July 1976

radio communication

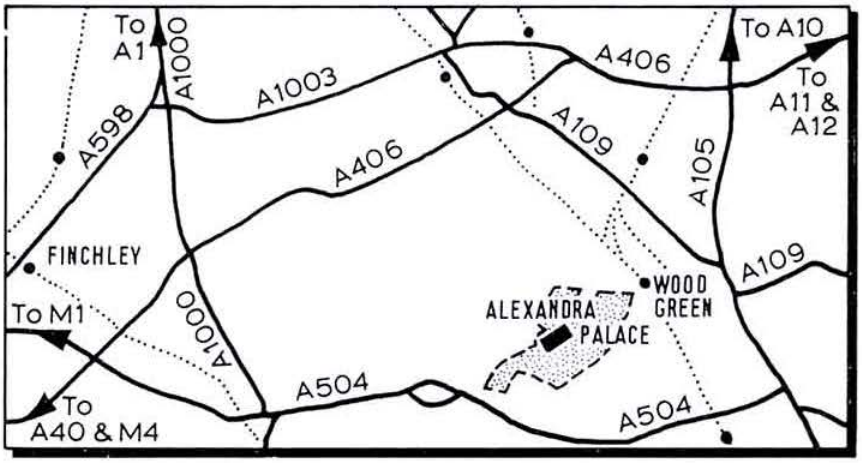
journal of the Radio Society of Great Britain

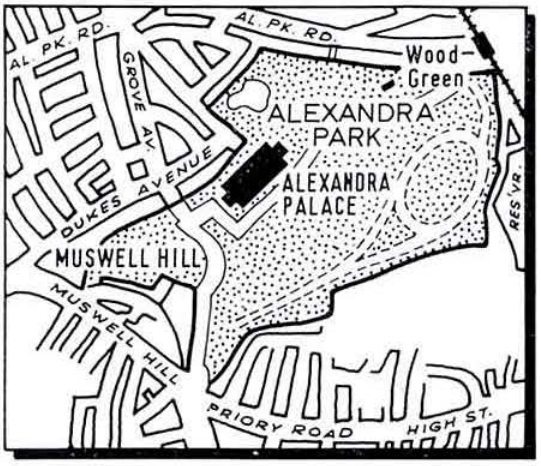
★ RADCOMEX 76 ★

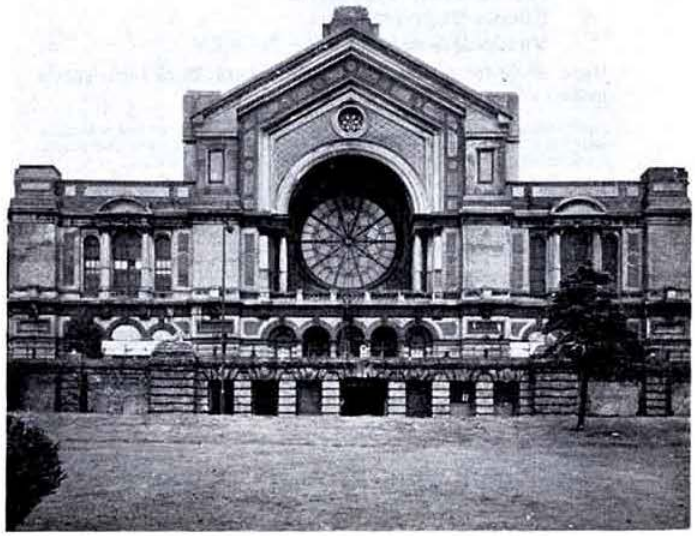
Routes to the

RSGB RADIO COMMUNICATION EXHIBITION

Full details on page 493







One aspect of Alexandra Palace ▶

(Photo: Greater London Council)

RSGB NEWS BULLETIN SERVICE

The RSGB news bulletin, callsign GB2RS, is broadcast every Sunday morning on hf and vhf, giving almost complete coverage of the British Isles. Its main purpose is to provide an outlet for amateur radio news items and announcements which, by virtue of their topicality or urgency, cannot wait for the next issue of *Radio Communication*.

The bulletin is prepared early on Thursday morning, and news items, marked "GB2RS news" should reach RSGB HQ by first post that day (telephoned items can also be accepted until 10am). No guarantee can be given of inclusion in part or whole of any item submitted and, once broadcast, items are not usually repeated.

SCHEDULE

Time	MHz	Location and coverage (hf) or beam heading (vhf) of station
0930	3·6	G2MI, Bromley, Kent (SE England)
1000	3·6	G8ML, Cheltenham (SW England)
	144·5	GM3UAG, Ellon, Aberdeenshire (NNW)
	144·5	G8GGK, Croydon, Surrey (NE)
1015	3·6	GI3GAL, Belfast (N Ireland)
	144·5	GI3TLT, Bangor, Co Down (N)
1030	3·6	G2CVV, Derby (N Midlands)
	144·5	G4DCH, Burnham-on-Sea (NW)
	144·5	GM3UAG, Ellon, Aberdeenshire (SW)
	144·5	G3PWJ, Brierley Hill (NW)
1045	144·5	G8CDP, Middlesbrough (NW)
	144·5	G8GGK, Croydon, Surrey (SW)
	144·5	G8BHQ, Stockport (NNW)
1100	3·6	G5VO, Bridlington (NE England)
	144·5	G3PWJ, Brierley Hill (SW)
1115	3·6	G3LEQ, Knutsford (NW England)
1130	3·6	GM3EHI, Bellshill, Lanarkshire (S Scotland)
1200	3·6	GM3HGA, Aberdeen (NE Scotland)

An rtty news bulletin, callsign GB2ATG, is also transmitted every Sunday at 1200 on 3·590MHz and at 1230 and 1245 on 144·6MHz. This bulletin carries items of interest to rtty enthusiasts.

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radio communication

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ABC
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Closing date for contributions unless otherwise notified: 4th of month preceding month of publication.

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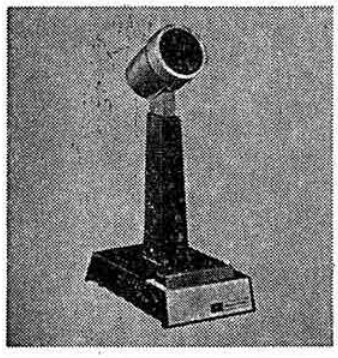
increase talk power, cut "splatter"



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THE FT200 is without doubt one of the "best buys" available. Compare its features with similarly priced units and kits. SPECIFICATION 260W p.e.p., i/p SSB/CW. 75W AM 1kHz readout on all bands 3·5-4, 7-7·5, 14-14·5, 21-21·5, 28·5-29MHz (3 optional crystals available for 28-28·5, 29-29·5 and 29·5-30MHz. Stability: 100Hz 30 mins after warm-up. Sensitivity: 0·5µV 10dBS/S. N. Selectivity: 2·3kHz (6dB), 4kHz (60dB). Clarifier. 5kHz. Break-in CW keying. You will pay more for a kit with less power, only 5kHz readout and no receiver incremental tuning (Clarifier control). These prices only apply whilst current stocks last. Three extra crystals fitted for full 10m coverage. COST **£8.44** inc. VAT.

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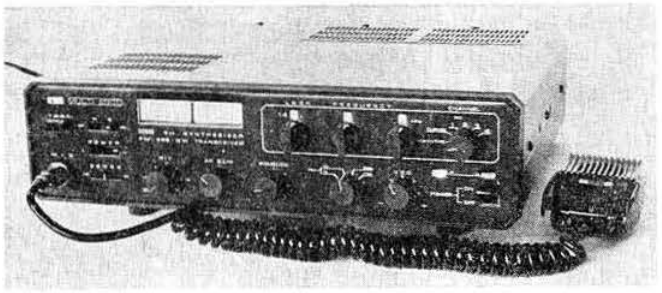

THE FDK MULTI-2000

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- Full cover 144–6MHz.
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FOUR METRES— FTC212

The FCT212 is a 4m., 12 channel, FM, 10W output, transceiver. It offers the best in modern VHF design. The low image response, single conversion receiver uses a Mosfet stage coupled via a 3-section helical filter to FET mixer, which is driven by (as in the transmitter) a low noise FET crystal oscillator. The 10·7 MHz IF is processed by a crystal filter and then two isolated ceramic filters for unrivalled stop-band performance. Two IC limiters feed the separate IC discriminator. Automatic final protection (AFP) is provided along with RF sensing LED transmitter indicator. Mic., accessories and three channels are supplied.

FTC212

SIG. 80R

THE VERSATILE ONE—SIGMASIZER 80R

The Sigmasizer 80R offers 80 (25kHz increments) channels on 2m. The received frequency is always indicated on the dial, either transceive (simplex) or for repeaters, the transmitter is automatically shifted down 600Hz. When the receiver is tuned to repeater input channel, the transmitter is automatically shifted upwards thus offering full, simplex, normal repeater or inverse repeater. The built-in tone burst functions only in repeater mode. A further channel may be programmed for instant selection of a local net or RAEN frequency. Automatic final protection, 10W of RF and a generous 2W of audio are available from the unit which draws only 2·2A on 12V. DC.

The FT221, complete 2m station

The FT221. The multimode USB, LSB, A.M., FM, CW (with semi-break-in and side tone), 2m transceiver offering the choice of: phase locked VFO or 44 crystal channels, simplex or repeater (600kHz up and down shifts), with unique "double push" auto tone burst, mains or 12V (3A) operation, excellent selectivity, SSB 2·4kHz (1·7: 1 S.F.) or FM 12kHz. Front panel adjustable VOX and mic gain, a calibrator (1MHz ÷ 10). 1kHz readout and linearity, sensitive squelch, clarifier with IRT and IRT with ITT (makes F.S.K. easy), switchable "S" and centre zero tuning meter, noise blanker, serviceable plug in boards all contained in 11½" (14") × 5" × 11½", 22lb rigid package.

FT221

YP150

POWER METER/Dummy Load YP150

The YP150 is a fan cooled 50 ohm dummy load, using a large carbon resistor which maintains impedance (VSWR less than 1·2:1 at 145MHz) by the use of a "Tapering Trough" and a power meter for use between 1·8 and 200MHz. calibrated 6, 30 and 150W FSD on a large 3½" × 2" meter with a maximum error of 10% (FSD) size 6(7") × 4½" × 11(12") weight 6lbs.

DIGITAL DISPLAY YC601

The YC601 digital display unit (for 101 and 401 series (3·18 MHz IF) Indicates transmit and received frequencies to 100Hz on six bright green, 9 segment gas discharge tubes. Built in mains P.S.U. (consumes only 10W), gate time of 100mS., size 3" × 8½" × 9" (10½") and weight 5½ lbs. Supplied complete with connecting cables, etc.

YC601

YAESU MUSEN

YO100

MONITOR SCOPE YO100

The YO100, the multi-purpose monitor scope, offers the facilities of monitoring the transmitted signal (through line) 1·8 to 50MHz on power levels from 10 to 500 watts. The IF of the receiver or transceiver can be monitored (3·18MHz standard, 455kHz or 9MHz options). AF and RF trapexoidal patterns can be displayed. The unit facilitates RTTY tuning, built-in 1·5 to 1·9kHz oscillators are suitable for Post Office two tone output measurements.

The FT101E, complete HF station FT101E(EE-EX)

The FT101E a complete mains or 12V DC station contained in a compact 30lb package. 260W P.I.P. of SSB (with in-built R.F. speech processor), 180W, CW and 80W of A.M., 10 to 160m. (inc. 10MHz RX). The sensitive and selective (permeability tuned RF stages and 8 pole crystal filter) receiver offers: threshold adjustable noise blanker, switchable 25 and 100kHz calibrator, ±5K clarifier (with separate on/off switch), etc., etc. The VFO is stable and linear (readout to 1kHz), external VFO or crystal control can be selected, with LED indicators illuminated accordingly. Carrier level is adjustable for: tune up, A.M., for CW operation, whose performance with the semi break in keying, with side tone, and the optional 600Hz filter installed is of a high order. Linear and transverter provisions are made with scockets for: relay contacts, ALC output, all internal HT supplies, low level RF heater links and switches, etc., etc.

FT101E

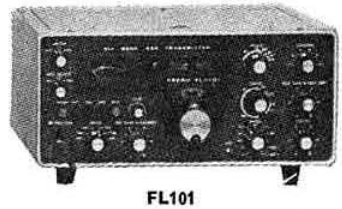
FR101

DELUXE COMMUNICATIONS RECEIVER FR101 DD(DS-D-S)

The FR101D (deluxe) wide coverage (23 (from 1·5MHz) 500kHz bands + 4 and 2 metres) receiver. Analysis of the signal path shows: 0-20dB switchable attenuator, two section permeability tuned input filter, Mosfet R.F. stage and mixer (crystal controlled), 3 section top coupled bandpass filter, no gain at first I.F., IC balanced mixer, 20kHz wide crystal filter, shunt diode noise blanker single FET buffer stage. AM, CW or SSB (RTTY: filter, appropriate detector and audio stage. Add to this, two excellent VHF converters, squelch, FM detector, 1kHz readout, excellent stability, Tx monitor control, crystal control facility, switchable AGC, transceive capability (FT or FL, 101) and that digital readout options are available of this (deluxe), or the standard (less the plug-in optionals, converters, broadcast band crystals, filters, etc.) version.

DELUXE TRANSMITTER FL101

The FL101 transmitter is the ideal companion to the range of FR101 receivers or the FT101 transceivers. It offers through the latest solid state techniques, the ultimate in base station performance and versatility. The transmitter operates from top band through to 10m (and 2 AUX 500kHz segments) on selectable SSB, (240W PIP), CW (180W 50%DS), AM or FSK (170Hz shift standard) (80W). It utilises reliable plug in circuit boards, for servicability, a cooling fan, for reliability, and provision for a RF processor, for signal 'punch'. Fully adjustable built in VOX and semi break-in keying with side tone, satisfy the demands of the most stringent operator. The VFO is stable within 100Hz during any 30 minutes after warm up, offers no more han 100Hz change for a 10% line voltage variation and a calibration accuracy better than 2kHz with back lash not exceeding 50Hz. A total of 12 transistors, 6 FETs, 4 ICs, 28 diodes and 3 tubes complete the transmitter's complement.



FL101

FT401B

BASE STATION FT401B

The FT401B. The powerful basestation, 560W. P.I.P. A3j. (430W. A1, 90W. A3) on 80 through 10m. (+2 aux bands and 10 MHz RX) from blower cooled 6KD6's. Stable, linear, V.F.O. (100Hz/30 mins. after warm up, or for 10% line change), readout to 1kHz with less than 50Hz backlash. The receiver is sensitive and selective (2·4kHz SSB (1·67 : 1) optional CW filter 600Hz at 6dB), with an AGC threshold of 1μV, attack of 2mS and switchable hang of 1 or 2 sec., image rejection of more than 50dB, and 3W. audio output to external speaker from a compact 16" × 14" × 6", 40 lbs package.

ECONOMY TRANSCEIVER FT200B

The FT200B. The "Best Buy"—260W. P.I.P. (A3j, A1) 75W. (A3), 80 to 10m. (28·5-29MHz, 3 other crystals optional). Sensitive and selective 2·3kHz at 6dB (1·75 : 1 SF). Solid state, stable, linear (readout to 1kHz), gear driven VFO. 100kHz calibrator, VOX/PPT, clarifier (±5kHz). Semi break in CW with sidetone, etc., etc. The pre mix oscillator system used, yields: low spurii outputs on transmit, and the good signal handling and low noise capability of a single conversion superhet (whilst retaining a 9MHz IF with high image rejection) and single range VFO stability.

FP200B FT200B

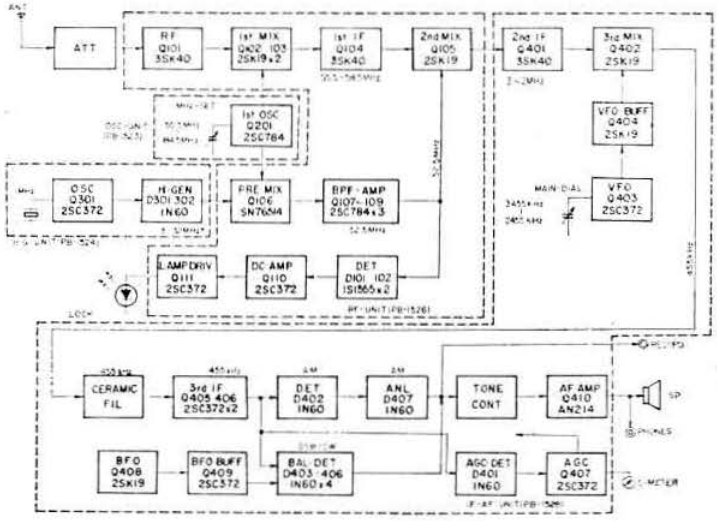
YAESU MUSEN

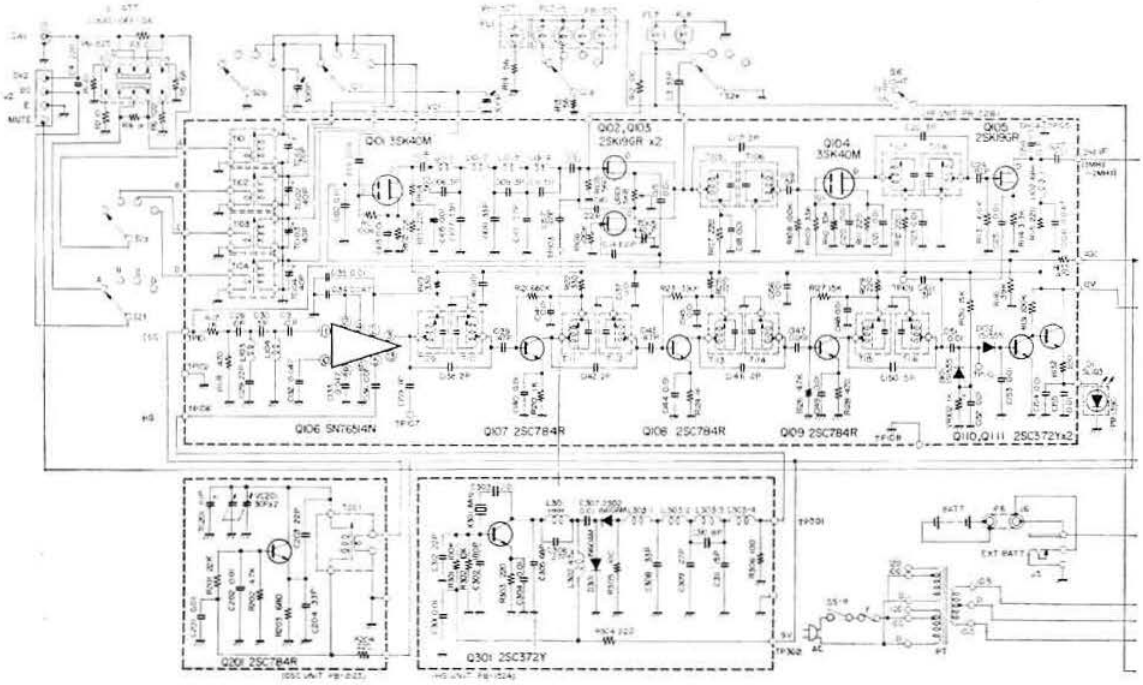
FRG7 General coverage

The FRG7 is a general coverage solid state receiver with specifications unparalleled in its price range. A spin tuned, phase locked synthesiser provides complete coverage from 500kHz to 30MHz to an accuracy better than 5kHz. Frequency selection is accomplished by setting the RF (pre-selector and range switch), dialling up the required number of megahertz, then tuning the VFO knob as normal.

The receiver is sensitive (0·5μV for 10dB, S + N/N (SSB)) and stable (within 500Hz for any 30 minutes after warm up) with AM, SSB and CW modes catered for. A 3 position audio filter, RF attenuator, dial lamp conservation switch, recorder and phone sockets are fitted. It is mains powered, but should the supply fail, or portable operation be required, 8 dry cells are automatically switched in.

BLOCK DIAGRAM ▶





YAESU MUSEN

solid state mains/12v receiver

The FRG7 receiver uses a Barlow Wadley triple mix drift cancelling loop for continuous, spin tuned, inclusive coverage of 0·5 to 30MHz.

The incoming signal, from the antenna, passes through a switched attenuator, to the bandswitched preselector coils and hence to gate one of the MOSFET RF amplifier. A low pass filter (fc 35MHz) removes the V.H.F. image and feeds two JFETS as a balanced mixer which, with the synthesised local oscillator (tuning 55·5 to 84·5MHz) upconverts to 54·5 to 55·5MHz. The first IF is bandpass amplified by a dual gate MOSFET and hetrodyned to 2–3MHz in a FET mixer driven by the synthesiser derived 52·5MHz.

A 1MHz crystal oscillator and diode harmonic generator produces a 3–32MHz comb spectrum. This is fed to a dual balanced IC pre-mixer together with the first hetrodyne oscillator. The output is filtered by a multiple stage selective amplifier to produce the second hetrodyne signal. A fraction of this 52·5MHz output is rectified and the DC level amplified to drive the lock lamp which lights when the MHz (first hetrodyne oscillator) is malset.

The second IF is mosfet amplified and is passed to the third JFET mixer (input and output tuned by capacitors ganged to the VFO) where it is hetrodyned by the buffered main VFO (2·455 to 3·455MHz) to the final IF 455KHz, which contains the ceramic filter selectivity elements.

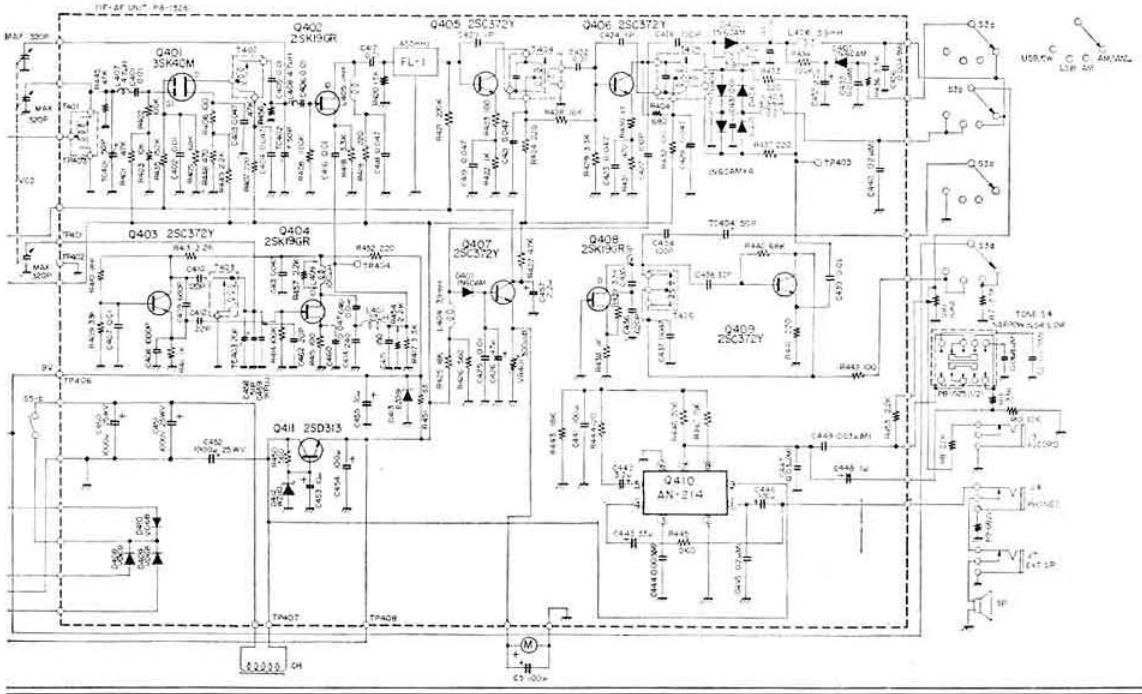
Further amplification follows (by the first bipolars in the signal path), then demodulation, by twin diodes for

AM, or a 4 diode product dectector with switched frequency FET BFO for SSB/CW.

A diode rectifies a fraction of the output from the final IFT; this is boosted to drive the 'S' meter, and gain control—the MOSFET Amplifiers in the first RF, second IF and the third IF.

A transformerless audio audio output stage delivers 3W to the loudspeaker.

The DC voltage for both AC and DC operation is supplied via an extremely stable 10V regulator, a further 9V rail is provided for oscillators and the harmonic generator.



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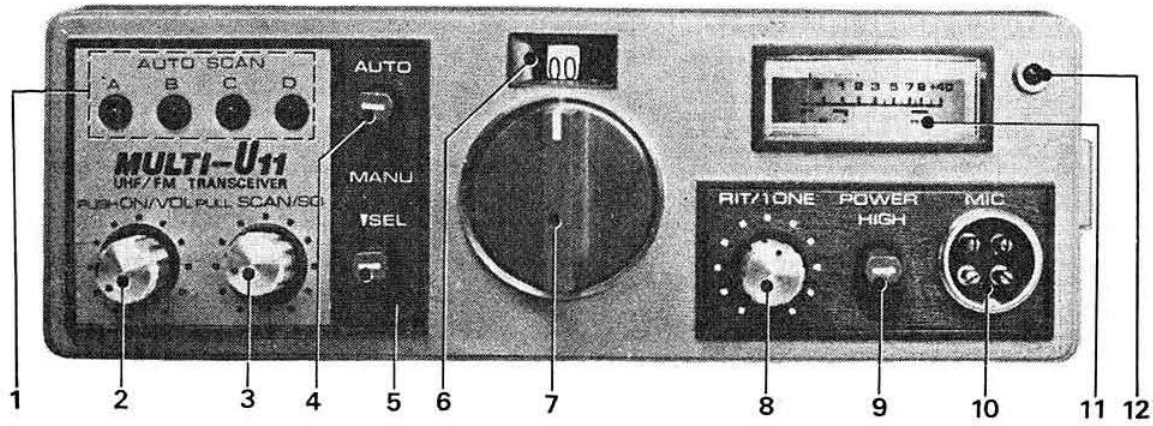
MULTI U11—NEW FROM SMC



70 CENTIMETRES 10W FM TRANSCEIVER 23 SWITCHED CHANNELS, 4 AUTO SCAN CHANNELS AND EXTERNAL VFO PROVISION

THE MULTI U11 MEASURES ONLY $6\frac{1}{2}'' \times 2\frac{1}{5}'' \times 9\frac{2}{5}''$ YET ADDS A NEW DIMENSION IN 70CM FM.

Scanning transceivers are convenient especially for mobile, and/or when activity is low, but either the number of channels is limited or the size (then cost) becomes prohibitive. A unique combination of frequency control, external VFO, 23 switchable or (instantly selectable) 4 Auto scanning channels, cater for all present and future needs. To highlight this farsightedness both the Tx deviation and the Rx bandwidth are switchable accommodating 50 or 25kHz spacings. The main dial is channel numbered (eg 16 = 433·4, 20 = 433·5 etc) and is illuminated only when a channel is crystalled up.

The triple conversion (45, 10·7, ·455MHz), receiver has a fixed first oscillator, offering high image immunity, great sensitivity (0·5μV for 30dB NQ) provided by the two RF stages, diode RF switching, receiver independent tuning etc.

The transmitter, of switchable 10 or 1W output, draws only 2·5A or 13·Av (0·6A or 0·3A Rx), has netting of new crystal facility, an "on the air lamp", PO meter, AFP of final stage, reverse polarity protection etc.

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8. **R.I.T. or push for Tx test**
9. **High/low power switch**
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FRG7

FRG7

The FRG7 is a general coverage solid state receiver with specifications unparalleled in its price range. A spin tuned, phase locked synthesiser provides complete coverage from 500kHz to 30MHz to an accuracy better than 5kHz. Frequency selection is accomplished by setting the RF (pre-selector and range switch), dialling up the required number of megahertz, then tuning the VFO knob as normal.

The receiver is sensitive (0·5μV for 10dB, S + N/N (SSB)) and stable (within 500Hz for any 30 minutes after warm up) with AM, SSB and CW modes catered for. A 3 position audio filter, RF attenuator, dial lamp conservation switch, recorder and phone sockets are fitted. It is mains powered, but should the supply fail, or portable operation be required, 8 dry cells are automatically switched in.

The FT101E is a complete station in a rugged 30lbs. package, constructed to high standards using serviceable plug-in boards and a complement of 14FET's, 26 Bi-polars, 3 IC's, 38 Diodes and 3 valves.

The transceiver with the "built-ins" which are often not available elsewhere or come as costly extras:

AC and 12V DC power supplies, R.F. speech processor, adjustable noise blanker, fully adjustable VOX, crystal calibrator (100 or 25kHz), internal speaker, Fan, Top Band, A.M., etc. and it comes supplied complete with hand microphone and full set of accessory plugs.

FT-101E (EE-EX)

FT221

The FT221. The multimode USB LSB, AM, FM CW (with semi break-in and side tone), 2m transceiver offering the choice of: phase locked VFO or 44 crystal channels, simplex or repeater (600kHz up and down shifts), with unique "double push" auto tone burst, mains or 12V (3A) operation, excellent selectivity SSB 2·4kHz (1·7:1 S.F.) or FM 12kHz. Front panel adjustable VOX and mic gain, a calibrator (1MHz ÷ 10), 1kHz readout and linearity, sensitive squelch, clarifier with IRT and IRT with ITT (makes F.S.K. easy), switchable "S" and centre zero tuning meter, noise blanker, serviceable plug in boards all contained in 11½" (14") × 5" × 11½", 22 lbs, rigid package.

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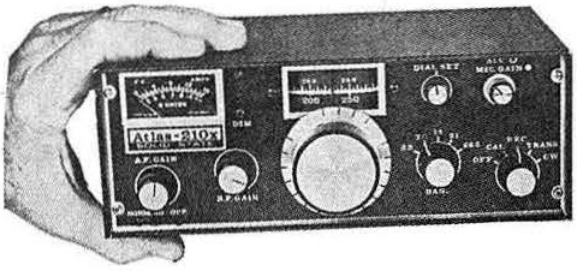

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The TS520 System
TRIO have now completed the first stage of the total system concept for amateur radio equipment. With the TS520 and its associated accessories, the amateur radio operator can assemble a station to suit any or all requirements for his hobby enjoyment. All modes and all bands, fixed and mobile/portable are provided by the TS520 system.

