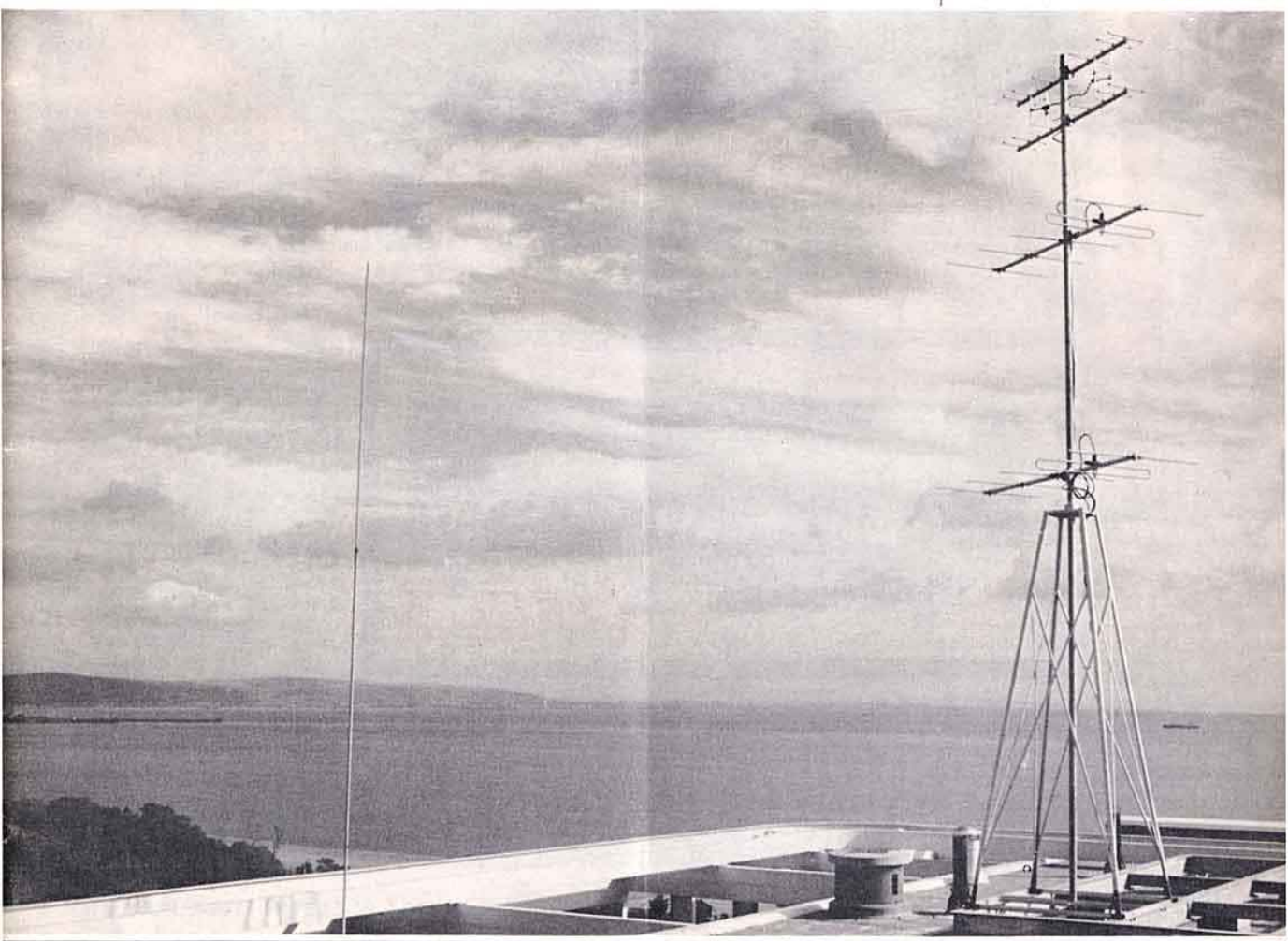
RSGB

BULLETIN

FEBRUARY 1967
VOL 43, No. 2

GB3GW



JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

KW 201 *High quality — low price*

AMATEUR BANDS COMMUNICATIONS RECEIVER

The KW 201 has been specifically designed for optimum performance on Single Sideband. 11 ranges give coverage in the amateur bands from 1.8 mc/s to 30 mc/s. A mechanical filter gives an I.F. selectivity of 3.1 kc/s at 6 db and 6 kc/s at 60 db. A 'Q' multiplier is available giving a variable range of 3.1 kc/s to 200 cycles selectivity.

£105 *basic*

additional extras if required 100 kc/s Crystal Calibrator £6.0.0. 'Q' Multiplier £8.10.0.

ALSO AVAILABLE

KW VANGUARD transmitter, 10-160 metres AM and CW **£73**

KW VESPA Transmitter, 10-160 metres SSB, AM and CW complete with AC PSU **£120**

KW600 Linear Amplifier—500w P.E.P. 572B tube built in power supply **£110**

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Microphones, co-axial cable and all your amateur radio equipment always in stock.

KW 2000A Transceiver

180 watt P.E.P. operation on all amateur bands 10-160 metres, complete with AC power supply **£220.0.0** inclusive. 12v DC supply available.

KW ELECTRONICS Ltd.,

1 HEATH STREET, DARTFORD, KENT *Phone:* DARTFORD 25574

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Now The Heathkit Single-Banders Feature New Performance & Value

• Upper/Lower Sideband On All Models • Improved Design & Styling • Improved Audio & AVC Response • ALC Input For External Linear Amplifiers • More Convenient Control Locations

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£55 £53.10

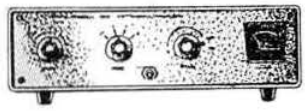
● 200 watts P.E.P. SSB transceivers ● Choose 80, or 20 metre model ● Single knob tuning with 2 kc/s dial calibration ● Operate fixed or mobile with appropriate Heathkit power supply ● Crystal filter type SSB generation ● High-performance receiver ● Built-in S-meter, VOX, PTT, and ALC

Now An Improved Version of the SSB Transceiver That Opened Up A New Era In Amateur Radio . . . the number of Single-Banders you hear on the air is proof of their popularity, so now Heath has improved on these favourite transceivers . . . to bring you even greater economy and better performance.

Practical Improvements For Operating Convenience . . . the microphone input & gain control, plus bias adjustment are now located on the front panel for ease in changing from fixed to mobile operation. An added function switch position controls the optional HRA-10-1 plug-in crystal calibrator. And the power connectors are now fully compatible with Heath SB-Series power supplies.

Engineered With Heath "Know How." The receiver features 1 μv sensitivity, 2.7 kc/s selectivity, and slow AVC action for optimum SSB reception. Transmitted carrier and unwanted sidebands are at least 45db down. Here is the performance you expect in higher priced equipment.

Heathkit "1 kW. Kompact" The Perfect Kilowatt Linear For Your Single-Bander



Designed For Easy Assembly. Over 90% of the components mount on a heavy-duty circuit board. Alignment is easy, requiring only a broadcast receiver, VTVM with RF probe, and a dummy load.

Single-Bander Plus 1 kW. Kompact Puts You On-The-Air With A Full KW P.E.P. Input SSB For Less Than £300. 1 kW Kompact tunes 80-10 metres. Features built-in SWR meter & antenna change-over relay, ALC output. Matches 52 ohm coax. Choose HP-14/HP-24 power supply.

Kit HW-12A, 80 metre, 15 lb. **£55**
Kit HW-32A, 20 metre, 15 lb. **£53-10-0**
GH-12, Push-to-Talk & VOX Mike, 2 lb. **£3-10-0**
Kit HRA-10-1, Plug-In 100 kc/s Crystal Calibrator, 1 lb. **£4-10-0**
Kit HP-13, DC Power Supply (mobile), 7 lb. **£33-0-0**
Kit HP-23E, AC Power Supply (fixed station), 19 lb. **£22-0-0**
Kit HS-24, Mobile Speaker, 4 lb. **£4-9-3**
Kit HA-14, 1 kW. Kompact, 10 lb. **£51-0-0**
Kit HP-14, High Power Mobile Supply, 10 lb. **£45-15-0**
Kit HP-24, High Power Fixed-Station Supply, 22 lb. **£25-10-0**

SPECIFICATIONS—RF Input: 200 watts PEP. **Sideband generation:** Crystal lattice band-pass filter method. **Stability:** 200 c/s per hour after warm-up. **Carrier & unwanted sideband suppression:** 45db. **Frequency coverage:** HW-12A, 3.6-3.8 Mc/s; HW-32A, 14.2-14.35 Mc/s. **Receiver sensitivity:** 1 μv for 15db (S + N)/N ratio. **Receiver selectivity:** 2.7 kc/s at 6db, 6.0 kc/s at 50db. **Output:** 50 ohm fixed (unbalanced). **Operation:** LSB, USB. **Audio output:** 1 watt at 8 ohms. **Mike input:** Hi-Z. **Tube complement:** Fourteen tube heterodyne circuit: (3) 6EA8's mic. amp. VOX relay amp., IF amp., RF amp., Recvr. mixer; (5) 6AU6's, VFO, VOX amp., IF amps., Xmtr. mixer; (1) 6BE6, VFO isolator (HW-12A), Het. osc. and mixer (HW-22A & HW-32A); (1) 12BY7 Driver; (1) 12AT7 Xtal. osc., product det.; (1) 6EB8 Audio amp. and output; (2) 6GE5 RF output. **Power requirements:** 800 VDC at 250 MA peak, 250 VDC at 100 MA, —130 VDC at 5 MA, 12 VAC or VDC at 3.75 amperes. **Cabinet dimensions:** 6½ in. H × 12¼ in. W × 10 in. D.

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A

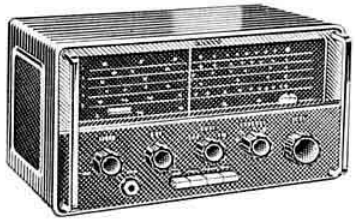
Eddystone EA 12

Amateur communication receiver

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.

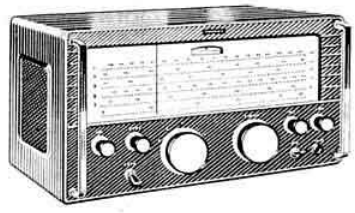
Primary features. Crystal controlled 1st oscillator, 2nd oscillator with continuously variable selectivity to 50 Hz, muting switched or by external relay, twin noise limiters, for a.m/c.w, and s.s.b, short-term drift better than 20 Hz and less than 100 Hz in any one hour, 'S' meter calibrated in nine 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. **£185.**

OTHER RECEIVERS IN THE FAMOUS EDDYSTONE RANGE



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. **£48.**



840C A.C or D.C communications receiver

An 8-valve receiver with gap free coverage from 600 to 10 metres providing excellent reception of broadcast programmes and all major s.w channels including marine and international distress frequencies. The famous Eddystone extended band spread and logging scale is an essential feature. Suitable for a wide range of a.c and d.c voltages. Fully tropicalized. **£66.**

940 13-valve high sensitivity receiver

A superb high performance receiver incorporating two r.f and two i.f stages, push-pull output and silicon diode noise limiter circuit. Gap free coverage from 480 kHz and suitable for reception of c.w, a.m, and s.s.b modes. Exceptional sensitivity and stability. Built to professional standards for the serious listener. **£133.**

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

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Volume 43 No. 2

February 1967

4/- Monthly

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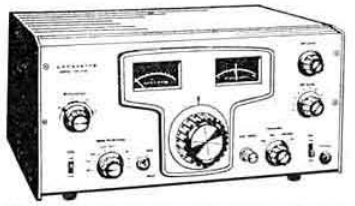
Front Cover: The view eastwards from the GB3GW mast atop Swansea Technical College. An article describing the beacon station appears on page 83.

The RSGB Bulletin is published on the first Wednesday in each month by the Radio Society of Great Britain as its official journal and sent to all members.
The closing date for copy for the March issue is 3 February and for the April issue 10 March.

LAFAYETTE 10-80 Metre SSB/AM/CW Amateur Receiver



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- Complete with Crystals for 80, 40, 20, 15 and 10 Metres
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- "S" Meter-Calibrated in "S" Units 1-9 and to +40 db

MODEL HA.350 Lafayette's newest and most advanced communications receiver. Dual conversion circuitry features an image and IF rejection of more than 40 db. A product detector, providing selectable upper or lower sideband, solves the problems in SSB reception. Tuneable preselector circuit gives sensitivity of less than 1 microvolt for 10 db signal-to-noise ratio. Selectivity: Bandwidth of 2 kc/s at 6 db down and 6 kc/s at 60 db down using mechanical filter. Front panel 100 kc/s crystal calibrator reset control used in conjunction with the 15 Mc/s WWV station assures accurate calibration. CHECK THESE SPECIFICATIONS. Audio output: 1-watt maximum. Speaker impedance: 8; 500 ohms (speaker not supplied). Front panel controls: Preselector; Cal—On/off; Band Selector; Receive/Send; Tuning Cal Reset; Function—Off/AM/SSB1-CW/SSB2; RF gain; AF gain; ANL; Phone jack. Valves: 6BZ6—RF amp; 6BL8—Xtal controlled 1st mixer; 6BE6—2nd mixer; 6BA6—VFO, 6BA6—1M amp.; 6BA6—1F amp; 6AL5—AVC rectifier and AM noise limiter; 6AQ8—product detector and crystal calibrator; 6AV6—1st audio amplifier; 6AQ5—audio output; 6BA6—BFO; OB2—regulator. Silicon Full Wave rectifier. Size: 15in. wide by 7½in. high by 10in. deep. For 230v. 50/60 cps AC. Wt., 25 lb. Less Calibrator Crystal.

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LAFAYETTE KT340 COMMUNICATION RECEIVER SEMI-KIT

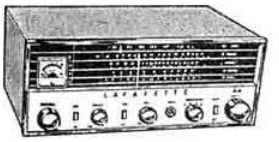
Build this wonderful receiver and save pounds. Supplied semi completed, main components ready mounted, RF section already wired and aligned. Full and precise instructions supplied. Specification: 8 valves + rectifier, 4 bands covering 550 kc/s–30 Mc/s. Incorporates 1 RF and 2 IF stages, "Q" multiplier, BFO, ANL, "S" meter, bandspread, aerial trimmer etc. Operation 115/230v. AC.

Price **25 GNS.** carr. 10/-.

S.W.R. METER. Model S.W.R.3. Freq. 1 : 1 to 1 : 3. 100 μA D.C. Meter. Available 52 or 75 ohms. Bargain offer **79/6.** P & P. 2/6.

R.107 RECEIVERS

Coverage 1·7–17·5 Mc/s. Operation 12V. D.C./230V. A.C. Built in speaker, BFO, vernier dial etc. Ideal set for beginners. Supplied fully tested and checked. £15. Carr. 30/-.



HAM-I 4 BAND COMMUNICATION RECEIVER

4 wavebands covering 535 kc/s–30 Mc/s. 5 valve superhet circuit. Incorporates S meter, BFO. BAND-SPREAD TUNING, BUILT IN 4in. SPEAKER, FERRITE AERIAL AND EXTERNAL TELESCOPIC AERIAL. Operation 220/250v. AC. Supplied brand new with handbook. **£16.16.0.** Carr. 10/-.

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				150mA ..	22/6
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				300mA ..	22/6
				500mA ..	22/6
				750mA ..	22/6
				1-0-1mA ..	22/6
				1A DC ..	22/6
				2A DC ..	22/6
				5A DC ..	22/6
				3V DC ..	22/6
				10V DC ..	22/6
				20V DC ..	22/6
				50V DC ..	22/6
				100V DC ..	22/6
				150V DC ..	22/6
				200V DC ..	22/6
				500V DC ..	22/6
				15V AC ..	22/6
				50V AC ..	22/6
				150V AC ..	22/6
				300V AC ..	22/6
				500V AC ..	22/6
"S" Meter	29/6			"S" Meter	
50μA ..	32/6	1mA ..	22/6	1mA ..	29/6
100μA ..	29/6	2mA ..	22/6		
200μA ..	27/6	5mA ..	22/6		
500μA ..	25/-	10mA ..	22/6		
50-0-50μA	29/6	20mA ..	22/6		
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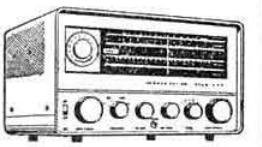
		500-0-500μA	29/6		

POST EXTRA Larger sizes available—send for lists.

LAFAYETTE HA-63A COMMUNICATION RECEIVER

Outstanding value. High-class receiver covering 550 kc/s—41 Mc/s. on 4 bands. Incorporates seven valves plus rectifier, RF stage, illuminated 'S' meter, 1·5μV sensitivity. Electrical bandspread on the 80/40/20/15 and 10 metre bands. Slide rule dial, aerial trimmer. B.F.O., noise limiter. Output for phones or speaker. Operates on 115/220/240V. A.C. Supplied brand new and guaranteed, with manual. **24 Gns.** Carr. 10/-.



R209 MK. II COMMUNICATION RECEIVER

11 valve high grade communication receiver suitable for tropical use. 1-20 Mc/s on 4 bands. AM/CW/FM operation. Incorporates precision vernier drive, B.F.O. Aerial trimmer, internal speaker and 12 v. D.C. internal power supply. Supplied in excellent condition, fully tested and checked. **£22/10/-.** Carr. 20/-.

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Compact true one hand operation. Frequency range 1·7-180 Mc/s. 230v. AC operation. Supplied complete with all coils and instructions. **£12.10.0.** Carr. 5/-.

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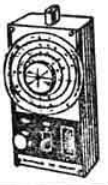

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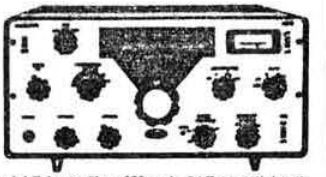
STAR SR.600 AMATEUR COMMUNICATION RECEIVER

New crystal controlled triple conversion de luxe 80-10 metre band receiver. Extremely high sensitivity, selectivity and stability. Special features include 3 IF stages, crystal controlled oscillator, 4 section L/C filter, "S" meter, BFO-ANL, 100 kc/s crystal calibrator, etc. Supplied brand new and guaranteed. New Last Few! Special Price to Clear **£80** each. SAE for full details.



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HA-52A F.M. RECEIVER. 152-174 Mc/s. Fully tuned R.F. stage and 3 I.F. stages. Built in speaker. 115/230 v. A.C. Wonderful value. **£20.** Carr. 10/-.

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JOYSTICK VFA turns PRO!

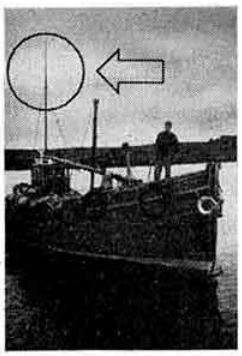
History repeats itself ! Throughout the development of radio communication the keen private experimenter has contributed largely to the advance of our science. The amateurs of the thirties pioneered reliable shortwave transmission and reception. Basic theories and their practical application are to this day latched in the fertile minds of ingenious men who are the leading amateurs of our time.

The Joystick Aerial System can now be regarded as the perfect example of a purely amateur development " turning professional." Thousands of Joystick variable frequency aerial systems have been sold. The enormous number of enthusiastic testimonials that have accumulated at the Joystick factory are now in themselves calling for a separate filing room! The continuing success of the VFA has not only spread right round the world but has finally penetrated the barrier of professional and official circles. Professional bodies in the USA, Europe, Africa and the Far East have ordered VFA systems for operational use and for experimental work. Security forbids the whispering of names but clearance has been given to mention the Nigerian Police and an Australian fire control organisation.

In the Scottish fishing boats which have installed the system communication with other ships and shore stations has become considerably more reliable over difficult paths.

This VFA system is a remarkable invention and its unique quality of high performance at any selected frequency from 1 M/c to 30 Mc/s—particularly from difficult locations—has radically changed the attitude of both the licensed amateur and the shortwave listener towards their aerial problems.

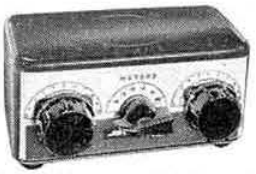
Each Joystick VFA system is complete with a Joymatch matching unit suitable for each type of operation.



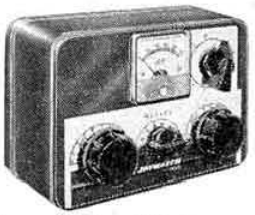
Scottish Fishing Boats Aerial Problems solved !

The Joystick aerial was successfully subjected to the most rigorous tests under appalling weather conditions aboard the MFV *Crystal Sea* OB104 and the MFV *Margaret Ann* OB79 out of Mallaig. Previously the old-fashioned wires had to be lowered every time the ships' derricks were used. Communication with shore stations and other ships was consistently good.

Joymatch Type 2A—General medium wave coverage extending over short wave spectrum.



Joymatch Type 3A—General short wave coverage for SWL. Bandswitched for amateur bands.
Joymatch Type 4—(Similar to Type 3A) For transmission and reception. Bandswitched on 160-10 metres.



Joymatch Type 4RF—For transmission and reception on 160-10 metres. Includes RF meter for peak efficiency.

Joymatch Type 3—General shortwave coverage SWL (Junior model).

You cannot afford to ignore the potential of the Joystick VFA. The system is simple to use—the Joystick VFA will clip to a chimney, tree or mast, can be laid upon a pelmet, stood in the corner of a room, will even give a good account of itself in a basement.

Mobile Joystick systems are available and a new marine model has been introduced for the nautical types!

You are strongly recommended to contact the Joystick factory immediately (or one of our agents) for a brochure with full details.

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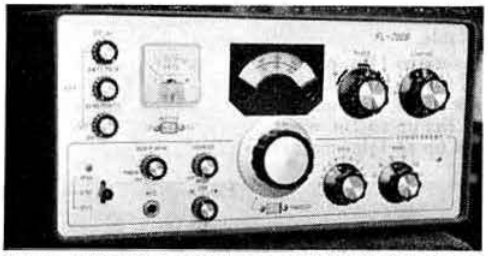

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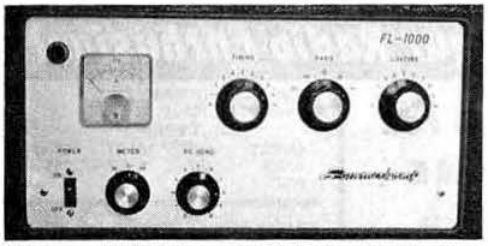

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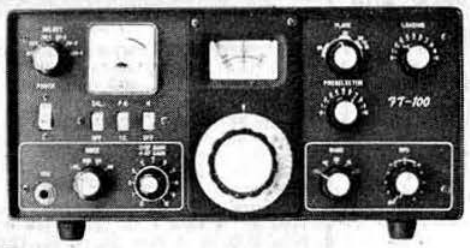

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PRESENTATION OF TROPHIES AT THE SOCIETY'S AGM

9 December. 1966
at the Royal Society
of Arts, London

G3SBA receiving the Ostermeyer Trophy for his article "The G3SBA Top Band Transistor Transmitter."

G3HQT receiving the 1930 Committee Cup as winner of the Low Power Contest 1966.

G3HTA receiving the NFD Shield on behalf of the Exeter Group, winners of NFD 1966.

G3JAF receiving the Whitworth Trophy as winner of the Telephony Section of the 21/28 Mc/s Contest 1966.

The G3YF Memorial Trophy was presented, for the first time, at the AGM to the NFD station scoring highest points on 14 Mc/s. Mr J. J. Hollington, G4GA (right), is handing the trophy and a certificate to the Chairman of the Exeter Group, Mr J. E. Bright, G3TJW.

Mr J. R. Gazeley receiving the Wortley Talbot Trophy for his article "A Fully Transistorized Converter for 432 Mc/s."

G3PXZ receiving the V.H.F. Manager's Trophy on behalf of the Albright and Wilson ARS, highest scoring group in an RSGB 70 Mc/s contest.

G3OQD receiving the Horace Freeman Trophy for his s.s.b. transceiver exhibited at the 1966 Exhibition.

G3MVZ receiving the Courteney Price Trophy fo developing a transistorized transmitter described in the RSGB Bulletin by G3TFW.

G3NMR receiving the Calcutta Key for service rendered to Amateur Radio by himself and his wife.

GM3NYY receiving the Maitland Trophy as Scottish member scoring highest points in two consecutive Top Band Contests.

Part 2 of a series on field effect transistors †

An FET Converter for Seventy Centimetres

By A. L. MYNETT, B. Sc., G3HBW*

THIS article deals with the form, construction and operation of a converter for the 70cm band using field effect transistors. It is a companion design to the 4m and 2m converters described in the November, 1966 issue of the RSGB BULLETIN, and although, like the v.h.f. units, it is fairly inexpensive and easily put together, it nevertheless gives a very high performance in all respects. Measurements show the overall noise figure to be in the region of 5db, the spread being from about 4 to 5·5db. Double frequency-changing is employed within the converter to reduce second-channel effects to an absolute minimum.

The design is intended primarily for incorporation, together with the v.h.f. units, into a complete receiver, using a 2·0 to 4·0 Mc/s tunable i.f., but it can, of course, be used with a standard communications receiver as a tuner, in the normal manner.

The main reasons for designing FETs, rather than ordinary bipolar transistors, into the r.f. and mixer stages of this 70cm front end are rather different from those which suggested their use in the v.h.f. converters. The 2N3819, as a common gate r.f. amplifier at 430 Mc/s, provides a satisfactory, stable, insertion gain of from 12 to 14db, together with an excellent noise performance. In the case of the mixer, the most useful feature of the FET is the high input impedance, in the region of 1 K ohm, attainable in common-source at u.h.f., together with the good noise performance. The former characteristic eases the design of the local oscillator chain which, in this case, requires only three stages in all, using cheap silicon planar devices to provide adequate local oscillator injection (Fig. 1(*a*)). The excellent strong-signal properties of the FET are, of course, still in evidence and will assist in preventing overload from nearby transmitters, such as a neighbouring 2m transmitter during V.H.F. NFD. However, in the writer's experience, there are not too many cases in which serious strong-signal troubles occur due to the proximity of 70cm stations, even in these days of feverish " G8 plus three " activity!

Therefore, a modification to the standard design is included (Figs. 1(*b*) and 4(*b*)) in which a bipolar transistor may be substituted for the FET in the second mixer. In this way, the total cost of the converter is reduced by almost one pound. However, the strong-signal performance is degraded to the extent that the front-end will only accept signals up to a few millivolts without exhibiting serious non-linearity, whereas, using the FET, several 100 mV signals are acceptable. There is no other significant change in performance produced by this modification, apart from a small increase in insertion gain. The second mixer stage is not, of course, protected by any selectivity to interfering in-band signals and yet has 20db or so of gain ahead of it.

The modified design will handle most signals from distances of more than a mile or so, even with mutual beam

* 10 Prior Grove, Chesham, Bucks.

† Part 1 was published in the November 1966 issue.

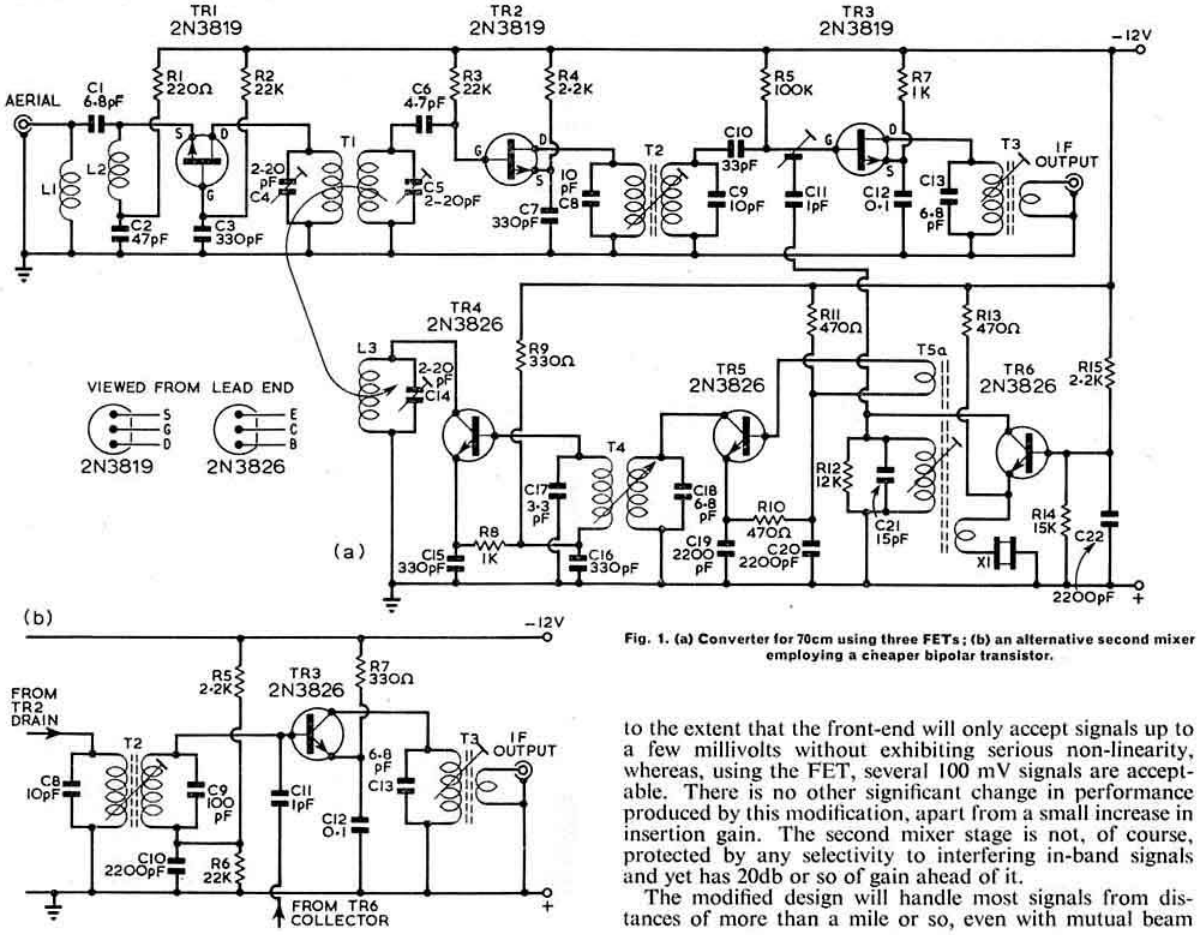


Fig. 1. (a) Converter for 70cm using three FETs; (b) an alternative second mixer employing a cheaper bipolar transistor.

alignment. However, if the full strong-signal performance is required, the standard, all-FET design is recommended.

Form of the Converter

An un-neutralized common-gate r.f. stage, using a 2N3819 (Texas) is inductively coupled into a common-source first mixer, also a 2N3819 (Fig. 1). Then follows a further mixer employing a 2N3819, also in common-source or, in the alternative design already mentioned, a common-emitter 2N3826 silicon planar (Texas), with local-oscillator injection at the crystal frequency itself.

Double tuned circuits, with mutual inductance coupling, are employed between the r.f. stage drain and first mixer gate. The aerial input is fed into the source of the common-gate r.f. stage via a circuit which is the exact dual of a conventional pi-coupler, with two shunt inductors and a series capacitor. This has the advantage that it tends to simulate a high-pass rather than a low-pass filter, at frequencies far outside the matching band, and this helps to reduce possible i.f. interference. The only slight disadvantage relative to the more normal pi-coupler is that mutual coupling between the two coils must be kept fairly low.

Double tuned circuits, at the first i.f. in the 36 Mc/s region, are used to feed the second mixer stage. The second i.f. extends from 2·0 to 4·0 Mc/s, for 432·0 to 434·0 Mc/s coverage, in the present design, using a crystal on or near to 33·077 Mc/s. Surplus crystals do not appear to be available exactly on this frequency, the nearest known being 33·0622 Mc/s, which provides an i.f. of about 2·19 to 4·19 Mc/s. If this offset is not acceptable, it will be necessary to order a crystal specially from a crystal manufacturer. The output i.f. may, of course, be put anywhere in the range up to about 15 Mc/s by appropriate choice of the crystal and by making modifications to the first (T2) and second (T3) i.f. transformers. The changes to be made to T2 are relatively minor and are easily estimated. Sample designs for T3, suitable for several different i.f.s, may be found in the i.f. transformer table (Table 1), 2m section, in the previous article. The formula for calculating the crystal frequency is:

$$\text{crystal freq.} = \frac{432{\cdot}0 - (\text{lowest freq. of tunable i.f.})}{13}$$

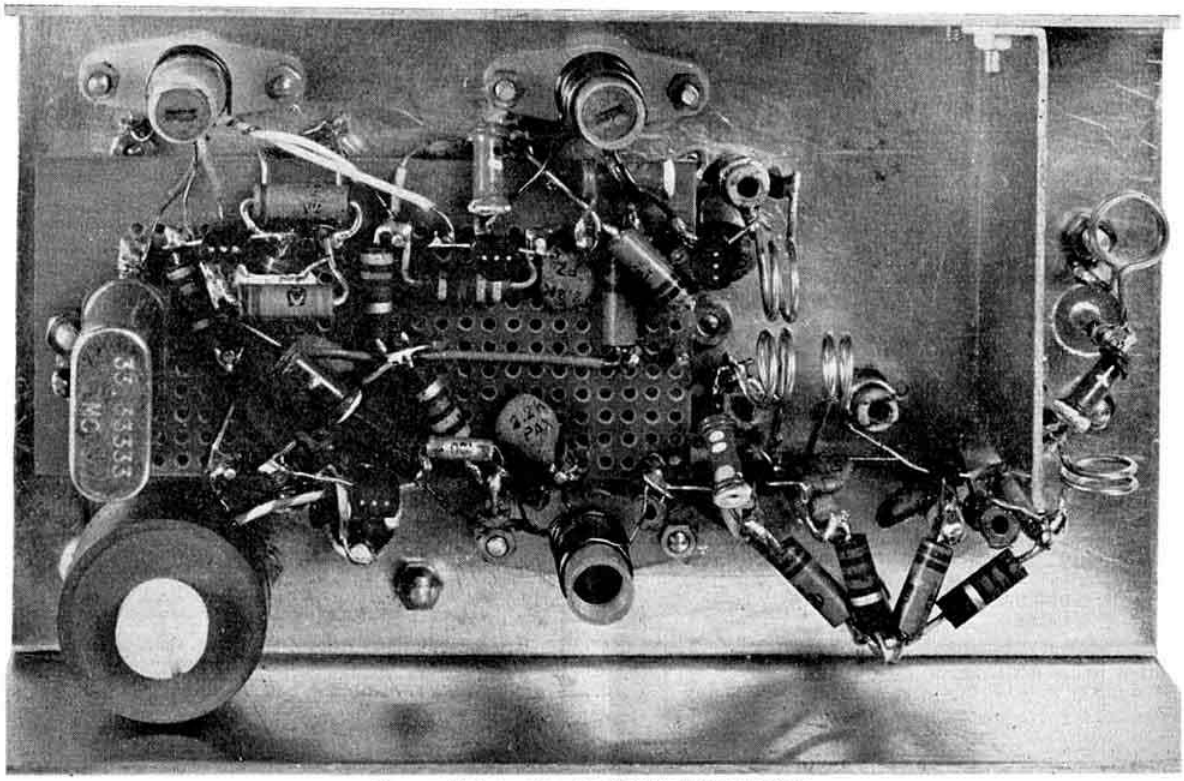
For example, another suitable i.f. would be 3·0 to 5·0 Mc/s, requiring a 33·0 Mc/s crystal, which is, in fact, available on the surplus market at the present time. The design for T2 would be essentially unaltered and that for T3 would be as follows:

Primary: 58 turns of 34 s.w.g. enamelled,
Secondary: 5 turns of 28 s.w.g. enamelled (for 75 ohms output)
13 turns of 28 s.w.g. enamelled (for 600 ohms output) in the pot-core, as before.

The local oscillator chain consists of three stages, employing 2N3826s, the first as an overtone crystal oscillator in the 33 Mc/s region, the second tripling to 99 Mc/s, with double tuned interstage coupling circuits and the final stage quadrupling to about 396 Mc/s which is coupled into the first mixer by the mutual inductance between L3 and the secondary of T1.

Construction

Like the two v.h.f. converters, the 70cm unit uses a piece of Lektrokit board mounted inside a small, 20 s.w.g. aluminium U-channel chassis. The chassis for all three converters are identical but, for the 70cm unit, a shorter piece of Lektrokit



The completed converter using 2N3819 field effect transistor.

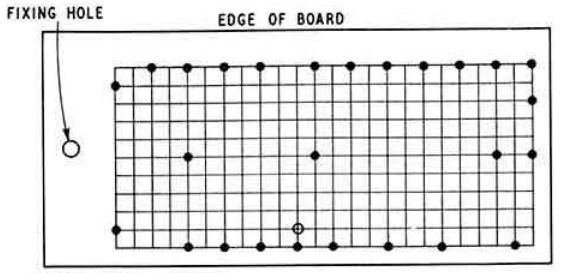


Fig. 2. Wiring pin arrangement on the Lektrokit circuit board.

board is used than for the other two. It is spaced about $\frac{5}{16}$ in. away from the chassis, with one end fixed as previously, the other being secured by soldering a wiring pin to an earthed tag bolted to the chassis. Wiring pins in the board serve to support most components but those operating at signal or first oscillator frequency are mounted either upon ceramic pillars or on small tubular trimmers. A small screen between the input and output circuits of the r.f. stage ensures good stability. The single fixing hole in the screen tab should be marked and drilled only after the two holes have been drilled in the main flange, so allowing the screen to be fitted.

Apart from these details, most of the remarks in the constructional section of the previous article apply also to the

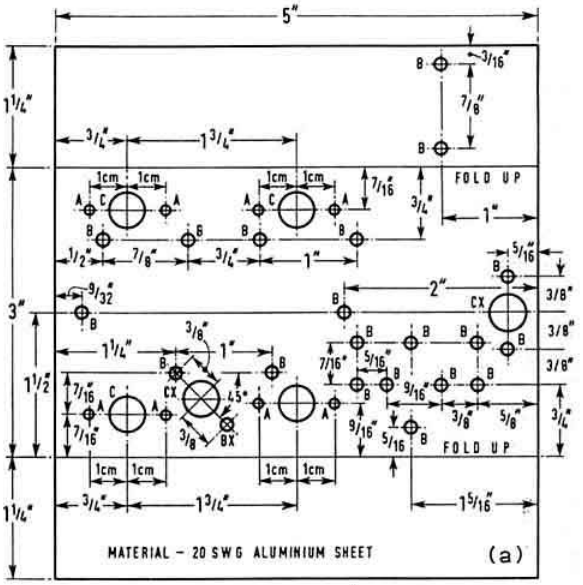


Fig. 3. Dimensions of the chassis and screen for the input stage.

Measured Operating Conditions

All voltages are measured with respect to the —12 volt supply line.

