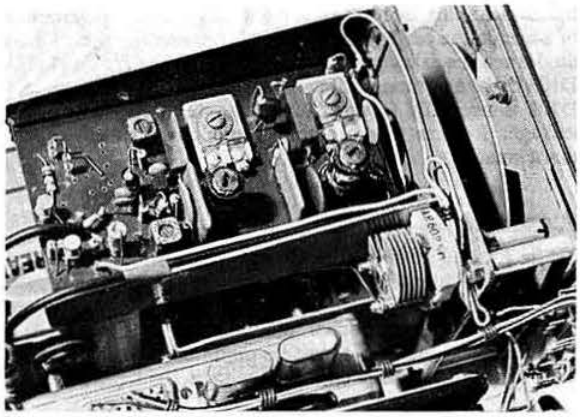
R201	68 k
R2, 11	22 k
R3	(2 k) Adj. T.
R4, 16	680 I_d = 3 mA.
R5, 7	82 k
R6, 15, 19	3·3 k
R8, 22	100
R9	470
R10, 12	100 k
R13	4·7 k
R14, 17	1 k
R18	220 k
R20	3·9 k
R21	10 k

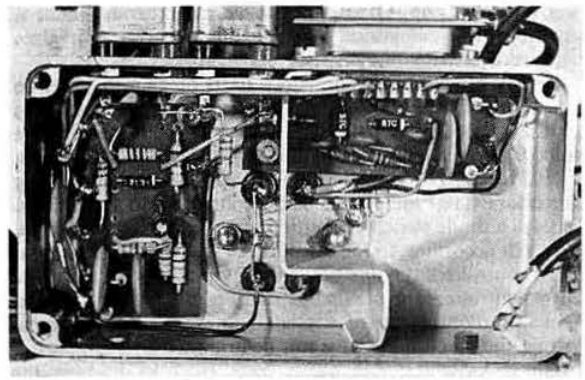
C201, 7	250 p comp. trimmer
C2, 8, 21 3 gng.	500 p J.B. miniature
C3, 9	560 p S.M.
C4, 10	270 p ,,
C5, 11, 26	0·01 ceramic
C6, 12, 13, 14, 25	0·001 ,,
C15, 27	0·1 μ ,,
C16	10 μ elect.
C17	33 p N750 ceramic
C18	50 p N750 trim.
C19	35 p air trimmer.
C20	520 p S.M.
C22	330 p ,,
C23	5000 p ,,
C24	1000 p ,,

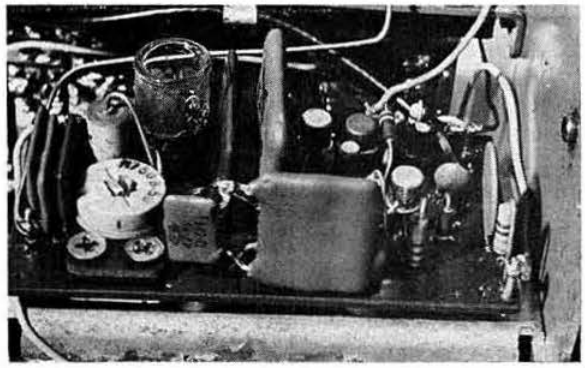
D201, 2 Germanium.
D3 Low power zener 5·6V type

.L201	$\frac{3}{8}$ in. Aladdin former slug tuned PRI 3 turns 36 s.w.g. enam.
	SEC 35 turns 36 s.w.g. ,,
	Source link 8 turns 36 s.w.g.
L202	,, ,, ,, PRI 35 turns 42 s.w.g.
	SEC 35 turns 36 s.w.g.
L203	1 in. × $\frac{3}{8}$ in. diam. Pyrex (cut from a test tube)
	40 turns 42 s.w.g. single layer.

TR201, 2	2N3819
TR3, 4, 5, 7, 9	2N2926
TR6	BSY27
TR8	2N3702
T201, 2	Min. 7mm IFT's (any ratio)







The prototype dial and front end assembly (above) the filter unit (top right) and the v.f.o. (right).

around the whole lot. The author's receiver uses a home constructed dial mechanism but the Eddystone type 898 has been used in later versions and apart from being much larger is ideal.

Finally it should be borne in mind that a stray capacitance of as little as 0·1 pF across the mechanical filter can modify its performance and screening, as indicated on the circuit, is essential. Single point earthing should also be practised as far as possible in this part of the receiver.

(To be concluded)

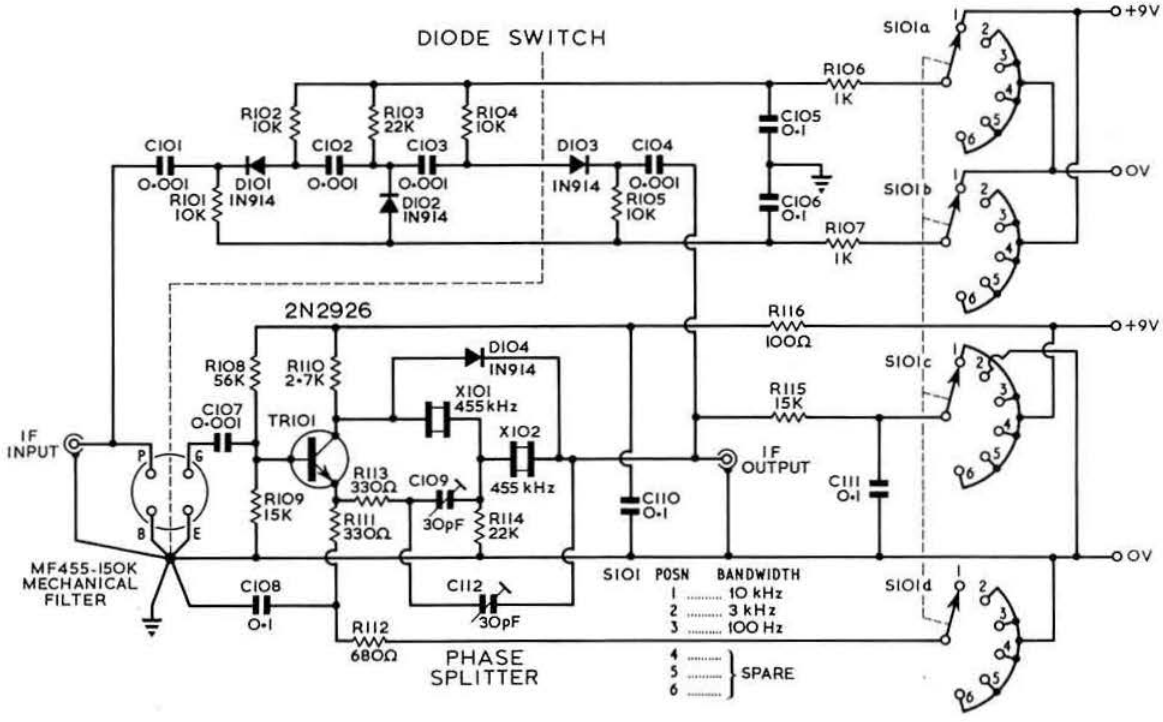


Fig. 4. The filter unit.

REGULAR FEATURE

THE MONTH ON THE AIR

By JOHN ALLAWAY, G3FKM*

A VERY warm welcome is extended to all those who may find themselves reading *MOTA* as a result of interest stimulated by a visit to the RSGB Show. The writer hopes that all new readers will become members of our Society and make a habit of sending information on their DX activities to G3FKM each month!

VK9TB, who is in charge of the Papuan QSL Bureau wishes it to be known that in future only cards for Papuan stations should be sent to PO Box 204, Port Moresby. Cards for stations in the Territory of New Guinea will be subject to delay if they are sent to this address.

There seems to be evidence of considerable ignorance concerning which parts of our amateur bands should be used when operating on either phone or c.w. Although we in the UK are fortunate in being *legally* free to use any mode anywhere our US friends are obliged by the terms of their licences to remain within certain strictly defined portions of the bands when using telephony. Some years ago it was decided that in the interests of law and order European stations would observe a voluntary division between the phone and c.w. stations. Although only a " gentleman's agreement " the European Band Plan, as it is known, gives a fair slice to each mode, and in our own interests it should be adhered to rigidly. It is supported by all IARU Societies in Europe and is as follows:

3·5-3·6 MHz c.w. only.
3·6-3·8 MHz c.w. and phone.
7·0-7·04 MHz c.w. only.
7·04-7·1 MHz c.w. and phone.
14·0-14·1 MHz c.w. only.
Around 14,090 kHz RTTY.
14·1-14·35 MHz c.w. and phone.
21·0-21·15 MHz c.w. only.
21·15-21·45 MHz c.w. and phone.
28·0-28·2 MHz c.w. only.
28·2-29·7 MHz c.w. and phone.

Top Band News

Full details of the programme of DX tests for the forthcoming winter have now been received from Stew, W1BB. They are as follows: Dates—1, 15 and 29 December, 12 January, 2 and 16 February, between 05.00 and 07.30 GMT. Frequencies will cover 1800-1820 kHz (E. coast W/VE), 1975-2000 kHz (W. coast W/VE), and 1823-1830 and 1851-1861 kHz for European stations. Call " CQ DX Test " on alternate five minute periods (W's call for 1st, 3rd, 5th etc five minutes of each hour, Europeans during the 2nd, 4th etc five minute spells). Keep to periods exactly, unless in QSO. The 15 December and 2 February mornings are " First Timer's " tests, and those in Europe who have already had a transatlantic QSO are asked to keep off except for the purposes of helping those who have yet to get a contact. 5 January and 2 March will be for the American first timers. It would be appreciated if all participants would report their results to W1BB, Stewart Perry, 36 Pleasant Street, Winthrop, Mass., 02152, USA, and also to G3FKM.

A series of Trans-Pacific tests has also been arranged for 13.30-16.00 GMT 30 November, 14 and 28 December, 11 January, and 1 and 15 February. In addition to the QRG's mentioned in the previous paragraph JA's will use 1907·5-1912·5 kHz, ZL's around 1876 kHz, and VK's 1802 kHz. The time periods will be divided up as in the transatlantic event, with the W/VE's calling first.

The expedition to Curaçao, PJ0CC, promises to be the first 160m operation from that country, and use of the frequencies 1800-1850, and 1950-2000 kHz has been authorized.

GM5AHS (Stephen Mendelsohn, PO Box 574, RAF Edzell, Nr. Brechin, Angus) whose home call is WA2DHF, is actually located at Kincardineshire, and is at present crystal controlled on 1804, 1851, and 1902 kHz. He hopes to become v.f.o. controlled soon, and promises skeds to anyone who would like to contact him. He QSL's 100 per cent.

W0VXO is now living in St Croix, US Virgin Is., and hopes to be able to make trips to other islands in the Caribbean area. He operates on 1820 kHz at 02.00 and is looking for UK stations. Skeds can be arranged by writing to the address in *QTH Corner*.

G3SIA reports that G3UUR hopes to be active from Grenada during the coming season with the call-sign VP2GBR. He will be able to use 50 watts but due to restricted space may be limited to a vertical aerial. The transmitter is crystal controlled on 1822·5 and 1981 kHz. Dave's address is: D. G. Smith, c/o Presentation College, St Georges, Grenada, West Indies. Some operation on the other bands may also take place.

News From Overseas

A letter from WB4APC, who is at present in Vietnam, reads as follows: " I noticed in a recent issue of the *Bulletin* that K8NHW/XV5 had quite a spell of activity from Saigon just prior to his departing from here. It is said that it is believed that he was not cleared for working US stations by the FCC. I believe that K8NHW/XV5 was the American Ambassador to Vietnam, and as such was the only American authorized to operate from there. I also believe that he got a temporary lift of the FCC ban on XV5 activity during the Christmas and New Year period for the purpose of passing third party traffic from servicemen during the holiday period. At the present time there is no activity by American person-

*10 Knightlow Road, Birmingham 17. Closing date for the November issue is 16 October for the December issue 13 November, and for the January issue, 4 December.

nel nor will there be any for some time." Billy says that the President of South Vietnam seems favourably inclined to amateur radio, but the biggest delaying factor is the US military command. He sends his regards to all fellow members of the Society, and promises to keep us informed of any alterations in the situation.

Dave, VU2OLK (ex-GM3OLK), passes along the information that he will be in the Maldive Islands in late October or early November. He will be at the capital, Male, and has already been issued with the call-sign 8QALK by the Director of Broadcasting and Communications. (It seems that once again a mistake has been made over the allocation of a call-sign—the correct call would appear to be 8Q followed by a numeral and then the LK.) Dave points out that the Maldive Islands group consists of over 1000 islands spread out over a few thousand miles, and that Male is approximately 700 miles to the North of Gan—the QTH of VS9MB. Application for separate country status has been made to ARRL and the outcome is awaited with interest. There appear to be two resident Maldivian call-signs—8QAYL (formerly 4S7YL), and 8QAWA (formerly 4S7WA) both of whom are in Male, and came from Ceylon. They are active on 20 and 40m a.m. at the moment, but hope to be on s.s.b. soon. If country status is granted VU2OLK will be accompanied by VU2VZ, and possibly VU2TS, and they will try to make a one month DXpedition out of the journey.

DXCC

Official Bulletin No. 183 from ARRL says that two new countries have been added to the ARRL Countries List. These are Blenheim Reef and Geyser Reef. Confirmations for contacts after 4 May, 1967 will now be accepted for DXCC credit. The VQ8CBN operation from Nelson's Island may be claimed as credit towards the Chagos Is. listing.

It would appear that credit for contacts with the recent station on Christmas Is.—VR3DY—is still being withheld. The original licence was sent to Fanning Is. and is still there, communications are very poor and KH6GLU is trying to obtain a copy from the licensing authority. Credit is now being given for contacts with the recent activity in the Caribbean area by KP4DBU.

A further Official Bulletin (No. 185) from ARRL confirms the fact that the new Five Band DXCC Award will require confirmations from at least 100 countries on each of five separate bands, only QSO's after 31 December 1968 being eligible. More details will be available soon, This should prove to be quite a challenge to DX enthusiasts.

Dxpeditions

A group of US amateurs (W9AQW, W9VNE, W9ZRX, W9ZDT, K9RHN/5, K9KIC/7), together with PJ2MI, will be operating during the phone section of 1968 CQ WW DX Contest (26/27 October) from **Sint Maartin Is** using the call PJ5MN. They will have four separate 1 kW transmitters and a good assortment of aerials including three element Yagis for 10, 15, and 20m, and a triband quad. This expedition will be sponsored by DOTM and all QSL's should go via W2GHK.

SV0WN is hoping to pay a visit to **Rhodes** during October. This should have taken place earlier in the year but had to be postponed.

DL5NJ is due to be on the air from **Andorra**, starting 23 October, using his PX1BW call-sign. He intends to use the frequencies formerly used by the W9WNV expedition.

The 1967 SAC Contest Committee, Aila, OH2BIN, smiles after a job well done. In the foreground are the SAC 1967 logs with OH2AM's at the top, while in the background is OH2A, the Headquarters station of SRAL.

VE3EUU will be leading an expedition to **St Martin** (FS7) for the duration of the *CQ* phone contest—26/27 October. They will be working all bands on s.s.b. and will be using the FG7TI/FS7 call-sign. Some activity on 14095 kHz teletype will also take place.

WB4APC has been told that in order to obtain operating permission from the authorities in Portuguese Timor (CR8) it is necessary to be resident there for one year, and the same appears to apply to Malaysia, Hong Kong, and Singapore. Thailand and Taiwan will not issue a licence to non-nationals. A Sarawak licence has been obtained and work on licences for Lord Howe Is and Norfolk Is is proceeding.

Expeditions, etc.

The 11th Jamboree on the Air will be taking place on 19/20 October and GB3HH will once again be active from Gravesend and District Scout Association's ground. There will be c.w. and s.s.b. activity for the whole 48 hours on 80m and the h.f. bands and QSL's should be sent via T. Biddlecombe, G3WAO, 39 Portland Avenue, Gravesend, Kent.

G2DHV/M was at the Knokke Convention in September and was licensed as ON8IR. George also acquired PA9DHV and F0KI call-signs to add to his European list.

Another special call-sign which will be heard on all bands 1·8 to 28 MHz (mainly s.s.b.) during the Scout Jamboree weekend will be GB2SS, organized by the Saltash and District Amateur Radio Club from the Saltash Scouts HQ. QSL's should be sent via G3XCS, 5 Frith Road, Saltash, Cornwall.

Contests

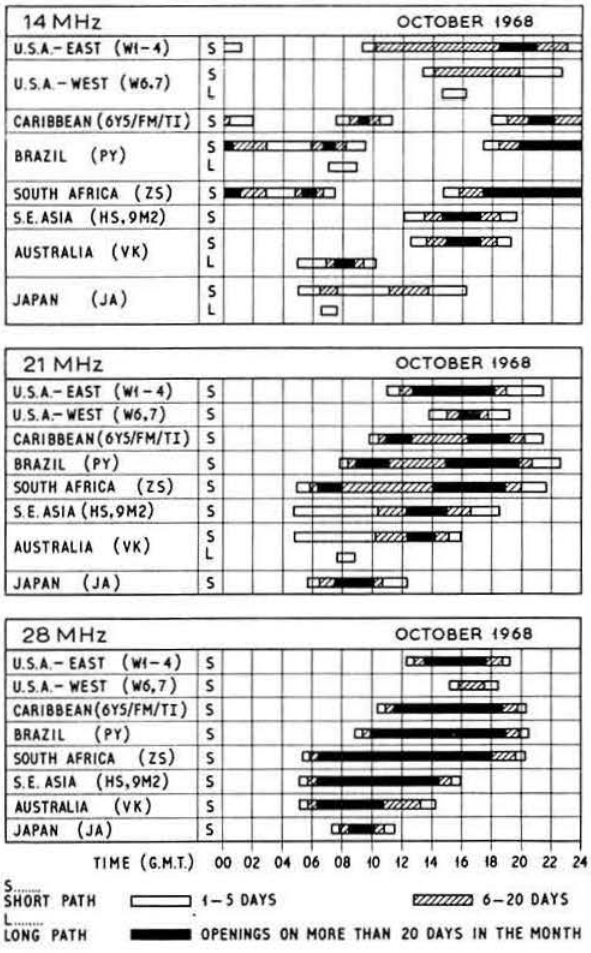
The Phone section of the **CQ World Wide DX Contest** will be held between 00.00 26 October and 24.00 27 October. This contest covers all bands 1·8 to 28 MHz, and entries may be single or multi-band. Multi-operator entries may enter the single or multi-transmitter categories, but must be multi-band. Contest exchanges consist of report plus zone number (the whole of the UK is in CQ zone 14), QSO points are as

follows: for contacts with other stations on the same continent (outside one's own country) 1 point, with stations in other continents 3 points. Contacts with stations in the same country are permitted for zone/country multiplier credit, but do not count for QSO points. The multiplier consists of the total number of zones plus the total number of countries worked on each band. The final score is established in the following way: (*a*) Single band, zones plus countries multiplied by QSO points; (*b*) All band, sum of zones plus sum of countries multiplied by total QSO points. It should be emphasised that multi-transmitter stations may only transmit one signal per band. A separate log sheet should be used for each band, 40 contacts to the page, indicating zones and countries the first time they are worked. The official summary sheet should be completed and sent with all entries. These may be obtained from your scribe in exchange for a large s.a.e., and some log sheets are also available. It is not essential to use official log sheets, home made ones being adequate provided that they resemble the official ones with 40 QSO's per page. There are a number of trophies awarded to winners of this contest; in it one may work new countries, new prefixes, new band countries, or just have fun, and in your scribe's opinion it is one of the more interesting offerings of the contest year. These rules and remarks apply equally to the c.w. section, which takes place between 00.00 23 November and 24.00 24 November.

A reminder that the **VK/ZL/Oceania** contest takes place on 5/6 October (Phone), and 12/13 October (c.w.). Full details were given on page 458 of July *MOTA*.

Apologies to those who looked for PY's in the LABRE contest advertised for the weekend of 10/11 August. The date of this event was suddenly brought forward by one week!