SSB/CW Transceiver TS-520
A real "compact"; powerful, rugged and reliable. It has everything which otherwise is available only as an accessory at extra cost; built-in power supply for fixed-station use, transistorized DC/AC power converter for mobile operation, loudspeaker, fixed-channel provisions, VOX control, etc. And these are the TS-520's special features in short format:

Versatile Transmit- and Receive Operations—USB, LSB and CW on all radio amateur bands from 80m. to 10m., and—with the aid of the 2m.-Transverter TV-502—also on the VHF-band from 144 to 146 MHz, as well as fixed frequency operation on four channels. The TS-520 also allows reception of WWV stations on 10 MHz for dial calibration. By adding the External VFO-520 (optional) the TS-520 demonstrates utmost versatility: independent RX- and TX operation with different frequencies, transceive operation with slightly variable RX frequency by means of the built-in RIT circuit (Receiver Incremental Tuning) plus fixed channel operation totalling nine different combinations.

Advanced Circuitry—With the exception of the transmitter driver and final stage which are equipped with blower-cooled vacuum valves of type 12BY7A and 2 x S2001 the TS-520 is fully transistorized. The semiconductor complement consists of 44 transistors, 18 FETs, 1 IC and 84 diodes. The reliability and stability of this circuit has been substantiated by numerous contests and during rugged mobile operation.

Outstanding Receive and Transmit Performance—The transmitter section of the TS-520 features separate driver, plate and final tuning, a 2-stage ALC circuit for local and DX operation, thus assuring undistorted clearly legible TX signals even after hours of continuous operation. Provisions for linear amplifiers, such as ALC input, antenna relay switching output, etc,. are available and ready for use. Dual-gate MOSFETs are employed in all critical receiver circuits to improve the input sensitivity, cross-modulation response and spurious rejection. An 8-pole SSB crystal filter in the IF amplifier provides exceptional selectivity and stability. An optional 500Hz CW filter is available as an accessory and can be installed at any time. The switch-selectable time constant of the AGC assures perfect reception of SSB and CW signals.

Precision-type VFO—a feature of all TRIO receivers, transmitters and receivers also contributes to the supreme performance of the TS-520. The VFO is fully encapsulated and is controlled by a meshedgear dial drive (reduction ratio 4 : 1). Dial accuracy is better than ± 1 kHz, frequency drift will not exceed ± 100Hz per hour. Dial calibration is accomplished by means of a built-in 25 kHz crystal marker oscillator.

Built-in Power Supplies—for fixed station use with 120/240 VAC 50-60Hz line voltage or for mobile operation with 12-13·8 VDC by means of the built-in DC/AC converter.

Loaded with Extra Features: threshold-type RF gain control; semi-break-in circuit with sidetone; VOX/PTT/MOX-control; RIT; TUNE switch; LED function indicators for RIT, VFO and FIX channel operation; WWV receive pushbutton; 4-position fixed channel selector switch; built-in 25 kHz crystal marker oscillator; two-stage AGC; multi-function meter; terminals for optional accessories such as: 2m.-Transverter TV-502, External VFO-520, External Speaker SP-520, linear amplifier, headphone, microphone and key.

OPTIONAL ACCESSORIES
EXTERNAL VFO-520
Developed exclusively for the TS-520, this external VFO fulfils the same functions as a separate transceiver due to its numerous cross-operation and split frequency features. Design and specs. of the VFO-520 are identical to those of the TS-520's built-in VFO. It operates on oscillator frequencies between 4·9 and 5·5 MHz. Remote control and power supply are furnished by the TS-520 by means of a special interconnecting cable. In conjunction with the transceiver the VFO-520 provides a total of nine different operating modes, including RX or TX operation with continuously tunable frequencies and fixed-channel operation.

2m. TRANSVERTER TV-502
This new addition to the TS-520 accessory line extends the transceiver's scope of application to include the 2m.-VHF range which is becoming more popular every day. The TV-502 transverts the 10m.-band to 144-145·7 MHz for SSB and CW operation. By installing an optional 39 MHz crystal, the TV-502 will also cover the range between 145·0 and 146·0 MHz, thus making the entire 2m band available for the shortwave radio amateur. The unit features preselector tuning on the antenna side and IF tuning by means of a multi-gang capacitor, utilizing the TS-520's ALC meter for tuning control. The TV-502's transmitter is controlled by the ALC voltage supplied by the transceiver and provides 10 watts RF output power. The highly sensitive receiver seation responds to input signals of less than 0·3μV. Like the TS-520, this transverter can also be used for fixed or mobile stations, operating either from 120/240 VAC, 50-60Hz line voltage, or 12-13·8 VDC supplied by a car battery.

EXTERNAL SPEAKER SP-520
Styled to match the TS-520 accessory line, this 5in-speaker will greatly improve the readability of RX signals, especially in DX operation. Voice coil impedance is 8 ohms, frequency response from 100 to 5,000Hz.

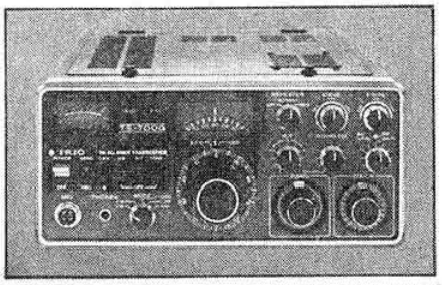
Sole Importers
LOWE ELECTRONICS
119 Cavendish Road
Matlock Derbyshire
Tel: Matlock 2817/2430

TS520 £336.00 VAT Exc

ON SHOW AT LEICESTER 28, 29, 30, OCTOBER 1976

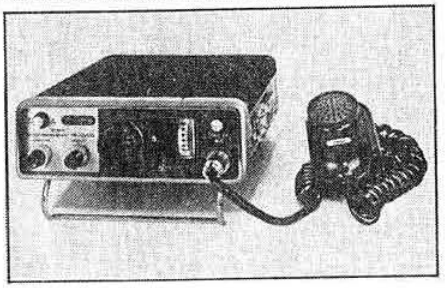
TRIO

LOWE ELECTRONICS



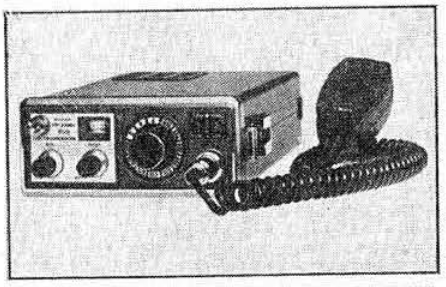
TS700G £340 +VAT

The standard by which all others are judged. Full 2 metre coverage, VFO or crystal controlled. All modes AM, FM, USB, LSB, and CW. Mains or battery operation. Normal and reverse repeater facilities. Trio exclusive tuning fork access tone generator. Plus, of course, Trio quality and reliability backed by Lowe Electronics service. If you haven't seen it yet, go to one of our branches and be prepared to be impressed.
15 Watts output. 0·25 microvolt sensitivity. European standard FM selectivity. This rig has all others beaten.



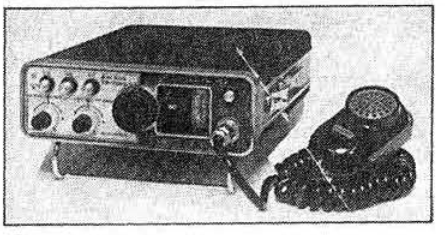
TR7200G £144 +VAT

The TR7200G has set all 2 metre FM operators talking about its outstanding performance on both transmit and receive. Not only is it the best engineered transceiver on the market, but it's also the most sensitive at 0·3μV for 15dB quieting and has the cleanest transmitted signal both in and out of band (the economy transceivers simply lack the interstage filtering to ensure that the owner is not put off the air by the Home Office.)
Supplied complete with microphone, mobile mount, power leads, spare fuses and incorporating the TRIO exclusive tuning fork access tone generator, the TR7200G includes five fitted channels (S20, 21, 22, R6 and R7) or alternatives if requested.



TR3200 £132 +VAT

The newest FM handy transceiver from the TRIO range. Superb performance for the 70cm. operator, 12 channel capability in the range 432-436MHz with three channels fitted (SU8, SU18, SU20). Transmitter output switched 2W/400mW and incorporating the TRIO exclusive 1750hz tuning fork access tone generator. ¼-wave detachable antenna for high gain performance on both transmit and receive.
Supplied complete with all accessories as the TR2200G and with the new miniature handy microphone.



TR7010 £176 +VAT

Following the worldwide success of the TS700, Trio have taken the TS700 basic design and packaged it for 2 metres SSB mobile use.
The TR7010 sets new standards in receiver sensitivity and low spurious emission on transmit. Operating CW and SSB from 144·1-144·3MHz, the TR7010 covers all CW SSB and beacon activity. 40 5kHz channels plus VXO and RIT provide continuous coverage. 8 extra channels can be used, without retuning, in the range 144-145MHz by fitting auxiliary crystals.
Single conversion using an IF of 10·7MHz with a superb crystal filter provides outstanding selectivity. Wide range amplified AGC and newly developed FET devices in RF amplifier and mixer stages allow maximum sensitivity to be used with freedom from overload due to adjacent signals.
Single conversion transmitter with fully balanced mixer system generates a beautifully clean signal with crisp audio quality.

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Complete with mounting brackets for masts up to 1¾" O.D.
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ASP659UK.

425–440MHz 5dB Gain Base station collinear
Power capability 100W
Termination Female 'N' Type connector.
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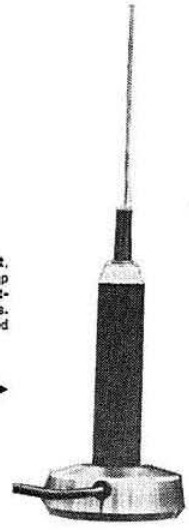
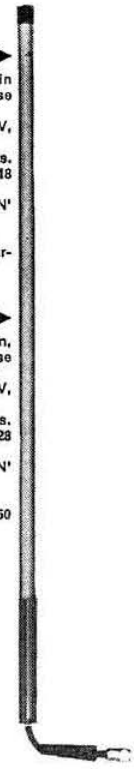
Available soon.

FOR AMATEURS WHO DEMAND THE BEST



ASPJ680UK ▶

144-148 MHz 6dB gain DC Grounded Base Station Collinear.
Power capability 350W,
Length; approx. 12'
Weight: approx. 4 lbs.
Rated wind velocity: 118 mph.
Termination: Male 'N' Type Connector.
Available mid July,
£45.00 plus £2.00 carriage.

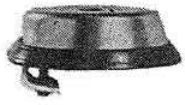


ASPN701UK. ▶

430-440MHz 12dB Gain, DC Grounded, Base Station Collinear.
Power Capability 250W,
Length approx. 18'
Weight approx. 9·5lbs.
Rated wind velocity 128 mph.
Termination Male 'N' Type Connector.
Available now,
£100.00 plus £2.50 carriage.

MOBILE ACCESSORIES

ASP332
Gutter mount suitable for use with ASP629, ASP393 complete with 10' RG-58U cable and PL-259 connector **£7.00** plus 50p post and packing.



K-203
No hole boot mount, suitable for ½" hole snap in mount, easily adaptable for other mounts.
£3.20 plus 50p post and packing.

ASPR332
Gutter mount suitable for use with ASP677, ASPE667, easily adaptable for use with other antennas. Complete with 10' RG-58U cable and PL-259 connector.
£7.00 plus 50p post and packing.

New Magnetic Mount ▶
Shown with ASP629, but also fits ASP393, ASP677 and ASPE667. Complete with 10' RG-58U cable and PL-259 connector. **Price to be announced.** Available mid-July

VAT of 12½% to be added to above prices.

Please send SAE for catalogue of complete range.

FOR MOBILE ANTENNAS PLEASE SEE PREVIOUS ISSUES.

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This month's Heathkit selection. 2 metre FM equipment.

As with all Heathkit amateur radio equipment this month's selection of 2 metre gear comes to you in kit form. So besides the pleasure you'll get from using it, you'll also get a lot of enjoyment from building it.

And paying for it won't in any way be painful either. For example you can get up to £200 worth of equipment for just £10 a month on the Heath Monthly Budget Plan.

Write now, enclosing 10p for postage, and we'll send you a Heathkit catalogue.

HEATH Schlumberger

HA-202 2-M FM Amplifier

Delivering 40 watts (nominal) out for just 10 watts in, the HA-202 needs only a 12 VDC supply. So you can easily use it in your car or boat. It features all solid-state design and is a perfect match for the HW-202 Transceiver.

HW-2021 Hand-held 2-M Transceiver

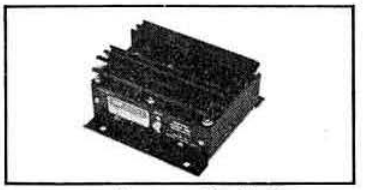
Offering 5 receive and 10 transmit channels, the HW-2021 has 1 watt output min. One of the smallest models on the market, it also has a built-in microphone, a compact, flexible aerial and rechargeable nickel-cadmium cells.

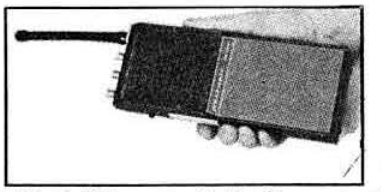
HW-202 2-M FM Transceiver

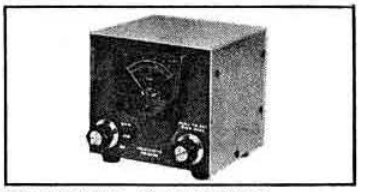
With all solid-state design, multi-channel capability, PTT mike and optional tone burst encoder. The HW-202 has 10 watt minimum output and is designed to operate into even an infinite VSWR without failure.

HM-2102 VHF Wattmeter

With a built-in SWR bridge and 50 to 160 MHz range, the HM-2102 is the perfect tune-up tool for 2-M gear, and covers 2-way commercial, aircraft and amateur communications.







Amateur Radio Department, Heath (Gloucester) Ltd., Gloucester, GL2 6EE. Tel: (0452) 29451.

RADIO SOCIETY OF GREAT BRITAIN

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Incorporated 1926

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The national society representing all UK radio amateurs

Membership is open to all those with an active interest in radio experimentation and communication as a hobby.

Annual membership rates: UK—£8 (including VAT); Unlicensed members under 18 years of age, £3. Overseas—£7.50.

Applications for membership should be made to the general manager, from whom full details of Society services may also be obtained.

GENERAL MANAGER AND SECRETARY
G. R. Jessop, CEng, MIERE, G6JP

EDITOR
A. W. Hutchinson

CQ de RSGB

AMATEUR SPIRIT

One of the most noteworthy aspects of amateur radio is that it appears to be associated with an intangible "something"—a strong bond which exists between many of its adherents who are otherwise total strangers.

From the earliest days of our service it has been a source of personal pride to the established amateur or listener that he will always do everything in his power to help a newcomer, or to assist a fellow who is in any kind of difficulty. Amateur radio seems to be the password to friendship with, and hospitality from, like minded people throughout the world, and there is no more warming feeling than to be greeted as a personal friend by someone in a strange land which one has never visited before.

The old cliché says "the amateur is a gentleman". This means that he operates with consideration for all other users of our frequencies, and tries not to cause inconvenience or difficulties for other amateurs. He radiates only the cleanest signals, and if he is using the morse code and talking to someone who is less proficient than he, he slows down without making his action obvious. On any mode he uses only the amount of power needed to establish and maintain effective contact—and thereby avoids excessive rf pollution of the bands. He avoids talking about controversial non-amateur radio subjects (such as politics or religion) and does not cause offence to others by exchanging jokes of doubtful merit over the air.

Perhaps the best demonstration of the Amateur Spirit is shown by those operators who find themselves at the scene of a disaster and able to provide emergency communications—as in Guatemala recently, and by those who help blind and disabled amateurs set up and operate equipment for their enjoyment.

The Amateur Spirit is something that we, as radio amateurs, may be truly proud of, and should fiercely defend in these days of falling standards.

Membership & Representation Committee

QTC

amateur radio news

"Radio Communication"

Members will have noted the extra trimming of the June issue and some may not be aware of the reason for this. The issues of the journal are planned so that alternate issues of 64 pages are within the 100g weight limit, 9p by second-class mail. If the weight of the issue exceeds this figure by only 1g then the higher rate of postage of 11p becomes payable. Multiply this 2p difference by the number of copies mailed and it will be seen that there is a significant saving to the Society by maintaining the weight within the 100g limit. It is hoped that members will accept the appearance when trimmed in the interests of economy. It is not considered worthwhile to incur the extra cost in order to send white paper through the post.

The position will alter when the address labels are produced and pre-sorted with the aid of a data processor. The journal will be despatched by bulk post and the weight limits will not apply to individual postings. Extra trimming will not be necessary and a uniform appearance can be maintained.

August subscription renewal notices

Members due to renew their membership of the Society in August may not have received a renewal notice with their June issue of *Radio Communication*. This was due to misinsertion by the printers before despatch, and in order to ensure that all members due to renew in August had received the correct notice the Society forwarded duplicate notices by post.

Renewal notices are sent out eight weeks early as, in the Society's experience, a considerable amount of time is required by banks to process amended bankers orders. Members renewing by bankers order are requested to bear this in mind and return the forms promptly.

New licences

Following discussions between the RSGB and the Home Office, the latter have agreed that the existing form of amateur service licences will be discontinued. In the future there will be one licence covering all forms of transmission and both mobile and fixed station operation. The present position regarding the use of hand-held equipment will be revised and separate letters of authority will no longer be required. The new licence will cover all forms of image transmission including facsimile, slow scan and high definition television.

It is hoped that the appearance of the new licence will materially reduce the time taken by correspondence concerning licence conditions. It is expected that the fee for the new licence, covering all modes and mobile, pedestrian and fixed station operation, will be around £5.50 pa. The Home Office and the Society will be examining the draft document, and the earliest time for the issue of the first new licences will be early 1977. In addition to new licensees, the document will be available to those holding existing licences.

Consideration has been given to the issue of three or five-year licences but for several reasons this possibility has been rejected. The actual form of the licence is still under discussion. The Society is in favour of a small "credit card" type licence with the conditions appearing in a separate document.

This is the first occasion for 30 years that the amateur licence format has been materially altered. The new licence will remove many anomalies and obviate misunderstanding. The RSGB is happy to record the co-operation of the Home Office in this matter. **Another example of the way in which Society activity is of advantage to ALL radio amateurs and is not restricted to RSGB members.**

STAFF VACANCY

Assistant General Manager

A vacancy will arise at RSGB headquarters in the near future for an Assistant General Manager with a view to becoming General Manager.

The candidate should ideally possess the following qualifications:

(a) At least five years' executive experience.

(b) Working knowledge of accountancy.

(c) Hold an amateur transmitting licence.

Salary will be commensurate with qualifications.

Applications should be made before the 30 September 1976 to the chairman of the Finance & Staff Committee, Mr C. H. Parsons, 90 Maesycoed Road, Heath, Cardiff, Glamorgan.

More postal increases

From 7 June, letters and parcels over 150g in weight have been subject to increased postal charges. These increases mean that the "by post" prices of most publications sold by the Society have had to be raised. The new "by post" price list is given on the inside back cover of this issue.

Repeater summary

The RSGB had 33 VHF/UHF repeaters licensed, of which 17 are operational, at the time of going to press. The ones which are licensed but not yet operational await the completion of equipment by the various groups responsible for the individual repeaters. As new repeaters become operational details will be given over GB2RS. A full repeater status report appears on p524.

New callsigns

The ITU has provisionally allocated the callsign series D7A-D9Z to the Republic of Korea.

Raynet authorized users

The RSGB represents **you** whatever your activities or interests in the amateur radio field. In fact, whether you are a member or not, the RSGB represents all radio amateurs.

As an example, the Society's general manager and the Raynet Committee chairman attended a meeting at the Home Office on 24 May when it was agreed that the HO would add "County Emergency Officers and their deputies" to the list of authorized user services who are entitled to request assistance from the Radio Amateurs' Emergency Network (Raynet). It was also understood that this did not

extend to rallies, motor races, point-to-point races etc. The RSGB and Raynet undertook to do everything possible to prevent any breach of this arrangement by radio amateurs.

RAOTA reunion and get-together

An attendance of only 24 was recorded at the Radio Amateur Old Timers' Association reunion held on 1 May. After due discussion it was decided by those present that future reunions will revert to a Friday evening and be held on the first Friday of May each year.

Arrangements for a get-together over a cup of tea will be made at the RSGB Radio Communication Exhibition to be held at Alexandra Palace, North London, on Saturday 31 July, provided there is sufficient interest.

Details of membership can be obtained from the secretary, Miss May Gadsden, 79 New River Crescent, London N13 5RQ. Tel: 01-882 1272.

Members who intend to visit the exhibition on 31 July are asked to let the secretary know in good time.

RAC/Amateur Radio Group Scheme

This Royal Automobile Club Group Scheme commenced on 17 May 1976 (World Telecommunication Day), and is open to all those interested in amateur radio; be they members of a club or not.

Group scheme membership offers the same services and benefits as individual RAC associate membership, with the added advantage of being cheaper. At present the saving is £2.50. Existing members of the RAC can transfer into this scheme when their membership is due for renewal, and they pay at the pro-rata rate which takes them up to the group renewal date.

RAC membership has always included husband and wife for the same fee, and this also applies to this group scheme. In addition to this you are eligible as a group member to a discount on RAC car insurance rates.

Application forms can be obtained from the group secretary, Mr M. J. Parks, GM8HBU, 18 Netherplace Crescent, Newton Mearns, Glasgow G77 6BT.

Membership cards will be issued by the RAC direct to the member's address.

Bargain prices to visit the exhibition

As the RSGB Radio Communication Exhibition later this month is the first the Society has held in London for some years, we obviously want to make it as easy and inexpensive as possible for our members, families and friends to attend. Rail travel and hotel accommodation are becoming more and more expensive each year but we have made special arrangements with British Rail and Grand Metropolitan Hotels which will save a considerable amount of money.

One payment will cover an entrance ticket to the exhibition, return rail fare, two nights accommodation in a centrally located hotel, English breakfast, service and VAT. Here are some examples of prices:

Birmingham	from £18.70
Manchester and Liverpool	£22.40
Leeds	£21.50
Edinburgh and Glasgow	£28.10
Swansea	£20.90

For further information contact Toni Margiotta, who is handling all details of this special arrangement, at Grand Metropolitan House, 7 Stratford Place, London W1A 4YU. Tel 01-629 4014.

IARC 1976 AGM

Some 40 members of the International Amateur Radio Club (IARC), which has its station 4U1ITU at the International Telecommunication Union (ITU) headquarters in Geneva, Switzerland, were present for the club's 1976 AGM, held on 11 May in a picturesquely located lakeside restaurant just outside Geneva. In addition to radio amateurs from ITU staff and other Geneva-based members, a number of CCIR Study Group delegates currently participating in an interim meeting at the ITU profited from their presence in Geneva to attend the IARC reunion.

Following the treasurer's report, the outgoing IARC president, Richard Kirby, W0LCT, who is also Director of CCIR, gave a brief account of club highlights over the previous 12 months, in particular praising the efforts of the local CERN (European Nuclear Research Centre) radio amateur group in organizing the IARU stand at the Telecom 75 exhibition. Mr Kirby requested to stand down as club president for the coming year, and the following committee members were then elected: president, Ted Robinson, F8RU; vice-presidents, Roy Stevens, G2BVN, and Wolfgang Hampel, DL9PS; secretary Jerzy Rutkowski, SP5JR; treasurer, Len Jarrett, HB9AMS.

The IARC convention was subsequently modified to allow radio clubs to be admitted as members; a report was given of 4U1ITU station activities, and a number of new members were admitted. This closed the official part of the AGM which was followed by a dinner and social get-together of all participants.

After the AGM of the IARC (l to r): Len Jarrett, HB9AMS, treasurer (seated), Ted Robinson, F8RU, president; Dick Kirby, W0LCT, retiring president and Director of the CCIR and J. Rutkowski, SP5JR, secretary

★ RADCOMEX 76 ★

RSGB RADIO COMMUNICATION EXHIBITION 1976

Alexandra Palace, London

Friday 30 July–Sunday 1 August

Official opening by Lord Wallace of Coslany at noon on 30 July

TIMES OF OPENING

Friday: 1000 to 2000. **Saturday: 1000 to 2000.** **Sunday: 1000 to 1600.**

In response to ever-increasing demand, the Radio Society of Great Britain has pleasure in re-establishing an old event in the radio amateur calendar, but in a new and larger venue surrounded by pleasant parkland—the Great Hall of Alexandra Palace in north London.

Recognizing that no one should be ignored, it is hoped that there will be something of interest for all members of the family.

FOR THE RADIO AMATEUR

- RSGB committee members and headquarters staff to handle queries
- RSGB bookstall for the latest and best in amateur radio publications
- BARTG demonstration
- Oscar display
- Raynet stand
- Demonstration station GB3AP
- Demonstration of Ceefax
- Many major UK firms will be exhibiting equipment
- BBC Radio London will be present
- Talk-in on GB2VHF and GB3RS. 160, 80 and 2m on 144·305MHz (ssb) and S0, S20 and S21 fm

FOR THE FAMILY

- Eighteen-hole pitch and putt golf course
- Boating lake
- Park trail
- Ski slope
- Rose gardens
- Children's playground
- Creche (in case of inclement weather)
- Play-group open 1000–1200, 1400–1600, each day, with qualified staff in attendance for children aged three years and over
- Free facilities
- Wheelchair facilities for the disabled

Prices of admission: Adults 40p, Children 20p. **Buffets and bars open during exhibition hours**

Reception for overseas visitors, Friday 30 July, commencing at 1800. Price 75p.

Alexandra Palace is easily reached by road from the A1, A10, A11, A41 and M1 via the North Circular Road, and there is almost unlimited free parking on the site. Caravanners are also welcome but overnight stays are not permitted under GLC regulations. See maps on front cover of this issue. Venue will be signposted by AA or local council.

Bus service W3 passes the door. Connects with Victoria and Piccadilly Underground lines at Finsbury Park and British Rail at Wood Green.

If an overnight stay is contemplated, contact the Alexandra National Hotel, 330 Seven Sisters Road, London N4, and mention the RSGB Exhibition. See also Grand Metropolitan/British Rail arrangement on p492.

Some new insights into the mechanism of the sunspot cycle

by F. M. SMITH, G8KG*

THE author's interest in the behaviour of the sunspot cycle has a double origin. First, during much of the cycle which is just ending, his job of organizer for the G3SSO contest team generated a growing interest in the problem of short-term propagation prediction. The rules for predicting conditions are well established, but the results depend critically on how accurately one can predict the sunspot number. Second, to paraphrase the Psalms, "the years of a man's life are six solar cycles", and having lived through rather more than five and being on the brink of retirement, a keen interest in the likely behaviour of Cycle 21 is not unexpected, particularly since there have recently been some rather gloomy forecasts on that subject.

In pursuit of these two objectives, an up-to-date plot of the progress of Cycle 20 was begun in the mid-'sixties using the Swiss Federal Observatory provisional monthly sunspot numbers published in *Radio Communication*. As time went by it became increasingly clear that its shape was very far removed from the classical slightly-rounded saw-tooth of its immediate predecessors [1]. Indeed it became affectionately known as "that picture of the Himalayas" and a glance at Fig 1 will show why.

The author spent much time studying its peculiarities until recently when, while recovering from a bout of flu, the idea occurred to him that Cycle 20 was a composite of two distinct cycles. More of this later, but the idea, coupled with the memory of a reference in *The Times* in early 1975 to a new theory that sunspot cycles were linked with tides in the sun produced by the planets, led to a feverish hunt for relevant data. For the author the results were exciting and fascinating. In short:

(*a*) The mechanism behind the sunspot cycle seems to behave like an injection-locked oscillator (the "Goyder lock" of the early years of stable frequency transmission), the injection source being the tidal variations.

(*b*) Recently, ie for over a century, the system has been locked but previously synchronism had been lost for periods of 60 years and more.

(*c*) The odd behaviour of Cycle 20 seems to be some sort of re-synchronization, but the prospect of sync being held during the next few cycles looks good.

(*d*) This "new look" at the possible mechanism casts doubt on long-term forecasts based on a presumed link between Cycles 18–22 and Cycles 2–6. If sync is maintained it is cautiously predicted that Cycle 21 will have a peak smoothed number at least as high as the one just ending and the peak may well be in the region of 150.

It is hoped that this brief glimpse of the conclusions will encourage those readers with an interest in future band conditions, or with a layman's curiosity about natural phenomena, to read on. The author is not a scientist and has tried to present a synthesis of known facts, published theories and some contributions of his own in a form which will interest readers. If it also helps the professionals, so much the better. It would have been impossible without the vital contribution of K. D. Wood of the University of Colorado [2].

Sunspot cycles

Data on maximum and minimum sunspot years from 1610AD is available in a publication [3] by Professor M. Waldmeier of the Swiss Federal Observatory, who also provides the monthly forecasts in *Radio Communication*. Systematic data on annual sunspot numbers begins in 1750 with the peak of Cycle 0. While the average cycle length over the series of 33 cycles since 1610 is between 11·05 and 11·1 years, they come in all shapes and sizes. Trough-to-trough periods range from 8·5 to 15 years, and the peak-to-peak length from 8·3 to 16·6 years. Because a high proportion of the extreme values occurred before Sc8 (Solar cycle 8) (peak 1837·2) some analysts have questioned the accuracy of the earlier data, but an alternative explanation which seems to vindicate the early observers emerges later in this article.