		Emitter or Source	Base or Gate	
TR1	R.F. Amplifier	0·5 to 1·5	—	
TR2	First Mixer	0·7 to 2·0	—	
TR3	Second Mixer	0·7 to 2·0	—	(2N3819 FET)
		0·8	1·1	(2N3826)
TR4	Second Mult.	1·2 to 1·8	—	
TR5	First Mult.	1·5 to 2·5	—	
TR6	Crystal Osc.	0·9 to 1·1	1·5	

Components List

C1, 13, 18	6·8 pF ceramicon
C2	47 pF ceramicon
C3, 7, 15, 16	330 pF disc ceramic
C4, 5, 14	2 to 20 pF tubular ceramic trimmers (Henry's of Edgware Road)
C6	4·7 pF ceramicon
C8	10 pF ceramicon
C9	10 pF ceramicon (FET mixer), 100 pF ceramicon (bipolar mixer)
C10	33 pF ceramicon (FET mixer), 2200 pF disc ceramic (bipolar mixer)
C11	1·0 pF ceramicon
C12	0·1 μF 30V disc ceramic
C17	3·3 pF ceramicon
C19, 20, 22	2200 pF disc ceramic
C21	15 pF ceramicon
R1	220 ohms
R2, 3	22 K ohms
R4, 15	2·2 K ohms
R5	100 K ohms (FET mixer), 2·2 K ohms (bipolar mixer)
R6	not required (FET mixer), 22 K ohms (bipolar mixer)
R7	1 K ohms (FET mixer), 330 ohms (bipolar mixer)
R8	1 K ohms
R9	330 ohms
R10, 11, 13	470 ohms
R12	12 K ohms
R14	15 K ohms
T2, 4, 5	0·3 in. diam. nylon Aladdin former, with iron dust core
T3	Denco Neosid pot-core (Henry's of Edgware Road)
TR1, 2	2N3819 FET (Texas Instruments Ltd.)
TR3	2N3819 FET or 2N3826 bipolar (see text)
TR4, 5, 6	2N3826 bipolar silicon planar transistor (Texas Instruments Ltd.)
X1	HC-6/U crystal (and holder) or HC-18/U crystal, as required
	6 Oxley Type SO1 (6BA) ceramic stand-off pillars
	Lektrokit S.R.B.P. board and wiring pins, as required
	Belling-Lee coaxial sockets, if required

Note: The transistors may be obtained from: Texas Instruments Supplies Division, 12 Wellcroft Road, Slough, Bucks.
Some HC-6/U crystals in the required frequency range may be obtained from Henry's of Edgware Road.
Lektrokit Board and pins are available from Home Radio of Mitcham.
Oxley Stand-Off Pillars may be obtained from Odeon Radio of Harrow.

Coil Details

L1 2 turns, 20 s.w.g. tinned copper, wound on $\frac{1}{4}$ in. mandrel, with $\frac{5}{16}$ in. long leads.

L2 As L1, but with $\frac{1}{8}$ in. leads.

L3 As L1, but with one $\frac{5}{16}$ in. lead and one $\frac{1}{8}$ in. lead.

T1 *Primary:* as L1, but with one $\frac{1}{8}$ in. lead and one 1 in. lead.
Secondary: as L1, but with one $\frac{5}{16}$ in. lead and one $\frac{1}{8}$ in. lead.
Primary and secondary co-axial, earthy ends near together with approx. $\frac{1}{8}$ in. spacing.
(Note: The underside photograph shows clearly the shapes and relative positions of the coils L1, L2, L3 and T1)

T2 *Primary:* 13 turns, 28 s.w.g. enamelled c/w on 0·3 in. Aladdin former.
Secondary: 13 turns, 28 s.w.g. enamelled c/w (2N3819 second mixer); 4 turns 28 s.w.g. enam. c/w (2N3826 second mixer).
Both coils wound initially upon $\frac{1}{4}$ in. drill and allowed to spring off. Earthy ends near together on former, separated by $\frac{1}{8}$ in. Secondary near to chassis end of former.

T3 *Primary:* 82 turns 36 s.w.g. enam., 41 turns wound in two adjacent sections of pot-core former (2·0 to 4·0 Mc/s i.f.).
Secondary: 6 turns 28 s.w.g. (for 75 ohm i.f. output impedance) or 16 turns 28 s.w.g. (for 600 ohm i.f. output impedance), in remaining section.

T4 *Primary:* 5 turns 22 s.w.g. enam. c/w on 0·3 in. Aladdin former.
Secondary: 5 turns 22 s.w.g. c/w on 0·3 in. Aladdin former. Coils mounted with earthy ends near together, space $\frac{5}{16}$ in. Primary near to chassis end of former. Both coils wound initially on $\frac{1}{4}$ in. drill and allowed to spring off.

T5 *Main:* 11 turns 28 s.w.g. enam., close wound on 0·3 in. Aladdin former.
Emitter: 1 turn 28 s.w.g. enam., overwound at " cold " end of main winding.
Output: 2 turns 28 s.w.g. enam., overwound at centre of main winding.

present model. As before, the aerial input and i.f. output terminations may be either internal or external, using Belling-Lee coaxial sockets.

The coils associated with L3 and T1 are tuned with tubular trimmers. The type specified was chosen for its mechanical suitability but it has an unmodified capacitance range of from 2 to 20 pF. This minimum capacity is too high and should be reduced by removing about $\frac{3}{16}$ in. of silvering completely from the normally clamped end of the trimmer using a file and a piece of medium grade emery cloth.

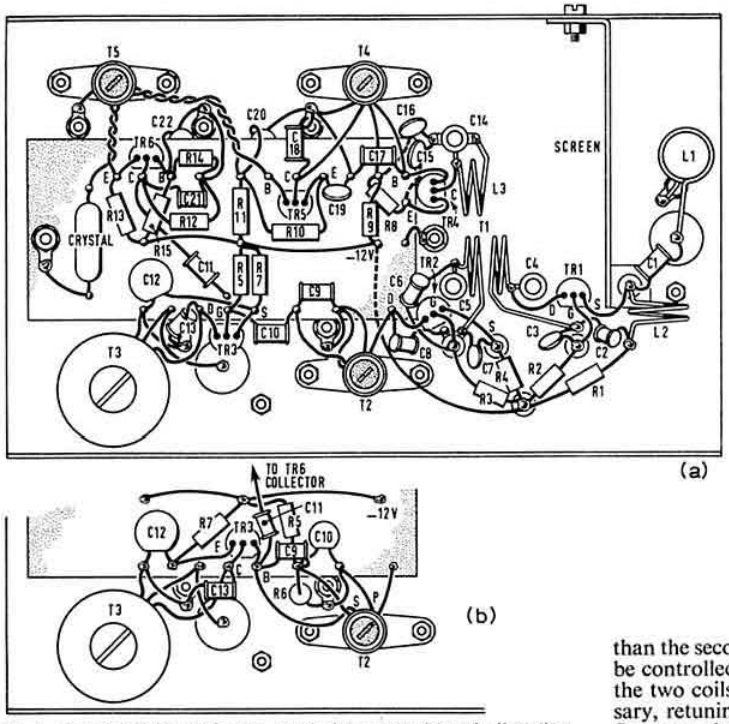


Fig. 4. Component layout for the standard converter (a) and alternative mixer (b).

The coils for L3 and T1 are mounted directly upon their respective trimmers but their earthy ends are not brought to the base of the trimmer, instead they are returned to the stage common-earthing point (Fig. 4 and photograph). The gate lead of TR1 is shown, for clarity, in Fig. 4 as being connected directly to the appropriate stand-off but, in fact, a shorter gate-earth lead results if C3 is grounded by a very short wire and then the gate of TR1 is connected as close as possible to C3 itself. The mixer, TR2, source lead should also be kept short. The by-passing of TR4 is improved if C15 and C16 are taken to their respective pins on the underside of the wiring board, before the latter is fitted. The negative supply wire to the TR1-TR2 stand-off may also be connected underneath the board in this way.

If an HC-6/U crystal is to be used, the crystal holder should have its lugs bent outwards and then soldered to the wiring pins provided. However, a miniature HC-18/U crystal should be fitted by passing the wires through a convenient pair of holes and then bringing the wires up through the board again for soldering to the pins. Very loose capacitative coupling is required between the crystal oscillator collector and the second mixer gate. This is accomplished by utilizing the capacitance between two adjacent pins on the Lektrokit board in series with the 1pF ceramicon C11. When the 2N3826 mixer is employed, C11 alone provides the correct oscillator injection level at the mixer base.

Aligning the Converter

Again, most of the comments in the previous article still apply. The local oscillator chain should be aligned first. An r.f. detector and a set of absorption wavemeters are very helpful during this procedure. However, it is almost impossible to find the wrong harmonics using the coils and capacitors suggested. When the oscillator chain is properly adjusted, tune the secondary of T2 until the drain current of TR3 increases slightly, as evidenced by a rise in d.c. voltage across R7. Then detune T2 secondary on the h.f. side until a small noise peak is heard. Next the slug in the primary of T2 may be adjusted to produce a further noise peak, due to the first mixer stage. A check with an absorption wavemeter will be worthwhile at this stage to ensure that T2 is tuned within the 35 to 37 Mc/s range. Incidentally, it will be noticed that the shot-noise output of the FET mixer stage is very low as compared with that produced by bipolar mixers, until the local oscillator is coupled in and the input circuit tuned to resonance. The next step is to disconnect the drain lead of TR1 and unscrew C4 fully. Then, resonate C5 and the secondary of T1 at the oscillator frequency by adjusting C5 either until the d.c. voltage measured across R4 kicks upwards slightly or else by coupling an r.f. indicator loosely into L3 and tuning C5 for a dip in indication. Detuning C5 slightly on the h.f. side should give rise to a small noise peak. Re-connect the TR1 drain lead and, with the aerial plugged into the input socket, increase the setting of C4 until a further noise peak is heard, or until local signals are peaked up. The primary of T1 will be found to be more sharply tuned than the secondary. In fact, the overall bandwidth of T1 may be controlled by adjusting the tightness of coupling between the two coils. The coil spacing should be changed as necessary, retuning C4 and C5, until the response of T1 is fairly flat over a band of from 4 to 6 Mc/s wide, centred at about 433 Mc/s. Insufficient coupling can even result in self-oscillation of the r.f. stage, when using some 2N3819s. It will probably not be found necessary to alter the component values in the input pi-coupler, but if a noise generator is available, C1 may be temporarily replaced by a 2 to 8 pF Mullard trimmer and L1 and L2 adjusted by bending them to optimize the input coupling circuits absolutely for the 2N3819 in use. Increasing the value of C1 will probably be found to reduce the loaded Q of the T1 primary, to a certain extent.

In conclusion, the writer would like to take the opportunity of thanking Mr V. Cedar, of Texas Instruments Ltd., for his kind co-operation.

Can You Help?

● J. W. Swinnerton, G2YS, 29 Beacon Way, Rickmansworth, Herts., who requires circuit and component details of the FL8A audio filter?

● K. Parkins, A4772, 86 Brant Road, Lincoln, England, who wishes to correspond with an overseas SWL?

● T. Manby, 23 Leigh Road, East Ham who wishes to dispose of one 12 in. diam. and one 8 in. diam. mains energized loudspeakers?

NFD '66 A Retrospective Survey

By D. J. ANDREWS, G3MXJ* and D. THOM, G3NKS†

WHEN the frightening task of checking the 1966 National Field Day entries was tackled by the Contests Committee, a significant number of requests were found for statistics, in addition to the usual table of results, to be published in the BULLETIN. It was felt by groups that this would render valuable information when plans are laid for the 1967 event. The easiest way to present statistical data is by tabulation; this has been attempted, and the writers hope that the form chosen is reasonably easy to interpret and provides the desired information.

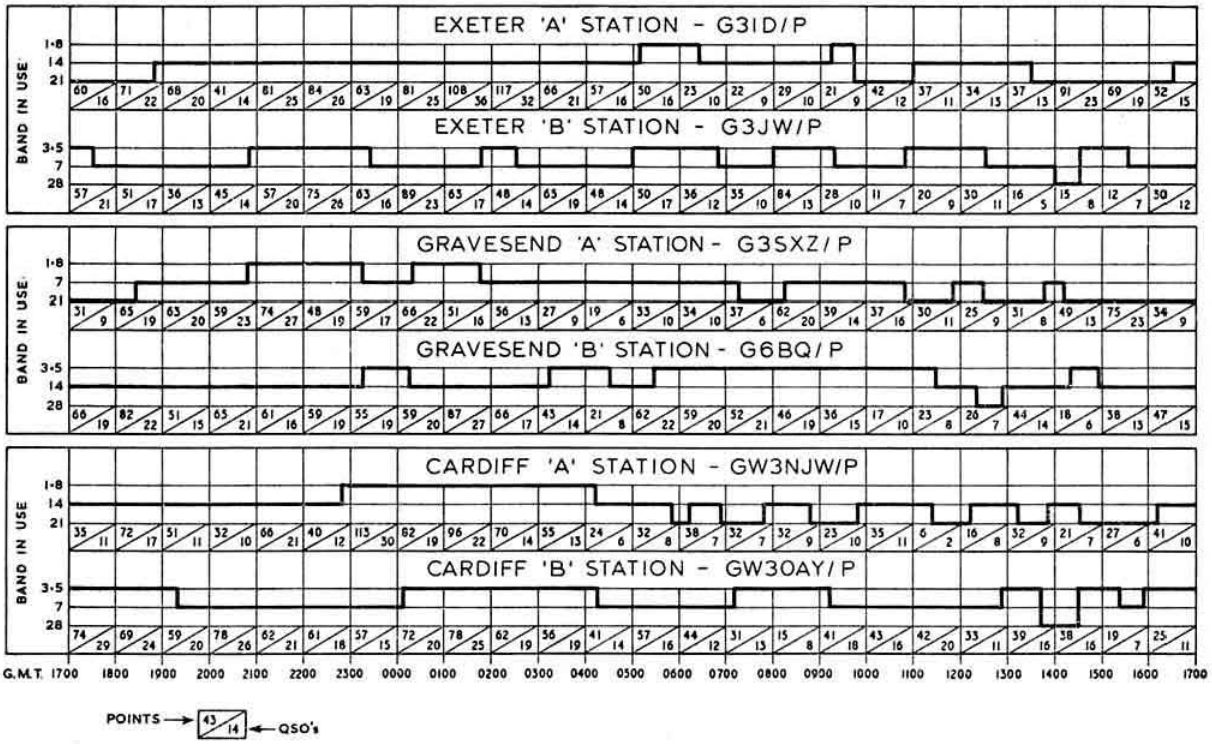


Fig. 1. The band usage and scoring rates of the three leading groups throughout the contest.

Preparations

Most groups probably make the same resolution each year, namely to begin preparations for the event while the winter's snow is still on the ground. Unfortunately, however strong one's will-power, and however enthusiastic the team, the bulk of the donkey work is usually done in the week or two immediately preceding the contest. Certain decisions must, however, be made well ahead of the event, most important of which is the selection of a suitable site. Technical considerations such as good ground conductivity or height above sea level may well be of secondary importance to such practical considerations as ease of access to the site, facilities available on it and the proximity of the hostelry!

The optimum choice of band grouping depends largely on the period of the sunspot cycle, but *can* depend far more on the actual conditions on the day of the contest. Two-thirds of the two-station entries this year used the ABABAB band grouping, as this is the obvious choice for conditions close to a sunspot minimum. At this time, 7 Mc/s can be very poor during the night, which virtually dictates that 1·8 and 3·5 Mc/s be on separate stations; 3·5 and 7 Mc/s must be separated so that the A station is not completely out of action after it has cleared up Top Band. As conditions advance towards the sunspot maximum and the higher frequencies remain active throughout the night, these considerations do not apply and a much wider choice of groupings is available. This year's contest coincided with a burst of good conditions which suited the Exeter and Cardiff

* 6 Chestnut Gardens, Horsham, Sussex.
† 12 Willow Road, Redhill, Surrey.

groups, who, by using different band grouping, were able to make full use of the excellent 14 Mc/s openings to North America.

It is worth giving considerable thought to finding the right aerials for the job. It is often better to stick to a well-tried aerial which the group's members use at home and are familiar with, rather than ambitious systems which may not perform as expected when erected on the site. The aerial must put out a good signal in the direction from which most of the points are likely to come. Consideration must also be given to whether a high, medium or low angle of radiation is required. Aerials on the l.f. bands show little variation, with the majority of stations using dipoles of one form or another. A fairly low dipole puts a very nice funnel of energy straight upwards—and this is just what is required, as a vast number of points on these bands come from UK or European portable stations. Ground planes, while excellent aerials for working VKs on 80 or 40m, will not put much of a signal into the optimum areas.

The h.f. bands show much more variation in the choice of aerials. Quads increase in number each year and prove to be excellent, provided the mechanical difficulties of erection and precise tuning on the site are overcome. 14 Mc/s has this year—and will even more, in years to come—produced a large number of contacts with North America and it is well worth having a special aerial pointing in that direction. Fifteen metres has been patchy in the last few years, but one recalls very high scores being made on this band around the last sunspot maximum; it will not be very long before this is again the case. Ten metres can produce many useful points, but it is unlikely to ever produce a record score in a June contest. Last year's winning score of 105 points was an all-time record for this band, even including the sunspot maximum years!

Operating

It would be an impossible task to list precisely the qualities and methods of operation that put a group or an individual at the top of a contest list. The most important factor must be experience; the experience of the individual operators and the overall experience of the group in organizing a successful entry. The latter accumulates from year to year until the group evolves a winning formula. This accounts for the same names appearing at the top of the list time after time.

Without any doubt the groups who get the most enjoyment out of field-day never appear anywhere near the top of the table, for only by running a group in a thoroughly undemocratic manner, virtually as a military manoeuvre, can a group hope for success. *It must be decided who are the best and most experienced operators in the group and the maximum number of hours operating they can be pushed to. Each station needs one main operator who can comfortably put in sixteen or more hours, and one or two supporting operators to fill in the quieter hours.* Unfortunately, as a result of this, only five or six members of the group ever get near a key out of perhaps 20 or 30 people who put effort into the entry. It can only be assumed that to come near to, or actually win the contest is sufficient compensation. Of course, there is nothing to stop anyone gaining experience in the many other contests held throughout the year and eventually *earning* a place on the group's operating team.

The people invited by a group to do the actual operating can do a lot to prepare for their task. " Facts and Figures on Field Day," by G3IOR, which appeared in the March, 1966 RSGB BULLETIN was an excellent and well prepared account of how his own group had done this. The article should certainly be compulsory reading for anyone taking NFD seriously, and it would be needless repetition to cover here the points made in it.

An infallible logging system is obviously of paramount importance. It must be easy to use, involve the minimum of

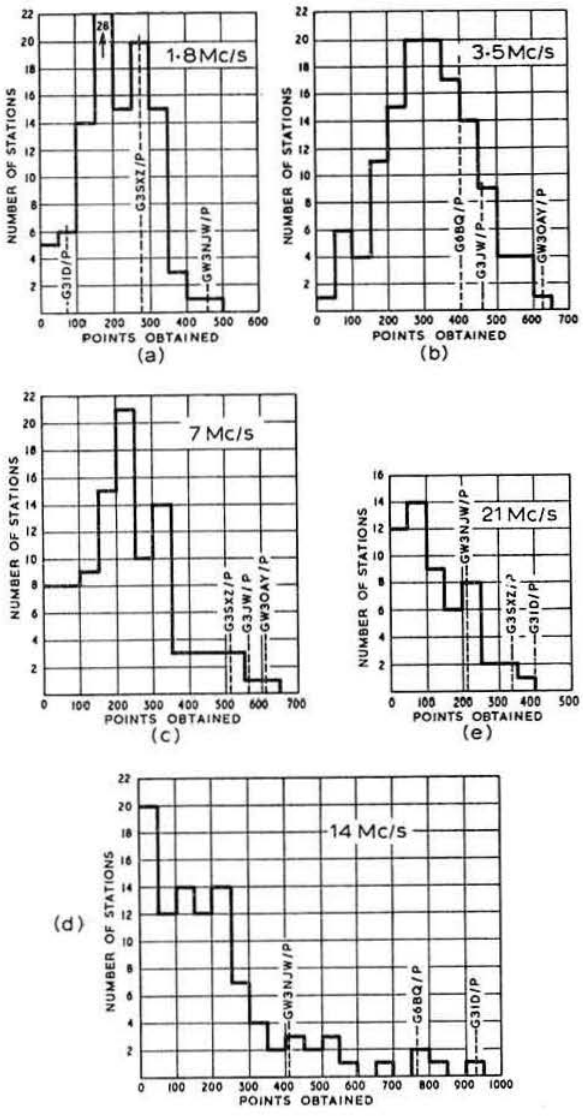


Fig. 2. The number of groups obtaining band totals within the limits indicated. The relative positions of the overall leaders are shown.

paperwork, and leave the least possibility of errors. In the 1966 NFD, the leading stations changed places many times during the checking and eventually it was the accuracy, and not the size of the logs, which decided the final positions. Where contacts are being made at high speed, it is often advantageous to have a second operator keeping the log. However, unless the person keeping the log is as proficient a c.w. operator as the person operating the station this would seem to introduce a grave possibility of errors. The writers' own opinions are that the more information recorded by the main operator personally, the better.

To Make the Punishment fit the Crime

Many people are not familiar with the way in which points are deducted by the Contests Committees during the

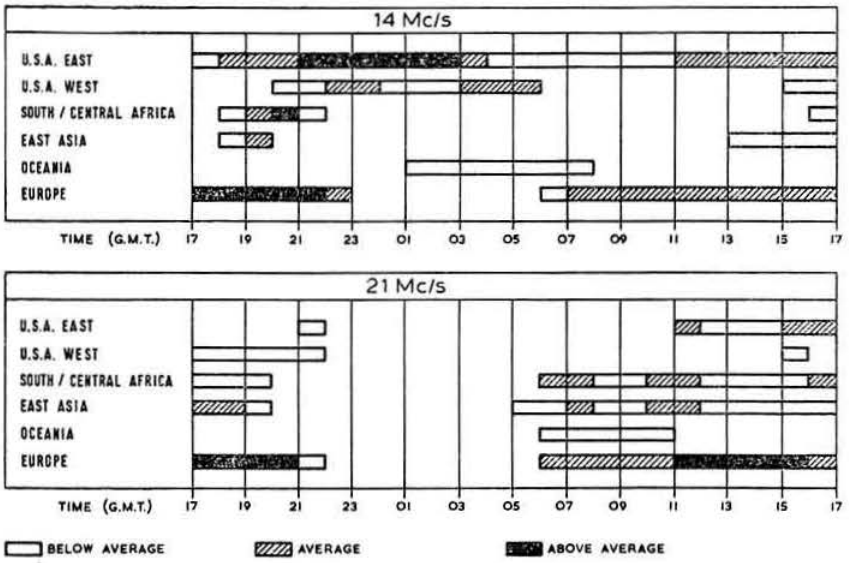


Fig. 3. An assessment of h.f. band conditions during the contest. The signal reports from the leading logs on each band were averaged. S7 was taken as an average signal, S8 or S9 as above average, and S6 or less as below average.

checking of logs. Any error in the call-sign, prefixes or suffixes, results in loss of all points (including any bonus points) to *both* sides of the contact. Both sides *should* send *both* call-signs at sometime during the contact, so if any mistake is made both sides are at fault. Where mistakes occur in the exchanged information—RST, serial number, etc., a proportion of the points (including any bonus points) are deducted from the log containing the error. Where points have been deducted they will be added on again if a duplicate contact is shown and is accurate. Also any bonus points deducted will be applied, if possible, to a later contact. There is no penalisation for duplicate contacts, provided they are clearly marked as such, and no points have been claimed. So it may well be advisable to make a second contact with a station if the first is in any doubt. It probably takes far less time than trying to sort out the details of the first contact and it insures against any errors in the original.

Thoughts on the 1966 Event

Allocation of operating time to the various bands can be decided beforehand to some extent from the published propagation tables. On 1·8, 3·5 and to a large extent 7 Mc/s it can be predicted fairly accurately how many points in how many hours are required on each band for a successful entry; and time used in exceeding these quotas is time wasted, because it can probably be used to advantage on another band. It will be seen in the points distribution tables that it is only on the h.f. bands that the overall winners come near to being band leaders. On 1·8 and 3·5 Mc/s they have satisfied themselves with a reasonable score and not wasted time chasing individual band awards. The h.f. bands cannot be predicted in this way. Generally speaking, they must be worked whenever an acceptable scoring rate can be achieved, even though this may be much lower than could be made on a l.f. band. From Fig. 1 it will be seen that Exeter applied this very successfully. Twenty metres remained open for them all night and overall it was worth their while to forgo virtually all 160m operation. The Gravesend B station remained on 20m for 10 of the first 12 hours of the contest, only working 80m to any great extent after 20m had closed. Their 400 points on 3·5 Mc/s in about eight hours operating time could have been fitted in at almost any time during the twenty-four, but the actual period they chose depended on the state of the h.f. bands. Had they operated 80m from the beginning of the contest, they would have achieved a good scoring rate, although they would have lost valuable h.f. band points which could not have been regained later.

Examination of the cover sheets shows an undoubted trend toward the use of all-commercial stations on Field Day. The original concept of the contest as an emergency exercise largely seems to have vanished. Even without any underlying purpose, this contest is, in the writers' opinions, the most enjoyable in the calendar. The rules are under constant review by the Contests Committee. Although pleas are made every year for liberalization of them, there is little evidence to suggest that this is the wish of the membership as a whole. The replies to the questionnaire sent to competing groups last year showed that the vast majority were in favour of retaining the present restrictions. A number suggested limiting the type of valve which could be used in transmitters; this has been adopted for next year's event. Comments from members on contest rules, either in notes accompanying logs or in separate letters, are always very welcome, and are invaluable to the committee when considering any changes.

Any Connection Between . . .

Although the writers are both members of the H.F. Contests Committee, the views and opinions expressed in this article are their own, and do not necessarily reflect those of the committee as a whole.

They are, however, indebted to the committee for permission to use figures drawn from this year's logs, and to individual members of the committee for their help and advice in preparing this article.

RSGB Intruder Watch

Correspondence for the Intruder Watch should be addressed to the Honorary Organizer, RSGB Intruder Watch, Radio Society of Great Britain, 28 Little Russell Street, London, WC1.

GB3GW

Britain's First Solidstate Beacon Transmitter

By Ron Barrett, GW3DFF*

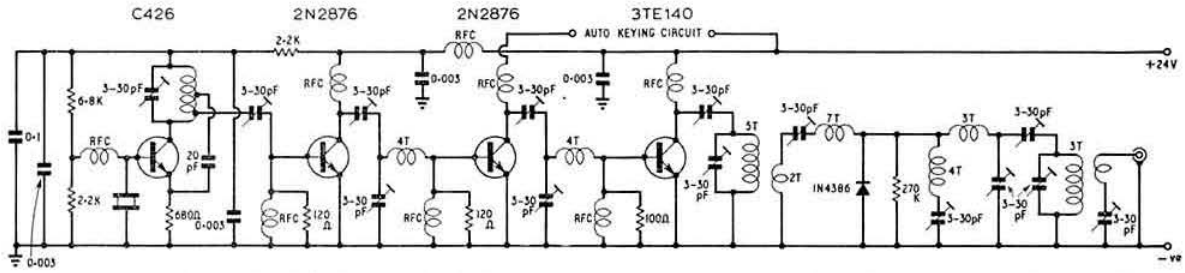


Fig. 1. Circuit of the GB3GW 144·25 Mc/s Varactor transmitter.

V.H.F. activity in South Wales is surprisingly high when one considers the nature of the terrain and the general level of population. Although GW stations may be blessed as far as a lack of QRM is concerned, the disadvantages of tuning a dead band on 2m and 70cm night after night can soon bring the most avid enthusiast to his knees.

For those who have not visited this haven of v.h.f. silence, let us explain that the valleys of South Wales mostly run from North to South and the hills are anything up to 3000 ft. in height. If a station is located within the shadow of one of these mountains it is difficult to believe sometimes that one's equipment is working, and the problem of improving receivers and converters, or for newcomers to find the band can be almost insurmountable.

The answer to the problem seemed to be a beacon transmitter which would provide a constant signal throughout this area, and might also result in a few more stations in other parts of the country turning their beams to the west for a check on conditions. When a present arrived from the USA in the shape of a handful of v.h.f. transistors and Varactors, it appeared that time and trouble were the only things standing in the way of a South Wales beacon station.

A group of local v.h.f. amateurs were consulted and it was decided to apply to the RSGB and the General Post Office for information as to how to proceed with such a venture. The RSGB consulted other amateurs who might be interested in the establishment of a beacon station in South Wales through their regional representatives, and eventually permission was granted for the station to be installed at the University College of Swansea. The Department of Electrical Engineering of the University was most helpful, and as well as allowing the equipment to be installed within the Department, permitted erection of the necessary aerials on the roof of a building some 180 ft. above sea level, with a clear take-off to the east across Swansea Bay. The only thing remaining to be done was to design and build the transmitter and keying device.

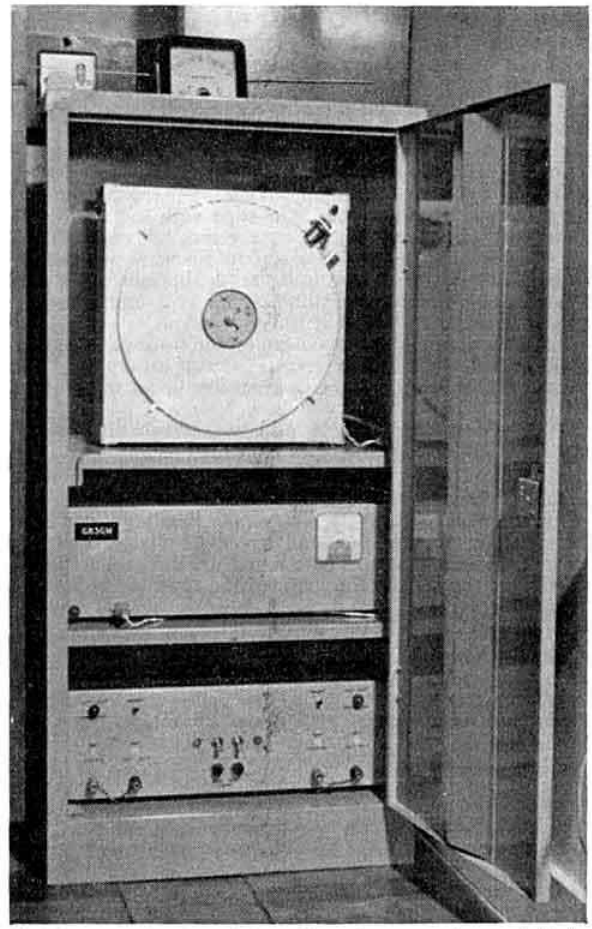
The Transmitter

After consulting all the data that was available on the design of transistorized transmitters for v.h.f., and considering what devices were available, it was decided that a crystal oscillator on 24 Mc/s doubling to 48 Mc/s, followed by a power amplifier on 48 Mc/s driving a Varactor tripler to 144 Mc/s would be the best arrangement. The circuit is shown in Fig. 1.

The aim was for a power output of about 5 watts which together with directional aerials at 180 ft. should provide a service over the greater part of South Wales. In consultation with the RSGB the frequency of 144·250 Mc/s was selected for the beacon.

Work was started on the Varactor tripler stage first, and this was built in a small aluminium box to be fitted at a later date in the transmitter proper. A 1N4386 Motorola Varactor was used, and as this can be run at an input of some 50 watts at 50 Mc/s giving an output of 32 watts at 150 Mc/s it was

(*Continued on page 97*)



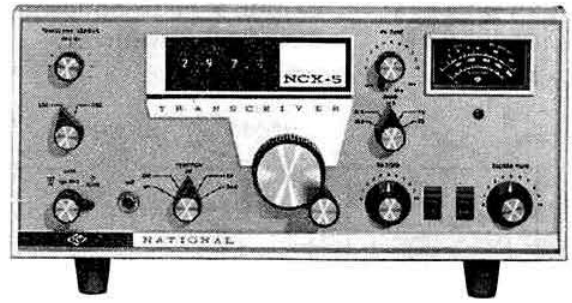
The light-operated keying unit, transmitter and power supply mounted in the special cabinet.

* Argeles, 5 Woodland Avenue, West Cross, Swansea.

EQUIPMENT REVIEW

THE NATIONAL NCX-5 MKII TRANSCEIVER

By B. D. A. ARMSTRONG, G3EDD*



THE NCX-5 is the first transceiver to be tested in this series of reviews. It was loaned by Ad Auriema Ltd., 125 Gunnersbury Lane, London, W3, who market it for £242, plus £58 for the companion power supply unit type NCX-A. The transceiver is designed for five band operation—80 to 10m—tuning in 500 kc/s segments. Crystals for the ranges of 28-28·5 Mc/s, 29-29·5 Mc/s and 29·5-30 Mc/s are not supplied, but sockets are provided.

The transmitter employs a 6 Mc/s crystal filter exciter to drive a pair of 6GJ5A p.a. valves. The receiver is a double superhet with a crystal controlled first mixer on all bands except 80m. The first i.f. is 3·5-4 Mc/s, and the second i.f. is about 6 Mc/s where an eight pole crystal filter provides the main selectivity. There is no built in crystal calibrator, but an octal socket is included on the rear apron for an external 100 kc/s calibrator. This can be controlled by a switch on the front panel. The common v.f.o. is transistorized, and the frequency indication is unusual in that it uses a digital odometer system. The main tuning mechanism employs spring biased gears. In order to cope with the two v.f.o. tuning directions necessitated by the mixing arrangement, the complete digital drum is shifted sideways on certain ranges so that a different set of figures is displayed in the dial windows. Numerical calibration is to 1 kc/s, and a vernier drum has calibration lines at 100 c/s intervals.

All the main tuning controls are on the front panel, and a small panel carrying VOX GAIN, CARRIER INSERTION, VOX DELAY and MIC GAIN controls is accessible under the cabinet lid.

Transmit switching can be accomplished in three ways: VOX, MOX and PTT. Antivox is built in.

Technical Specification—Handbook Figures

Although the separate power supply handbook contains performance details, the transceiver handbook had no section devoted to this. There were, however, some figures distributed throughout the chapters and these are quoted:

Tuning range (Mc/s): 3·5-4, 7-7·5, 14-14·5, 21-21·5, 28-28·5, 28·5-29, 29-29·5, 29·5-30.

Frequency accuracy: ±500 c/s
Transmitter power input: 200 watts p.e.p.
Transceiver vernier range: ±5 kc/s
A.l.c. range (internal): 10db
External a.l.c. requirement: 10-15 volts
Carrier suppression: 50db
Transmitter/receiver frequency error: 50 c/s
Gain variation over 500 kc/s segment: 6db
Filter bandwidth: 2·8 kc/s at 6db
Filter shape factor: 1·7 : 1
Aerial impedance range: 40-60 ohms

Not Quoted:
Sensitivity
Signal-to-noise ratio
Sideband suppression
Audio output
Spurious response attenuation.

* Member of RSGB Technical Committee.

Power Supply

The NCX-A a.c. power supply is in a separate matching cabinet and contains a 6 in. × 4 in. loudspeaker. Interconnection is via a 3 ft. long multicore cable terminated in a small Jones socket, fitting a plug on the transceiver chassis. Transformer primary taps are provided for 117 or 234V 50-60 c/s a.c. operation, which can be selected by a toggle switch accessible through a hole in the rear of the power supply cabinet. Both 280 and 700V d.c. smoothing circuits are choke input from a common silicon bridge rectifier.

Input: 117 or 234V a.c. ±10 per cent 50-60 c/s
150 watts RECEIVE
365 watts C.W. TRANSMIT

Output: High voltage, 700V d.c. at 50-300 mA, better than 2 per cent regulation min.-max. load.
Low voltage, 280V d.c. at 200 mA.
Bias voltage −80V d.c. at 10 mA.

Dimensions: 8½ in. wide × 6$\frac{5}{16}$ in. high × 12 in. deep.
Weight: 24½ lb.

Testing the NCX-5

THE V.F.O.

During on the air tests the frequency calibration was suspected for no c.w. stations appeared in the first 10 kc/s of any band. On examination it was noticed that very occasionally there was slip between the tuning knob and the digital indicator, which was found to be due to the final gear on the digital drive chain not being properly keyed to its shaft. There was no obvious way in which it could be tightened and so it was left. Consequently the following measurements of v.f.o. accuracy serve only to indicate the linearity.

Nominal V.F.O. Frequency	*Measured Frequency*
10·0236 Mc/s	10·027476 Mc/s
9·9236 Mc/s	9·927525 Mc/s
9·8236 Mc/s	9·827712 Mc/s
9·7236 Mc/s	9·727434 Mc/s
9·6236 Mc/s	9·627457 Mc/s
9·5236 Mc/s	9·527548 Mc/s

National specify the linearity as being within ±500 c/s. Tests show that the equipment tested was well within this limit and was quite impressive. Any error can be taken up by disengaging the drive to the v.f.o. capacitor by pulling the main tuning knob away from the panel and trimming the knob so that the digital indicator can be turned to the correct frequency reading—the range of this adjustment is ±5 kc/s.

The resettability of the v.f.o. was measured by returning to a given dial reading several times and measuring the frequency. Approaching from the same direction every time gave a re-setting accuracy of less than 100 c/s; comparing the frequencies obtained from each direction revealed backlash of less than 200 c/s. These results are good, particularly in view of the intermittently faulty indicator drive.

The v.f.o. has an incremental adjustment on RECEIVE. The control is brought into operation by pulling out the transceiver vernier knob and turning it either way. It is automatically cut out on transmit. The control adjusts the bias on a variable capacity diode in the main oscillator circuit. The frequency range of this incremental control was measured as +7·3 kc/s and −10 kc/s. The claim is ±5 kc/s.

The v.f.o. only was tested for frequency stability because the rest of the oscillators are crystal controlled and should contribute negligible drift compared with the v.f.o. With a transistor oscillator in which considerable attention has been paid to the design, and adjustable compensation is provided, excellent results are to be expected. However, during use, it was noticed that stations worked slowly drifted in frequency. The following test shows that it was in fact the NCX-5 which was drifting.

Elapsed time from cold start	*Frequency error*
1 minute	−210 c/s
2 minutes	−214 c/s
5 minutes	−220 c/s
10 minutes	−466 c/s
15 minutes	−954 c/s
30 minutes	−1775 c/s
45 minutes	−2435 c/s
1 hour	−2726 c/s
1 hour 30 minutes	−2954 c/s
2 hours	−3000 c/s

The test was carried out twice, in case of measurement error, with the same result each time.

The v.f.o. compensation can be adjusted for considerably better results, but it seems that the factory test had not been properly carried out.

TRANSMITTER

Unwanted Sideband and Carrier Suppression

These parameters were measured during the power output measurements. The unwanted sideband suppression was better than 40db, depending on audio input.

The carrier suppression was 58db just after switch on, and degraded on warm-up to 45db with no drive. The level of suppression varied with drive and with full output the level was 30db.

R.F. Power

The power output was measured by tuning up according to the handbook instructions and then feeding in a signal from a two tone generator until the intermodulation products were −26db but without exceeding the rated input. It was possible to exceed the following power output figures at the expense of the intermodulation products. The results are very satisfactory.

Band	*P.E.P. Output*
80m	140 watts
40m	150 watts
20m	130 watts
15m	140 watts
10m	110 watts

The a.l.c. worked well and the use of excessive audio gain did not result in excessive intermodulation products.

RECEIVER

Sensitivity

The audio output power was measured with 1μV input and the function switch on s.s.b. The result showed a variation of between 5 and 30 mW depending on frequency. This was much lower than could be expected.

It was felt that the equipment was faulty for not only was the sensitivity considered poor, but the S meter was "lazy" and the a.g.c. hardly satisfactory. These shortcomings indicate a lack of gain. A quick check could have been to compare results with the handbook specifications, but unfortunately no figures were quoted. Ad Auriema were asked for the specification figures but were unable to help; they stated that their Service Agents might be able to help, but they could not.