Two "QSO Parties" are being held on the weekend of 5/7 October. The **Massachusetts** party starts at 23.00 on the 5th and finishes at 05.00 on the 7th. Stations may be worked on each band and mode, and each QSO counts two points. Each of the 14 counties counts as a multiplier. Likely frequencies for Mass. stations are given as 3560, 7060, 14060, 14290, 21060, 21110, 21410 and 28060 kHz. Logs should be



PROPAGATION PREDICTIONS

The daytime F2 m.u.f's will reach the year's highest values in the northern hemisphere during October and November. With the present intense sunspot activity they will be high enough for all regions to be worked on **28 MHz.** North America and Japan should come through reliably on this band, especially during the latter half of this month, and on favourable days (i.e., those with above average F2 m.u.f's) also Western North America. Short skip conditions for contacts from 500 to 1100 miles will only occur under exceptional conditions this month, and in the coming winter months. This also applies to **21 MHz**, where all continents should be workable on this band. There will be reliable contacts with Western North America on this band. **14 MHz** offers good DX possibilities in the evenings, and during the day it will be suitable for European traffic as well as DX. On **7** and **3.5 MHz** the path lengths will increase somewhat during the day. The dead zone will not affect **7 MHz** during daytime. With the approach of the winter season the DX conditions on **7 MHz** will further improve when the greater part of the transmission path lies in darkness; the best period on this band will be after midnight. Interruption of local traffic on **3.5 MHz** by the dead zone will take place only rarely in the latter half of the night.

The provisional sunspot number for August 1968 provided by the Swiss Federal Observatory was 110·9. Activity was highest between 11 and 24 August. The predicted smoothed monthly sunspot figures for December, January and February 1969 are 100, 98 and 95 respectively.

posted no later than 4 November to: MIT Radio Society W1MX, Box 558, 3 Ames Street, Cambridge Mass., USA 02139. The other is the **California QSO Party** starting at 20.00 5 October and finishing at 02.00 on the 7th. QSO's count 1 point, and the 58 Calif. counties are the multipliers. Frequencies for this one are given as 3550, 7075, 14075, 14270, 21075, 21125, 21370, 28075 and 28700 kHz. Entries should be postmarked no later than 8 November and sent to: John Minke, WA6JDT, 6230 Rio Bonite Drive, Carmichael, Calif., USA 95608.

Results of the **1967 SAC Contest** have just been received from SRAL. About 1500 stations took part, 958 sent in logs (682 on c.w. and 276 on phone). Top c.w. non-Scandinavian entrant was YU3EY with 7982 points, on phone YU3LB with 6486 points. UK scores were as follows: (C.W.) **G3IAR (5075),** G3LHJ (4972), G3ESF (3660), G3PSY (3654), G3JFY (1940), G3HLW (1694), G2GM (864), G3WP (180). (Phone) **G3IAR (3960),** G3ESF (2682), G3HLW (2058), G3OHC (1365), G3JFY (704) and G3WFB (240). **GM5AHS** was the only GM entrant in both sections with 693 points in the c.w. and 64 in the phone. The two Welsh entrants were both in the phone category—**GW3OCD** (2718) and GW3SFC (1012).

Vlad, UA1CK, had many contacts during his visit to Mongolia in 1967. We have just received this picture of him operating UA1CK/JT.

DX News

Those who contacted LG5LG will be interested to know that this station was situated at Morokuilen, on the Norwegian/Swedish border. G3WET reports receiving the information from Norwegian sources that the site of the operation was a small field regarded as " free territory " between LA and SM. He says that amateurs of any nationality are permitted to use the site and that part of the equipment is in Norway and part in Sweden! Further information is awaited with interest.

W4UDF was expecting to arrive in **East Pakistan** on 14 August and hoped to obtain operating permission.

It is reported that in future stations operating from Auckland or Campbell Island will use a /A suffix, and from Chatham and Kermadec Islands /C and /K suffixes respectively.

There appears to be further activity from **Kure Is.** KH6EDY has been reported on 14 MHz s.s.b. and hopes to be on 7 and 21 MHz later. The new operator is called Con, and he says that he will be there for 4 months.

Those needing a contact with **Brunei** will be interested to know that VS5MH's equipment is now being used by VS5TJ, who has been reported on 14 MHz s.s.b. A quad is in the process of construction and should produce a much better signal than the vertical currently being used.

4J0AH was scheduled to appear on the air during the WAE (telephony) contest, and was UA3AH from the Valdaj Mountain area of E. Siberia. QSL's should be sent via Box 88, Moscow.

It is believed that the prefix block A2A to A2Z has been allocated to Botswana (formerly Bechuanaland, ZS9).

W4UDF/AP2 was located in Chittagong, **E. Pakistan** and asking for QSL's to be sent via WA9KMD, Kenneth Fox, 3337 W. Southland Drive, Franklin, Wisc., USA.

GM3VRR has now arrived in the New Hebrides and has been given the call-sign YJ8JM. His personal effects are still on their way out and he hopes that he will receive them in time to become active on 10, 15, and 20m c.w. before the end of the year. The G5RV aerial is already in place, and medium wave stations in uhe USA have been heard at S8! No European amateur signals have been heard yet.

Band Reports

An increase in the number of letters received by your scribe has heralded the beginning of autumn conditions and a consequent upsurge in interest. A very welcome feature has been the increase in the number of reports of c.w. stations. A great deal is heard about the difficulty of working DX without high power or s.s.b., but G3FKM recently witnessed a QSO between a G station and VP8JH on 14 MHz c.w.—the input at the UK end was not more than 9 watts and a solid contact was obtained, which could hardly have been possible using telephony.

80m has started to produce DX signals in the early mornings from the USA and New Zealand, 40m appears to have produced a peak of interest between 21.00 and 24.00, and again in the early mornings. As usual 20m has continued to carry the bulk of the strong DX signals, although there are now nights when the band is closed for several hours during the small hours. 15m has been carrying Pacific signals some mornings and has possibly been the most interesting band, and 10m has at last begun to open a little more often with the odd burst of signals from the USA although N/S propagation has still been more common.

Many thanks to the following for sending in logs: GM2HCZ, G2HKU, GW3AX, G3GVV, G3HCT, G3HDA, G3NKQ, G3NMH, G3OLY, G3PQF, G3PVD, G3TBK, G3URX, G3USA, G3VJG, G3WBN, G3WTJ, G3XBY, G3XKV, GM5AHS, G8JM, G8VG, BRS6604, BRS30094, A5135, A5390, A5489, A5662, A5812, A5943, A5950, A6015, A6081, and an anonymous reporter in Filey! All calls listed in italics are c.w., the rest s.s.b. unless otherwise stated.

80m. CN8AW (23.30), W1FZJ/KP4 (00.07), OA8V (06.00), VQ8CC (04.00), ZL2BCG (06.15), ZS3T (23.30).

40m. CN8AW (22.00), CP1XN (23.00), CR6HW (21.00), EA6BG (21.15), *EA9EO* (01.55), FY7YK (22.15), OX3DX (21.30), *PZ1CF* (22.10), TA2BK (21.35), TF3EA (24.00), *VK2VN* (06.17), VP2GAO (22.00), VP2KF (22.15), VP8JB

(21.15), VP8JG (Antarctica), VP8's HZ, IA, JC (21.15), ZP3AB (23.13), ZS3T (21.15), 3A2MJC (23.00), 5N2AAJ/AAX (21.30), 6W8AL (21.25), 9G1AW (21.00), 9J2BC (21.30), 9M2DQ/DW/PO (21.30), 9Q5EP (21.30), 9Y4KR (22.30).

20m. AP2KS, (17.40), *AP5HQ* (16.39), CE0AE (18.16), CR9AK (18.40), *EA6BD* (08.35), ET3RN (PO Box 145, Addis Abbaba, 17.17), *FG7TG* (21.33), FK8AZ (07.40), *FY7YK* (00.37), *KC4USM* (S. Pole. QSL via K1TWK. 20.00), KC4USV (09.17), KH6BQ (08.30), KJ6BZ (07.50), *K1EUF/KS6* (07.05), KX6TD (11.19), MP4BHA (18.06), *OX3UD* (13.37. QSL via W2CTN), TA1IB (European Turkey. 11.00), *TA2SC* (17.51), *UA0YT* (Zone 23, 16.32), *VK8HA* (15.30), VK9DJ (Papua, 07.37), VK0IA (Macquerie Is 07.01), VP5CB (Caicos Is 07.41), *VP8HO* (S. Georgia. 19.05), VP8JH (S. Orkneys. 18.36), *VP8JX* (Halley Bay, 18.47), *VP8KF* (22.07), YA5RK (17.28), YN2JS (07.00), ZS9Q (19.15), *3V0AA* (08.12), 4U0TIC (10.34), *4S7DA* (18.05), *7P8AB* (18.18), 7Z3AB (19.55), 8R1E (08.45), *9A1CC* (08.06), 9V1OS (15.30-19.45). Good L.P. openings to VK between 03.30 and 09.00, but ZL signals apparently arriving best over Asia at those times.

15m. *CE3FI* (22.25), CE0AG (15.15), *CM1AR* (23.00), CR9AK (16.00), *CT3AS* (15.00), DU1RZ (14.30), *FG7XC* (21.28), *HL9KQ* (13.30), HM3DR (16.01), *HS1EL* (16.10), *KL7GGU* (18.15), *KR8AE* (07.12), KS6CG (08.55), *KX6FN* (08.30), GJ (11.47), MP4MBB (15.36), MP4TCF (12.15), *TA0A* (10.50), *TN8BG* (18.05), TU2AZ (12.50), VK9CR (New Britain. 13.07), VK9GN, LR, WD (11.00-14.00), VP2GLE (20.13), VP8's JC, JP (15.30), *VP8JH* (15.15), *VP8JX* (17.30), *VQ8CC* (10.34), *VQ9B* (07.15), VR1L (10.02), *VS6AA* (13.48), VS9MB (18.08), XW8AL (15.10), *JA1EZM/YB5* (14.45), YB0AB (18.26), *YN4SA* (16.40), ZD3D (18.20), ZD9's BE, BL (18.00), 4S7PB (16.53), 5W1AS (07.21), 6O1GB (18.45), 7Q7AM (17.30), 9K2CB (17.47), *9V1PB* (16.00).

10m. CP1HW (18.15), CR7BL (11.30), *CT3AS* (19.23), *ET3USA* (10.32), FG7XT (15.34), KZ5DO (17.35), *LU8EY* (18.04), *MP4BGX* (14.57), OA4ED (17.55), OD5EP (16.37), TA1II (12.00), *TJ1AJ* (16.14), VK6NM (10.48), VP8JC (17.38), PV8JT (16.31), *VQ9B* (18.07), *VS9MB* (10.00), VU2DKZ (09.30), W's 1-0 except 6 and 7 (20.00), ZD7DI (12.00), ZD8DG (17.00), ZD9BE (18.30), *ZE1BA* (17.37), ZP9AC (a.m. 18.16), ZS's (08.00-19.00), 5H3JJ (10.28), 5J4RCA (19.10), 5N2AAF (18.48), 5X5JK (a.m. 15.30), 5Z4AA (18.07), *6W8XX* (18.52), *9J2's BC, XZ* (17.44), 9V1OS (09.21, 14.00).

Very many thanks to all correspondents and particularly to the following for permission to reproduce the contents of their publications: The *Ex-G Radio Club Bulletin* (W3HQO), the *DX'ers Magazine* (W4BPD), the *Florida DX Report* (W4BRB), *CQ DX* (ARI), the *HKARTS Newsletter*, *DX'press* (PA0FX), *NARS News* (5N2AAF), the *L.I.DX.A. Bulletin* (W2GKZ), *Long Skip* (VE3DLC), *QUAX* (SM4DXL), *QTC Newsletter* (5Z4KL), the *DX'er* (K6CQF), *DX News Sheet* (Geoff Watts), *MARS Newsletter* (VQ8CC), *QUA* (Radio Society of Rhodesia), and the *WA Bulletin* (VK6BE).

Please send all contributions to reach G3FKM no later than **16 October** for the **November** issue, **13 November** for **December**, and **4 December** for **January** issue.

QTH CORNER

CN8HD via W2GHK (see PJ5MN).
EA6AR 11/9 to 22/9 via DL7FT, Franz Turek, Petumienweg 99, 1 Berlin 47, Germany.
GC5AET via DJ1QP, Gerd Schnautz, Falkstr. 1, 59 Siegen, Germany.
HB0AAI via HB9AAI, Rene Stegrist, Wuerzenbachhalde 2, 6000 Luzern, Lu., Switzerland.
HB0AIC via HB9AIC, Bruno Heger, Wesemlinstr. 8, 6000 Luzern, Lu., Switzerland.
HS1EL PO Box 1930, Bangkok, Thailand.
KX6FN/KC6 via W2GHK (see PJ5MN).
KC6BY Now K1ONZ, Robert Worsley, 11 Lake Ridge Drive, Marlborough, Conn., USA.
K1EUF/KS6 via K2LTI, Michael Rukin, 31 Sleigh Rd., Chelmsford, Mass. USA.
W0VXO/KV4 Herb Schoenbohm, Box 310, Christiansted, St. Croix, US Virgin Is.
MP4TWU via DJ5WU, Bernd Jacobi, Kindlasserweg 9, 8454 Schnaittenbach, Germany.
PJ5MN via W2GHK, Box 7388, Newark, NJ, USA 07107.
PJ0CC via W2ADE, John A. Doremus, Pocono Rd., Mountain Lakes, NJ, USA 07046.
PY0APS Box 2177, Recife, Brazil.
PY0ARM Box 1998, Recife, Brazil.
TA2EA via SM7DQC, Osten Magnusson, Box 51, Taberg, Sweden.
TN8BG PO Box 712, Brazzaville, Congo Republic.
VK0JW via VK3UQ, N.G.R. Foxcroft, 181 Victoria Rd, Northcote, Victoria, Australia.
VP5AA (21 to 29/9) via W1WQC, R. Hamilton Robinson, PO Box 368, Coventry, Conn, USA.
VQ8CG via G3APA, E. G. Kendall, 48 Westhill Rd, Coventry, Warwicks. CV6 2AA.
VS5TJ PO Box 308, Brunei, Brunei.
VS6DO Paul R. Bailey, c/o Police HQ, Arsenal St., Hong Kong.
YA2HWI via W9FLJ, George Hammond, 627 E. Main St., Barrington, Ill., USA.
YJ8JM J. Macintyre, Dpt. of Radio Telecoms., Santo (Luganville), New Hebrides.
ZB2AY R. B. Crofts, 2 Old Naval Hospital, Gibraltar.
4S7PB via K6CAZ, Joseph Butler, 516 Reina Del Mar, Pacifica, Calif., USA. 94044.
5R8AF via K7HCD, V. Clayton Brown Jr., 3930 S.W. Lake Grove St., Lake Oswego, Oregon. USA.

RSGB QSL Bureau: G2MI, Bromley, Kent.

1968 COUNTRIES TABLE

	160m	80m	40m	20m	15m	10m	Total
G3IAR	4	35	31	118	95	42	325
G3VPS	13	23	18	48	12	—	114
G3XBY	4	28	39	64	82	53	270
G3XDV	15	10	17	38	1	18	99
G8VG	5	15	26	45	58	52	201
G3ING	9	11	12	5	11	7	55
G3PQF	10	7	32	58	5	25	137
SM2BYD	—	14	6	49	16	—	85
G3TBK	3	6	26	39	31	23	128
G3OLY	—	3	8	136	93	53	293
G3VJG	—	2	10	17	19	43	91
G8JM	—	—	7	193	112	65	377
9J2BC	—	—	17	106	54	64	241
A5610	10	71	17	35	25	31	191
A4886	14	56	50	187	103	89	489
A5943	10	42	30	53	65	33	233
BRS25429	3	55	54	171	125	93	490
A3942	14	38	36	58	60	50	256
BRS30094	10	33	29	157	150	111	490
A5662	13	30	41	136	124	102	446
BRS28198	2	32	46	66	32	92	270
A5126	2	31	31	81	53	44	242
A5459	8	25	34	84	37	22	210
BRS27806	4	27	17	168	136	78	473
A5154	3	25	21	140	121	70	380
A5950	7	23	20	66	73	68	257
A5457	3	24	3	19	18	6	73
A5390	4	22	35	158	162	87	468
A5466	5	21	23	106	38	28	216
A5135	5	20	35	113	74	50	297
A6015	6	16	30	65	53	43	213
A5489	—	10	6	110	95	51	272
A6081	—	9	12	47	44	—	112
A5805	—	—	42	—	—	—	42

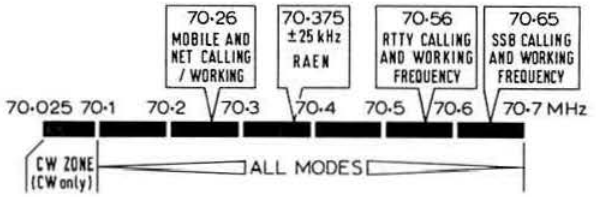
(This month's table is in order of 160 plus 80m totals)

FOUR METRES AND DOWN

By JACK HUM, G5UM*

The Plan for " Four "

SINCE V.H.F. Manager Geoff Stone, G3FZL, announced at the Whitton Convention almost six months ago that 4m would be extended down to 70·025 MHz, there has been no comment on this page about it for the very good reason that it would not become mandatory until an announcement had appeared in the *London Gazette*. One did allow oneself the remark at the time that at last an opportunity had arrived to plan "Four" in a simple and easy-to-remember manner.



The bandplan for " Four " is shown in the accompanying diagram. The newly received 75 kHz at the bottom end will be reserved for c.w., in line with practice on the h.f. bands, with phone in the rest, taking careful note of the following:

National Mobile and Net Calling/Working Frequency: 70·26 MHz. As its title suggests this frequency can be used for both fixed and mobile contacts, but mobiles should always take preference as it is normally easier for a fixed station to change channel. The other point to remember is: if you are operating on 70·26 MHz, only listen and work stations on this channel, i.e., no cross-channel working.

RAEN: 70·375 MHz, plus or minus 25 kHz (see footnote to the Amateur Sound Licence).

RTTY: 70·56 MHz.

Single Sideband: 70·65 MHz. The Society's V.H.F Committee looked at the possibility of suggesting 70·41 MHz as the s.s.b. calling and working channel, remembering that 145·41 is the sideband channel for " Two " but there was a big snag: it would have been much too close to the RAEN allocation. By having a spot frequency, sideband operators will at last be spared the chore of searching the whole of the 675 kHz of " Four " to find other s.s.b. men to work.

* * *

With 4m planned on a modes basis rather than geographically, it is anticipated that co-channel operation will increase rapidly. Many users of the band expect to see v.f.o. techniques developing to the extent that it will always be profitable to check one's own frequency first after calling CQ. To indicate that this is being done it will suffice to say " Checking my own frequency before tuning " if on phone, or " QMF " if operating on the key. Sending " QLF " no longer means " Send with the left foot now OM " as it did in the early days of the art: it tells listeners that the operator intends to tune only the low frequency end of the band for c.w., a widely accepted abbreviation on " Two " which will now doubtless be adopted on " Four."

In less than two months' time the new c.w. end of " Four " will be well exercised: the annual telegraphy contest takes place on 1 December (officially, the Fourth 70 MHz (C.W.) Contest). Will you have that new v.f.o. or v.x.o. ready in time?

* * *

From discussing co-channel working on " Four," which is not planned geographically, over now to " Two," which is. . . .

" Co-channel or " Split " on " Two "

When operating on 2m check your own frequency after a CQ: someone may be calling you on it. And if you have a v.f.o., call the other man on *his* channel, reverting to your own zone spot during or after the QSO.

These procedures, advocated by operators who wish to see the " modern techniques " of the h.f. bands adopted on v.h.f., were discussed here a couple of months ago, and in the nature of things are already in widespread use by those equipped for sideband. But they do not by any means find universal favour.