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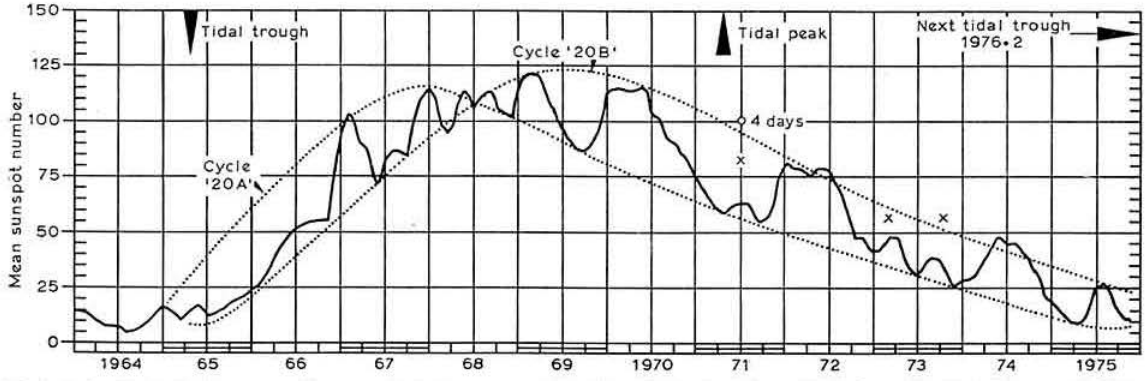


Fig 1. Solar Cycle 20—three-month mean. Note the suggestion of two distinct cycles with "phase jitter" during most of the cycle. Crossover is at 1968·5. The smoothed curve in Fig 3 obscures much of the significant data

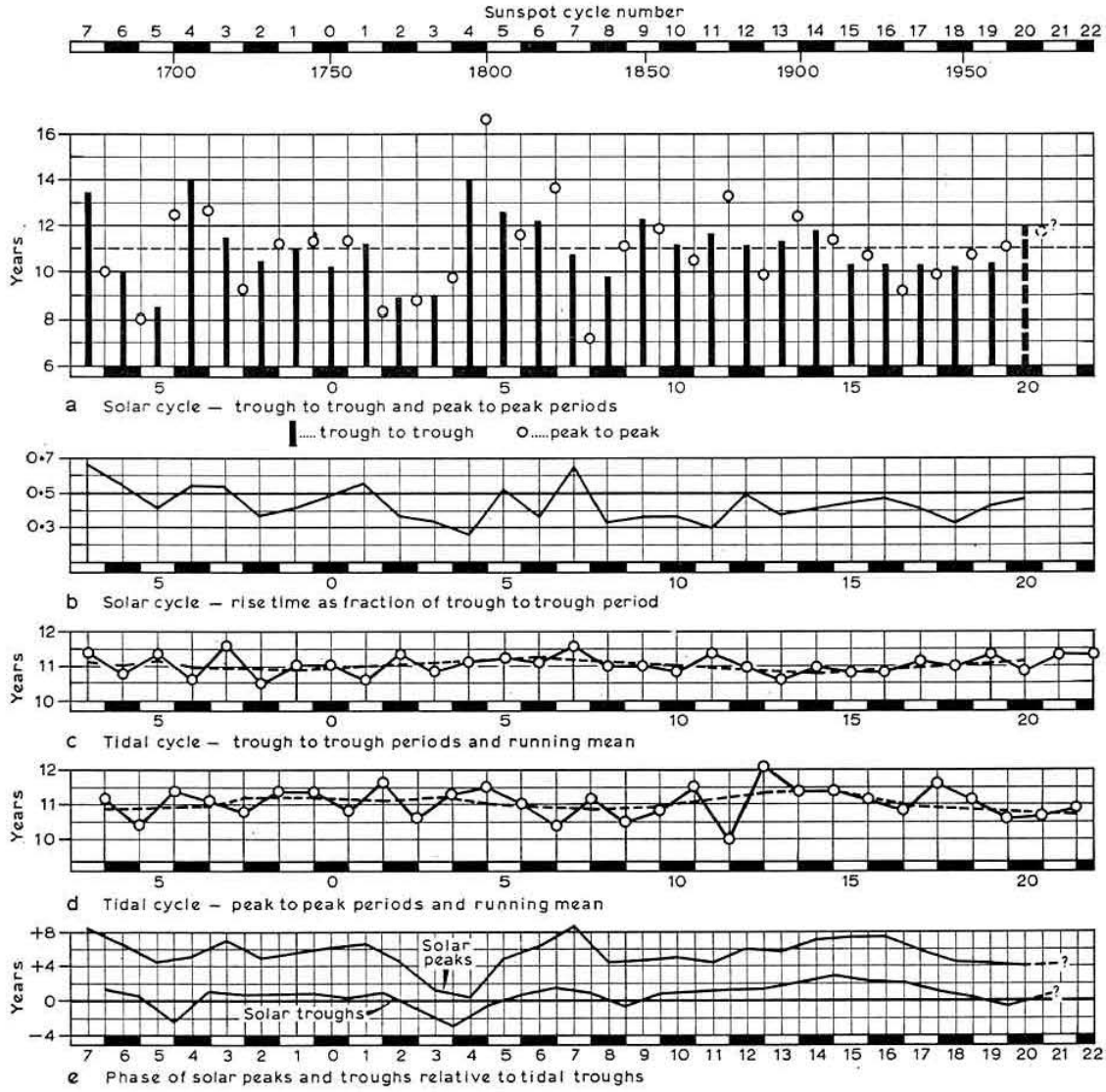


Fig 2. Comparison of sunspot cycle with tidal cycle

In the following analysis, data since Sc—7 beginning in 1679 has been used. Figs 2(a) and 2(b) show the associated Solar trough-to-Solar trough (St–St) and Solar peak-to-Solar peak (Sp–Sp) periods and the relative rise time (St–Sp) for each cycle. It is important to realize that the horizontal scale is not a linear time scale, time being somewhat compressed during a sequence of long cycles, and *vice versa*. A few dates are added to give an idea of time.

Looking first at the St data for Sc8–Sc20 it can be seen that there are two groups. Sc8–Sc14 have an average period of 11·3 years (Sc10–Sc14 average 11·46 years). Sc15–Sc19 form a group with periods close to 10·3 years. Sc20 looks like lasting 12 years in which case the average of 19 and 20 will be 11·2, close to the average of 8 and 9.

During this same period Sp–Sp initially averaged near to 11 years, fluctuated during Sc12 and Sc14 (a reason for this will emerge) and then precessed downwards for a few cycles and back again. This means that the peaks were moving in relation to the troughs, which is evident in Fig 2(b). Rise time is stable at about 0·35 up to Sc11, jumps to 0·5 at Sc12 and then back to 0·35, after which it precesses up and then back.

Some of this behaviour is not easy to visualize and an alternative approach is to plot the phase of St and Sp relative to an arbitrary time scale with a period of 11·05 years. This produces a result very similar to Fig 2(e) (the reference in the caption to tidal troughs should be ignored *pro tem*). The phase of St drifts later each cycle from St8,9 to St14,15 and then returns to a slightly early value by St19,20. Sp follows a similar trend except for the "jink" at Sp12. This general behaviour need imply no more than that the sunspot

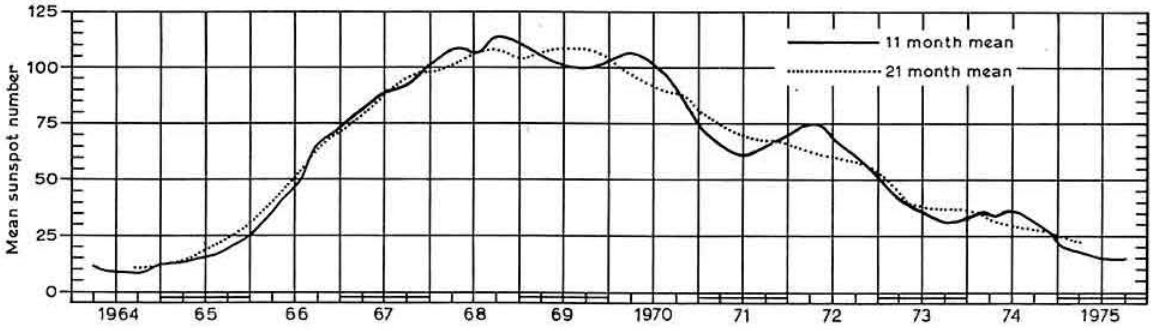


Fig 3. Solar Cycle 20—smoothed sunspot numbers

mechanism is drifting in frequency compared with our arbitrary 11·05 year "clock". One feature—the reversal of phase drift after one "early" St at both St8,9 and St19,20 is, however, suggestive of the behaviour of an injection-locked oscillator—or of the balance wheel of a watch if a mechanical analogy is preferred.

What about the period before Sc8? From Sc−7 to Sc−5 the St period fell rapidly from 13·5 to 8·5 years and back to 14 years at Sc−4. Then followed five cycles in which the St period fluctuated gently around an average of 10·9 years, suggesting synchronism from Sc−3 to Sc+1. Then there is a dramatic change. Two very short cycles (*c* nine years) are followed by a very long one (Sp–Sp is over 16 years) after which the cycle rate gradually increases, overshoots the 11-year mark and finally settles down at about Sc8.

This behaviour looks uncommonly like loss of sync after Sc1 followed by a period of "hunting" until St8,9. Fig 2(e) shows this well and there seems to be a *prima facie* case for the "injection-locked" oscillator model, but this merely poses a new question. If it is in any sense a correct picture of what is happening, what is the source of the injection frequency?

Tidal cycles

The answer to the above question has been available since at least 1972 in a very stimulating letter to *Nature* by K. D. Wood of the University of Colorado [2]. He points out that the tidal forces on the sun vary under the gravitational influence of Mercury, Venus, Earth and Jupiter. Venus and Earth are in line with the sun (ie in conjunction) every 1·6 years and this results in a tidal fluctuation which varies according to how their joint influence combines with that of Jupiter whose orbital period is near to 11·6 years. The resultant "tidal fluctuation function" turns out to have a mean period of 11·08 years and to show marked correlations with the sunspot cycles.

Over the period from 1610 to 1976 there have been 33 sunspot cycles and 33 of Wood's cycles. Despite the fluctuations in the Sc data already discussed, the phase difference between the two sets of data only twice approached 180°, a condition which only lasted for one cycle after which the phase difference rapidly decreased. The mean value of the phase difference is around 35°, solar troughs lagging on the tidal troughs.

Readers who want full details should refer to [2]. The essential feature of Wood's tidal fluctuation cycles, which we will now abbreviate to Tc, is that they always have sharp troughs but their shape varies smoothly from approximately that of the average Sc to a much more flat-topped configuration. It must be remembered that the reliability of the planetary data is not in doubt in the early period and is predictable with similar accuracy into the future. Data up to Tc22 is therefore included in the analysis.

The variation in length of the tidal cycles is much less than for Sc. Trough-to-trough periods are shown in Fig 2(c) and peak-to-peak periods in Fig 2(d). To bring out the variations the vertical resolution has been doubled as compared with Fig 2(a). Features to note include:

(a) The longest Tt period is 11·6 and the shortest 10·5 years (Tc−3 and −2). Corresponding figures for Tp periods are 10·0 and 12·1 years (see Tc11, 12 and 13). Note that both pairs average 11·05 years.

(*b*) Alternate long and short periods (phase modulation at f/2) are a marked feature, particularly up Tc3 (see also Fig 6(c)).

(*c*) The mean period varies between approximate maxima of 11·3 years and minima of 10·8 years. These variations do not seem to have a regular periodicity and the means of the trough and peak data do not vary in step, ie the relative rise time varies.

(*d*) The tidal peak data is somewhat rougher than that for the troughs.

Sunspot cycles synchronized by tidal cycles?

Fig 2(e) shows the phase relation of both solar troughs and peaks with respect to tidal troughs. Let us first look at the "stable" sequence from Sc9 to Sc19:

(*a*) It is "bracketted" by early St at Tt8,9 and 19,20, ie Tt was *later* than St only at the beginning of Sc9 and Sc20.

(*b*) From Sc9 to Sc14 the phase lag of the solar troughs increased progressively to a maximum of 3·2 years. The solar peaks follow a similar trend except for the fluctuations at Sc11–13 which we can now see are clearly related to the large "jink" in the tidal peak data at this point.

(*c*) The reversal of phase drift after Sc14 is clearly related to the drop in mean Sc period from 11·5 to 10·3 years and continues up to the early St19,20.

(*d*) The tidal cycles immediately prior to Sc9–14 have a mean period of around 11·1 years while those prior to Sc15–19 average 10·9 years.

(*e*) The rise of the mean tidal period above 11·1 years looks like resulting in a 12-year period for Sc20.

This certainly looks like some sort of synchronization based on the timing of the tidal troughs with small changes in the mean Tt period causing relatively large shifts in the

mean solar period. It looks as though a "late" tidal trough may play a key part in establishing a particular mode of synchronism and further evidence of this will emerge later. Synchronization is discussed in greater detail in the Appendix.

What about the earlier data? There is no evidence of sync until Sc−3. This situation extends back to Sc−13, a period of more than a century. Sc−3 to Sc+1 look to be synchronized, an interesting feature being the stability of St phase despite the phase modulation of the Tt periods, ie there is a hint that the solar cycle is being "driven" rather than in a "resonant" state.

The dramatic change at Sc1 would seem to be due to the large antiphase movements of Tt and Tp during cycles 0–3*. Recovery begins at Sp4 when the phase slip has almost reached 180°, ie Sp and Tt practically coincide. During recovery there is a hint that St phase might be following the Tp curve (Fig 2(d)). True synchronism begins with the early St8,9.

In summary, our model based on the "Goyder lock" oscillator holds up well, with the tidal troughs being the main synchronizing feature but the peaks also contributing. Perhaps it is the *slope* of the tidal function which is the key factor, its sharp troughs producing a sharp pulse in the first differential.

The electronic analogy must not be pushed too far. First we have a fairly unstable, in radio terms, synchronizing source with quite violent phase modulation at times. More important, our "locked oscillator" is presumably some sort of tidal wave resonance, the rules for which undoubtedly differ from those of LC resonators or RC oscillators.

Nevertheless it all seems to fit, but it would help if one could find independent evidence that Wood's tidal function affects the sunspot cycle. This is where Cycle 20 comes into the argument. Remember that it is the first since 1844 in which Tt (1965·3) occurs later than St (1964·9).

Solar Cycle 20

As stated in the introduction, the original reason for keeping a running plot of Cycle 20 was concerned with short-term forecasting of band conditions. The standard approach uses the running 12-month mean and deliberately smooths out the short-term variations. The snag is that a 12-month mean is always six months old, and more like nine months at the time a forecast is prepared.

The solid line in Fig 3 shows the running mean for Cycle 20†. Try temporarily covering the right-hand part of the curve at mid-1969 or early 1971 and the problem facing the forecaster will be seen. The dotted curve shows that it was necessary to use a 21-month mean to get something like the classical shape, and even this has two maxima (and is much too much ancient history to be useful for prediction).

It was because of these problems that a three-month running mean was kept and, from 1966 onwards, this began to show violent fluctuations which soon proved to be characteristic. The resulting curve is shown in Fig 1. The dotted lines give the game away but any reader who cares to trace just the solid curve and ponder over it will see that it is full of tantalizing periodicities which will not quite fit.

The data falls into place as soon as one sees that joining the peaks before 1968·5 with the troughs after that time and *vice versa* reveals the presence of two intersecting curves, each with a classical sunspot cycle shape. From late 1966 the short-term mean oscillates up and down between these two curves. Before the intersection in 1968·5 the upward and downward movements both have a mean slope of about 10 numbers per month. The "pinch" effect at the intersection is most marked and after that time the rise time is still about 10/month but the fall is nearer to seven months. The greater the gap between the curves, the longer the descent lasts—note the long fall in 1970—but the rate of fall seems to be independent of the gap, and once the mean has started to drop it does not change direction until it has reached the lower curve. The minor peaks in 1971 and 1973 are reduced in amplitude by the smoothing of the data and in fact contain one month in which the monthly number is at or near the "Cycle 20B" curve.

Note that the smoothed cycle resulting from the behaviour described above is roughly the mean of the two components, ie there is little reinforcement and this is presumably why Sc20 had rather a low peak.

There is an element of conjecture in the placement of the two cycles but the following are "best guesses":

Cycle 20A
Starts: 1964·5
Rise time: 3·4 years
Peak: 110 at 1967·9
Trough: probably 1975·5, ie already past.

Cycle 20B
Starts: 1965·5
Rise time: 4¼ years
Peak: 125 at 1969·7
Trough: probably late 1976.

The following tentative conclusions as to the origin of the two cycles seem to fit. The shape and phase of Sc20A closely follow those of Sc19 and it would therefore seem to be a continuation of the "resonant" sequence Sc15–Sc19. The reduced amplitude is presumed to be a decremental effect because that resonance is ending as the mean Tt period lengthens (Fig 2(c)).

Cycle 20B seems very probably to have been triggered by the tidal trough centred on 1965·3—remember that this is the first late Tt since 1844. It is interesting to note that the rise time of 20B is in reasonable agreement with Tc19's *decay* time of 4·6 years.

To summarize, Cycle 20 seems to have been a time of phase adjustment resulting from the slowly rising mean Tt period which, as we saw earlier, requires an adjustment of St period from the previous average of 10·3 years to something close to 12 years. The large fluctuations in the three-month mean are, in electronic terms, a form of "phase jitter"—though to an erstwhile small-ship radio operator they are reminiscent of the North Atlantic at its worst!

Independent evidence of the modification of the sunspot cycle by Wood's tidal fluctuation function is seen to be present and the cautious suggestion of a causal relationship in earlier paragraphs can be confirmed with some confidence.‡

* In [2] the date for Tt1,2 is 1765·6 and Tt2,3 is 1771·1, a period of only 5·5 years which would indeed have caused disaster. However, the second date does not fit other data in the reference and has been assumed to be a misprint for 1777·0. There are also ambiguities in the trough data for troughs 3,4, 12,13 and 20,21.

† Provisional numbers were used because they are the earliest available data. A check against final numbers shows no significant differences as they affect the argument which follows. For practical convenience the writer used the 11-month mean but again the differences are not significant.

‡ The writer has not yet had time to carry out a similar analysis of earlier cycles. The period in which synchronization was established, ie Sc7–Sc9 and the speeding up from 11·4 to 10·3 during Sc14 and Sc15 should prove interesting. Anyone interested in trying this analysis should make sure that they are using the original monthly numbers and not the 12-month running means.

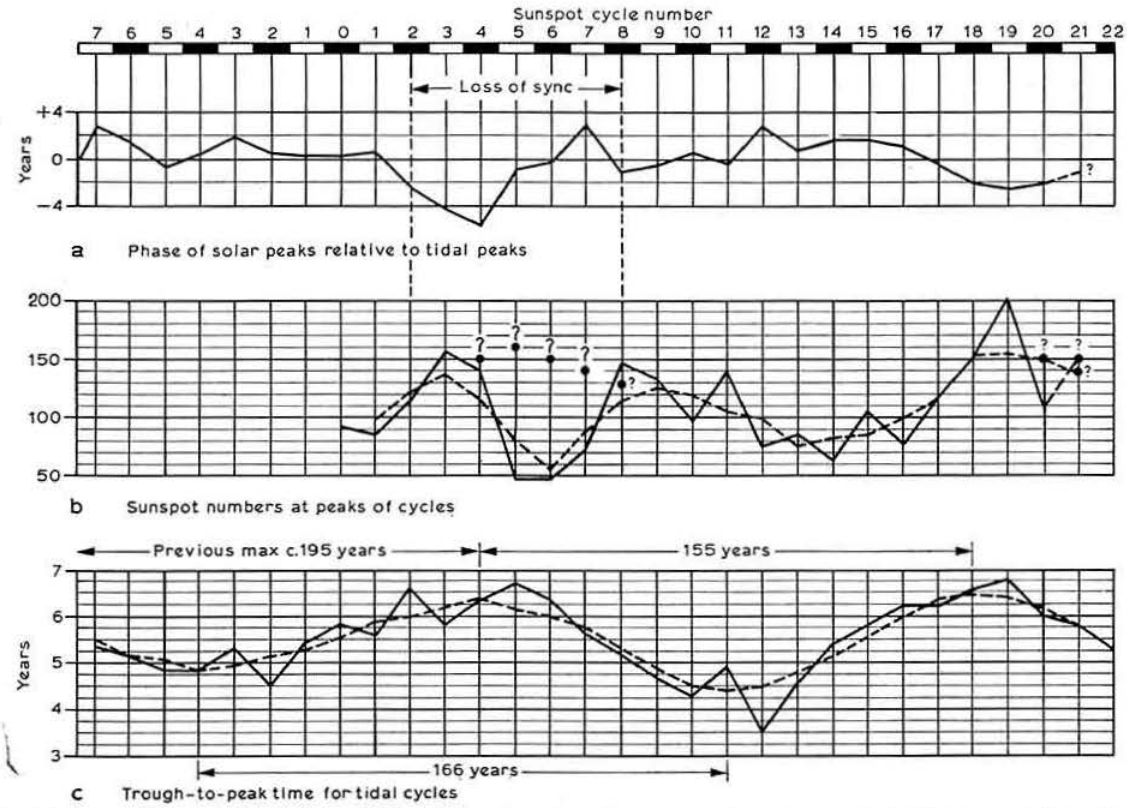


Fig 4. Evidence of connection between tidal cycle trends and maximum sunspot numbers. Note in (c) the close similarities to peak sunspot number curve both in trend and detail between Cycles 8 and 20, and indication that the previous high peak sunspots might have been in Cycles 4 to 6 but for loss of synchronization by Cycle 2

Maximum sunspot numbers

So far the discussion has been concerned with the causes of the cyclic behaviour. What about the height of the cycles, which is the factor of greatest interest to the amateur operating in the hf bands? In the past there has been no clear explanation of the cycle-to-cycle variation in peak sunspot numbers. Attempts to predict future trends [1], [4], [5], have necessarily been based on extrapolation from the past, and 20 cycles of a waveform is little enough as a basis for prediction. Does the connection between the solar and tidal cycles throw any light on this problem?

In Fig 4(a) the phase of solar peaks is plotted relative to the tidal peaks. In Fig 4(b) the solid line traces the smoothed sunspot number for each peak year since Sc0. It is apparent that the curves trend in opposite directions—when Sp is earlier than Tp peak numbers are high. There is a similar correlation between Fig 2(e) and Fig 4(b), peak numbers being highest when St is less than about a year after Tt. In both cases the correlation is best during Sc8–Sc20 and less clear during Sc1–Sc7 which has been identified as a period of loss of synchronization. Indeed, dissipation during Sc1–Sc3 of the energy stored in the previous period of resonance is a sufficient explanation for the very low peaks 5, 6 and 7.

But are we seeing the cause or effect in these correlations? It could simply be that high solar cycles have earlier peaks than low ones, which is already an observed fact. In search of a purely tidal function correlating with Fig 4(b), Fig 4(c) was plotted showing the trough-to-peak rise time of the successive tidal cycles. Over the period from Sc8 it will be seen that the general trend and the detailed movements of this function correlate well with the observed peak sunspot numbers, the mean of the latter lagging by about one cycle on the mean of the tidal curve.

The earlier "super-cycle" of Fig 4(c) from Sc−4 to Sc+11 includes the "loss of sync" period. The conflicting phase demands during Tc0–Tc3 are very evident and there is a clear suggestion that if these had not destroyed synchronism the peak solar cycles would have been Sc4, 5 and 6. The curve sketched in with question marks in Fig 4(b) bridges the "hole" from Sc4 to Sc8 quite convincingly. It would seem that during synchronism the mean of the peak numbers oscillates about a value of about 110 in step with the function in Fig 4(c).

The peak-to-peak period of the tidal rise-time function in the data used in Fig 4(c) is 155 years, not the popular 170–180 years [4], [5]. Insufficient tidal data is available in [2] to show when the next maximum will occur, but that previous to Sc5 was at or before 1615, around 195 years earlier (to be fair, the mean of 155 and 195 is 175!) The minima in Fig 4(c) are somewhat blurred but seem to be spaced by 166 years and the data does not extend to the next one.

It was convenient to use rise-time for Fig 4(c). There are

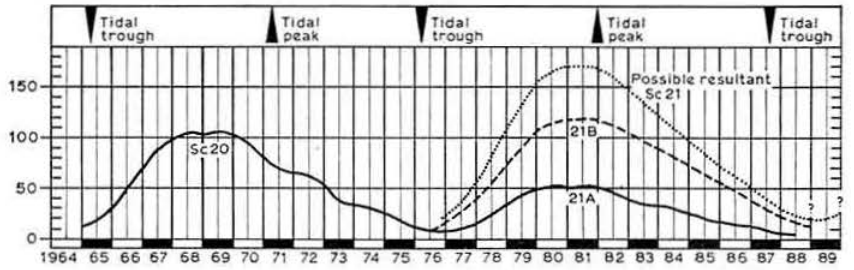


Fig 5. The shape of things to come?

other features of the tidal function which may be relevant. Wood only gives shapes for Tc5–Tc22 and these follow the relevant parts of Fig 4(c) with the "slimmest" cycles coinciding with the minimum and the "fattest" lagging by a cycle or two on the maximum. It is when the Tc are "slim" that Tp effects have the most visible effect on Sp, as in Sc10–12.

The immediate future

Some recent predictions for the next few solar cycles are pessimistic, eg those of Cohen and Lintz [4] and [5] based on spectral analysis of Sc0 onwards. Their technique is a mathematical equivalent of using a spectrum analyser on the complex waveform of monthly sunspot numbers which has amplitude, phase and width modulation. It shows up the roughly 90-year a.m. of the cycle peaks, the 11-year periodicity, and what seem to be the first- and third-order upper sidebands of the approximately 170-year phase modulation which is very evident in Figs 2(e) and 4(a). They go on to propose that these periodicities are intrinsic in the data, and use them to predict that Sc21 and Sc22 will be repeats of Sc5 and Sc6 with peaks around 50 and that peaks above 100 will not occur until 2015.

Since, however, the "hole" is a major contributor to both the phase and amplitude modulation and the system did not lose synchronism this time round, their conclusions regarding the next few cycles would not seem to have any valid basis. To the 21MHz enthusiast all the work involved in reaching this point has been well worthwhile. However, the future trend has wider importance than just a hobby interest, and in the climatological field as well as for hf radio. What, if anything, does our model tell us about the future?

First, what are the prospects of continued synchronism? Remember that there was little evidence of this between 1610 and 1720. During that period the cycle-to-cycle modulation was high on either or both the Tt and Tp data. No similar reason for loss of sync appears in the data up to and including Tc23. Beyond that the Tp data gets rougher but nothing as gross as the "jink" at Tp11–Tp13 appears, and that did not break the sync. Nevertheless, someone needs to analyse the tidal data over the next few centuries and compare it with the past to see when and if synchronization is at risk. The next maximum in the "super cycle" may not be until 2145AD.

Readers are no doubt more concerned with the near future. Comparing Figs 4(b) and 4(c) shows that the peak numbers for Sc18, 19 and 20 are similarly positioned with respect to the mean as are the corresponding values of the Tt–Tp function. For Sc21, Tt–Tp is back on the mean and above the value which in Sc9 produced a peak number of 141. There is a slight uncertainty through what seems to be a misprint in Wood's trough data for Tt20, 21, because Tc21 is the "fattest" in the super-cycle, and its predecessor, Tc7, unfortunately occurred at the end of the "hole". Nevertheless it is possible, on balance, cautiously to predict a peak around 150 for Sc21 and a little lower for Sc22.

There is, of course, another possible approach to this problem. When analysing Sc20 (Figs 1 and 3) we found two components, one the resonant carry-over of the previous cycle and the other triggered by the tidal trough. Perhaps we can reverse the process and synthesize Sc21. This step into the unknown is attempted in Fig 5. Cycle 21A is the "resonant projection" of Sc20 assuming a decrement of 50 per cent as found in Cycle 20A. Cycle 21B is the assumed result of the tidal trough centred on 1976·2 using the same criteria as seemed to apply to 20B.

In this case the timing is such that 21A lies entirely within 21B, there is negligible phase difference and no crossover. Can it be that under these circumstances the two functions reinforce? The whole of this is very speculative and may be grossly over simplified but it yields a similar answer to that obtained by comparing Figs 4(b) and 4(c). If it is correct, Sc21 should be showing smoothed numbers between 15 and 25 by the end of this year (though we shall not be sure of this until June 1977). A smoothed number near to 50 should be reached by about the end of 1977, and the peak of 150 or higher should extend from late in 1980 for about two years.

It is clearly time to say "this product carries no guarantee". Nevertheless, the arguments seem to hang together so do not scrap those 10 and 15m beams just yet. Also, if early warnings that the conclusions of this article are even roughly correct are required, try keeping a three-month running mean plot of the provisional Zurich numbers. If nothing else, you will find that you have a better feel for the trend of band conditions and will sometimes see why the forecasts turned out to be somewhat wide of the mark.

References

[1] *Radio Communication* August 1973, p545.
[2] "Sunspots and planets". *Nature* 10 November 1972, p91.
[3] "The sunspot activity in the years 1610–1960". M. Waldmeier.
[4] "The sunspot cycle; analysis and predictions". *CQ* March 1974, pp24–28.
[5] "Long term periodicities in the solar cycle". *Nature* 2 August 1974, p398.

APPENDIX

Some aspects of synchronization

In Fig 6 some of the relationships between the 33 sunspot cycles and the 33 tidal cycles since 1610AD are presented. While this must be regarded as a very small sample it seems

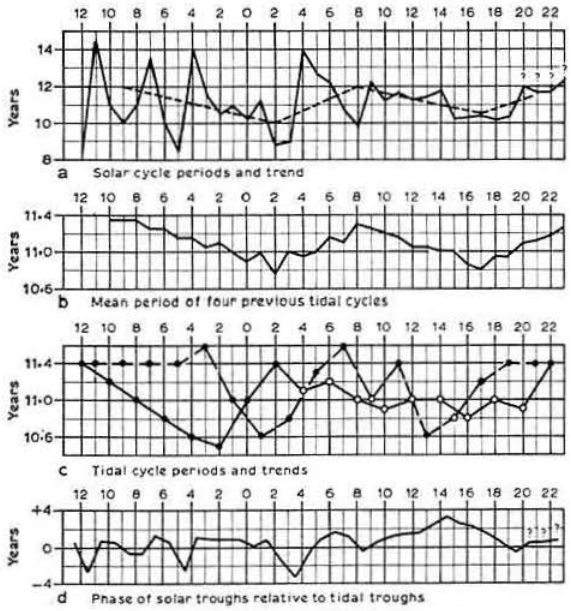


Fig 6. Aspects of synchronization

to show two basic patterns of behaviour for the Sc:

(*a*) Some type of synchronism as in Sc−3 to Sc+1 and Sc9 to Sc20.

(*b*) "Hunting", ie oscillation about the mean between maximum values in the 13–15-year range and minima between 8 and 10 years. as in Sc−12 to Sc−4 and Sc2 to Sc8.

There seems to be a close correlation between the trend of the mean Sc period (Fig 6(a)) and the curve in Fig 6(b) which shows the mean period of the four tidal cycles *immediately preceding* a given Sc, ie the immediate past behaviour of Tc influences the present Sc periodicity. The two periods of synchronism both start with a single "early" St (Fig 6(d)) at a time when the mean Tc curve is falling and drops below a value of around 11·2 years. However, the sequence Sc−3 to Sc+1 differs from Sc9 to Sc20:

(*a*) In the first sequence synchronism ends abruptly following the sharp drop in mean Tc period to 10·77 years. Also, the phase delay between St and Tt (Fig 6(d)) is constant at about a year.

(*b*) In the second sequence the mean Sc period remains reasonably constant with an average of 11·45 while the mean Tt period is falling from 11·2 to 11·0 and then moves sharply down to around 10·3 as the Tc mean drops below 11·0 to 10·8 and increases to 10·95 years.

(*c*) At the same time the phase lag of St on Tt increases up to St14,15 and then decreases until St19,20.

(*d*) The movement of the mean Tt period to 11·1 corresponds with a period of about 12 years for Sc20.