Signal-to-Noise Ratio

The signal-to-noise ratio on s.s.b. was measured at 1μV input. The variation was from 13db on the lower frequencies to over 20db on the higher frequencies.

Cross-Modulation, Intermodulation and Blocking

For the cross-modulation test, the receiver was tuned to a signal which produced a 14db signal-to-noise ratio, after passing through a 10db loss combining network. A second signal was injected at this point, tuned +20 kc/s with respect to the wanted signal. The output of the off-channel signal generator had to be 70db above the on-channel signal to produce a 3db degradation in signal-to-noise ratio.

The intermodulation performance was checked by feeding in two strong signals 10 kc/s apart and looking for an intermodulation product 10 kc/s below the lower signal or 10 kc/s above the upper signal. Two signals of 78db above 2μV e.m.f. (i.e., well over S9+40 on the S meter) produced an intermodulation signal of S1. No blocking was found at maximum output (30 mV at the receiver input) of the signal generator used.

These results were considered excellent.

Internally Generated Signals

Almost any superhet receiver will generate internal spurious signals, and the NCX-5 is no exception. Almost all the responses are fast tuning, generated by high order harmonics of the v.f.o. The receiver was checked by the simple expedient of tuning over the various bands on both upper and lower sidebands without an aerial connected; 3·5 Mc/s was free of signals and the other bands had four to six. Most were very low level and none were strong enough to lift the S meter off its stop.

A.G.C.

The a.g.c. was ineffective for most of the practical range of signal inputs. It did not properly commence until the input signal reached S9. An 80db increase of signal input resulted in a 40db increase in audio output.

The S Meter

The S meter zero adjustment is set so that the meter reads between 0 and 1 with no signal input and the r.f. circuits detuned. When this was done after the equipment had been switched on for an hour, the S meter read S3 on switch on. Measurements on 14 Mc/s showed the following:

Meter Reading	*db rel. 2μV e.m.f.*	*Meter Reading*	*db rel. 2μV e.m.f.*
S1	14	S7	32
S2	18	S8	35
S3	21	S9	37
S4	24	S9+20	44
S5	27	S9+40	52
S6	30		

The variation with frequency showed:

Frequency	*db rel. 2μV e.m.f. to read S9*
3·5 Mc/s	52
7·0 Mc/s	44
14·0 Mc/s	37
21·0 Mc/s	38
28·0 Mc/s	41

It is interesting to compare these figures with the Lafayette HA350 which was reviewed earlier. The HA350 showed about 4db per S point, and the NCX-5 about three, but the NCX-5 is more consistent with frequency.

The Crystal Oscillators

The first oscillator has provision for six crystals, but only three were provided. It was pleasant to see that provision is made for crystal frequency trimming, although small mica compression trimmers are used, which makes trimming a difficult task when working in the region of maximum capacity owing to the high rate of change of capacitance. The crystal frequencies were measured:

Crystal Frequency	*Measured Frequency*	*Error*
11 Mc/s	10·999657 Mc/s	−343 c/s
18 Mc/s	17·997345 Mc/s	−2655 c/s
25 Mc/s	25·001934 Mc/s	+1934 c/s

It would be reasonable to expect a better factory setting than these. After the frequency measurement, the crystal trimmers were adjusted to see if the crystal frequency could be adjusted to what it should be. It could.

The carrier oscillator crystals were checked, and it was found that the Handbook disagreed with the crystal marking. In the Handbook the frequency chart gives 6·0236 and 6·020 Mc/s. The carrier oscillator setting section says 6·0234 and 6·020 Mc/s. The frequency marked on the crystals was 6·023430 and 6·020280 Mc/s. The frequencies were measured as 6·023356 and 6·020011 Mc/s. It may be that the crystals are matched to a particular crystal filter, but no mention of this is made in the handbook. Although crystal trimmers are provided, no attempt was made to adjust the frequency since it is not clear what exact frequency they should be, and the carrier oscillator frequency has a marked effect on carrier suppression.

POWER SUPPLY

The regulation of the 700 volt line is good. From no drive to full output the voltage falls from 770 to 730. On RECEIVE, the 700 volt line rises to 900 with 240 volt a.c. input. The 450 volt smoothing electrolytics are in series: one had 458 volts and the other 442 volts across it on RECEIVE.

MECHANICAL CONSTRUCTION

All steel construction is used with the exception of the front panel and styling trim. The case is painted in very fine blue crackle paint and the front panel of the transceiver has a combination of grey paint and polished aluminium. The matt black knobs have aluminium inserts. The transceiver case has strengthening straps on the sides to which the mobile mounting bracket (which is supplied) is fixed.

One of the chokes on the power unit is fitted on a rather flimsy bracket which had become bent during transit.

Internally, the main components and controls are well marked. Screened leads are numerically marked at each end to aid circuit tracing.

IN OPERATION

The NCX-5 MkII was used on all bands. The lack of gain did not show up on the lower frequency bands, but on 21 and 28 Mc/s the equipment generally had to be operated at full r.f. and a.f. gain. At full audio gain there was a pronounced hum from the loudspeaker; this was not present on a.m. when the carrier oscillator was not in circuit.

The equipment was extremely easy to use and with the r.f. circuits common to transmitter and receiver the transmitter was always near enough on tune. There was a pronounced and annoying feedback pulse on switching to transmit on MOX or PTT, which the handbook suggests is a constant reminder of the extremely fast attack time. Care had to be taken in setting up the vox circuits for under certain conditions the main relay would continually switch itself on and off with no external audio input. Otherwise the vox worked satisfactorily.

The equipment was operated on c.w. using grid block keying: this proved to be clean and free from chirp. Break-in keying is automatically available. The only feature which puts the NCX-5 at a disadvantage is the lack of narrow selectivity for c.w. reception.

One failure occurred; for no apparent reason the two p.a. valves—6GJ5As—ceased to conduct. The replacements cost 22s. 6d. each. It was observed that although the handbook and chassis marking identified the p.a. valves as 6JB6, 6GJ5As were in fact fitted to the equipment when received.

TVI

The NCX-5 was checked for TVI under identical circumstances to the KW Vespa and the Heathkit HA14.

On 7 and 14 Mc/s the only trouble was due to the high level of r.f. getting into the TV set on channel 5. A high pass filter in the TV feeder cured the cross modulation. The other channels were clear.

On 28 Mc/s no filters were needed in either the TV or NCX-5 feeders, but not so on 21 Mc/s. Although channels 6 and 11 were clear, severe interference occurred on channel 5. This interference was not cleared by filters in both the TV and NCX-5 feeders.

THE HANDBOOK

The transceiver handbook and separate circuit are excellent. Full alignment instructions are given. One very surprising omission is the electrical specification. Some facts and figures are provided but these are hidden in the text. A comprehensive parts list includes mechanical items and the National part numbers.

GUARANTEE

The equipment is guaranteed for one year. The first 90 days is on a labour and material basis and the remainder of the time on a material only basis, but excluding valves and semiconductors. The guarantee registration card is interesting in that it invites comment on various aspects such as workmanship and general performance. This seems to indicate customer interest on the part of the National Radio Company.

CONCLUSIONS

The NCX-5 MkII is not the lowest cost transceiver, but it possesses many facilities and utilizes advanced circuitry. Its appearance, in the writer's opinion, is very attractive. The potential frequency accuracy and the selectivity are but two of its good points. If the particular equipment under test was not faulty, the sensitivity (in terms of gain) is a poor point. The potential buyer must decide for himself what the advantages are worth in the terms of hard cash.

QUA Associates

conducted by "JIX"

I AM glad to see that, despite a lapse of several months, *QUA* . . . is still appreciated, judging from letters received in response to the first article in this new series (December, 1966 BULLETIN). No doubt a high proportion of readers are newcomers, the older supporters having " passed on " after receiving their tickets. Nevertheless, I hope that the latter generation will keep in touch, and above all, of course, remain sympathetic to SWLs.

So far, unfortunately, the bulk of communications have been only from those Associates who were with us before. If this feature is to survive, we must have support from all of you, especially the younger set. Your views *are* interesting—please air them. Technical info. is particularly useful to fellow readers, and so if you have built a piece of test equipment, a receiver using out-of-the-ordinary circuitry, or more-or-less anything connected with this hobby, don't keep it to yourself, but *tell us*. Until you obtain your licences, there are few other ways of exchanging ideas with others over the country.

Clubs, of course, are the natural way of finding out what other enthusiasts are doing, but communication between clubs is also beneficial, particularly with regard to club projects. We can help here!

Robert Gilchrist (A5094) writes from Manchester to say he is pleased to see the new series of *QUA* . . . He has built the a.t.u.s mentioned by A4585 and reports success with them. Keep up the Morse practice and the swotting for the RAE, Robert, and good luck when you come to sit the exam. Robert suggests that a junior countries table for Associates would be a good idea for *QUA*. . . . What do the rest of you think?

Roger Lapthorn (A3554), who last wrote to *QUA* . . . about two years ago, believes that the general layout of *QUA* . . . and its contents are ideal for associate members. There was plenty in the letter: for instance, the h.f. bands seem too crowded nowadays and the future of Amateur Radio lies in the bands 4m and down. Rog. believes that the RAE is too simple and suggests that a graduated set of licences should take its place, together with the reintroduction of the compulsory 12 months on c.w. Roger would like to hear from any SWLs in his area. His address is Fourwinds, Green Close, Kingstridge, South Devon.

D. Hilton (A5103), Manchester, wonders why the RSGB does not make concessions in the way of extra points for the age of a receiver during a contest. He believes that he has little chance with his 1950 domestic receiver against the SWL with all the modern gear. Do any other readers feel this way?

Colin Pownall, who I met at Ollerton last year, is now an associate member of the RSGB and sent a QSL card with his " A " number very clearly shown: A4827.

W. D. Colley writes from Birmingham and besides being pleased in seeing the return of *QUA* . . . wonders if his area could support its own club for the SWL. He would be pleased if any SWL with views on this subject would contact him at 11 Brampton Avenue, Hall Green, Birmingham 28.

* K. L. Smith, G3JIX, 82 Granville Road, Walthamstow, London, E.17.

A Transistor B.F.O.

Last time, a transistor oscillator was mentioned. We come now to a quick description of this simple device, which would be suitable for those of you with broadcast receivers without b.f.o.s.

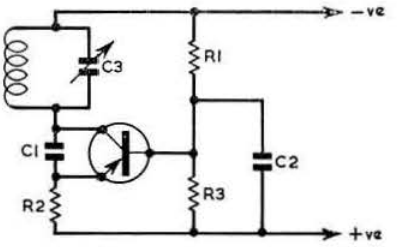


Fig. 1. The simple 465 kc/s oscillator using an OC170 transistor. C1, about 39pF; C2, 220pF; C3, 100pF; R1, 15 K ohms; R2, 10 K ohms; R3, 3·9 K ohms.

You should not have much difficulty getting it going. The —ve supply can be obtained from a small battery, or (and you can always do this for transistor devices operating from valve equipment) a small rectifier on the heater line will give about 8 volts d.c. when smoothed.

Construction

A small piece of Vero-board, with a lattice of about 8 by 7 holes, was chosen as the base for this small oscillator. A 465 kc/s i.f. transformer which you might find in an old Japanese transistor receiver or could purchase for a few shillings, is suitable for the coil. It might be a wise investment to obtain an old Japanese transistor receiver from which you could use the components for the construction of this oscillator. The transistor can be an OC170, OC171 or an AF117. Three of the connections on the i.f. transformer

(*Continued on page 97*)

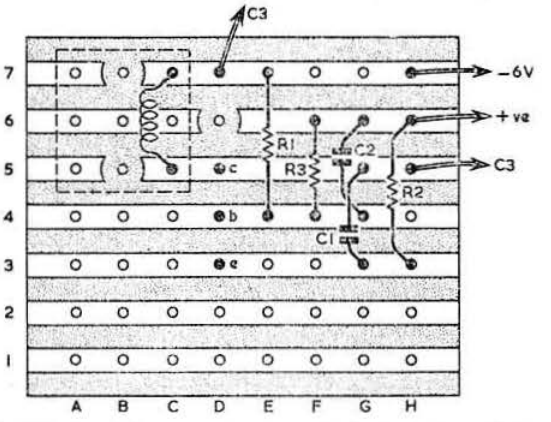


Fig. 2. The layout of components and connections to the Veroboard sheet.

THE MONTH ON THE AIR

By JOHN ALLAWAY G3FKM

FOLLOWING on the remarks made in previous *MOTA*s concerning VE4OX and the QSL card situation, the Society has received a very honest letter from Ed which explains in considerable detail the reasons why he does not feel inclined to answer cards received via the bureaux for the stations for whom he acts as QSL Manager. Unfortunately space precludes publication of the entire letter, but relevant extracts from it and from a copy of a letter which he has sent to the Jamaica Amateur Radio Association, should be of considerable interest to readers. Some of the points made are as follows: (i) The printing of QSL cards costs several cents each, (ii) 25 per cent of those who QSL direct send only postage and the cost of envelopes, etc., has to be borne by Ed, (iii) There is no outgoing QSL bureau in Canada, so that the cost of posting cards to overseas bureaux is considerable, quite apart from actual cost a great deal of time is taken up by these chores. Originally, VE4OX only volunteered to act as W/VE QSL Manager, but in order to help out extended his offer of help to all amateurs. It might also be pointed out that Ed also looks after the VE4 QSL Bureau, a task he has performed for several years. In view of all these facts it would seem to your scribe that to criticise a fellow amateur who has already given so much in time and money to help others is grossly unfair, and it is hoped that VE4OX will accept the apologies of all fair amateurs now that the facts are known. There can be very few who cannot afford the price of an s.a.s.e. for a QSL *which they really want*—why should someone else not directly involved be expected to provide a subsidy? Finally attention should be drawn to the facts that cards may also be sent to the DX stations *via* the bureau—*not* endorsed " *via* VE4OX."

The **Third London S.S.B. Dinner** is to be held on 20 May at the Royal Gardens Hotel, Kensington. Parking space will be available. Further details on page 115.

Top Band News

9V1LP reports hearing G3FPQ and G3OQT calling him when he was on from W0GTA/8F4 during the contest. He only made four contacts on 160m—with 9V1MT, W6QHQ, W6RW, and EI9J. The band has not been nearly as good as it was last year in S.E. Asia but there have been a few good openings and Europe has been heard at least weakly almost every day. Bob says that his set-up in Singapore is not too good, and that he seems to hear them rather better than they can hear him. His first European QSO this winter was with G3MYI on 2 December, since then he has contacted G3RPB, DL9KRA, G3RRJ, G3PQA, G3OQT, G3FGT, G3IGW, EI9J, G3LIQ, and G3TKF. It seems that ZD8J is having trouble with power line noise, but is intending to operate his equipment from a petrol generator from a site remote from the source of his troubles as soon as he returns from his leave. ZD8J reported hearing W0GTA/8F4 at RST 589 during the contest, and KL7FRY is said to have contacted JA1PVK and ZL3RB from his location in the Aleutian Islands.

The latest news from Stew, W1BB, sent from the *S.S. President Cleveland* when near Hawaii, says that he is having a fine time, and that the Japanese boys really rolled out the red carpet for him! He reports hearing WB6MNN, W6PBR, W6LRA, and W7DOL from a position over 4000 miles W. of California. The most distant signal logged from that location was K9PAW (at 569).

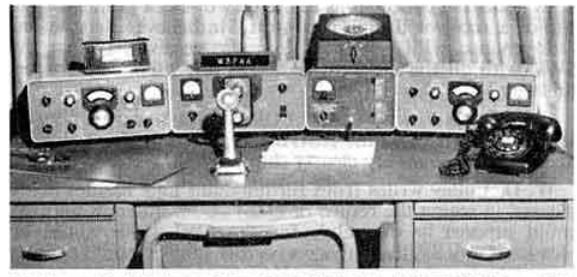
Further to the paragraph in December *MOTA* concerning operation from Orkney, it now appears that GM3CCK will operate GM3MTS on Saturday evenings by *prior sked only*, QTHR.

Judged by reports received, the 1966/67 series of Top Band tests have shown a very marked deterioration in results over those held a year ago. G3IGW and GW3OAY were reported readable by SWL George Allen in Perth, Western Australia, two hours before the RSGB contest began. During the *CQ* WW DX contest many OK/OL, DL and HB stations were also heard in VK6. GM3IGW/A was being put on the air from Locknaw Castle in Wigtownshire by G3IGW and G4MH during the *CQ* 160m DX Contest; they hoped to use vertical aerial supported by met. balloons if the weather stayed good, otherwise *only* inverted Vs 90 ft. up!

News from Overseas

A long letter received from Bob Snyder at Christmas explains why so little has been heard of 9V1LP or W0GTA/8F4 recently. Apparently his arrival in Sumatra before the *CQ* Phone Contest was much later than anticipated so he was not able to make all the preparations which he would have liked to make, and also he was very tired. However, he made over 1,300,000 points but talked to VQ9AA/D and discovered that Don's score was some four million points—over twice the previous record score! Bob managed to score about 1,220,000 points in the c.w. section. Further activity from Sumatra looks doubtful as the company for which he works is pulling out from there, and it seems that he will be leaving Singapore at the end of January for a short spell in Cairo. Further movements are doubtful but may involve going to Libya or Trinidad.

G3LZN reports on his experiences with what he thinks may be the first licence issued under the UK/South Africa reciprocal licensing arrangements. He had to submit copies of his "G" licence, Radio Amateur's Certificate, and covering letter from the GPO, and also had to purchase a local broadcast receiving licence. On 21 November he was issued



The Aeronautical Centre Amateur Radio Club s.s.b. station W5PAA consists of a Collins " S " line feeding a Hy-Gain four element three band beam at 55 ft. The club is operational on all bands from 160m to 2m.

* 10 Knightlow Road, Birmingham 17. Please send all reports to arrive by **8 February** for the **March** issue, **15 March** for the **April** issue and **12 April** for the **May** issue.

The W1BB/MM 160m receiving station set up aboard a liner crossing the Pacific to enable Stew to study 160m conditions and propagation while en route to Japan and the Far East. A transmitter was unfortunately not permitted by the shipping company.

(W1BB print)

with a permit to operate a " portable/mobile " station with 25 watts input—the normal power limit for portable/mobile stations in ZS. His call was G3LZN/ZS, and he expects to be using it again for about four weeks from the end of January. Anyone intending to apply for a ZS licence is invited to contact G3LZN for assistance—he may be reached at: The Bell House, Rowington, Warwick.

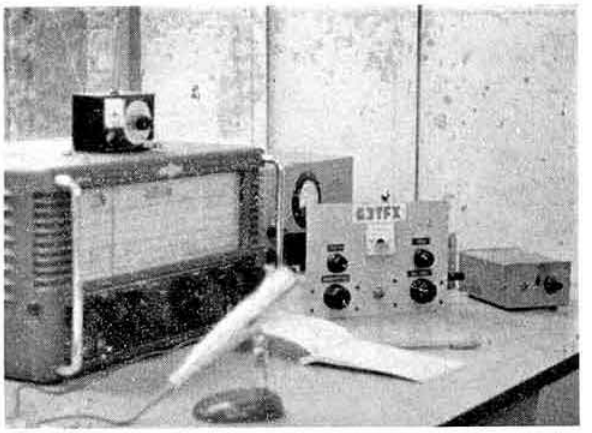
VS9MB is now active again, on c.w. only. The equipment consists of a Hammarlund HX 50 transmitter, an HQ 170 receiver, and a three element beam. It is hoped to be on s.s.b. shortly. This news came from Colin Simmonds, who has just returned to Gan after spending a year at VS9OSC. He will be in the Maldives until next October, and says that he still has his VS9OSC logs and will try to help anyone still needing his QSL.

A letter received from Ray Vasper, VS9ARV, explains that the first attempt to get to Kuria Maria Is. ended in failure after a cyclone played havoc with the ship and equipment. Fortunately it was possible to get the 500 ton wooden boat to Bahrain safely, but a lot of the equipment was either lost or damaged by sea water. Ray reports that on the second attempt (which materialized on 8 January) he would be accompanied by an interpreter, a doctor, and a cook, besides a few other assistants to help with the chores.

Latest news on Gibraltar activity comes from ZB2AM. He reports that ZB2AK and he will be leaving for the UK in July, and that this will leave only ZB2AP (who is mainly active on v.h.f.) and ZB2AT who is at present inactive. ZB2AM is to be found on 21,010 kc/s most days between 12.00 and 12.45, but if the band is not open he uses 14,050 kc/s. He is willing to arrange skeds on all bands 1·8 to 28 Mc/s with the proviso that "awkward time" skeds are only possible at weekends, preferably on Friday or Saturday, and will also be on during BERU and other contests up to and including NFD. Those desiring to make skeds should write to Mike at: CPOs Mess, *HMS Rooke*, Gibraltar. QSLs are handled by W1HGT (see *QTH Corner*).

Awards

The ex-MM Radio Officers of the Antwerp (OSA) CW-DX Club are about to issue an award for contacts with /MM stations—the **" Antwerp Maritime Mobile Award."** This may be obtained by contacting six maritime mobile stations plus one ex-Radio Officer member of the club or three other members. Ex " Sparks " members are ON5DI, ON4GK, ON4IT, ON4NW, ON4QX, and ON4WD. Other members are ON5AX, ON4EK, ON5FM, ON5JM, ON4NM. This award is also available to SWLs who have proof of



The station belonging to one of our QRP readers, G3TFX, who lives at Bexleyheath in Kent. He runs 10 watts, or less, into a dipole (we reported a 1·5 watt 10m contact he made with W8BIQ, in the December issue).

having heard QSOs between six /MM stations and one ex-Radio Officer or three ordinary members. Contacts must have been since 1 January, 1954 and minimum signal reports of RST338 or RS33 must have been exchanged. Applicants should send a list showing stations worked (or heard), date, time, frequency, reports exchanged, QTH and name of ship. This should be certified by two other amateurs or a radio club official as being correct, and the log plus seven IRCs should be sent to: OSA-MM Award Manager, ON5DI, PO Box 331, Antwerp 1, Belgium.

The same club also issues the **Benelux Award** for contacting seven Netherlands, seven Belgian, and two Luxembourg stations (four, four, and two respectively for stations outside Europe). A certified log copy should be sent with seven IRCs to ON4NM at the address given above. A third award is for contacting Antwerp stations—the " **WOSA** " Award—and involves making contact with six Antwerp stations (five if outside Europe). A certified log should be sent to ON4GK (same address) together with nine IRCs.

The **Islands on the Air Award** is issued for confirmed contacts with at least 75 per cent of the activated island groups of any continent (in the case of the continental Awards), or for contacts with at least 100 islands listed in the *Directory of Islands*. Other variations are available and make an interesting group of awards to work for, especially by those who are looking for fresh pastures to explore! It is suggested that a copy of the latest *Directory* (just being issued) and leaflet giving all details of the awards should be obtained from: Geoff Watts, 62 Belmore Road, Norwich, NOR. 72.T. The cost of the IOTA *Directory* is 2s. or four IRCs.

A new certificate is now available from the **Ex-G Radio Club** for contacting members on their c.w. net which is held on 14,065 kc/s at 19.00 every Saturday. A total of 10 points is needed, one point for each member contacted. Duplicate contacts with the same member count but only if on different days. A copy of the log entries should be sent to: N. Thompson, W8YHO, 1368 Roslyn Street, Akron 20, Ohio, USA. There is no mention of a fee, but obviously sufficient IRCs to cover the postage on the certificate would be appreciated.

Further to the information given in last month's *MOTA* concerning French awards, more recent information was given in January " *Radio REF.*" It is pointed out that claims for all their certificates should be accompanied by at least six, and preferably nine IRCs to cover the costs involved, and that particulars of all awards may be obtained by sending a self-addressed envelope and an IRC to the General Secretariat, REF, 60 boulevard de Bercy, Paris 12e, France.

The QSL card which will be issued by G5UG, QSL Manager for the expedition station VK8OX. It is printed in six colours on glossy card—and we understand that each one cost approximately 2s. 6d. to produce.

DXCC News

It is believed that a decision has been taken by ARRL not to count the UN Technical Training Centre in Turin as a separate " country." This seems to the writer to be a very sound decision as its acceptance would possibly have led to each and every diplomatic building in every country being added to the list! The January *QST* lists the following UK stations in the Honor Roll: G3FKM 321/337, G8KS 319/336, G4MJ 317/333, G2PL 315/337, G3HCT 315/325, G2BOZ 312/329, G3AAM 312/335, and G3HDA 312/323. The Radiotelephony list gives G3FKM 317/330 and G8KS 313/326. The first number is the total countries confirmed less any credits given for deleted countries whilst the second gives the total number of DXCC countries confirmed including deletions. Readers would no doubt like to join with your scribe in congratulating G2BOZ, G3HCT, and G3HDA in managing to achieve a feat which must be unique in the annals of DXCC—i.e., three members of one family (father and two sons) entering the Honor Roll together!

The new prefix for Guyana (formerly British Guiana) is 8R and there are three districts—8R1, 8R2, and 8R3.

Roger Bains, MP4TMO, runs a KW2000 transceiver, an FL1000 linear amplifier and a Drake 2B receiver with a TA 32 multi-band dipole. One of his other activities is scouting—he is a member of the Trucial Oman Scouts.

Contests

The **1967 Islands-on-the-Air Contest** began on 1 January. This will continue until 31 December, the object being to obtain confirmations from as many of the world's islands as possible in the year. The world highest amateur and SWL will each receive a cup, and other winners, certificates. Interested readers are advised to contact the sponsor, Geoff Watts (see *Awards* section) for details.

The **BARTG Spring RTTY Contest** will be held on all bands 3·5 to 28 Mc/s during the period 02.00, 4 March to 02.00 6 March. Exchanges should consist of message number, report, GMT, and country, and stations may be contacted on each band. All two way RTTY QSOs with one's own country count 2 points, with others 10 points. 200 points is scored for each country worked including one's own. The final score is arrived at by adding the total obtained by multiplying total QSO points by the number of ARRL countries worked, to the number obtained by country points multiplied by the number of continents contacted. Note that VO (3B) is counted as a country. There are single and multi-op. sections. Logs should arrive by 1 May at: G2HIO, The Firs, 3 Trinity Close, Ashby-de-la-Zouch, Leics.

Apologies to those interested in the results of the **1966 ARRL DX Contest.** These results are not sent to G3FKM by ARRL (as are those of *CQ Magazine*) and the writer's copy of October *QST* was lost in the mail! A replacement has only just been received.

PHONE SECTION

Single Operator		*Multi-operator*	
	points		*points*
G3UML	**137,664**	**GB2DX**	**305,816**
G2QT	88,215	G3SVH	210,936
		GW3NWV	**192,780**

C.W. SECTION

Single Operator			
	points		*points*
G2RO	**138,701**	G3HLW	6800
G2QT	117,600	G2AJB	3840
G2DC	95,472	**GI3OQR**	**387,072**
G3APN	44,550	**GM2HCZ**	**34,020**
G6VC	31,008	GM3JDR	14,208
G3KSH	8208	**GW3JI**	137,000

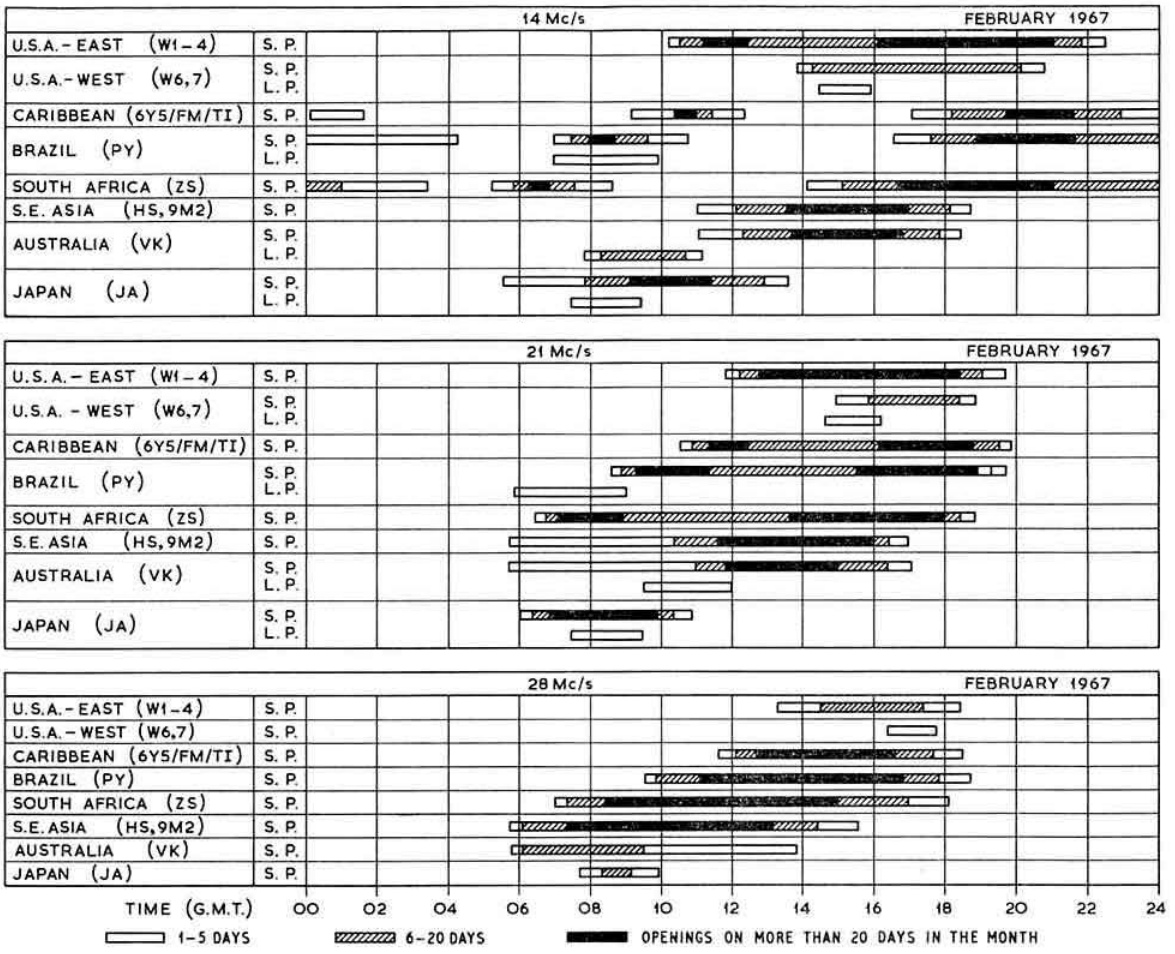
Multi-operator			
	points		*points*
G3SSO	**414,060**	**GW3ITZ**	**58,860**
GM3GUJ	**63,843**		

Congratulations to winners and especially to **GI3OQR** who was European champion on c.w., and to **G3SSO** who was European multi-op. champion on c.w. Also to **GB2DX** who headed the European multi-op. list in the Phone section. Note that for purposes of scoring in the 1967 contest the US multipliers are the 48 continental states (this *excludes* KH6, KL7) and Canadian Call Areas (not provinces).

The **YL International SSB'ers 1966 QSO party** results were as follows: **G4MJ** (201,372 points), G3MWG (163,835 points), G3EYN (112,413 points), **GM3NOV** (174,410 points) and **GW3SFC** (17,141 points). The top three European entrants were DJ2YL (274,964 points), PA0EEM (258,930 points) and G4MJ.

The **YL/OM Contest** is in two sections—phone and c.w.—the former runs from 18.00 25 February to 18.00 26 February, the latter between the same times on 11 and 12 March. All bands will be used, OMs call " CQ YL " (!!) and YLs call " CQ OM." Exchange QSO number, report, and country. A station may only be contacted once and counts one point. Score is number of QSOs times the total number of ARRL countries and " sections " contacted. Those running less than 150 watts (300 W p.e.p. on s.s.b.) multiply this total by 1·25. Signed logs should be posted before 20 March or 10 April respectively to: Marte Wessel, Box 756, Liberal, Kansas, 67901.

Propagation Predictions



DXpeditions

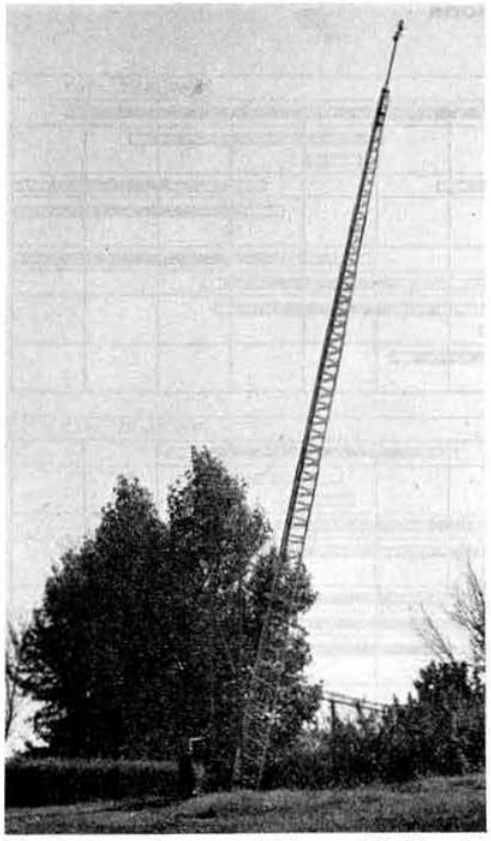
An expedition to Rio do Oro and Ifni during the second half of January by EA7GF and EA7JQ, using an SR 150, SR 500 and SX 117 loaned by Hallicrafters, should have materialized by the time this is read. However, it is possible that some delay may occur. About a week should be spent in Rio do Oro and 3/4 days in Ifni. QSL *via* URE (*see QTH Corner*). Contributions will *not* be accepted.

According to K6SSJ a world wide expedition will be undertaken by WA6SBO this year. He will be travelling by trimaran, and will be accompanied by two other trimarans. His itinerary is not yet available, but it is understood that he will commence in the Caribbean area and then move into the Pacific. It is promised that all QSLs for this operation will be sent in response to a s.a.e. only.

A letter from K6JAJ says that Myron Zobel (W6NMC) will be leaving on a trip around the world during the summer. Last year he operated as 9L1NM, TY4ATC and from TR8, TN8 and other places. Apparently cards for his 9L1 and

During February the winter gradually nears its end and so the days become longer. The 14, 21 and 28 Mc/s bands will thus remain open longer in the evenings, especially towards the end of the month. The increase in solar activity is slow and so conditions on the h.f bands (21 and 28 Mc/s) will also improve only slowly. Eastern North America will probably not yet be workable with certainty on 28 Mc/s, although contacts with Africa and South America should be possible. On 21 Mc/s all continents should be heard. With the approach of the equinox the chances of working one or other of the DX zones via the long path will decrease on 21 as well as on 14 Mc/s. 14 Mc/s will remain open until just before midnight, especially towards the end of the month. In the latter half of the night, however, DX contacts will only occasionally be possible. In the forthcoming ARRL DX contest Southern European stations will be better placed than northerly stations for contacts with North America. Contacts with Hawaii and Alaska will only be possible on 14 Mc/s under very favourable conditions in the period 16.30 to 18.30 GMT, the former being favoured. QRM permitting on 7 Mc/s, Eastern North America should be heard from 21.00 GMT until one to two hours after sunrise, though in the latter half of the night these contacts may be lost now and again because of a drop in the m.u.f. Likewise traffic with North America on 3·5 Mc/s may be interrupted by other causes in the latter half of the night. Local traffic (outside the ground wave zone) on 3·5 Mc/s will hardly be possible in the latter half of the night, and sometimes even earlier, because of the dead zone.

The mean provisional sunspot number for December 1966 was 68·2 with daily sunspot numbers running into three figures between 10 and 16 December. The predicted smoothed sunspot numbers for April, May and June are 74, 76 and 79 respectively.



W0GDH's 100 ft. tower being raised to support his 160m aerial

TR8 contacts do not count for DXCC, but the others are all in order. Gary points out that he will be acting as QSL manager for this year's trip as well as for those still needing QSLs for last year's effort. Applicants should send two IRCs for direct reply, otherwise cards will be sent out *via* the bureau.

The operator on board a German research ship DI2LE/MM will be visiting New Caledonia, British Solomon Is, New Guinea, Timor, Cocos Keeling Is. and Christmas Island between April and August this year. No licences have yet been obtained, but it is hoped to operate from all these places. DL9ST will act as QSL manager.

Don Miller, W9WNV, was thought to have left the Seychelles Is. on 14 January, en route for more stops. No information was available at time of going to print about his exact schedule which will depend on weather conditions in the Indian Ocean, however it is expected that the Laccadive Is. (VU) and Chagos Is. (VQ8-C) will be activated.

W4CHA should have left the US for Australia in early January, together with his KWM-2 and 75S3. He hopes to spend three months on Norfolk Island, then visit Lord Howe, Nauru, and Christmas Islands. Frequencies to be used: 7005, 14,065 and 21,065 kc/s.

A brief mention was made in December of possible activity from G3POX when he accompanies a British Joint Services Expedition to Central Australia. It is now known that this will definitely materialize, and by the time that this is read, activity should, in fact, have started under the call VK8OX. He will be on the air daily, between 08.00 and 10.00 GMT, using the frequencies 21,120 kc/s and 14,100 to 14,110 kc/s, with operation on s.s.b. and c.w. only. The fixed equipment consists of a KW2000 feeding a five wavelength Vee beam on 15m, power being derived from a Honda generator. A Pye SSB 125 has also been taken for use when circumstances permit mobile operation; its frequency will be fixed at 14,105 kc/s. Initial activity is from Adelaide, but after 24 February, for 95 days, the expedition will move to Central Australia. One special request is made by G3POX—please do not break in when G8FC is in contact with VK8OX passing information. The QSL Manager is G5UG, who will require pre-paid postage for QSLs not sent via the bureau.

Band Reports

Conditions appear to have been rather poor on all bands during the last month, and the good openings experienced on the l.f. bands last winter seem to be a great deal less frequent, as is to be expected in view of the increasing sunspot activity. January should begin to show some improvement, and with the increasing use of beam aerials and more efficient equipment all round 1967 should prove to be a record year for those interested in DX.

Once again your scribe would like to express his thanks to the following who sent in reports and information for this issue of *MOTA*: G2BOZ, G2LB, G3AAE, GW3AX, G3HCT, G3HDA, G3IGW, GM3ITN, G3JVJ, G3KSH, G3OIT, G3PQF, G3SML, GM3SVK, G3SYC, G3URX, G3VMQ, G3VNC, G4JZ, G4MJ, GM4QK, G8JM, G8VG, 9J2BC, BRS20317, BRS25605, BRS27806, BRS27845, BRS28198, A3942, A4038, A4568, A4713—ZC4L164, A5016, A5105, and A5182.

1·8 Mc/s C.W.: JA5PKU (449, 1910 kc/s at 05.30), W1HGT (05.46), W2EQS (07.40), W6TTR (05.30), W8HGW (07.15), K9PAW (07.50), K9YWO (07.55), W0OKJ (05.30), VE3BWY (07.30), VO1FB (05.50), ZD8J (22.25), W0GTA/8F4 (22.50), 9A1VU (00.20), 9H1AE (05.33), 9V1LP (23.00).

3·5 Mc/s C.W.: CO2BO (23.15), EP2BQ (21.55), ET3ZL (23.40), JA1s FFP, LQC (20.30), KV4CI (22.31), OD5EY (22.56), 5Z4MU (22.47).