For example, it is argued that under normal propagation conditions operators will tune only a small part of the 2m band—their local zone, where contacts are most likely to mature—and will so quickly identify calling stations that co-channel working by v.f.o. is of no advantage: in fact, adds needless complexity to the station equipment.

Another point which is put by G3TZN of Bristol stems from the practical experience of trying to keep a nightly schedule with his son, G3PHZ, near London, operating co-channel: " It is quite possible to work a station in the London area from Bristol when that station is in its own frequency zone' but if that station comes on *your* frequency he is then competing with all your locals and his weak signal doesn't stand a chance. If I had QSY'd to the G3PHZ frequency what chance would my signals have had competing with his locals? When we both kept to our own bandplan there were very few occasions when QRM made the contact difficult: fading was usually the reason."

* * *

From Cambridge, Brian Armstrong, G3EDD, writes: " If single frequency working catches on, the v.h.f. bands will become like the h.f. bands, where weak signals cannot be worked, without a large element of luck, when the band is open. Most of the protagonists are the s.s.b. gang, who are usually

* Houghton-on-the-Hill, Leicester LE7 9JJ. Send reports for the November issue by 14 October, and for the December issue by 11 November

tied to transceivers and therefore wish to change the method of working to compensate for the limitations of their equipment. This is wrong. Long live the bandplan and split frequency working! "

Putting on his professional's cap, G3EDD goes on to say that two-frequency working is recognised in the business radio world as the optimum system for best use of the frequency spectrum. On v.h.f., unlike the h.f. bands, the nearer one is to a station the stronger the signal; therefore if locals are distributed throughout the 2 MHz of the 2m band it is very difficult to work weak signal stations farther afield.

The professional arguments for split frequency working are contained in a CCIR Document XIII/53-E. (Some of the readers of this page may have access to it: it is not classified). The conclusion stated in the document is that " it is clear that two-frequency working makes more efficient use of the available spectrum."

Field Day and After

Just for once, " typically Field Day weather " did not plague contestants over V.H.F. NFD at the beginning of last month. The superstitious will want to point out that this was because the event fell on the *second* Sunday of September instead of on the first, as before. So let's be superstitious for the next few years in the hope that this year's weather conditions will be granted to future V.H.F. National Field Days, for it seems fairly likely that the event will take place on the second weekend of the month now that the first weekend is taken up by " August Bank Holiday," if you remember what that was!

With " Four Metres and Down " closing only a few days after V.H.F. NFD there has not been time to collect any quantity of hard news about the event; what does seem certain is that forecasts of greatly increased activity on 13cm have been borne out, and that several *countries* were worked on 23cm.

On these microwavelengths the random calling and searching techniques characteristic of 4m, 2m and 70cm seldom if ever pay off. The other station's frequency and bearing need to be known precisely if a communication circuit is to be set up. This takes time, and as much as an hour can be expended before success is achieved. The result: a multiplier of 125 on 23cm and 500 on 13cm can be claimed. To earn the same pointage on 70cm, where the multiplier this year was 7, it would be necessary to work a large number of stations at considerable distances very quickly indeed. And this, as 70cm adherents will confirm, just isn't on. So the incentive to attempt 23 and 13cm under field day conditions is high.

Even so, there may be other methods of contest computation on the microwaves lurking in the back of people's minds. Let us hope they have been transferred to the back of the Summary Sheet, as requested by the V.H.F. Contests Committee in the rules published last May.

Now for another observation on V.H.F. NFD. . . .

Telegraphy, 1:

Even before V.H.F. National Field Day, 1968, had run its course members were breathing fire and slaughter about the intrusion of phone stations into the bottom 100 kHz of the 2m band—and *after* the event their comments had reached the sulphorously unprintable.

Observed facts were these: contrary to the belief of many, the DX was *not* always at the bottom end of the band (the idea that it is going to be must be an infiltration from the h.f. bands). Many ON and F stations were to be heard well above 145 MHz.

In certain Continental countries the c.w. segment extends well above 144·1 MHz, and operation on A3 within that area is unthinkable.

Thirdly, this year's V.H.F. NFD produced more activity at the c.w. end than ever before. Heavy interference and cross-modulation in the phone areas persuaded many operators that it was quicker and more reliable to exchange the necessary code groups on c.w. down at the bottom end, or would have been if intrusive phone stations had kept out of it. As it happened, the intruders tended to be " hoist with their own petard " when they discovered that " tuning low to high " meant starting at 144·1 and not 144·0. The problem would have solved itself if *everyone* had announced this fact.

Another and more salutary solution to it would be to disqualify any phone contestant heard in the c.w. segment, which was a suggestion going the rounds after the September event. No doubt it, too, will have found its way on to the back of Summary Sheets.

Telegraphy, 2:

In spite of what is said above about the use of telegraphy during V.H.F. NFD, anyone with half an ear could hear that an enormous preponderance of the contacts made were on phone, and A3 at that. All modes were permitted, but sideband and n.b.f.m. have not yet caught on where Field Day is concerned.

There was one respect in which c.w. was mandatory if contacts were to be made at all, and that was on 23 and 13 cm. What was surprising to newcomers to " Twenty Three," though the old hands have come to accept it, was the startling disparity in signal strengths between stations at identical radii from a given point. At one station visited an F1 was booming in on " Twenty Three " as loudly as he had been doing on 70cm before the QSY up. A later contact with a portable in the next county was so marginal as to make c.w. imperative.

Which brings us right back to the comment made on page 596 last month to the effect that limited c.w. facilities for Class B operators, who at present are denied them, are worth considering. We quote a very well known Class B man, Geoff Rogers, G8ABB, of Bletchley:

THE EXTENSION TO " FOUR "

As is stated on the preceding page, the extension of the 4m band down to 70·025 MHz becomes effective following the announcement in the official Government journal, the *London Gazette*.

This announcement has not yet appeared, and operators should therefore not use the bottom 75 kHz of " Four," which is c.w. only, until it does. A statement will be made over GB2RS at the appropriate time.

BEACON STATIONS

Call-sign	Location	Nominal Frequency	Emission	Aerial Direction
GB3ANG	Craigowl Hill, Dundee	145·985 MHz	A1	S
GB3CTC	Redruth, Cornwall	144·13 MHz	A1	NE
GB3GI	Strabane, N.I.*	145·990 MHz	A1	N/SE
GB3GW	Swansea	144·250 MHz	A1	E.N.E.
GB3GM	Thurso	144·995 MHz	A1	N/S
GB3GM	Thurso	70·305 MHz	A1	N/S
GB3GM	Thurso	29·005 MHz	A1	Omni
GB3GEC	W. London	434·000 MHz	F1	N/W
GB3SX	Crowborough,Sussex*	28·185 MHz	A1	E/Omni
GB3VHF	Wrotham, Kent	144·500 MHz	F1	North-West

* Not operational

GB3VHF

The Society's v.h.f. beacon transmitter frequency at Wrotham, Kent, measured by the BBC Frequency Checking Station (nominal frequency 144·50 MHz):

Date	Time	Error
27 August	13.45 GMT	270 Hz high
3 September	16.35 GMT	270 Hz high
11 September	11.35 GMT	220 Hz high

" While c.w. facilities for the Class B man on 2m are not necessary, as frequencies go up received signal strength goes down, due to receiver noise factors, transmitter powers and path losses. It is not unusual to find that a station who is giving a solid RS58 on 70cm will produce only RS54 on 23cm. Anything below Strength 5 to 6 on 70cm cannot be expected to produce a readable phone signal on 1296 MHz.

" On many occasions I have located and read Class A stations on 23cm at RST529 when they have found it impossible to identify my own A3 carrier under receiver noise and i.f. breakthrough. Even when the carrier is located the inevitable report is RO, S2-3. In the case of a contest this weighs heavily against the Class B station: if no intelligence is passed, no contact.

" Under the marginal signal conditions which are the rule rather than the exception on our u.h.f. bands, permission to exchange just RST and call-signs on c.w. would add much to the value of the Class B licence."

" Brute Force " Again

Back to V.H.F. National Field Day for our next item. We remark above about the heavy interference and cross modulation which were experienced in the phone areas of 2m. Here is how the situation sounded to a member who happens to sit in a region favoured by portable operators, the Surrey-Sussex Downs:

" In conversation over the air after Field Day weekend several of us commented on the bad signals which had been radiated by a very small minority of portable stations (the majority were really good signals, and did their owners nothing but credit). Sheer over modulation was the trouble with the offenders, one in particular being audible 100 kHz either side of carrier, even with my beam swung off him to reduce his signal to S6 and to make sure my receiver was not being blocked. I gave this station a call and points, and reported politely and I hope tactfully on the width of the signal. Net result nil, except to shout louder! The call in use was not a newly licensed one but was lent by a professional of many years' standing. As another local, G3UEQ, remarked, if that is professionalism, you can keep it! "

The writer is G3TNO of Horsham in Sussex, who feels that after the brute force blowtorch comments which arose from a similar situation last year, the problem should not have recurred in 1968.

* * *

The phrase " brute force " comes up again, this time in a note just to hand from Bill Scarr, G2WS, of Weston-Super-Mare. " Aren't we all getting just a little tired of the same call-signs at the top of every contest result? " he asks, and goes on to suggest that it is about time portable stations were required to be really portable. " A vanload of gear, including 150 watt transmitter and enough power to run a factory was never classed as portable in the old days. And when such stations dominate the highest mountains in the land who can blame the ordinary home-station operator if he doesn't bother to enter? "

Strictures such as these have been made before, and the answer is well known: if communication is to be established on v.h.f. then go to the highest spot you can reach and use as much power as you can take. This brings its own answer: is it in the " letter and spirit of the contest "?

There is no easy answer, but in an attempt to provide one G2WS comes up with the following constructive proposal, which is worth the consideration of all v.h.f. contestants: " It is time " he says, " that severe limits were placed on all stations operating portable during contests. The ' portable only ' contests would be much more enjoyable if input powers were limited to 10 or even 5 watts, and real skill would be required to obtain a winning score, as against the present brute force."

TF Next on " Four "?

Stick one end of a pair of compasses into the centre of England on a map of Europe, and radius the other end out to ZB2VHF at 1200 miles. Then swing it round to ascertain how many other interesting places there are that could be worked on 4m if only the band were available there, *e.g.*, Helsinki, Belgrade and Algiers to name only three.

Another is Reykjavik, capital city of Iceland, where operation on a spot frequency of 70·25 MHz has now been allowed to TF3EA. By the time this piece appears, the first UK-to-Iceland contact on " Four " may well have been established. And if it should go to one of the members of the South Coast V.H.F. Group, that would be appropriate indeed; for that energetic body, who have done so much to

KEEP MONDAYS FOR 70CM

Monday Night is Activity Night on the 432 MHz band—and it starts as early as the first CQ.

The 70cm bandplan is a duplicate of that on 2m. West is the bottom end, south the middle, and midlands and north the top of the 432-434 MHz communication sector.

Other operators will be searching your geographical zone and will find you more quickly if you are in it.

foster " Four Metre Mindedness " in Gibraltar, Malta *et al*, are prime movers in attempts to initiate it over the path to Iceland. Already a talk-channel is in operation on 14·26 MHz between their G3GVM and TF3EA, and G3JVL has supplied a precision transistor oscillator on 70·25 MHz so that equipment at both ends may be set up exactly on frequency for any meteor scatter tests.

Calculating the chances of success over the North Atlantic, Don Hayter, G3JHM, gives 2000 to 0200 hours local time as the most promising, and the months of June, July, August, September, May, April and March in descending order as those producing ES openings. He adds that the path might open up also during Sudden Ionospheric Disturbances and periods of bi-static Auroral propagation.

If the results obtained from the Thurso beacon are anything to go by, contact with Iceland is not a forgone conclusion. GB3GM on 70·305 MHz produces a consistent but fleeting signal in the south of England, although on 31 August it was a good RS56A for an hour with G3TCT and G3WBQ in Surrey. All the indications are that TF3EA will emerge from the background on " Four " to those able to monitor the band consistently. In particular, this would seem to be an opportunity for the GI and GM members, who are a bit nearer to the Aurora than the southern operators, to keep their receiver b.f.o.s switched in and dials set to 70·25, with beams north westerly, not forgetting an occasional swing to other northerly bearings in case TF-by-Aurora comes in from an unexpected direction.

* * *

As for ZB2VHF, the beacon was consistently heard throughout August, and at breakfast time on 2 September by G3JHM and G3LVP: " . . . the first recorded opening in September we have ever heard via ES," says Don Hayter.

" Tone A " on Four Metres

It will be evident from the above that much goes on in the 70 MHz band which is likely to be lost upon operators who remain content with local chats from simple rigs and indoor dipoles—and no harm in that of course, if through either site or inclination (or both) this is the preferred way to use " Four."

The real potentialities of the band were no doubt realized by portable operators over Field Day weekend who happened to notice there was an Aurora on. Just before the contest started, G3WBQ in monitoring " Four " from his home location at Leatherhead in Surrey noted GB3GM coming in from Thurso at RST56A, and an immediate CQ brought a reply from GM3UAG at Banff with a report of 55A, over a path 450 miles long.

Distant television stations on a northerly bearing provide G3WBQ with useful indicators of 4m conditions. Meldrum near Aberdeen and Pontop Pike near Newcastle (Channels 4 and 5, both near to 4m) were exhibiting Auroral carriers for an hour and a half after Field Day had closed. Much farther south, even Wenvoe had a Tone " A " note to it.

G3WBQ laments the lack of c.w. activity on " Four " that might have resulted in further contacts by the Auroral mode. It seems to us that if a few more regular long haul schedules were to be kept on 4m—undeterred by lack of immediate results, more often than not—some startling openings might be proved. But as this sort of vigilance can be demanding on the time of operators who may have such things as family commitments and even other recreations to take into account, there is a case for organising Auroral watches on a group basis. This way there would always be *somebody* combing the band and pumping out c.w. calls at regular intervals. A dozen in Scotland and a dozen in the Home Counties and the thing is on. This would provide a good south to north path; though obviously operators in other areas who are prepared to give the time for northerly monitoring, especially on GB3GM, could play a useful part.

All who may be interested in helping to develop " Four " along the lines suggested above need only drop a postcard to " Four Metres and Down " so that others may be alerted.

* * *

By way of a pendant to the above, it might be added that GB3GM although a fleeting target is there probably more often than might be thought. On the weekend before V.H.F. NFD both G3WBQ and his neighbour G3TCT as noted above logged it at RST56A, and taped it. This was at teatime on 31 August. In other words, you don't have to *see* Aurora to know it's there.

Pioneering 13cm

A brief stop-press reference was made last month to the pioneer work done on the 13cm band by G3IUD/P and G3NLZ/P in establishing a world record of 80 miles as long ago as 11 June, 1962. Mike Norrington, G3IUD, of Wilmslow, has now filled in the details.

The 80 mile path was between the Great Orme on the North Wales coast and Cold Fell in Cumberland, and the contact was a duplex one of 75 minutes' duration, yielding reports of S8-9 both ways. Twin paraboloids were used at each end, fed by a CV90 in a home constructed cavity oscillator circuit delivering about half a watt of r.f. On the receive side tunable mixers on the " incoming " dishes fed 48 MHz i.f. strips.

Earlier, G3IUD/P had worked G3NLZ/P on the 8cm band over a distance of 38 miles between Mow Cop in Cheshire and Winter Hill in Lancashire, again duplex. The date was 2 June, 1962. For equipment there was a single 17-inch paraboloid at each end with 726A klystrons in paraplexer circuits. " The power output on the 8cm band was approximately one-tenth of a watt," says Mike; but the enormous power gain afforded by dish aerials helped the signal to a good Readability 5 each way.

Both the 13cm and 8cm contacts were believed to be world records (outside the USA) at the time, and may well stand to this day.

Rarities and Expeditionaries

As we remarked here a couple of months ago, 1968 has been something of a vintage year for the number of expeditionaries which have been out and about, giving many v.h.f. operators additional counties—and often difficult counties—to collect for their " Four Metres and Down " certificate claims.

A polite reminder comes from Ron Parsons, GI3HXV, that so far as Northern Ireland is concerned none of the six counties can be regarded as " rare," though we would like to add that to many people down south they are certainly " difficult." Ron reminds us that in five of the counties there is regular v.h.f. activity, and in the sixth, Fermanagh, plenty has been originated by this year's expeditions.

He goes on to say: " To create the impression that GI is

only an area of rare counties is entirely unfounded. Expeditions to GI in the past have been surprised at the (for example) amount of 4m mobile activity there is over here. I do not wish to belittle the expeditions who have visited and are most welcome in GI and I hope they will continue to come, for at least they can spread the gospel when they return to their home QTHs. But let it be clear that the six counties are far from rare."

Ron makes a further point which has been stressed before but is in need of reiteration: that the counties of the Republic of Ireland cannot be included in claims for the " Four Metres and Down " certificate. The Republic possesses its own prefix as distinctive and independent as F or ON, and if its counties are to be included in British v.h.f. award systems then you might as well start in on the administrative divisions of F and ON and everywhere else. Before you know where you are you will find that the pernicious h.f. bands practice of inventing countries or counties or bits of land to work in order to collect bits of paper has spread to v.h.f., where up to now questing experiment has been allied to a relaxed friendliness quite reminiscent of the earliest days of Amateur Radio. May this situation long continue. Correction: may it *always* continue.

More Operating Awards Granted

Another five more operating awards were ratified at the last meeting of the Society's V.H.F. Committee. The " Four Metres and Down " transmitting certificate for 70 MHz operation goes to G3UBX, who collects no. 51 for this band, G3VSA no. 52 and G3NKL no. 53. Only two claims for the 2m certificate were before the Committee: G3OUL collects no. 108 and G3UIK no. 109. There were no 70cm claims. No doubt there will be as cards come in from contacts made during this year's several contests on 432 MHz.

" As cards come in . . ." There's the rub. Because the QSL card holds little appeal to a large proportion of the v.h.f. fraternity it is difficult to get one back more often than not—and to the people in those rarer counties in demand for certificate claims it can have a positive nuisance value.

Even so, it's a bit hard on an operator seeking verifications for his RSGB certificate to earn after many weeks of waiting only TWO replies to a dozen QSLs sent out complete with s.a.e.s (G8BJK), or TWO cards back for 21 sent out, again with s.a.e.s (G3UFA), to quote just two instances from many.

Does every holder of a " Four Metres and Down " certificate, recalling the travail with which he got *his* cards in, make a point of always replying to others' applications? We'd like to think so (especially when an s.a.e. is provided).

On the Receiving Front

Picking up the sentiments of the preceding sentence we'd like to think that *receiving* members, too, get a fair return from the QSLs sent out—and there are plenty of them around, seeking verifications in aid of the RSGB Listeners' Award, or competing in the V.H.F. Listeners' Championship Table, and assessing metre-wave band conditions in general.

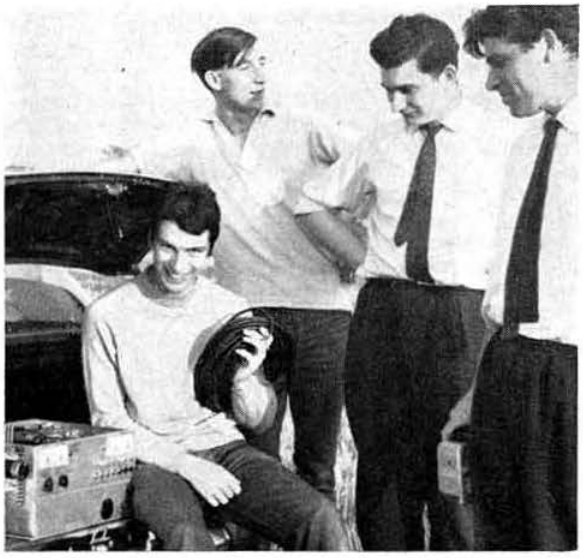
It does not take a listener long to get the point that reports to local stations are of little value. Nor, we guess, do they help much in the case of well sited high power stations audible over much of the country much of the time. Yet it is worth putting oneself in the shack of the newcomer to v.h.f., mentally at any rate, to discover anew the thrill of hearing one's very first signal on " Two " or " Four " and the resultant urge to tell the other fellow that you have done so. Good heavens, the heap works!