There is a tentative suggestion in this data that there might be "preferred values" of stable Sc period of which we have seen 10·3, 10·9 and 11·45 corresponding to mean Tc periods of 10·9, 11·0 and 11·1 years respectively. Small shifts in the Tc period seem to cause relatively large changes in the solar period. The pairs of values satisfy the approximate empirical equation $Ps = 5{\cdot}5\ Pt - 49{\cdot}6$

The extreme individual values of solar and tidal periods, ie 8–10·5 years and 14–11·6 years, also fit the equation quite well.

It is clear that, whatever might be its physical basis, this relationship has some odd consequences. Except when Ps = Pt = 11·02 there must always be phase drift between the solar and tidal cycles so that a particular mode of synchronism cannot last long; as can be seen in Figs 6(a) and 6(d), the typical duration is five cycles. It looks as though synchronism may be a fragile and uncertain affair.

What about the times when the Sc seemed to be "hunting"? Previous history has been seen to be important and tidal data before Tc−12 is not available in [2] but it is clear that the mean period was around 11·3 to 11·4 years. It is possible that the mechanism underlying the sunspot cycle is incapable of sustained oscillation under these circumstances. The above equation would require a solar resonance with a period in the region of 14 years and this would "beat" with the Tc period every few cycles; which is precisely what seems to be happening between Sc−12 and Sc−3. A possible contributing factor is the fine structure of the Tc data. This is plotted in Fig 6(c) and the marked cycle-to-cycle variations are brought out by joining alternate points to show that there are, in fact, two sub-sets of the data. Incidentally, note that there are no repeats in nearly 400 years unless, coincidentally, Tc21 and Tc22 are repeats of Tc−12 and Tc−11.

During the initial period of "hunting", the two sub-sets diverge rapidly which might be a contributory cause. However, the synchronism during Sc−3 to Sc1 is established when the *mean* drops below 11·2 years even though the cycle-to-cycle fluctuations are large.

The other interesting feature of Fig 6(c) is the presence of a "thread" of Tc periods (marked with circles) between 11·2 and 10·8 immediately preceding and throughout the present period of synchronism but completely absent in the earlier period. This may have meant that the synchronism from Sc−3 to Sc+1 was fragile and easily destroyed by the sudden drop of mean Tc period from 11·0 to 10·77 years immediately prior to Sc2. Possible contributions from conflicting Tt and Tp demands were mentioned in the main text. At all events, loss of sync clearly occurred and we can be thankful that we escaped a similar fate at Sc17, presumably due to the smoother passage through the 10·8 minimum in the Tc mean.

To summarize, there is insufficient data to provide a comprehensive picture but synchronism is seen to occur if the mean Tc period lies between about 11·2 and 10·8 years and the trend is reasonably gentle. We have no evidence of what to expect when, as at present, the mean Tc period is *rising* smoothly and passes through the 11·0 year value. On balance, synchronism looks safe up to and including Sc22, ie to the end of the century, solar periods being probably between 11·5 and 12·0 years with troughs at approximately 1976·5, 1988·2 and 1999·9. The mean Tc period for the four cycles prior to Sc23 will be 11·27 which may be high enough to cause trouble. Beyond that point the Tt data in [2] ceases.

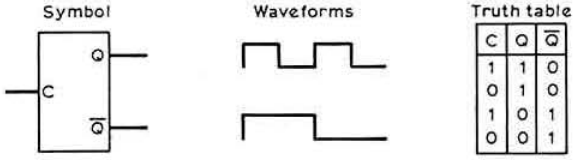
The conditions for synchronism are important to the hf radio user because, if the period from Sc4–Sc7 is typical, loss of sync means exceptionally low peak sunspot numbers when, on other considerations, numbers should be high. It is a sobering thought that the era of hf radio seems inadvertently to have coincided with the only prolonged period of stable sunspot cycles in four centuries and that synchronism may well be at risk by 2010AD. □

LEARNING ABOUT LOGIC

by P.J.Horwood, G3FRB*

Part 2. Flip-flop types

IN Part 1 the various gates were introduced, and from them the basic rs flip-flop was derived. Remember that the rs has two inputs, a high (1) applied to s making Q high, and a high applied to r making Q low, $\bar{Q}$ always being complementary to Q. A flip-flop can be much more useful if the r and s inputs are combined to form one trigger or clock input. Input pulses will cause r and s action alternately (Fig 10).



C	Q	$\bar{Q}$
1	1	0
0	1	0
1	0	1
0	0	1

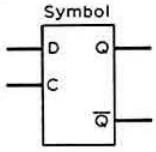
Fig 10. Top waveform C, lower Q

From the truth-table it can be seen that every time the clock input changes from 0 to 1 the Q and $\bar{Q}$ outputs exchange condition. This is called complementing. The waveforms illustrate this; notice the frequency has been halved. It is important to note that it is the leading edge of the input waveform which causes the output to change.

This simple flip-flop is not available as an ic package although it may be made up from a dual NOR gate. It does sometimes form part of more complex devices.

Development of integrated circuit technology lead to many variations of the basic flip-flop. To some extent these have been rationalized into the following types: D type, edge-triggered J-K, master-slave J-K.

D type (Fig 11)



Truth table

D	Q	$\bar{Q}$
0	0	1
1	1	0

This table has been deliberately simplified

Fig 11.

The D input decides whether Q shall change to 1 *at the next clock pulse*; a 1 at D does not change the state of Q on its own. For Q to change, D must be held high before the clock pulse arrives and be maintained at that level for a specific period at least as long as the clock pulse. After this explanation it is possible to draw a truth table showing the whole action (Fig 12). This is not the normally accepted diagram for a D type but at this stage it is easier to understand. Pulses are shown at C; D is shown in the two possible conditions, as are the Q and $\bar{Q}$ states.

Truth table

C	D	Q	$\bar{Q}$
1	0	0	1
0	0	0	1
1	1	1	0
0	1	1	0

Fig 12.

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However, the complexity of flip-flop packages is increasing and will continue to do so in subsequent types, and because of the increased usefulness of more complex devices the D type is less used on its own but is often used as a part of a more complex package.

Edge-triggered J-K (Fig 13)

Two new inputs, J and K, have been introduced and it is now necessary to explain the conventional way of displaying a truth table. The C input is not shown, only the effect on the outputs *after each clock pulse has arrived* (Fig 14). Present time is described as Tn, Tn+1 means after the next clock pulse and so on. $\bar{Q}$ state is always assumed to be complementary to Q.

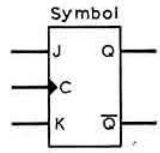


Fig 13.

Truth table

Tn		Tn+1
J	K	Q
0	0	Qn
0	1	0
1	0	1
1	1	$\bar{Q}$n

Fig 14.

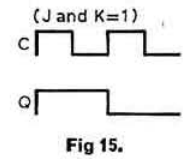


Fig 15.

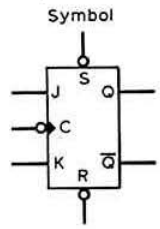
When both J and K are low no change takes place at Q or $\bar{Q}$ even though a clock pulse arrives. If J is held high Q will go high at the next clock pulse, whereas if K is held high Q will become low at the next clock pulse. If both J and K are both held high permanently Q and $\bar{Q}$ will exchange states at every clock pulse. The change of state takes place at the leading (rising) edge of the input waveform (Fig 15).

The positive-edge triggered flip-flop is generally restricted in use to high speed circuits.

M-S-J-K flip-flop (Fig 16)

The name is derived from the internal circuit; this consists of a pair of flip-flops, the master driving the slave, usually exchanging function at each clock pulse.

The truth table is the same as that for the positive-edge triggered J-K but the change of state takes place at the negative edge of the clock pulse. Although this difference may seem of little consequence it has an important bearing on the way a group of flip-flops will count, as we shall see later.



Truth table

Tn		Tn+1
J	K	Q
0	0	Qn
0	1	0
1	0	1
1	1	$\bar{Q}$n

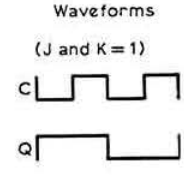


Fig 16.

On the symbol, inputs S and R have been restored. These have overriding control of the output states, irrespective of

(Continued on p505)

A transistorized slow-scan television monitor

by J. L. WOOD, G3YQC*

THIS sstv monitor is representative of the more sophisticated designs, the performance of which compares favourably with commercially-built equipment. The slow scan video bandwidth is 900Hz, ie the highest video frequency is 900Hz, consequently there are only 300Hz between this frequency and the sync frequency of 1,200Hz. To improve on this interference situation a linear integrated circuit working as a limiter is used in the input stage, Fig 1a. This ic has differential outputs, and the output pulses will therefore have opposite polarities. They are used to drive two monostable multivibrators, the digital ICs SN74121, which work as pulse-counting detectors and give an output signal that has a frequency range that is twice the range of the input signal. The frequency range of the input signal is 1,200Hz to 2,300Hz, and thus the output signal will have a range of 2,400Hz to 4,600Hz. The difference between 900Hz and sync (2 × 1,200Hz = 2,400Hz) is now considerably greater and a much cleaner video signal is obtained.

The input ic limits, according to data, at an input signal of 100μV, while in this circuit an input signal of about 50mV is needed for full limiting. The output of the multivibrators goes to a low-pass filter with a flat characteristic from zero to about 900Hz, and the quality of the desired video signal is closely associated with the design of this filter. All signals up to about 900Hz should pass through the filter unaffected, while all higher frequencies should be greatly attenuated.

The output signal from the filter, which should be about

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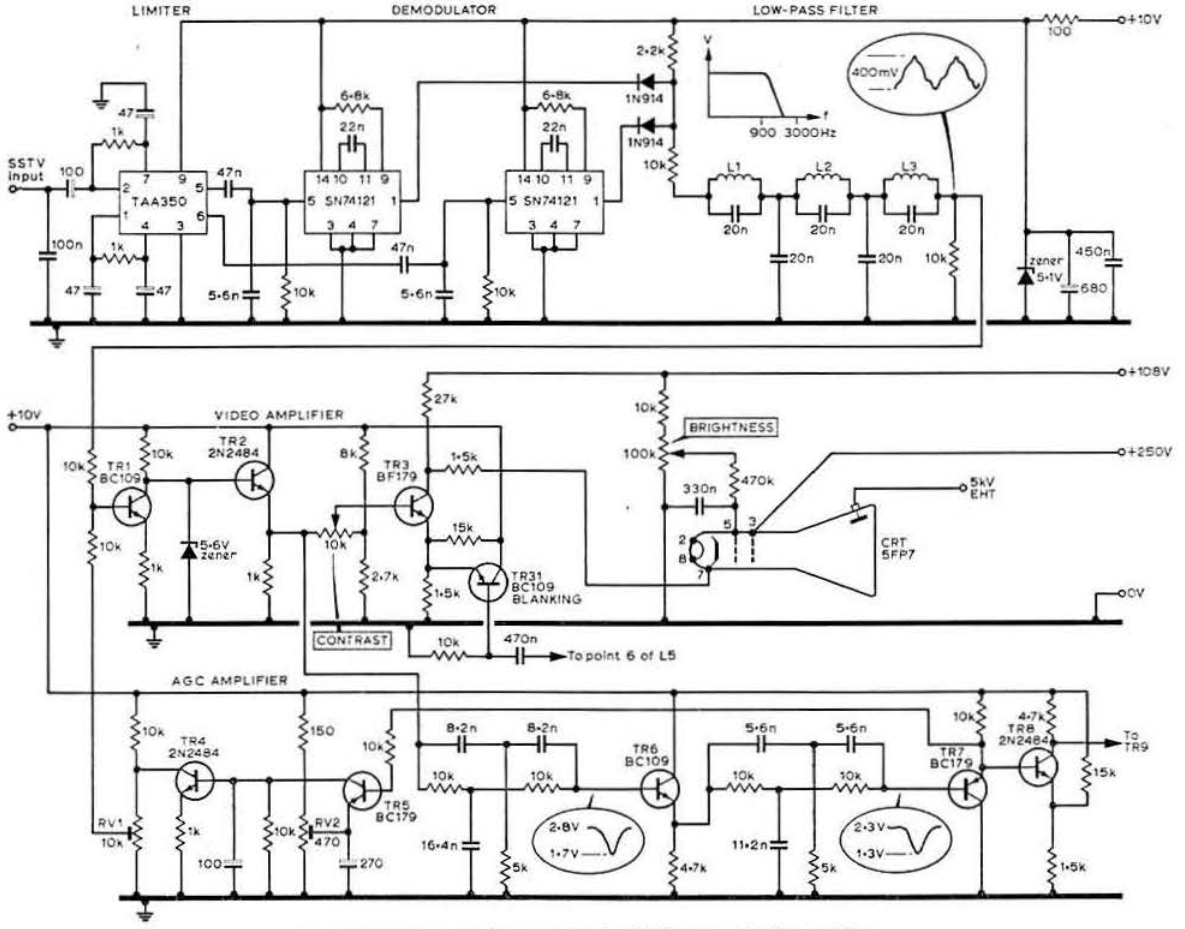


Fig 1(a). First part of three-part circuit diagram of sstv monitor

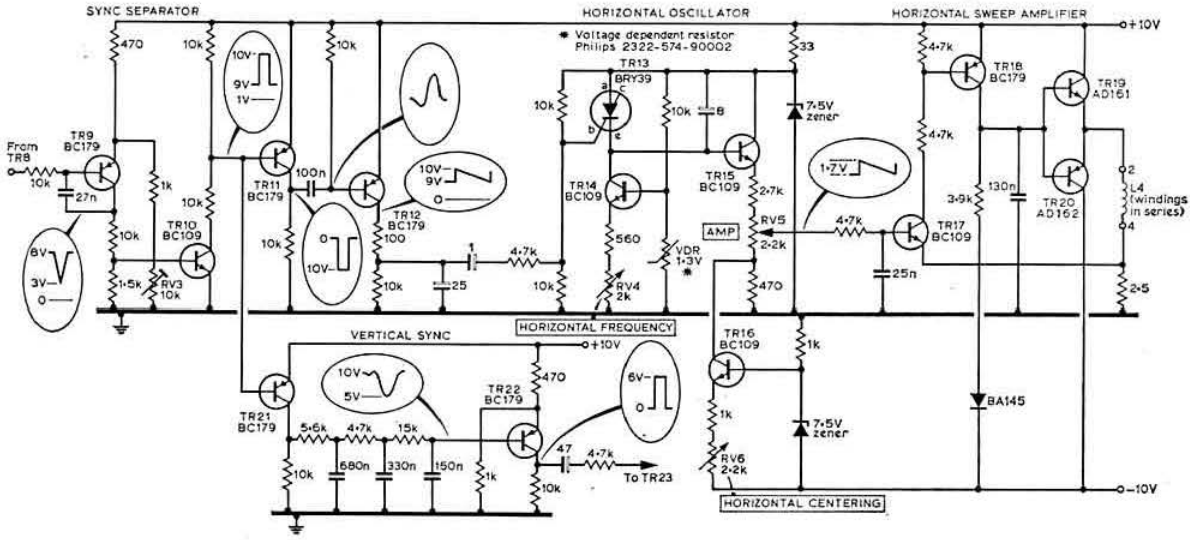


Fig 1(b). Second part of three-part circuit diagram of sstv monitor

400mV p-p, is fed to video stages TR1, TR2 and TR3. The signal from TR3 intensity-modulates the cathode of the monitor tube. From the emitter of TR2, the signal will be connected to the active filter stages TR6 and TR7. Here all signals between approximately 2kHz and 3kHz will be greatly attenuated, ie noise and other interference will be considerably decreased. The attenuation will be about 60dB as shown in Fig 2.

From the emitter of TR7 the signal goes back to agc amplifiers TR5 and TR4 and further to the video input stage TR1. The level with respect to ground of the signal at TR7 emitter should be 1·9V. With the preset control RV2 the voltage on TR5 base is set to 6·2V, and RV1 is adjusted so that the signal on the emitter of TR4 will be at 1·7V for peak sync and 2·4V for black. Maximum white will then be at 3·5 to 3·8V depending on the quality of the incoming signal. By proper adjust-

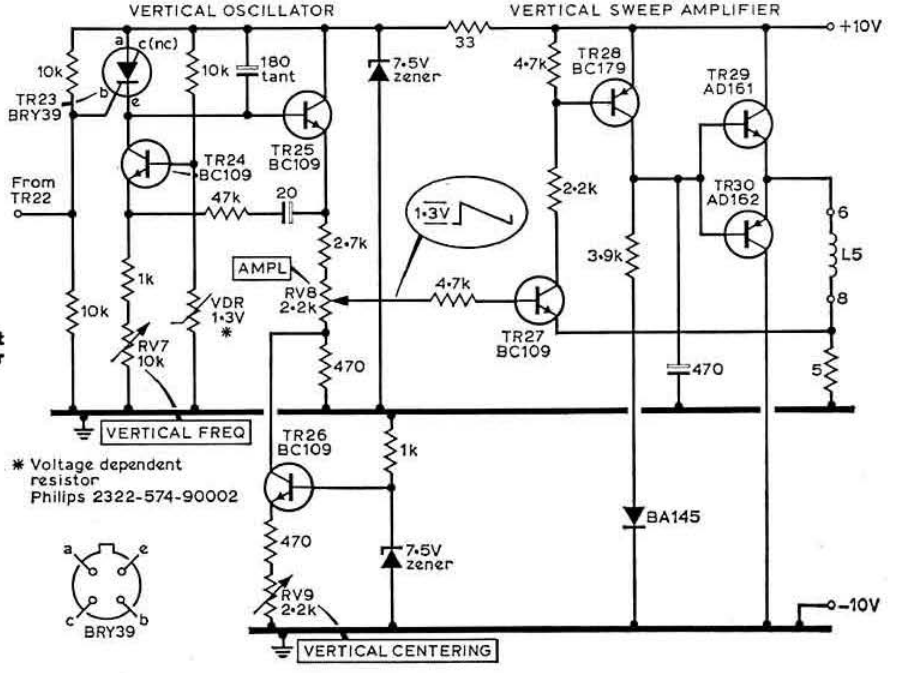


Fig 1(c). Third part of three-part circuit diagram of sstv monitor

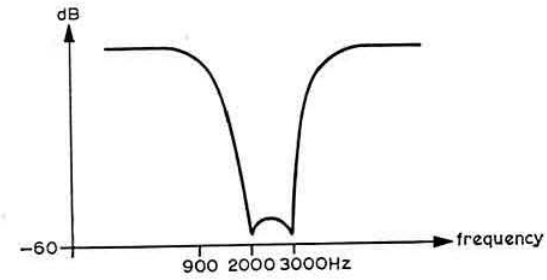


Fig 2. Frequency characteristics of active filter stages TR6-TR7

ment of the age amplifier the frequency setting of the ssb receiver is no longer so critical.

The signal is fed from TR8 to TR9 where it is integrated by the 10kΩ resistor and the 27nF capacitor. The pulse measured at the collector of TR9 is set by RV3 to around 5V p-p. On the base of TR11 there will now be a positive-going square pulse with a width of 3ms. This pulse is integrated in the next stage and will appear as a sawtooth on the collector of TR12 from where it is fed to the horizontal sweep stages.

Other features of this design involve the increasing of the signal sensitivity and the decreasing of the sensitivity to interference. Earlier, the method used was that the incoming sync pulse triggered the sweep oscillators, but as the system could not differentiate between a sync pulse and an interference pulse the oscillator was triggered by any pulse that appeared. At strong interference levels this could result in beam absence during long periods—it was consequently impossible to get the monitor to synchronize. At weak signal levels the sync was not large enough and the sweeps did not operate for that reason.

In this design, local horizontal and vertical oscillators through which there will be a raster on the screen continuously, irrespective of whether a signal is being received or not, are used. Together with the action of the active filter stages TR6 and TR7, the result is such that it is possible to receive signals under rather strong interference conditions, and weak signals under fading conditions.

The sawtooth from TR12 will consequently control the frequency of the sawtooth oscillator TR13, the basic frequency of which is adjusted to a somewhat lower frequency by potentiometer RV4 on the front panel, this setting is not critical but is necessary as the sweep frequencies from various stations can differ.

From the emitter of TR15 the sawtooth is picked off through potentiometer RV5 which controls the sweep amplitude. To the same emitter is also connected transistor TR16 which centres the sweep on the screen, this setting is made by potentiometer RV6. The sawtooth is amplified in TR17 and TR18 and will drive the complementary stage TR19-TR20 which brings about a sawtooth sweep in the deflection coils. To improve the linearity a small signal is fed back to TR17.

From the base of TR11 the square pulse is fed to the vertical sync stage TR21 and is integrated in that collector circuit. On the collector of TR22 there will be a square pulse that controls the local oscillator TR23. The function of the vertical sweep stages is similar to that of the horizontal stages.

Between the emitters of the final amplifier stage and ground there should be a sweep of 15V p-p for the horizontal stage and 13V p-p for the vertical stage. Between the emitters of TR24 and TR25 there is a 47kΩ resistor and a 20μF capacitor for improving the linearity of the vertical sweep.

The capacitors on TR17 base and TR18 collector serve to decouple the vertical sweep which could be superimposed on the horizontal sweep. The capacitor on TR28 collector decouples the horizontal sweep from the vertical sweep. Transistor TR31 is a stage for blanking the beam during vertical flyback.

Power supplies

The low-voltage power supplies are shown in Fig 3. It is important that the +10V and −10V supplies be stabilized in order to maintain good linearity. The transformer used should have a current rating of 5A. The horizontal deflection coil requires a current of about 500mA p-p and the vertical coil about 300mA p-p.

The 250V supply for the eht generator uses conventional circuitry and is not shown. The +108V should be dropped from the 250V supply using a suitable resistor and should be stabilized if possible.

A line-output transformer suitable for the eht supply may be obtained from a domestic tv set. The large overwind coil is used and is wired up according to the circuit in Fig 4. The eht diode should be mounted between two 1in ceramic standoff insulators and covered to eliminate the possibility of being touched accidentally. This eht is lethal and adequate safety precautions should be taken.

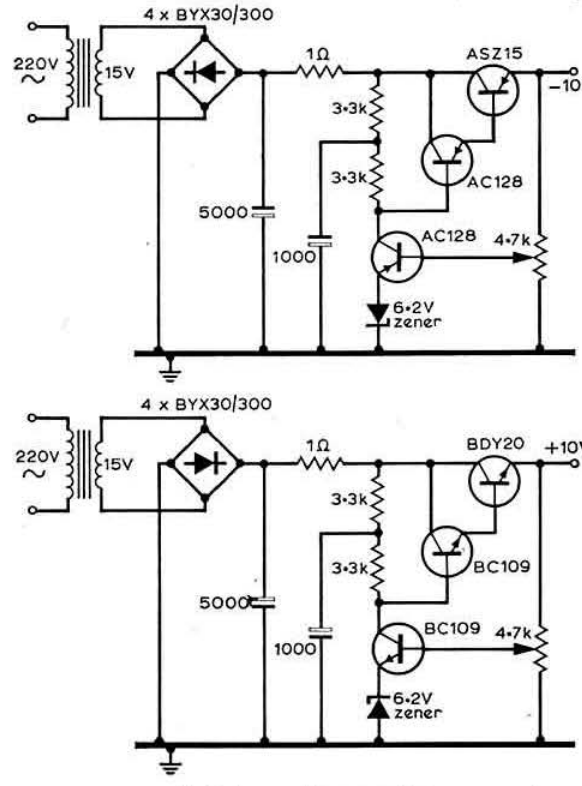


Fig 3. Low-voltage supplies

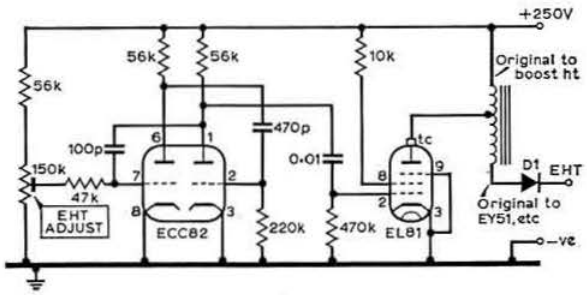


Fig 4. EHT generator

Component considerations

TAA350 may be replaced with a TAA350A, in this case the pin numbers are all rotated clockwise by three pins.

The lowpass filter in Fig 1a uses Philips cores H20; an equivalent is the Mullard LA1302. A slightly lossy substitute can be wound using LA1 cores; fill the formers with fine wire and then tune them in circuit to 900Hz, 2kHz and 3kHz respectively by removing turns and using an oscilloscope and audio generator.

The 1·3V voltage-dependent resistors in the bases of TR14 and TR24 may be replaced by two silicon diodes in series (BA100) or possibly with a 1·3V zener diode.

A suitable scan coil assembly and permanent magnets for focussing may be obtained from an old tv set having a tube neck of similar size to the 5FP7. The scan coils should have their windings series or parallel connected as necessary to give the nearest resistance readings to those quoted in the parts list.

Parts list

L1, L3 Philips H core type H-20 or Mullard LA1302, 400 turns of 34 swg enamelled copper wire.
L2 Philips H core type H-20 or Mullard LA1302, 550 turns 34 swg.
L4 Horizontal deflection coil approximately 4·6Ω.
L5 Vertical deflection coil approximately 38Ω.
D1 BY140, BY176 or BY182.

Mechanical design

The electronic and high-voltage circuits can be housed in a cabinet measuring 160mm wide by 240mm high by 300mm deep. However, it may be preferable to build the power supplies in a separate cabinet as trouble may be experienced with the ac fields surrounding the transformers.

The monitor tube is clamped against the front panel by fabricating a round clamp from a strip of 18swg aluminium, a pinch-bolt should be used for tightening onto the tube, and four lugs bent out at 90° to fix the clamp to the front panel.

The transistor stages may be mounted on two vector boards measuring 130mm by 220mm, or by using printed circuit boards. The input stages TR1 to TR12, TR21 and TR22 are mounted on one board with the sweep stages on the other. The boards are placed vertically on both sides of the monitor tube and fixed to small distance-spacers. □

Learning about logic

(Continued from p501)

the clock and J and K conditions. Only a pulse is required at S or R to set Q high or low. Sometimes the reset terminal (R) is called Clear (CL). A separate truth table shows the S and R action (Fig 17). Note S and R must be made low (0) to change the output state. This is signified by a circle on the leads. Similarly the clock input is designated negative-edge triggered by the circle and arrowhead respectively.

Truth table

S	R	Q	$\overline{Q}$
0	1	1	0
1	0	0	1

Fig 17.

The M-S-J-K with set and clear is the most complex flip-flop and has the greatest number of potential uses. The reader may wonder at all this increasing complexity, but its purpose will become apparent when groups of flip-flops are used in various types of counter.

It is advisable to remember what the values 1 and 0 represent in terms of voltage. The blocks described here are all positive logic; 1 is always positive with regard to ground. The normal supply voltage (Vcc) for ICs is 5V, therefore 1 equals 5V or something approaching it; not less than about 3·5V. 0 equals zero volts, or a low voltage not exceeding about 1V. It is important to grasp that 0 does not mean open-circuit. In fact most logic inputs take up a high (1) value if left open. All inputs must be tied back to a definite logic level if not used; either to a previous output terminal etc, or to ground (0) or Vcc (1) as the circuit demands. Two examples of this are shown in Fig 18.

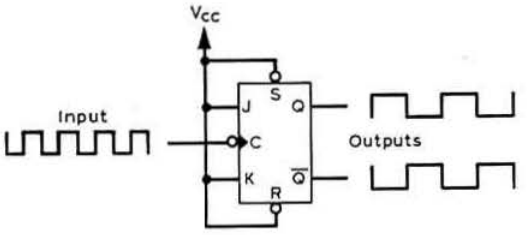
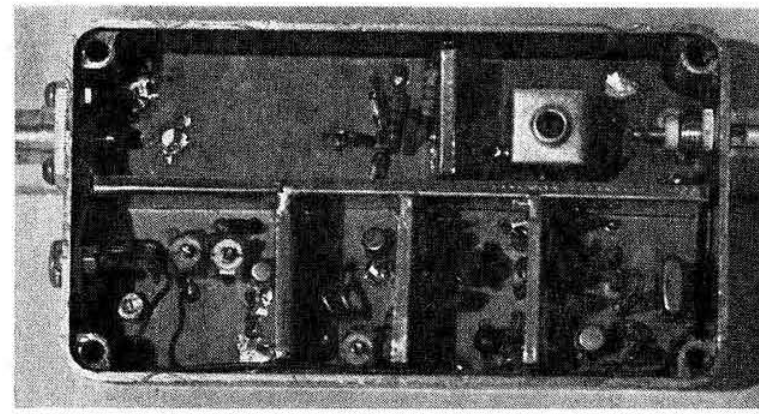


Fig 18.

The M-S-J-K is required to act as a divider, the Q output changing state at each input trailing (negative-going) edge. To allow this both J and K must be held permanently high. Although for experimental lash-ups it would be permissible to leave J and K open-circuit (and thus high), in a finalized circuit stray pick-up of fast pulses could upset the operation. Therefore J and K are strapped to Vcc. The S and R inputs are not required and to prevent possible spurious operation they are also held permanently high. This is a good example of how the most complex package is not necessarily fully exploited in some applications, yet for the sake of standardization similar ICs are used in each stage.

We have now reached the point where several flip-flops may be cascaded to form increasingly complex dividers or counters. These will be the subject of Part 3. □

A simple solid-state 1·3GHz converter and tripler



by G. D. LEAN, G3WJG*

THIS article describes a simple 1·3GHz converter and tripler which can be constructed quickly and will convert any station with 432MHz transmitting capabilities into the next band up.

Although simple, the equipment is by no means poor, and indeed the author is tempted to state that the pre-amplifier described gives near state-of-the-art performance for transistor amplifiers.

The converter

The converter is shown in the photograph and the circui diagram is in Fig 1. The oscillator chain consists of TR1 as a 70·4MHz oscillator driving TR2 which frequency doubles to 141MHz. TR3 trebles the frequency to 423MHz. All these stages employ conventional lumped circuitry but the final trebler to 1,268MHz employs TR4 in a stripline output circuit. The mixer is a novel design suggested by G3HWR which has been squeezed in order to fit on to the board size.

The local oscillator is injected into one port of the ring and the power is divided equally between the diodes. Similarly the signal entry on the fourth port is again divided between the two diodes. The diodes are "Teed" together to produce the i.f. signal across R13. C19 is used to remove the oscillator and signal frequencies from the i.f. amplifier TR5.

The diodes D1 and D2 should ideally be low noise Schottky barrier diodes, but small GEX66M type diodes can be used if it is intended to use a pre-amplifier ahead of the main converter. HP 5082-2800 diodes would be suitable equivalents.

Construction

For some time the author has been fascinated by stripline as a construction mode, particularly as a design once proved can be copied relatively easily. However, a poor circuit cannot readily be improved without making a new printed board.