3·5 Mc/s S.S.B.: CN8AW (21.37), CT3AV (20.30), HI8XAL (06.45, 23.11), W1FZJ/KP4 (23.54), MP4TBO (22.02), OD5AC (20.30), PZ1CF (21.00), TI2NA (23.40), UW9AF (22.28), YS1FSE (06.53), YV7AV (07.24), VE2BUJ/SU (20.24), VP5AB (22.30), VP7DX (23.30), VS9AJC (21.10), W9JLH (07.13), ZC4MO (20.30), 7X0AH (22.00).

7 Mc/s C.W.: EP2RV (23.42), HI7MRC (23.17), HP1XHG (23.50), JA1IDU (14.51), JA6AK (21.42), KA9AK (09.00), TA2BK (21.45), TU2BK (22.43), UA0LH (Zone 19, 12.18), YV1AD (08.25), VE8MD (23.39), VE8ME (08.30), VU2FN (17.10), WA6IVN, W6IXK, etc. (09.00), K0TPH (Colo. 08.45), ZD8J (21.34), ZL2BZ (08.20), 4S7BT (18.50), 4U1ITU (14.53).

7 Mc/s S.S.B.: EP2BU (17.45), FM7WQ (21.50), HI8XNO (21.40), MP4TBO (19.10), PZ1CF (21.03), VP2AA (21.20) VP6s EW, KL (22.00), W7CUT (Utah. 08.25), ZD8ARP (21.14), 7Q7s PBD, PH (20,00), 9X5MH (21.18).

14 Mc/s C.W.: CE2RK (18.41), CT3AE (14.31), FB8YY (17.00), JX5AK (13.45), KR6JM (08.41), OA4VE (09.35), TA2AC (16.30), UA0KYA (Zone 23. 10.10), VP1PV (11.50), VQ8BJ (16.30), VQ9TC (16.08), VU2QM (14.34), ZD3G (19.10), 3W8A (16.20), 5R8AW (19.00), 6W8DD (00.30).

14 Mc/s S.S.B.: CE6CF (12.00), CR4AJ (21.00), CR5SP (06.53), FH8CD (16.28), FK8AT (08.07), FO8AA (16.00), HL9US (10.00), HS4AK (15.17), HV3SJ (08.55), KC4USV (08.20), KG6IC (08.10), KL7FGH (09.20), OA4QN (22.07), PX1PA (09.25), TG9EP (13.10), VK9OM (08.15), VK9RH (Norfolk Is. 08.36), VK9XI (Christmas Is. 15.48), VK0CR Macquarie Is. 12.50), VK0KM (16.56), VQ8AX (17.22), VQ8BFA (Agalega Is. 15.57), VQ9AR (16.35), XW8BS (15.17), ZD3D (19.33), ZD3G (16.50), ZS8L (17.24), 4S7LM (14.48), 5R8AU/P (Ste. Marie Is. 17.05), 8R1P (18.10).

21 Mc/s C.W.: CO2BO (15.35), FG7XJ (12.25), FL8RA (11.41), HI8LC (12.02), KS4CC (13.05), OD5EJ (13.04),

QTH Corner

CO2BO	via OK3MM
EA9 Expedition	via URE, Box 220, Madrid, Spain.
EP2BQ	Box 1065, Teheran, Iran.
ET3ZL	W4WBA, 65 Alden Av. N.W., Atlanta, Ga., USA.
F QSL Bureau	—w.e.f. 1/1/67—REF., BP 70, 75 Paris 12, France.
FG7XJ	New QSL Mgr.-W8GIU, 206 N. Main St., Box 97, Mt. Cory, Ohio.
GD3AIM	via W2CTN.
KW6EM	via K6JAJ (see below).
MP4QBF/TBJ	9 Springcroft, Manor Drive, Hartley, Dartford, Kent.
ST2SA	Box 244, Port Sudan, Sudan.
VE2BUJ/SU	via VE2NV, 135 Thorncrest Av, Dorval, Que, Canada.
TR8AH	Box 3122, Libreville, Gabon.
VK0CR	via VK7 Bureau, or Greg Johnston, 3 Inglis St, Newtown, Hobart, Tasmania.
VK8OX	via G5UG, 32 Worlebury Park Road, Weston-super-Mare, Somerset.
VP1DX	via W4HGW, 1212 Kruger Av, Charleston, S.C., USA.
VQ9AR	via WA8GUA, 18243 Riverside Drive, Birmingham, Mich, 48009.
VS9HRV	Ray Vasper, 210 Sig. Sqdn, BFPO 69, or via RSGB.
VS9MB	SAC C. Simmonds, Signals Section, RAF, Gan, BFPO 180 or via W2CTN.
VS9OC	(Op. Jim) 21 Berwick Crescent, Sidcup, Kent.
VS9OSC	(Op. Brian) see VS9MB.
W6NMC/World trip	—via K6JAJ, 4645 Oakwood Place, Riverside, Calif, 92506.
ZB2AM	via W1HGT, 19 Woodstock Avenue, Brookline, Mass.
ZD3F	via W2CTN
ZD3G	via K6ENX, 3246 Grand Avenue, Vista, Calif. 92083.
5H3HG	21 Johnscorner, Tanganyika, Tanzania.
9L1LP	Box 20, Meakeni, Sierra Leone.
9U5DP	DS 17, Burasira, Burundi.
QSL Manager	
W2CTN	159 Ketcham Avenue, Amityville, NY 11701, USA.

RSGB QSL Bureau: G2MI, Hayes, Bromley, Kent.

VP1DX (13.00), VP6PJ (13.03), VQ9AR (14.00), VU2WB (10.40), ZP5LS (13.47).

21 Mc/s A.M.: CT2AC (15.05), CT3AS (11.30), EA9EJ (Rio do Oro, 16.26), KR6BF (09.21), ST2SA (14.04), TT8AB (16.10), TU2AF (14.06), XE1GGX (13.38), YB1RI (13.08), YV3BH (16.53), 5X5JK (14.12), 6Y5WF (16.19), 7X2MD (12.45).

21 Mc/s S.S.B.: CE6EZ (11.40), CR4BA (09.00), CP6GA (11.00), W6DFM/DU1 (10.35), HR1JAP (17.00), HR4DHS (Amapala Is. 12.00), HS3MP (11.50), MP4MAW (11.52), MP4TBO (09.45), W2YEJ/OA4 (12.50 L.P.) TU2BD (16.33), YS1AM (17.00), VK9HS (14.50), VS6s BE, EK (11.30), VS6FS (12.14), VU2s FN, JM (09.25), ZD8CX (12.40), ZE1BS (15.50), ZL2AC (08.25). Other ZLs 08.30-09.50 L.P. then S.P., ZS9BJS (17.00), 4U1SU (Gaza Strip, 14.05), 9U5DP (09.53).

28 Mc/s C.W.: CX2CO (11.00), KV4CI (13.39), VKs 5JT (09.50), 7SM (10.10), VEs (14.00-16.00), VQ8BJ (12.04), VU2WB (10.50), WI, 2, 3, 4, 8, 9 (14.00 to 18.00).

28 Mc/s A.M.: CR4BO (11.29), TJ8AC (10.50), VS9AJC (13.00), XE2DDZ (16.08), ZD3E (12.23), ZD3G (12.35), ZE1AV (09.40), 9Y4VS (13.10).

28 Mc/s S.S.B.: FH8CD (10.55), KV4CX (14.50), SV0WL (Crete, 13.30), VK6GP (11.30), VP6EW (12.30), YS1DAG (15.00), ZS8L (16.10).

DX Briefs

ZD3G is on 14 Mc/s s.s.b. frequently and runs 60 watts to a dipole at present. He hopes to have more power and a beam shortly. Ray's home call is WA6LBP, he is in the Peace Corps, and expects to be in Gambia for about one year.

Another station has been reported on 14 Mc/s c.w. from Gabon. This is **TR8AH** who has been heard on 14,024 kc/s at 21.00. **TY2BC** is said to be the call of 5N2AAW and 5N2AAX when visiting Dahomey. They are active from there nearly every weekend, according to WB2FSW.

VK2AVA is making plans for a DXpedition to Lord Howe Is. during late April or early May. He will be using a KWM-2 and a ground plane. **ZM7FL** will be the call-sign of VR2FF during a short visit to the Tokelau Is. during January, his QSLs will be dealt with by K9OTB. **4W1K** is reported to be on from Yemen—QSL via HB9AAT.

VP2GSM will be active during the first week of February from Grenada. This is W9YSM, and he will use 14,250, 14,275, 21,350 and 21,400 kc/s. Further **VP2KY,** Anguilla, and **VP2AZ,** Antigua, operation by W0IIC should also occur at about the same time. He should be on all bands, the only frequency given being 14,001 kc/s.

G3BID plans to operate from the Gambia during February, operating with the call-sign **ZD3F** on 10-80m s.s.b.

Once again thanks are due to all correspondents, especially to the following: The *L.I.D.X.A Bulletin* (WA2EFN), *DX'press* (PA0FX), *The DX'er* (W6HVN), *DX News Sheet* (Geoff Watts), *The DX'ers' Magazine* (W4BPD), *The West Gulf DX Bulletin* (W5IGJ), *Florida DX Report* (W4MVB), *CQ DX* (A.R.I.) and the *Ex-G Radio Club Bulletin* (W3HQO. Please send all items for the **March** issue to arrive no later than **8 February**, for the **April** issue by **15 March,** and for the **May** issue by **12 April.**

Final 1966 Countries Table

	Mc/s						
	1·8	**3·5**	**7**	**14**	**21**	**28**	**Total**
G3UML	**4**	**41**	**68**	**183**	**107**	**110**	**513**
G3NMH	—	—	71	195	132	88	486
G8JM	5	2	14	238	120	38	417
G3SSO	14	39	57	112	117	68	407
GM3SVK	13	17	65	117	122	38	372
G3IAR	7	44	65	92	88	51	347
G3HS	15	40	58	110	70	35	328
G8VG	5	30	31	95	78	57	296
5N2AAF	9	14	23	137	68	29	280
G3IGW	22	58	47	69	59	1	256
G3KSH	8	27	59	69	61	29	253
G3LHJ	7	23	23	97	48	33	231
GM3KLA	3	38	45	44	70	15	215
9J2BC	1	1	5	64	54	76	201
G3JVJ	18	43	37	40	17	6	161
9V1LP	6	14	26	49	46	27	148
G3MWZ	7	17	24	59	23	14	144
G3PQF	1	25	62	20	9	25	142
9V1LK	—	—	10	63	46	19	138
G3TWG	5	7	26	30	38	20	126
G3WZ	2	4	27	26	2	—	61
A4038	**12**	**21**	**29**	**249**	**151**	**102**	**564**
BRS27806	4	27	30	218	152	72	505
BRS26222	5	40	44	215	122	73	499
A4568	6	45	50	215	131	51	498
A4609	18	49	77	128	140	86	498
BRS25429	8	57	81	146	124	79	495
BRS20317	22	88	127	93	73	49	452
A4886	6	29	42	193	116	39	425
G8API	2	17	47	161	138	56	422
BRS25605	11	44	56	127	96	43	377
A4489	21	59	76	157	25	1	339
A3942	14	54	78	130	59	1	336
A4048	9	39	52	118	72	26	316
A5105	2	20	28	138	91	35	314
A4431	6	25	40	104	108	30	313
A4552	2	25	12	127	84	30	280
A4182	5	21	25	129	43	28	251
A3609	7	24	27	76	63	16	213
A4370	4	30	10	137	39	1	212
A4311	—	15	13	115	37	23	203
A4955	9	22	33	51	60	22	197
A5025	11	17	30	50	22	14	144

Congratulations to the winners **G3UML** and **A4038,** and thank you to all who took part. Some scores would have been higher if their owners had reported more recently! The first of the 1967 tables will be in next month's issue.

A High Power Varactor Tripler for 70cm†

By G. B. ROPER, G8AKM*

ALTHOUGH it has recently become possible to generate quite useful amounts of power at 430 Mc/s with transistors—8 watts with the RCA 2N3733, for example—really high power on 70cm remains the province of the QQV06-40A and 4X150A. An alternative route to the production of u.h.f. power, however, is to generate it at a lower frequency and multiply at high level to the required frequency without further amplification, and a Varactor is a device for accomplishing this.

Presently available Varactors will triple from 2m at output power levels of about 25-30 watts with efficiencies approaching 80 per cent without requiring any additional power supplies, and this article describes such a unit built by the author. It is small enough to be mounted, together with a pre-amplifier and aerial changeover relay, on the mast close to the 70cm aerial thus eliminating virtually all the feeder losses at 432 Mc/s. Since even a 50 ft. run of low-loss u.h.f. TV cable will have a loss of about 3db at 70 cm, the 25 watts available at the masthead from the Varactor is as good as 50 watts of r.f. in the shack, or say 100 watts d.c. input. Furthermore, as the p.a. efficiency will be higher and the feeder losses lower at 144 Mc/s, a 100 watt (input) 2m rig will fully drive the Varactor unit (40 watts r.f. in) via the same length of feeder to produce 25 watts at the aerial.

There are snags, of course, and these will be dealt with later, but it is hoped that enough has been said to sufficiently interest anyone with a 2m transmitter to read the rest of this article!

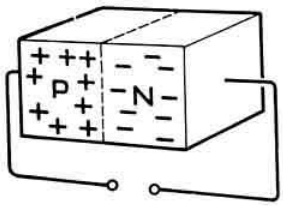


Fig. 1. A junction of p type and n type semiconductor materials.

Principles

As the theory of Varactor operation is unfamiliar to most readers, it is worthwhile having a brief look at how they work. Fig. 1 shows a *p-n* junction formed by butting a piece of type *n* semiconductor material, that is, material doped so that it has spare electrons available, and a piece of *p* type material, which has spare " holes " (missing electrons). This is the familiar semiconductor diode. Spare electrons near the junction in the *n* region are attracted into the *p* region where, after wandering about for a while, they combine with holes and are neutralized; conversely some of the holes near the junction on the *p* side find their way to the *n* region and combine with electrons there. The volume of material near the junction is thus swept clear of holes and electrons, and forms a sort of no-man's-land—the depletion layer where to all intents and purposes there are no charge carriers. No net current flows to the outside world, and the whole thing behaves like a capacitor with the depletion layer as the dielectric between the conducting *p* and *n* region " plates." It is a slightly charged capacitor, because the charge separation process produces a space charge or " contact potential " across the junction. This is about 0·5 volt for silicon.

If we connect an external d.c. supply in such a sense as to aid this space charge, i.e., we reverse-bias the junction, then the increased electric field sweeps more carriers out of the bulk material and increases the width of the depletion layer. Thus the junction capacitance is reduced, just as when the plates of a parallel plate capacitor are pulled apart. Conversely, reducing the space charge by forward bias decreases the width of the depletion layer and increases its capacitance, until finally the depletion layer width becomes zero, the plates, in effect, touching, and the device conducts in the forward direction. This, of course, happens at about 0·5 volt for a silicon diode.

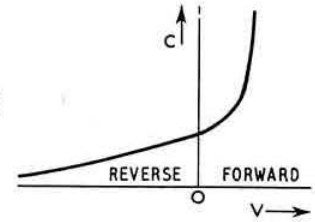


Fig. 2. A typical plot of capacitance against applied voltage for a semiconductor junction.

Thus the junction diode behaves, when reverse biased, like a voltage variable capacitor: the limits to the capacitance swing are set by reverse breakdown of the junction at one end, and forward conduction at the other. Actually, at v.h.f., Varactor diodes may be driven quite hard into the forward region without appreciable current flowing, because the applied voltage reverses again and sweeps most of the injected carriers back to the side from which they started, before they have time to recombine on the other side. This results in a large increase in capacitance swing and hence power handling capacity.

If we now plot capacitance against voltage for a semiconductor junction we obtain a curve similar to that shown in Fig. 2, although the exact shape depends on the way that the doping levels vary near the junction.

The charge on a capacitor is given by the expresssion $q = CV$, and Fig. 3 shows a plot of charge, q, against voltage. If we superimpose an input sinewave of charge on the curve, we see that the resultant Varactor voltage waveform is spiky—in other words, it contains harmonics.

This is the way in which the "classical" Varactor produces frequency multiplication, but there is another important mechanism which deserves a brief mention. It was said above that if a diode is driven for a short time into the forward region, when the applied voltage reverses against those carriers which were injected from one side of the junction into the other will not have had time to combine with opposite charges there, and will return to their side of origin appearing as a brief pulse of reverse current (see Fig. 4). This recovered

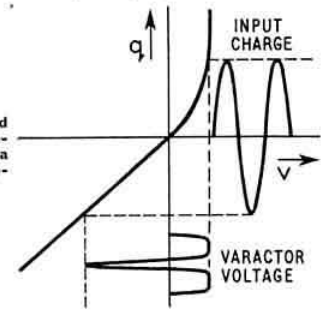


Fig. 3. The curve of junction stored charge plotted against voltage, being non-linear, severely distorts a sinewave input charge, thus producing harmonics.

† Submitted June 1966.
* 19 Normay Rise, Newbury, Berks.

charge, which is a nuisance in ordinary diode circuit applications, is useful in Varactors as we have already seen, as it represents a welcome increase in effective capacitance swing. However, if the impurity doping levels near the junction are suitably profiled, it can be arranged that the stored charge all comes back in one lump, giving a very fast cut-off of reverse current, as in Fig. 5. This phenomenon, known as " step recovery " results in the production of a great deal of extra useful harmonic energy, and is exploited in some modern Varactor diodes to increase the harmonic output power available.

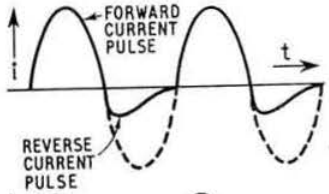


Fig. 4. The reverse current overshoot of a normal *p-n* junction.

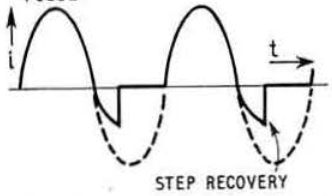


Fig. 5. If the semiconductor layers are suitably doped, the reverse current pulse can be tailored to produce an extremely rapid recovery, thus improving the harmonic output.

In order to make use of these effects (harmonic generation by non-linear capacitance and by step recovery) in a practical circuit, it is necessary to arrange to feed current into the Varactor at the input frequency, and to extract the harmonic energy generated in some way. Varactors may be used in either series or shunt circuit configurations, but the shunt arrangement is more convenient for high power use as it allows one side of the device to be solidly connected to a good heat sink—usually the chassis. Filters are needed to isolate the input and output, and these may simply be series tuned circuits, suitably tapped to provide impedance matching between the source, Varactor and load.

Thus we arrive at the basic circuit of Fig. 6, in which C1, C2, L1 and the diode capacitance form a tuned circuit series resonant at the input frequency, and C3, C4, L2 and the diode capacitance (usually quoted at two-thirds of the breakdown voltage value for this purpose) is series resonant at the output frequency. With the addition of a bias resistor across the Varactor to induce a little forward current to flow on peaks of forward drive, Fig. 6 would form a perfectly good frequency doubler. For higher order multiplication, greatest efficiency is obtained by short-circuiting the Varactor at the second harmonic frequency with an " idler " circuit, and thus allowing second harmonic currents to flow in the diode, where mixing occurs with the fundamental to produce sum and difference frequencies. In this way, tripling, quadrupling and so on can be achieved, although at progressively lower efficiencies owing to idler circuit losses.

Because of the harmonic relationship between the amateur v.h.f./u.h.f. bands, we are most interested in tripling, and

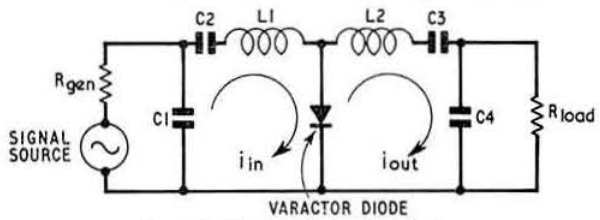
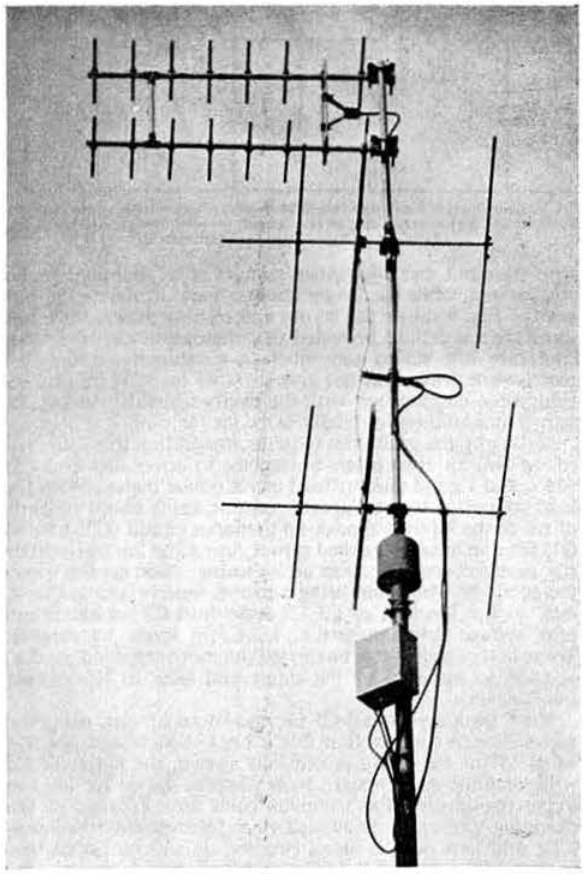


Fig. 6. A basic Varactor doubler circuit.



The Varactor tripler mounted, along with a receiving preamplifier and changeover relay, close to the aerials to reduce the attenuation of a long coaxial feeder at the transmitted frequency.

Fig. 7 shows a typical tripler circuit. This is developed from Fig. 6 simply by the addition of an idler circuit comprising L3 and C5, series resonant with the diode capacitance at twice the input frequency. The bias resistor *R* is not critical and is usually chosen between 68-200 K ohms. Efficiencies from 60 to 80 per cent are attainable when tripling from 144 to 432 Mc/s with this circuit, using devices such as the Mullard BAY66 (12 watts maximum input), BAY96 (40 watts) or the Motorola 1N4387 (40 watts), but it is not quite suitable, as it stands, for connection direct to an aerial, because the single tuned output circuit does not give sufficient attenuation of the fundamental and unwanted harmonic signals appearing across the Varactor. It is therefore necessary to provide at least a double tuned output circuit, and at 70cm this can conveniently consist of a stub in a co-axial cavity, with a series tuned input loop taking the place of L2 and C3 in Fig. 7. With proper adjustment, spurious signals will be reduced to about 40db below carrier, but if the odd milliwatt of spurious emission causes interference to local 2m stations, an additional high-*Q* break may be used.

Construction and Alignment

The complete circuit of the G8AKM multiplier is shown in Fig. 8 and by now should need no further explanation. The unit is built in a copper box 6 in. long by 1½ in. square, brazed or soldered up from 16 to 18 s.w.g. sheet. A partition 2½ in. from one end forms two compartments, the Varactor

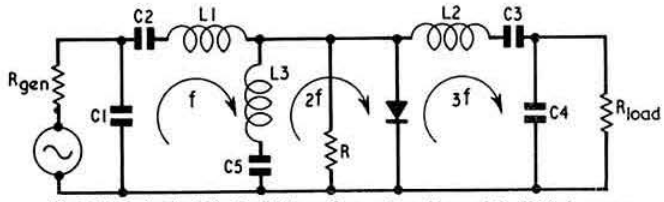


Fig. 7. The circuit of Fig. 6 with two refinements: a bias resistor (R) to improve the doubling performance, and an idler circuit tuned to the second harmonic, to facilitate higher order multiplication.

with its input and idler tuned circuits being mounted in the smaller one, while the longer compartment forms the output cavity. Fig. 9 shows the layout and leading dimensions, but these are not critical provided that the output cavity dimensions are not varied too much—consequently, a detailed metal-work drawing is not given. A $4\frac{1}{2}$ in. × $3\frac{1}{2}$ in. × 2 in. Eddystone die-cast box with the cavity formed by a copper partition would undoubtedly work just as well.

Setting up the multiplier requires, in addition to a source of r.f. at 2m, an absorption wavemeter to cover 288 and 432 Mc/s, and a good dummy load or r.f. power meter. With the load connected to the Varactor output, apply about 10 watts of r.f. to the input and peak up the input circuit (C2, L1 and C1) for maximum absorbed power, using the 2m transmitter p.a. anode current meter as an indicator. Next set the wavemeter to 288 Mc/s, and bring a probe, loosely coupled to it, near to the junction of L2 C3 and adjust C3 for maximum idler voltage at this point (i.e., L2 C3 in series resonance). These first two steps can be carried out more rapidly if a g.d.o. is used to initially set the input and idler to the correct frequencies.

Next, peak up C4 and C5 for maximum r.f. out, using the wavemeter to confirm that this is on 432 Mc/s and not 576 Mc/s. With the cavity dimensions shown, the plates of C5 will be about $\frac{1}{16}$ in. apart. Now increase the power level in steps, re-adjusting the trimmers each time because of the changing Varactor capacitance which forms part of the input, idler and first output tuned circuits. It will be found that correct adjustment of the idler circuit produces a peak in the output power, but this is not a reliable way of adjusting the idler since a number of spurious peaks will occur if C3 is varied over its range, owing to interaction between the various tuned circuits. Having set the idler to series resonance by the method suggested above, it is best left alone, and subsequent alignment confined to the input and output circuits. If a reflectometer is available, it may be used to adjust C1 for optimum match to the feeder cable, again at the proper power. In practice, adjustment of C1 so that the 2m transmitter p.a. does not detune as the coupling loop is brought in, seems to be satisfactory.

After a short period of operation at full power, check the Varactor stud temperature. At the maximum allowable r.f. input level of 40 watts, the 1N4387 will produce about 25 watts of r.f. output, and will therefore be dissipating 15 watts as heat; at this dissipation the maximum permissible stud temperature is 100°C. The box shown in Fig. 9, if made of 16 s.w.g. copper, will have a thermal resistance of about 5°C/watt in free air, and at 15 watts will therefore hold the Varactor stud at 100°C in an ambient of 25°C. This, of course, is on the limit of the device rating, and is uncomfortably hot in any case, so it is recommended that the tripler unit be mounted to a thick copper or brass bracket bolted directly on to the Varactor stud.

Limitations

There are snags associated with the use of Varactor triplers, the most important of which is probably the cost. The Motorola 1N4387, used in the multiplier described, cost just over £15 at the time of writing, but the Mullard BAY96, which has a similar performance and should work just as well in this unit, was available at less than £10. This is practically the only outlay required if the 40 or so watts of r.f. are already available, and it compares quite well with the cost of, say, a QQV03-20A tripler and QQV06-40A p.a. rig, by the time the valves, valveholders, metalwork and all the other complications of a high-power valve transmitter have been acquired.

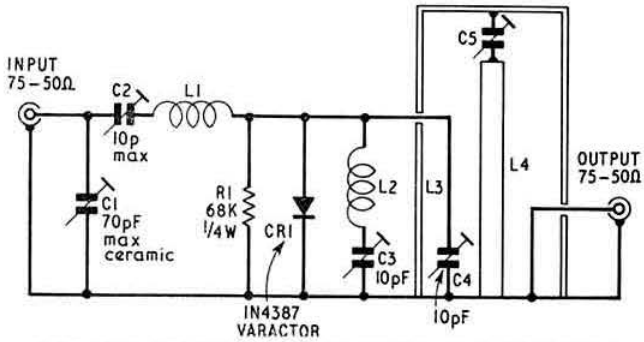


Fig. 8. The final circuit of the tripler. C1, 70pF max. ceramic; C2, 10pF max.; C3, C4, 10pF beehive; C5, two 1 in. diam. discs, approx. $\frac{1}{16}$ in. apart; D1, 1N4387 Varactor diode; L1, $3\frac{1}{2}$ turns, 16 s.w.g., $\frac{1}{4}$ in. diam. (0·2μH); L2, 2 turns, 16 s.w.g., $\frac{3}{8}$ in. diam. (0·06μH); L3, 2 in., 16 s.w.g.; L4, $3\frac{1}{8}$ in., $\frac{3}{8}$ in. o.d. brass tube; R1, 68 K ohms, $\frac{1}{4}$ watt.

The other snag—although many users may not find it so—is connected with the choice of modulation. The power levels quoted above are c.w., and in fact the Varactor may limit, due to reverse voltage breakdown, at a power level slightly above the manufacturer's rated maximum. This means that although the 1N4387 or BAY96 will produce 25 watts of c.w. power, the *peak* power level attainable will not be much more than this. The writer has found that with the 1N4387 it is necessary to reduce the input power from 40 to 20 watts in order to produce reasonably symmetrical 100 per cent a.m. This diode, which is a graded-junction step recovery device, will, in fact, multiply an a.m. signal very well with good linearity, but the abrupt junction types, such as the BAY66 and BAY96 detune more rapidly with changes of drive level, and would probably be slightly less satisfactory for a.m. use.

But why use a.m.? Phase or frequency modulation is cheaper to achieve and more suitable (because of voltage

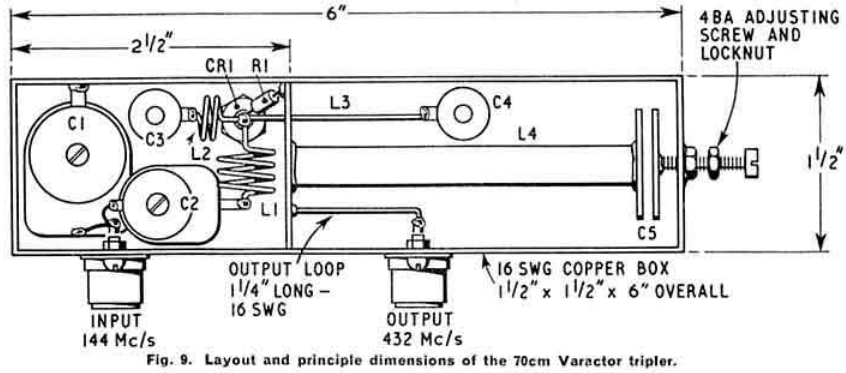
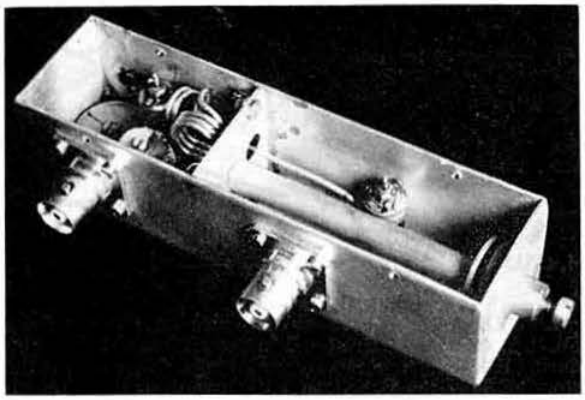
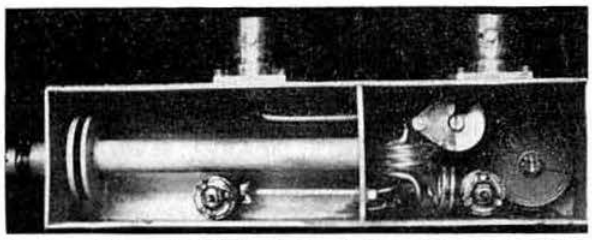


Fig. 9. Layout and principle dimensions of the 70cm Varactor tripler.





Two views of the completed tripler. The Varactor is mounted on the base of the box at the junction of the two coils.

breakdown and hence peak power limitations) for Varactor and transistor transmitters. Furthermore, when it is fully appreciated by amateurs that future transistor field-day rigs provide a choice of 8 watts f.m. or 2 watts a.m. at 70cm, for example, f.m. may become a little more popular anyway! If you must, however, use a.m. with a Varactor tripler, it is advisable to tune it up with a 100 per cent sinewave modulated signal at the normal power level while watching the demodulated envelope on an oscilloscope. Look for peak clipping, and for discontinuities in the scope pattern due to dynamic detuning as the applied power varies over the modulation cycle. These can be eliminated by adjusting the input power level, and finding a compromise setting for the input tuned circuit. These complications are unnecessary, of course, with n.b.f.m.!

Appendix

For further reading on high power Varactor devices, readers are recommended to application reports issued by Motorola. These are too many to list here, but two of the most useful are (i) AN147: *High Power Varactor Diodes—Theory and Applications;* (ii) AN151: *Charge Storage Varactors for Extra U.H.F. Power.*

A 167 to 500 Mc/s tripler using the BAY66 was described in a Mullard handout at the 1964 Instruments, Electronics and Automation Exhibition, and a 150-450 Mc/s tripler using the BAY96 in *Mullard Technical Communications*, Vol. 8, No. 78, November 1965.

The Motorola 1N4387 is obtainable, price £15 8s. from Celdis Ltd., 4 Trafford Road, Reading, Berkshire, and the BAY96 at £9 from J. C. Woodward, 94 Great Brick-kiln Street, Wolverhampton, Staffordshire.

GB3GW

(Continued from page 83)

obviously going to be quite happy. It was tested with a valve transmitter and the input power required at 48 Mc/s to supply 5 watts output at 144 Mc/s noted. It was discovered that the efficiency of the Varactor varied with the power going into it, and it was necessary to run it at about 12 watts input to obtain the required output.

A Clevite 3TE140 transistor is used as the power amplifier at 48 Mc/s, this being driven by a 2N2876, in turn driven by a 2N2876 doubling from the crystal oscillator frequency of 24·04166 Mc/s. The crystal itself is in a crystal oven running on a reduced voltage in order to increase its turn on/turn off time.

Keying

Keying is arranged by switching off the supply rail voltage to the driver transistor with a Schmitt trigger circuit, which is controlled by an ORP12 photocell positioned behind the keying disc which has the Morse symbols DE GB3GW cut on its perimeter. A small lamp, considerably under run in order that its life may be extended, shines through the holes in the disc, and the disc turns at one revolution per minute driven from a self-starting synchronous motor. When you hear GB3GW you will notice that in addition to its call-sign repeating once every minute there are short breaks of a few milliseconds in the carrier every 15 seconds. This is to assist rapid identification of the station, and is produced by small projections placed at 90° intervals around the keying disc.

The transmitter, power supply and keying unit are installed in a metal cabinet, and a 75 ohm co-axial cable is run to the aerial which consists of a 5-over-5 element array pointing slightly North of East from Swansea. Mounted over the 2m array is a 70cm bi-directional aerial in readiness for the 70cm beacon which it is hoped to get permission for in the near future. This will consist of a similar transmitter to that used on 2m, but will drive an additional Varactor tripler on 70cm.

Reception reports of GB3GW are always appreciated, and will be acknowledged by QSL card. They should be sent to GB3GW, University College, Swansea, Glamorgan.

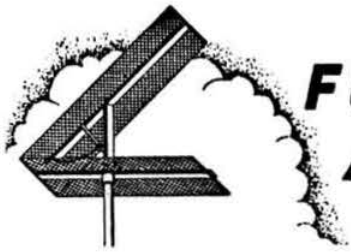
The writer wishes to thank the many people who assisted in getting GB3GW on the air, including GW3CBY who contributed with many suggestions and helped with tests over a considerable period.

QUA Associates

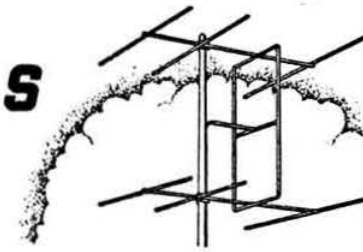
(Continued from page 87)

have to be isolated from the circuit, as only the tuned winding is used, and this can be done by enlarging holes B5, B7 and D6 with a large twist drill. The two connections which you are using can be soldered into holes C5 and C7 as shown in Fig. 2.

You can solder the transistor, an OC170, OC171 or AF117, in now—the collector in D5, the base in D4 and the emitter in D3. The rest of the components (which might be obtained from your Japanese receiver) can now be connected: R1 between E4 and E7; R2 between H3 and H6; R3 between F4 and F6; and C2 between G4 and G6. When you come to the capacitor C1, however, the capacitance is so small that two pieces of insulated wire connected in G3 and G5 and then twisted together will be needed. You may have noticed by now, incidentally, that the positive line is the copper strip labelled number 6, and the negative is strip number 7. The variable capacitor C3 which you might get from your Jap. receiver as well has to be connected between D7 and H5. You can see that the finished oscillator is so small that it will fit under most chassis and perhaps could be fitted into an ordinary broadcast receiver as a b.f.o.



FOUR METRES AND DOWN



By JACK HUM, G5UM*

Three Months To Go

IT is difficult, while the snow lies round about, to project oneself to the balmy leafiness of May and a salubrious Thames-side environment. Yet these are the conditions in which a few hundred of us will be meeting together personally in little more than three months from now when the Thirteenth International V.H.F./U.H.F. Convention will be on, its ground plan broadly as past Conventions—afternoon lecture session, evening banquet—but its venue very, very different. For at last it has been possible to take the convention out of central London to a place where there is rather more room to move, where overland communications are good and where (dare we say it?) car parking problems are negligible.

By now the date of Saturday, 13 May will be down in the diaries of most enthusiasts along with the place, The Winning Post Hotel, at Whitton, which is part of Thames-side Twickenham.

This gives plenty of notice for arrangements to be made at the next few Club and Group meetings to decide who will go in whose car, or whether block travel bookings should be made by rail to Whitton station hard by the hotel, or to London Airport, only a few miles to the west.

Right: you have the date and place. Watch, " Four Metres and Down " for the fuller details in the next couple of issues.

The American Scene Through British Eyes

The inherent optical-range nature of v.h.f. prevents most of us from knowing what the rest of the v.h.f. world is like beyond the 50 mile radius of the urban localities in which the majority of us dwell. Occasionally, as during portable events the opportunity comes to assess " the sound of the band " (be it 4m, 2 or 70cm) in rather different circumstances from those we experience for the remainder of the year.

A little less occasionally there are " openings," when it is possible to work DL at S9 with a dipole clamped in the vice in the garden workshop, or F stations operating with 1 watt input from cars on the Normandy coast, to quote actual examples. Then, also, literally scores of European signals appear on "Two" and " Seventy Cems " to give those of us who live in the UK a surprising insight into the intense v.h.f. activity which is going on all the time in other countries, yet of which we have no inkling except when propagation is anomalous.

Members have been heard to say that a really sustained opening of the kind that can happen when a stable high pressure system covers Western Europe (hot and still in Summer, foggy in Winter) becomes positively exhausting. They quietly long for a return to normal!

Rather more intriguing are the " targets of opportunity " that occur under auroral or sporadic-*E* conditions. More of this in a moment, and back now to the sound of v.h.f. in places other than your own.

Last October we were able to give an account from DL7HR of how the 2m band in the UK sounded to him during his Summer tour of these islands. Now here is the story of how the American v.h.f. world sounds through *British* ears, and it comes from Alan Clemmetson, who was G8AIA at the time but has probably received his G3-plus-three by now (he took his Morse test in December).

Last July, Alan while on vacation from Liverpool University visited the States and was given special permission by the FCC to operate from W1NBN/P1 from Mount Grace (1,600 ft.) in Western Massachusetts during the September V.H.F. Contest organized by the ARRL. It was, he says, a really hair-raising experience:

" Six metres is like 20m when it is wide open, only with a little more a.m. Virtually everyone is v.f.o. controlled, and pile-ups on my frequency were not uncommon. A bit different from 4m in G-land. Two metres is only slightly less active, but 220 Mc/s is virtually never used, except to get multipliers during contests, and 432 Mc/s is only slightly more so. This is because very little commercial equipment is available for above 2m—and where would most American amateurs be without commercial gear? "

Alan seized the opportunity while on Stateside to visit John Beanland, late of Hertfordshire and now G3BVU/W1, and was much impressed with his 80 ft. mast on a hilltop site that gives him 6m and 2m to order and all the Boston and New York television programmes when he wants them.