From experience in v.h.f. listening comes selectivity in report sending. This does not mean confining reports only to stations at extreme range: there are occasions when a card dropped to a local one may be valuable by telling him something he may not know about his transmissions, *e.g.*, that he is putting out spurious emissions (though check this with another receiving member first, or you may invite the retort: " Look to your receiver! ")

Reports to transmitting members who persistently fail to get replies to CQ calls are also of value by confirming that at least their rigs were getting out (it is as well to send off a report at once while the other fellow needs the solace). And the increasing body of people using extreme QRP from transistor transmitters find any sort of report useful to get.

Many 2m operators are familiar with the reports received from BRS24550, Wilf Hodkinson of Colne in Lancashire, and know them to be exemplars of their kind. Wilf goes into detail that helps the man at the other end: " . . . slow QSB of 8 seconds duration . . . received signal not quite readable on lows . . . for comparison GB3VHF at 215 miles was RS33. Site 600 feet a.s.l . . ." and much else of practical value.

Over to BRS30352, Bob Wakefield of Solihull, who succintly states the receiving man's philosophy: " . . . thanks are due to all licensed amateurs on v.h.f. for replying to BRS men's reports. From my experience the majority do. May they continue the good work, bearing in mind the



POST-OPERATIVE CONFERENCE after V.H.F. National Field Day, between (left to right), G8AYA, G3XHO (once G8ACP), G8ASP and G8ACE, all of whom operated G3WGC in north Herts, using the " box " which has just been stowed in the boot of the car. Designed and built by G8ACE, it is a bandswitched 23/70cm transmitter-receiver. The blower on the left cools the 2C39A p.a. used on 23cm. The built-in converters feed an external Eddystone EC10. Changing from 70 to 23cm takes 15 seconds.

immense amount of pleasure experienced by the BRS or A operator when he receives a QSL from a new county far outweighs the actual cost of a few pence to the sender. By its very nature listening is the most passive part of amateur radio, and we can only give it that extra bite by collecting QSLs and aiming for achievement certificates."

Down in Sussex BRS15744 misses little of what goes on in the 70, 144 and 432 MHz bands; his special interest is plotting the performance of the RSGB beacon chain on " Two," and relating it to conditions potential and actual (" Another strong case for the beacon service," he says). Ron Ham can receive GB3GW much of the time, GB3CTC some of the time and GB3VHF (to which he is in a null) all of the time.

* * *

A rather different line of activity is pursued by A4976, Bernard Wright of Barton on Humber in North Lincolnshire. He is one of the select band of seekers after television DX. Throughout the summer he has been able to receive stations from Spain and Belgrade in spite of local QRM in the shape of the BBC Holme Moss transmitter.

One of the difficulties any TV receiving man is up against is identifying overseas stations broadcasting in a foreign language on the sound side, while putting out video which is virtually indistinguishable from the home product. So A4976 waits for caption cards to come up to provide station identification. His receiver is a modified Regentone 17-in. operating from an X-type array specially erected to beam on to Europe (the domestic aerial faces the other way, to Holme Moss). At the aerial feed point a balun converts low impedance to 300 ohms to enable a low loss line to be run the 90 ft. to the house end. Here it is transformed back via an a.t.u. to 75 ohms to match into the receiver.

Foregatherings

An admirable admixture of technical, social and business items was on the agenda for the 14 September Amateur Television Convention organised by the British Amateur Television Club at an appropriate and palatial venue, the ITA Conference Suite in Brompton Road, London. There was a half hour business meeting for members only in the early afternoon (a film show for other visitors), followed by a tech-lecture session. As the Convention opened at 10 a.m. there was plenty of opportunity to inspect an impressive array of home constructed working equipment for putting video on to 70cm.

It is hoped a fuller report and perhaps pictures will arrive from BATC for next month's issue.

* * *

At Wolverhampton a second V.H.F./U.H.F. Dinner, preceded by an afternoon informal causerie, was held on 30 August, " keeping the channel occupied," as it were, for the big Midlands Convention planned for 1969. If it's anything like last year's it will be " the tops."

Xtal Xchange

G3RQI, G. J. Shipway, 53 Penyston Road, Maidenhead, Berks. Offers the following new HC-6/U crystals: 6019, 6040, 6068, 6069, 6075 kHz. Will exchange these for any crystals, preferably HC-6/U or FT243, to come out at 144·0 to 144·1 MHz. Anything in the 6, 8 or 12 MHz range acceptable.

Listen Out Specially For . . .

. . . F1RJ, who will be on 1297·1 MHz during the 23cm contest of 13 October, operating from AJ51A. He will keep watch on 70cm and 2m in order to set up a communications channel on 23cm.

. . . GW8ACG/P, every Thursday evening on 433·2, and GW8AWS/P every Monday evening on 433·35 MHz, both on mountains in North Wales and capable of working into southern England under quite ordinary conditions.

. . . GM3WOJ on 70·272 MHz with 15 watts and a 4-element beam. He can offer fixed station or portable schedules to any requiring Wigtown—or just the opportunity for a DX chat! Either A1 or A3 can be offered, early morning or evening. Write Chris Tran, Ladyburn Manse, Glenluce, Newton Stewart, Wigtownshire.

. . . G3TTG, who like 'WOJ above is in an area of sparse 4m population. He is on 70·2 MHz every night from 19·30 BST and looks out particularly for DX c.w. calls. For schedules write Vic Batchelor, 236 AMQ, RAF St Eval, Wadebridge, Cornwall.

. . . G3TNO, who is another operator keen on c.w. schedules and asks for them within 144·0 to 144·1 MHz, where he is v.f.o. controlled. He is on every weeknight except Wednesdays, 9 p.m. until midnight.

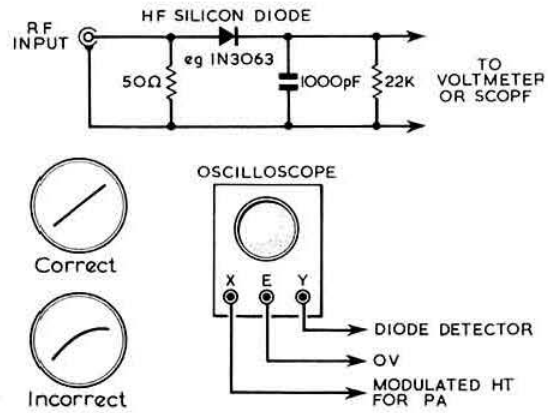
Tech Corner

From G8ARV (David Taylor, Dudley, Worcs.):

Referring back to the all-transistor 2m transmitter described here in July and September, here now are the alignment notes promised then:

Make up a dummy load to the circuit shown at Fig. 1. First of all feed the low power exciter unit (the printed circuit board device) in at the " R.F. input " end, and adjust for maximum r.f. out, which will give an indication of 4·8 to 5·2 volts on a d.c. voltmeter connected to the output of the dummy load.

Next, couple the low power unit into the BLY33 p.a., and feed the output from the latter into the dummy load. Adjust for optimum modulated output as seen on the 'scope, representing 12-13 volts d.c. on the meter. The correct and incorrect waveforms presented by the 'scope are indicated in the sketch. NB.—Orders for the components for the all transistor transmitter should go to G8AEV and not G8ARV.



From G6SN (E. Shackleton, Harrogate):

Here are some further brief notes about the sideband trans-

verter described by G3AAV in August on page 537 (the writer has built a virtual duplicate of the design illustrated then):

Referring to the diagram on page 534, the three split-stator capacitors in the QQVO3-10 plates and grid circuit are Eddystone miniature Microdensers Cat. No. 552 with the plates double spaced to give two moving and two fixed plates per side. This is rather a tricky job but it can be done with a spirit lamp and blowpipe, having first completely stripped the capacitor.

All remaining variable capacitors can be Jackson Bros trimmers with the exception of the 10 $\mu\mu$F in the ECF82 pentode plate circuit. This may be an Erie ceramic trimmer.

Note that the grid coil of the final QQV03-10 is an untuned two turn link to prevent instability.

In the writer's design a 0-50 mA meter mounted on the top panel of the Eddystone diecast box which houses the transverter is switchable between the plates of the two QQV03-10 valves by a two-pole changeover slide switch. Once the crystal oscillator chain has been tuned up all final adjustments can be done on the mixer plate meter.

As the s.s.b. source is likely to be a commercial transceiver with an output of 90 to 180 watts p.e.p., some means of dropping the power to the transverter will be necessary. The old fashioned large " two watt " carbon resistors are still available and ten 750 ohm or eleven 820 ohm resistors in parallel, immersed in transformer oil for the higher power, make an excellent attenuator.

A container for the attenuator can be made from a Cadbury's drinking chocolate tin with the seams soldered to make it oil tight. Solder the resistors to two rings of 16 s.w.g. copper wire, earth one ring to the lid by three wire struts and take the centre connector to the lower ring through a glass or ceramic seal in the centre of the lid.

This transverter as shown will give an output of only a few watts p.e.p., which is not enough for satisfactory work without a linear amplifier. However, with a 6-over-6 slot aerial at a reasonably good site it has worked over 100 miles " barefoot."

From GW8AHI (Bill Davies, of Prestatyn):

The theorists tell us that when a signal leaves a multi-element v.h.f. aerial array it does so at a slight angle above the horizontal for 2m and at an even smaller angle for 70cm. It was decided to take advantage of this phenomenon when a new aerial system was recently erected at GW8AHI.

This aerial array consists of four 14-element " Skybeams " disposed to the configuration shown in the first illustration herewith, and giving a calculated gain over a dipole of 22dB. Arrangements were made to apply beam tilting when the array was up to its maximum height of 40 ft. This was done by means of a linear actuator (electric), which can be seen in the second close-up picture.

Results so far from a sea level location show that most stations on 70cm peak at an optimum slightly above the horizontal, but as if to confound theory, one station, G8AFJ at Heysham, across Morecambe Bay, peaks at a slight declination.

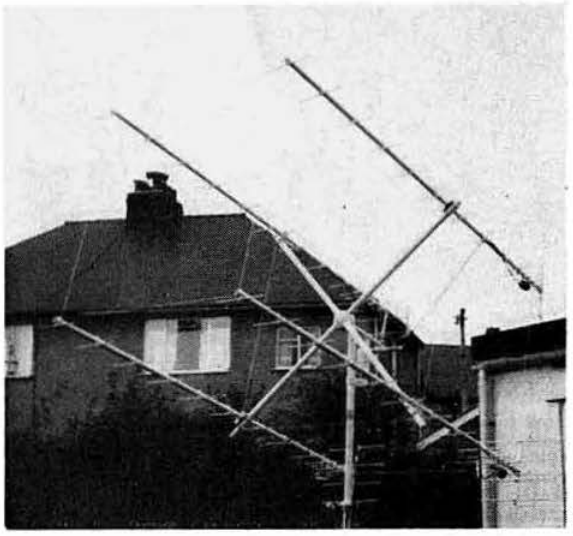
The tiltable array has been of special value on signals coming over the mountains to the south of the GW8AHI site. During V.H.F. NFD two stations who were in the contest, GW3OXD/P in Radnor and GW3PXP/P in Brecon, peaked at quite a steep aerial inclination. On both of these stations the difference between horizontal and tilt was a good three S points.

Perhaps these results may encourage other 70cm operators to experiment with tilt, even though they may be using only a long Yagi.

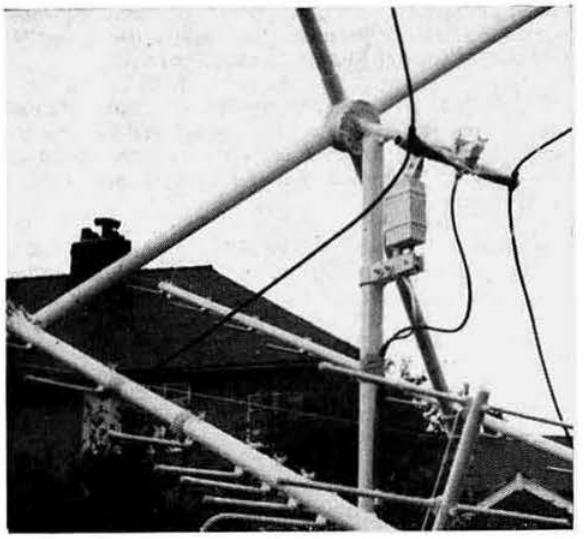
DESIGN POINTERS FOR 2m SIDEBAND:

(1) From G8ANQ (Bill Burton of Whitby):

In a 2m sideband transmitter now just about ready to go, attempts have been made to keep the emission of unwanted products to the lowest possible level. It will be appreciated



The new aerial array at GW8AHI has four 70cm " Skybeams " arranged in a box shaped configuration, and capable of being tilted (See " Tech Corner ").



A close view of the electrical actuator on the aerial system at GW8AHI to enable tilt to be provided, remotely controlled from the radio room.

that this is one of the main snags with the transverter system of deriving s.s.b. Injection is at 14 MHz and there are high *Q* breaks on the transverter output and at the output from the 4CX250B power amplifier.

The crystal filter rig is home constructed similar in part to the G2DAF design, and there is a QQVO3-10 balanced mixer followed by another "Three Ten" as a straight through amplifier to drive the p.a., which operates in Class AB1.

(2) From G3TNO (Malcolm Healey of Horsham):

A home built 2m transmitter recently completed has been made modes-compatible by providing a.m., n.b.f.m., f.s.k., A1 and sideband, using a QQVO7-50 at 150 watts or 200 watts in AB1 on sideband. Some economy in multipliers in the transverter section was realised by using a 116 MHz overtone crystal with which 28-30 MHz can be mixed in a QQVO3-10.

The sideband source is a much modified G2DAF transmitter with some extra filtering to avoid the emission of odd images on 2m, and with the f.m. and f.s.k. facilities built into it.

Here and There

"Many of this year's 2m contests have been spoiled because of protracted CQ calls being made on phone in the c.w. section, expecially in the last hours of contests. Quite a number of DX contacts have been lost due to this inconsiderate operating"—G3BPM.

* * *

"If we are going to have c.w.-only zones at the l.f. ends of the v.h.f. bands then more publicity should be given to the necessity to tune (on 4m for example) 70·1 up, or—and even better, perhaps—70·7 down, after a CQ call on telephony. This would help to keep A3 emissions out of the c.w. segment, and would encourage as well as assist c.w. operation"—G3NKS.

* * *

"I will not work any G including GDX who is on phone in the c.w. section of 2m. After all, a crystal outside the c.w. segment can be bought for as little as a couple of bob. I know; I bought some. I have a few 6 MHz crystals I would be glad to *give* to anyone unable to afford one themselves"—G3TNO, 63 Curzon Avenue, Horsham, Sussex.

* * *

"On V.H.F. NFD everyone seemed to be having a grand time . . . one thing *was* annoying, though, and that was the persistent gabbling of their call-signs by some operators. Out of zone operation was rather prevalent, too"—G8ANQ.

* * *

Another Field Day brevity: PA0CML was heard to remark that he has now worked 600 United Kingdom stations on 2m.

Yet another: G8AWO put his 50 milliwatt rig on to "Two" to give out a few points, and was surprised to receive RS59 from ON4KJ, who was all of 256 miles east of Welwyn Garden City. And Fred Lambeth, G2AIW ("Mister V.H.F." . . . he is hon. sec. of Europe IARU/V.H.F.) was heard working all over the UK with his new one watt transistor c.w. rig.

* * *

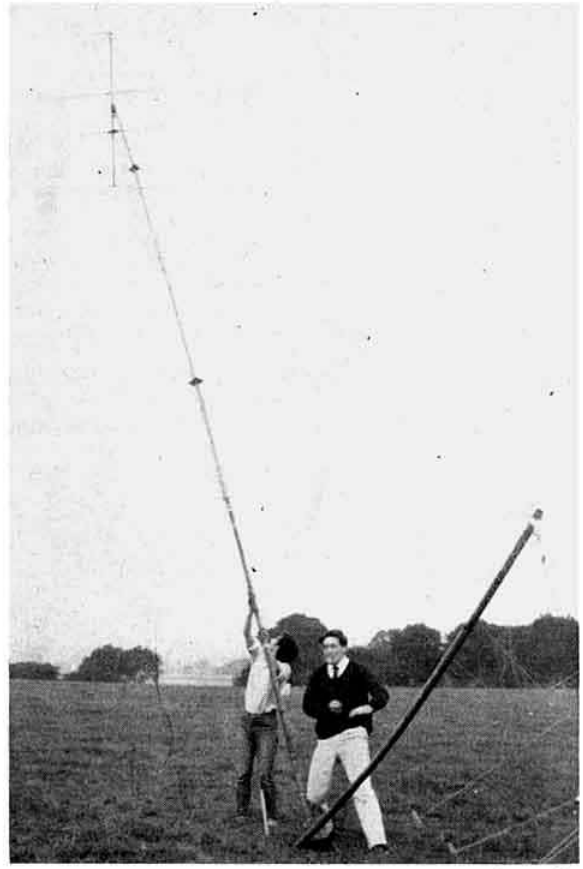
Better news from Alan Williams, GM3KSU, whose plea for 4m skeds from his near impossible site in Edinburgh was printed here last time. With the co-operation of GM3VEI, who runs the Radio Astronomy Section of the Edinburgh Astronomical Society, he now operates as GM3KSU/A from the City Observatory up at 325 ft. on Calton Hill. This permits reliable schedule keeping with GM3WFH in Paisley, 50 miles to the west over a very poor path, every Friday at 21.00 BST and Sundays at 10.30 BST. "All are welcome," says Alan.

* * *

G3TTG finds that it *is* true that you can "join the RAF and see the world." He has just returned to home base (St Eval) after ten days in Malta, where he learned that 9H1AL has now accepted responsibility for the 4m beacon project . . . hopes to have it on the air in weeks. A stop-off at Gib gave the opportunity of personal QSOs with two more noted 4m men, ZB2BO and ZB2BC.

* * *

"I spoke to one G8A—who was operating s.s.b. in the c.w. sector and his reply was 'I like to work in the c.w. portion as people tune there with their b.f.o.s on.' That takes some beating for sheer irresponsibility"—G2WS.



How to erect a 36-foot mast in 36 seconds, complete with 4-metre beam aerial in position, G3TEX pushing and G8BGM pulling. When the mast was horizontal the gin pole was vertical. The latter is equipped with two automobile-engine hoist-pulleys through which pass the halyards, which when hauled erect the mast and drop the gin-pole. Mast and pole are securely lashed at their bases, and the pole firmly dug into the soil so that it will not slip during the hoisting operation. At the base of the feeder G3AAZ/P was connected up for V.H.F. National Field Day, one of three stations operated by the Mid Herts. Amateur Radio Society.

SOCIETY AFFAIRS AND NEWS SUPPLEMENT

Another RSGB roofshoot, this time taken when Mike Dransfield, 5NA2AF visited HQ a few weeks ago. Left to right, Trevor Preece, G3TRP (Assistant Editor, *Radio Communication*), Eric Dowdeswell, G4AR (General Manager), Mike Dransfield and R. F. Stevens, G2BVN.

A brief report of the RSGB Council Meeting held on 9 August, 1968 in the Kingsley Hotel, London

Present: The President, J. C. Graham (in the Chair), Messrs. B. Armstrong, J. Etherington, R. J. Hughes, A. Hunter, E. G. Ingram, L. E. Newnham, A. D. Patterson, J. Petty, R. F. Stevens, G. M. C. Stone, J. W. Swinnerton, G. Twist, E. W. Yeomanson (Members of Council), C. P. Pope (Secretary), A. E. Dowdeswell (General Manager), T. R. Preece (Assistant Editor).

Apologies for absence were received from Messrs N. Caws, H. E. McNally and D. W. Thomas.

Membership and Affiliation

Council resolved (i) To elect 111 Corporate and 39 Associate members. (ii) Corporate Membership to eight Associates.