Ordinary glass-fibre double-sided pcb as used for this circuit has been found to be ideal for stripline purposes at

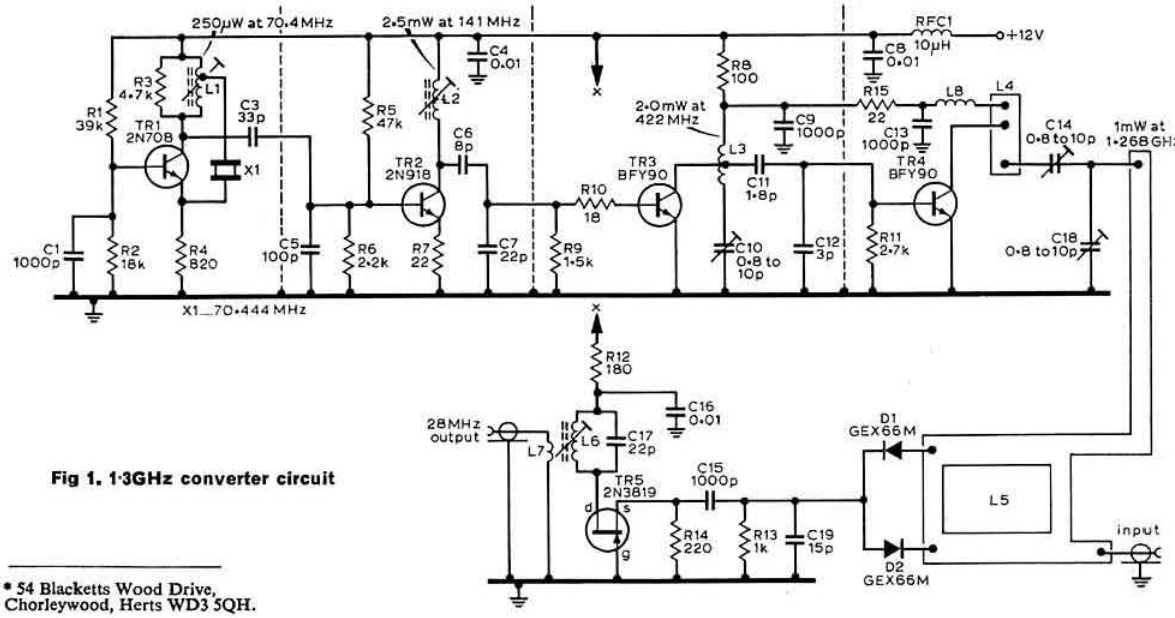


Fig 1. 1·3GHz converter circuit

* 54 Blacketts Wood Drive, Chorleywood, Herts WD3 5QH.

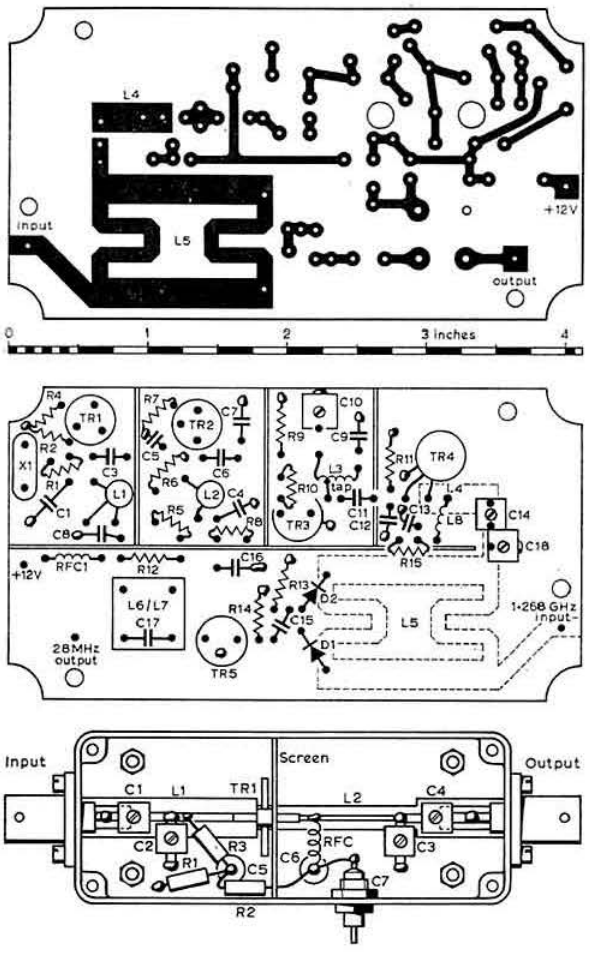


Fig 2. Converter layout

this frequency. Detailed measurements on a sample of board were first made to assess its usefulness for this purpose, and experimental results for impedance and velocity factor agree well with the published theoretical data [1]. In fact, a simple analysis shows that this board at this frequency is far more suited to stripline than the high K alumina board and triplate that some manufacturers insist on using.

The errors caused by constructors acquiring a board which has slightly different characteristics are quite small, as the normal $\frac{1}{16}$in thick board requires quite a wide track to produce an impedance of 50Ω and thus slight variations in track width become very small percentages of the impedance. Also the impedance changes roughly as the inverse square root of the permativity and thus a 10 per cent change in board characteristics results in only a 3 per cent change in characteristic impedance. The dielectric constant of the board used by the author was found to be 4·0.

The method used by the author to produce the board was to photocopy the circuit layout shown in Fig 2 and to stick this with sticky tape to a piece of double-sided board of the right size. The component holes are drilled from the diagram through the board. The diagram layout is removed and the holes de-burred. The circuit tracks are then drawn on the underside of the board with a Dalo pen using the board layout. The upper (component side) of the board is then completely sprayed in cellulose (car paint) before etching. After the etch is completed the holes in the component side are countersunk using a drill to provide a small insulated ring around each of the component wires when they are soldered in.

The tinplate (or copper) screens should be soldered to the copper side of the board first and then fit all the components. It is important that transistors TR3 and TR4 should have short leads (ie approximately 3mm) otherwise the collector circuits will not tune to the required frequency.

Alignment

The alignment is fairly straightforward and consists of tuning each of the stages in the oscillator chain for maximum power on the frequency shown on the circuit diagram. The approximate power measured with a two-turn coupling coil at various points after completion and alignment is also given to assist in fault finding, or for reference if the constructor has access to a thermistor power meter.

The author used a 200MHz counter to measure the oscillator and doubler stages, and a crystal detector with two-turn search coil to tune up the following stages. When tuning TR4, first reverse D1, place a 1mA meter between the junction of D1 and D2 and earth, then tune C14 and C18 for a maximum reading (approximately 150μA). Occasionally 846MHz tends to bias the diodes and it is possible to adjust C14 and C18 to give the maximum diode current from 846MHz in error. As a check, connect a 1,268MHz filter to the converter input and tune C14 and C18 for maximum 1,268MHz (100μW). Reconnect D1 correctly, then finally connect L7 to a receiver and tune L6 for maximum noise. Tune in a strong signal at 1,297MHz and re-trim each stage for best results.

The 70·444MHz crystal is required when a 28-30MHz i.f. is used, but any i.f. within reason can be used provided L6 and L7 are wired to suit. L1 may require an extra turn if, say, a 64MHz crystal is used to provide a 144-146MHz i.f.; however, some loss of performance may result using a high i.f. as the mixer ring relies on the fact that both the signal and oscillator frequencies are within a few per cent of each other.

The source resistor R14 for TR5 should be chosen for the best noise performance of the i.f. pre-amplifier stage, and TR5 should draw about 5mA.

When fully aligned the converter has a noise figure of 12-17dB which is adequate when fed from a high gain pre-amplifier. The author uses a four-section high-Q filter in front of L5 to keep out the image response and reduce the mixer noise when fed from a pre-amplifier. It is not essential for a simple set-up.

The varactor tripler

This unit is built into a small Eddystone die-cast box measuring 4¼in by 2¼in which is identical to that used to house the converter. The layout is shown in Fig 4.

The circuit diagram is shown in Fig 3. L1, C1 and C2 form a matching network for the input frequency, and C3 L2 are series resonant to provide a low impedance path to the diode. C4 with its connecting tab forms a second harmonic shunt to provide the idler circuit. The third harmonic of the input is selected by the two section filter. The coupling

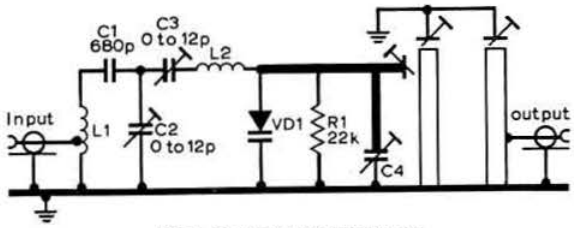


Fig 3. Varactor tripler circuit

to the filter is provided by the adjustable 6BA screw shown in the layout drawing.

This circuit has been found to work well in practice and two versions have been made to date, including a ×6 multiplier to 2·6GHz [2].

Construction

The input matching components are bolted through the base of the diecast box together with the earthing tag under C4. Another earthing tag is screwed in a convenient position for L1.

The varactor diode is mounted in a bar of aluminium which forms a screen across the box. The diode is held between a copper screw in the screen and the brass block holding the 6BA filter coupling screw. As several different case styles exist for suitable varactors, some slight modification of the diode mounting assembly may have to be made if the constructor has different diodes to that used by the author. The diodes used in the author's unit are BXY37D, which have a small flat at one end and a screw thread at the other. The copper plug screw in the screen is tapped 3-48 UNC to take the diode thread, which is the heat sink end, and thermal grease should be used on the threads to aid the heat conduction. This mount will also take BXY37E diodes which are similar to the D variety except that there are no threads on the diode pin. These untapped diodes are not suitable for high power with this mounting arrangement unless extra care is taken to ensure good thermal contact. The maximum input to risk on an unthreaded diode is about 2W.

The author's tripler gives an output of 900mW for 2·5W input using the BXY37D tapped diode. Where more power is available at 432MHz a BXY36D could be used to give the same or better efficiency. A word of warning: some high power (20W) varactors which are available on the surplus market will not work unless this power is available. Most high power (high capacity) diodes are the same and it is far better to go for the lower power, higher frequency diodes when using low or indeterminate power.

Low power diodes give better efficiency and linearity at low power but limit the output if too much input is put in (unless the diode burns out in the process). Most amateurs are over-optimistic about their output powers at these frequencies and such optimism about the 432MHz output may well lead to very bad results on 1·3GHz if the wrong diode is used. Losses of 10–20dB by using a diode with high capacitance are in no way uncommon. The constructor is recommended to measure the power available at 432MHz carefully before deciding on the diode and if this is not accurate to err on the very low side.

The output filter is made from ¼in small bore copper tubing, and the end capacity tuning screws are so positioned that they penetrate into the ends of the tube without touching the sides when fully inserted.

Alignment

The alignment is best carried out with the aid of a spectrum analyser. For those with access to this equipment no details need be given, but a rough alignment can be achieved using the following procedure:

Equipment needed 3W source of 432MHz
Diode detector
10dB attenuator capable of taking the full output*
High Q break or good 1·3GHz filter
DC amplifier for diode detector

* A good attenuator of about 10dB is 20yd of UR43 coaxial cable.

Connect the tripler to the attenuator through a filter and monitor the output on the diode detector and dc amplifier (ideally a 50Ω 10dB pad feeding a coaxial diode mount is required to minimize mismatch effects).

Apply about 0·5W of 432MHz and tune the output filter screws on the 1·3GHz tripler until some output is detected. Increase the output to maximum by tuning the input matching capacitors and the second harmonic rejection trimmer. When these adjustments have produced the best output, increase the coupling into the filter by screwing in the filter coupling screw through the access hole in the side of the box. Repeat the output filter tuning and input match tuning until maximum output power is obtained. Always retune all the trimmers and output filter after making a coupling adjustment as any alteration in coupling will detune the output filter and give an apparent loss of power before retuning.

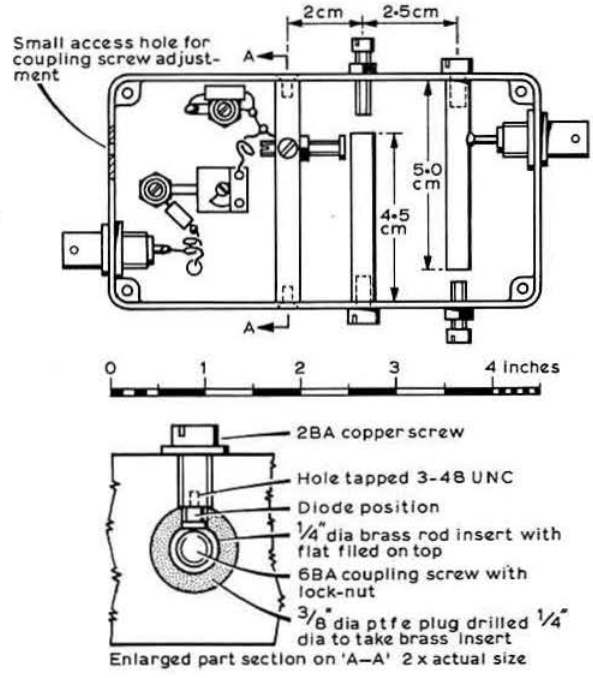


Fig 4. Varactor tripler layout

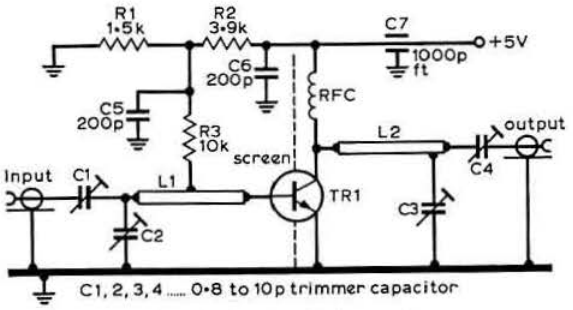


Fig 5. Pre-amplifier circuit

Once the alignment with an input of 0·5W is completed, the power can be raised slowly to ~3W input while retuning slightly as the power is raised.

When the tripler is finally connected directly to the aerial it is possible that it will not function properly because of the different match presented to it, and it is most important that the aerial presents good match or this will happen. The author found that his 34-el Yagi had a return loss of only 8dB when first constructed, which pulled the tripler off tune. However, rematching the aerial to better than 20dB return loss (~ 1·2 vswr) cured the problem. However, there is a slight help in the fact than any normal feeder system incorporating UR67 or uhf low loss coaxial cable will have a feeder loss of more than 4dB, which in turn will improve the aerial return loss by a further 8dB. Thus a poor aerial on a 50ft feeder will have a return loss of 16dB. Users of good low loss cable such as Andrews' FHJ4-50B will not "benefit" from such a loss and the aerial match must, therefore, be <1·2 in its own right.

A high gain pre-amplifier

As most people have acclaimed the use of pre-amplifiers ahead of almost any converter, it is not worth spending a lot of money on good diodes when this is more advantageously spent on an extra pre-amplifier transistor. Several designs for BFR90 pre-amplifiers have appeared in *Radio Communication* [3, 4] but another design using a surplus transistor is given here for those who have acquired these devices. Surplus 2GHz rf transistors are available from J. Birkett for around £3 which give a performance well in excess of anything that can be achieved from a BFR90 or 91. These "surplus" devices have a gain of over 8dB at 2·3GHz and the gain achieved by the author at 1·3GHz was 16dB! The noise factor is below 4dB.

However, this performance is not easily tamed and care has to be taken to isolate the input and output and good decoupling and screening is essential. The design shown is still not unconditionally stable but behaves well when terminated in 50Ω loads. However, the author has come across BFR90 pre-amplifiers which are not unconditionally stable so it is well worth the effort to achieve the extra 8dB gain and better noise figure with the surplus devices.

The single transistor is used in a stripline circuit which is mounted in a small 3½ by 1½ by 1¼in diecast box. The stripline circuit uses ordinary glass-fibre double-sided board which is only etched on the top side (the underneath forms the ground plane).

As the desired matching networks are high impedance lines, these were carefully drawn using a Dalo pen and then trimmed after etching. The bypass disc ceramics must be flow-soldered on to the top side earth plane before any of the other components are fitted because of the large amount of heat necessary. The screen is soldered across the transistor with a minimum cut-out so as to provide the best isolation between the input and output circuitry.

Components list

CONVERTER

R1	39kΩ	C1, C9, C13, C15	1,000pF
R2	18kΩ	C2, C4, C8, C16	0·01μF
R3	4·7kΩ	C3	33pF
R4	820Ω	C5	100pF
R5	47kΩ	C6	8pF
R6	2·2kΩ	C7	22pF
R7	22Ω	C10	0·8–10pF
R8	100Ω	C11	1·8pF
R9	1·5kΩ	C12	3pF
R10	18Ω	C14	0·8–10pF
R11	2·7kΩ	C17	22pF
R12	180Ω	C18	0·8–10pF
R13	1kΩ	C19	15pF
R14	220Ω AOT		
R15	22Ω	D1, D2	GEX66M (or Schottky barrier diodes; see text)
TR1	2N708		
TR2	2N918		
TR3	BFY90	X1	70·444MHz xtal
TR4	BFY90		
TR5	2N3819		

L1 6 turns tapped 1 turn from cold end } 22swg ¼in former
L2 4 turns }
L3 1½ turns 18swg centre tapped ¼in diameter
L4 } Stripline ccts. See layout, Fig 2
L5 }
L6 18 turns 26swg ¼in former
L7 3 turns 22swg wound over L6
L8 RFC 3 turns 26swg $\frac{3}{32}$in diameter

RFC1 10μH choke

PRE-AMPLIFIER

R1	1·5kΩ	C1	0·8–10pF
R2	3·9kΩ adjust for 5mA Ic.	C2	0·8–10pF
R3	10kΩ	C3	0·8–10pF
TR1	Stripline shf transistor (J. Birkett)	C4	0·8–10pF
		C5	200pF chip disc
L1	Stripline 0·9 by 0·05 in	C6	200pF chip disc
L2	Stripline 1·2 by 0·02in	C7	1,000pF feedthrough

VARACTOR TRIPLER

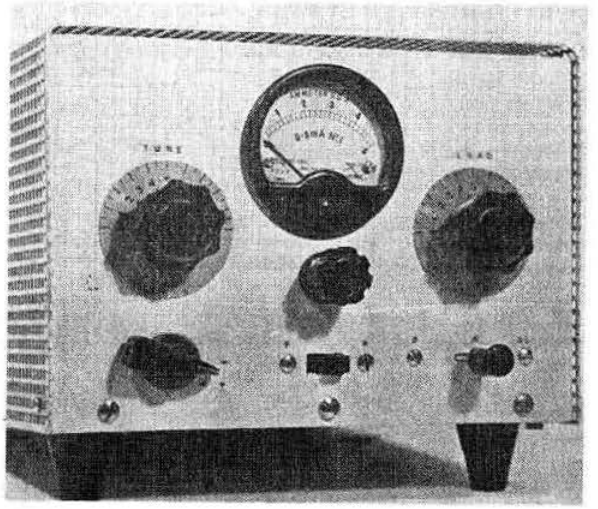
R1	22kΩ	C1	680pF
L1	2 turns 18swg tapped ½ turn from cold ¼in diameter	C2	0–12pF
L2	1 turn 18swg ¼in diameter	C3	0–12pF
		C4	6BA screw

References

[1] Wheeler, "Strip transmission lines", *Microwave Journal Handbook and Buyers Guide*, 1969.
[2] G. D. Lean, "A solid-state source for 10GHz", *Radio Communication* August 1975.
[3] *Radio Communication* June 1974, p384.
[4] *Radio Communication* September 1974, p596. □

A 10-80m aerial tuning unit

by R. N. HEDGES, DMA, AMBIM, G2HCV*



THE majority of amateurs today purchase factory-built all-band transmitters, receivers or transceivers, and most of them are excellent, but the urge to construct still lurks within most amateurs. What better way to use this latent force is there than to build the tuning unit usually necessary to match the transmitter output and receiver input to the aerial, especially since these devices are now becoming very expensive indeed?

The term "Z-match" has tended to become regarded as synonymous with the latter-day "aerial tuning unit", which it is not. It is certainly not the most efficient type of its species, but it is a form which is very convenient and easy to construct. The piece of equipment to be described is a "Z-match". It is straightforward and incorporates an swr bridge, a switch to connect the transceiver to the tuning unit, the dummy load or straight through to another coaxial socket, all positions utilizing the bridge. It uses components which are relatively easy to obtain and solves the problem of finding that elusive two gang 250pF variable capacitor; the coils are home-made. Its limitation is that one must be content with what some consider the modest 100W output usually available from commercial transmitters. Those with higher aspirations and big linear amplifiers must continue their search for that wide-spaced 250/250pF variable!

The case measures 10in deep, 7¼in wide and 5in high, and is made from aluminium. The swr bridge is the standard "monimatch" described by Paul Harris, G3GFN, in the May 1964 issue of the *RSGB Bulletin*. Essentially it comprises a 16in length of standard 70Ω coaxial cable with a thin enamelled pick-up wire inserted beneath the braiding. As the 500μA meter is used only as an indicator it need not be accurate; one of the 15/600V units from the old army 19 set is quite adequate and still very cheap.

The 500pF loading capacitor is a standard type used with valve receiver equipment and must be insulated from the case. The tuning capacitor, usually shown in Z-match circuits as a two-gang 250pF, consists in this version of two single short-wave receiver type capacitors—those once made by Raymart, Premier, Hammarlund, Cardwell, etc are all suitable—bolted to a U-bracket and coupled together with a metal coupler. Those used were 200pF (but the once popular 160pF may well be large enough) and are adequate to tune all bands 10 to 40m. Only on 80m is 250pF necessary, and this increase is obtained by switching a good quality 100pF fixed mica capacitor (C4) in parallel with the tuning capacitor used for the low-band tuned circuit—it is switched out for all bands other than 80m.

The switch, which should be ceramic, is mounted on the U-bracket immediately beneath the tuning capacitor. The fixed capacitor should be large enough to pass the current circulating, the chocolate size Dubilier, TCC, Hunt etc, used abundantly in wartime equipment, being quite suitable. The capacitor can be seen immediately under the right-hand tuning capacitor in the photograph showing the interior.

The coils are wound with 18swg tinned-copper wire according to the details given in the table. The formers used for winding should be of slightly less diameter than required,

*"Eastcliff," Brookshill Drive, Harrow Weald, Harrow, Middlesex.

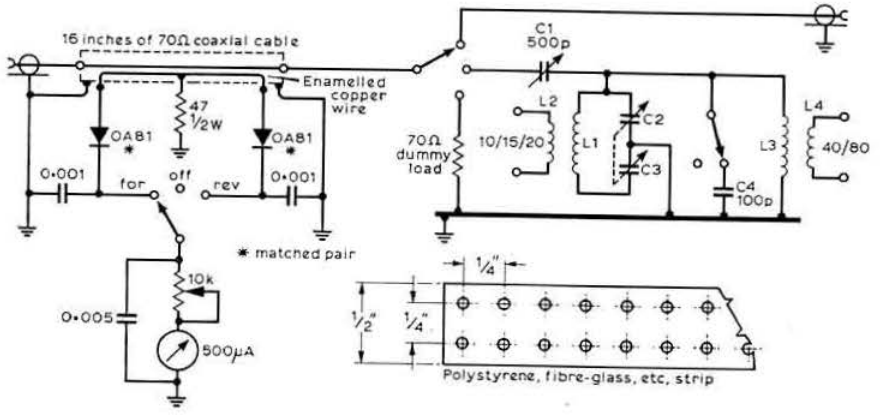
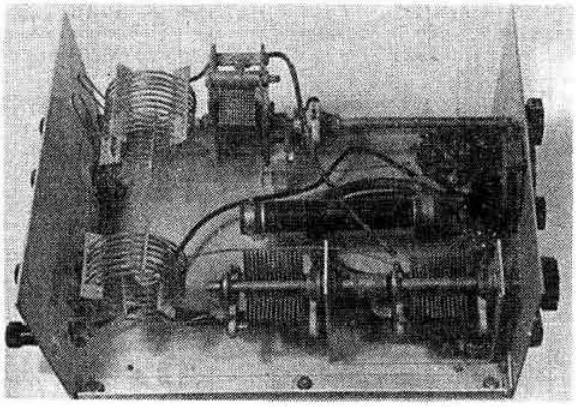


Fig 1. The circuit of the aerial tuning unit



The interior of the unit

to allow for the wire springing out when winding tension is released. Each coil is kept to shape by four strips of polystyrene or other suitable low-loss material, the original being strips cut off discarded computer glass fibre PCBs. The coils are threaded through the holes drilled in them—the inner coil first, and when correctly positioned the wire can be cemented to the former strip with "Durofix", etc.

The aerial input switch S1 is a side movement Yaxley, but a standard rotary switch is obviously usable. The component shown is a good-quality paxolin type and has given no trouble but, in view of the amount of current flowing, a ceramic switch is much to be preferred. The author was fortunate in having a suitably sized 70Ω carbon resistor for use as a dummy load, but if a similar one cannot be found (and he has no knowledge of any source) a suitable load can be made by series or parallel 3W and or 5W carbon resistors. A dissipation of about 25W is ample provided power is applied only for short periods—as it should be in any case with modern ssb transmitters.

Thanks are due to G2AOX for the coil design. For many years he has used a standard post-war two-gang 500pF variable for C2 and C3 in his Z-match. He has green fingers, but it might be worth trying. □

Coil data

L1	5½t, 2in dia, 36in long approximately.
L2	5t, 2½in dia, 40in long approximately.
L3	11t, 2in dia, 70in long approximately.
L4	6t, 2½ in dia, 48in long approximately.

BOOK REVIEWS

Hi-Fi Choice – Receivers by Angus McKenzie. Published by Aquarius Books Ltd. Available from booksellers, price £1.

Those who know Angus McKenzie only as G3OSS may not be aware that he has a high reputation as an audio engineer and journalist, whose first book in this series, *Hi-Fi Choice—Cassette Decks*, enjoyed wide popularity. This new booklet sets out to examine and compare some 80 or more tuner-amplifiers now on the market in the £100-plus price range as a first stage to hi-fi (including stereo) reception, but what is most important from the radio amateur's point of view is that it breaks new ground in subjecting each equipment to an "emc" (electromagnetic compatibility) assessment based on its ability to defend itself against signals generated close at hand in the 1·9 and 144MHz bands. As might be expected, very few of the equipments tested acquitted themselves well under such stress, and this publication will go a long way in alerting members of the general public to the possibility of radio interference and why pressure should be exerted on manufacturers to improve rejection.

Each receiver is given a comprehensive description of its specification and performance in a searching programme of technical tests. There is a "best buy" section and a chapter on "the ideal receiver" in which some 47 technical features are tabulated on an "A to F" scale for each of the receivers tested. While none are so very inadequate as to receive an F for emc, only 18 merit an A rating —in other words if your neighbour buys himself a new receiver costing more than £100 you have only a 1-in-4 chance that you will avoid interfering with it. Angus is to be congratulated on bringing this problem out into the open and in showing where the blame for interference problems largely lies.

The book opens with a survey of the basic principles and methods of modern radio reception including stereo coding and decoding, and ranges through intermodulation and ergonomics while managing to steer a roughly middle course between oversimplification and "blinding with science", although the hi-fi tyro might be in for some hard reading. But the sections on emc and on "hi-fi equipment and the law" demand no technical ability to understand, and should do much to arm the intending purchaser with the right questions to ask when he sallies out to make his purchase. If there is an error here it is that the book appears to take the technical competence of the dealer for granted—too often, alas, he is a salesman who will sidestep a technical question and reply with an all-embracing platitude.

A minor "crib" is that the standard of English and of proof-reading are allowed occasionally to slip, but from Aiwa to Yamaha here is a readable and authoritative account of the current market which should be on your bookshelf not only to show your irate neighbour what "emc" really implies but also to browse through and enlarge your own knowledge. Definitely an "A" for value at £1, but don't lend it to your neighbour—you probably won't get it back!

G2YS.

"Constructors' Guides"

A series entitled *Constructors' Guides* has been launched by Newnes-Butterworth. These are intended to provide background information for readers of electronics journals and conventional text books, being sources of reference on constructional techniques and prototype assembly.

The first three titles now available are: *Electronic Diagrams*, 112 pages; *Printed Circuit Assembly*, 96 pages; and *Electronic Components*, 112 pages. Each book is 216 by 138mm, limp bound, and costs £1.80.

Electronics Diagrams is aimed primarily at the newcomer and takes the reader through the logical steps of building up circuit diagrams from basic symbols to complex assemblies. *Printed Circuit Assembly* deals with the production of printed circuit boards, dealing with the practical aspects and showing the stages involved in translating circuit diagrams into printed circuit layouts. *Electronic Components* is intended to be a guide to choosing and using such circuit elements as resistors, capacitors, inductors, semiconductors and integrated circuits. The accent is on the practical aspects of circuit assembly to enable the reader to acquire the skill involved in the constructional work.

The books are copiously illustrated and the presentation is clear. They will undoubtedly be of considerable value to constructors in all fields, particularly those with limited experience. The volumes are edited by M. A. Colwell and published by Newnes Technical Books, Borough Green, Sevenoaks, Kent, TN15 8PH.

oscar news

AMSAT Phase 3

When AMSAT-Oscar Phase 3 becomes Oscar 8 the amateur satellite programme will have entered a new stage. All the spacecraft so far launched have been experimental but Phase 3 is being designed for operational use to provide the amateur service with a long life and reliable means of communication. With Oscar 8 in orbit, users will no longer have a 5,000-mile limitation on range, for a whole hemisphere will then be available. Any station in the northern hemisphere will be able to communicate with any other in that hemisphere for the greater part of a day in addition to stations in the southern hemisphere during shorter periods. The possibility of communication will always be there irrespective of solar flares, the state of the sunspot cycle and other phenomena that can disrupt communications below 30MHz.

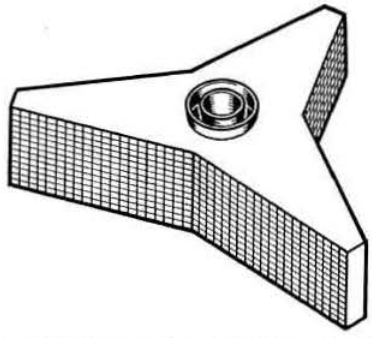


Fig 1. Artist's impression of the Phase 3 satellite

The transponders on Oscar 6 and Oscar 7 increase the range of a 2m or 70cm station up to 5,000 miles but only for about 20min three or four times a day. With the Phase 3 spacecraft in orbit a whole hemisphere can communicate, and round table contacts between stations in Europe, North America and Asia could become routine. This could introduce a new era in emergency communications and educational uses of the project.