Targets of Opportunity

Now back to targets of opportunity: those DX stations who appear out of the v.h.f. blue when all signs are that the bands should be normal.

During the great auroral opening of last year's V.H.F. NFD a call-sign that figured consistently was that of GM3TFY, whose QTH is at Balerno in Midlothian. Its owner, David Guest, did well then, and he reports detecting one or two auroral openings since.

For instance, on the afternoon of 14 December, which, being a Wednesday, was unlikely to witness much 2m activity at that time of day, David worked SM0BSZ, SM6PU and GW2HIY in the course of an auroral opening that appeared to extend from 15.30 to 17.30 GMT, in addition to which EI2A, GB3LER and GB3VHF were heard. He says:

" In the handful of aurorae which have occurred in the past year almost always the first stations to appear include SM6PU, GW2HIY and EI2A! These three generally seem to have their ears to the ground so far as auroral openings are concerned." So, we opine, does GM3TFY!

Because aurorae and sporadic-*E* are so much less easy to anticipate than tropo there is only one way in which to catch them, and that is *to keep 2m busy*—not easy when most of us have breadwinning preoccupations to attend to. Yet it is only by sustained occupancy and a willingness to use c.w. that these auroral targets of opportunity, some presenting themselves for a matter of minutes, others for several hours, will be well and truly hit.

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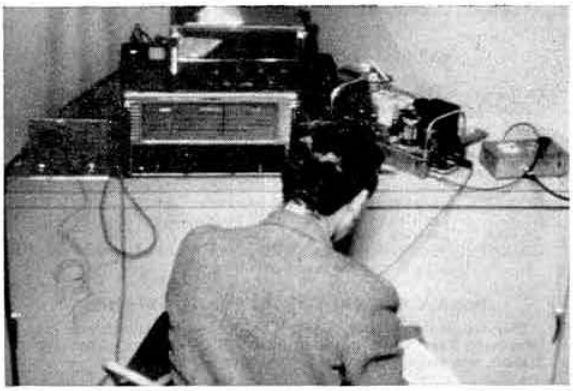
* 27 Ingarsby Lane, Houghton-on-the-Hill, Leicester. Please send contributions for the March issue to arrive by 8 February.



G3PSH operating G3OUL, the University of Liverpool's club station during the recent 4m c.w. contest.

More About "Four," Westabout

Echoing the *cri de coeur* of Bert McHenry, GI3NSM, to mainlanders to turn their beams westwards more often, Albert Latham, EI6AS, and one-time Voice of Stevenage, Herts., comments on the high level of many G signals during the December 4m c.w. contest. As might be expected, G3OUL of Liverpool just across the water gave an S9 signal at almost any beam heading; farther afield G3FDW in Nottinghamshire gave Albert another of several contacts the two of them have had on "Four," and *that* piled up some useful points over a 220 mile path.

And if you expect us to go on and say that this confirms the superiority of c.w., well, we won't. For one thing, G3FDW on sideband is always a tremendous signal in Dun Laoghaire; for another, the obvious thing to do on all v.h.f. bands is to select the mode to suit the conditions and the intervening terrain (though we must admit that this statement will have a hollow ring to the G8-plus-threes who are forbidden to pound the brass).

For his part EI6AS rings the changes on c.w. and phone as the situation dictates. And he (and his many GI confreres who also use "Four") would hand out many more DX contacts on this band if only those easterly beams were turned westabout more often. It is no bad thing, perhaps, to prearrange DX schedules in advance by post. Once a circuit is set up at known times the reliability factor has a habit of remaining pretty high even though on occasion the signal may be almost level with the noise.

Apropos G3OUL, the Liverpool University Club station referred to above, all 4m operators who were impressed by the very fine signal it laid down all over England (and that was most of us) will like to know that in the 70 Mc/s C.W. Contest in December participation was from the University Astronomical Observatory at the top of the 150 ft. Physics Tower, "leaning out of the dome to turn the beam occasionally," as one of the key-pounders puts it. The accompanying picture—focus not too good but put that down to the excitement of the moment—shows G3PSH demonstrating that a well-known ex-commercial "blue" transmitter is adaptable for c.w.

Concentration in Time

To concentrate v.h.f. operating sessions into defined activity periods is a well-tried method of generating plenty of inter-communication. For the last ten years or so "Monday Night at Eight" has drawn operators in large numbers on to "Two" in the sure knowledge that there would be plenty of others around to talk to.

Clearly it does not do to have one full night and six empty ones to follow, and in many areas additional activity nights have sprung from the main one, for example, Thursdays fo 70cm in the Midlands, Fridays and Saturdays for 70cm and 2m in the Home Counties—and of course Sunday mornings everywhere for "Four."

But Monday night seems to remain *the* top night nationally, both for 2m and for 70cm for the commonsensical reason that once you put heat into the radio room you might as well make the most of it by having an extended session there.

Thanks to the establishing of a 70cm activity night on Mondays in the South West, along with the existing 2m one, a big accession of interest has occurred in the region. Bill Scarr, G2WS, who did so much to galvanize activity in the West Midlands when he was at Coventry, is a source of infectious enthusiasm radiating from his fine new QTH at Weston-super-Mare. He writes:

"Our 70cm activity is now well established and is attracting attention on both sides of the Bristol Channel as well as further afield. Every Monday between 6 and 10 p.m. stations come on, and the 'regulars' include (in call-sign order) G2WS, GW3ATM, G3MPS, G3TND, GW6OAJ/T, G8AII, GW8ASA, with G2UN, Gloucester, and G8AHF of the Isle of Wight joining in on occasion."

What is significant in all this activity is the large number of contacts which can be made only by reflection from the hills which abound in South Wales and Somerset. In some cases, adds G2WS, aerials must be pointed up to 45 degrees off the direct line and in a few cases signals have clearly to be bounced back from hills *behind* the listening station before contact can be established. This is a situation barely discernible on 2m but which can be of great significance on 70cm—and on 23cm perhaps even more so.

With a "Two-er" in Yorkshire

Welcome to a newcomer to v.h.f., Bill Scarlett, G3RXS, of Bingley. Four years licensed, Bill thought he would like to try v.h.f., and the quickest way to get there in his particular circumstances was with a Heathkit "Two-er." Results were predictable from his 625 ft. location: a dipole brought in the nearer stations of Yorkshire, and a J-Beam 2-over-2 slot the more distant ones—with real excitement during the big openings of last Autumn.

"But then I had to bow out," John adds, "under the strain of so many overlapping signals in the super-regen receiver section." He says "the barn door selectivity is a problem at times and in really high activity areas might make the rig impossible, but to someone who has to build on the kitchen table and operate from there, or the dining room, it is ideal . . . I have not regretted my first year on 2m."

And next it's heigh-ho for "Four" and "Seventy" now that he has weighed v.h.f. in the balance and found it not at all wanting.

"Twenty-three" Burgeons in the North

On 14 December, 1966, at 14.55 GMT contact was established on 1296 Mc/s between G8AGG of South Liverpool and G3SKT/P eight miles away on Bidston Hill, who replied on 4m. Possibly this was the first 23cm contact in the north west; probably it was the first in which a Varactor was used at the transmitting end.

Using a hand-held 6 element Yagi, G3SKT logged G8AGG as RS58, and was still receiving a readable signal after he had moved along to a different hill twenty miles away.

At G8AGG an 8-over-8 slot aerial at 30 ft., although of course not as efficacious as a three-foot dish, is recommended as a compact and efficient device. Amplitude modulation to the 70cm drive to the Varactor tripler was used.

On the point of Varactors G8AGG reports that G3FNQ/P in the course of a one-way contact with G3EEZ of Wolverhampton over a path distance of 12 miles used amplitude

modulation of the 2m driver to a 70cm Varactor tripler which fed another Varactor tripler to 23cm! And on the subject of modulation generally, he adds that the increasing use of Varactors might well cause a swing to frequency modulation, where a distinct improvement over a.m. and s.s.b. in signal-to-noise ratio can be achieved if the deviation is kept large.

At least half a dozen stations on or around Merseyside are actively building 23cm equipment. Rather further inland G3EKP, James Whittle, hopes soon to be driving a jet of r.f. energy on this band across the Irish Sea from Blackburn. If the paralysing strength of his signal on the lower v.h.fs is anything to go by he should do well on 1296 Mc/s this Summer, when the equipment is scheduled to be ready. " Firsts " on 23cm with GD, GI and EI are not beyond the bounds of possibility, and schedules with operators there will be welcomed.

G3EKP harking back to his 70cm contact with GD3FNQ/P does not claim this is a " first "; it occurred on 21 July, 1966, for the record, at 21.00 GMT. " Perhaps we may get more details of any other G-GD contacts that may have been made in previous years," he says (see " Here and There " below).

The QSL Situation

Writing from Retford, Mike Gibbings, G3FDW, endorses the remarks made here last month about the difficulty of securing enough QSL verifications to permit applying for the RSGB operating awards. To obtain his certificate for 4m he had to wait three years from the date of contact in certain cases.

Mike brings up again a suggestion which has been made before: that contacts taking place with stations entering for RSGB contests should rate towards the needful total. He appreciates the extra burden this would throw on the V.H.F. Contests Committee, but makes a further trenchant point that it is wrong to expect top contest men, and especially the expeditionaries, to make out a hundred or more cards after the event. (As it happens, some of the larger expedition teams are very good in this respect: they dispose of so many willing pairs of hands that making out QSLs can be readily delegated.)

Incidentally, still apropos 4m operation, G3FDW has beaten the Midlands TVI bogy, and can now run 50 watts to a 6-element aerial with no distress to his local viewers 70 miles away from Sutton Coldfield's Channel 4. An article on the " how " of it is on the stocks for the BULLETIN.

From BRS15744, R. A. Ham, of Storrington in Sussex, come a few words on the QSL situation as the receiving man sees it. Transmitting members seem well aware that their BRS and " A " colleagues are in need of verifications to secure themselves the appropriate " Four Metres and Down " receiving certificates, and their place in the BULLETIN table—in which it will have been noted last month, BRS15744 holds special distinction as No. 1 for 4m as well as 70cm and as the sole occupant in the " 144 Mc/s Senior Receiving Section."

To achieve this last-named feat he had to gather in QSL cards from 60 counties and 15 countries. How, when transmitting men find it difficult enough in all conscience, did he do it? His answer: " The most important way to get replies is to give a complete report and enclose an s.a.e." His result: a QSL return rate of 85 per cent. In fact, after the 4m contest of May, 1965, it was even better than that. " I heard 18 counties, and next day I QSLd the lot. No less than 17 replied—but to get the remaining three required for the 20 counties heard on ' Four ' took me round to the following February."

All of which should be a stimulus to those receiving members who have not had a go at the V.H.F. Listeners' Championship to think about doing so.

V.H.F./U.H.F. BEACON STATIONS

Call-sign	Location	Nominal Frequency	Emission	Aerial Direction
GB3ANG*	Craigowl Hill, Dundee	145·985 Mc/s	A1	S
GB3CTC	Redruth, Cornwall	144·10 Mc/s	A1	North-East
GB3GEC*	Hammersmith, London	431·5 Mc/s	F1	
GB3GI	Strabane, N.I.	145·990 Mc/s	A1	
GB3LER	Lerwick	145·995 Mc/s	A1	S
GB3LER	Lerwick	70·305 Mc/s	A1	N/S
GB3LER	Lerwick	29·008 Mc/s	A1	N/S
GB3VHF	Wrotham, Kent	144·50 Mc/s	F1	North-West

*Not operational

RSGB V.H.F. BEACON STATION GB3VHF

The frequency of the Society's v.h.f. beacon transmitter at Wrotham, Kent, when measured by the BBC Frequency Checking Station, was as follows (nominal frequency 144·50 Mc/s):

Date	Time	Error
7 December	14.20 GMT	130 c/s low
14 December	10.09 GMT	30 c/s low
21 December	11.25 GMT	160 c/s low
29 December	11.12 GMT	160 c/s low

It may surprise many a transmitting member to learn how far his v.h.f. signals do in fact penetrate—and it is the remote receiving member who can earn his gratitude (and his QSL) by telling him.

Quick Start on Video

Although understandably many people do not contemplate " Stroke T " operation by reason of lack of finance or lack of time (or both) it is, observes G6ABM/T (one time G8AGG, now G3VYB), quite feasible to make a quickstart with video without getting involved with complicated circuitry.

" My television system is incredibly simple," he reports; " I feed the vidicon camera into an old television receiver, and screen modulate my QQV06-40 p.a. using a one-valve vision modulator, which is an ECC82 voltage amplifier and cathode follower. This is driven from the video output stage of the TV set. Couldn't be simpler! Although tonal gradation leaves a little to be desired and the video bandwidth is only about 1½ to 2 Mc/s, this seems adequate for most purposes. Indeed, many people tolerate worse from poorly adjusted commercial receivers. In any case, the definition is usually limited by the noise on the picture."

Richard adds that his Liverpool-generated video has been received up the coast at Blackpool by G8ANY and across at Prestatyn by GW8AHI. Frequent local video-to-video contacts are also to be had.

Tech Corner

From G3VYB (ex-G8AGG) **(Richard A. Butterfield, Liverpool):**

Of the different types of Varactor available some are very suitable for a.m. drive.

Most Varactors are of the " abrupt junction " type, e.g., the BAY96, but there are others which have a specially doped junction and consequently a controlled resistivity profile across the junction. They are actually recommended for good linearity when driven with a.m. One such is the Motorola 1N4347, a diffused junction Varactor. It would be interesting to hear from any members who have had an opportunity to test this device on the air. (See p. 94—ED.)

Still on the subject of Varactors, but in another context, although it is not possible to put a.m. video through one of these devices great use is made commercially of Varactors in solid state transmitters for frequency modulated video.

They are also often used to produce the f.m. video by utilizing their voltage-capacitance characteristic to vary the frequency of a transistor oscillator.

From BRS27122 (Michael Poole, Hemel Hempstead):

The question by G8ARV regarding the distortion in the modulation of a signal undergoing Varactor multiplication prompted me to do a few sums to see just what does happen.

Varactor diodes come either as square-law or cube-law devices, and I have taken the simplest case, namely, amplitude modulation in a square-law Varactor. Now, a.m. can be represented as

$$v = a(1 + m\cos\omega_m t)(\cos\omega_c t)$$

where a = a constant
$m < 1$ = modulation index
$\cos\omega_m t$ = modulating signal
$\cos\omega_c t$ = carrier

A square-law Varactor will square this expression, giving, in addition to the original signal,

$$v^2 = a^2\cos^2\omega_c t\,(1 + m\cos\omega_m t)^2$$

$$= \frac{a^2(1+\cos 2\omega_c t)}{2}\left\{1 + 2m\cos\omega_m t + m^2\frac{(1+\cos 2\omega_m t)}{2}\right\}.$$

$$v^2 = \frac{a^2(1 + \frac{m^2}{2})}{2} + a^2 m\cos\omega_m t + \frac{a^2m^2\cos 2\omega_m t}{4}$$

$$+ \frac{a^2}{2}\cos 2\omega_c t\left(1 + 2m\cos\omega_m t + \frac{m^2\cos 2\omega_m t}{2}\right).$$

In this expression the first term is d.c., the next two are audio and twice audio respectively, while the last term is a.m. In the a.m. term it will be noticed that the carrier is $\cos 2\omega_c t$ hence frequency doubling, and that there are two modulating signals, one at the original modulating frequency and one of smaller amplitude at twice this.

Thus a square-law Varactor will introduce second-harmonic distortion due to the introduction of the $\cos 2\omega_m t$ term. Similarly a cube-law Varactor will introduce both second and third harmonic distortion on the modulation.

It will be seen that the second-harmonic modulation in the above example is proportional to the square of the modulating index. Thus a reduction in modulation depth will cause greater reduction of the second-harmonic element in the signal than in the fundamental, which is directly proportional to the modulation index. Conversely, over-modulation will increase distortion, in addition to its other well known effects.

From G8AIA (G3 call awaited!) **(Alan Clemmetson, Whitley Bay):**

With so much correspondence in the BULLETIN these days about Varactors, I would like to quote a small section from a large and extremely informative booklet called " Varactor Harmonic Generation " published by Microwave Associates Inc., which on the subject of amplitude modulation has this to say:

" Harmonic generators are inherently non-linear. The output power is normally not proportional to the input power, and faithful reproduction of complex a.m. waveforms from input to output must not be expected. Various harmonic generators differ widely in this regard. Some are capable of reproducing deeply modulated signals with acceptable ' linearity ' for passing intelligible voice frequencies, while others give drastic distortions of various kinds.

" All such circuits show a ' threshold ' effect in that weak signals are passed with very poor efficiency. All show saturation effects at excessive drive levels. Some show sharp amplitude jumps as the driving level is smoothly increased. The tendency to exhibit discontinuities and strong distortion effects is more common in multi-stage devices than in single stage units. Such effects are minimized by optimum coupling at input and output. In general, harmonic generators are capable of being modulated to a moderate

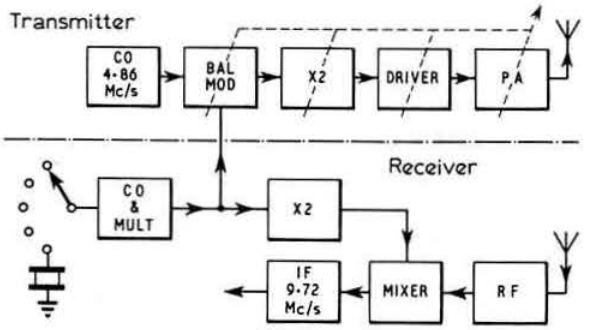


Fig. 1.

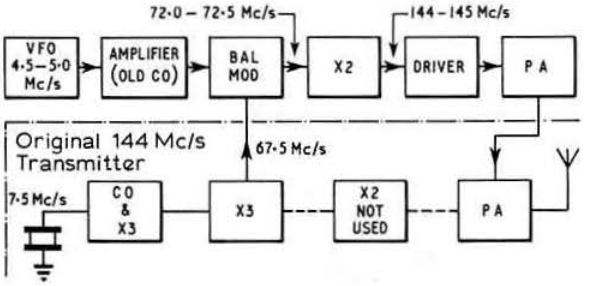


Fig. 2.

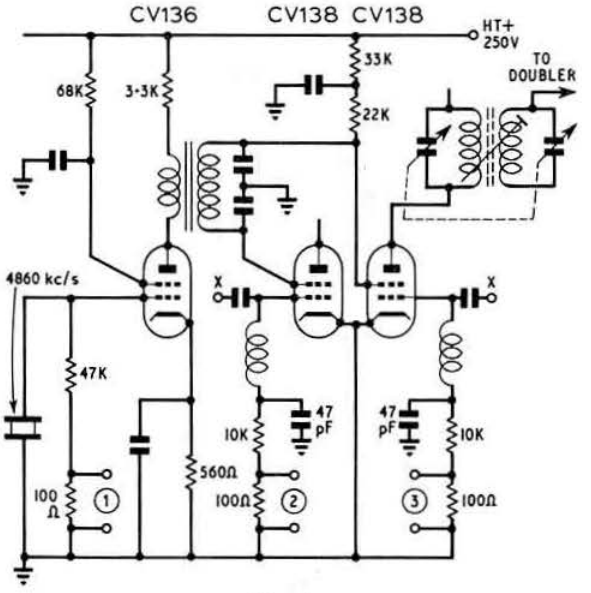


Fig. 3.

In " Four Metres and Down," page 821, December, 1966, some hints on how to adapt the ex-R.A.F. TR1900 series of transmitter-receivers for " Variverter " operation were given by G3JGO. Intending users of these " war surplus " devices will find the following diagrams useful:

Fig. 1. Block schematic diagram to show the original TR1900 arrangement.

Fig. 2. Proposed system of adaptation for " Variverter " use by G3JGO.

Fig. 3. The crystal oscillator and balanced modulator stages. Push-pull input from the receiver crystal chain goes to Point X-X located on a ceramic plate on one side of the unit.

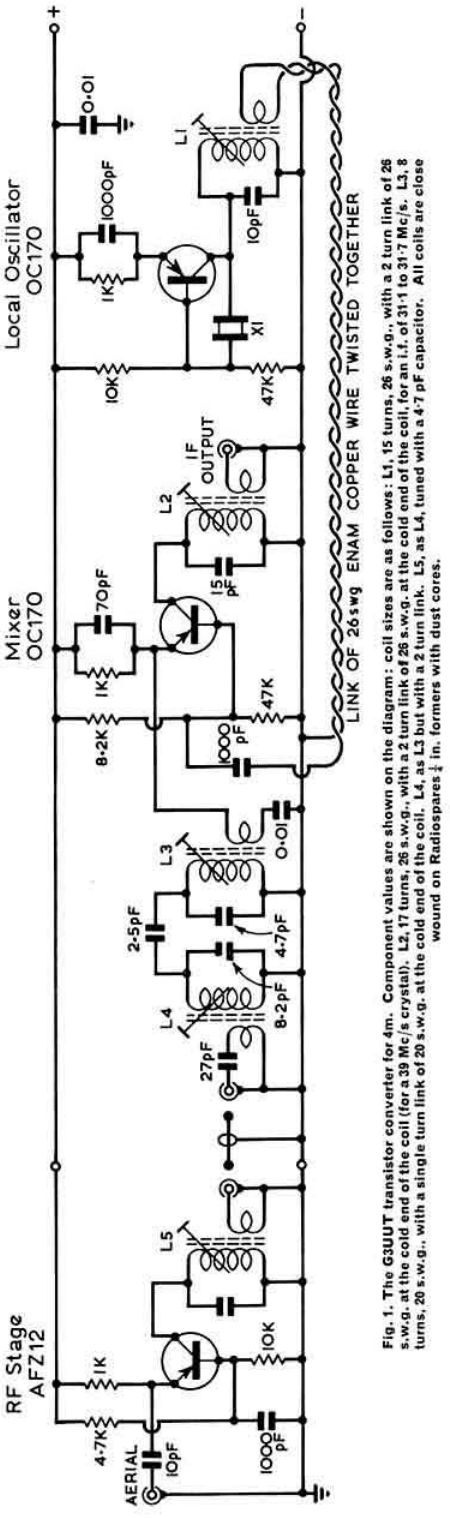


Fig. 1. The G3UUT transistor converter for 4m. Component values are shown on the diagram: coil sizes are as follows: L1, 15 turns, 26 s.w.g., with a 2 turn link of 26 s.w.g. at the cold end of the coil (for a 39 Mc/s crystal). L2, 17 turns, 26 s.w.g., with a 2 turn link of 26 s.w.g. at the cold end of the coil, for an i.f. of 31·1 to 31·7 Mc/s. L3, 8 turns, 20 s.w.g., with a single turn link of 20 s.w.g. at the cold end of the coil. L4, as L3 but with a 2 turn link. L5, as L4, tuned with a 4·7 pF capacitor. All coils are close wound on Radiospares ¼ in. formers with dust cores.

degree by varying the input level so that amplitude modulated waves can be multiplied provided the depth of modulation is suitably limited. With careful design, the range of proportional control can be extended considerably.

" *At our suggestion a major manufacturer of microwave relay equipment applied a modulating signal directly to the Varactor, producing completely acceptable amplitude modulation. This practice is only recommended for the final stage of multiplier chains.*"

I must admit that I have not tried this method of modulation yet, but publishing the idea in Tech Corner might get some experimenter with more time than I going on the project.

From G3UUT (John Wilson, York):

The accompanying circuit diagram, Fig. 4, shows a transistorized 4m converter I have designed and built. As regards sensitivity and noise figure it is as good as my valve converter using E88CC r.f. and ECC85 mixer.

The 70 pF capacitor in the mixer emitter circuit does not in actual fact shunt the signal but provides additional gain by tuning to resonance the link to L3, and by decoupling the emitter at the local oscillator frequency and at i.f.

The crystal used in the prototype was a 39 Mc/s HC-6/U type obtained from Henry's Radio. This gives an i.f. tuning range of 31·1 to 31·7 Mc/s, corresponding to 70·1 to 70·7 Mc/s. Other i.f. ranges can of course be used by employing different crystals and making appropriate changes to L1 and L2.

It might be added that the r.f. stage, mixer and oscillator were made as separate units so that different types of r.f. stage could be tried without the need to rebuild the whole converter.

The provision of 10 pF and 27 pF capacitors at the input of the r.f. stage and mixer respectively will be noted. These were chosen to attenuate signals at image frequency (8 Mc/s) but not at 4m. Further image attenuation is provided by the choice of the components related with L3 and L4.

For best noise figure, resistor values should be chosen to give 9 volts on the mixer and oscillator and 4·5 volts on the r.f. stage.

Skeds Operative

G3VYB, Liverpool, to G3BJD, Seascale, Cumberland, on 70cm every Sunday morning at 11.00 GMT on telegraphy. Comment by G3VYB: " We can usually make it on c.w., but previously with my G8AGG call we kept it on phone and rarely had a QSO! "

G3VYB, Liverpool, to G3BNL, Nottingham, on 70cm every Friday evening at 21.30 GMT.

Skeds Wanted

G2FXA of Stockton on Tees now adds his strength to the 70cm scene in the north east. He will welcome skeds any evening after 23.00 hours or Sunday mornings 10.00 to 12.00 GMT. Frequency: at the top, north eastern, end of the 432-434 Mc/s area. Low power is in use at present but a QQV06-40 p.a. is on the way.

By G3IOL, Gloucester, any time: frequency is 144·14 Mc/s.

Here and There

The old Brimar valve-book won a place on many a hamshelf for the wealth of circuitry information it contained. We believe the new Electroniques-STC Hobbies Manual, which comes from much the same stable, will do the same. There's plenty of v.h.f.-info in its 610 pages full of practical constructor-appeal, and quite obviously the cover price of 10s. 6d. is only a notional one; the Manual must cost more than that to produce. If you didn't get one at the RSGB Exhibition send half a guinea to Electroniques (STC Ltd), Edinburgh Way, Harlow, Essex. You'll be using it a lot.

" One request to all G stations: please turn your beams North occasionally and plug in a key. We want to work you as much as you want to work us."—GM3TFY.

* * *

Welcome to the new South East V.H.F. Group, the inaugural meeting of which at the end of last month had G3FZL, the Society's V.H.F. Manager, as principal speaker. The Group should have a big appeal to the large number of v.h.f./u.h.f. workers in Kent, East Sussex, South London and around. Details from G3DAH. And forthcoming fixture-information to " Four Metres and Down," please.

* * *

" I hope the 144/432 Mc/s Cumulative Activity Contests will bring plenty of contacts. I don't know whose idea it was for these contests but it's a jolly good one. An hour and a half of quick fire working on lots of weekends."—G6FI.

* * *

" I like innovations like ' Tech Corner.' I am no professional technician but any reasonably intelligent person can understand the contributions. . . ."—G3RXS.

* * *

A printing error in the 432 Mc/s Transmitting Section of the Four Metres and Down Certificates list published last month unfortunately identified G8AEJ (14) and G8AGG (15) as G8HEJ and G8HGG.

* * *

Harking back to the 70cm " Firsts " from the Isle of Man (this page, December), Reg Smith, G2DCI, has a recollection that the late GD3DA/P worked G, GI, GM and GW from the Island on 432 Mc/s probably as long as sixteen years ago. If anybody concerned can supply log checks or QSLs covering this pioneer work we'd like to have them for reference here.

* * *

Another request from a man fairly well out in the blue: G3ILO of Dursley, Gloucester, whose " Skeds Wanted " is above. Tom says will easterners look westwards more often, not only to EI but to places nearer at hand. " Conditions are not such a stumbling block as some people lead us to believe."

* * *

Late 4m news from G3JVL near the south coast . . . the Gibraltar beacon was very strong on 7 January. Will other 4m operators listen for and report on it? And on 2m don't forget reports over 50 miles are still needed on GB3GI and GB3GW.

* * *

Special request from the V.H.F. Contests Committee: will all participants in v.h.f. and u.h.f. contests accompany their logsheets with comment on the desirability (or otherwise) of QRA locators?

* * *

And a request of a different kind: it is from G6QM, the G6-G8 QSL Sub-manager. He asks G8 plus threes to make sure that they have deposited self-addressed envelopes with him for the forwarding of cards received for them. Most important, also, if they change their call-sign to let G6QM know, so that their G8 envelopes may be passed on to a G3 Sub-manager.

* * *

Big news: the date of the Midlands V.H.F. Convention has been fixed as Saturday, 29 April, the venue once again the Park Hall Hotel, Wolverhampton, scene of last year's exceptionally successful " do." The committee of six is now busy on the details. More next time.

* * *

And another flash: Scotland's V.H.F. Convention is to take place on Saturday, 6 May. That makes three v.h.f. get-togethers on successive weekends giving nation-wide coverage. Once again all details next time, but the venue, reports George Millar, GM3UM, will be the Carlton Hotel, North Bridge, Edinburgh.

PROJECT OSCAR AUSTRALIS 1

By W. BROWNING, G2AOX*

Information was received from Melbourne just on the closing date that all final tests have been satisfactorily carried out on the Amateur Satellite *Australis 1*, and it is expected to arrive in the USA early in February. It will then have to be specially tested by the Space Authorities, and when passed will take its place in the queue for launching into orbit.

It was originally intended to use the call " VK " for identification, but this has been changed to the usual " HI," for reasons not stated.

It will transmit a continuous beacon signal on 144·050 Mc/s, which will be modulated by an eight channel audio telemetry tone, which will comprise sensors for two temperatures, battery voltage and current, two for horizon alignment, a magnetic coil attitude and finally the keyer sending the call sign HI HI. Each channel will operate for 10 seconds, and so the sequence will repeat every 80 seconds. It will also transmit the same signal and telemetry simultaneously on 29·450 Mc/s, and so a comparison on reception on the h.f. and v.h.f. bands can be made, giving an indication of the propagation conditions on the 10m band.

Power will be by chemical batteries only, and the expected life is 2 to 3 months. It is hoped that it will be launched into a near circular orbit with a height of 580 S. Miles, similar to that of *OSCAR III*.

Further details and the method of resolving the telemetry will be issued, as and when received, direct to those stations that have deposited stamped addressed envelopes with G2AOX.

* 47 Brampton Grove, Hendon, London, NW4.

RSGB LONDON
LECTURE MEETING

V.H.F. MOBILE RADIO

BY BRIAN ARMSTRONG, G3EDD,
OF PYE TELECOMMUNICATIONS LTD.

WEDNESDAY, 22 FEBRUARY, 1967

INSTITUTION OF ELECTRICAL ENGINEERS
Savoy Place, Victoria Embankment,
London, WC2.

BUFFET TEA	LECTURE
6 p.m.	6.30 p.m.

TICKETS ARE AVAILABLE FROM HEADQUARTERS ON REQUEST

Single Sideband

By G. R. B. THORNLEY, G2DAF*

Alignment of a G2DAF-Type Receiver

A Step-by-Step Story of bringing a Representative G2DAF-Type Receiver up to the Required Standard.

THIS story started some months ago, with an impassioned appeal by a member of the Blackpool Radio Club. It appeared that G3OCX had undertaken systematic and careful construction of the G2DAF Communication Receiver; exactly as laid down in the RSGB booklet *Communication Receivers* by G. R. B. Thornley, G2DAF. He had used current production components and valves, followed circuit instructions to the letter, and throughout endeavoured to make a first class job of the mechanical parts and general construction. Notwithstanding all this effort, three months struggling with the alignment—limited by having only a BC221 as the signal source—had failed to produce more than a tremendous roar of hundreds of signals—literally climbing on each others backs—on three bands only, while the other three remained silent and without any signals at all! The statement, " I have been struggling with it for three months; I have done all I know; I haven't got either the know-how or the test equipment to go any further . . . will you have a look at it for me?" would have touched a much harder heart than that of G2DAF. What followed from the day the receiver was delivered to the writer's workshop, until the day alignment was completed and the receiver passed its " acceptance tests " has proved to be a very interesting story.

* 5 Janice Drive, Fulwood, Preston, Lancs.

When the original articles " Communication Receiver Design Considerations " were published in the BULLETIN and then re-published as *Communication Receivers* in booklet form, the receiver alignment was not given in detail because it was considered that the building of a complex piece of equipment such as an all-band receiver would only be undertaken by a limited number of skilful constructors who would already have the necessary knowledge and experience. It is now known—from specialist manufacturers' returns, and from the volume of correspondence—that more than 500 receivers have been constructed to the G2DAF design and in fact it is estimated that the final figure may not be far short of double this number. Also of importance is the realization that a great many of these receivers have been built by relatively unskilled persons who are newcomers to the ranks of Amateur Radio. It will also be agreed—without any reflection on individuals skill—that a substantial number of these receivers will not be giving the " performance target " figures and will not be giving complete satisfaction to their owners. It is in fact because of these considerations that this series of articles has been written, in the expectation that detailed alignment notes on a representative G2DAF-type receiver will be of use and of help to many existing owners.

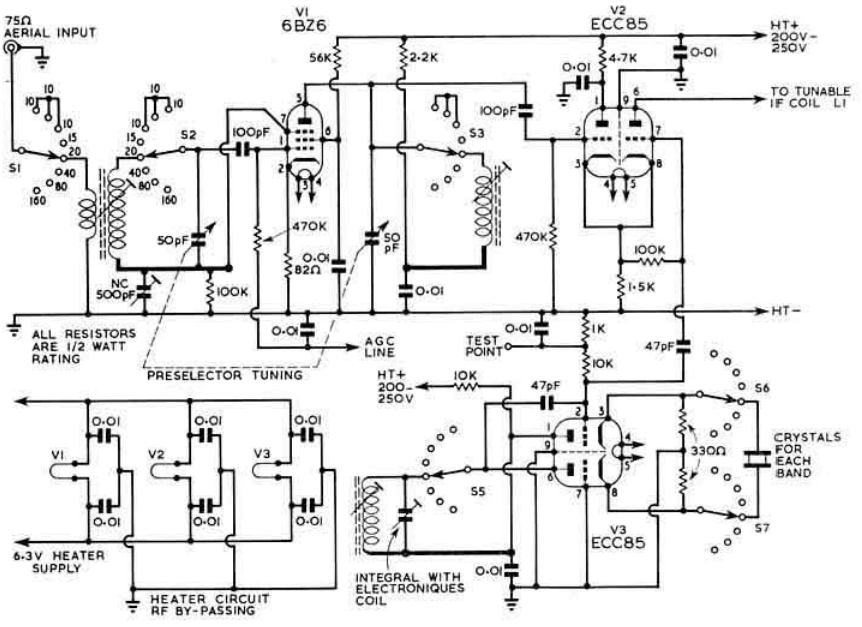


Fig. 1. The circuit of the first three stages of the G2DAF-type receiver undergoing alignment and test.

The Step-by-Step Story

The receiver under discussion has been built to the basic design, but incorporating the " front end " using Electroniques coils, 6BZ6 r.f. valve and ECC85 mixer and conversion oscillator as shown in the circuit of Fig. 1, and with the Kokusai mechanical filter and i.f. circuit as shown in Fig. 2. The power supply had been constructed as a separate chassis unit coupled to the main receiver chassis by Belling-Lee 7 pin " O-Z " plugs and sockets. The remaining tunable i.f. coils, 3 gang tuning capacitor, band change switch assembly, 455 kc/s i.f. transformers, and *Q* multiplier pot core inductance were also of Electroniques manufacture. All crystals were current production types, the h.f. crystals being supplied by Cathodeon Ltd. An " S " meter had been fitted to the front panel and this was the $1\frac{5}{8}$ in. square type, of Japanese origin, with a scale engraved by the manufacturer in S units and db.

Preliminary Check

The first most obvious requirement was an overall performance check to determine what was working and what was not. Accordingly the receiver was connected to the power unit and the mains supply switched on. The 10 minute delay during the initial warm-up time also provided an opportunity to connect an external 3 ohm speaker, the 75 ohm aerial feeder cable, and check the h.t. supply voltage and the output valve anode current. Anode current was quite easily measured without unsoldering any wires, by switching the model 8 AVO meter to the 100 mA range and holding the test prods across the primary connections on the output transformer. Values were satisfactory at 200 volts, 150 volts and 27 mA anode current.

The band change switch was then set to 160m and the main tuning traversed the tuning range. This revealed a confused welter of loud signals, none of which were positively identifiable as amateur transmissions, hardly affected at all by the position of the preselector tuning control. Switching to 80m gave roughly the same kind of performance, but around the centre of this band it was possible to tune and identify G3EPL and the sideband net. However, a little lower on the dial a strong broadcast station transmitting pop record music turned out to be Radio Caroline, which was at the high frequency end of the medium wave broadcast band. The 40m band was also working—again a tremendous roar from a great jumbled mass of confused signals of all shapes and sizes! Amateur signals could be received on the 20m band, but the 15 and 10m bands proved to be completely dead producing only valve hiss and no tunable signals at all.