It was resolved to waive the subscriptions of four members owing to blindness or other disability.

Applications for Affiliation

Council accepted the following applications:

Dunstable Downs Radio Club (Hon. Sec. G. N. Bath, G3NMZ); Mexborough Grammar School Amateur Radio Society, G3XOL (Hon. Sec. M. Valentine); Douglas and District Amateur Radio Society (Hon. Sec. W. T. McEvoy, A5570); Wycliffe College Amateur Radio Society (Hon. Sec. Mr R. Williams); Sunderland Amateur Radio Society (Hon. Sec. M. Erskine, G3WTE); 22nd Technical Signals Unit—Sharjah (Hon. Sec. Sen. A/C Hoskins).

Scottish V.H.F./U.H.F. Convention 1968

Following receipt of a letter from Mr N. Cox, GM3MUY (RR Region 14), this event was discussed and it was decided that Mr G. M. C. Stone (Chairman of the V.H.F. Committee) would attend and open the Convention.

New Headquarters

Mr Stevens reported that work on the building was nearing completion. The main services were all now functioning as was the central heating. The Post Office had allocated the telephone number: 01-837 8688 (3 lines).

The President, Mr Graham, stated that he had received the latest figures on the Debentures and Headquarters fund which were now: Debentures £18,550 and Donation £4,958.

Election of Council 1969

The President: Council appointed Mr J. W. Swinnerton, G2YS, to fill the Office of President from 1 January 1969.

Ordinary Members of Council: Council nominated Mr A. D. Patterson and Mr G. M. C. Stone to fill the vacancies which will occur on 1 January 1969.

Scottish Mobile Rally

Mr Hunter stated that Scottish Members would like an official representative from Council or Headquarters to attend their Mobile Rally. Council asked Mr Yeomanson to attend and he was pleased to accept.

Recommendations of Committees

The following resolutions were accepted by Council.

V.H.F. Contest Committee

(a) Mr Baker, G3USB, be co-opted on to the V.H.F. Contests Committee for the remainder of 1968. (b) The awards for V.H.F. Contests. (These awards are published in *Radio Communication*.)

Scientific Studies Committee

(a) That G3AAJ and G3DME be appointed corresponding members of the Committee. *(b)* That the Scientific Studies Committee did not advise Council to proceed with a UK Satellite Project at the present time owing to the vast effort required in terms of manpower and cost.

H.F. Contests Committee

(a) That the awards for NFD are made as recommended and published in *Radio Communication*.

Film Library

On recommendations made by Mr Cathles, Council agreed to an expenditure of £50 for the 1968 Film Magazine.

Publications

Mr Stevens stated that the 1969 Call Book would be available at the Exhibition.

Council was in session for 4½ hours

THE 1968 GENEVA CONVENTION

The annual Convention of the **International Amateur Radio Club** was held over the weekend 6-8 September with the formal events of the Convention taking place in the building of the International Telecommunication Union. Due to the preoccupation of many of the Club members with the recent CCIR Conference in Boulder the publicity concerning the Convention had been delayed and the attendance was somewhat smaller than in recent years. However, there were present representatives of eleven countries, and amongst the Presidents of National Societies there were: F3FA (REF), HB9RK (USKA), OD5LX (RAL) and G3TR (RSGB). HV3SJ, Brother Edwin Arnram, attended from the Vatican City and 5Z4KL represented the Radio Society of East Africa.

The technical panels, always a feature of the IARC Convention, produced interesting and stimulating discussion on such varied subjects as satellites, ionospheric propagation forecasting, beacons and third party traffic. After the formal opening of the Convention on the Friday evening, the technical panels commenced on Saturday morning with an address by Jack Herbstreit, W0IIN, the President of the IARC and Director of CCIR. The Convention banquet was held in the Hotel Richemond by Lac Leman on the Saturday evening and after further technical discussions the formal part of the Convention ended at lunchtime on Sunday.

A preliminary report was made by L. M. Rundlett, K4ZA, on the contest sponsored by the IARC and for which 150 logs were received. The leading all band station was XW8AX with a score in excess of 238,000 points whilst UA9BZ and SM7CSN held the top spots for single band c.w. and s.s.b. operation respectively. The full results will be given in " Month On The Air " in the near future. It was announced that in 1969 the Contest would be held between 00.01 on 1 March and 23.59 on 16 March (c.w. section). and 00.01 on 29 March and 23.59 on 13 April (Telephony section). There will be several alterations from the rules used in 1968 and full details will be published well before the contest dates.

There are now 137 members of the International Telecommunication Union and the administrations of these countries are in constant touch with the ITU at Geneva, which can justly be considered as the hub of the telecommunications world. The presence of an Amateur Radio organization in this place is an asset to amateurs everywhere and many informal contacts of great value can readily be made. The IARC does not intrude into IARU matters and their aims do not conflict, indeed there is considerable co-operation between IARC and Region 1 of the IARU for whom G2BVN acts as the liaison.

On a domestic note it was most pleasing to enter the superb Central Library of the ITU and to see prominently displayed the latest issue of *Radio Communication*. The various technical publications of the RSGB are sent to this library and are thus available to the delegations attending conferences at the ITU. The recently published booklet by IARU Region 1 which provides information on Amateur Radio for those who may not be familiar with its many aspects is also to be seen in the building. By these and other means it is hoped to introduce Amateur Radio to the representatives of countries where it has yet to be fully accepted.

On behalf of the visitors to the Convention thanks are expressed to Jack Herbstreit, President of the IARC, Dr. Joachim, OK1WI, Ted Robinson, F8RU (the Secretary of the IARC), and to the many Club members who made the journey to Geneva so worthwhile.

G2BVN

Election of Regional and Area Representatives 1969-1971

The terms of office of all present Regional and Area Representatives end on 31 December, 1968, and elections have therefore to be conducted.

The details of the elections are as follows.

Regional Representatives

Not later than **Monday, 21 October, 1968,** and **five Corporate members** resident in a particular Region may nominate any other qualified Corporate member resident in the Region for the office of Regional Representative by delivering their nomination in writing to the Membership and Representation Committee at RSGB Headquarters, together with the written consent of such person to accept office if elected. Each such nominator shall be debarred from nominating any other person for this election of Regional Representatives.

The names and addresses of the present Regional Representatives are given on page 637.

In the event of no nomination being received from the Corporate members in any Region by 21 October, 1968, the Council reserves the right to make an appointment.

A list of the counties in each Region was published on page 396 of the June 1968 issue.

Area Representatives

Not later than **21 October, 1968,** any **five Corporate members** resident in an Area may nominate any qualified Corporate member resident in that Area for the office of Area Representative, by delivering their nomination in writing to the Membership and Representation Committee at RSGB Headquarters, together with the written consent of such person to accept office if elected.

In the case of London, Area Representatives may be nominated for groups of Postal Districts. In the case of certain other large towns, Area Representatives may be nominated on a geographical basis, viz, North Birmingham, South-East Manchester.

Area Representatives will only be confirmed in their appointment if the total membership in the area they propose to represent is **at least 10.**

Ballots

In the event of more than one person being nominated for a particular office a ballot will be conducted, details of which will be published in the November 1968 issue of the RSGB BULLETIN.

Resignations

If, for any reason, an elected representative wishes to resign his office, he should notify Headquarters who will advertise the vacancy. *Local members cannot automatically appoint another member to undertake the duties of a representative who has resigned.*

The Council reserves the right to call upon any representative to resign his office if, in their opinion, he is considered to be unsuitable or unsatisfactory.

Silent Keys

DOUGLAS CLAGUE, G2BSA

Although many of the Cornish Amateurs knew that Douglas, G2BSA, was no longer a young man, or in very good health, it was, nevertheless, with a very real sense of loss that we heard of his death on Sunday, 8 September, 1968.

Many people were first attracted to Amateur Radio by listening to him over the air. Always courteous and helpful, especially to new licences, his QSOs were impeccably run and a pleasure to listen to. For some time he organized a very popular Invalid and Bedfast net, and he always kept an ear for mobile on Top Band and Four Metres, his shack was the envy of us all, and his guests always enjoyed their visits.

Very warm sympathy is extended to Mrs Clague by his many friends.

E. M. C.

GPO Requirements for Frequency-checking Equipment

Many enquiries are made both to the GPO and the Society concerning the interpretation of Amateur (Sound) Licence condition 3, *Frequency Control and Measurement*. Each case is considered separately by the GPO but the following comments may be of assistance to members in assessing the suitability of their own equipment.

A licensee is required:

(*a*) to be able to verify that his transmissions are within the authorized frequency band, (i.e. that no appreciable energy is radiated outside the band.)

(*b*) to use a satisfactory method of frequency control.

(*c*) to ensure that his transmissions do not contain unwanted frequencies (i.e. harmonics and spurious frequencies).

When his station is inspected by PO staff, the licensee will be expected to demonstrate that he can conform with the requirements (*a*) to (*c*) above.

The PO considers that, as a general rule, a station requires a crystal reference source to comply with 1(*a*) and (*b*) above so that:

(*a*) with a crystal-controlled transmitter an absorption device of suitable frequency range and accuracy is necessary to check that the desired harmonic of the crystal frequency is selected.

(*b*) with a transmitter that is not crystal-controlled a wavemeter based on a crystal oscillator is necessary.

Within these outline requirements the licensee is free to decide how he will meet the licence regulations. The Post Office cannot of course, endorse or recommend particular makes or types of equipment, and assesses the suitablity of what the licensee proposes to use from the details he gives in his licence application.

The following comments may provide useful guidance:

(*a*) *Frequency measuring equipment* should be of sufficient accuracy to verify that emissions are within the authorized frequency bands. For example, operation in the centre of the 21·0-21·45 MHz band would require frequency measurement to an accuracy of $\pm 1{\cdot}0$ per cent to ensure that emissions were within band, whereas operation within, say, 10 kHz of band edge would require measurement to an accuracy of $\pm 0{\cdot}05$ per cent. When determining the proximity of an emission to band-edge, the band-spread due to modulation, on the appropriate side of the carrier, needs to be added to the frequency tolerance of the carrier.

(*b*) *Heterodyne wavemeters and crystal calibrators.* When used in conjunction with a general coverage receiver, a 100 kHz crystal is usually adequate for checking frequencies up to 4 MHz. For higher frequencies the spacing between 100 kHz marker points is too small for accuracy, and a crystal of 500 kHz, or preferably 1 MHz, should be used in addition. If the receiver covers only the Amateur frequency bands the bandspread scale will usually allow a 100 kHz crystal to be used with sufficient accuracy throughout the h.f. bands.

(*c*) *Absorption wavemeters and similar devices.* The scale length and accuracy should be suitable for measurements of the required accuracy to be made, and the frequency coverage should extend up to the second. and preferably the third, harmonic of the radiated frequency so that the presence of unwanted frequencies may be detected. For v.h.f. and u.h.f. transmitters, probably the best technique is to measure the frequency of the fundamental oscillator as accurately as possible and to use an absorption device to confirm that the wanted harmonic has been selected. When a v.h.f. or u.h.f. converter is used in conjunction with an h.f. receiver and the calibration of the main receiver can be checked with sufficient accuracy, this will provide a means of frequency measurement but it is also advisable to use an absorption wavemeter to check the measurement and to confirm that no unwanted radiations are present.

Use of narrow band frequency modulation.

The maximum permissible bandwidths for the use of this class of emission in the amateur bands are:

Up to 29·7 MHz, 6 kHz bandwidth.

Up to 70·7 MHz, 12·5 kHz bandwidth.

Above 70·7 MHz, 25 kHz bandwidth.

New Headquarters—Money Still Coming In

To the total of donations reported last month we can now add a further £20 7s., making £146 6s. 6d. in all. Thanks go to the following:

Radio Society of Harrow £14 7s. (total now £51 1s.)

Mansfield ARS £6 (total now £11).

Taking up Harrow's suggestion of a " per capita " competition, we now have the following:

Harrow 10s. per member

Mansfield 7s. 6d. per member;

Crawley 2s. 2d. per member

South Shields 1s. 10d. per member

Edgware 1s. per member

while the **Bedford and District ARC** Debenture represents an " investment " of just over £1 per member. Who'd like to depose Harrow from top place? They would be delighted!

Our grateful thanks to all those societies, large and small, which have heeded the " Harrow Challenge." Donations are *still* very acceptable, because they reduce our Interest liability. Next month we hope to carry a full account of your new Headquarters.

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

You ?

A good command of English, coupled with an interest in the production of a technical journal, is needed in the form of a licensed radio amateur to work for the RSGB.

He (or she) would be directly involved in the production of Radio Communication, and would take a hand in compiling regular features, editing articles, proof reading and pasting-up. He must hold a call-sign and will probably be in his late teens or early twenties. A sense of humour would be a desirable qualification!

Please apply in writing to the General Manager, Radio Society of Great Britain, 28 Little Russell Street, London, WC1, marking the envelope " Confidential."

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

Mobile Rallies—Organizers please note

Interest in Mobile Rallies is increasing by leaps and bounds. Each year a new batch of locally-organized events take place, supplementing the old established rallies, providing a gathering of mobiles somewhere in the country almost every weekend of the summer season. This being so, the possibility of a clash of dates becomes greater and this can only be avoided by planning carried out well in advance.

The RSGB Mobile Committee sought accommodation at Woburn Abbey during the latter part of 1967 and, because of increasing pressures for space on the Woburn authorities, had to accept a date which they learnt later coincided with the popular Derby and District Mobile Rally. The organizers of each event feared the worst because of this but we are pleased to say that both events were highly successful. Had the weather been unkind there may well have been a sadder story to tell and it is sensible at this stage, whilst plans are still being made, to think in terms of some sort of insurance against similar clashes in the future.

The RSGB Mobile Committee have discussed this and it has been arranged that the Secretary will, in future, maintain a diary of the dates of intended Rallies throughout the country and will be pleased to advise organizers before they finalize their arrangements if they will let him have their queries as to other events taking place at the time. Likewise he will ensure that an up-to-date diary is published in *Radio Communication* throughout the year as information becomes available.

Will all organizers of Mobile Rallies please send queries and/or confirmed dates to:

J. M. Stuart,
G3TUM,
Hon. Secretary,
RSGB Mobile Committee,
10 Stewards Close,
Epping,
Essex.

giving as much detail as is necessary to positively identify the locality in which it is proposed to hold the event. When queries are made, organizers should remember to confirm the dates in due course. No entries will be made in the diary until this confirmation is received.

Here are the dates of two major rallies already fixed:

Sunday, 10 August, 1969—RSGB National Mobile Rally—Woburn Abbey.

Sunday, 17 August, 1969—Derby and District Mobile Rally.

Saltash Mobile Rally

The fourth annual Mobile Rally of the Saltash and District Amateur Radio Club was held at Saltash Grammar School on Sunday, 28 July, 1968. A new school building and its attractive surroundings proved ideal for the purpose, and the perfect weather enabled the visitors to enjoy the panoramic views from its hill-top site. The attendance was the best ever—well over 500 people, including, of course, many amateurs who were on holiday in the South West. Three came specially from Hampshire for the event—G2DC (Ringwood), G8ADH (Burley) and G3JAF (Lymington), the latter winning the prize for the furthest distance travelled. R. McMillan, A4322, of Yeovil, was awarded a prize for being the SWL who made the longest journey. GB3SAL talked in the mobiles, and for the second year running there was a noticeable drop in the proportion of mobiles using v.h.f. The 4-metre talk-in station was receiving ZB2VHF at S8, but with only a vertical dipole on hand, no contact could be made. The Rally was formally opened by A. C. Edwards, G6XJ who, until his recent retirement, was Managing Director of Eddystone Radio Ltd.

The RAIBC was represented at the Rally by G3VUC who was conducting a " Stamp Sale." For the past six months members of the RAIBC and supporting clubs have been collecting used postage stamps, a la Blue Peter, and sending them to G3VUC. Out of the tens of thousands sent to him, he had sorted the rarer stamps for sale in aid of RAIBC funds. On the nearby River Lynher G3UBY and SWL N. Burton kept the children entertained by giving free trips in their speedboats. Consistently viewable pictures from France were provided by the Saltash Club's DX-TV enthusiasts. Amongst the other attractions were performances by the Band of the Saltash Army Cadet Force.

Prizes for the furthest contacts with the talk-in station GB3SAL en route to the rally were won by G3WWK/M (Salcombe) and G3WKP/M (Truro). In the Frequency Measuring Competition, the calibration of G3NXV's (Hollywood, Birmingham) mobile receiver was the best. The Valve Identification Competition was won by G8AFA (Yeovil), while G3NPA (Crayford, Kent) was successful in the DX-Darts Contest. A "Hunt The Hidden Ham" Competition was won by G3XLZ (Plymouth), the identity of the " Hidden Ham" being none other than Dennis Bowden, 9M2NF, who was born in Saltash. There were well over 100 prizes in the Grand Prize Draw. The star Radio Prize, a multimeter, was won by G6XJ, who promptly handed it over to G3VUC for the RAIBC—a nice gesture.

It was generally agreed that this was the most successful mobile rally yet held by the Saltash and District Amateur Radio Club.

Woburn Abbey Mobile Rally

Printing deadlines made it impossible to report on the Woburn Rally in the September issue of *Radio Communication* so that a belated account such as this is of purely academic interest.

Mention has been made elsewhere of the unhappy clash of dates between Woburn and Derby and this meant that many of our friends from the Midlands were elsewhere. Despite this and some anxiety about the weather there was a very good turnout indeed on 18 August.

The Bring and Buy sale was a great success and Society funds benefited to the tune of 10 per cent of the proceeds. We thank those people who kindly donated equipment and parts for sale on behalf of the Society.

The discovery of the Rally was undoubtedly Council member Alec Hunter, GM3LTW, who, having " conned " all and sundry into spending the rent money on massive piles of components, provoked one of his more heavily laden G8—— customers into the outburst . . . " I'll need a ruddy pantechnicon to get this lot home " ! ! !

We hope he made it.

Torbay Rally, Dartmouth

On Sunday, 18 August, unfortunately clashing with two other rallies, the Torbay Amateur Radio Society staged its fourth mobile rally at Dartmouth, Devon. It attracted over 200 people, many of whom turned up in 88 vehicles, 28 of which were equipped with mobile radio installations. The weather obviously came as a surprise, almost a shock, for the statement in the report we received of " perfect—dry, warm and sunny " was underlined twice and followed by two exclamation marks! Awards went to G3JFF/M of Portsmouth for travelling furthest to the rally, to G3PU/M for the longest distance contact with the 160m talk-in station, to G3GMN/M for the same achievement with the 80m station, and G3PWJ/M for 2m. A prize for the best mobile installation went to G8ADP/M, the runner-up being G3PWW/M.

Swindon Mobile Rally

The third Mobile Rally organized by the Swindon and District Amateur Radio Club took place on Sunday 25 August, 1968 at Lydiard Park, about three miles west of Swindon.

The accommodation was much larger than in previous years and a huge marquee housed the trade-stands, the competitions and raffle stalls, reception, the S & DARC club stand and refreshments. About 185 cars arrived, with 72 fitted for mobile working. Talk-in was arranged on 160m, 4m and 2m with once again the Top Band station doing the most work. A guess at the attendance figures would make it about 500 people.

Due to the generosity of the trade exhibitors, there were plenty of prizes for the raffles and side-shows and each programme entitles its owner to a free gift. As in previous years, a special ladies raffle was organized, with prizes of a table lamp, a box of toilet waters and similar items guaranteed not to appeal to the OM's.

Prizes were awarded as follows: Longest distance travelled, G3VGY (Haverford West). Longest 160m talk-in QSO, G2AMX/M. Longest 4m talk-in QSO, G3FHL/M. Longest 2m talk-in QSO, G3TOQ/M. Best Commercial Installation, G3OOD/M. Best home-brew installation, G2BSR/M. Safest installation, G3XOD/M.

Refreshments were arranged by a local catering company which considerably eased the work load on club wives and girl-friends. Children were looked after by large-scale football matches and by testing their skill on an extremely large model racing car set-up.