The Phase 3 spacecraft will be launched into orbit in the period 1977-8. It is hoped that it will contain two transponders, the first having an uplink on 145MHz and a downlink on 435MHz. The second transponder will have a 435MHz uplink and a 145MHz downlink.

Whether the spacecraft will ultimately contain one or both transponders will depend upon the time set for launch and the ability of the spacecraft builders to prepare the equipment within the time schedule. As with many amateur radio projects, the whole future of the spacecraft building project depends upon the skill and enthusiasm of a small number of persons. Those involved in the Phase 3 project, in addition to AMSAT-USA, are AUSTRALIS-WIA, AMSAT-Canada and AMSAT-Deutschland. It is perhaps unfair to mention names but Jan King, W3GEY, Karl Meinzer, DJ4ZC, and Perry Klein, K3JTE, are individuals without whose wholehearted effort the project would probably fail.

Users of Oscar 6 and Oscar 7 will be well acquainted with the problems of planning the passband so that equitable use by the users of the various modes may be assured. It is pleasing to note that in IARU Region 1 there is very considerable conformity to the voluntary band plan so that users of cw and ssb can operate without mutual problems. The same type of discipline will be absolutely vital to operation through

Spacecraft characteristics

Attitude control system	Spinning spacecraft (≈120rpm); attitude will be controlled by magnetic torquing near perigee to adjust spin rate and axis orientation. Sun and earth sensors will be employed
Miscellaneous	All onboard functions controlled by spacecraft microcomputer.
Final orbit characteristics	Apogee (h_a 7·1 = r_e (39,000km) Perigee (h_p) = 1·228 r_e (1460km) Inclination (i) 101·5°
Weight	120lb
Configuration	"Tri-Star" shape, each arm 0·6m long.
Primary experiment	Two high-efficiency, high-power (50W) communication transponders.
Power system	40W bol from body-mounted solar arrays eclipse operation from nicad battery.
Propulsion system	Small perigee kick motor will be utilized to modify Delta orbit.

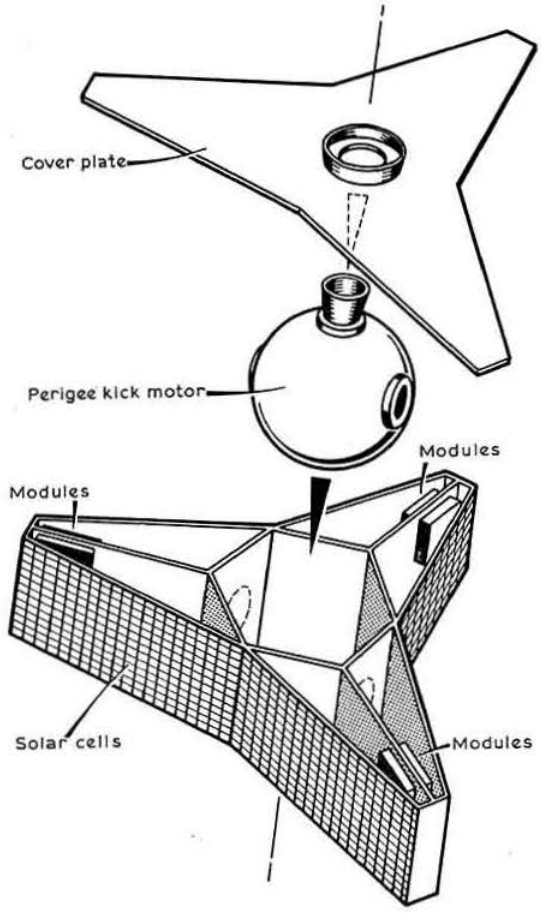


Fig 2. Expanded view of the satellite

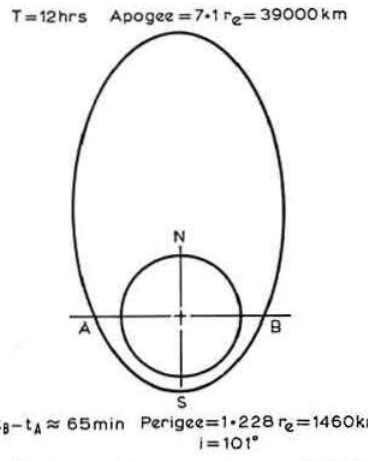


Fig 3. The planned orbit of the Phase 3 satellite

the Phase 3 spacecraft. Any station operating on 145MHz in the northern hemisphere may suddenly be heard throughout that area, and consider for a moment the number of stations that may be operating on a frequency in the 144MHz band in the different countries of Western Europe. Under present conditions they are inaudible to each other but through the Phase 3 transponder they can all be heard half a world away. While the AMSAT organisations are building and testing the spacecraft it is vitally necessary that the potential users should through their national societies and the IARU agree a band plan so that the maximum benefit can be obtained from the most sophisticated spacecraft yet intended for the use of the amateur service.

In the near future there will be further and more precise information concerning the equipment that the Phase 3 spacecraft will carry and also an outline of the ground station requirements for reception and transmission.

For a commercial organisation to design, build and launch a similar spacecraft would require an investment of several million dollars. While the Phase 3 project can be accomplished for a fraction of this amount, the funds available to AMSAT are limited and are already allocated to the full. The most effective way of supporting Phase 3 is to support AMSAT. Information can be obtained by sending an sae to A. Bailey, G3WPO, 5 Erin Way, Burgess Hill, Sussex. □

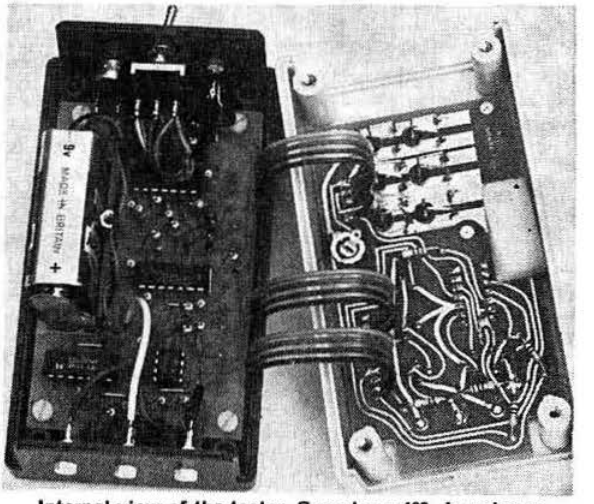
EQUIPMENT REVIEW

Datong Datest 1 tester

This instrument is a new type of automatic tester for transistors and integrated circuit operational amplifiers. With this sophisticated yet pocket-size instrument it is possible to test bipolar and field effect transistors and diodes both in and out of circuit. Operational amplifier ICs may be tested out of circuit. The polarity of the device is not required to be known before testing nor whether it is a bipolar or fet: the instrument will provide this information. The test results are displayed instantly as one of a number of characteristic patterns on an array of six light-emitting diodes. Where it is desired to investigate the device further, a number of parameters can be measured by connecting the Datest 1 to a multimeter. Among the functions of the instrument are:

(a) go/no go and polarity test for transistors in-circuit;
(b) go/no go and identification test for transistors out-of circuit;
(c) go/no go test for operational amplifiers;
(d) go/no go test for diodes;
(e) to determine the pin connections of an unknown transistor;
(f) bipolar current gain;
(g) bipolar leakage current;
(h) diode leakage test.

The Datest 1 is powered by an internal 9V PP3 battery. A battery check function is incorporated in the instrument. The weight including the battery is 200g and the case dimensions are 120 by 64 by 40mm. The tester is supplied complete with a "tweezer-probe" and a "needle-probe" for in-circuit testing. The comprehensive instruction booklet provides clear information concerning test procedures.



Internal view of the tester. See also p 463, June issue

While obviously designed primarily for service departments, R & D laboratories and production areas, this tester would be a valuable addition to the workshop facilities of any club or group. Advertisements in *Radio Communication* frequently offer quantities of manufacturers surplus devices at very reasonable prices, but invariably these devices carry no type number and present a problem of identification. The use of an ohmmeter for testing bipolar transistors often gives ambiguous results. Using the Datest 1 a batch of unknown transistors was evaluated at a speed governed mainly by the time it took to insert each transistor into one of the six test sockets.

The tester is attractively cased with clear markings and the construction is of the high quality associated with other products from this manufacturer. The price of the Datest 1 (including VAT) with test probes is £52.92. Full information can be obtained from Datong Electronics Ltd, 11 Moor Park Avenue, Leeds LS6 4BT. Tel 0532 755579. □

technical topics

Pat Hawker, G3VA

THE recent conference and exhibition at Brighton "Communications 76" was the first in the series to be organized by the IEE and one result is that the convention book (*IEE Conference Publication No 130*) contains no less than 87 papers covering many aspects of modern radio and line communications. Most of these have little immediate relevance to amateur radio (at least for those of us who have no ambitions to become computer-controlled, data-transmitting, satellite-based communicators) although a Canadian study on a search and rescue satellite system is partly based on the use of Oscar 6. However, several aspects of current professional thinking are of considerable interest and of practical value and we start this month with a rundown on some of the ideas and techniques noted in these papers.

"Communications 76"

The prospect of using delay-stabilized surface acoustic wave oscillator (sawo) modules as a means of providing stable oscillators with fundamentals up to 1 or 2GHz turns up in a paper from the University of Edinburgh. This approach is basically similar to previous items in *TT* on delay-line oscillators, and information has also previously been published by Marconi. This new paper is concerned with both direct and phase-locked sawo systems for mobile and hand-held radio transceivers. Apart from the very high fundamental frequency, the sawo also has the advantage that direct frequency modulation is possible. Since the short-term stability is good even with a direct sawo (ie one not phase-locked to a lower frequency crystal reference) there would seem a good prospect of using the simpler approach for non-channelized amateur operation where long-term and ageing drift is unimportant, so avoiding the spurii involved with crystal multiplier chains. The sawo, it would seem, may at long last provide us with the equivalent of a 1GHz crystal, and since surface acoustic wave techniques are already being developed as bandpass i.f. transformers for consumer equipment, the cost should not be inherently high.

Plessey described their wide-aperture hf df system that provides overall accuracies of 1–2° rms and down to 0·6° on ground wave, based on their relatively small "Wullenweber" type approach which they also use to provide multiple directional receiving beam aerials. The same firm is also using elevated-feed monopoles (see *ART*) to provide a more compact form of conical monopole broadband aerial for hf or vhf: an swr of less than 2·5 is claimed over a 10:1 ratio (eg 9 to 90MHz): Fig 1.

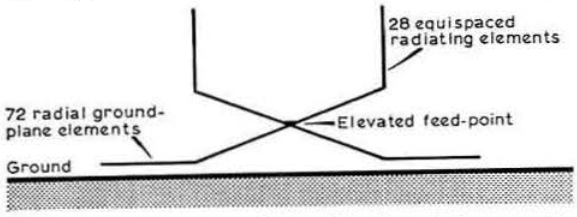


Fig 1. A modified form of broad-band conical monopole developed by Plessey and hung in a square formed by four poles (side view)

Miniature active receiving aerials form an important element of the Royal Navy's ICS3 system (made by Marconi-Eddystone) since the small element does not pick up the overwhelmingly-large signals from the many transmitters on board a modern warship. Active log-loop aerials are used by C & S Antennas to form low-profile receiving arrays (their basic unidirectional loop element was described at the 1974 convention). Another aerial system used by the RN is to isolate sections of a ship's mast to provide broadband systems as developed by the Admiralty SWE.

The vital importance of good dynamic range of hf and vhf front-ends of receivers is now everywhere recognized. For example, a paper from Racal (concerned with a computer-controlled application of the RA1772 receiver) states: "Professional users now recognize and accept the fact that the level of intermodulation products is the single most important parameter in the receiver specification". The RA1772 uses four FETs in its switching-mode mixer. Up-conversion in a balanced switching-mode mixer is used by Marconi in the ICS3 system to provide an ultra linear hf mixer. The new Plessey PTR1410 vhf military mobile units (replacement of the long-established C42 radio) is described as having "exceptional co-siting capability" with tuned rf amplifiers using medium-power rf transistors with feedback and running at 2W dissipation, and claimed to retain linearity in the presence of local signals providing receiver inputs up to 2V, and here again a switching mode balanced mixer is used with a very high level of local oscillator injection (27dBm).

A system that could conceivably have repercussions on 144MHz amateur operation is the forthcoming introduction of Post Office radio-paging just above 150MHz in London for up to 100,000 subscribers. One must wonder whether the miniature receivers will be knocked out in the presence of local 144MHz transmitters and it is hoped that this possibility has been investigated. Otherwise we may see a rapid growth of rpi (radio-paging interference) to add to bci, tvi, afi etc and with the blame wrongly put on the amateur signals!

With so much emphasis on higher frequencies, it is interesting to find that the new fire-ground communication system (used operationally at the Moorgate tube disaster) is an hf ssb 10W p.e.p. base station and low-power pocket set working on about 3MHz (Plessey). The use of low hf allows the system to work in many situations, such as basements and steel-framed buildings, where vhf or uhf signals cannot reach.

VXO with capacitors

Many designs for variable crystal oscillators (vxos) have been published, many using crystals with series inductance or with both inductance and variable capacitance loading: crystal "pulling" by capacitance alone is usually confined to frequency trimming of calibrators and similar applications where only limited pulling range is needed. However, in *Electronic Design 7*, 29 March 1976, Frank W. Noble shows that a useful degree of crystal pulling can be provided by capacitance alone provided that certain design factors are taken into account. For example, a 5 to 7kHz shift with 7MHz AT-cut crystals is a useful figure for both hf and vhf applications.

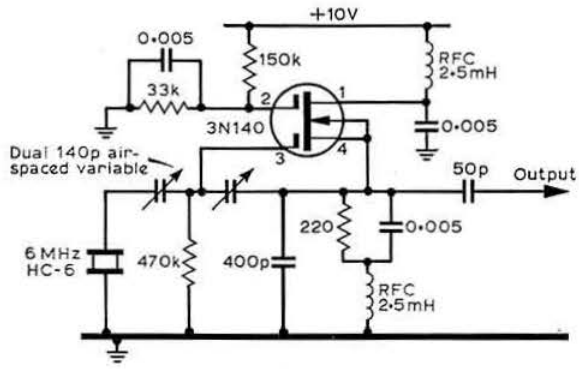


Fig 2. A capacitive vxo that is claimed to achieve up to 5kHz deviation with a standard 6MHz AT-cut HC-6 crystal using a dual 140pF capacitor (eg Hammarlund MCD-140-D). Layout should keep stray capacitances affecting crystal as low as possible. Other types of dual-gate mosfet could be used

The article analyses in considerable detail this type of crystal pulling which Frank Noble believes can provide superior stability to other forms of vxo. He concedes that the systems using inductors and active circuits to simulate inductors can provide greater frequency shifts, but such inductive component elements tend to be unstable and the crystal operates where the slope of its reactance versus frequency characteristic is relatively shallow.

The key to obtaining the widest useful pulling of a crystal by varying the capacitive loading is to be found in designing for the highest possible maximum/minimum capacitance ratio, and in practice this requires the lowest possible minimum capacitance. For an AT-cut 7MHz crystal this should theoretically be of the order of only 3pF. However, even with careful design such a low minimum is unlikely to be readily achieved and 7pF is suggested as a more practical target; even this figure is likely to require the use of dual air-spaced variable capacitors as in Fig 2. With a Cmax/Cmin ratio of 10 and a minimum of 7pF, the maximum becomes 70pF, suggesting the use of a 2 by 140pF ganged capacitor. This is capable of providing a theoretical frequency pulling of about 7·3kHz, although in practice 5kHz is a more realistic figure.

The article also notes that generally to achieve optimum conditions for frequency pulling, crystals should be used that have plated areas larger than twice the diameter of standard crystals: possibly some experimentation with some of the large, older types of crystal might be worthwhile.

Slow-rate rtty

One of the problems with amateur rtty, it has always seemed to me, is that error rates rise very rapidly when conventional systems are used at low signal-to-noise ratios. In effect, as is well known, considerably stronger signals are needed for good rtty operation than for cw or even ssb. The professionals have attempted to tackle this problem in several ways; one notable example is the Foreign Office Piccolo system that by integrating parallel transmission of tones over a longer period than normal is capable of good copy from signals virtually buried in noise, but demanding transmitter/receiver stabilities of the order of 1 or 2Hz. Another approach has been forward error correction, though in effect this is a system that simply adds redundancy and parity checks to the signal rather than tackling the basic problem of achieving good copy on weak signals.

At "Communications 76" another technique was described by W. R. Lange of Rohde & Schwarz in the paper "Reliable and frequency-economic communication on shortwave by bit-rate reduction". This system uses low-speed (12·5 baud) rtty but with electronic speed converters to allow the use of standard rtty equipment. With narrow-band filtering the system can operate at signal-to-noise ratios of much the same order as for the equivalent 20wpm cw, making it possible for the rtty man to work effectively on the sort of signals that would provide a real challenge for cw. Further, as implemented by Rohde & Schwarz, the system can be switched to normal rate rtty operation when conditions permit.

Another attractive feature for amateur operation is that at the 12·5 baud rate the signal occupies a channel width of only about 25Hz so that many more rtty stations could operate in a given band without mutual interference, particularly when means are provided of slightly shifting the transmitter frequency to dodge any interference. While the paper does not go into detailed circuitry it would appear from the outline in Fig 3 that the speed converter electronics is by no means excessively complex and well within amateur capabilities. The system needs good basic frequency stabilities but not to the extent of the Piccolo system.

The frequency shift on transmission is ±10Hz, and for reception a selective filter at an i.f. of 30kHz has a bandwidth of ±15Hz. A 1MHz clock signal at both ends provides synchronous working; shift registers are used as speed converters. (In Fig 3, "J & D" means "Integrate & Dump".

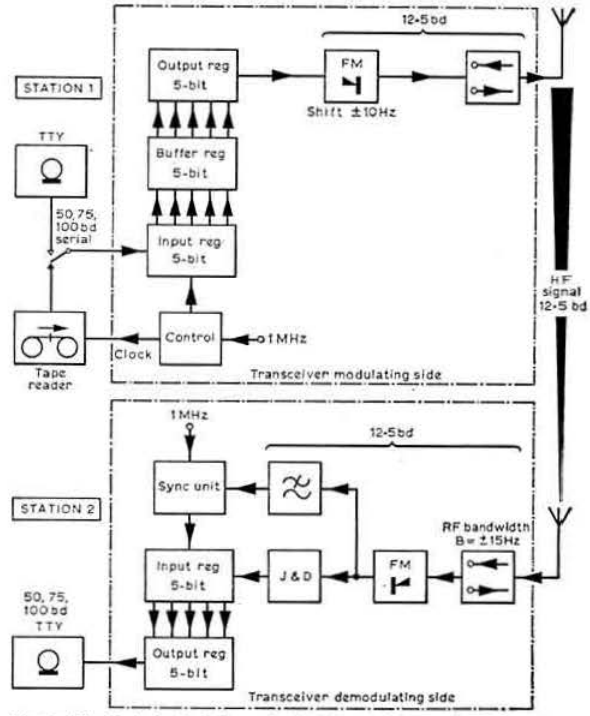


Fig 3. The Rohde & Schwartz 12·5 baud (20 wpm) rtty system used with 50, 75 or 100 baud equipment and capable of providing good copy on weak but stable signals

One aspect of the firm's investigation of this system is that in the laboratory, subject to Gaussian noise as simulated interference, the system can provide copy on signals that a manual cw operator cannot begin to copy. However, in field conditions it is admitted that cw improves its relative position (though the paper considers the rtty system is still superior) because of "the adaptability of a well-trained radio operator in the presence of fading effects, the automatic text correction because of the redundancy of the language and the high selectivity of the human ear with narrowband interference". There is of course also the possibility for a cw operator to decrease his speed well below the 20wpm rate of the 12·5 baud rtty system.

It would appear that the provision of optional 12·5 baud facilities would offer real advantages for amateur rtty operation, particularly when it is recognized that this still provides a 20wpm communication facility. It should be noted that the British amateur licence specifically limits rtty operation to 45·5 or 50 bauds, but surely the Home Office would be prepared to consider a change to these rules to allow amateurs to experiment with what seems a very useful rtty development?

Noise, diodes and LEDs

Steven Whitt, G8KDL, recently drew attention to a source of noise that can easily affect vhf reception: the noise generated by the various diode-like devices used in auxiliary circuits. In his case a specific cause of noise was a voltage indicator arrangement on a hand-portable 144MHz transceiver where a zener diode plus series diodes and light emitting diode were connected in series. This caused excessively high noise level on receive, and although G8KDL did not trace the noise to a particular one of these components, he readily cured the problem by connecting a 5,000pF disc ceramic capacitor (Fig 4) across the supply line with the leads as short as possible. This completely eliminated all rf noise.

G8KDL has also recently built a noise bridge for adjusting 144MHz aerials, and has found that the types of transistor often used as diodes for stabilization of af amplifiers in low-cost Japanese pocket radios provide a very potent noise output audible to well over 150MHz. When correctly biased (9V with series pre-set resistor) the noise output is higher than with the BZY88 series of zener diodes or from a number of other odd junk-box diodes that were tried. Even without amplification the stabilizer diodes provided S6 signals on 144MHz, and on mf generated noise equivalent to the signals from local broadcast stations.

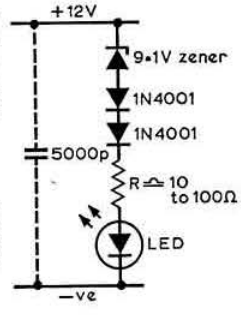


Fig 4. Voltage indicator arrangement found by G8KDL to generate rf noise. Cure was to connect 5,000pF disc ceramic capacitor as indicated

PA0KSB pll vfo

Last month we reported comments from John Hoare, G3PJI, on what he clearly felt to be the extremely useful, yet so far undervalued at least in the UK, vhf pll vfo design by Klaas Spaargaren, PA0KSB, and reproduced in the July 1975 *TT*. Even before these comments appeared, two other appreciative reports on this design had come my way: one concerning its use on 144MHz, the other for 70MHz.

Geoff Suggate, G3NPI, provided a useful check list that he hopes will encourage others to tackle this excellent design:

(1) Like G3PJI, he notes that the more readily available SN76660N can be substituted for the TBA120.

(2) He uses MPF104 FETs as these provide sufficient output, after having tried the 2N3819 without success.

(3) A 2N706 is used in the crystal oscillator.

(4) The three oscillators should be carefully trimmed to frequency.

(5) He was unable to make the first of the two crystal overtone oscillator circuits work satisfactorily and the alternative circuit (Fig 7 of July 1975) was adopted.

(6) The use of the buffer circuit given in Fig 8 on page 540 was found to be essential.

He uses the pll system to convert a Pye Cambridge receiver for continuous tuning with the pll vfo output on 54MHz and with a Pye transmitter using 8MHz crystals. Not least of its attractions, he stresses, is that the entire pll vfo can be built for little more than the cost of two crystals!

This design was originally described in *Electron* in March 1974 and a more recent article by PA0KSB (*Electron*, No 12, December 1975) describes a phase-lock-loop system suitable for use with hf receivers having a 9MHz i.f. This has a 5 to 5·5MHz vfo, a 500kHz spectrum generator and again uses the TBA120 (SN76660N) as a phase detector but is necessarily a little more complex than the vhf unit since it incorporates diode bandswitching.

Mobile research at Bath

An account of the mobile communication research being carried out at the University of Bath under Professor William Gosling (*National Electronics Review*, January/February 1976) throws some interesting light on a number of techniques which promise to improve mobile working (although rather surprisingly nothing is said of circular polarization which I suspect will come to play an increasingly important role in this field).

Work on the double-sideband diminished carrier (dsbdc) system (*TT* December 1972) is continuing, particularly as a means of reducing error rates in digital data and also for hand-portables where the saving in power consumption is seen as important. But a lot of research is also going on in mobile ssb, and the team believes that the feasibility of ssb for commercial two-way systems "can no longer be dismissed". For instance it is reported that "successful field trials have been conducted of an ssb quasi-synchronous system which demonstrate that ssb, although in channels only 6·25kHz wide, can tolerate substantially greater frequency offsets and Doppler shifts than either a.m. or fm quasi-synchronous systems in 12·5kHz channels. This is a matter of great practical significance, but in order that ssb can be used effectively it is also necessary to demonstrate that effective ssb transmitters can be constructed, of good power efficiency and not likely to cause excessive spectral pollution; that ssb receivers of adequate frequency stability can be made at economic cost, and that the severe problem of impulsive noise in narrow-band receivers can be effectively met.

"Single-sideband transmitter research has concentrated on transmitters using high-level modulation which thus avoids the need for linear amplifiers. In this way spurious emission,

always a difficult problem with ssb transmitters, can be reduced to a low level. It is commonplace to require a.m. transmitters to produce spurii 70dB down at the centre of the adjacent channel and this can now be met by ssb transmitters developed at Bath despite a halving of the channel width. Efficiency, defined as ratio of total rf output power to dc input power, can be comparable with that of an a.m. transmitter. If, on the other hand, efficiency is defined as the ratio of sideband power to input power, the new ssb transmitters are very much more efficient than the a.m. equipments that they would replace.

"With regard to ssb receivers, a new automatic frequency control system has been developed which is based upon the introduction of inaudible distortion into the transmitted audio signal. This is subsequently detected in the receiver and used to correct any frequency drift or Doppler shift which may have occurred. The system is capable of compensating frequency errors of up to several hundred hertz in the receiver and thus, together with modern highly stable crystals and the use of synthesizers, overcomes the frequency stability problem.

"With regard to impulsive noise reduction, a very extensive study has been carried out of the practical advantages to be gained from the use of noise blanking and noise clipping of varied degrees of sophistication. This study, based upon digital simulation, is the first exhaustive theoretical treatment of these methods of noise reduction and shows that they can lead in the most favourable circumstances only to a modest reduction of receiver impulsive noise. Attention, therefore, is now being concentrated on so-called 'smear de-smear' systems, which involve a suitable process of the modulating signal through dispersive networks before transmission and inverse processing in the receiver. In this way the original signal is restored in the receiver but the inverse dispersive networks can produce a substantial reduction in the peak value of impulsive noise."

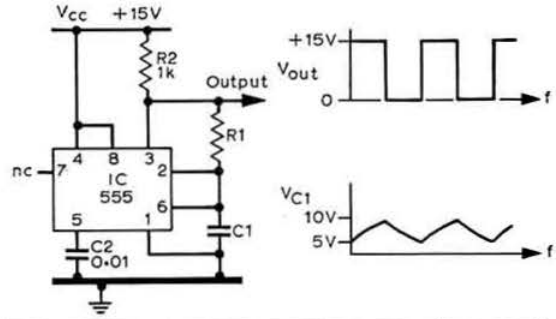
This supplies several clues to novel techniques which could be useful to amateurs: for instance, high-level ssb modulation to avoid the need for linear amplifiers and the new ideas for noise suppression.

Square-wave timer

The 555 integrated circuit timer has been widely used by amateurs; but when forming an astable multivibrator it normally produces a pulse-type output having only a brief duty-cycle. This means that the digital output consists of a series of short sharp pulses, and additional pulse-shaping stages will be needed if a true square-wave output is needed; for example, in keyers and similar applications.

In *Electronics* (13 May 1976) Frank N. Cicchiello describes a 555 timer circuit that automatically produces a 50 per cent duty cycle (1:1 mark-space ratio) to within ± 1 per cent. This circuit is shown in Fig 5 together with the timing component values for frequencies of approximately 0·1, 1, 5 and 50kHz. Fine control of frequency can be achieved by making R2 variable. R1 should be at least 10 times the value of R2. Circuit operation is governed by the formulas: $t1 = t2 = 0{\cdot}693\ (R1 \times C1)$ and $T = t1 + t2 = 1{\cdot}386\ (R1 \times C1)$. It is claimed that for values of supply voltage from 5 to 15V the output frequency should not vary from the values indicated by more than about one per cent and that the output is free of all switching transients.

The secret of this modified arrangement is that the time constants for both charge and discharge are set by the same



f (design) kHz	C1 µF	R1 (calculated) kΩ	R1 (actual) kΩ	f (actual) kHz
0·1	0·05	144·3	150	0·0962
1	0·01	72·2	75	0·962
5	0·01	14·4	15	4·81
50	0·001	14·4	15	45·3

Fig 5. A 555 ic timer that provides 50 per cent duty cycle (square wave) output. Time constants for both charge and discharge are set by R1 and C1

pair of components (R1 and C1) and the usual 555 discharge pin 7 is not connected.

Synchronous cw systems

The use of a synchronous cw system in which the start and finish of each symbol is accurately anticipated by the receiver has been described in *The Milliwatt* (and subsequently in *QST*) by Raymond Petit, W7GHM, as perhaps the ultimate in micropower systems; I referred briefly to the system in *TT* June 1975.

This work has led Chris Railton, G3YQV, to look into various possibilities of using such systems in connection with standard ssb transmitters and receivers. However, instead of A1 keying he notes that, for a given error rate, it is theoretically possible to work down to even lower s-n ratios by using F1 or, better still, differential phase shift keying which he suggests should have a 6dB advantage over A1.

At the time he wrote (I must apologize that this was a little while ago) he had already built a keyer clocked by a 1MHz crystal and using a cmos 14-stage divider to get down to 12·207Hz; as well as a modulator capable of producing A1, F1 and dpsk, and an A1 detector using incoherent correlation. Tests over a short rf link seem to indicate that the theoretical results are being achieved and he was hoping to extend the system to provide automatic synchronization and then to modify the detector to cope with dpsk. But he warns that, like Piccolo, receiver/transmitter frequency stabilities of the order of 1Hz are going to be needed, calling for crystal control on hf and probably a Droitwich-locked system on vhf. He would be interested to get in touch with anyone already experimenting in this fascinating field or who would be interested in doing so (Symphony, Elm Park Road, Pinner, Middlx HA5 3LE).

Digital frequency doubler

The use of ttl digital integrated circuits to provide frequency dividers is well known and widely used by amateurs in the construction of crystal calibrators, synthesizers and the like. But one seldom sees any circuits for frequency doubling. An exception is one by Gerald Vano in *Electronic Design*, 7, 29

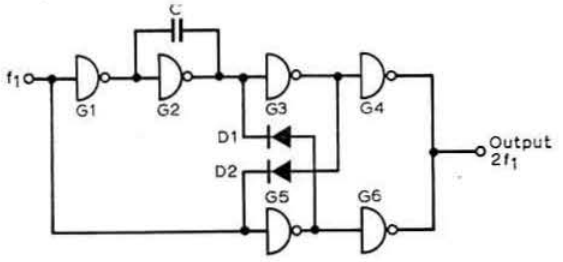


Fig 6. Digital frequency doubler using hex-inverter ic. It can operate between 1Hz and 100kHz. G1 to G6 hex inverter (eg MC840P), D1, D2 1N914, C to have reactive capacitance of 1,000Ω at input frequency derived from formula Xc = 1,000,000/(2πfC) where f is in hertz, C in μF and π about 3·14

March 1976. This system, Fig 6, requires a square-wave input, is stated to be limited to frequencies under about 100kHz, and provides an approximately symmetrical square-wave output.