It was very apparent that the receiver had plenty of gain, indicating that all the i.f. transformers had been peaked at the mechanical filter centre passband frequency, so for the time being these stages were left alone. The next requirement was to ensure that the tunable i.f. circuits were covering the range 5·0 to 5·5 Mc/s correctly and also that the i.f. image rejection was adequate. V1 and V3 were removed from their holders, and the Marconi TF144G signal generator output lead connected to the grid pin of the mixer valve V2 with the signal generator adjusted to give 100 μV output at 5·25 Mc/s. Having tuned this signal around the mid-band position of the main dial, a note was made of the S meter deflection. The signal generator was then slowly tuned up to 5·5 Mc/s, at the same time following the signal with the receiver main tuning control, and watching out for any change in the S meter reading. On reaching 5·5 Mc/s the procedure was reversed and the signal generator with the receiver in step slowly tuned down to 5·0 Mc/s. Throughout this test the S meter deflection remained steady, except below 5·2 Mc/s when the meter reading began to fall slowly—dropping by about two S points at 5·0 Mc/s. The next test was to determine the tunable i.f. image rejection, the procedure for this measurement being as follows: With V1 and V3 removed and the signal generator connected to V2 grid as previously, the AVO meter was switched to the 100 volt a.c. range and connected across the

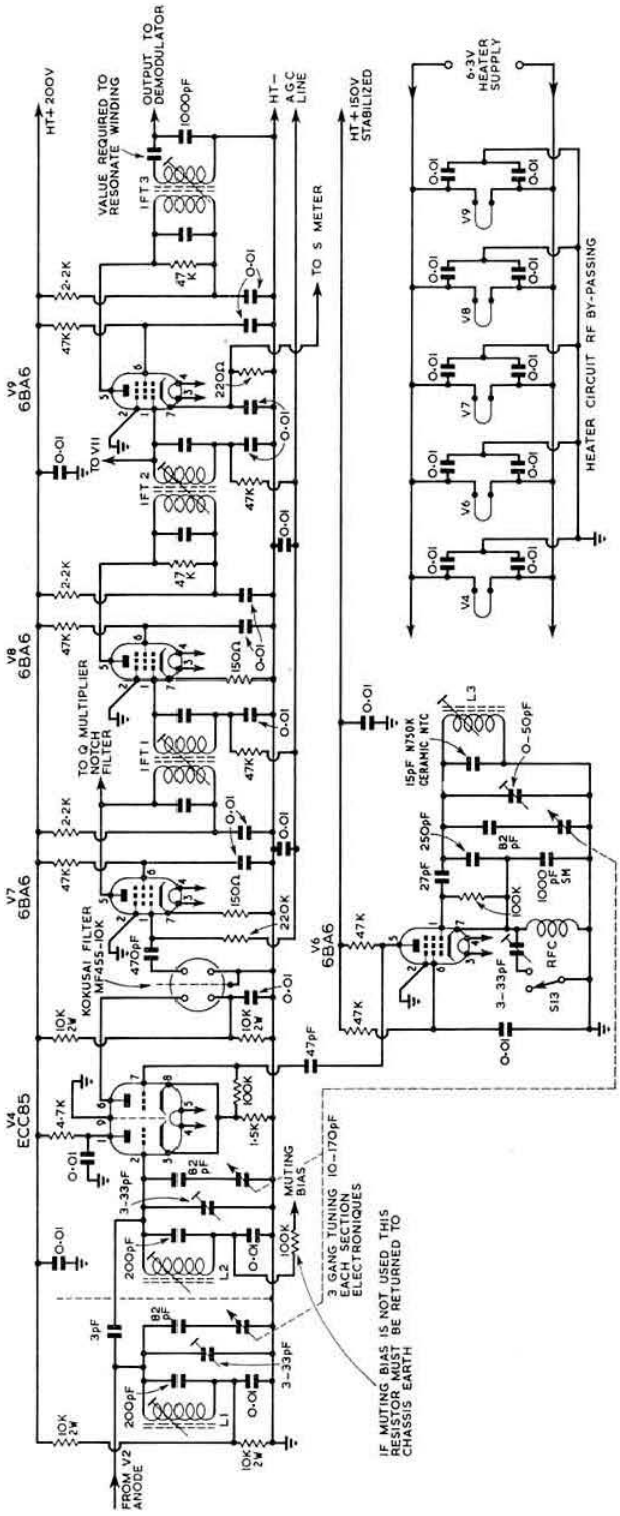


Fig. 2. Circuit showing the second mixer, v.f.o. and i.f. stages. The capacitor values associated with L1, L2 and L3 are suitable for the Electroniques 10-170pF three gang tuning capacitor. Valve numbering is the same as in the original circuit—the original cathode follower V5 is no longer used. IFT1, 2 and 3 are standard transformers (not employing pot cores).

primary connections of the output transformer. The a.g.c. control was set to OFF, the s.s.b./a.m. switch to l.s.b. and the signal generator set to 20db (10 μV) output (unmodulated c.w.) at 5·25 Mc/s. The receiver was then tuned for maximum audio output as heard from the speaker and indicated on the AVO meter (maximum deflection will occur at an audio beat frequency of between 1 and 1·5 kc/s). The R.F. GAIN and AUDIO GAIN controls were then set to give a convenient meter deflection at an amplitude well within the overload capability of the i.f. and audio valves: 20 volts is a useful value.

Having got a steady audio output of 20 volts with the fundamental 5·25 Mc/s input signal, the signal generator was re-set to give an output at the image frequency of 6·16 Mc/s (for a tunable i.f. of 5·0 to 5·5 Mc/s the v.f.o. tunes 5·455 to 5·955 Mc/s and the image appears over the range 5·91 to 6·41 Mc/s). After a touch on the receiver main tuning to centre this frequency in the passband, the signal generator output attenuator was re-set to give the same 20 volts audio output as previously. This setting proved to be 44db (160 μV). The difference between the amplitude of the fundamental (5·25 Mc/s) and the image (6·16 Mc/s) test signals required to give exactly the same audio output, is the measure of the image rejection—in this case 44db less 20db = 24db. A tunable i.f. image rejection of 24db is most unsatisfactory. Under these conditions, at every setting of the main tuning the receiver would be receiving two incoming signals—one in the amateur band and a second one 0·91 Mc/s away in the heavily populated commercial band. Clearly it was necessary to investigate and correct this fault before proceeding with any further tests.

The poor rejection figure indicated that the tunable i.f. resonant circuits were either too tightly coupled, or alternatively not correctly aligned. The top coupling capacitor was checked on the bridge and found to be 3 pF—the correct value—and attention was transferred to the coils. All associated capacitors were of 1 per cent tolerance and of the capacity value given in the circuit diagram. The signal generator output frequency was changed back to 5·25 Mc/s and each dust slug " tweeked " to observe the effect on the overall gain. The input coil proved to be sharply at resonance and the output coil (grid circuit of V4) very " flat." When the experiment was repeated with the signal generator tuned to 6·16 Mc/s, the input coil resonance was flat and the output coil resonance sharp. This indicated that the second circuit was tracking high. Ideally the amount of trimming capacity required and the position of the dust slugs should be approximately the same for each of the two resonant circuits. The coils in use were the standard Electroniques type with a small diameter ceramic body pre-set trimmer mounted on top of the former and spot welded to the inductance connecting tags. This capacitor was not marked in any way to indicate the maximum and minimum position, and as adjustment was undertaken by rotating the circular ceramic top plate there was no way of estimating the amount of capacity actually in use. The trimmer also obscured the threaded centre portion of the former and prevented sight of the dust core.

The two tunable i.f. input coils have not only to be resonated correctly at the mid-band setting of the main tuning control, they have additionally to be further adjusted to track correctly with the v.f.o. right across the 500 kc/s tuning range. While the v.f.o. is tuning 5·455 to 5·955 Mc/s the i.f. input circuits must keep in step 455 kc/s below, over the range 5·0 to 5·5 Mc/s. To obtain the required accuracy the L and the C in the two input circuits must be adjusted *in step*—the inductance at the low frequency end of the range (5·1 Mc/s) and the trimming capacity at the high frequency end of the range (5·4 Mc/s). Alignment is made very much easier when the operator can see the position of the dust cores and can estimate the amount of trimmer capacity actually in circuit. Accordingly the two Electroniques built-in trimmers were removed by cutting through the support tags with tin snips, and replaced with Philips beehive type 3-33 pF, air spaced trimmers, each mounted on a 4 BA brass rod bolted through the chassis top face. Both circuits were then carefully re-aligned to obtain correct tracking across the frequency band. The main receiver tuning and the signal generator were then re-set to 5·25 Mc/s and the audio gain control adjusted to give 20 volts reading on the output meter. The signal generator frequency was then changed to 6·16 Mc/s and the attenuator adjusted to give the same 20 volts on the output meter. The image rejection now proved to be 68db—a very satisfactory figure.

"White Noise" Output

Many amateurs judge the performance of a communication receiver on the amount of noise it makes. A common test is to switch to 10 or 15m and set all the gain controls at maximum. If the hiss from the speaker is low, the receiver is condemned as lacking gain and obviously of little use for weak DX reception. Conversely, if the receiver makes a tremendous roar and the noise sounds like a railway train blowing off steam 10 feet away, the observer is highly delighted and remarks, " This receiver sounds lively, obviously has plenty of gain, and must be good for DX reception! " This assessment of, " The more noise—the better the receiver! " is one that is commonly used. Nevertheless it is a complete fallacy and quite the reverse of the truth.

" White Noise," is a term used by the engineer to define the coherent noise that is caused by the random movement of electrons within the various components that make up the circuit—particularly within the valves themselves. This noise has a characteristic rushing sound similar to that of escaping steam, and is often referred to as background noise or hiss. White noise is a self generated noise and is still present, even when the receiver aerial input socket is short circuited—it must not be confused with man-made electrical interference, static or solar noise picked up by the aerial itself. On the higher frequency DX bands, the random " off-air " noise is of relatively small amplitude so that the ability of the receiver to resolve a weak signal is a direct function of the receiver signal to noise ratio. This is the amplitude of the wanted signal relative to the amplitude of the self generated white noise output. A ratio of 10db (approximately 3 : 1) is generally considered to be the minimum signal-to-noise ratio that will give reliable voice communication. It is therefore very clear that the white noise output has an important bearing on the receiver weak signal performance. The more noise, the greater the strength of the signal required to overcome it! In addition to this, the white noise output is also a measure of the overall amplification that has been built into the receiver.

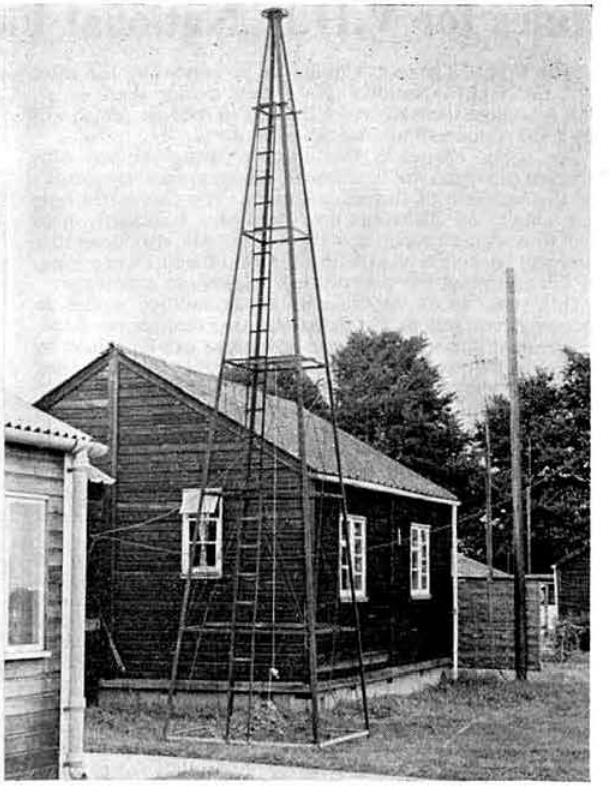
When a new receiver has been constructed and got to the stage where it is in rough alignment and working on one or two bands, a stage by stage measurement of white noise output is necessary because it will indicate with almost uncanny accuracy not only whether the overall amplification is excessive, but of greater importance which stage is faulty and contributing more noise than it should do.

For the benefit of the less experienced, it may be as well to digress here for a moment and state the following maxim:

" The maximum required gain in a communication receiver is that which will convert the smallest usable input at the aerial terminal to the required audio output at the loud speaker terminal; any greater gain than this will only add to the overall noise and will not improve the signal-to-noise ratio in any way." With modern techniques it is possible to keep the white noise at a level equivalent to a 0·15 μV aerial input. For a signal to noise ratio of 10db, the required signal will have to give an aerial input of 0·5 μV. The receiver r.f., i.f. and audio stages are required to amplify this signal to the level required to drive fully the grid of the output valve.

(Continued on page 115)

At the farm : the tower on its way down.



Operation Windpump complete—ready for the rotator and aerials.

Operation Windpump

LOOKING for an inexpensive support for your beam? So were the boys at G3LPC, the Royal Signals club station at Bampton, Oxon. After a lot of head-scratching, WOI Ray Evans, G3LQC, came up with the novel suggestion that they acquire a windpump. Many of these structures, erected 30 or 40 years ago and used on farms for pumping water, have fallen into disuse and now merely serve to disfigure the landscape. Consisting of a metal tower, ladder, platform and in some cases bearings for turning the rotors, they are well-suited for use as beam supports. G3LQC thought that it should not be too difficult to persuade one of the local farmers to part with one of these out-dated rigs.

In the Bampton shack Ordnance Survey maps were scanned and the locations of nearby windpumps noted. Then followed a series of telephone calls to the farmers concerned, offering the services of a party of military windpump-dismantlers. The calls proved fruitless, and it was decided to try the eyeball approach. This quickly brought success and it was not long before an enthusiastic demolition party was setting out for a nearby farm.

On arrival at the farm it was found that the tower legs were well embedded in concrete. The legs were cut through and with the aid of the farmer's tractor and a hawser the tower was safely lowered. Much lighter than had been expected, the tower was loaded on to a trailer and whisked back to camp. Operation Windpump was completed and soon one newly-painted tower was ready for service.

The boys at G3LPC think that an operation of this sort should not be beyond the capabilities of any club which is in need of a tower and which can produce an Ordnance Survey map, a sympathetic farmer, a bunch of helpers, a cargo trailer and a couple of gallons of paint.

Anyone got a spare magslip?

Royal Signals Amateur Radio Society

The Royal Signals Amateur Radio Society offers membership to all who have served, or are now serving in the Regular Army, TA, AER or Cadet Forces. The society publishes a quarterly newsletter, issues its own awards and runs an active Headquarters station, G3CIO, at Catterick Camp.

At the recent Radio Hobbies Exhibition, RSARS members operated RTTY by remote control from the Seymour Hall, keying the G3LPC rig at Bampton in Oxfordshire. Old soldiers and young alike may obtain more information by writing to the Society Field Secretary, Major L. H. Beaumont, 24th Signal Regiment, Catterick Camp, Yorkshire.

Rules for V.H.F. National Field Day 1967

THE V.H.F. Contests Committee is presenting the rules for V.H.F. National Field Day earlier than usual. This is because there are major changes in the rules which will effect the equipment and tactics of entrants.

The major change is that three separate stations with different call-signs will be allowed. There are several reasons for the inclusion of this extra station. The committee feels that activity on 70cm has now reached a sufficiently high level to warrant a separate station. This will also mean that there will be more time available for the difficult 23cm testing, an activity which the committee is anxious to encourage.

This year, as an experiment, the committee wishes to encourage entrants to use more than one receiver per band. It is evident that in many cases advantage can be gained by the use of two receivers. The second receiver could be used in a number of different ways: coupled into the main receiving aerial for tuning the band more quickly or on a separate aerial for DX searching in a different direction from the main beam. The committee hopes that the use of two receivers will not encourage entrants to attempt the confusing practice of working two stations at once. It should not be beyond any group to muster two receivers given sufficient advance warning.

QRA locators were used by a large majority on the 2m band in the 1966 event. This is pleasing, as its use was optional. This year QRA locators are required for 4m and 2m, and encouraged for use on the other bands. Of course there is nothing to prevent entrants from exchanging additional location information if they feel it is necessary. At the time these rules were prepared there was news of new QRA locator maps becoming available. The committee has not yet seen these new maps, but they should be considerably better and more accurate than the present map. Contestants will be advised as to the suitability of these maps as soon as they are available.

The timing of V.H.F. National Field Day is a problem. The committee would prefer to make the start of the contest two hours earlier, so that the finishing time on Sunday is not too late (this is in response to many requests). If this were done, those stations who enter the IARU Region 1 contest would lose the first two hours of QSOs for that contest (the first two hours of operating usually produce a large number of QSOs). No doubt the popularity of the IARU contest will effect the timing in future NFD contests, but as a compromise this year the contest has been shortened by one hour to allow an earlier departure on Sunday evening. Comments on this and all other aspects of the rules are always appreciated by the V.H.F. Contests Committee. For ease of processing, comments on the rules should be made on the reverse side of the summary sheet.

The V.H.F. Contests Committee hopes that the new rules will provide a more interesting and enjoyable contest.

Rules

1. Duration. From 18.00 GMT, **2 September,** to **17.00 GMT, 3 September, 1967.**

2. Eligible Entrants. Any RSGB member or group of members within the British Isles.

3. Operators: (*a*) Operators of portable stations competing in the contest must each hold a current British Isles amateur (sound) licence and must be fully paid up Corporate members of the RSGB at the time of the contest.
(*b*) Operators of portable stations competing in the contest may not give points to the station or group of stations that they operate, using their own call-sign.

4. Power Supplies: Power for any part of the station shall not be derived directly from supply mains.

5. Stations: Each competing group will be permitted a maximum of three stations, each using a different call-sign. Only one station may operate on a given band but there is no restriction to the way in which the bands are allocated. Only one transmitter per band is allowed. Two groups may combine their scores but the bands must be allocated between a maximum of three stations. Groups may situate their stations at the same or different sites.

6. Apparatus: No apparatus or aerials for use in this contest may be assembled or erected on the field day site prior to 09.00 GMT on **2 September, 1967.** This does not apply to accommodation used for storage purposes.

7. Contacts may be made on any permitted mode except A2 (m.c.w.), in the 4m, 2m or 70cm amateur bands with a d.c. input power not exceeding 25 watts to any r.f. stage of the transmitter. Contacts may be made on any permitted mode with any permitted power in the 23cm and lower wavelength amateur bands.

8. Scoring: (*a*) On 4m and 2m, one point per kilometre.
(*b*) On 70cm, two points per kilometre.
(*c*) On 23cm and other bands, eight points per kilometre.

Contestants should enter the distance between stations in the points claimed column on the log sheet and not multiply each contact by the band multiplier. When the total of distance worked has been totalled, then this figure should be multiplied by the band multiplier.

9. Contest Exchanges: (i) RST or RS reports followed by serial number. Serial numbers start from 001 on each band.
(ii) Location information.
(*a*) 4m and 2m: Only QRA locators are required on the logs for the purpose of scoring. However, contestants are reminded that they may exchange any other type of location information if they feel it is necessary.
(*b*) 70cm, 23cm and other bands: QRA locators or any other type of location information may be sent.
It is the responsibility of the receiving operator to obtain the information he requires to calculate distances. All operators on the 70cm, 23cm and lower wavelength bands should know the correct QRA locator for their site and be prepared to give it if requested.

10. Logs: Logs should be submitted on RSGB Contest Log Sheets and tabulated in columns as follows. (*a*) Date and time

CONTESTS DIARY

4-5 February —ARRL DX Contest (Phone)
12 February —First 70 Mc/s Contest (Open)* (see page 834, December 1966)
18-19 February—First 1·8 Mc/s Contest (see page 111)
18-19 February—ARRL DX Contest (C.W.)
4-5 March —Second 144 Mc/s Contest (Open)* and 144 Mc/s Listeners' Contest* (See page 52, January, 1967)
4-5 March —ARRL DX Contest (Phone)
11-12 March —BERU (see page 838, December 1966)
18-19 March —ARRL DX Contest (C.W.)
2 April —Low Power Contest (3·5 Mc/s) (see page 115)
15-16 April —Second 70 Mc/s Contest (Open)* and 70 Mc/s Listeners' Contest* (see page 111)
7 May —Third 144 Mc/s Contest (Portable)*
20-21 May —First 1296 Mc/s Contest (Open)*
27-28 May —First 432 Mc/s Contest (Open)*
3-4 June —National Field Day (See page 50, January, 1967)
2 July —Fourth 144 Mc/s Contest (Portable)*
8-9 July —1·8 Mc/s Summer Contest
23 July —Third 70 Mc/s Contest (Portable)*
2-3 September —V.H.F. NFD/IARU Contest*
10 September —80 Metre Field Day
7-8 October —Second 1296 Mc/s Contest (Open)*
14-15 October —RSGB 21-28 Mc/s Telephony Contest
14-15 October —Second 432 Mc/s Contest (Open)*
28-29 October —RSGB 7 Mc/s DX Contest (Phone)
11-12 November —RSGB 7 Mc/s DX Contest (C.W.)
18-19 November —Second Top Band Contest
3 December —Fourth 70 Mc/s Contest (C.W.)*
* Qualifying contests for V.H.F./U.H.F. Listeners' Championship.

(GMT); (*b*) Call-sign of station worked; (*c*) My report on his signals and serial number sent; (*d*) His report on my signals and serial number received, (*e*) QRA locator received; (*f*) Additional location information if required; (*g*) Call-sign of operator; (*h*) Distance of contact in km.

Separate logs must be submitted for each band.

11. Additional rules: (*a*) Only one contact per band is permitted with a given station, for which points may be claimed.

(*b*) Contacts with stations that change their location, i.e. change from fixed to /A or /M, etc., will only be scored once and the best contact will count for points. Such contacts for which points are not claimed must be marked as repeat contacts in column 5 or 6 of the log sheet.

(*c*) Repeat contacts with any station must be clearly marked in column 6 and no points claimed.

(*d*) Cross band contacts will not count for points.

(*e*) Contestants are advised to indicate on which band they are transmitting when calling CQ and to indicate in which part of the band they intend to tune.

(*f*) Proof of contacts may be required.

12. Entries: (*a*) Must be post-marked not later than **25 September, 1967.**

(*b*) The special cover and summary sheets provided for this contest must be completed and signed by a member who will be responsible for the entry. These sheets are available from RSGB Headquarters upon receipt of a large s.a.e.

13. Awards: At the discretion of Council, the Surrey Trophy will be awarded to the winner and a miniature cup to the runner up. Certificates of merit will be awarded on a country and band basis.

Rules for IARU Region 1 V.H.F./U.H.F. Contests

One of the five official Region 1 IARU V.H.F./U.H.F. contests coincides with V.H.F. National Field Day on 2-3 September, 1967. Those who enter this contest must forward two extra copies of their NFD log to Headquarters, who will pass it on to the V.H.F. manager. The V.H.F. Contests Committee hopes that more portable stations and fixed stations will enter the IARU contest held on 2-3 September this year.

Rules

1. Eligible Entrants. All licensed radio amateurs resident in Region 1. Multiple operator entries will be accepted provided only one call-sign is used. Contestants must operate within the letter and spirit of the contest and at no greater power than permitted in the ordinary licences of their country. Stations operating under special high power licences do so hors concours and cannot be placed in the contest proper.

2. Contest Stations. The first, second, fourth and fifth contests will comprise the following sections:

i. Fixed stations, 2m.
ii. Portable/Mobile stations, 2m.
iii. Fixed stations, 70cm.
iv. Portable/Mobile stations, 70cm.
v. Fixed stations, 24cm.
vi. Portable/Mobile stations, 24cm.

The third contest will be operated on 70cm and 24cm only (Note 3). Portable/Mobile stations must operate from the same locations throughout the events.

3. Dates of Contests. The four general contests will take place during the first weekend of March, May, July and September each year; the third contest (70/24cm only) will take place during the last weekend in May (the sequence 31/1 or similar not to count).

4. Duration of Contests. The International Region 1 V.H.F./U.H.F. Contest will commence at 18.00 GMT on the Saturday and will end at 18.00 GMT on the Sunday, the exact times and/or time intervals being at the discretion of the organizing National Society, provided they fall within these two time limits. The sub-regional contests taking place during the first weekends of March, May and July will be held between 18.00 GMT on Saturday and 18.00 GMT on Sunday, the exact times and/or time intervals being at the discretion of the organizing national society provided that they fall within these time limits.

5. Number of Contacts. Each station can be worked once only on each band whether fixed, portable or mobile. If a station is worked again during the same contest on the same band only one contact will count for points, but any duplicate contacts should be logged without claim for points and should be clearly marked as duplicates.

6. Types of Emission. Contacts may be made on A1, A3, A3a or F3.

7. Contest Exchanges. Code numbers exchanged during each contact shall consist of the RS or RST report, followed by a serial number commencing at 001 for the first contact on each band and increasing by one for each successive contact on each band. This exchange must be immediately followed by the QRA Locator of the sending stations (example 579021YG46E). QTHs may also be exchanged if desired.

8. Scoring. Points will be scored on the basis of one point per kilometre. The final claimed score must be shown at the top part of the first sheet.

9. Entries. Entries must be set out as shown in the example below. In the case of the International Region 1 V.H.F./U.H.F. Contest, two copies of the entry must be sent to the National V.H.F. Manager concerned, postmarked not later than the second Sunday following the contest weekend. Late entries will not be accepted. The judging of the entries shall be the responsibility of the organizing Society whose decision shall be final. Submission of a log implies acceptance of the rules (Note 2).

10. Disqualification. Entrants deliberately contravening any of these rules shall be disqualified. Minor errors may result in loss of points. Errors in call-signs and code numbers will be penalized by deducting the following percentage of claimed scores for both stations.

One error: 25 per cent; two errors: 50 per cent; three or more errors: 100 per cent.

The claimed contact will be disqualified for (a) an obviously wrongly stated QTH, when no QRA Locator is exchanged; (b) a time error of more than 10 minutes (Note 1). Contest entrants will not be penalized for the failure of non-entrants to comply with these rules.

11. Awards. The winner of each section will receive a certificate. The top score on 2m, whether fixed or portable, will be awarded the Region 1 V.H.F. Trophy. The winner in the remaining 2m category will be awarded the PZK cup.

NOTES

1. In some countries it is customary to use a band identification letter (A for 2m, B for 70cm and C for 24cm). Should this letter be used or not used no penalty will be exacted.

2. Not later than the seventh Sunday following the International Region 1 V.H.F./U.H.F. Contest the V.H.F. Manager or properly constituted Contests Committee will forward to the Society organizing the Contest one copy for each entry, after examining the logs and certifying them to be acceptable to the best of their knowledge.

3. The May 70/24cm contest will be known as the IARU Region 1 U.H.F. Contest.

Sample Contest Log Sheet

Contest ..... Date ..... Claimed Score .....
Section ..... Call-sign .....
Name .....
Home address .....
Location of station..... Latitude ..... Longitude .....
Height above sea level in metres .....
Transmitter ..... Input power ....watts....
Operating frequencies .....Crystal or v.f.o. .....
Receiver .....Aerials .....

Date/ Time	Call-sign	Serial Sent	Numbers Received	QTH	Emission	Distance km	Points claimed

Declaration

I declare that this station was operated strictly in accordance with the rules and spirit of the contest and I agree that the ruling of the organizing society shall be final in all cases of dispute.

Date ..... Signed .....

CONTEST NEWS — RESULTS—REPORTS—RULES

Fourth 70 Mc/s Contest (C.W.) 1966

Top place in the Fourth 70 Mc/s Contest (C.W.) held on 4 December, 1966, goes to GW3RUF/P, with runner-up G3OXD/A. In section A, last year's runner-up G3JEQ has just beaten G3SKR. Propagation conditions during the contest were poor and low signal strengths were the order of the day. However, very many good long distance contacts were made (surprising what a little c.w. can do!).

There were not many comments on the rules. Some thought the reduction in hours better, others did not, and one entrant suggested a later start. The overriding comment on timing comes from G3FDW (Retford) who suffered from TVI problems. There is no doubt that TVI accounts for a number of lost entries. G3FDW suggests, to combat this, that the contest should run from 00.01–11.00, but the committee feels that this would lose even more entries! As TVI is such an important factor in the timing of 4m contests, particularly those with fixed station entries, the committee feels that splitting the contest into two halves on adjacent Sundays, timed from say 09.00–14.00, would be acceptable (repeat contacts each day would be allowed).

There was some confusion over the statement of one's location. Several entrants were sending two, three or even four variations of their location. For example one station sent: 5 miles NW of ——, 8 km NW of ——, or just 5 NWof —— or 8 NW of ——. Undoubtedly the situation was not clarified by the rules and the fact that those who were not entering (and had therefore presumably not read the rules) were sending their distances in miles. Perhaps in future a " K " (for km) or an " M " (for miles) placed after the figure and before the bearing would clarify the position. It would also assist if entrants only gave distances in the unit used for scoring. Of course this problem does not arise with QRA locators!

Four University club stations entered the contest this year, three of which operated from the University buildings with high aerial systems. At present, such entries are classed with portable stations. It is fair to say that club stations normally have an advantage over fixed stations because of aerial systems and more operators (G3OUL and G3KAC occupy sixth and seventh positions), but they lack some advantages of portable stations. The V.H.F. Contests Committee will therefore define the sections of the contest more closely in future events as follows; Section A, single operator fixed stations, Section B, club stations and /A stations, and Section C, portable stations.

Finally, the following are some lists of stations that " got away." From G3OUL: GC3OBM, G3EHY, G8DT, G3RWM/P, G3GOX and G3GVM. From G3KMI: G3RLE, G3NEO and GC3OBM. From GW4CG: GW3RUF/P, G3SKR, G3EHY, G3KAC, G2WS, GC3OBM and G3EDD.

The Committee wishes to thank those who entered and G2WS for his check log.

Call-sign	Position A	Position B	Score	QSOs	QTH	Receiver Converter R.F.	Power Input Watts	Aerial Type	Aerial Height ft.
GW3RUF/P		1	7947	46	nr. Brecon	EF189	30	4 ele	18
G3OXD/A		2	7132	49	nr Dudley	—	50	4 ele	—
G3NUE/P		3	6716	49	nr Evesham	E88CC	25	4/4	45
G3JEQ	4		4947	41	nr Dorking	6CW4	50	4 ele	40
G3SKR	5		4866	43	Wembley	6DS4	50	4 ele	40
G3OUL		6	4695	32	Liverpool	EF91	50	3 ele	150
G3KAC		7	4690	30	Bristol	E88CC	20	4 ele	150
G3RLE	8		4216	27	Cleckheaton	E88CC	50	4 ele	22
G3FDW	9		3975	24	Retford	6CW4	50	6 ele	—
G3GGL/P		10	3872	29	nr Ludlow	E88CC	10	3 ele	—
G5HZ/P		11	3640	39	nr Newbury	—	15	4 ele	16
GW3UCB/P		12	3290	28	nr Ruthin	E88CC	25	6/6	—
G3KMI		13	3235	28	Southampton	E88CC	50	4 ele	150
GM3EGW	14		2819	10	Dunfermline	*	30	4 ele	—
G3OHH	15		2067	18	nr Macclesfield	6CW4	50	4/4	28
G3OJE	16		1930	28	SE20	6CW4	40	4 ele	30
G3NKS	17		1897	28	Redhill	6CW4	40	4 ele	20
G3UYB	18		1672	27	Bromley	6CW4	30	4 ele	20
G3PMJ	19		1550	12	Manchester	GM0290	45	5 ele	—
G3OYU	20		1499	24	Tatsfield	EF183	40	3 ele	42
G3UUT	21		1380	10	York	AFZ12	40	4 ele	30
G6HD	22		930	18	Bexley	E88CC	18	Dipole	20
G5UM	23		832	10	nr Leicester	—	25	4 ele	†
G3JKY	24		237	13	Beckenham	6CW4	10	Sterba	†
GW4CG	25		187	3	Porthcawl	6AK5	30	4 ele	†
G2DHV	26		42	4	Sidcup	6CW4	25	3 ele	†

* Transistorized Converter † indoor aerial

V.H.F./U.H.F. Listeners' Championship 1966

Entries for this contest totalled 19, with 65 logs submitted. This compares favourably with the 1965 event when 35 logs were received from 14 listeners. Entries for 432 Mc/s increased fourfold, and one listener is known to be equipped for 23cm reception.

The value of bonus points on u.h.f. bands is reflected in the entry from BRS26234 in fourth overall position. Most of the contestants were located in London and the South-East, but A4743 in Burnley took third place with consistent scores on three bands. Entries for the c.w. contests were very disappointing. Listeners are reminded that c.w. loggings carry double points.

The leading scorer was D. A. R. Poulter, A4048, of Morden, Surrey. Moving up from fourth place, he narrowly beat BRS 15744, last year's winner. This is by way of a " farewell performance " as Mr Poulter has passed the RAE and is probably licensed by now. A3672, A3696 and A4743 are now licensed as G8AQA, G8ASJ and G8ATG respectively.

With one or two exceptions the standard of logkeeping was very good, and entries from A4242 in particular were a pleasure to check. The V.H.F. Contests Committee is apt to be rather uncharitable when faced with a log in which call-signs and reports are made doubtful by poor handwriting.

This year several contestants operated on more than one band during V.H.F. NFD. In totalling the scores, as described in rule 4, 70 Mc/s and 144 Mc/s results have been combined and treated as a single v.h.f. contest. Similarly, 432 Mc/s NFD logs have been counted as for an individual u.h.f. contest. Competitors should bear this in mind when considering how to make the best use of the time available in V.H.F. NFD.

There is no objection to portable operation by listeners and several reports of this type of activity were received.

Equipment

Mr Poulter's equipment is as follows: *70 Mc/s.* A 2N1742 preamplifier feeds a converter using 2N1742, AF116, AF117 and AF115 transistors, with an Eddystone 504 as the main receiver.

The aerial is a 3 element Yagi at 25 ft. *144 Mc/s.* A GM378 pre-amplifier feeds a 6CW4-6AK5-6J6 converter which is coupled via a PR30X preselector into a Heathkit RA1, tuning 28–30 Mc/s. The aerial is an 8 element Yagi. *432 Mc/s.* A trough-line pre-amplifier using two 2N1742s feeds a TW converter with the Eddystone 504 receiver tuning 14–18 Mc/s. The aerial is a 14 element Yagi.

Comments

" I prefer the county system for scoring but the QRA system is acceptable " (A4048). " The equipment I used was all transistor, powered by one PP6, one PP9 and two PP1 batteries " (BRS15744). " We will be entering the transmitting contests now " (A4743). " Aside from my 12 completed entries I recorded 12 other French stations, all badly interfered with by motor car ignition " (BRS26234).

Awards

Subject to the approval of Council, the Hanson Trophy will be awarded to D. A. R. Poulter and a Certificate of Merit to R. A. Ham.

Posn.	Entrant		QTH	1st 144 Mc/s Jan.	1st 70 Mc/s Feb.	2nd 144 Mc/s Mar.	2nd 70 Mc/s Apr.	3rd 144 Mc/s May	1st 432 Mc/s May	4th 144 Mc/s July	3rd 70 Mc/s July	NFD 70 Mc/s Sept.	NFD 144 Mc/s Sept.	NFD 432 Mc/s Sept.	2nd 432 Mc/s Oct.	4th 70 Mc/s Dec.	Total Rule 4
1	D Poulter	A4048	SY		1055	1915	1650	1225	3315	1530	1400		2535		3420		14365
2	R. Ham	BRS15744	SX		1180	2450	1750	1460	3120	1690	1310		2330		2880		14220
3	S. Williamson	A4743	LE		220	540	390	850	1020	910		400	860	510			5090
4	E. MacDuff	BRS26234	SX										1125		3060		4185
5	R. Thomas	BRS15822	LD			1600						440	1280				3720
6	C. Baker	A5032	HF					590		435	670	585	315	1185			3690
7	D. Butler	A4242	LD		560	645	780	730		730	850						3290
8	P. Nickalls	A3672	KT						3285								3285
9	A. Goacher	A3942	SX	700		680		440		380			1060				2880
10	G. Swan	A3696	KT			1535							830				2365
11	A. Baker	A4248	HF			1530											1530
12	E. Harland	A4388	DT			1485											1485
13	P. Briggs	A4752	LE				645					570					1215
14	D. Barlow	A3768	BS			730		405									1135
15	A. Watts	A4871	WR							650			410				1060
16	T. Plumb	A5082	SY					230		595							825
17	S. Berry	BRS27482	LD			530											530
18	R. Eve	A4751	HF			360											360
19	P. Howie	A4694	CH				330										330

First 1·8 Mc/s Contest 1967

The rules for this year's First Top Band Contest are as follows:

1. **When:** 22.00 GMT on Saturday, **18 February, 1967,** to 08.00 GMT on Sunday, **19 February, 1967.**

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

3. The General Rules published in the January, 1967 issue of the RSGB BULLETIN relating to RSGB contests will apply.

4. **Contacts:** C.w. (A1) only in the 1·8-2 Mc/s band.

5. **Scoring:** Three points for contacts with stations in the entrant's own county and those counties having a common boundary with that of the entrant and five points for all other contacts.

6. **Contest Exchanges:** RST reports followed by the contact number starting with 001 and the county code letters given on page 50 of the January, 1966, issue of the BULLETIN, e.g. for a contact from Surrey 579005SY. 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.

(b) The cover sheet must be made out in accordance with RSGB Contests Rule 4. The declaration must be signed.

(c) Entries must be postmarked not later than **6 March, 1967.**

8. **Power Input:** The d.c. input to any stage of the transmitter shall not exceed 10 watts.

9. **Awards:** At the discretion of the Council, the *Somerset Trophy* 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 Second 1·8 Mc/s Contest 1966.

A certificate of merit will also be awarded to the non-transmitting member submitting the best check log. Check logs submitted by non-transmitting members for consideration for the award of a certificate of merit should give in this order the following details: Date/Time (GMT); Band; Call-sign of station heard; Report and serial number sent by station heard; Call-sign of station being worked; any other information required by the above rules.

Second 70 Mc/s Contest (Open) 1967

1. **When:** 18.00 GMT on **Saturday, 15 April,** to 18.00 GMT on **Sunday, 16 April, 1967.**

2. The General Rules for RSGB contests published in the January 1967 issue of the RSGB BULLETIN will apply except as superseded by the rules of this contest.

3. **Eligible Entrants.** Multiple operator entries will be accepted in Section B, as will stations with the suffix /A.

4. **Sections (A).** Single operator, fixed stations. **(B)** other stations.

5. **Contacts** may be made on any mode permitted in the Amateur (Sound) Licence except A2 (m.c.w.).

6. Scoring will be on the basis of one point per kilometre.

7. **Contest Exchanges:** RST or RS reports followed by the contact number and location (e.g. RST 599001, 4 north Macclesfield, Cheshire). This location must be identifiable without ambiguity on the Ordnance Survey " Ten-mile " map. It is the responsibility of the receiving operator to obtain the information necessary to calculate his distances correctly.

8. **Entries: (a)** Logs should be tabulated in column headed in this order: " Date/Time (GMT) "; " Call-sign of station contacted "; " My report on his signal and serial number sent "; " His report on my signal and serial number received "; " Location of station received "; " Call-sign of operator " (Multi-operator entries only); " Distance in km."

(b) The cover sheet must be made out in accordance with General Rule 4 and the declaration signed. The section for which entry is being made must be shown. The QTH as sent, QRA if used, and the NGR full six-figure reference must be recorded. Stations outside the area of the National Grid should show latitude and longitude.

(c) Entries must be post-marked not later than **Monday, 2 May, 1967.**

10. **Awards.** At the discretion of Council, the V.H.F. Manager's Trophy will be awarded to the overall winner. Certificates of Merit will be awarded to the winner of the other section and to the runner-up in each section.

Listeners' 70 Mc/s Contest 1967

The following are the details of the Listeners' V.H.F. Contest to be held at the same time as the 70 Mc/s Open contest. Entries for this event will be automatically credited to the Listeners' V.H.F. Championship.

1. **Duration.** 18.00 GMT 16 April to 18.00 GMT 17 April, 1967.

2. **Eligible entrants.** The contest is open to all fully paid-up members of the RSGB. Only the entrant may operate his receiving station for the duration of the contest. Holders of amateur transmitting licences are eligible to take part if they do not own transmitting equipment for the 70 Mc/s band.

3. **Logs and scoring.** Entrants will be required to log stations operating in the 70 Mc/s band. Logs must be set out and scores calculated as described in the rules for Listeners' V.H.F. Championship in the January 1967 RSGB BULLETIN.

4. **Awards.** At the discretion of Council, certificates of merit will be awarded to the leader and runner-up.

News from Headquarters

Mr J. C. Graham, G3TR, Executive Vice-President

In accordance with Article 11 of the Society's Articles of Association, the Council has appointed Mr J. C. Graham, G3TR, to the office of Executive Vice-President for 1967.

Mr Graham was elected to Council in 1962. He is Chairman of the Membership and Representation Committee, and is also member of the Finance and Staff, H.F. Contests, Exhibition, Headquarters ad hoc Committees, and the IARU Working Group. A " Profile " of Mr Graham was published in the October 1966 issue of the RSGB BULLETIN.

RSGB QSL Bureau Manager

Mr A. O. Milne, G2MI, has been reappointed Manager of the Society's QSL Bureau for 1967.

V.H.F. Manager

Mr G. M. C. Stone, G3FZL, has been reappointed the Society's V.H.F. Manager for 1967.

Certificates Manager

Mr C. R. Emary, G5GH, has been reappointed the Society's Certificates Manager for 1967.

Slow Morse Practice Transmissions Organizer

Mr M. A. C. MacBrayne, G3KGU, has been reappointed Organizer of the Society's Slow Morse Practice Transmissions during 1967.

RSGB Film, Tape and Slide Library Curators

The following members have been appointed Curators of the Society's libraries:

Film Library: Mr R. A. Cathles, G3NDF.
Recorded Lecture Library: Mr G. S. Milne, G3UMI.
Colour Slides: Mr. A. O. Milne, G2MI.