Preston Mobile Rally

The first Mobile Rally to be held in the North West of England was organized by Preston Amateur Radio Society and held on Sunday, 1 September, 1968. The event was held on the car park of the local football ground (Preston North End FC) with indoor accommodation in Kimberley Barracks, adjoining, where there were trade displays, surplus stalls, RSGB Bookstall and other attractions, including a licensed bar. The weather was dull but dry and activity started early with the first visitors arriving at 10 a.m., and the talk-in station on 160m, was kept very busy until well into the afternoon. The event was officially opened at 12 p.m. by the Region 1 Representative, Mr Basil O'Brien, G2AMV, and the final estimated attendance was 500. An unexpected highlight was the arrival of the Andorra Expedition (PX1RI) with vehicle and equipment and this proved to be a popular exhibit. The event was very successful and it is hoped that this will be the forerunner of many bigger and better Preston Mobile Rallies.

At the Derby Rally on 18 August; part of the car park and crowd watching the Police demonstration of road safety.
(Photo by G3SZJ)

Also at Derby: Tom Darn, G3FGY, amuses the crowd at the famous Derby Junk Sale.
(Photo by G3SZJ)

The Cornish Radio Amateur Club struck lucky with the weather at its Newquay Rally on 21 July, making a good profit into the bargain and obtaining some favourable publicity with a TV interview. Even all the rigs "worked like a dream." Brian Locke, G3NKE and Joe Johnson, G3THT are seen at the desk for the Top Band talk-in station.
(Photo by G3VJB)

A group of Preston Club members with the RR, Basil O'Brien, G2AMV, and his wife, G3WIO, taken at the Preston Rally. The group is standing in front of the vehicle used for the PX1RI Expedition to Andorra at the end of June last.
(Photo by G6FC)

CONTEST NEWS

Second 1·8 MHz Contest 1968

1. When. 21.00 GMT on Saturday, 16 November, 1968, to 02.00 GMT on Sunday, 17 November, 1968.

2. Eligible Entrants. All fully paid-up members of the RSGB resident in G, GC, GD, GI, GM, and GW.

3. The **General Rules** published in the January, 1968, issue of *Radio Communication* relating to RSGB H.F. Contests will apply.

4. Contacts. C.w. (A1) only in the 1·8-2·0 MHz band.

5. Scoring. Six points for each of the first 6 contacts with any one country; three points for the seventh and subsequent contacts with that county. Six points for each contact with a station outside the British Isles as defined in Rule 2.

6. Contest Exchanges. RST reports followed by the contact number starting with 001 and the county code letters as given on page 63 of the January, 1968, issue of *Radio Communication*, e.g. for a contact from Sussex 569001SX. All reports must be acknowledged with " R ".

7. Logs (*a*) Must be tabulated in columns headed (in this order): " Date/Time GMT," " Call-sign of station worked," " My report on his signals and serial number sent," " His report on my signals and serial number received," " County code letters received," " Points claimed." The county code letters as sent must be entered at the top of each log sheet. RSGB Contest Log Sheets should be used (available from HQ on request accompanied by large s.a.e.).

(*b*) The cover note must be made out in accordance with the General Rule 4. The declaration must be signed.

(*c*) Entries, addressed to H.F. Contest Committee, Radio Society of Great Britain, 35 Doughty Street, London WC1, must be postmarked not later than 2 December, 1968.

8. Awards. At the discretion of the Council, the Victor Desmond Trophy and a Certificate of Merit will be awarded to the winning station, and Certificates of Merit to the stations placed second and third. In addition, the Maitland Trophy will be awarded to the Scottish member with the highest aggregate number of points in this contest combined with the First 1·8 MHz Contest 1969.

Listeners' Section

1. When. 21.00 GMT to 23.59 GMT on Saturday, 16 November, 1968.

2. Eligible Entrants. All fully paid-up members of the RSGB who do not hold an amateur transmitting licence for the bands below 30 MHz. Only the entrant may operate his station.

3. Entries. (*a*) Should be clearly written or typed, preferably on RSGB Contest Log Sheets (available from HQ on request accompanied by a large s.a.e.), in columns headed (in this order) (1) Date/Time GMT; (2) Call-sign of station heard; (3) Report, serial number and county code letters sent by station heard; (4) Call-sign of station being worked; (5) Points claimed.

(*b*) Must be addressed to the H.F. Contest Committee, Radio Society of Great Britain, 35 Doughty Street, London WC1, and must be postmarked not later than 2 December, 1968. Envelopes should be marked "Second 1·8 MHz Contest."

4. Scoring. for each complete log entry of a c.w. contact 6 points may be claimed.

The Contest Committee reserves the right to disqualify any entrant whose log is consistently inaccurate.

5. Declaration. All entries must contain the following, signed declaration:

" I declare that this receiving station was operated strictly in accordance with the rules and the spirit of the contest, and I agree that the decision of the Council of the RSGB shall be final in all cases of dispute. I do not hold an amateur transmitting licence for the bands below 30 MHz."

Date..... Signature.....

6. Awards. At the discretion of the Council of the RSGB, a certificate of Merit will be awarded to the leading entrant, and also to the runner-up providing that 10 or more entries are received.

NFD 1968

In addition to those tabulated in the August issue, the following NFD Groups were inspected by representatives of the H.F. Contests Committee: The Amateur Radio Club of Nottingham, Leicester Radio Society and Derby and District ARS.

A number of check logs were received after the adjudication had been completed: OK1QM, OK1CIJ, OK2BJU, OK1KZ, OL2AIO/P, YU1NPV, LA2Q, SM6AVD, W2MEL and W0BBM. All these operators are sincerely thanked for sending in logs, but it is regretted that logs arriving after the closing date for entries cannot be used for checking.

Fourth 144 MHz Contest (Portable) 1968

An incorrect call-sign appeared against the entry for 13th position in the Fourth 144 MHz (Portable) Contest on page 602 of the September issue. For G3SBR read G3SBL.

Seventh 144 MHz (S.S.B.) Contest 1968

1. Date and Time. 11 November from 19.00 to 21.00 GMT.

2. All entries **must** be sent to the adjudicator at V.H.F. Contests Committee: 80 Argyle Road, Ealing, London W13.

The following **General Rules** also apply; 3b, 4, 5a, 6a, 7c, 8c, 9a, 10a, 11 to 18, 20, 23, 26 to 28.

The General rules of RSGB V.H.F./U.H.F. Contests were published in the January issue of *Radio Communication*. Copies are available from RSGB HQ.

Operators G3EDD and G3GGK were running GM5PI/P from the Mull of Galloway during the 144 MHz Contest on 3-4 August. (*Photo by G3GGK*)

RADIO AMATEUR EMERGENCY NETWORK

By S. W. LAW, G3PAZ*

THIS month the Radio Amateur Emergency Network joins with all other facets of our unique hobby in wishing a still greater success to the Radio Communications Exhibition. Well we might, for we shall be there! This year the Manchester Independent Group will be proudly demonstrating the well-equipped trailer station which many of you may have seen and admired at the Woburn Rally, where it did yeoman service as a " talk-in " station. It is hoped to have the trailer fully operational on several modes at the Show, and it will be through no fault of the Manchester boys if this is not the finest example of what can be provided in the way of facilities yet seen. True, there is as yet no TV link installed, but this is something for the future. To date, the only example we have come across was the set-up used by the Southampton Group some while back when an exercise was run for the benefit of one of the User Services to demonstrate the practicability of a TV link from a /P incident station to a base station at the User Service HQ. There is food for thought here for those G6 + 3/T types who might think that RAEN activity is outside their orbit. Come to think of it, what *does* constitute a " third party message " on amateur TV? Anyway, see you at the Show and we can have a good ragchew on this and many other points. And don't forget, if you have time on your hands, that the Manchester chaps could do with a break for the odd hour or so—don't be afraid to offer your services on their exhibit for a while.

Manuals

It is hoped that (saving yet another plague of gremlins!) copies of the RAEN Manual will be available at the Show. The patience and forbearance of our members has been greatly appreciated in this matter.

Gentle Jog?

The hard-working Hon. Registrations Secretary is only too pleased at the growth of membership, but expresses puzzled concern at the three hundred—repeat *three hundred*—who have so far failed to re-register this year. It is to be presumed that, saving for obvious causes such as emigration (that " brain-drain " again?), the people concerned fondly imagine that their membership is still valid. Well, we will say it yet again—unless your membership card is stamped up to date you are not a member. The Police will not allow you into an incident area and moreover, you are not covered by insurance while on RAEN business. Also should you have occasion to enter User Service premises you may be required to present a valid card. Send it in NOW—even by fourpenny post! The address is on this page.

Westerly Winds

It is with pleasure that we note the growth of RAEN activity in the West. The delectable county of Somerset is showing an agreeable rise in membership under the able leadership of G3WPJ, and we are sure that the special problems involved in coverage of a county that has certain hazards not immediately apparent to non-residents will be well looked after here. Devon, of course, needs no commendation from us. Their organization has already proved itself as readers of this page are well aware, and their membership continues to flourish. Wales too is growing nicely, and the various areas are by no means moribund. GW Controllers 3JBH, 3RIY, 3LQE and 4CG will always be glad to advise prospective members in their areas. Those on 2m should listen around mid-day and early evening on 144·35 for GW4CG and his Group. So far we have little news of the Severn and Gloucester area, but no doubt things are quietly fizzing around there. Over the sea also Controllers GI3OIC and GI3PLL are quietly attending to the needs of User Services in the Emerald Isle.

Service Problems?

There are, we understand, red faces in certain quarters over the undisputed breakdown rate of certain highly-sophisticated (and expensive) walkie-talkie sets. We are trying to find a Latin quotation to fit the case, but on second thoughts (and for the benefit of those with an ear to the ground) we can find nothing better than the old exhortation that " the cobbler should look to his last! "

Gentle Push

We hear that a little push is needed in the Northants area to get things moving. A look at our membership list for the County would seem to indicate that, whilst there is a keen (if small) nucleus, there are one or two members who do not appear to have re-registered. For once we will stick our neck out and start the ball rolling by asking any SWLs in the area to contact A5241, A. T. Bowers at 27 Chequers Lane, Grendon, Northampton with a view to stirring up the licensed members in Northants. Get those cards stamped up, chaps, and let's see some action! (Address below). Remember, five *members'* signatures to the RAEN Committee constitute a nomination for the post of Group Controller. To un-attached members in other areas we advise a little recruiting (take a listen around the locals) and sound out the possibility of getting together. And don't be afraid to ask the opinion of the User Service as to the best way to fit in with their requirements.

The Hard Way?

When we mentioned u.h.f. recently we didn't give a thought to microwave, so we were most intrigued to see an amateur link set up recently on the 10 GHz band with the aid of heliograph mirrors and " rogers " from car headlights at a range of over two miles. Makes you think, doesn't it?

Over the Border

Those who visited the Scottish Mobile Rally found RAEN well in the picture due to the energetic efforts of GM3LTW and his willing band of helpers. It was an excellent idea to show the flag by means of a RAEN stand, and we hope that Controllers in other areas will follow this example. Rally organizers are always ready to listen to ideas for stands which have some relevance to the Mobile Scene and that aspect is well covered by the average RAEN Group. Remember, there *are* Radio Amateurs who still don't know what it's all about!

V.H.F. Equipment

A cheeky little bird tells us that those Groups who are still anxiously awaiting news of gear available for 4 and 2 may start writing letters to Santa Claus. There are distinct possibilities that the position will become a little more rosy in the next few months.

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* 11 Chisholm Road, Croydon, Surrey, CRO 6UQ.

Honorary Registrations Secretary : **Mr R. A. Ledgerton, G2ABC 1 Latchingdon Gardens, Woodford Bridge, Essex.**

Honorary Secretary, RAEN Committee : **Mr E. R. L. Bassett, BRS16075, 57 Upper St. Helens Road, Hedge End, Southampton, SO3 4LG.**

CLUB NEWS

Please send all information direct to Regional Representatives, giving full details of future meetings, and any snippets of activities which would be interesting in print. When listing meetings, please be sure to include the date and time, the meeting place, the lecturer's full name and the call-sign to whom prospective members can refer. The last day on which Regional Representatives can accept letters for inclusion is the first of the previous month.

REGION 1

Ainsdale (ARC)—9, 23 October, 6 November, 8 p.m. 77 Clifton Road, Southport.

Allerton (Liverpool) Scout Radio Hobbies Society—Thursdays, 8 p.m., 3rd Allerton Scout Group Headquarters Church Road, Woolton, Liverpool.

Ashton-under-Lyne (AUL & DARS)—Fridays 7.30 p.m., Stamford Street, Stalybridge.

Blackburn (East Lancashire Amateur Radio Club)—3 October, 7 November, 7.30 p.m. YMCA, Limbrick Blackburn.

Blackpool (B & FARS)—Mondays, 8 p.m., Pontins Holiday Camp, Squires Gate. Morse tuition from 7.30 p.m.

Bury (B & RRS)—8 October (Surplus Equipment Sale) 12 November (Construction Competition and Quiz against Blackburn), George Hotel (private room) Market Street Bury. Secretary G3VVQ, 411 Holcombe Road Greenmount, Bury.

Cheshire (Mid Cheshire ARC)—An excellent start has been made to a new Club which is being formed for Members in this area. Meetings are being held every Wednesday, commencing 7.30 p.m. at Oak House Farm, Beeston Drive, Over, Winsford. From 7.30 p.m. to 8 p.m. there is slow Morse tuition.

Chester (C & DARS)—Tuesdays, 8 p.m. YMCA.

Crewe & District—No meetings will be held for the time being as no accommodation is available. However, the Area Representative, Mr R. Owen, 10 Circle Avenue, Willaston, Nantwich, will welcome visitors at his home.

Eccles (E & DRC)—Tuesdays, 8 p.m. Patricroft Congregational School, Shakespeare Crescent Patricroft. Every Thursday Club Top Band net 8.30 p.m.

Leyland Hundred Amateur Group—Weekly Net each Thursday at 19.15 GMT (1915 kHz).

Liverpool (L & DARS)—Tuesdays, 8 p.m. Conservative Association Rooms Church Road, Wavertree.

(NLRC)—11 25 October, 8 November, 8 p.m. Landsbury House, 13 Crosby Road South, Liverpool 22.

Macclesfield (M & DRS)—8, 22 October, 5 November, 8 p.m. The George Hotel, Jordangate.

Manchester (M & DARS)—Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10. Hon. Secretary, G. Tillson, G3TJX, 95 Kelverlow Street, Oldham, Lancs.

(SMRC)—Every Friday, 8 p.m. A new meeting place has been arranged. It is the Conservative Organization Divisional Office, 449 Palatine Road, Northenden, Manchester 22.

North West V.H.F. Group—Following the loss of its Headquarters, meetings are taking place on a temporary basis every Tuesday at 50 Great Ancoats Street, Manchester. Members are asked to keep in touch with the Committee for any changes which may take place at short notice. G3FNM, 141 Norris Road, Sale.

Preston (PARS)—3, 17, 31 October, 14 November, 7.30 p.m. (private room), " Windsor Castle," St. Paul's Square.

St. Helens (SES)—1, 15, 29 October, 12 November, 7.30 p.m., IVS Centre, 55 College Street, St. Helens.

Southport (SRS)—Wednesdays, 8 p.m. and Sundays, 2.30 p.m., The Esplanade.

(73 S.S.B. Society)—Tuesdays, 8 p.m. (all commencing with a talk on part of the RAE Syllabus), 73 Avondale Road North, Southport.

Stockport (SRS)—2, 16, 30 October, 13 November, 8 p.m., Royal Oak Hotel, Castle Street, Edgeley; new members are always welcome. Further details from G3FYE.

Warrington-Culcheth (CARC)—Fridays, 7.30 p.m. Chat Moss Hotel, Glazebury All visitors will be welcome. Secretary, K. Bulgess 32 Hendon Street, Leigh.

Westmorland—4, 18 October, 1 November, 7 p.m., The Allen Technical College, Sandes Avenue, Kendal.

Wirral (WARS)—Former Civil Defence Headquarters, Upton Road, Bidston, Birkenhead. First and third Wednesday of each month at 8 p.m., 2 October (Annual General Meeting), 16 October (to be arranged)—The first meeting in August was a very entertaining and instructive lecture on Radio Teletype by Bill Evans, G3VQT. This was illustrated with various examples of terminal units, yards of printed RTTY copy and even a picture produced on a teleprinter keyboard. *G3PXX.*

REGION 2

Barnsley (B & DARC)—11 October (film, "Nuclear Power," by UKAEA), 25 October (" Transistorized Power Supplies," by J. Ward, G4JJ). Meetings second and fourth Fridays, 7.30 p.m., King George Hotel, Peel Street, Barnsley.

Hull (H & DARS)—4 October (Rx comparisons—Part II CR100 and HQ170), 11 October (" America today " by G3RMX), 18 October (" S.W.R. Bridges," G3FCY), 25 October (" Can you beat this," introduced by G3AGX), 7.45 p.m., 592 Hessle Road, Hull.

Northern Heights—9 October (" Solid State Transmitters Transceivers," by T. K. Bierney and C. N. Whittingham, G3DSR), 19/20 October (Scout Jamboree Station for the 3rd Keighley Scout Troop), 23 October (Mr Craven's Lecture), 30 October (" DXing on Top Band the Hard Way," by Stew, W1BB, Recorded Lecture), 6 November (RAEN," by G3MBQ), 7.45 p.m., Sportsman Inn, Ogden, Halifax.

Scarborough (SARS)—8 p.m., Thursdays, c/o RAF Association, Fulbeck House, 3 Westover Road, Scarborough.

Spen Valley (SVARS)—3 October (" How I entered Radio," by Gladstone Law, Vice-Chairman), 9 October (Solid State Rx and Tx —joint meeting with Northern Heights with a visit from Lelante Lectronics), 17 October (" Elementary Semi-conductor Theory," by L. W. Burkitt), 7.30 p.m., The Grammar School, High Street, Heckmondwike. Two visits are arranged 24 October to Baird Television Ltd., Bradford, to hear a lecture on Varactor Diodes and on 31 October, to Research Electronics Ltd., Bradford Road, Cleckheaton.

REGION 3

Birmingham (MARS)—Third Tuesday in the month 7.45 p.m., Midland Institute, Margaret Street, Birmingham 3.

(Solihull ARS)—An initial meeting was held at the Mason's Arms Hotel, High Street, Solihull on 15 August, to form the Solihull Amateur Radio Society, with a further meeting on 19 September. The attendance was encouraging with 20 licensed amateurs and 10 Short Wave Listeners. Meetings will be held at this venue on the third Thursday in each month until further notice at 7.30 p.m. 17 October (Junk Sale). Hon. Secretary, G3VXV. Tel. 021-705 3060.

(South)—2 October (AGM) 8 p.m., The Scout Hut, Pershore Road (opposite Bob's Café), Selly Park, Birmingham.

Bromsgrove (B & DARC)—11 October (Surplus Sale), Co-op Hall 8 p.m.

Coventry (CARS)—4 October (Film Show), 11 October (Night on the air with Club's KW 2000), 18/20 October (Participation in Jamboree on the Air), 25 October (Lecture by G8APB, back from VE land), Scout HQ. 121 St. Nicholas Road, Radford, Coventry.