It requires the use of six inverter gates such as those in various hex-inverter devices (eg MC84OP), a couple of 1N914-type diodes and a single fixed capacitor selected to provide a reactance of 1,000Ω at the input frequency. Where almost perfect symmetry is required the fixed capacitor may be padded with a series or parallel resistor.

The input signal is split into two components, phase-shifted by 90° (inverter gates G1 and G2 and capacitor C1). The four output gates are cross-coupled by D1 and D2.

It is claimed that this arrangement is very stable and that several such doubler stages can be cascaded if required.

More on car regulators

The item from John King, G4CFJ, on interference-free electronic car regulators (*TT* March 1976, Fig 7) has prompted Dick Halls, G3EIW, to add some further suggestions. He writes: "I had been thinking of pointing out that with a series diode in the line side and an electronic regulator fed from the battery, most generator car charging circuits could almost equal the results obtained from the average alternator. However, G4CFJ's circuit needs only one small change to achieve this result. If TR2 is fed from the battery via the ignition switch, the charge will start at much lower engine revolutions than when fed from the armature. Most alternators have a wound field fed from the battery which enables them to generate at low revs. A diode across the field may be a wise precaution to avoid possible damage to TR2."

Low-noise power MOSFETs

From time to time I have referred to the use of power fet devices, either as rf power amplifiers for transmission or for providing high dynamic range in receiver rf amplifiers or switching mode mixers. Recently Ed Oxner of Siliconix has drawn my attention to some interesting new devices just being introduced by his firm. One of these is the VMP4 "Mospower" device which appears to be especially suitable for medium power vhf amplifiers operating in Class A, B, C or D. This enhancement mode device is not only capable of providing over 10W rf output for 0·4W input at 144MHz, but is also exceptionally promising as a linear small-signal receiver amplifier with a noise figure of 2·3dB measured at 146MHz. A lower-price device in a TO5 package may appear before very long. Current price and availability in the UK are not known.

Typically, when operated from a 26V supply, the VMP4 may have a drain current of the order of 1·6A, and Siliconix claim that the device is immune to thermal runaway, secondary breakdown and can withstand any swr presented by a load; it is also rated at a minimum of 10dB gain at 200MHz.

Also in this series is the VMP-1 Mospower device for switching and amplification, for such applications as a relay driver with cmos logic or lamp driver with ttl, or two devices forming a transformerless audio amplifier.

Noise suppression with non-linear filters

Richard J. Harris, G3OTK, draws attention to an unusual technique that appears to have considerable promise as a means of eliminating impulsive noise spikes from signals, by operating as a form of "rate of change" limiter as mentioned before in *TT* and *ART*. A special low-pass non-linear filter has been introduced for such applications by the American firm Non-Linear Filters (UK agent Lyons Instruments Ltd of Hoddesdon, Herts), and its operation is fully described in *Bulletin IPI-1*. However, G3OTK has outlined some ways in which he believes that such a filter could be fashioned using standard integrated circuits: Fig 7. He writes:

"From reading the data sheet, I surmise that the method of operation is by using what is normally considered a nuisance in amplifiers, namely, 'slew rate limiting'. The filter faithfully reproduces the input waveform, without phase shift, provided that it is changing its amplitude with respect to time less than some critical rate (determined by the value of current sources charging capacitors). If this critical rate is exceeded by the input waveform, the filter is incapable of following it and its output will rise or fall linearly with time until the input waveform has slowed down sufficiently for it to catch up. Because this filter uses slew rate limiting, there is a direct relationship between the amplitude of the highest frequency sine wave that can be passed without distortion and its frequency, since the larger the amplitude and/or the higher the frequency the greater becomes the maximum rate of change.

"The manufacturers of this form of filter claim great things for the approach, particularly its ability to suppress impulsive noise (since it cannot slew its output fast enough to follow spikes) and they mention various applications such as filtering the audio output of communication receivers and reducing the effects of scratches on gramophone records (noise due to

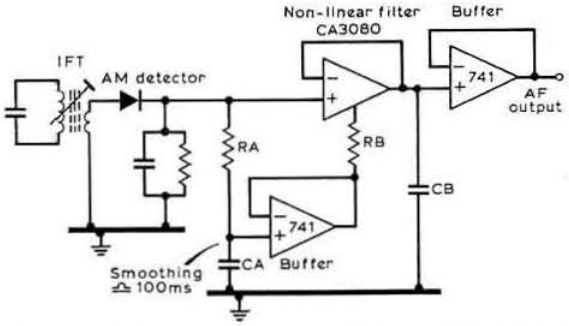


Fig 7. G3OTK's suggested non-linear filter used as a rate-of-change a.m. noise limiter

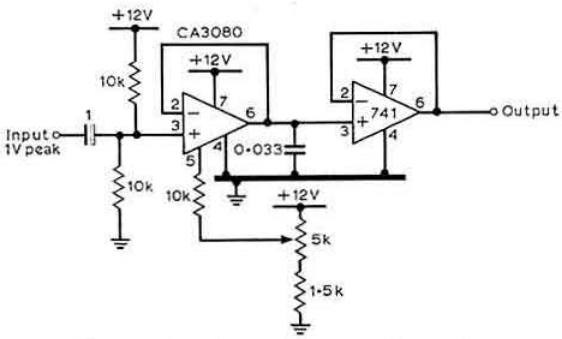


Fig 8. Voltage-tuned form of non-linear filter

scratches appears largely in the form of spikes and can thus be substantially reduced with this technique without reducing the audio bandwidth).

"The firm also manufactures a voltage-controlled version and, although the data sheet does not indicate the circuit techniques used, I have devised a simple circuit which will do this (Fig 8). This is based on the RCA operational transconductance amplifier type CA3080 which has a current drive output (rather than a voltage drive output typical of conventional operational amplifiers) the maximum value of which is set by an externally derived bias current. The bias current can be varied over a range of five to one by means of the 5kΩ potentiometer and, with the capacitor value indicated, corresponds to a filter cut-off frequency from 1 to 5kHz for a 1V peak sine-wave signal.

"To be effective as a noise limiter, the amplitude of the input signal must be kept under control since the cut-off frequency is a function of amplitude. This could possibly be achieved in the filtering of the audio output of a communication receiver, say, by placing the filter before the volume control and letting the agc hold the signal constant. Alternatively, some audio output could be rectified and smoothed and used to adjust the bias current of the filter in such a way that any variation in the cut-off frequency of the filter due to amplitude changes are cancelled. Fig 8 shows how this could be achieved to make an a.m. noise limiter/audio filter. Assuming 100 per cent modulation, the audio component peak value and the dc component due to the carrier are in a direct 1:2 relationship and the latter can be used (after smoothing with R_a and C_a) to set the cut-off frequency of the filter, in conjunction with R_b and C_b." This subject is also covered in *Electronics* 1 April 1976, pp 82-83.

Mobile safety

Last year (*TT* April 1975) Ian Mant, G8AVJ, drew attention to the danger of the beryllia contained in some silicon planar transistors. At "Communications 76", M. Arrowsmith of Pye added to this warning by writing: "Beryllia has a unique combination in that it is a good insulator but also a first-class conductor of heat. It is a hard, clean material which is normally perfectly safe to handle. However, beryllia dust is highly toxic and can prove fatal. Dust or chippings can be formed by accident or even deliberately by someone not aware of the danger. So where is one to find beryllia? How can it be recognized? An experienced engineer is likely to know that beryllia can be found in rf power transistors. On the other hand, exposed beryllia in the form of, say, washers is indistinguishable from ceramic. It is therefore important that all items containing this material be clearly identified in an equipment manual."

This seems a clear indication that beryllia may be found not only in some transistors but also, for example, in the form of washers used in the mounting of power transistors on a chassis or to heat sinks. It is well worth remembering this warning when dismantling or modifying solid-state equipment stemming from the professional market.

A check-list of safety factors for mobile radio designers also appears in this paper, as follows:

(1) Fixings on dashboard-mounted equipment should not be likely to break away under impact.

(2) No sharp edges.

(3) Recessed controls behind an impact-absorbing panel.

(4) Fire resistant grades of glass-fibre boards for printed circuits.

(5) No exposed beryllia.

(6) No components operated beyond their ratings.

(7) Adequate installation instructions with special advice to users with electronic fuel-injection systems or anti-skid devices.

In respect of item (7), M. Arrowsmith notes that there have been instances where rf from a mobile transmitter has resulted in the malfunctioning of electronic fuel-injection and anti-skid braking systems on trucks plus other less serious occurrences. In such cases, he points out, it is difficult to categorize either the transmitter or the electronic systems as intrinsically unsafe, though together they may form a potentially lethal combination.

Feedpoint impedance

Carl C. Drumeller, W5JJ, very rightly takes me to task for letting slip through in a recent *TT* a statement that clearly confused "radiation resistance" with "feedpoint resistance" or more correctly "feedpoint impedance" (in excuse, it did not affect the idea under discussion). As he points out: radiation resistance is the convenient fiction to describe the loss of power to space; it is determined by the configuration of the radiating device and by its environment. Feedpoint impedance is quite another matter. A half-wave antenna at a certain height above ground may have a feedpoint impedance of 73Ω at its centre. But that same antenna, with nothing done to affect its interface with space, can be delta fed from 600Ω open-wire feeders with a perfect match.

"There is no reason," he adds, "to confuse the two, yet often no distinction is made. It is no wonder that so many amateurs have such a hazy, even fuzzy, concept of antennas, feedlines, the junction between those two, and the effect of impedance mismatch at that junction upon the sending and impedance of the transmission line."

My apologies for adding to the fuzziness and I have humbly written out "radiation resistance is not feedpoint impedance" one hundred times. I feel almost as bad as I did at seeing that confounded 1971 April Fool joke of *Radio-REF* (the "NASA" audio filter for male and female voices) solemnly turn up once again in the June 1976 issue of *Ham Radio*! Luckily it was ascribed to NASA and not to *TT* or *Radio-REF*.

Feedback

If you are building Bob Heaton's transistorized OZ7BO keyer (May *TT*) you have probably already spotted that the RLA1 relay contact is shown open when it should be closed.

The Interference Survey

by J. W. SWINNERTON, G2YS
Chairman, Interference Committee

Origins

About five years ago two members of the RSGB Interference Committee, Ian Jackson, G3OHX, and Andrew Holloway, G3VUQ, paid a number of visits to local groups to talk on tvi matters, and they discovered that not only did the incidence of interference and attitudes towards it differ greatly from what was widely believed, but also that the persistence of such attitudes could be detrimental to the hobby. Comments such as "I never get any tvi because I don't operate during tv hours" or "I haven't tried any cures for tvi, so I just stay off" were all too frequent, and suggested that band occupancy was being reduced to a point at which the very retention of certain bands could be in danger.

It became apparent also that the figures given in the annual Home Office statistics for interference—while accurate to the base on which they were formulated—did not give the full story, because there could be many more cases where Post Office investigators were not called in: the amateur went off the air, the complainant refused an investigation, and so on. Yet the "official" figures were those to which equipment manufacturers referred when they wanted to show that the problem was a negligible one, no precautionary steps were called for, and the problem could be neatly "swept under the carpet". In this attitude they were—make no mistake—abetted by the inertia of amateurs themselves—we were our own worst enemies.

Clearly an investigation was called for, and it had to be valid both statistically and sociologically. So over a period of a year a questionnaire was devised, revised, tossed around and tested on "guinea pig" volunteers at club meetings. Again the sample results were assessed for validity; words altered here, meanings clarified there, until finally the survey in its published form (*Radio Communication* May 1975) was evolved.

Exhaustive—or exhausting?

No one claimed that the survey was anything but a compromise, with reasonable conciseness at some sacrifice of validity. While not entirely lacking in expertise, the Interference Committee was perhaps long on statisticians and short on sociologists. Many questions went unasked, not because the committee did not think of them, but because they would have extended the survey to a point where many members would either not have attempted it or their enthusiasm and interest would have waned long before the end, so leading to minimal or distorted returns. The compromise *had* to be such as to induce as many members as possible to complete and return the form. A return of 1,221 forms (at members' own expense) was just sufficient to give a result which could be related reasonably to the amateur "population".

Readers may have wondered why the results have taken so long to publish. In the first place, it was decided to allow a full measure of time for returns to come in, and in fact they were still coming in four months after publication. Second, there were over 30,000 separate entries to be checked and cross-checked. Certain questions were framed so that they checked the validity of others—this is a usual sociological technique—and apparent inconsistencies had to be studied and evaluated. All this takes time, and the final reckoning has to be "synoptic"—this enormous task was undertaken by Ian Jackson, and the results are a tribute to his energetic pursuit of knowledge in the service of his fellow-amateurs.

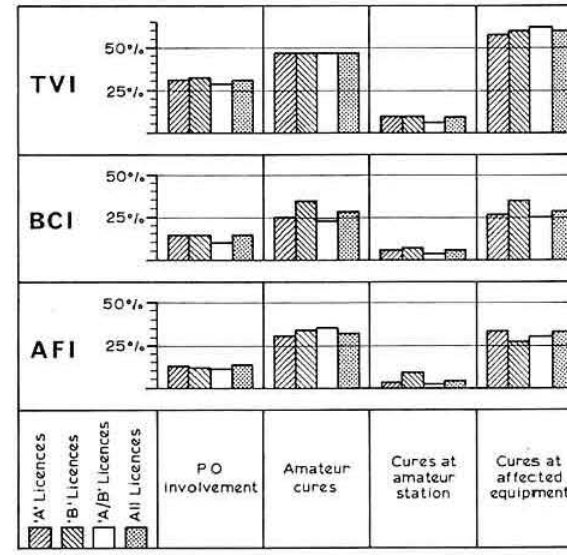


Fig 1. What the survey showed

A matter of form

As a nation we are perhaps becoming "form-happy", so it is not surprising that some answers showed evidence of confusion. At the same time there appeared an overwhelming desire to be helpful, and many found it well-nigh impossible to confine themselves to pure statistics. It seemed that blank spaces just *had* to be filled: to write "cure not completely successful" was apparently more satisfying than putting "0", but it did involve that much more time to sort out a true answer. Those who wanted to "spread themselves" were given Section 5, but not everyone cared to use it. One enquiry was, "Why no space for callsign?" Those who wished to preserve their anonymity were given the opportunity to do so—the enquirer answered his own question by signing his own name and callsign in Section 5.

All Section 5 comments were welcomed, and were closely studied whether complimentary or critical, but it is emphasized that the survey was primarily statistical: anyone who would like to write to the committee at length is welcome to do so. It does seem, however, that the opportunity was missed to enquire about "tvi in reverse" from line time-base radiation; this is a wider problem than was believed at the time. Perhaps it is appropriate here to draw members' attention to the "no interference" clause on the back of the television receiving licence, which has yet to be tested, but could with advantage be pointed out to the owner of an offending receiver. Who wants to take it from there?

The comments gave a revealing insight into members' attitudes, and were often not without humour. But they also

betokened a negative attitude that *must* change if we are to overcome the interference problem. Those who fail to grapple with their breakthrough cases are doing a disservice to themselves and to their fellow-amateurs: by staying off the air they are inviting other interests to take over our bands by default. Here are some typical comments:

"*The PO engineers suggested the fitting of several filters of which I would have to pay the cost. As a result I have gone voluntarily QRT.*" This appears to be an incorrect assumption; why was the Society's assistance not sought?

"*Station operation is at times and in a manner convenient/acceptable to the party suffering interference.*" Perhaps the amateur likes to be dominated?

"*Relationship already strained for other reasons; have cut operation severely to prevent upsets.*" Intimidation by a bully?

"*Messrs—— said their equipment could not be at fault, so with owner's permission fitted chokes and capacitors in ls and pu leads—instant cure.*" We hope the details were "leaked" back to the manufacturer!

"*. . . colour tv which the manufacturer admits to but is not prepared to do anything about.*" Again no reference to the Society—how can we "educate" the manufacturers without evidence?

"*My experience is that the cure is never complete. Audio systems are impossible to correct if transistor types.*" Secure in his knowledge, or in the lack of it?

"*One always feels that someone is suffering in silence.*" And the tv manufacturer is laughing all the way to the bank.

"*My only trouble was with a very objectionable neighbour, now happily removed.*" We had our moments!

The findings

It is impossible to encompass the full report into the pages of this journal, but some tables are given which illustrate some of the results evolved. Members and organizations wishing to study the full report can obtain copies at 60p each on application to the general manager at Society headquarters.

The return of 1,221 forms represents just under 10 per cent of licensed RSGB membership, or about 5·7 per cent of all UK licensees, and provides a cross-section from which reasonably valid inferences can be drawn relative to the whole amateur "population".

From Table 1 it can be seen that 10 per cent are "severely worried" about causing interference. If this leads the group to curtail or abandon operation then band occupancy could be curtailed by some 2,000 over all bands. The implications for vhf/uhf bands could be serious, since other interests are casting envious eyes upon them, and a lack of activity by 500 Class B licensees alone would leave "wide open spaces".

Band problems (Table 2) reveal that 1·8MHz is least troublesome, whereas 3·5MHz is beset with problems, as is 144MHz. The widespread use of fm on 144MHz does not avoid difficulty for 31 per cent of Class B licensees on this, their most popular band. The 70MHz band is relatively unpopular with "B to A" licence graduates, probably because they are busy exploring the newfound delights of the high and lower frequency bands, and wish to avoid interfering with fm broadcasting.

Amateurs living in a "wired tv" area represented about 10 per cent of the total, but their interference problems were not significantly different from their "receiving off-air" fellows. If they did "leak" into a wired system the results could be devastating, but usually one cure cured all.

Post Office investigators were involved in about 30 per cent of cases of tvi, and this fact is important relative to the figures published in *Technical Topics* in the September 1975 issue of *Radio Communication*. If the PO deals with an average of 1,044 cases yearly it appears that *some 2,436 more are never reported to the PO*. Of the 3,480 cases each year, the amateur himself cures 1,600. Assuming that the PO cure *all* cases referred to them, then some 836 cases (24 per cent) remain uncured each year. Since only nine per cent of tvi cases were cured by modifications to the amateur station, it would seem that set manufacturers have a lot to answer for. The average amateur has an 83 per cent chance of having tvi problems, but a 50–50 chance of curing them by fitting an external filter. So why do not the manufacturers *incorporate* the filter and at a stroke reduce the man-hours of PO work and the threat to good-neighbourly relations involved?

As for radio interference, it is found that the PO was involved in only 14 per cent of cases. The *actual* number of cases was therefore nearer to 721 than the PO figure of 101 per year, with 418 uncured. Only 5·1 per cent of bci was cured by station modification. Cures at the receiver were effective in only 46 per cent of cases, probably because so many listeners use spurious-response-prone a.m. portables.

Table 1. Concern over interference problems: percentage of all licensees

Answers to Question 3	All licensees	Holders of Class A licences	Holders of Class B licences	Holders of Class A/B licences
Not worried	25·96	24·61	32·8	21·83
Slightly worried	36·45	37·88	32·0	35·92
Moderately worried	25·75	26·78	21·2	27·46
Severely worried	10·07	10·25	9·2	10·56

Table 2. Restriction of operation by bands: percentage of all licensees

Band (MHz)	Interference known to occur (%)	Interference feared—not proved (%)
1·8	5·05	2·27
3·5	19·67	7·52
7	13·29	5·15
14	21·22	9·17
21	23·59	13·08
28	19·98	10·81
70	7·21	5·46
144	15·15	3·19
432	3·36	1·97

Table 3. Incidence of interference by types

	Percentage with no interference of any kind	TVI Percentage with none	TVI Cases per licensee	BCI Percentage with none	BCI Cases per licensee	AFI Percentage with none	AFI Cases per licensee
All licensees	8·76	17·36	2·65	55·61	0·86	32·93	1·24
Class A	7·6	16·04	2·72	55·24	0·88	32·93	1·24
Class B	14·0	24·0	2·3	63·6	0·68	38·8	1·06
Class A/B	6·4	13·38	2·83	43·66	1·04	22·54	1·62

The audio scene

From correspondence addressed to the committee, it is evident that afi is becoming an increasing problem. While audio equipment is unlicensed and therefore unprotected, there is nevertheless a degree of PO involvement reported. This may be because engineers are already visiting complainants to clear tvi/rfi cases, but it also suggests a commendable willingness on the part of the engineers to be helpful. Since audio-only equipment is by definition not a receiver, blame for pick-up rests squarely on the lack of protective devices incorporated in the design. Only four per cent of all cases

(Continued on p 524)

22nd International VHF Convention

Almost 1,000 people from all parts of the UK, and from France, Germany, Holland, Italy, Japan and the USA, attended the 22nd International VHF Convention, which this year was held for the first time at Brunel University, Uxbridge, on 8/9 May. The facilities at the new venue were first class and confirmed that the event had outgrown its previous venue. The additional space for formal and informal activities, the excellent catering arrangements, and, for the over 100 visitors who stayed overnight, the accommodation, were greatly appreciated by all who attended.

Opening addresses

The convention was opened by Dr E. J. Allaway, G3FKM, RSGB President, who spoke on the role of the Society in promoting the general advancement of amateur radio. He pointed out some of the Society's achievements in recent years, particularly those resulting from its relationship with the licensing authority, such as Class B licences, extended microwave allocation, and permission to establish and use repeaters. A continual dialogue is maintained with the Home Office and the Society is appreciative of the rapport which results from this.

Research into microwave propagation was being led by the RSGB, and the beacon network was part of an international project conceived by the Society. The Society's publishing activities were in the forefront of the field in range and quality, amply illustrated by the considerable demand for the Society's books overseas as well as in the UK.

Dr Allaway concluded his opening address by referring to the 1979 World Administrative Radio Conference. He warned that bad behaviour by a minority on the air might well contribute to the loss of amateur frequency allocations to other services at the conference.

This reference served as an introduction to the next speaker, Mr R. F. Stevens, G2BVN, the Society's Telecommunications Liaison Officer, who outlined the work the Society was doing in preparation for WARC. A major brief was being prepared for the UK representation at the conference to justify the present amateur frequency allocations and prepare a case for greater allocations in future. Efforts were being made to reach agreement with other users of the frequency spectrum so that the UK delegation could present a composite plan at the conference.

He pointed out that the RSGB would have no vote at WARC: the delegations would consist of representatives of the 148 countries who were members of the International Telecommunication Union, each of which would have one vote irrespective of its size or standing in the world. The duty of the Society was to impress upon our own country's delegation and, through the International Amateur Radio Union, the delegations of other countries, the value of the amateur radio service. This was particularly important in those countries which did not look favourably upon the service. The IARU represented all but some 3,000 of the world's radio amateurs, including those who are not members of national societies, and G2BVN concluded by saying that whatever the outcome of the conference, it could not be said that the amateur radio service had not done its homework in preparing its case for the deliberations which will take place there.

Delving among the trade stands

The Saturday lectures

With the end of the opening addresses, the three lecture streams got under way. The scope and variety of lectures (14 sessions in two days) meant that there was something for everyone; the only problem for those with a wide interest was that it was not possible to be in three places at the same time.

One thing the GB3SN group does not lack is enthusiasm for its project, and this came over strongly in the first lecture in Stream A. Particularly interesting was the amount of thought devoted to the psychology of operating, and the way that the knowledge gained had been built into the repeater. This sometimes gave GB3SN the appearance of almost human behaviour and judgement, justifying the nickname "Susan" given to the repeater. The audience was given a wealth of information on the operation of the Hampshire repeater, and the point was made that not only did the device provide a means for amateurs to contact each other, but it was also a vehicle for technical research and the study of the psychology of operating.

Peter Blair, G3LTF, gave an informed and fascinating talk on the technique and technicalities of moonbounce operation. The intriguing aspect of this mode to G3LTF is that the path is just, and only just, possible using equipment that amateurs can reasonably be expected to obtain or construct. He demonstrated the calculations necessary to ascertain whether a given system was capable of being successfully used in eme experiments, showing that the problems increase with the reduction of frequency. He discussed the various problems of background noise, libration fading, Faraday fading and Doppler shift, and gave his views on the various aerial systems used. As a final tip G3LTF suggested a method of checking whether a receiving system was really good enough for serious moonbounce work: incredible as it

may seem, a good system will "see" the star Cygnus some 1·5dB above noise.

While these lectures were taking place in Stream A, Stream B was devoted to Oscar, with Pat Gowen, G3IOR, and Brian Bower, G3COJ, each giving a lecture on various aspects of this fascinating means of communicating over vast distances.

Stream C was devoted to the microwave bands with lectures on 1·3GHz ssb by C. W. Suckling, G3WDG, and K. S. Hutchinson, G4ALN; and getting going on 10GHz by G. D. Lean, G3WJG, and P. M. Tunbridge, G8DEK.

The trade exhibition

Once again the convention was well supported by traders, who took advantage of the increased floor area to display their wares to the best advantage. Despite the attraction of the lecture programme, the trade area was the focal point for most of the visitors, who crowded into it throughout the Saturday.

Some 25 firms were present, among them nearly all the well-known names in the amateur market. The list of these is too long to detail here but, being leaders in the field, most are to be found in the advertising pages of *Radio Communication*. Inevitably, Japanese equipment was much in evidence, but it was pleasing to note that more British firms are manufacturing products in the over 30MHz range.

The RSGB bookstall had a queue for much of the day, as visitors made their purchases from the comprehensive range of RSGB and other publications on sale. The best-seller was, of course, the just-published third edition of the RSGB *VHF/UHF Manual* which had been long awaited by those whose interest lies in that part of the spectrum; the demand was so great that further supplies had to be delivered on the Sunday morning.

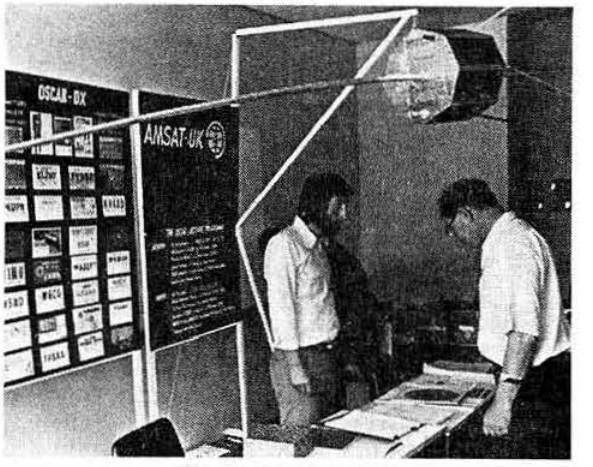
Dining and dancing

Well over 200 people rounded off the first day of the convention at the dinner and dance held in the evening. This was greatly enjoyed for its most excellent meal and the ample space available for dancing—or just for rag-chewing, once again demonstrating the advantages of the new venue.

The guest of honour was Dr J. A. Saxton, CBE, an Honorary Member and Past-President (twice) of the Society, while among the distinguished guests were Lord and Lady Wallace of Coslany, Mr C. E. Godsmark of the Home Office and Mr L. E. Howes, G3AYA, editor of *Practical Wireless*.

Dr Saxton, proposing the toast "The RSGB", congratulated those responsible for organizing this most successful convention. He stressed a need for a strong RSGB. Demands for the allocation of frequencies had to be justified, and although individuals use the amateur bands, they cannot represent themselves at international level. This would only be done by the Society and the IARU. In this connection he praised the work of the Society's Telecommunications Liaison Officer, G2BVN, who is also secretary of IARU Region 1.

Responding to the toast, the President of the RSGB, Dr E. J. Allaway, G3FKM, confessed (to good-natured cries of "shame") that he had not yet operated on vhf but hoped to remedy that some day. He spoke of his recent visit to the USA when he had the honour of attending the IARU conference in Miami when all three IARU regions had met to prepare a concerted policy for WARC 79. He had noted the surprising lack of interest in vhf in the Americas, with the exception of the USA, and the phenomenal growth of the Citizen's Band with its attendant danger of the media confusing its users with radio amateurs. He concluded by reminding his audience that it was up to amateurs themselves, by radiating clean signals and conversation, to give themselves the best possible chance of retaining and extending their frequency allocations after 1979.



The AMSAT-UK stand

The formalities of the dinner concluded with the presentation of the following awards and trophies by the President: the John Rouse Memorial Trophy to G8DLZ for his excellent 144 to 1,296MHz low-level mixer; the Surrey Trophy to the March & District RAS, winners of the 1975 VHF NFD; the Mitchell Milling Trophy to the Bognor University team GW3UCB, winners of the 144MHz Open Contest; the VHF Manager's Trophy to the Golden Valley Contest Group, winners of the 1975 70MHz Open Contest; and the J. Fraser Shepherd Prize to G3WJG for the technical excellence and boldness of approach of his experimental 10GHz transmitter.

Finally, before the dancing commenced, the draw for the lucky menu number took place with prizes for both ladies and gentlemen.

The Sunday lectures

The convention continued on the Sunday with three lecture streams. In Stream A, Angus McKenzie, G3OSS, discussed audio distortion in transmitters and receivers. As a professional audio engineer, G3OSS is well qualified to talk on this subject, and with the help of tape recordings he gave a fascinating lecture. His experiments to show the improved readability of signals in noise with proper clipping and limiting were most impressive, and he demonstrated that it was possible to copy speech solidly up to 4dB below the noise level. He described some of the elementary design faults in imported commercial equipment, and the effects of these in terms of the hash and spurii transmitted by certain 144MHz "black-boxes".

This was followed by an open forum with members of the VHF Committee and VHF Contests Committee dealing with various subjects raised from the floor. There was lively discussion and no shortage of questions. Contests questions ranged over a wide field from mixed "dx" and "local" con-

tests on 144MHz to scoring methods and selection of dates. Several questions to the VHF Committee dealt with the way that WARC was likely to affect the vhf/uhf spectrum.

Stream B again dealt with Oscar, with lectures by David Wallard and Martin Sweeting, G3YJO, followed by a general discussion on Oscars.

Microwaves was again the subject of Stream C, and included lectures on microwave Yagis by Mike Walters, G3JVL, and on microwave dishes by Dain Evans, G3RPE.

Finale

So the convention ended, and all agreed that in the history of VHF Conventions the 22nd had been the best yet.