Affiliated Societies

The following societies are now affiliated to RSGB:

SUMMERLEAZE PARK AMATEUR RADIO CLUB
R. Galpin, Summerleaze Park School, Yeovil, Somerset.

AYRSHIRE AMATEUR RADIO CLUB
Dr R. D. Harkess, GM3THI, Gibbsyard, Auchincruive, Ayr, Ayrshire.

EAST WORCESTERSHIRE AMATEUR RADIO GROUP
John Bazley, G3HCT, Hon. Secretary, " Brooklands," Ullenhall, Solihull, Warwickshire.

SILVERTHORN RADIO CLUB
P. J. Casemore, G3SGF, 11 Oakhurst Gardens, Chingford, London, E4.

TRINITY SCHOOL AMATEUR RADIO SOCIETY
R. C. Whitbread, A4674, Trinity School, Shirley Park, Croydon.

The address for the Electrics Society, published in the January issue, was incorrect. It should be: c/o P. A. Halliday, Students' Union, Royal College of Advanced Technology, Salford 5, Lancs.

Area Representative

The following member has been appointed Area Representative for:

HAVERING
O. S. Tillet, G3TPJ, 27 Cranbrook Drive, Gidea Park, Romford, Essex.

Committees of Council 1967

The following members have been invited to serve on the Committees of Council during 1967:

Contests, H.F. *Council Member:* J. C. Graham, G3TR; *Non-Council Members:* D. A. Findlay, G3BZG, R. L. Glaisher, G6LX, M. Harrington, BRS20249, R. J. Hughes, G3GVV, D. Thom, G3NKS, R. G. B. Vaughan, G3FRV.

V.H.F. *Council Member:* J. C. Foster, G2JF; *Non-Council Members:* A. H. Dormer, G3DAH, D. Evans, G3OUF, A. J. Gould, G3JKY.

Education. *Council Members:* L. E. Newnham, G6NZ, J.W. Swinnerton, G2YS; *Non-Council Members:* R. J. Hughes, G3GVV, D. M. Pratt, G3KEP, R. Wallwork, G3JNK.

Exhibition. *Council Members:* L. E. Newnham, G6NZ, R. F. Stevens, G2BVN, E. W. Yeomanson, G3IIR; *Non-Council Members:* P. Balestrini, G3BPT, L. A. Crane, G3PED, D. C. French, G3HSE, G. W. Norris, G3ICI, F. F. Ruth, G2BRH, P. A. Thorogood, G4KD, R. G. B. Vaughan, G3FRV, A. J. Worrall, G3IWA.

Finance and Staff. *Council Members:* N. Caws, G3BVG, J. C. Graham, G3TR, L. E. Newnham, G6NZ, J. F. Shepherd, GM3EGW, R. F. Stevens, G2BVN, E. W. Yeomanson, G3IIR.

GPO Liaison and TVI. *Council Members:* J. Etherington, G5UG, L. E. Newnham, G6NZ, R. F. Stevens, G2BVN, J. W. Swinnerton, G2YS, E. W. Yeomanson, G3IIR. *Non-Council Member:* A. O. Milne, G2MI.

Membership and Representation. *Council Members:* N. Caws, G3BVG, J. Etherington, G5UG, J. C. Graham, G3TR, F. K. Parker, G3FUR, J. F. Shepherd, GM3EGW, G. Twist, G3LWH. *Regional Representatives are ex-officio members.*

Mobile. *Council Member:* E. W. Yeomanson, G3IIR; *Non-Council Members:* H. T. Brock, G3FD, K. F. Eastty, G3LVP, M. A. C. McBrayne, G3KGU, N. O. Miller, G3MVV, D. R. Purchese, G3LXP.

RAEN. *Council Members:* L. E. Newnham, G6NZ, E. W. Yeomanson, G3IIR; *Non-Council Members:* G. A. Allcock, G3ION, P. Balestrini, G3BPT, E. R. L. Bassett, BRS16075, R. Ferguson, G4VF, Dr A. C. Gee, G2UK, J. D. Kingston, G3VK.

Scientific Studies. *Council Members:* J. F. Shepherd, GM3EGW, R. F. Stevens, G2BVN, G. M. C. Stone, G3FZL; *Non-Council Members:* W. H. Allen, G2UJ, C. E. Newton, G2FKZ, S. F. Weber, G8ACC (R. G. Flavell, GM3LTP, A Low, GM3GUI, Dr. J. M. Lyon, GM3GUJ, G. Mills, G3EDM, W. D. Oliphant, GM2FLQ, Dr. W. E. D. Parker, G6BY—Corresponding Members).

Technical. *Council Members:* B. Armstrong, G3EDD, R. F. Stevens, G2BVN, G. M. C. Stone, G3FZL; *Non-Council Members:* W. H. Allen, G2UJ, D.N. Corfield, G5CD, G. C. Fox, G3AEX, T. L. Herdman, G6HD, G. R. Jessop, G6JP, J. W. Mathews, G6LL, G. D. Roe, G3NGS.

V.H.F. *Council Members:* N. Caws, G3BVG, J. C. Foster, G2JF, G. M. C. Stone, G3FZL; *Non-Council Members:* W. H. Allen, G2UJ, P. Balestrini, G3BPT, F. E. A. Green, G3GMY, F. A. Griffiths, G3MED, J. Hum, G5UM, A. L. Mynett, G3HBW.

IARU Working Group. *Council Members:* N. Caws, G3BVG, J. C. Graham, G3TR, E. G. Ingram, GM6IZ, L. E. Newnham, G3BVG, R. F. Stevens, G2BVN, G. M. C. Stone, G3FZL, E. W. Yeomanson, G3IIR.

Headquarters ad hoc Committee. *Council Members:* N. Caws, G3BVG, J. C. Foster, G2JF, J. C. Graham, G3TR, R. F. Stevens, G2BVN.

The President, Mr A. D. Patterson, GI3KYP, is an ex-officio member of all Committees.

John A. Rouse

Members will be sorry to hear that Mr John A. Rouse, G2AHL, the General Manager of the RSGB, has been taken ill and is at present in hospital. During Mr Rouse's absence members are asked to restrict correspondence with Headquarters to essential items.

New Year Honours

Congratulations are offered to Francis McLean, C.B.E., director of Engineering, BBC, who received a knighthood in the New Year Honours List, to Mr Leslie Hayes, recently *ad interim* director of the CCIR, who received a C.B.E. and to Arthur Bulgin, managing director of A. F. Bulgin & Co., who received an O.B.E.

Sir Francis McLean can claim an early historic link with one of the pioneers of Amateur Radio in that he was actively associated as a young telephone engineer with Cecil Goyder, G2SZ, at Standard Telephones, Hendon, more than 40 years ago. (Cecil Goyder was the first European amateur to establish two-way contact with the Antipodes when he worked New Zealand, Z4AA, in October, 1924. Later he became Chief Engineer of All India Radio.) Since that time he has shown a continuing interest in Amateur Radio and its problems. Leslie Hayes, who prior to his CCIR appointment was with the BBC, has on many occasions rendered quiet but invaluable services to IARU Region 1 observers at ITU Conferences. In the early days of the Amateur Radio movement Arthur Bulgin and his component firm gave consistent support to the T & R BULLETIN and other Society publications. His interest in the work of the Society has been fully sustained.

RSGB Dinner Club

More than 50 members and their friends attended the New Year event of the recently formed RSGB Dinner Club on 7 January at the Kingsley Hotel, Bloomsbury Way, London, WC1, not far from Society Headquarters. The meeting closed at 11.15 p.m. after a most enjoyable evening.

The next meeting of the Club will be held on the evening of Friday, 7 April, 1967 at 7.30 p.m. for 8 p.m., and a welcome is extended to all members. The proceedings are completely informal and tickets will be available from RSGB Headquarters, price 25s each.

Dutch Hamfest

The Dutch Amateur Radio Society VERON will be holding an open air meeting during the weekend 12–15 May, 1967. This event will take place on a free camping area about one mile south of Amersfoort, with hotel and restaurant accommodation in the neighbourhood. All amateurs and families who would like to participate are advised by the VERON to contact W. Kerstens, PA0UHS, Nachtegaalspad 2 Arnhem, who will take care of necessary arrangements. Among the organized events are D/F Hunts and a special event station PA6AA. British licensees are reminded that when applying for a PA call, a copy of their British licence must be enclosed. Applications should be addressed to Radio Controledienst, 12 Kortenaerkade, The Hague, Holland.

GPO Morse Tests

Provided sufficient applications are received, the Post Office will be holding Morse tests during the week commencing 6 March, 1967, at Birmingham, Cambridge, Derby, Leeds and Manchester Head Post Offices. Applications forms may be obtained from: The Radio Services Department, Radio Branch, GPO Headquarters Building, St Martin's-le-Grand, London, EC1. Completed application forms, to which the entrance fee of 10s. must be affixed in stamps, must be posted to the Wireless Telegraphy Section to arrive not later than 16 February, 1967.

R. HAWLEZ, G3OOA

It is with deep regret that we report the death of Ray Hawley, G3OOA, of Crewe, Cheshire (late of Goostrey, Cheshire).

Ray was not only well known but was respected by the local amateurs and many SWLs.

A member of RSGB, RAEN and RAIBC, although handicapped by semi-blindness, he helped whoever he could. He lived alone in his home, but was cheerful and friendly.

He will be missed by many.

R. H. O.

EDGAR JAMES, GW5TJ

The sudden death of E. T. James, GW5TJ, on 12 December, 1966, at the early age of 65, has been a great shock to his many friends.

He had been interested in Amateur Radio from its very beginning, and had been licensed for over 50 years. His call-sign, GW5TJ, had been fashioned partly from his initials, and up to the very end it was regularly heard on the h.f. bands.

He had many other interests during his lifetime, including membership of the Magic Circle, but it was Amateur Radio that was his abiding interest.

He felt strongly that he had a duty to pass on his enthusiasm and knowledge to the younger generation, and there are many licence holders in the Merthyr Tydfil area who would not have made the grade without his support.

His voice will be sadly missed both locally and on the DX bands.

Last respects were paid on behalf of the Amateur Radio fraternity by GW8NP, GW5BI, and members of the Merthyr ARs.

To his widow and family we express our deepest sympathy.

J. G. L.

R. T. MATHEWS, G3SAG

It is with regret that we report the death of Bob Mathews, G3SAG of Redditch, Worcestershire. He was a founder member of the East Worcestershire Amateur Radio Society, with interests focusing on mobile operation and DX operating on 14 Mc/s. His humour and advice will be sadly missed by all members. He leaves a widow and son to whom we extend our sympathies.

J. B.

SAM SWINDELL, G3NGV

The death occurred on 11 November of Samuel Swindell, G3NGV.

A very keen enthusiast from the early days of wireless, obtaining his licence in later life presented no problem. He was a very practically minded amateur and always on hand to give aid to the beginner, a very enthusiastic member of the Society and at one time acted as reserve News Reader for North Midlands.

Due to illness he had retired from business and his voice was well known to the many who tuned in each morning at 10.30 on 160m for the " Coffee Net " which he pioneered. His comments and his chuckle will be sadly missed by many.

To his widow and his family we extend our truest sympathy.

F. C. W.

W. K. WALKER, G2WO

It is with profound regret that we have to report the death of " Johnny " Walker, G2WO, of Stevenage, on 2 January, within a year of the passing of his brother, " Jerry " Walker, G5JU.

William Kenneth Walker, who held a senior appointment with the British Aircraft Corporation at the time of his death, was widely known in the aeronautical and space age industry, and from the time of his release from the RAF in 1945 with the rank of Squadron Leader (Signals) he had been engaged in electronic development of an advanced kind. His expertise was reflected in the superb v.h.f. transmitting station, almost entirely self-constructed, which he kept at his home at Stevenage, and which enabled him to maintain a regular weekly schedule with G5JU.

While in the RAF he earned a " mention in dispatches " for special service on the island of Malta.

G2WO, who was 59, had been ill for some months following a major operation. He will be greatly missed not only by his Mid Herts friends but by many in the West Country and South Wales, where he once lived.

To the family, and especially to Gladys, his widow, heartfelt sympathy is extended at this time.

J. H.

AUDREY BERYL WARD

The tragic death occurred on the 8 December, 1966, of the young wife of Fred Ward, 5Z4FB/G3CAT, of Box 41, Nakuru, Kenya.

Mrs. Ward fell into the Nile river just above the Murchison Falls, Uganda, and was swept over the Falls, despite the valiant attempts of her two companions (a married couple who are friends of the family). Her body has not yet been recovered, despite a long search by the authorities. Mr. Ward was in Nairobi on business at the time.

Both Audrey's mother and her husband wish to thank all friends who have sent their condolences, both by letter and over the air, in their bereavement.

" Age cannot wither her, nor customs stale
Her infinite variety; . . . "

Pirates Fined

As a result of Post Office enquiries into the suspected unlicensed use of wireless telegraphy transmitting equipment, the following convictions have recently been obtained.

On 4 November, 1966 at Tottenham Magistrates' Court, a Mr Adrian Michael Forster of 12 Mitchell Road, London, N13, was convicted of two charges of using wireless telegraphy transmitting apparatus without the appropriate licence, contrary to the provisions of Section 1 of the Wireless Telegraphy Act, 1949. He was fined £10 on each of the charges and ordered to pay £5 5s. towards the costs.

On 15 December, 1966 at Lawfords Gate, Bristol Magistrates' Court, a Mr David George Moore of 11 The Crescent, Staple Hill, Bristol and a Mr Frederick Ernest Moore of 14 Victoria Street, Staple Hill, Bristol were each convicted of two charges of using wireless telegraphy transmitting apparatus without the appropriate licence, contrary to the provisions of Section 1 of the Wireless Telegraphy Act, 1949. They were each fined £5 on each of the charges and ordered to pay £2 12s. 6d. towards the costs and to forfeit the equipment to the Postmaster General.

Amateur Licences

On 31 December, 1966, the number of amateur licences in force in the United Kingdom was as follows:

Amateur (Sound) Licences A:	12,050
Amateur (Sound) Licences B:	514
Amateur (Sound Mobile) Licences A:	2194
Amateur (Sound Mobile) Licences B:	8
Amateur (Television) Licences:	176

There were also 10,361 model control licences in force.

Headquarters Fund—List No. 31

The following are additions to the list of those who have contributed to the Fund:

B. Priestley, G3JGO, F. Legge, ON4MN, H. G. Hughes, GW4CG, G. Slaughter, G3PAO, P. L. A. Burton, VK5ZPB and the London Members' Luncheon Club.

Total amount contributed to date: £2271 5s. 2d.

RSGB Amateur Radio Call Book

The following are corrections to the 1967 edition:

G2VV, J. N. Roe, 53 Thames Street, Sunbury-on-Thames, Middlesex.

G2CXR, E. M. Challons, 20 Windmill Balk Road, Woodlands, Doncaster, Yorks.

G3HJM, D. Outram, 1 Culross Building, Battlebridge Road, London, NW1.

G3BRW, R. G. Wyatt, 17 Harbour View Road, Parkstone, Dorset.

G3IMN, F. E. Perrisset, 23 Victoria Park, Dover, Kent.

G3REA, C. F. Peers, 21 Abbotsbury Gardens, Eastcote, Pinner, Middlesex.

G3RUI, G6RUI/T, R. K. Furness, 17 Hillingford Avenue, Pheasey Estate, Great Barr, Birmingham.

G3TWD, T. E. Druce, 20 Farmlands Way, Wannock, Sussex.

G3VWX, Anthony R. Unwins, Ravenscourt, Grange-over-Sands, Lancashire.

G6WI, R. J. Crutchley, 7 Cobham Close, Charford, Bromsgrove, Worcs.

G8AHJ, B. Loveday, 34 Chapel Road, Weldon, Corby, Northants.

GM3CSM, I. Hamilton, 102 Roffey Park Road, Oldhall, Paisley, Renfrewshire.

GW2FOF, W. J. G. Williams, Somerset House, 67 Brook Street, Williamstown, Rhondda, Glam.

Silent Keys

We record with sorrow the passing of the following amateurs:

R. G. Wyatt, G3HFJ, of Wokingham, Berks.
E. F. Brooke, G3IGF, of Ingatestone, Essex.
S. L. Sawyer, G3IRL, of Ilford, Essex.
R. T. Matthews, G3SAG, of Redditch, Worcs.
E. James, GW5TJ, of Merthyr Tydfil, Glam.
G. Stokes, BRS21136, of Week St. Mary, N. Cornwall.
H. M. Farrar, BRS22694, of Penzance, Cornwall.
A. McDonald, BRS24903, of Cumnock, Ayrshire.
J. A. McOwen, BRS27719, of Arbroath, Angus.
K. N. Oliver, BRS28122, of Guildford, Surrey.
T. Sydney Skeet, ex 2LX, Nottingham

Third International Convention at Knokke

The organizers tell us that the 1967 event will take place on 15, 16 and 17 September. The centre of the Convention will again be the Casino at Knokke and a full programme has been arranged. Further details and application forms will be available in due course.

Canadian Centennial Calls

Canadian amateurs will have the option of using the prefix 3C in place of VE and 3B in place of V0 during 1967 to call attention to the 100th anniversary of Canada as a nation. No special application or endorsement of the licence will be necessary.

QRM—The Cure

It never rains. . . .

The last sentence of the list of corrections published on page 47, last month, should have read:

"The circuit of Fig. 4 was also in error; C1 should have been shown connected between the junction of R1 and R2 and the junction of R3, R4 and R5; C2 is connected from earth to the grid of the 12AU7."

Amateur Bands Receiver

In the article by L. Williams, published last month, the sensitivity should have been quoted as 1μV for 15db signal-to-noise ratio, and the inductance of the Q-Multiplier coil (Fig. 9) is, in fact, 120-150 μH.

GB2RS SCHEDULE

RSGB News Bulletins are transmitted on Sundays in accordance with the following schedule:

Frequency	Time	Location of Station
3600 kc/s	9.30 a.m.	South East England
	10 a.m.	Severn Area
	10.15 a.m.	Belfast
	10.30 a.m.	North Midlands
	11 a.m.	North West England
	11.30 a.m.	South West Scotland
	12 noon	North East Scotland
145·10 Mc/s	9.30 a.m.	Beaming north from London
	10.00 a.m.	Beaming west from London
145·8 Mc/s	10.15 a.m.	Beaming south from Belfast
145·30 Mc/s	10.30 a.m.	Beaming north west from Sutton Coldfield
	11.00 a.m.	Beaming south west from Sutton Coldfield
145·50 Mc/s	11.30 a.m.	Beaming north from Leeds
	12 noon	Beaming east from Leeds

News items for inclusion in the bulletins should reach Headquarters not later than first post on the Thursday preceding transmission. Reports from affiliated societies and from non-affiliated societies in process of formation will be welcome.

Mr F. G. Lambeth, G2AIW, has been presented with an Eddystone 940 receiver in recognition of his service to the Society by contributing the RSGB Bulletin monthly feature " Four Metres and Down " for over 10 years. At the Society's AGM on 17 December, 1966, the President, Mr R. F. Stevens, handed him an engraved plaque for the receiver, and also an Eddystone loudspeaker plinth.

Mullard Meetings

Meetings organized by the Films & Lectures Organization of Mullard Ltd. will be held on the following dates during February, 1967: 7th, Technical College, Kings Lynn; 8th, Stuart Hall, Norwich; 13th, Raven Hotel, Droitwich; 15th, Green Dragon Hotel, Hereford; 21st, Capitol Ballroom, Leeds; 22nd Co-operative Society Restaurant, Park Road, Peterborough; 23rd, College of Advanced Technology, Birmingham; 27th Guildhall, Gloucester.

The programme for the current series of meetings consists of a talk on Transistors and Television and the showing of the Mullard film *Electronics in Harness*. All meetings commence at 7.45 p.m. except the one at Kings Lynn which will commence at 7.30 p.m. Light refreshments will be served during each evening. RSGB members are welcome to attend the film meetings, but in order to help the organizer a request for a ticket(s) should be made to Mr Ian Nicholson, Mullard House, Torrington Place, London, WC1.

US Reject Hertz

The US Services Interdepartmental Committee and the Federal Communications Commission have decided not to adopt the term hertz in place of the more descriptive cycles per second.

THIRD LONDON S.S.B. DINNER

SATURDAY, 20 MAY, 1967

PRELIMINARY ANNOUNCEMENT

ROYAL GARDEN HOTEL KENSINGTON HIGH ST. LONDON, W8

An entire floor has been reserved. From 3.30 p.m. there wil be an informal display of s.s.b. equipment.
The dinner at 7 p.m. will be followed by dancing, a cabaret, and a raffle of s.s.b. equipment. Late night refreshments will be provided before the close at 1 a.m. Many overseas visitors are expected, including a party of Ex-G Radio Club members from the USA.

Enquiries regarding hotel accommodation for those wishing to stay in London overnight should be sent to Mr J. C. Farlow, G3BXI, 49 Mount Pleasant Road, Chigwell, Essex.

The Royal Garden Hotel is very new, situated at the south-west corner of Kensington Gardens. It has a two-level underground car park. Enquiries for tickets should be addressed to Mr N. A. S. Fitch, G3FPK, 79 Murchison Road, London, E10. The cost is 75s. per person.

International Convention in Spain

The Spanish Society, URE, has invited RSGB members to the First International Convention of Radio Amateurs at Malaga, which will take place on 3, 4 and 5 March, 1967. Further information may be obtained from D. Francisco Mota Perez, EA7KG, PO Box 262, Malaga, Spain.

Single Sideband

(Continued from page 106)

"A gain requirement of 0·5 μV to 5·0 volts (140db), will be necessary. Any greater gain than this will only result in excessive noise and cannot under any circumstances make a weak signal more readable."

It was already apparent during the initial work that the receiver under test was very noisy and had excessive gain. Clearly an accurate determination of white noise output—both overall and from each stage in turn—was necessary in order to be able to plan subsequent circuit adjustment and alignment procedure. The measurement procedure used will be given in detail next time.

(to be continued)

Contest News

(Continued from page 111)

The rules for the Low Power Contest to be held on 2 April are given below. It should be noted that the event is for one day only.

1. **When:** 07.00 GMT to 19.00 GMT on 2 April, 1967.
2. **Eligible Entrants:** All fully paid-up members of the RSGB resident in Europe.
3. The General Rules relating to RSGB Contests, published in the January, 1967, issue of the RSGB BULLETIN, will apply except as superseded by the rules of this Contest.
4. **Contacts:** Must be made on c.w. (A1) only between 3500 and 3600 kc/s.
5. **Scoring:** Points will be scored on the following basis:

Watts input to p.a. stage	Up to 0·5	To 1	To 2	To 3	To 4	To 5
Points per contact	100	50	25	15	10	5

Low Power Contest 1967

A bonus of 100 points may be claimed for the first contact with each different country code area listed on page 54 of the January, 1967 issue of the RSGB BULLETIN.

6. **Contest Exchanges:** RST reports followed by the contact number, starting at 001, and the county code letter, e.g. 559061SX or Sussex.

7. **Logs:** (a) Must be tabulated in columns headed (in this order) " Date/Time (GMT)," "Call-sign of station contacted," " My report on his signals and serial number sent." " His report on my signals and serial number received," " His County," " My input power," " Points claimed."
(b) The cover sheet must be made out in accordance with the RSGB Contests Rule 4 and the declaration signed.
(c) Entries must be postmarked not later than Monday, 17 April, 1967.

8. **Awards:** At the discretion of the Council, the 1930 Committee Cup will be awarded to the winner, and certificates of merit to the runner-up and to the non-transmitting member submitting the best check log in the opinion of the Contests Committee.

Supplementary Report of the Council*

THE Council has pleasure in submitting a brief supplementary report to that published in the November issue of the RSGB BULLETIN covering the period since 30 June, 1966.

The RSGB International Radio Communications Exhibition

The Society's Exhibition, opened this year, for the first time, by the Society's Patron, His Royal Highness, The Prince Philip, Duke of Edinburgh, attracted a record attendance of 10,290. So successful has the Exhibition now become that next year's show will be held in a much larger hall, the New Horticultural Hall during the last week of September. In order to broaden the scope of the show it will be known as the RSGB International Radio Engineering and Communications Exhibition.

The Council places on record its most grateful thanks to the Society's Exhibition Organiser, Mr P. A. Thorogood, G4KD, who was again responsible for the management of the Exhibition. The Council is also most grateful to all members of the Exhibition Committee, under the chairmanship of Mr E. W. Yeomanson, G3IIR.

Regional Meetings

Two very successful Regional Meetings have been held since the end of the Society's year: in Region 12 on 20-21 August and at Weymouth on 2 October.

The Council was pleased to note the very cordial and enthusiastic atmosphere at both of these meetings.

Regional Representatives' Conference

A Conference of Regional Representatives and Council Members was held in London on 8 October when the discussions ranged over a wide area of Society business.

The Council considers that this type of meeting, at which members from all parts of the United Kingdom can express their views, is most important to the operation of the Society on behalf of all its members.

During the Conference it was announced that, in order to make the liaison between Regional Representatives and the Council even closer, all Regional Representatives will in future be ex-officio Corresponding Members of the Membership and Representation Committee of the Council.

Reciprocal Licensing

The Council was pleased to learn late in October that the Post Office had agreed to a request by the Society that the double-barrelled call-signs required under the Class C and D licences should be dispensed with. In future, only the three letter G5 call-sign will be used.

Aerials and Planning Permission

During the last year or so the Council has become increasingly concerned by the difficulties experienced by members in connection with the erection of aerials and masts.

Members will have read in the BULLETIN of action at present being taken and the Council wishes to place on record its thanks to Mr A. H. Yallop, G3SVQ, for his assistance and advice in this connection.

RSGB Dinner Club

The Council was very sorry to learn earlier this year of the ending of the London Members' Luncheon Club which did so much over the years to entertain members and overseas visitors to London.

After considerable discussion, the Council decided to encourage the formation of the RSGB Dinner Club which held its first meeting last month. Inspired by the success of this first event, a New Year Dinner has been arranged for Saturday, 7 January. It is intended that the Club be entirely self-supporting.

Radio Amateurs' Examination

The Society again arranged a centre for candidates unable to make local arrangements and 118 sat the Examination at the RSGB Centre on 7 December, 1966.

RSGB Bulletin

The December issue of the BULLETIN ran to 96 pages—the largest issue since the Second World War.

It is the Council's hope that during the coming year more issues of this size will be published occasionally.

RSGB Amateur Radio Handbook

The Third Edition ot the Society's *Handbook* went out of print last month after the sale of well over 32,000 copies.

The Council is pleased to announce that work on a new Fourth Edition has already started.

* As read to members present at the Annual General Meeting of the Society held in London on 9 December, 1966.

Society Affairs

A brief report on the November, 1966 meeting of the Council

THE meeting was held on Saturday, 5 November, 1966, and was attended by Messrs R. F. Stevens (President), J. Etherington, J. C. Foster, J. C. Graham, L. E. Newnham, A. D. Patterson, J. F. Shepherd, G. M. C. Stone, J. W. Swinnerton, G. Twist and E. W. Yeomanson (Members of the Council), John A. Rouse (General Manager and Secretary), and P. C. M. Smee (Assistant Sceretary).

Apologies for Absence were submitted on behalf of Messrs N. Caws, L. N. Goldsbrough, E. G. Ingram, W. A. Roberts and Louis Varney.

Recommendations of Committees

The Council accepted recommendations relating to the results of the Fourth 144 Mc/s Contest 1966 and the Third 70 Mc/s (Open) Contest 1966 and rules for Cumulative V.H.F. Contests (*V.H.F. Contests*), the proposed extension of the GB3VHF beacon station service to the 432 Mc/s band and the establishment of a beacon station in Cyprus (*V.H.F.*).

Membership

The Council elected 228 new members (174 Corporate and 54 Associates) and accepted 18 applications for transfer from Associate to Corporate grade.

The subscriptions of six new members were waived on the grounds of blindness or disability.

Affiliation

Affiliation was granted to the following:

Barry College of Further Education Radio Society.
Cambridge House Boys' Club.
Guernsey Radio and Electronics Society.
Ludlow Grammar School Amateur Radio Society.
Mid-Herts Amateur Radio Society.

Newham Radio and Electronics Society.
University of Nottingham Radio Society.

RSGB International Radio Communications Exhibition

The President and the Chairman of the Exhibition Committee reported on the Society's exhibition.

A vote of thanks to the members of the Exhibition Committee was carried unanimously. (A report on the Exhibition was published in the December 1966 issue of the RSGB BULLETIN.—EDITOR)

Scrutineers for the Council Ballot

It was agreed to invite all the members who volunteered at the 1965 Annual General Meeting to scrutinize the ballot.

Braaten Trophy

The Council awarded the Braaten Trophy for 1966 to Mr W. A. Roberts, G2RO (see page 46, RSGB BULLETIN, January 1967.—EDITOR)

Milne Trophy

The Council awarded the Milne Trophy for 1966 to Mr D. Gibson, GI3OQR (see page 46, RSGB BULLETIN, January 1967.—EDITOR).

VERON Amateurs' Day

The Council noted with pleasure that the President had been invited to attend the Dutch National Society's Convention in Utrecht on 12 November, 1966.

RSGB Intruder Watch

The Council appointed Mr C. Thomas, GW3PSM, to the office of Honorary Organizer of the Society's Intruder Watch.

Planning Permission

Permission was given for the publication of a statement based on advice received from Counsel on the subject of planning permission for aerials. (The statement was published on page 827 of the December 1966 issue of the RSGB BULLETIN.—EDITOR).

"History of the Society"

It was reported that Mr John Clarricoats had submitted for consideration the final part of his manuscript. The section covers the years 1946 to 1960.

Minutes of Committees

The Minutes of the following Committee meetings were received as reports: RAEN (29.9.66), V.H.F. Contests (28.9.66), Exhibition (30.9.66), Mobile (4.10.66), V.H.F. (10.10.66) and H.F. Contests (20.10.66).

The Council was in session for 3½ hours.

A brief report on the December, 1966 meeting of the Council

THE meeting was held on Thursday, 8 December, 1966, and was attended by Messrs R. F. Stevens (President), J. Etherington, J. C. Foster, J. C. Graham, E. G. Ingram, L. E. Newnham, A. D. Patterson, J. F. Shepherd, G. M. C. Stone, J. W. Swinnerton, G. Twist and E. W. Yeomanson (Members of the Council), John A. Rouse (General Manager and Secretary) and P. C. M. Smee (Assistant Secretary).

Apologies for Absence were submitted on behalf of Messrs N. Caws, L. N. Goldsbrough, and Louis Varney,

Recommendations of Committees

The Council had accepted recommendations relating to the co-option of members (*Education and V.H.F. Contests*), staff salaries, pre-publication price of the Fourth Edition of the *Amateur Radio Handbook*, honoraria for various voluntary workers (*Finance and Staff*), the results of *V.H.F. National Field Day 1966* (*V.H.F. Contests*), trophies and certificates for BERU 1966 and the award of the 1930 Committee Cup for 1966 (*H.F. Contests*).

Membership and Affiliation

The Council elected 146 new members (105 Corporate, 41 Associate) and accepted 23 applications for transfer from Associate to Corporate grade.

The subscriptions of six members were waived on the grounds of blindness and disability.

Life Membership was granted to Mr V. J. Reynolds, G3COY.

Affiliation was granted to the following:

Ayrshire Amateur Radio Group.
Silverthorn Radio Club.
Trinity School Amateur Radio Society, Croydon.
Summerleaze Park Amateur Radio Club, Yeovil.

Resignation of Mr W. A. Roberts—Co-option of Mr B. Armstrong

After considering the casual vacancy created by the resignation of Mr W. A. Roberts, G2RO, from the Council, it was agreed to co-opt Mr B. Armstrong, G3EDD, to serve on the Council with effect from 1 January, 1967.

(Mr Roberts' resignation and Mr Armstrong's co-option were reported on page 11 of the January, 1967 issue of the RSGB BULLETIN.—EDITOR.)

Discount Scheme for Corporate Members

After considerale discussion, it was agreed to adopt the Better Buying Service Scheme as a service to members. Mr Shepherd and Mr Yeomanson voted against the suggestion. The Society would derive no financial benefit.

Mr P. C. M. Smee

The Council noted with regret that Mr Smee had resigned from the Society's staff with effect from 12 January, 1967.

The Council placed on record its appreciation of Mr Smee's work during his period of office.

National Field Day 1967

The rules for National Field Day 1967 were approved for publication in the RSGB BULLETIN.

RSGB News Bulletin Service

Ways and means of improving the RSGB News Bulletin Service were discussed but the matter was referred to the Membership and Representation Committee for detailed consideration the following day.

Minutes of Meetings of Committees

The Minutes of the following Committee meetings were received as reports: Education (12.10.66), GPO Liaison and TVI (17.10.66), Exhibition (21.10.66), Scientific Studies (7.11.66), Finance and Staff (8.11.66), Mobile (8.11.66), V.H.F. Contests (9.11.66), Education (19.11.66) and H.F. Contests (24.11.66).

QRA Locators in Contests

Consideration was given to the use of QRA locators for UK contacts in RSGB v.h.f. contests. Arising from the discussion, it was agreed to ask entrants in v.h.f. contests to comment on the need for QRA Locators when sending in their entries.

The Council was in session for four hours.

RSGB Publications

28 LITTLE RUSSELL STREET, LONDON, WC1

	Post Paid UK
RSGB PUBLICATIONS	
Radio Data Reference Book	14/–
Technical Topics for the Radio Amateur	10/8
Amateur Radio Call Book (1967 Edition)	6/6
Radio Amateurs' Examination Manual (Fifth Edition)	5/9
Guide to Amateur Radio (Twelfth Edition)	5/9
S.S.B. Equipment	3/–
Communications Receivers (Second Edition)	3/–
Morse Code for Radio Amateurs (Fourth Edition)	2/–
ARRL PUBLICATIONS	
Antenna Book, 10th Edition	18/6
A Course in Radio Fundamentals	10/–
Hints and Kinks, Volume 7	10/–
Mobile Manual for Radio Amateurs	23/6
Radio Amateur's V.H.F. Manual	18/6
Single Sideband for the Amateur (Fourth Edition)	23/6
Understanding Amateur Radio	18/6
USA Licence Manual	5/–
CQ PUBLICATIONS	
Antenna Roundup	23/6
Antenna Roundup Vol. 2.	30/–
CQ Anthology, 1952–59	23/6
CQ Anthology, 1945–52	16/–
CQ Mobile Handbook	23/–
CQ New Sideband Handbook	24/–
RTTY Handbook	30/–
Shop and Shack Shortcuts	29/6
73 MAGAZINE PUBLICATIONS	
Care and Feeding of a Ham Club	8/–
Parametric Amplifiers	15/–
Simplified Maths for the Hamshack	4/6
Test Equipment Handbook	4/6
V.H.F. Antenna Handbook	15/–
RADIO PUBLICATIONS INC.	
Beam Antenna Handbook	28/–
Better Short-wave Reception	24/6
Cubical Quad Antennas	22/–
Electronic Construction Handbook	22/6
S-9 Signals	8/6
EDITORS & ENGINEERS	
Transistor Radio Handbook	42/6
AMERICAN MAGAZINE SUBSCRIPTIONS‡	
CQ (*Cowan*) Monthly (p.a.)	44/–
†*QST* (*ARRL*) Monthly (p.a.)	43/6
Institutions, groups, etc. (p.a.)	50/–
†*73 Magazine* Monthly (p.a.)	37/–
† *Sample Copy 2/6*	
‡ *Mailed direct from USA*	
MISCELLANEOUS PUBLICATIONS	
Basic Electronics (*Dover*)	23/6
Basic Electricity (*Dover*)	25/6
Basic Theory and Application of Transistors (*Dover*)	11/6
★Dictionary of Electronics (*Penguin*)	8/–
Foundations of Wireless (*Iliffe*)	22/3
Guide to Broadcasting Stations (*Iliffe*)	6/6
★How to Listen to the World (*New Edition*)	26/–
Ham's Interpreter (5th Edition)	8/6
Log Book, 150 pages, opens flat (*Martins*)	22/6

	Post Paid UK
Manual of Transistor Circuits (*Mullard*)	13/6
Outline of Radio and Television (*Hawker*)	34/6
Radio Amateur Operator's Handbook (*Data*)	5/6
Radio Amateur's Vocabulary (German/English)	9/3
★Semaphore to Satellite (I.T.U.)	70/–
Short Wave Listening (*Iliffe*)	13/2
Short Wave Receivers for the Beginner (*Data*)	6/6
Understanding Television (*Data*)	40/–
Wireless World Radio Valve Data	10/6
★World Radio–TV Handbook (1967)	32/–
MORSE COURSES	
G3HSC Rhythm Method of Morse Tuition	
Complete Course with three 3 speed L.P. records + books	84/–
Beginner's Course with two 3 speed L.P. records + books	60/6
Beginner's L.P. (0-15 w.p.m.) + book	50/–
Advanced L.P. (9-42 w.p.m.) + book	50/–
Three speed simulated GPO test. 7 in. d.s. E.P. record	11/6
RSGB Morse Instruction Tape (900 ft.)	35/–
RSGB Morse Practice Tape (450 ft.)	20/–
(both at 3¾ i.p.s., up to 14 w.p.m.)	
SHACK AIDS	
★Easibinders, round backed, gold blocked, for RSGB Bulletin	16/6
Easibinder Year Stickers (1965, 1966 or 1967)	1/6
★Admiralty Great Circle Map (In Postal Tube)	8/–
QRA Locator, Western Europe	5/6
RSGB Countries List	1/–
Panel Signs, transfers (*Data*)	
Set 3: White Wording	4/9
Set 4: Black Wording	4/9
Set 5: Dials (Clear Background)	4/9
Set 6: Dials (Black Background)	4/9
Decalet Panel Lettering Transfers (Black or White)	1/–
Blick Dry Print Lettering (Letters and Numerals, Black)	2/6
RSGB MEMBERS ONLY	
Bound copy RSGB Bulletin (Vol. 42–1966)	25/–
Car Badge (De Luxe with call-sign)*	25/–
(*Postage on overseas orders 5/6 extra*)	
Car Badge (RSGB Emblem with call-sign)*	18/–
Car Badge (RSGB or RAEN Emblem)	9/–
Leather Key Fobs, with RSGB Diamond attached —Black, Natural, Red, Green, Blue	7/–
RSGB Terylene Tie (Maroon or Dark Blue)	16/–
RSGB Blazer Badge (Black or Dark Navy Blue)	8/-
Stereo Block (RSGB or RAEN Emblem)	10/–
Area Representatives Badge (ARs only)	10/–
Members Headed Qto. Paper (100 sheets)	10/6
Call-sign Lapel Badge (with RSGB or RAEN Emblem, pin or stud fitting)*	8/6
Call-sign Lapel Bar*	7/–
RSGB Lapel Badge (½ in. size) stud or pin fitting	2/–
Plastic Window Sticker (RSGB or RAEN Emblem)	1/3

★ *These publications will be available at the end of the current month*

* *Delivery 6-8 weeks*

(*Stamps and Book Tokens cannot be accepted*)

CLUBROOM

A Monthly Survey of Club and Group Activities

For further information on membership or the activities of a particular club, application should be made to the person whose call-sign is indicated at the end of the item. Full addresses may be obtained from the RSGB Amateur Radio Call Book.