The most ambitious annual club camp held by the Silverthorn Radio Club was put on during the Summer Bank Holiday weekend. Operation from the station GB3SRC was on Top Band, the h.f. bands and 2m, using a.m., c.w. and s.s.b. With about 75 per cent of the club's members licensed, the station was virtually continuously on the air. The photograph shows some of the members taking a breather: *sitting*, SWL Hudson and SWL Bean; *standing*, G3WPR, G3LJB, SWL Head, SWL Roberts, G3RJI (behind), SWL Wright, G8BUC and G3WYS.
(Photo by G2HR)

Dudley (DARC)—8 October 22 October, 8 p.m., Central Library, St. James Road.
Hereford (HARS)—4 October, 7.30 p.m. (G.D.O. Rally), Trinity Hall, Whitecross Road, Hereford.
Lichfield (LARS)—7 October, 15 October, 7.30 p.m., Swan Hotel, Lichfield.
Mid-Warwick (M-W ARS)—14 October (" Design and construction of simple transmitters," by G3HCM), 21 October (The layout and construction of equipment), 28 October (" Using Veroboard," by A. J. Woodhouse) 8 p.m, 28 Hamilton Terrace, Leamington Spa. Hon. Secretary, J. F. Coggins, Tel. Toll Bar 3688.
North Staffs. (NSARS)—Every third Tuesday in the month at Moorland Road Junior School.
Rugby (R & DAR & EC)—Tuesdays and Thursdays each week. RAE and Morse practice Wednesdays. RAEN Group Last Tuesday of each month, 12 October D/F—visit to CARS, Midnight Double D/F.
Salop (SARS)—10 October (AGM), 25 October (Dinner and Social), Old Post Office Hotel, Milk St., Shrewsbury.
Slade (Birmingham), (SRS)—11 October (Junk Sale), 13 October (D/F test, start 2 p.m.), 25 October (" House wiring and the I.E.E. regulations," by D. Grant), 7.45 p.m., The Church House, High Street, Erdington, Birmingham 33.
Stourbridge (STARS)—1 October (One of the Hi's [FI or Freq.], G8AAW), 3 November, The Library, Longlands School, Stourbridge.
Wolverhampton (WARS)—7 October (AGM and Junk Sale), Neachells Cottage, Stockwell Road, Tettenhall.

REGION 4

Burton on Trent (BoT ARS)—Details from G3ACR.
Chesterfield (C & DARS)—Details from G3VDI.
Derby (D & DARS)—Details from G2CVV.
Grimsby (GARS)—Thursday, 8 p.m., North Lincs Photographic Society's Room, back of 50 Welholme Road, Grimsby. G3RSD.
Heanor (TSEDRS)—Tuesday, 7.30 p.m., Club Room, South East Derbyshire College of Further Education, Ilkeston Road, Heanor, Derbys. G3LGK.
Leicester (LRS)—Mondays, 7.30 p.m., Sundays, 10.30 a.m., The Club Rooms, Gilroes Estate Cottage, Groby Road, Leicester. G3UQX.
Lincoln (SWC)—An enthusiastic nucleus are re-organizing the Club. Further details from G3TJO.
Mansfield (MARS)—First Friday in each month 7.45 p.m., New Inn, Westgate, Mansfield. G8HX.
Melton Mowbray (MMARS)—details from G3FDF.
Newark (NSWC)—Mondays, Thursdays, 7.30 p.m., Guildhall, Guildhall Street, Newark. G3TWV.
Nottingham (ARCN)—Tuesdays, Thursdays, 7.30 p.m., Room 3, Sherwood Community Centre, Woodthorpe House, Mansfield Road, Nottingham. G3SRX.
Peterborough (P & DARS)—For details G3KPO. First Friday in month, lecture or demonstration in the Electronics Section at Peterborough Technical College, Eastfield Road. 7.30 p.m. Other Fridays. Meet at the Club HQ in the old Windmill, behind the Peacock Inn, London Road, 8 p.m. onwards.
Spilsby—7 p.m., 18 October (Junk Sale), The Bull Hotel, Harlton Road, Spilsby.
Worksop (NNARS)—Tuesdays, Thursdays, 7.30 p.m., Club Room, Gateford Road, Worksop.

REGION 5

Bedford (B & DARC)—3 October (Junk Sale), 10 October (Microphones, Bring yours . . . G3CWV), 17 October (Police Radio Communication), 24 October (AGM), Secretary, Ken. Whitbread, G3ADU, 78 Pipit Rise, Bedford.
Bishops Stortford (B & DARC)—21 October (" Talk on Receivers," R. P. Essery, G3KFE). Visitors welcome, 8 p.m., British Legion Club, Windhill, Bishop's Stortford Hertfordshire. Secretary, P. J. Toynton G3RGA, Old Mead Lane, Henham, Herts.
Cambridge (C & DARC)—Fridays, 7.30 p.m., Club Headquarters, Corporation Yard, Victoria Road, Cambridge. Secretary, Richard Baker, G3USB, 32 Harbour Avenue, Comberton, Cambs.
Dunstable (D & DRC)—Alternate Fridays, 7.30 p.m., " Star & Garter," High Street, South Dunstable, Bedfordshire. Secretary, George Bath, G3NMZ. Tel. Fancott 487, 182 Bishopscote Road, Luton, Beds.
March (M & DRAS)—Tuesdays, 7.30 p.m., Old Police Headquarters, High Street, March, Cambs.
Shefford (S & DARS)—Thursdays, 8 p.m. (Morse Classes, 7.45 p.m.), Church Hall, High Street, Shefford, Bedfordshire. Secretary, Maurice B. Goodwin, G3WKR, 16 Roe Close, Stotfold, Bedfordshire.
Stevenage (S & DARS)—8 p.m. on first and third Tuesdays in each month at Hawker-Siddeley Dynamics Ltd., Gunnels Wood Road, Stevenage, Hertfordshire. Secretary, W. P. Sheppherd, G3WMA, 83 Spring Road, Letchworth, Hertfordshire.

The Society's President, John Graham, G3TR, has been very well travelled this year, and among the many clubs which he has visited was the Echelford Amateur Radio Society. In this picture are G3TLG, the Chairman; G3AFT, the Vice-President; G3DXA, the President; John Graham, G3TR, and G3SAZ, apparently another Vice-President. In the background can be seen the aerial system for an Amateur TV demonstration.
(Photo by G3UNV)

REGION 6

Cheltenham (RSGB Group)—First Thursday in each month, 8 p.m., Great Western Hotel, Clarence Street, Cheltenham.
Forest Glade DX Club—This is a fairly new Club, specifically formed for contest operating. The Club call-sign is G3WWV. Members recently entertained WA4IKU and WA6CEB at their homes. Forest Glade, 3 Chinner Hill, Chinner, Oxford.
Gloucester (GRC)—Second and fourth Thursdays in the month, 7.30 p.m., Lamb Inn, Market Parade, Gloucester.

REGION 7

Acton, Brentford, Chiswick (ABCRC)—15 October ("Transistorized Mobile S.S.B. Tx," by G3CCD) 7.30 p.m., Chiswick Trades and Social Club, 66 High Road, Chiswick.
Addiscombe (AARC)—Second and fourth Tuesdays in each month, 7.30 p.m. 158 Lower Addiscombe Road (Toc H Hall).
Ashford (Middx.), (Echelford ARS)—31 October, St. Martins Court, Kingston Crescent, Ashford.
Barking (B & DEC)—Tuesdays and Thursdays, 7.30 p.m., Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking, Essex.
Bexleyheath (NKRS)—10 October (Junk Sale), 24 October (The Other Man's Hobby), 7.30 p.m., Congregational Hall, Chapel Road, Bexleyheath.
Chingford Group—Fridays. For details of meetings telephone 01-524 0308.
(SRC)—Fridays, 8 p.m., except the first Friday in the month, Friday Hill House, Simmons Lane, Chingford, E4.
Civil Service Radio Society—Meetings are held on the first and third Tuesdays of each month. On 15 October, Messrs Weller Electrics will lecture on "Soldering." *Membership is open to all Civil Servants and similar employments and is WORLD WIDE.* Members have undertaken to provide an article per issue for the *Newsletter*, so no more headscratching for the Editor. Car parking is convenient, and free, after 6 p.m. or 6.30 p.m., dependent upon site. Meetings begin at 6.30 p.m. for 7 p.m., at The Civil Service Sports Centre, Monck Street, London, SW1. Details from, G3KGM, 52 Pinewood Avenue, Sidcup, Kent. Tel. 01-300 0767.
Croydon (Surrey RCC)—15 October, 7.30 p.m., Blue Anchor, South End, Croydon.
Crystal Palace (CP & DAC)—19 October ("The Early Days," by G3IIR), 8 p.m., Emmanuel Church Hall, near Dulwich.
Dorking (DR & DRS)—8, 22 October at the "Wheatsheaf," Dorking.
Ealing (E & DARS)—Tuesdays, 8 p.m., Northfields Community Centre, Northcroft Road, W13.
East London—20 October, 2.30 p.m. (Radio Astronomy), Wanstead House, The Green, E11. Full details may be obtained from G3AAJ.
Edgware and Hendon (EADRS)—14, 28 October, 8 p.m., St. Georges School, Flower Lane, Mill Hill, NW7.
Gravesend (CRS)—Third Wednesday of each month, 8 p.m., RAFTA Club, Overcliff Road, Gravesend.
Guildford (G & DRS)—11 October (What did you see at the RSGB Exhibition), 25 October (Natter Nite), 8 p.m., Guildford Engineering Society in Stoke Park.
Hampton Court (TVARTS)—First Wednesday in each month, 7.30 p.m., Cardinal Wolsey, Hampton Court.
Harlow (H & DRS)—Tuesdays (General), Thursdays (c.w. practice), Fridays (Juniors), 24 October (Lecture), Mark Hall Barn, First Avenue.
Harrow (RSH)—11 October (Talk by G3HDA on TVI), 18 October (Annual Dinner), 25 October (Practical), Roxeth Manor School, Eastcote Lane, Harrow.
Havering (H & DARC)—9, 23 October, 8 p.m., British Legion House, Western Road, Romford, Essex.
Holloway (GRS)—Mondays, 7 p.m. (RAE), Wednesdays, 7.30 p.m. (Morse), Fridays, 7.30 p.m. (Club), Montem School, Hornsey Road.
Kingston (K & DARS)—Second Wednesday in each month, 8 p.m., Penguin Lounge, 37 Brighton Road, Surbiton.
Leyton & Walthamstow—Tuesdays, 7.30 p.m., Leyton Senior Institute, Essex Road, E10.
London U.H.F. Group—First Thursday each month, (6 October, Meeting at Exhibition), 8 p.m. White Hall Hotel, Bloomsbury Square, Holborn, WC1.
Maidenhead (N & DARC)—15 October, 7.30 p.m., Victoria Hall, Cox Green, Maidenhead.
New Cross—Wednesdays and Fridays, 8 p.m., 225 New Cross Road, London, SE14.
Norwood and South London—See Crystal Palace.
Paddington (P & DARS)—Thursdays, 7.30 p.m., Beauchamp Lodge, 2 Warwick Crescent, W2.
Purley (P & DRS)—First and third Thursdays each month, 8 p.m., Railwaymens Hall, 58 Whytecliffe Road, Purley.
Reigate (RATS)—9 October ("Transistor transmitters," by G3RIN), 7.45 p.m., George and Dragon, Cromwell Road, Redhill.
Romford (R & DRS)—Tuesdays, 8.15 p.m., RAFTA House, 18 Carlton Road, Romford.
Scouts (Kensington)—17 October, 7.30 p.m., Baden Powell House, Queensgate, South Kensington, SW7.
Sidcup (CVRS)—3 October (Extraordinary G.M. to approve new rules), 17 October (Surplus Sale), All Saints Church Hall, Bercia Road, New Eltham. All meetings commence at 8 p.m.
Southgate (SRC)—Parkwood Girls School (behind Wood Green Town Hall).
St Albans (Verulam ARC)—16 October ("P.E.P. and all that," by G3SBA).
Stevenage (SDARS)—8 p.m., 3 October ("Lasers," by G3DGN), 17 October (Heathkit Demonstration).
Sutton & Cheam (SCRS)—15 October ("Fundamental Calculations for Transistor Circuits," by DJ0DV), 25 August (Sutton and Cheam Mobile Rally).
Welwyn (Mid Herts ARS)—Welwyn Civic Centre, Welwyn.
Wimbledon (W & DRS)—11, 25 October, 8 p.m., St John Hall, 124 Kingston Road, South Wimbledon SW19.
Wembley (GECARS)—Thursdays, 7.30 p.m. The club is open to non GEC employees by invitation. Telephone ARNold 1262 first. Sports Club, St Augustin Avenue, North Wembley.

REGION 8

Crawley (CARC)—On 9 October, the usual informal meeting will be held. Details from G3FRV. The main meeting on 23 October will consist of an illustrated film talk by Arthur Milne (G2MI) on his travels in the USA and Canada. Visitors are welcome, as always.
Mid-Sussex (MSARC)—10 October ("Simple approach to 70 cm," by C. Amery, G8AXN), 24 October (Details from G3RXJ). All meetings at 7.45 p.m. at Marle Place Further Education Centre, Leylands Road, Burgess Hill. Enquiries should be directed to E. J. Letts, G3RXJ.
North Kent (NKRS)—Thursdays, 8 p.m., Congregational Church Hall, Bexleyheath.
South Coast (South Coast V.H.F. Group)—Details from G3JHM.
Worthing (W & DARC)—Rose Wilmot Youth Centre, Worthing.

REGION 9

Bristol Group—10 October (Open Invitation Evening to a General Interest Film Show, your wife, girl friends, neighbours, friends are all invited to spend an evening with the Group), 22 October ("Tale of a Quad," by G. Twist, G3LWH), 7.30 p.m., Beckett Hall, St Thomas Street, off Victoria Street, Bristol 1. G3PFD.
(BARC)—Mondays and Thursdays, from 7.30 p.m., University Settlement, 41 Ducie Road, Barton Hill, Bristol 5. G3WLZ.
Cornwall (CRAC)—3 October ("Short Cine Film, and Talk on Goonhilly"), 10 October ("Lecture and Exhibition, by J-Beam Engineering Ltd," at the Savoia Hotel, Newquay), meetings at the SW Electricity Board Social Centre, Pool, Camborne. G3NKE.
(S.S.B. Group)—Second Thursday in each month, 7.30 p.m.
(V.H.F. Group)—Third Thursday in each month, 7.30 p.m. Both Groups meet at the Barley Sheaf, Truro. G3OCB.
Exeter (EARS)—First Tuesday in each month, 7.30 p.m., George and Dragon, Blackboy Road, Exeter. G3HMY.
Plymouth (PRC)—First and Third Tuesdays in each month, 7.30 p.m., Virginia House, Bretonside, Plymouth. G3UQF.
Saltash (S & DRC)—Burraton Toc H Hall, Warraton Road, Saltash. G3UBY.
Taunton Group—11 October, 7.30 p.m., Lecture Theatre, Taunton Technical College. G3WNV.
South Dorset (SD ARS)—First Friday in each month, 7.30 p.m., Labour Rooms, West Walk, Dorchester. G3AKF.
Torquay (TARS)—Every Tuesday and Friday, 7.30 p.m., Club nights. Business meeting the last Saturday in each month, 7.30 p.m., Club Headquarters, Bath Lane, rear of 94 Belgrave Road, Torquay. 26 October ("Transistor Regenerative Rx," by Sir Douglas Hall). At the August meeting the Chairman welcomed old member G3TRW home on leave from El Adem, North Africa, together with two new keen SWL members. Four members passed the recent RAE. A film show of past events of the Club history, and activities were shown and presented by G3LHJ. G3VNG.
Wells (WARS)—Mondays from 8 p.m., EMIE Sports Club, Chamberlain Street, Wells. G3MQQ.
Weston-Super-Mare (WSMARS)—First Friday in each month, 4 October, 7.30 p.m., Westhaven School, Ellesmere Road, Uphill, W-s-M. G3GNS.

Yeovil (YARS)—Wednesdays, 7.30 p.m., Park Lodge, The Park, Yeovil. Tape Lectures on 16 October, 13 November, 11 December. G3NOF.

REGION 10

Blackwood (ARC)—7.30 p.m., Fridays. Headquarters off High Street, Blackwood, Mon. Further details from the Secretary, F. Mudford, 3 Albany Road, Blackwood, Mon.

Barry College of Further Education (ARS)—Thursday, 7 p.m., at the College, Colcot Road, Barry, Glam.

Cardiff (RSGB Group)—14 October (Annual General Meeting), 7.30 p.m., TA Centre, Park Street, Cardiff.

Llanelli Boys Grammar School (ARS)—Fridays at 3.30 p.m. at the School.

Pontypool (ARC)—Tuesdays, 7 p.m., Educational Settlement, Rockhill Road, Pontypool, Mon.

Pembroke (ARC)—Friday, 25 October, Defensible Barracks, Pembroke Dock at 7.30 p.m.

Rhondda (ARS)—Meeting, 14 October (Film Show), Pengelli Hotel, Treorchy at 7.30 p.m.

University College, Cardiff (ARS)—Details of the activities of this Society available from the Secretary, Students Union, Dumfries Place, Cardiff.

REGION 11

Rhyl (R & DARC)—Second Tuesday in each month. Rhyl's Silver Band Room, Windsor Street, Rhyl.

REGION 12

Aberdeen (AARC)—Fridays, 7.30 p.m. 4 October (Junk Sale), 11 October ("My Problem is . . ." (Panel)), 18 October ("Space Flight Communication," by GM3AEL), 25 October (Film Show). 6 Blenheim Lane, Aberdeen. GM3HGA.

Moray Firth (MFARS)—Mondays, 6 October ("P.C. Elching"). Further details from GM3IAA.

REGION 13

Edinburgh (LRA)—Alternate Thursdays, 7.30 p.m. Board Room, YMCA, 14 South St Andrew Street, Edinburgh.

Scottish Border Area—All members in the Scottish Border Area comprising the counties of Berwickshire, Peebleshire, Selkirkshire, and Roxburghshire, who are interested in the formation of a local Amateur Radio Group, are requested to contact George Shankie, GM3WIG, 8 Ettrick Terrace, Hawick.

REGION 14

Ayrshire (AARG)—Sundays, 7.30 p.m., Peter Boyle Bowling Club, Graigie Road, Ayr.

Glasgow University (GURC)—11 October, 7.30 p.m., Engineering South Building, University of Glasgow.

Greenock (G & DARC)—11, 25 October, 7.30 p.m., Arts Guild, Campbell Street, Greenock.

Lowlands Royal Signal Group (LRSG)—15 October, 7.30 p.m., 21 Jardine Street, Glasgow.

Mid-Lanark RSGB Group—18 October (Measurements, Ian Swan GM8BSW), 7.30 p.m., YMCA, Brandon Street, Motherwell.

REGION 15

Bangor (B & DARC)—First Friday in each month. Silverstream Unionist Hall, Belfast Road, Bangor, Co. Down. RAE class started in September, for details contact GI3OLJ.

Ulster (Mid-Ulster RSGB Group)—Temperance Hall, West Street, Portadown. For further details contact GI3ILV.

REGION 16

Ipswich (IRC)—18 October (Visit to Sugar Beet Factory), 25 October ("F.M. Tuners," by J. Rutherford), 7.30 p.m. Red Cross HQ, Gippeswyk Avenue, Ipswich.

Norwich (NARC)—Mondays, 7.30 p.m. 7 October (Lecture and Discussion on Linear Amplifiers), 14 October (Informal Meeting), 21 October (Do You Know? (Quiz)), 28 October (Industrial Electronics, by Reg. Chittock, G8AUN), 4 November (Junk Sale, Bring and Buy). All meetings at 7.30 p.m., the Clubroom, Brickmakers Arms, Sprowston Road. Sec., M. J. Cooke, 76 Falcon Road, West, Sprowston, Norwich, NOR 73R.

Gt. Yarmouth (GYRC)—7.30 p.m., Fridays, 4, 11, 18, 25 October, 98 Market Road South, Gt. Yarmouth.

REGION 17

Chippenham (C & DARC)—Tuesdays, 7.30 p.m. Details from G3PQG.

Farnborough (F & DRS)—7.30 p.m., 8 October (Natter Night), 22 October ("Thin film micro. circuits," by G3KND). Railway Enthusiasts Club, 310 Farnborough Road, Farnborough.

Reading (RARC)—8 p.m. Alternate Tuesdays commencing 8 October. Lounge of the Victory, The Meadway, Tilehurst.