Many societies and local organizations in the UK find difficulties in acquiring suitable accommodation. Although these are by no means unique to Amateur Radio enthusiasts, it is usually the desire to house and preferably install equipment that narrows the choice. The problems associated with storing equipment were solved last summer by members of the Dorking Amateur Radio Society, when for £10 they successfully bid for an old GPO mail van. Through the efforts of members, led by Walter Walsh, G3HZJ, and Robin Greenwood, G3LBA, the van was redecorated and given its first run on 11 September, 1966 to the RSGB Mobile Rally at Woburn Park. Since that first trip the society has participated in the second 70cm contest from a portable site near Minehead. Mobile headquarters in the guise of these roomy vans should not be outside the pockets of most clubs provided the enthusiasm is available. Although the van may solve one problem, there is always parking. . . .

The compiler reminds members that " Clubroom " reviews activities over the past month. Future events are published in " Forthcoming Events," copy for which should be sent to your Regional Representative and not RSGB Headquarters. Reports submitted for " Clubroom " should be concise and preferably typed double spaced.

AERE (Harwell) ARC set three projects at the beginning of 1966: the erection of a multiband aerial for the h.f. bands, the redecoration of the shack and the building of new h.f. equipment. The first two tasks were successfully completed, but for some reason the third failed. Shack Manager Peter McPherson comments that this is the third year he has had to report on the failure of club constructional projects—perhaps the Club should note the comments passed by their Chairman on the first page of its Newsletter. *G2HIF.*

The **Addiscombe ARS** has recently been formed in Croydon. Anyone interested in attending should contact G3VLJ (telephone ADD 6866) for details or attend a meeting which are held on the first and third Tuesdays in each month at 7.30 p.m., in the Addiscombe Toc H Hall, 158 Lower Addiscombe Road, Croydon. *G3VLJ.*

At the last meeting of the **Bristol RSGB Group,** Mr C. R. Birch presented an interesting talk on the early days of radio, including details of an early high power transmitter at Rugby and the valves used at that time. *G5UH.*

On 16 December, Brian Armstrong, G3EDD, demonstrated the NCX5 transceiver to a meeting of the **Cambridge and District ARC.** Mr Armstrong had made the transceiver the subject of an exhaustive test, and gave a most interesting account of his findings. With the AGM approaching on 3 March the Club is now looking for a volunteer to serve as Honorary Secretary. *G5BQ.*

Baden-Powell House Scout ARG comments in its Winter Newsletter on the Radio Group party held on 15 December which was a great success. During autumn last year the club station was also overhauled with replacement parts fitted to the transceiver and an 80m aerial erected. *G3SEM.*

Bromsgrove DARC has now completed decorating its newly acquired shack in which members should now be able to enjoy the many more facilities available. *G3VGG.*

Chelmsford ARS. At the December meeting, Mr Norman Lea gave an informative talk on his experiences as an early radio amateur. He went on to talk about television receiver deficiences, especially with regard to black level clamping for avoiding the usual " soot and whitewash " picture. A film show was held at the January meeting, when among others, the very interesting GPO film *Ship to Shore* was seen. *G3RZP.*

The **Civil Service RS** met on 3 January when Mr N. S. Roberts, G6NR, gave an informative lecture on aerials, discussing the origin of many of our modern aerial systems both for the amateur and professional. *G3JXZ.*

Cornish RAC met in December when about 50 members attended the meeting to hear a talk given by Mr D. Smith of the GPO Lands End Radio Station, entitled " GPO Coast Stations."

A further visit to this station is being arranged shortly. At the January meeting the " Cornishman S.S.B. transmitter " was described by Mr Taylor, G3OFN, and 23 members are now interested in building this transmitter. It would seem that the success of this club is attributable to a carefully arranged programme of lectures. *G3NKE.*

Crawley ARC held its AGM in December when G3TR, G3FRV and G3SGA were elected as Chairman, Secretary and Treasurer respectively. Members are reminded that the Annual Dinner will be on 17 March at the Crawley Forest Hotel. *G3FRV.*

Durham City ARS executed an exchange lecture visit to the South Shields DARC last December when G3SFL visited Durham and presented a talk on construction technique. *G3KMG.*

Ealing ARS closed 1966 with a social evening at the " Coach and Horses." Among the topics discussed were bottles of one type and another of which G3TXB seemed an authority. He also amused other members with comments he had heard on the air, and perhaps originated. *G3SGT.*

East London RSGB Group reports the election of officers to serve on the committee for the next 12 months. They are Chairman, S. J. Hobday, G3SKV, Treasurer, A. J. Reynolds, G3NNK, and Secretary R. A. Ledgerton, G2ABC. Following the AGM the RAEN County Controller for Essex, G3PFL, and the RAEN Police Liaison Officer spoke at length on the work of the Radio Amateur Emergency Network.

Grafton RS continues to meet on Fridays at 7.30 p.m., in Room 35, Montem School, Hornsey Road, London, N7. *G3SIL.*

Leicester RS passed through its AGM on 2 January, when the 1966 committee was re-elected for a further year, with the exception of the chairman and one committee member. The Treasurer reported a considerable increase in funds from the previous year and an Editor was elected to produce, it is hoped, an interesting Newsletter during this year. RAE and Morse classes have been started. A Dinner and Dance will take place on Saturday, 4 February, at the Empire Hotel, Leicester. *G3PBC.*

Luton and District ARS completed 1966 with a " Ham-burger Supper." G8ADS has been re-elected Chairman and G3VES been elected Honorary Secretary. A newcomer to the club, G3VAZ has also joined the committee. *G8ADS.*

During the building of the new Maidstone YMCA, all correspondence for the **Maidstone YMCA ARS** should be addressed to the Honorary Secretary, Mr C. Robertson, G3ERY, 17 Northumberland Road, Maidstone, Kent. *G3ERY.*

Midland ARS met in November last year to hear Mr Cress Titley, G3BGG, lecture on " Aerials." From the subject of long wires and dipoles, Cress went on to V-beams and rhombics. The use of u.h.f. signals illustrated the polar diagrams. A complete report on this lecture illustrated with drawings was published in the last issue of the Midland ARS newsletter. *G3JDJ.*

During the past month **Northern Heights ARS** has seen the passing of yet another ritual of many clubs; the annual dinner. Another ten months must now pass before members can feast again. Apart from this Dinner members also enjoyed a talk on Amateur Television. Many members may have been stirred into starting in this demanding side line of Amateur Radio. *G3MDW.*

Purley and District ARC. The first Southern Amateur Radio Association Christmas Party was held on 17 December and proved to be very successful with an attendance of over 80 members and friends. It is hoped that this event will now be held annually. The club runs two weekly nets, one on Sundays at 10.30 GMT on 1980 kc/s and the other on Wednesday evenings at 20.30 GMT on 70·32 Mc/s. *G3FTQ.*

Reading ARC look forward to a meeting on 14 February when a talk entitled " Mishaps with receivers " will be presented by G8APH to be followed a fortnight later by " Mishaps with transmitters " this time by G3VMY. *G8AAG.*

Reigate ATS. At the December meeting the Constructional Contest was judged by members of the Crawley, Dorking and Guildford Clubs. The open class and the " G8KW Cup " was awarded to G3TDT for his amateur band receiver; and the Junior Class, and the " XYL Cup " to G3RIN for his transistorized receiver and convertors. *G3NKS.*

(*Continued on page 121*)

Forthcoming Events

Details for inclusion in this feature should be sent to the appropriate Regional Representatives by the **first of the month** preceding publication. A.R.s and club secretaries are reminded that the information submitted must include the date, time and venue of the meeting and, whenever possible, details of the lecture or other event being arranged. Standing instructions cannot be accepted.

REGION 1

Ainsdale (ARS).—8, 22 February, 8 March, 8 p.m., 77 Clifton Road, Southport.

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

Ashton under Lyne (AUL & DARS).—Fridays, 7 p.m., Rooms F52 and F53, Ashton College, Beaufort Road.

Blackburn (ELARC).—2 February (" Mountain Rescue " with Films by G3NQX), 2 March, 7.30 p.m., YMCA, Limbrick, Blackburn.

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

Bury (B & RRS).—14 February, 14 March, 8 p.m., Old Boars Head Hotel (private room), Crompton Street.

Chester (C & DARS).—Tuesdays, 8 p.m., YMCA. Except first Tuesday in each month.

Crewe & District.—6 February, 6 March, 8 p.m., Earl of Crewe Hotel, Nantwich Road.

Eccles (E & DRC).—Tuesdays, 8 p.m., Patricroft Congregational Schools, Shakespeare Crescent, Patricroft. Every Thursday, Club Top Band net 20.30 hours.

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

(ULARS).—13, 27 February, 13 March, 7.30 p.m., Students' Union, 2 Bedford Street North, Liverpool 7.

Macclesfield (M & DRS).—14, 28 February, 14 March, 8 p.m., The George Hotel, Jordangate.

Manchester (M & DARS).—Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10.

(SMRC).—Fridays, 7.45 p.m., Rackhouse Community Centre, Daine Avenue, Northenden.

Morecambe.—1 February, 1 March, 125 Regent Road.

Preston (PARS).—14 February, 14 March, 7.30 p.m., St. Paul's School, Pole Street.

St. Helens (SES).—7 February (AGM), 21 February, 7 March, 7.30 p.m., IVS Centre, 55 College Street.

Southport (SRS).—8 February (" Aligning with an Oscilloscope." by G3NKL), 1 March (RSGB Tape Lectures—" 2 metres " and " Receivers "), 15 March (Talk by GPO official on interference). Other meetings Wednesdays 8 p.m., and Sundays 4 p.m., The Esplanade.

Stockport.—8, 22 February, 8 March, The Blossoms Hotel, Buxton Road.

Wirral (WARS).—1 February (" 70 cm " by G8AGG and G8AGY). 15 February, 1 March, 8 p.m., Harding House, Park Road West, Claughton, Birkenhead.

REGION 2

Barnsley (B & DARC).—10 February (" Electronics in School," by Mr J. Hudson), 24 February (" Break-in Keying " by Peter Carbutt, G2AFV), 7.30 p.m., King George Hotel, Peel Street.

Bradford (BRS).—14 February (" Chassis Bashing for the Ham," Mr H. Moore), 28 February (Display of Members' Gear), 7.30 p.m., Bradford Technical College, Horton Road, Bradford.

Durham (DCARS).—9 February (" High Power Linear Amplifiers," by G3SQR), 23 February (Mullard Film Show), 8 p.m., Bay Horse, Gilesgate.

Hull (H & DARS).—3 February (" Marine Procedure " by G3NOP), 10 February (Discussion on Workshop) Practice), 17 February (" Transistor Converters " by G3FCY), 24 February (Open Night), 8 p.m., 592 Hessle Road, Hull.

Northern Heights.—15 February (G3UBI Mobile), 1 March (Sale of Surplus Equipment), 7.45 p.m., Sportsman's Inn, Ogden, Halifax.

Scarborough (SARS).—Thursdays, 7.30 p.m., rear of 3 Trinity Road, Scarborough.

South Shields (SS & DARC).—10 February (" Aligning Communication Reecivers," by G3TDV), 8 p.m., Trinity House Social Centre, Laygate, South Shields.

REGION 3

Cannock Chase (CCARS).—First Thursday in each month, Bridgtown Social Club, Walsall Road.

Dudley (DARC).—10 February (Arrangements for a 2m Contest), 24 February (" H.F. Aerials," by member of BBC Wolferton), 8 p.m., Art Gallery, Dudley.

Midland (ARS).—Third Tuesday in each month, 7.45 p.m., Midland Institute, Margaret Street.

Leamington Spa (M-WARS).—13 February (Visit to Bearley Radio Station), 27 February (" Thirty Years of Amateur Radio "), 7 Regent Grove, Leamington Spa.

Shrewsbury (SARS).—9 February (Talk by Royal Signals), 23 February (" V.H.F. Propagation," RSGB Tape), Old Post Office Hotel, Milk Street, Shrewsbury.

Stratford upon Avon (SuA & DRC).—9 February (RSGB Tape Lecture), 23 February (to be arranged), Halls Croft Old Town Hall, Stratford.

REGION 4

Derby (D & DARS).—1 February (Surplus Sale by Auction), 8 February (AGM), 15 February (" Collectors Items," Recordings by A. Parker and B. J. C. Brown), 18 February (Annual Dinner and Dance, Derbyshire Yeoman), 22 February (Technical Film Show), 1 March (Surplus Sale by Auction), 7.30 p.m., Room 4, 119 Green Lane, Derby.

Grimsby (ARS).—9, 23 February, 8 p.m., Grimsby Model Engineers' Club Room, Fletchers Yard, Wellowgate, Grimsby.

Heanor (H & DARS).—7 February (AGM), 14 February (Sale of Surplus equipment), 21 February (Films—Room 3), 28 February (" Frequency Synthesisers—Principles and Practice," by B. Sandall, G3LGK), 7 March (Constructors' Exhibition), 7.30 p.m., Room 14, South East Derbyshire College of F.E., Ilkeston Road, Heanor, Derbys.

Leicester (ARS).—4 February (Dinner Dance), Empire Hotel, Leicester. Mondays, 7.30 p.m., (Slow Morse Transmissions), Sundays, 10.30 a.m., Club Rooms, Old Hall Farm, Braunstone Lane, Leicester.

Loughborough (LARC).—3 February (" Two Metres," by B. Bestwick, G3PAU), 10 February (RSGB Tape Lecture), 17 February (Preparations for Annual Dinner), 18 February (Fourth Annual Dinner at The Old Pack Horse Inn), 7.30 p.m., Club Room, Bleach Yard, Wards End, Loughborough.

Mansfield (MARS).—First Friday each month, 7.30 p.m., The New Inn, Westgate, Mansfield.

Melton Mowbray (ARS).—16 February (" The Registration Service," by R. Winters, LIR, G3NVK), 7.30 p.m., in G3NVK's office at the White House, High Street.

Newark (NSWC).—Mondays, Thursdays, 7.30 p.m., The Hall, Guildhall Street, Newark.

Nottingham (ARCN).—Tuesdays, Thursdays, 7.30 p.m., Room 3, Sherwood Community Centre, Woodthorpe House, Mansfield Road, Nottingham.

Peterborough (P & DARS).—Fridays, 8 p.m., Old Windmill, behind The Peacock Inn, London Road (opposite Murkitts Garage).

Worksop (NNARS).—Tuesdays (RAE Class), Thursdays (Lecture Night), 7.30 p.m., Club Room, 13 Gateford Road, Worksop.

REGION 5

Cambridge (C & DARC).—3 February (Quiz), 10 February (Informal), 17 February (Receiver Alignment), 24 February (Activity Evening), 3 March (AGM), Fridays 7.30 p.m., Club Headquarters, Corporation Yard, Victoria Road, Cambridge.

Cambridge University (CUWS).—Meetings on alternate Tuesdays during University Term started on 24 January. 8.15 p.m., Psychology Department Lecture Room, Downing Site.

Luton (L & DARS).— 7 February (Ideas Evening—Opportunity to pass on Helpful Hints), 14 February (Illustrated Talk—G3OHW), 21 February (" Two Metres." by G3JZW and G3TLE), 28 February (Display of Home Brew Equipment), Tuesdays, 8 p.m., ATC Headquarters, Crescent Road, Luton, Bedfordshire.

March (M & DRAS).—Tuesdays, 7.30 p.m., rear of Police Headquarters, High Street, March, Cambs.

Royston (R & DARC).—Wednesdays, 8 p.m., Manor House Social Club, Melbourn Street, Royston, Herts.

Shefford (S & DARS).—2 February (Circuit Design—G3VMI), 9 February (" Mobile Techniques," by G3ROL), 16 February (" Computors," by Dr Williams), 23 February (" Basic Radio—Part 2," by G3RFG), 2 March (NFD Planinng & Junk Sale).

REGION 6

Cheltenham RSGB Group.—2 February (AGM), 8 p.m., Great Western Hotel, Clarence Street, Cheltenham.

High Wycombe (CARC).—23 February, 8 p.m., contact G3UJK.

REGION 7

Acton, Brentford & Chiswick (ABCRC).—21 February (Mixed Film Show), 7.30 p.m., Chiswick Trades & Social Club, 66 High Road Chiswick.

Addiscombe (AARS).—First and Third Tuesdays each month, 7.30 p.m., Addiscombe Toc H Hall, Lower Addiscombe Road, Croydon.

Ashford, Middx. (EARS).—23 February (" Trouble Shooting," by G2CNX), 30 March (RTTY), 27 April (AGM), 7.30 p.m., St Martins Court, Kingston Crescent, Ashford, Middx.

Bexley Heath (NKRS).—9 February (Jumble Sale), 23 February (Redifon Transistor Equipment," by G3FRD), 7.30 p.m., Congregational Church Hall, Chapel Road, Bexley Heath.

Chingford RSGB Group.—Alternate Fridays, 10, 24 February,

(SRC).—Fridays (except first in month), 8 p.m., Friday Hill House, Simmons Lane, Chingford, E4. Contact G3EHD, SIL 5642.

Croydon (SRCC).—21 February, 7.30 p.m., The Blue Anchor, South End.

Dorking (D & DRS).—14 February, 8 p.m. (Informal Meeting), Wheatsheaf. 28 February, 8 p.m. (Formal Meeting), Star & Garter, Dorking.

Ealing (E & DARS).—Tuesdays 7.30 p.m., Northfields Community Centre, Northcroft Road, Ealing, W13.

East Ham.—First and third Tuesdays, 7.30 p.m., 12 Leigh High Road, East Ham.

East London.—18 February (" Transformer Design," by W. E. Thompson, G3MQT), 2.30 p.m., Wanstead House, The Green, Wanstead, E11.

East Molesey (TVARTS).—First Wednesday each month, Prince of Wales, Bridge Road, East Molesey.

Edgware (E & DRS).—13 February (to be announced), 27 February (" Transistor Production and Testing," by G3NYK), 8 p.m., John Keble Hall, Church Close, Deans Lane, Edgware, Middx.

Gravesend (GRS).—Third Wednesday each month, 7.30 p.m., RAFTA Club, Overcliffe Road.

Guildford (G & DRS).— 10, 24 February, 8 p.m., Guildford Model Engineering Society, in Stoke Park.

Harlow (DRS).—Tuesdays, Thursdays, 7.30 p.m., Mark Hall Barn, First Avenue.

Harrow (RSH).—3 February (Practical Morse and RAE), 10 February (Lecture), 17, 24 February (Practical Morse, RAE), 8 p.m., Roxeth Manor School, Eastcote Lane.

Holloway (GRS).—Mondays (RAE), 7 p.m., Wednesdays (Morse), 7.30 p.m., Fridays (Club), 7.30 p.m., Montem School, Hornsey Road.

Hounslow (HADRS).—9, 23 January, Canteen, Mogden Main Drainage Dept., Mogden Works, Isleworth.

Ilford.—Thursdays, 8 p.m., 103 Heath Road, Chadwell Heath.

Kingston.—Fortnightly, 2, 16 February, 8 p.m., YMCA., Eden Street, Fridays (Morse Classes), 2 Sunray Avenue, Tolworth.

Leyton & Walthamstow.—7, 21 February, 7.30 p.m., Leyton Senior Institute, Essex Road, London, E10.

London U.H.F. Group.—2 February (First Thursday to be altered from March, phone MUS 1403, GK4D, for details, 7.30 p.m., Bull & Mouth, Bloomsbury Way, Holborn.

London RSGB Lecture.— 22 February (" V.H.F. Mobile Radio," by Brian Armstrong, G3EDD of Pye Telecommunications), 6 for 6.30 p.m. IEE, Savoy Place, WC2.

Loughton.— Alternate Fridays, 10, 24 February, 7.30 p.m., Loughton Hall, (nr. Debden Station).

Maidenhead (M & DARC).—21 February, 7.30 p.m., Victory Hall, Cox Green, Maidenhead.

New Cross.—Wednesdays, Fridays, 8 p.m., 225 New Cross Road, SE14.

Norwood & South London (CP & DRS).—18 February, CD Centre, Catford, London, SE6.

Paddington (P & DARS).— Wednesdays, 7.30 p.m., Beauchamp Lodge, 2a Warwick Crescent, W2.

Purley (P & DARC).—17 February, 3 March, 8 p.m., Railwaymen's Hall, Side Entrance, 58 Whytecliffe Road, Purley.

Reigate (RATS).—8 February, 7.30 p.m., George & Dragon, Cromwell Road, Redhill, 24 February (Anunal Dinner & Dance), Lakers Hotel, Redhill.

Romford (R & DRS).—Tuesdays, 8.15 p.m., RAFTA House, 18 Carlton Road.

Science Museum (CSRS).—7 February (Informal Meeting), 21 February, Science Museum Star Dome (Planetarium), conducted tour and talk by H. Saunders of Science Museum, 6 p.m., Science Museum, South Kensington.

Scout (ARS).—16 February (" Hints & Kinks " by Alf Watts), 7.30 p.m., Baden Powell House, Queens Gate, South Kensington, SW7.

Sidcup (CVRS).—First Thursday every month, 7.30 p.m. Congregational Church Hall, Court Road, Eltham.

Slough (SDR Group).—First Wednesday every month, 8 p.m., United Services Club, Wellington Street.

South London Mobile Club.—Second and fourth Saturdays in each month, 8 p.m., Clapham Manor Baths, SW4.

Southgate & District.—9 February, 7.30 p.m., Parkwood Girls School, (behind Wood Green Town Hall).

St Albans (Verulam ARC).—15 February, (" Semi-Conductor Devices," by Arnold Mynett, G3HBW), 7.30 p.m., Cavalier Hall, Watford Road, St Albans.

Sutton & Cheam (SCRS).—21 February, 8 p.m., The Harrow Inn, High Street, Cheam.

Welwyn Garden City (Mid Herts ARS).—9 February (Lecture & Demonstration on " Coils, Cores and Magnetic Materials," by Neosid Ltd.), 8 p.m., Backhouse Room, Handside Lane, Welwyn Garden City.

Wimbledon (W & DRS).—10 February (" BBC TV Centre," by G3LXN), 10 March) "Stabilising V.F.O.s," by G3RKK), 8 p.m., St John Ambulance HQ, 124 Kingston Road, SW19.

Wembley (CECARS).— Every Thursday, 7 p.m., Sports Club, St Augustines Avenue, N. Wembley. Visitors: This Club is now open to non-employees of GEC by invitation: Telephone ARNold 1262 first.

REGION 8

Belfast and District RSGB Group.—Third Friday in each month 8 p.m., War Memorial Building, Waring Street, Belfast.

Canterbury (EKRS).—Future meetings of the Society to be decided shortly. Interested persons should contact Honorary Secretary D. N. T. Williams, G3MDO, 65 New House Lane, Canterbury.

Crawley (CARC).—8 February (informal, for details contact G3FRV), 22 February (Constructional Contest), 8 p.m., Trinity Congregational Church Hall, Ifield. Friday, 17 March (Annual Dinner, for details contact G3FRV).

Haywards Heath (M-SARS).—1 February (" Amateur Radio in Borneo," by 9M6GA), 15 February (" The RSGB," by Council Member G3TR), 8 p.m., Lindfield Primary School, Nr Haywards Heath.

Thanet (TRS).—Fridays, 8 p.m., Hilderstone House, Broadstairs. 8 April (Annual Dinner and Dance), San Clu Hotel, Ramsgate.

Tunbridge Wells (WKARS).—10 February (Surplus Equipment Sale), 24 February (Film Show and NFD plans), 10 March (" Recent work on V.H.F. Conventions," by G2UJ), 7.30 p.m., KEC Adult Education Centre, Monson Road, Tunbridge Wells.

Worthing (W & DARC).— 14 February (" Telecommunication," by G3IWL), 14 March (Construction Contest and Components Old and New), 11 April (" 405 verses 625 line Television," by G3GVM), 8 p.m., Adult Education Centre, Union Place, Worthing. 25 February (Annual Dinner), 7.30 for 8 p.m., Lennox Hotel, Chapel Road, Worthing. Tickets from G3JHM, G3LQI and G6KFH, price 19s. 6d.

REGION 9

Bath.—24 February, 7.30 p.m., RNR Training Centre, James Street West, Bath.

Bristol.—24 February (Discussion on new NFD regulations), 7.30 p.m., Transport House, Victoria Street, Bristol 1.

(BARC).—Mondays and Thursdays, 7.30 p.m., 43 Ducie Road, Barton Hill, Bristol 5.

Burnham-on-Sea (BoSARS).—Second Tuesday in each month, 8 p.m., Crown Hotel, Oxford Street, Burnham-on-Sea.

Camborne (CRAC).—First Thursday in each month, Staff Recreation Hall, SWEB Headquarters, Pool, Near Camborne.

(C.R.A.C. V.H.F. Group).—First Thursday in each month, 7.30 p.m., The Coach and Horses, Ryder Street, Truro.

Exeter.—First Tuesday in each month, 7.30 p.m., George and Dragon Inn, Blackboy Road, Exeter.

Plymouth (PRC).—Tuesdays, 7.30 p.m., Virginia House, Bretonside, Plymouth.

Saltash (S & DARC).—Alternate Fridays, 7.30 p.m., Burraton Toc H Hall, Warraton Road, Saltash.

South Dorset (SDRS).—First Friday in each month, 7.30 p.m., Labour Rooms, West Walks, Dorchester.

Taunton.—Alternate Thursdays, 7 p.m., Lecture Theatre, Taunton Technical College.

Torquay (TARS).—Last Saturday in each month, 7.30 p.m., Club HQ, Belgrave Road, Torquay.

Wells (WARS).—Mondays from 8 p.m., EMIE (Wells) Sports and Social Club, Chamberlain Street, Wells, Somerset.

Weston-super-Mare.—First Friday in each month. 7.30 p.m., Technical College (Wyndham Hall).

Yeovil (YARC).—8 February (" Australia," by Mr Woodward), 1 March (" Getting started on V.H.F.," by G8AFA), 7.30 p.m., Park Lodge, The Park, Yeovil.

REGION 10

Blackwood.—3, 10, 17, 24 February (include informal RAE classes), 7.30 p.m., Blanche Cottage, off High Street, Blackwood, Mon.

Cardiff.—13 February, (" Organs I have known," by H. Pritchard), 7.30 p.m., TA Centre, Park Street, Cardiff.

Port Talbot.—7 February (Colour Television Demonstration), 7.30 p.m., 1 Lynvi Road, Maesteg.

South Wales V.H.F. Group.—20 Austin Avenue, Porthcawl, Glamorganshire.

REGION 13

Edinburgh (LRS).—9 February (" A visit to W6," by E. J. Kelly, GM3POK), 23 February (" The RSGB," by J. F. Shepherd, GM3EGW), 7.30 p.m., YMCA, South St. Andrew Street, Edinburgh.

REGION 14

Ayrshire RSGB Group.—Alternate Wednesdays, 7.30 p.m., Park Hotel, Monkton.

Auchenharvie (ACDARC).— Tuesdays, Thursdays, 7.30 p.m., Auchenharvie Community Centre, Stevenston.

North Ayrshire (NAARC).—First Sunday of the month, 7.30 p.m., Ardrossan ATC, The Academy, Ardrossan.

Glasgow RSGB Group.—Second and Fourth Fridays of the month, 7.30 p.m., Christian Institute, Bothwell Street, Glasgow.

Glasgow University (GURC).—Second Wednesday of the month, 7.30 p.m., Engineering North Building, University of Glasgow, Glasgow.

Greenock (G & DARC).— Alternate Fridays, 7.30 p.m., Arts Guild, Campbell Street, Greenock.

Motherwell RSGB Group.—Third Friday of the Month, 7.30 p.m., Carfin Hall, Motherwell Road, New Stevenston, Motherwell.

REGION 16

Basildon (BDARS).—Details from G3IJB.

Chelmsford (CARS).—7 March 7.30 p.m., Marconi College, Arbour Lane, Chelmsford.

Great Yarmouth (GYRC).—Fridays, 7.30 p.m., The Manager's Office, the Old Power Station, Swanstons Road, Great Yarmouth.

Ipswich (IRC).—Last Wednesday in the month, 7.30 p.m. Red Cross HQ, Gippeswyk Hall, Ipswich.

Norwich (NARC).—Meetings every Monday at Old Lakenham Hall, Mansfield Lane, Norwich.

Clubroom

(Continued from page 119)

Salop ARS reports a successful meeting on 8 December when Mr F. J. Balston of the BBC spoke on " H.F. Aerials and Feeders." During November the Society entered its first contest and came 84th. Perhaps this proves that results come with experience.

Saltash DARC comment on good attendances over the past four months. Stable attendance figures are perhaps one important factor of any club on which the committee should keep an eye. Constant variations could reflect a lack of confidence by members in the manner in which it is run. The two winning entrants in the construction contest held on 30 December were G3PGT with his VOX unit and G3SPI with his Top-Band transmitter. Earlier on 16 December Alan Clark talked on Amplifiers.

Surrey RCC reports the success of its Christmas Dinner and wishes to express thanks to the organizers Jack North and Tony Naylor for their efforts. Congratulations are also due to Miss Lonsdale who is now licensed as G3VXL. *G3KGA.*

Sutton Coldfield RS has now reformed and meets on the second Monday and fourth Wednesday of the month at " The Fox," Walmsley, at 8 p.m. Talks on Transistors, RTTY and CCTV are scheduled for February, March and June. *G3CNV.*

Southgate RC, in an Editorial in its newsletter, comments on the lack of support given it by members for its publication; a situation not unique to this club. This club has 45 members and while, as the newsletter points out, many have other commitments, there must be half a dozen who if pushed could write or comment on something. If any member of Southgate RS has any suggestions on how to *persuade* a colleague to write copy for the newsletter why not drop the Editor Bruce Edwards a line.

Thames Valley ARTS reports the success of its annual Dinner held on 10 December. Among the guests was the 1966 President of RSGB, Roy Stevens, G2BVN. On 4 January the AGM was held, when the committee was re-elected. *G3JKA.*

Verulam ARC reports a change in secretary to J. Thomas, G3RXA, 9 Highland Drive, Hemel Hempstead, Herts. *G3PAO.*

Mid-Warwickshire ARS suffered aerial damage during recent gales when its long wire came adrift from the Town Hall Clock Tower. With the AGM over and with the aerial re-erected the Society should look forward to another successful year in 1967.

A member of the **Wirral ARS,** G3UFO/MM is sailing for the Far East on board the *MV Clan Malcolm.* Anyone interested in working his first maritime mobile station should look out for G3UFO/MM, who is crystal controlled on 40, 20, 15 and 10m. At the recent Annual Dinner guests included Councillor Roy Pilkington, J.P., Mayor of the Borough of Birkenhead and Region 1 Representative Basil O'Brien, G2AMV. *G3PXX.*

East Worcestershire ARG took advantage of an opportunity to visit Birmingham City Airport, a visit which proved to be a great success. Members of the Group who have recently acquired v.h.f. gear should be interested by a lecture and demonstration by J-Beams scheduled to take place at its February meeting. *G3HCT.*

It would be of assistance to the compiler of " Clubroom," if reports could be concise, typed double spaced and submitted before the final deadline if at all possible. In handwritten reports, please spell unusual words in block capitals.

Deadline for the **March** issue is **3 February** and for the **April** issue **10 March.**

LOOKING AHEAD

22 February.—RSGB Lecture at IEE, London.
13 May.—International V.H.F./U.H.F. Convention.
18 June.—ARMS Mobile Rally.
9 July.—South Shields Mobile Rally.
23 July.—Cornish Mobile Rally.

RADIO AMATEURS' EXAMINATION

FRIDAY, 12 MAY, 1967 — 6.30 p.m.

COLLEGE OF PRECEPTORS
BLOOMSBURY WAY
LONDON, WC1

Applications to sit the examination at this centre should be sent to the General Manager, Radio Society of Great Britain, 28 Little Russell Street, London, WC1. The fee, £1 10s. for RSGB members, or £2 for non-members, should be enclosed. Remittances must be made payable to the Radio Society of Great Britain.

The closing date for receipt of applications is 27 February, 1967

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AN ELECTRONIC TEST ENGINEER is required by Pavelle Ltd., manufacturers of Photographic Colour printing and processing equipment. Duties include supervision of production testing, design and construction of test equipment, and testing of prototypes. This post offers an excellent starting salary and prospects in a rapidly expanding Company. Applicants with experience of semi-conductor circuitry apply in confidence to Mr. P. Rockwell, Felstead Road, Epsom, Surrey.

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G8-3 SELLING UP. 70cms QQV03/20A Tripler/amplifier, £15; 350 v. P.S.U. for above, £5; 25 W. modulator (UM1) and P.S.U. (requires attention), £5; 70cms QQV02/6 Tx and driver, £15; 70cm Nuvistor Converter I.F. 12-16 Mc/s, £8; 70cms AF139 Preamp, £1; 70cms 2 × GMO290 Preamp. (needs attention) £3; Components for 144 Mc/s Driver (QQV03/10), £1 Eddystone 898 Dial, £3; Eddystone 840C, rough, OK as i.f., £15; 2 × Coax Relays, 1 × 12 v., 1 × 24 v., 10/- each; 1 × 3p c/o Mains relay, 10/- each; 1 × 24 v. c/o Relay, 4p, 7/6 each; 2 × 425 ohm 2p c/o Miniature Relays, 5/- each; 10 ele. Yagi, 70cms, £2; 8 over 8 23cm antenna, 30/-; TR11 Antenna Rotor, £8; 20 ft. × 2 in. Antenna mast, £2; 23cms converter, £7; R1475 Rx (2-20mc/s) and P.S.U., £10; Signal generator 150 kc/s-68 mc/s, £2; W1649 wavemeter, 140-240 Mc/s with P.S.U., £3; Eagle 100C Microphone, £1; 6·3 v. 7a. heater transformer, 15/-; 4 × Butterfly/split stator capacitors, 5/- each; Radio Amateurs VHF Manual ARRL, 10/-; Treco Scope (requires attention), £3; M/Coil Headphones and muffs, 15/-; Carbon Mike and transformer 10/-; 5 chassis punches: ½ in., ⅝ in., ¾ in., 1⅛ in., 1½ in., 25/-; Xtals new 33833·4 and 24075 kc/s, HC/6U, £1 each; Xtals surplus 250060, 210060 and 1000 kc/s, HC/6U, 5/- each; Xtal surplus octal 100 kc/s, 5/-.—G8AAF, QTHR.

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43 VALVES, £5 (5/- p.p.) two off, KT66, 807, VR105, VR150/30, 5V4, KTW61, 6Q7, TT11, 6L6, EF37, EF36, 6J5, EF92, 6N7, 6K7, 12A6, 6V6, ARTH2, EBC33, 6SN7, 6SH7, 1-6EN6. Quantity 6N7, EF37, at 3/- each.—K. Wallace, 42 Chepstow Road, Leicester.

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E88CC	12/-	ESU74	80/-	PL38	16/-							6SS7	2/-	35Z5GT	6/-		
E90CC	10/-	ESU208	6/-	PL81	7/-							6U4GT	9/6	37	4/-		
E1148	2/6	EY51	5/6	PL82	5/-							6V6G	5/-	38	4/-		
E1266	50/-	EY86	6/6	PL83	6/-							6V6GT	7/6	215SG	6/-		
E1415	30/-	EY91	3/-	PL84	6/6							6V6M	8/-	501.6GT	8/-		
E1524	12/6	EZ40	6/6	PL500	13/6							6X4	3/6	53A	7/6		
EA50	1/-	EZ41	6/6	PM24A	5/-							6X5G	5/-	57	6/-		
E173	7/-	EZ80	5/6	PT15	13/-							6Z5GT	5/3	58	6/-		
EABC80	5/9	EZ81	3/6	PT25H	7/6							6Y6G	6/-	59	6/-		
EAC91	3/6	F/6057	5/-	PT25M	7/6							6-30L2	10/-	75	5/6		
EAF42	8/-	F/6061	5/-	PX4	14/-							6Z4	5/-	76	5/-		
EB34	1/6	F/6063	4/-	PX25	12/6							7B7	7/6	77	6/6		
EB91	3/-	FW4/500	6/6	PY33	8/6							7C5	10/-	78	5/-		
EBC33	6/-	FW4/800	8/6	PY80	5/6							7C6	7/-	80	5/6		
EBC41	8/6	GTE175M	7/-	PY81	5/6							7C7	6/-	81	9/-		
EBC81	5/-	GU50	25/-	PY82	6/-							7H7	7/3	84	8/-		
EBF80	6/6	G1/236G	29/-	PY83	6/-							7Q7	7/-	85A2	8/-		
EBF83	7/6	G1/370K	20/-	PY800	8/-							7X7	5/-	88D	80/-		
EBF89	6/9	G50/2G	5/-	PY801	7/-							7Z4	4/6	210VPT 7-pin	2/6		
												8D2	2/6	220.PA	7/		
												9D2	3/-	220TH	4/-		
												9D6	2/-	225DU	9/-		
												10F9	9/-	307A	5/6		

TRANSISTORS

OC16	20/-	OC81D	5/-	OC201	12/6	XC141	10/-
OC22	23/-	OC81M	5/-	OC202	15/-	XC142	15/-
OC25	9/6	OC82	10/-	OC203	12/6	XC155	20/-
OC35	12/6	OC82DM	5/-	OC204	17/6	XC156	22/6
OC44	6/-	OC83	5/-	OC206	22/6	2N247	9/6
OC45	5/-	OC83B	5/-	AAZ12	6/-	2N412	7/6
OC71	4/6	OC122	5/-	AC128	7/6	2N502	47/-
OC72	5/-	OC170	6/-	BCZ11	7/6	2N1090	20/6
OC73	9/-	OC200	10/6	BY38	7/6	2N1091	29/-
OC81	5/-						

STV280/40	24/-	X66	7/6	5X4G	8/6
PZI-35	9/-	X118	8/-	5Y3GT	5/-
SU2150A	10/-	X145	8/-	5Y3WGTB	9/-
S11G12	10/-	Y63	5/-	5Z4G	6/6
T41	12/6	Y65	4/-	5Z4GT	8/-
TDOX-20	70/-	Y66	8/-	6AB6	4/-
TP22	5/-	Z800U	20/-	6AC7	3/-
TP25	15/-	Z801U	10/-	6AG5	2/6
TT11	5/-	1A3	8/-	6AG7	6/-
TT15	35/-	1A5GT	5/-	6AH6	10/-
TTR31	45/-	1B22	30/-	6AJ7	2/-
TZ0520	4/-	1C5GT	6/-	6AK5	5/-
TZ20	16/-	1D8GT	6/-	6AK7	6/-
U81	30/-	1E7G	7/6	6AK8	5/9
U12/14	8/-	1F2	2/6	6AL5	3/-
U17	5/-	1G6GT	6/-	6AL5W	7/-
U18	6/-	1L4	2/6	6AM5	2/6
U25	13/-	1LA6	6/-	6AM6	4/-
U26	13/-	1LC6	7/-	6AQ5	7/-
U27	8/-	1LH4	4/-	6AQ5W	9/-
U52	4/6	1N21B	4/-	6AS6	4/-
U191	11/6	1N43	4/-	6AS6W	9/-
U801	18/-	1N70	4/-	6AS7G	15/-
UABC80	6/-	1R4	5/-	6AT6	4/-
UAF42	9/-	1R5	3/6	6AU6	6/-
UBC41	6/-	1S4	5/-	6AX4	8/-
UBF80	5/6	1S5	4/6	6B4G	17/-
UBF89	6/6	1T4	3/-	6B7	6/-
UBL21	11/-	2A3	5/-	6B8G	2/6
UCC85	6/6	2C26	7/-	6BA6	5/-
UCF80	9/6	2C26A	3/-	6BA7	5/-
UCH42	8/-	2C34	7/-	6BE6	4/6
UCH81	6/-	2C45	22/6	6BJ7	7/-
UCL82	8/-	2C46	30/-	6BQ7A	8/-
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