LOOKING AHEAD

2-5 October—RSGB International Radio Engineering and Communications Exhibition, Royal Horticultural Society's New Hall, Greycoat Street, Westminster, London SW1. 10 a.m. to 9 p.m.
6 October—EI-GI Convention.
12-13 October—DXpedition to Kinross, GM8HP/P and GM3NVU/P. 160m., s.s.b. and c.w.
14 October—RSGB Council Meeting.
19-20 October—Special Event Station, GB3HH. JOTA. Gravesend and District Scout Association's Camping and Training Ground, Hopehill, Meopham, Gravesend, Kent. 80-10m, s.s.b. c.w. QSLs via G3WAO.
23 October on—DXpedition to Andorra. PX1BW. Frequencies as used on W9WNV expedition.
25 October—RSGB Dinner Club, Kingsley Hotel, Bloomsbury Way, London WC1. 7.30 for 8 p.m. 25s. per person. Reservations to RSGB HQ.
26-27 October—DXpedition to Sint Maartin Is. PJ5MN. 10, 15 and 20m. QSLs via W2GHK.
26-29 October—DXpedition to St Martin, FS7. VE3EUU and PJ2MI will be operating FG7TI/FS7 on s.s.b. on 26-27 October, and on RTTY on 28-29 October on 14095 kHz.
12 November—RSGB Council Meeting.
15 November—RSGB London Lecture Meeting: " Single Sideband at V.H.F." G3LBA, G3MED, G3SHK and G3FZL. Institution of Electrical Engineers, Savoy Place, London, WC2. Buffet tea 6 p.m. Lecture 6.30 p.m. Tickets from RSGB HQ.
16 November—Scottish V.H.F. Convention, Royal Signals (TA) Drill Hall, 21 Jardine Street, Glasgow NW, from 2.30-5.45 p.m. High tea will be served in the Methodists Hall, Marhill Road, Glasgow, NW, from 6.30 p.m. There will be lectures and displays of equipment, with a bring and buy sale. Talk-in stations will be operating on 4 and 2m. The charge for the convention will be 21s, and tickets are available from GM3RXU, GM3VAP, GM3VIO, GM3VOX and GM3UWX.
23-24 November—DXpedition to Curacao. PJ0CC. QSLs via W2ADE.
3 December—Winter Radio Amateurs' Examination. RSGB Centre at the College of Preceptors, Bloomsbury Square, London, WC1. Members 35s, Non-members 45s. Closing date 31 October.
6 December—RSGB Annual General Meeting. Royal Society of Arts, John Adam Street (off Strand), London, WC2.
7 March—RSGB London Lecture meeting.

CONTESTS

5-6 October—Third 432 MHz (Open) Contest.
5-6 October—VK/ZL/Oceania Contest (Phone). 10.00 Sat.-10.00 Sun. (see page 458, July).
5-7 October—Massachusetts QSO Party. 23.00 Sat.-05.00 Mon. (see page 670).
5-7 October—California QSO Party. 20.00 Sat.—02.00 Mon (see page 671).
12-13 October—28 MHz Telephony Contest (see page 405, June).
12-13 October—Second 1296 MHz (Open) Contest.
12-13 October—VK/ZL/Oceania Contest (C.W.) 10.00 Sat.-10.00 Sun. (see page 458, July).
16-17 October—YLRL Anniversary Party Contest (C.W) 18.00 Wed.-18.00 Thu.
19-20 October—WADM Contest (C.W.) 15.00 Sat.-15.00 Sun. (see page 591, Sept.).
19-20 October—11th Jamboree-on-the-air.
26-27 October—7 MHz DX Contest (C.W.) (see page 404, June).
26-27 October—CQ WW DX Contest (Phone). 00.00 Sat.-24.00 Sun. (see page 669).
6-7 November—YLRL Anniversary Party Contest (Phone). 18.00 Wed.-18.00 Thurs.
9-10 November—7 MHz DX Contest (Phone) (see page 404, June).
9-10 November—OK Contest (C.W.).
9-11 November—ARRL SS Contest (Phone).
11 November—Seventh 144 MHz (S.S.B.) Contest.
16-17 November—Second 1·8 MHz Contest (see page 686).
16-18 November—ARRL SS Contest (C.W.).
23-24 November—CQ WW DX Contest (C.W.). 00.00 Sat.-24.00 Sun. (see page 669).
1 December—Fourth 70 MHz (C.W.) Contest.

1969
6 January—First 144 MHz (S.S.B.) Contest.
26 January—Second 144 MHz (C.W.) Contest.
16 February—First 70 MHz (Open) Contest.
1-2 March—Third 144 MHz (Open) Contest.*
12-13 April—Second 70 MHz (Open) Contest.
3-4 May—Fourth 144 MHz (Portable) Contest.*
24-25 May—First 432 MHz (Open) Contest.*
24-25 May—First 1296 MHz Contest.*
22 June—Second 432 MHz (Portable) Contest.
5-6 July—Fifth 144 MHz (Open) Contest.*
27 July—Third 70 MHz (Portable) Contest.
4 August—Sixth 144 MHz (S.S.B.) Contest.
10 August—Third 432 MHz (Open) Contest.
17 August—Fourth 70 MHz (C.W.) Contest.
6-7 September—V.H.F. National Field Day.*
21 September—Seventh 144 MHz (C.W.) Contest.
5 October—Second 1296 MHz (Open) Contest.
3 November—Eighth 144 MHz (S.S.B.) Contest.
7 December—Fifth 70 MHz (C.W.) Contest.

* To coincide with IARU Region 1 Contests

MOBILE RALLIES

20 April, 1969—North Midlands Mobile Rally, Drayton Manor Park, Near Tamworth, Staffs.
10 August, 1969—RSGB National Mobile Rally, Woburn Abbey.
17 August, 1969—Derby and District Mobile Rally.

FET CONVERTERS

2 METRE FET CONVERTER. TIS88A cascode front-end. NF less than 1·0 db. 2 MHz. bandpass coupler ahead of 3N141 dual gate MOSFET mixer. Cathodeon VHF sub-miniature crystal. Silicon planar injection stages. High Q break. Power: 12v. at 9 ma. D.C. Positive earth. IFs.: 12-14, 14-16, 18-20, 20-22, 24-26, 28-30 MHz. **£16**

2 METRE SSB TRANSVERTER CONVERTER. Spec. as above less injection stages but including high Q break tuned to injection frequency. IFs : 14 MHz (130 MHz inj.), 28 MHz (116 MHz inj.). **£12**

SATELLITE CONVERTER. 136–138 MHz. Spec. as 2 metre unit. IFs : 20-22, 28-30 MHz. **£16**

FET PREAMPLIFIERS. TIS88A cascode front-end. NF less than 1·0 db. 2 MHz bandpass coupler preceding 2N3819 source follower 75 ohm output **£12**

4 METRE FET CONVERTER. Spec. as 2 metre unit. IFs : 2·1-2·7, 4·1-4·7, 18·1-18·7, 29·1-29·7 MHz. **£16**

Post and packing 3/9 per item

JXK CONVERTERS

Peel House, Porters Lane, Ospringe, Faversham, Kent.

ECHELFORD COMMUNICATIONS

32, FELTHAM HILL ROAD, ASHFORD, MIDDLESEX

As Echelford Communications is proving a little hard to find for one or two of you this month will be given over to directions on how to find us.

From London: Proceed down the A30 past London Airport towards Staines. After passing the Airport (about ¾ mile) you will come to a large roundabout you will require the 2nd exit (the A30 being the 3rd exit) " Princes Ski Club " board will show you the road if in doubt. About 1 mile down this road, passed a playing field, you will come to a crossroads. Turn right. 200 yds you will come to another roundabout, 2nd exit (straight across) and about 150 yds on the right is Echelford Communications.

More routes next month.

CODAR equipment is now coming in, including AT5's and P.S.U.'s
J BEAMS for 2 metres, 4 metres and 70cms (bit dead since GB's on 144 mc/s!)
CHANNELMASTER beam rotators, alignment bearings etc.
HALSON mobile whips
ECHELFORD 4M transmitters
Jap Meters. MR38 series, above 1 mA 26/- MR45 series, above 1 mA 27/6d.
STC diecast boxes, including the new deep types.
RSGB and other publications.

And a new service to you: QSL cards. Top quality work and card. 10/14 days delivery. 25/- 250 (post free) 70/- 1,000 (post free). SAE samples.

Trade-ins considered for both new and S/H items.

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NEW LAFAYETTE SOLID STATE HA600 RECEIVER

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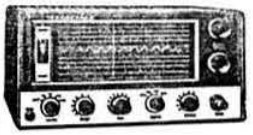
LAFAYETTE HA350 AMATEUR BAND RECEIVER £67. 10. 0



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8 valves, 5 bands incorporating two MECHANICAL FILTERS for exceptional selectivity and sensitivity. Frequency coverage on 5 bands 150-400 kc/s. 550-1,600 Kc/s. 1.6-4.0 Mc/s. 4.8-14.5 Mc/s. 10.5-30 Mc/s. B.F. stage, aerial trimmer, noise limiter, B.F.O. product detector, electrical bandspread, S meter, slide rule dial. Output for phones, low to 2KΩ or speaker 4 or 8 ohms. 220/240 volt A.C. Size 7½ in. × 15 in. × 10 in. Brand new guaranteed with handbook. **36 Gns,** Carr. 10/-

TRIO 9R-59DE

Brief spec: 4 band covering 550 Kc/s to 30 Mc/s continuous and electrical band spread on 10, 15, 20, 40 and 80 metres. 8 valves plus 7 diode circuit. 4/8 ohm output and phone jack. SSB-CW, ANL. variable BFO, S meter, sep. band spread dial. IF frequency 455 Kc/s. audio output 1.5 W. variable R.F and AF gain controls. 115/250 volt A.C. Size: 7 in. × 15 in. × 10 in. with instruction manual. **£37 10 0 Carriage 12/6.**

TRIO JR 500SE AMATEUR BAND RECEIVER £62. 10. 0.

UNR-30 4 BAND COMMUNICATION RECEIVER

Covering 550 Kc/s 30 Mc/s. Incorporates variable BFO for CW/SSB reception. Built in speaker and phone jack. Metal cabinet. Operation 220/240 volt A.C. Supplied brand new, guaranteed with instructions. **£13 13 0** Carriage 7/6.

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Just released by the Ministry. High quality 10 valve receiver manufactured by Murphy. 5 bands 650 Kc/s-30 Mc/s. I.F. 500 Kc/s. Incorporates 2 R.F. and 3 I.F. stages, bandpass filter, noise limiter, crystal controlled B.F.O. calibrator, I.F. output etc. Built-in speaker, output for phones. Operation 150/230 volt A.C. Size 19½ in. × 13½ in. × 16 in. Weight 114 lbs. Offered in good working condition. **£22.10.0.** Carr, 30/-. With circuit diagrams. Also available B41 L.F. version of above. 15 Kc/s-700 Kc/s. **£17.10.0.** Carr. 30/-.

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50-0-50μA	35/-	200mA	25/-	20V DC	25/-
100-0-100μA	32/6	200mA	25/-	50V DC	25/-
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1mA	25/-	500mA	25/-	150V DC	25/-
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Ex.Am Control Box with two Londex 7026 24v. D.C. Aerial change-over relays. New **39/6.** Carr. 5/-.

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QQV03-10.2 metre TRANSMITTER KIT
6BH6-6BH6-QQV03-10-QQV03-10. 6 or 12 volth eaters. Inc. Valves AE relay 6 or 12 volt. Less Crystal 8 MHz. Modulator. P.S.U. & Chassis. Delivery 14 days. **£4 17 6**

2 metre converter AFZ 12 1st RF amp. AFZ 12 2nd RF amp: AFZ 12 osc-multiplier GEX 66 mixer: or equivalent transistors of equal performance. Built on printed circuit. Will operate from 8 to 14 volt neg. or pos. earth. Space inside case (5" × 2" × 6") to take battery for portable use. IF adjustable from 12 to 29 MHz. Crystal supplied is in this band, but cannot be specified at this price. Low noise figure. Guaranteed for 3 months. Postage 3/6. Delivery 14 days. **£8 17 6**

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NEW POPULAR
12 volt DC input. 300v DC 150ma output, or 175v at 100ma. Built on aluminium chassis 6 in × 4 in. × 2½ in. with Toroidal transformer (2¼ in. × 2 in. × 1⅜ in.) mounted on top of chassis.
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12v DC in, 390v DC 200ma out.: or 160v at 145ma. Built on chassis 8 in. × 5 in. × 2½ in. with Toroidal transformer (2⅜ in. h. × 2½ in. w. × 2½ in.) and large heat sink mounted on top of chassis Postage 6/6 **£8 18 6**

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All above available with inputs and outputs relay controlled at 37/6 extra. All units are fully fused. Transformers are completely potted. Negative or Positive earth without change, complete and working with 3 months Guarantee. Delivery 21 days. Outputs are measured with mobile vehicles. With static vehicle they will be a little lower

KITS
2 metre transmitter kit (4m version available shortly). 6BH6—6BH6—QQV03-10—QQV03-20a. 6 or 12 volt heaters. Includes AE relay, 6 or 12 volt; and kit of spare valves. Full circuit and point to point wiring instructions. Items not included: Chassis Crystal (8 MHz), Modulator or P.S.U. Delivery 14 days **£14 5 0**
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Based on ready built units less chassis. All components, Toroidal transformer, relays and circuit supplied.

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Standard Model 12 volts input. 15 watts output. OC71 amp. OC72 amp. on pre-tested wired and dipped, printed circuit board. NKT404/404/OC35 driver. P.P. NKT404/OC35 output. Including transformer to suit QQV03-20a. Inc. tailored mike 300-3500 Hz. Less chassis. Postage 6/6 **£4 15 0**

QQV03-10 modulator and audio amplifier dual purpose kit, relay switched. OC 200 mod. compressor, NKT 223 emitter follower, NKT 223a Tx mod. amp and Rx audio amp. NKT 223a emitter follower. NKT 404 Tx and Rx driver. P.P. NKT 404 Mod. and Audio output. Complete with transformers. Pre-tested wired and dipped printed circuit board. Inc. tailored mike, press to talk. 300-3500 Hz. Less chassis.
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Valves QQV03-10 **6/6**
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CODAR ATS, mains PSU, £18. Eddystone S640 receiver, unmodified, £15. Class D wavemeter, 6V A.C. input, £5 5s. KW160, no manual, £18 10s. All items carriage paid.—Evans, 4 Gower Crescent, Baglan, Port Talbot, Glam.

SERVICE SHEETS. Radio, Television, Tape Recorders 1925-1968 by return post, from 1/- with free fault-finding guide. Catalogue 6000 models, 2/6. S.a.e. enquiries.—Hamilton Radio 54r London Road, Bexhill, Sussex.

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Keen Irish SWL requires s/hand radio books, *RSGB Bulletins* (pre '65), *SWMs* (pre '67), *PWs* (pre '67) and others at reasonable price and in gd. cond. The reason, education. J. K. Bradley, Mount Marion, Milford. Co. Donegal, Eire.

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Full algnmnt. prcdre. for HRO-MX rx. Prepared to purchase or hire. H. C. Pryse, 36 Hart Road, Byfleet, Weyfleet, Surrey.

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Mint KW2000A with a.c. p.s.u. for cash purchase. Also, hi-fi stereo pre-amp/amp. in gd. cond. G. N. Dale, 18 Lezayre Rd., Green Street Green, Orpington, Kent. BR6 6BP. Tel. Farn 54512.

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Interstage trnsfrmr. and mod. trnsfrmr for SCR522 tx. Rctfrs. VT266 (1616), R. C. Harris, G2BAB, "Cartref" Port Lane Close, Chillington, Kingsbridge, S. Devon.

Heathkit VF1U, 160m cnvrtr, for car radio. R. Idiens, 77 Amersham Road, High Wycombe, Bucks. Tel. HW 29317.

C.w./a.m., 50W, 4m tx, gd. trnsvcr. considered. A. R. Williams, GM3KSU, 35 Howard Place, Edinburgh 3.

Beg or buy *Wireless World*, Jan. '64, Feb. '65 and Sept. '65 to March '66. Inclusive bound vols '64, '65, '66 considered. Will collect reasonable distance from Rugby or Newark. J. A. Cawkwell, G8BTO, Caunton Manor, Newark, Notts.

Copies of pre '31 *QST*, pre '40 *Radio* and pre-war amateur radio call books. K. C. Lay, 226 Riders Bolt, Bexhill on Sea, Sussex. Tel. Cooden 3758.

Gd. EA12. C. R. Templer, G3RDX, Parsonage House, Woodbury, Exeter. Tel. Woodbury 364.

Wind 12V charger, Lucas Freelight or similar. Price and details. L, W. Lewis, G8ML, 34 Cleevelands Ave., Cheltenham, Glos. Tel. Cheltenham 56094.

KW, Sommerkamp, Heathkit or similar s.s.b. tx. or transcvr. Also cabinet for Hammarlung SP600 rx and 9 MHz xtal fltr. A. J. Goodwin, Chestnut, 8 Holmer Green Rd., Hazlemere, High Wycombe, Bucks.

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Hndk. for Murphy B41 RX. Xtals type HC-6/U, 6·5, 11·5, 12·0 and 12·5 MHz. B. Clark, GW3HGL, Meadfoot, Tan-Y-Bryn Road, Rhos-on-Sea, Colwyn Bay, N.Wales. Tel. Colwyn Bay 44997.

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Continued overleaf

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Two TCS 12 rx or tx, coil box, switch, v.f.o. platform, must be intact. R. J. Rothery, 520 Coventry Road, Birmingham 10, Warks.

Hndbk. for BRT400 rx. Makers original, not transcript. State price please. D. McArthur, GM3TNT, 67 Love Street, Paisley, Renfrewshire.

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Exchange Amtr. gear (v.h.f. etc.), for Aquria gear or fish. W.h.y., J. Brown, G3LPB, Marlborough Farm, Falmouth, Cornwall.

Exchange Command rx, R19, 118-148 MHz, tatty but working, for Command 3-6 MHz rx. All letters answered. J. Walker, G2DCF, 16 Himley Road, Clayton, Manchester, M11 4JF.

Any complete vols. of pre-war wireless periodicals, particularly *Wireless World* 1915-22. Also any American *Short Wave Craft, RSGB Handbook*. 1st edn., *RSGB Annual Log Book*, 1928 with supplements. F. A. Herridge, G3IDG, 96 George St., Basingstoke, Hants.

People nearby to buy and take away all my junk—valves, 19 sets, BC640B, 144 MHz tx. 144 MHz converter plus other gear. Might even supply transprt. to get rid! M. J. Newton, G3UKW, 3 Gillett Drive, Rothwell, Leeds. Tel. Rothwell 3189.

Genuine Vibroplex " original " bug. Other models considered. P. J. King, G3PVA, 10 Holne Chase, Morden, Surrey.

Loan of circt. manual for Green 2M2O/2M20A, 2m rx for a few days for copying. K. Aaron, 33 Broomhill Ave., Knottingley, Yorks.

KW77 or 888A rx. Latest Mk No, must be fb cond. and with manual. Would consider KW2000 or KW2000A. Also Pye Reporter, modified if possible. H. C. Pryse, G3WXT, 36 Hart Road, Byfleet, Weybridge, Surrey.

Urgently require Eddystone 898 dial complete and in gd. cond. Your price paid. B. A. Smith, G3WCY, 74 Lynmouth Drive, Ruislip Manor, Middx. Tel. 01-845 2345 ex 250 (day).

Crct. dgrm. for Monitor unit type 61. Also Morse record course to train air cadets. Please write stating price. Warrant Officer J. Armstrong, 36 Kingsley Ave., Whitley Bay, Northumberland.

Data for sale or loan on Aus. 15C6770 rx. W. A.Wootton, 17 Woodlands Drive, Loughborouth, Leics.

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Hndbk. and circt. dgrm. for Eagle RX80 rx. To borrow or buy. H. F. Dean, G3ANH, 32 Langdale Road, Heaton Chapel, Stockport.

Info. on Pye Ranger type 2007V, 34V. Can photocopy and return tchncl info. Also Central Electronics 20W phasing exciter, cond. unimportant. J. McNab, GM2CQI, 166 Kingswood Drive, Glasgow, S4. Tel. 041-632 2142.

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