The Society would like to thank all those who worked so hard to make the event such an outstanding success. □

UK REPEATER STATUS

(Compiled by RSGB HQ)

Callsign	QTHL	QTH	Chan*	Notes
GB3PI	AM71F	Barkway	R6	
GB3BC	YL35A	Myndd Machen	R6	
GB3MH		Malvern Hills	R7	
GB3LO	ZL5OE	Crystal Palace	R7	Operational
GB3SN	ZL75B	Fourmarks	R5	
GB3PO	AM77J	Martlesham	R3	
GB3NA	ZN33A	Barnsley	R3	
GB3CS	YP01E	Blackhill	R6	Licensed—operation Aug/Sep 76?
GB3HH	ZN6IA	Buxton	R4	Operational
GB3LT	ZL08D	Luton	RB10	Licensed—operation unknown
GB3NB	AM18A	Bacton	R7	Licence refused by HO
GB3PY	AM61A	Cambridge	RB14	Operational (434·95 i/p)
GB3BM		Birmingham	R5	Operational
GB3NC	YK56B	St Austell	R5	
GB3GN		Aberdeen	R7	Awaiting complete proposal
GB3TR		Torquay	R4	
GB3NI		N Ireland	R5	Proposal just received
GB3RF	YN19E	Burnley	R7	Awaiting licence from HO
GB3KR	AL67D	Dover	R4	
GB3WW	XL30A	Carmel	R7	Licensed—operation unknown
GB3MP	YN64A	Moel-y-Parc	R6	Operational
GB3LI		Liverpool	RB6	UHF Phase 2 (awaiting proposal)
GB3ER		Danbury	RB10	Licensed—operation July 76?
GB3CI		Corby	RB2	Operational
GB2SD	YK38A	Portland	RB14	Licensed—operation unknown
GB3IH	AM76C	Ipswich	RB4	
GB3HR	ZL29F	Bushey	RB14	
GB3NS	ZL59C	Banstead	RB10	
GB3BD		Bedford	RB4	Operational
GB3PH		Portsmouth	RB2	Licensed—operation unknown
GB3WS	AM74C	Sudbury	RB6	Operational
GB3BR		Brighton	RB6	Licensed—operation Aug/Sep 76?
GB3LV		Cheshunt	RB2	Licensed—operation 26 June 76?
GB3CB		Birmingham	RB14	UHF Phase 1 (awaiting licence)
GB3HU	ZL29H	Hull	RB10	Licensed—operation unknown
GB3CH	XK27C	E Cornwall	RB2	UHF Phase 2 (awaiting proposal)
GB3MR	YN60C	Manchester	RB4	Operational
GB3LW	ZL40E	Central London	RB6	Licensed—operation unknown
GB3LL	YN52D	Llanddulas	RB4	Operational
GB3SH		NW Kent	RB4	UHF Phase 1 (awaiting licence)
GB3TW		Tyne and Wear	R5	Awaiting complete proposal
GB3EK	AL48F	Margate	RB2	Licensed—operation unknown
GB3ME		Rugby	RB6	
GB3GL		Glasgow	RB14	UHF Phase 2 (awaiting proposal)
GB3ED		Edinburgh	RB14	
GB3BN		Bracknell	RB4	
GB3BS	YL48A	Bristol	RB10	
GB3FC		Fylde Coast	RB2	
GB3PF		Pendle Forest	RB6	
GB3NH	ZM66A	Northampton	RB14	
GB3ST	YN80E	Stoke on Trent	RB2	Operational
GB3KL		Kings Lynn	RB4	UHF Phase 2 (awaiting proposal)
GB3NR		Norwich	RB2	
GB3YL		Yarmouth	RB14	
GB3MW		Bushey	23cm	Awaiting proposal
GB3LE		Leicester	RB10	UHF Phase 2 (proposal received)
GB3HP		Aylesbury	RB2	UHF Phase 2 (awaiting proposal)
GB3WY		Queensbury	RB10	
GB3BK		E Ilsley	RB6	
GB3CR	YN75A	Mold	RB6	UHF Phase 2 (proposal received)

* R = VHF repeaters; RB = UHF repeaters

The Interference Survey

(continued from p521)

were cured by modification to the amateur station, and this was most likely to involve re-positioning of the aerial to reduce strong local field strength. In 33 per cent of cases it was necessary to modify the audio equipment internally; 18 per cent externally. Thirty-three per cent of respondents reported "No afi", but with the replacement of old valve-type audio installations by transistorized music centres the problem will increase unless manufacturers raise their immunity standards.

"Funnies"

Some members encountered problems outside the expected limits, and the range may well not be exhaustive. Here is a selection:

"One residence is affected—it has a damp-proofing consisting of an alloy foil under the plaster. The owner also suffers QRM from Gas and Electricity Board mobiles."

"Operation caused an electric clock to speed up."

"RF pick-up into a transistorized central heating programme controller caused the heating valve to malfunction".

"A case of deaf-aid interference (NH model); only cure is to switch off while person walks by".

And a possible case of ttvvii?:

"Many people round here look at two stations at once" (sic).

To sum up

From the returns it is possible to formulate a picture of "Mr Average Amateur". If he experiences any interference problems at all, he suffers about three cases of tvi (his own tv and two others?) a case of bci and two of afi.* He is not entirely convinced (as he should be) that interference *can* be cured, and he is too prone to fears (often unfounded) that limit his operation. Many of his cases are not reported to the PO, so that the Home Office statistics understate the problem to a considerable degree. This is fortunate for the complacency of the manufacturers, who continue to deny that any problem exists. With the growth of private radio services (including amateur) the problem can be expected to increase, and Mr Average Amateur can expect the situation to get worse before it gets better, unless he faces up to it squarely by (a) *using* his equipment; (b) facing up to interference problems, technical and social; (c) keeping in touch with the Society and seeking its help in difficult cases.

It is accepted that the statistical analysis of the survey has not been pursued to its possible limits, but the committee did not wish it to become a purely academic exercise, and any social statistician who wishes to delve further into the data is at liberty to do so if he undertakes to acquaint the Society with his findings. The full data and comments run to 18 pages and Ian Jackson has devoted much time and energy to produce the results outlined above. Members of the Interference Committee are thanked for their many hours' study of the returns, individually and collectively. And of course without the help of those 1,221 members the committee would have had nothing to study.

Perhaps the final word goes to a member who wrote: "I think interference should be regarded not so much as a nuisance as a challenge to cure it." And so say all of us! □

*However, these are unlikely to be the result of defects in his own station.

microwaves

Dain Evans, G3RPE*

Microwave round table

The sixth microwave round table will be held on Sunday 18 July at the IBA Engineering Headquarters, Crawley Court, five miles NW of Winchester, about half-a-mile off the A272 road to Stockbridge. Those attending these events generally arrive between 10 and 11am, and sandwiches and coffee are available.

There have been a large number of requests for another session on 10GHz, and it is therefore proposed to ask the question "Where next on 10GHz" during the morning discussion period and hopefully to come up with some stimulating answers. During the afternoon, a session for the testing of visitors' equipment is planned. There will be plenty of time for that all-important activity, chatting, and if past meetings are a reliable guide there will be a good selection of "junk" to be redistributed.

The G3JVL loop-Yagi

One of the more significant advances on the lower microwave bands in recent years has been the development of high-gain Yagi aerials which are much easier to use than dishes of equivalent gain. An example of a successful design is the G3JVL aerial, the design of which was first given in *Microwaves* (January 1975) and included in the third edition of the RSGB *VHF/UHF Manual*, p8.49. Judging from numerous letters received from many countries, this seems to be another of those special designs—like the K6AXN converter, for example—which have acted as the spur to developments on an international scale.

G3JVL has continued to develop this aerial and in his lecture at the recent VHF Convention made the following points:

(a) An additional director identical to the others can be fitted mid-way between elements numbered 6 and 7 in the figures. This means that the number of elements spaced at 1·78in is increased from two to four. The effect of this change is to increase the gain of the aerial by about 0·5dB and slightly to improve the quality of the match.

(b) During the original design work, it was found empirically that improved results were obtained if the height of the radiator strip was made less than its width by about $\frac{1}{4}$in. More recent work shows that this effect is associated with the length of the balun rather than with the radiator itself. Now that this is understood, G3JVL recommends the improved mounting of this element shown in Fig 1. In setting up the aerial, the length of the balun is adjusted for maximum gain or best match, and the radiator and the outer of the coaxial cable are then soldered to the bolt.

(c) As a result of much work with G8DIC, G3JVL suggests that the optimum stacking distance between two or four of these aerials is 3λ, that is 27in at 1,296MHz. Two aerials can be stacked either above or alongside one another: four are conveniently mounted at the corners of a square. The mounting supports interfere less if they are at right-angles to the plane of polarization so that the supports for a four-element system, for example, are best in the form of an H rather than a square. Suitable coaxial combiners are described in *Microwaves* (December 1974, p857) and the *VHF/UHF Manual*, p8.49. Stripline versions are given in *Microwaves* (December 1975).

(d) The diameter of the boom does not appear to be particularly critical. Indeed, at least one person seems to have been successful with material of square section. This perhaps could be expected because the geometry of this aerial tends to separate elements from the boom. What does appear to be critical is the thickness of the strip used to form the elements. This can be reduced from the design value (or the scaled value) without effect, but increasing its thickness results in a significant deterioration in performance. The reason for this characteristic is not yet known.

Readers will be pleased to hear that the development of these aerials continues.

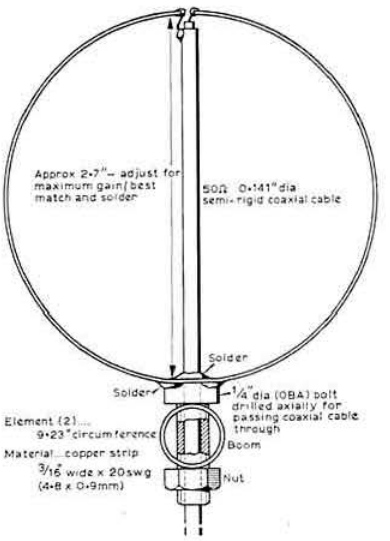


Fig 1. Modified radiator element for the G3JVL loop-Yagi aerial

A London 10GHz beacon

The proposed 10GHz beacon for the London area, GB3LBH (London Borough of Havering), is progressing well. G4ALN reports that the building and testing of the hardware is virtually complete, and if there is no undue delay in finalizing the licensing arrangements the beacon could well be on the air in August. It consists of a 150mW Gunn oscillator on 10,100MHz feeding a 10dB aerial of nominally omnidirectional characteristics. It will be sited in Romford 70m asl on top of a council building. The take-off is clear north to the Epping Ridge, south to the North Downs and west right up the Thames Valley. Eastwards, the first land mass beyond the horizon is Holland and Belgium, and it is perfectly possible that the beacon will be heard in those countries when conditions are good for super-refraction. A most interesting prospect.

The same group is currently considering the possibility of converting this beacon into a repeater, initially cross-band from 432MHz and later in-band at 10GHz.

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4-2-70

Martin Dann, G3NHE*

Expeditions

The Martlet Contest Group, G4DZO, will be active on 144MHz and 70MHz from the Western Isles of Scotland during the week commencing Sunday 25 July, and they hope to operate from the Isle of Arran in the 144MHz QRP Contest on 25 July. They would be pleased to hear from anyone with suggestions for islands to visit on their trip, and would welcome sked requests. Suggestions and requests should be sent to Dave Harmer, G4AOL, 10 Paddock Gardens, Wannock, Nr Eastbourne.

The RAF Sealand club, GW3ITZ, intends to operate three stations during VHF Field Day from Carleton Fell, near Burrow Head in south-west Scotland. They will be active on 144, 432 and 1,296MHz.

From 20 July to 1 August inclusive, Gregg Gilman, G3SCP, will be QRV on 144MHz ssb/cw from Luxembourg at almost any time of the day or night. However, the specific frequency and listening times when G3SCP/LX/P will be certain to be on are: Saturday 24 July, 1800gmt onwards and Sunday 25 July all day, frequency 144·24MHz ssb or cw. If conditions are good and things get hectic, Gregg will operate split frequency, high or low in 10kHz steps as indicated. G3SCP may be asking for calls from QTH locator squares and asks stations to wait for their own square to be called, and not cause unnecessary QRM. The location of G3SCP/LX/P will be near Clervaux, the old G3BA/G3BHT site.

We now have the detailed itinerary of the G3VCT/G4ALG expedition to Scotland in August on 432·22MHz (GM3VCT/P) and 70·22MHz (GM4ALG/P). Locations will be: 2nd, Dumfries and Galloway; 4th, Strathclyde; 5th, Highland; 7th and 8th, Grampian; 10th, Central; 11th, Lothian; 12th, Derbyshire. There is also the possibility of operation from North Yorkshire on 1st depending on how the travelling goes on the trip up from Reading. Operation will be on ssb (1800–2100gmt) and cw (2100–2200gmt) and morning skeds between 0600 and 0700gmt can also be arranged. Sked requests should go to G4ALG, QTHR, who mentions that 1·3GHz gear might also be available.

Two metres

Harold Meerza, BRS34348, reports good reception on a loft mounted 4-el of 144MHz signals from EI9Q, the distance from Chatham being over 500km. At the Irish end Dick Madigan runs 200W to his 6-el quad and is very satisfied with this aerial; he is even considering stacking two of them. EI9Q finds that he can work into the London area whatever the conditions from his Dunmore East location (WM65d), which is some 370ft asl.

Four metres

G4CVI concurs with G3LVP in wishing that remote stations would keep well clear of calling channels on 70MHz. What might appear to be a quiet channel to a GM on 70·2 or 70·26MHz is anything but quiet at Richard's QTH in Leatherhead, or any other location near centres of activity. One answer is for such stations to settle on a frequency well away from the calling channels on which to call, and give as much publicity to that frequency as possible. To this end we are always happy to publish preferred spot frequencies of any out-of-the-way stations on this or any other vhf/uhf band.

GD3YEO reports that he has built himself a prototype 70MHz converter and a 3-el beam on which he is able to copy the Buxton repeater, GB3SU. Richard Rimmer's problem, however, is the proximity of the local Channel 5 tv transmitter, about one mile away, which puts birdies and noise all the way up the band. He hopes sometime to build a high-Q break to see if that solves the problem, and is now looking for a long, long box in which to construct it!

One of the more remote stations we mentioned earlier is GW3XJQ, of Tenby in Dyfed, who has recently come onto 70MHz ssb and cw. He runs a '6–40A into a 4-el beam, and on the receive side a Microwave Modules converter. Take-off from his location is not too good, particularly to the north-east, but GW3XJQ would welcome beams being turned in his direction from time-to-time.

FM channel

Following the long-awaited granting of the GB3CS licence, the Central Scotland FM Group hope to have their repeater operational by August or September of this year. However, if it is possible to achieve an earlier date without cutting corners this will be done.

Progress with East Kent 432MHz repeater GB3EK since the granting of the licence in April has been held up by paperwork concerning permission to erect aerials on a tower block in Margate. When operational GB3EK will be on RB2 (input 434·65, output 433·05MHz).

After the "in principle" agreement by the HO to the GB3KR 144MHz Dover repeater, it is expected to be around six months before the licence itself is issued and the repeater goes into operation. The Kent Repeater Group intend to follow up recent successful coverage tests on R4 with further demonstrations during the summer.

Buxton repeater GB3HH, located at the same site as 70MHz beacon GB3SU, continues to operate in the beacon mode. No firm date can yet be given for commencing operation as a repeater, the main delay being caused by the wait for the cavity filters to be plated. The logic circuits have already been tried out on the Barnsley repeater GB3NA with some success.

G2AYQ would like us to remind readers who may be holidaying in the south-west that the Cornish repeater, GB3NC, has been in operation since 5 May on Channel R5. It seems to give good coverage in Cornwall, Devon and South Wales, and several French stations have been heard working through it.

GM3XNE (Ardrossan) reports excellent reception of the Moel-y-Parc repeater, GB3MP, at his QTH in Ayrshire (XP27d) during the good conditions at the beginning of June. He heard it being accessed by fixed and mobile stations in G, GI, GD, GW and GM. It is also understood that during the same lift Continental stations were being worked by GI through the Cornish repeater GB3NC.

Barry Chambers, G8AGN, of Sheffield, has submitted the first proposal for a beacon on the 3·4GHz band. The proposed frequency will be 3,456MHz, the callsign GB3UOS

* 49 Windermere Court, North Anston, Sheffield S31 7GJ.

and the location north-west of the city of Sheffield, about 400ft asl. ERP would be 10W nominal, modulation wideband F2, and the aerial a waveguide slotted array, nominal gain 10dB, horizontally polarized with a figure-of-eight polar diagram, main lobes north and south. The transmitting gear would be a 384MHz exciter, ×3 to 1,152MHz by varactor, and ×3 again to 3,456MHz by varactor, with interdigital filter and solid-state callsign generator.

The art of abbreviation

It is always pleasing to hear brand-new Class A licensees braving the bottom end of the 144MHz band and using their newly-acquired telegraphy skills. However, one sometimes wonders how much they have actually *listened* to real amateur cw QSOs before gaining their full licence. It seems to the writer (although he confesses to being somewhat out of touch with the hf bands these days) that the lack of knowledge of standard amateur cw abbreviations is a phenomenon peculiar to vhf, for in the days when G3NHE pounded the brass on the lower frequencies the new arrivals on the bands appeared to spring to the key fully equipped to both comprehend, and use, all the time-saving tricks of the mode. Perhaps the opportunity to listen to cw QSOs is very much less for the vhf than the hf listener.

If proper abbreviations are used it is possible to sit back and read a QSO partner's morse faster than it can be written, which is why some older hands find the laborious spelling-out of every letter of every word almost painful. The sort of shorthand to which we refer is the standard "ur" for "your", "hw" for how, "tmw" for tomorrow, "tnx" or "tks" for "thank-you" etc. The list is almost endless and there is not sufficient room here to produce a dictionary of abbreviations. In any case, most of them are no more than common-sense, and where the context makes comprehension inevitable, a considerable degree of inventive shortening can be used without affecting intelligibility.

We would hasten to add that we would rather hear a new telegraphist spelling out every word in full, than not appearing on the key at all; we only suggest that the use of the mode can be made so much more easy, efficient and enjoyable by the intelligent use of abbreviations and amateur conventions.

Technical corner

GW5BPC passes on a tip for improving audio quality by cutting low frequencies on an fm transmitter. The presence of these frequencies can sometimes cause an unintelligible mumble when transmitting through repeaters, and GW5BPC has found that a 50μF capacitor between his microphone and the speech amplifier input effects the necessary cure. Joachim also suggests the use of the base-collector junction of a "dead" silicon transistor in place of a varicap diode in an fm transmitter.

We often hear of the problems caused by strong local stations causing desensitization and cross-modulation of the receiver, and one answer to this problem has been built by G3IPV. He now has a vhf receiver with a 1kHz passband in the rf stage, and to achieve this he uses six high-Q breaks, eight dual MOSFETS, two J-FETS and a crystal filter on 144·05 MHz. The disadvantage of such a system is, of course, that one can only listen on a fixed frequency, so G3IPV uses the "QSU" code, to indicate that he requires a reply on his own frequency.

Sporadic-E

David Jarrell, CT2BS, in the Azores, is interested in arranging skeds with stations in the UK on 144MHz ssb or cw. David noticed last year that there were occasions when UK fm stations were stronger than local stations, and he believes that contacts between the UK and the Azores could take place this summer. CT2BS has worked several Gs via Oscars 6 and 7, including G3IOR, G3GIM, G3FPK, G3BVN and G3VYG. David Jarrell can be contacted at PSC Box 1008, APO New York, USA, 09406. David concludes by extending a welcome to any RAF amateurs flying in to the Lajes field in the Azores to look him up. Being in the US Navy he is aware how pleasant it is to meet someone of similar interests when abroad.

Peter Cutler, G3DAO, passes on information from F9LT that there was a sporadic-E opening on 22 May at around 1400gmt. Several PA0 stations worked into LZ, and DL7QY worked LZ2FA and LZ2NA. No reports have been received of any success this side of the Channel. It is also understood that French stations were working into Italy on the morning of 6 June.

News from the south

As predicted, the state of vhf in South Africa is already gathering pace since Joe Ludlow, GW3ZTH, arrived in the country. Joe now has the call ZS5ZY, and together with Roger Davis, ZS5ZD, (another expatriate) has received the go-ahead from SARL to set up a vhf committee on the lines of our own RSGB VHF Committee. They have already worked out a beacon plan for South Africa, and have 10 beacons ready to go on the air when approval is received from the authorities.

Joe is experiencing some difficulty in finding the time to devote to his own amateur radio activity, but is making 144MHz moonbounce one of his first priorities. He has all his moon-aiming data ready, and when the big pa is built, and the planned 8 × 10-el Yagis are erected (neighbours permitting!) Joe hopes to make his first eme attempt with W6PO who runs no less than 2kW to a 160-el stack.

Old friends of Joe Ludlow might like to know that GW4BLE and several other GWs have a sked with ZS5ZY on 21·385MHz ssb every Sunday afternoon between 1400 and 1430gmt. Another ex-G, G8FFV of the Southern FM Group, has also been worked on 15m from the shack of Roger Davis, ZS5ZD.

Meteor scatter

After our mention of the desirability of tuning above 144·1MHz for cw from Liner 2 operators, Ian White, G3SEK, would like us to remind readers that 144·1MHz is the international meteor-scatter calling frequency. G3SEK points out that this channel is likely to be in use at any time, and that during a meteor shower there is activity between 144·09 and 144·11MHz. Ian expresses the hope that unless cw operators know when the major showers occur, they will steer clear of the 144·09-144·11MHz segment, and *never* use 144·1MHz.

Ian White remembers that in the old days it was the practice to conduct ms contacts without artificial aids at about 40wpm, whereas the recent trend is to send at, say, 70wpm and use a multi-speed tape-recorder to enable the received signal to be copied. G3SEK confesses to having

some qualms about the ethics of departing from "real-time" operating, although he admits that the use of a tape-recorder brings an increase in accuracy, while the higher sending speed gives more chance of completing contacts.

On the subject of the credibility of some claimed ms contacts, raised by EI2W in *4–2–70* a few months ago, Ian, in his brief ms experience has already received a card (from a well known ms station) for a contact he did not make. On the occasion in question, G4DGU had stepped in as a substitute, and it was he who completed the contact, but care was not taken at the other end to ensure that the callsign had been properly received.

VHF/UHF records

The last appearance of this table appeared on p699 of the October 1974 *Radio Communication*, and an updating of this information is long overdue. Unfortunately, there seems to be a great reluctance on the part of vhf/uhf operators in admitting to working dx which might be a record, so the table would not be very much changed if it were to be published now. If anyone thinks they might have established a distance record on vhf/uhf, we should be pleased to hear from them. Please give details of the contact, with the QTH locator at *both* ends of the contact. Anyone who has difficulty in calculating the distance involved should send both QTH locators to the writer, and he will endeavour to have the correct QRB computed.

Moonbounce

Doug Mallett, G3HUL, is very interested in this mode of operation and has already heard WA6LET on 144MHz via the moon, although he has had no luck yet on 432MHz. Doug has an AF279 pre-amplifier following a 13-el long Yagi giving him a theoretical aerial gain of 16·8dB. He would like to see more advance publicity of eme tests, but unfortunately the tests are often arranged at too short notice for inclusion in *Radio Communication* before the event.

Beacon news

Regular beacon checkers on 144MHz will have noticed that the Wrotham beacon, GB3VHF, was missing for a while during May. Early in the month a burble developed, sounding much like modulation by a wobbly 1-2kHz tone. Removing the 40W pa and running the exciter straight into the aerial did not cure the fault, so beacon-keeper G3COJ had the exciter removed for examination. No reason for the fault was found and the device worked perfectly on the test bench, so it was assumed that the problem must lie in the power-supply. On 25 May the beacon was re-installed with another supply powering the exciter, and all appears well at the time of writing.

Reports indicate that the 432·91MHz Emley Moor beacon is being received well in the south of the country; G4ALN, for example, finds that GB3EM is audible in Romford even under the poorest of conditions. Even as far to the south-west as G8AGU's portable site on Exmoor, the beacon can just be copied.

Alan Williams, G3KSU, writes to point out that the 10·1GHz beacon GB3IOW was omitted from the beacon list published last month. The beacon has been in operation since January 1975, moving to its present permanent site on St Catherine's Hill, Isle of Wight, in April 1975.

It seems to be important to keep signal reports on 10GHz beacons up to date, so if anyone has any information on GB3IOW, especially of a long term nature, please will they send it to G3RPE so that it can be summarized.

The RSGB VHF Committee is considering setting up a 50MHz beacon in the UK to be used in conjunction with the ARRL and transatlantic sporadic-E tests. Further details will be given when available.

Contest news

Conditions for the 144MHz Portable Contest and the concurrent cw event, while nothing special, did allow a reasonable amount of dx to be worked. There seemed to be no shortage of activity for either event, with some very high serial numbers being passed towards the end.

We have received notice of a vhf/uhf contest organized by the Bulgarian Radio Club Gabrovo. The contest is open to all amateurs although double points are scored for contacts with LZ (a sporadic-E opening coinciding with the event would be useful!). The contest is divided into two cycles; 1800gmt Saturday 31 July to 0400gmt Sunday 1 August, and 0600–1600gmt on 1 August. All modes except fm may be used, and scoring is (quote) "a point a km, rounded off numbers (without tenths) to 50km points." Bands are 144 and 432MHz with double points for the higher band. Contest exchanges should consist of rst, serial number and QTH locator, and stations may be worked once in each cycle. There are separate sections for non-LZ fixed and portable stations, and logs to District Radio Club LZ2KAD, PO Box 15, Bulgaria 5300 Gabrovo, must be postmarked no later than 15 August.

Awards

144MHz Senior Transmitting: No 96 to G8IMF of Swindon.

432MHz Senior Transmitting: G8FMK of Thame in Oxfordshire earns certificate No 28. Most of Ray's contacts were achieved using just 1W of a.m., and the rest using no more than 2W a.m., and the certificate has been endorsed accordingly. G8FMK found QSL returns quite good on 432MHz, providing one is prepared to be patient. He suspects that operators on this band do not send cards to the bureau very frequently!

The RSGB vhf awards manager is happy to report the making of another piece of history by the awarding of the first-ever 1,296MHz Senior award to Roger Taylor, G4BEL. In gaining certificate No 1, Roger not only turned in cards for the required 40 counties, but handsomely exceeded the necessary six countries by producing cards for nine. It took Roger three-and-a-half years to collect the cards for this award, and notable among them were several cards from G3WDG for his G/GM/GW trips. G4BEL already holds Supreme Award No 5.

The awards manager was pleased to endorse several applications for foreign awards, such as for G3VSA, who put in for the German vhf cw award, with 31 direct cw contacts with Germany, and 23 via Oscars 6 and 7.

Finally, copy for the August issue should reach G3NHE by no later than 7 July, and for the September issue by 9 August.

swl news

Bob Treacher, BRS32525 *

Forming a club?

As a result of the mention in the last *SWL News*, Crosbie Rodgers, BRS32286, is beginning to realize his ambition of forming a club in the Dumfries area. He now has 10 licensed amateurs and SWLs interested but is still keen to recruit more to make it a worthwhile venture. Crosbie's address is 5 Elder Avenue, Lincluden, Dumfries.

Colin Fawcett, BRS32859, is interested in sstv reception and is keen to hear from licensed amateurs and SWLs in the Oldham area with a similar interest with a view to exchanging ideas on receiving techniques. They are invited to write to Colin at 761 Ashton Road, Bardsley, Oldham, Lancs.

Jon Fletcher, A9103, is a Scout and will be involved in JOTA activities later in the year. He is keen to form a Scout receiving network and will be interested to hear from any Scout groups who have their own receiving or transmitting station. Jon's address is 170 Beechcroft Road, Wall Heath, Brierley Hill, West Midlands DY6 OHS.

A very heavy mail

With 20 correspondents writing this time and the limited amount of space available, your scribe has had to make use of his guillotine for the first time in many months.

Noel Phelps, BRS35608, still appears to be at his receiver when it matters most and remains at the head of the Countries Table. Noel comments, as have many others, on the good 10m conditions during late May/early June. Europeans have been heard on most days with occassional dx appearing, for example 9X5PT and 5Z4JE. Other correspondents comment on hearing the following other 10m goodies: D2AAV (new px for CR6), VQ9P, 9LINP, EL2AK, 5N2NAS, 8P6GB, KV4AD plus numerous stations from PY, LU and ZP. Returning to Noel's comments, his 160m score now includes 4X4SL/JY and 9K2GB, while he is keen to refute the suggestion that he is after Dave Sharred's "Crown". Noel simply tries to get much pleasure out of the hobby without getting too serious about it, whether it is hearing a new one or QRP stations on 10 and 80m. Noel also mentions receiving a QSL from 5U7BA for a 7MHz cw report. It seems he finally got around to trying A1 after reading an article in *QST* extolling the pleasures of cw operation. However, he quite rightly points out that a large number of the dx countries do not seem to have a code exponent at all.

John Fitzgerald, BRS33823, has not found time to write to *SWL News* for some time but has now managed to rectify that. He has been QRL at work and his listening time has been cut by half. Recent activities include listening in the CQ-M Russian contest when he succeeded in his object of logging enough call areas for the R-10-R Award, but as he says, 100 oblasts in 24 hours was slightly more difficult. John runs a 9R59DS plus PM11 with a Technical Associates audio filter which is a great asset on cw. He has recently installed a 6m vertical which seems to be very effective on 40m.

Dave Sharred, A8312, was looking forward to 22 June when his "A" level exams would be completed, which would enable him to return to the serious business of catching up on all the rarities which have eluded his grasp while studying. VR3AK is Dave's best dx this time but he remarks on hearing WB7ABK's expedition to Christmas Is, VK9XX, on 15 and 20m. The next day produced VK9XI on 20m, and two days after this VK9XC was heard on 80m.

Keith Morrison, A8883, reports hearing his first Pacific dx during early May in the shape of KG6, KX6, KS6, KH6, KM6, FO8, VR8 to mention but a few. These have helped push Keith's all-time scores soaring but he was also in the throes of revision for exams when he wrote.

Tim Chapman, A8890, also comments on the good conditions to the Pacific — FK8, 5WI and KJ6 — and TI9PT on 80m. He also puts forward the idea of an international listener penfriend system. It is an idea which we will have to keep in store for the time being.

Richard Staples, A9172, writes for the first time to make an entry into both the Countries Table and the 80m Table. Richard considers his best 80m dx to date is JH0BQU; he gets much pleasure from listening in contests and is looking forward to the RSGB hf contests in the autumn. His KW202 receiver into a trapped dipole or 90ft long wire are complemented by a Stephens-James atu which he considers has vastly improved his reception efficiency.

Neville Spry, BRS17567, will be holidaying in New Hampshire, USA, when this is read. He is visiting friends and is looking forward to hearing the famous W-QRM at first hand as well as comparing the dx to be heard. Neville recently had the pleasure of entertaining John Allaway, RSGB President, for a few hours following his official visit to Region 11.

As a result of the heavy mailbag, I regret that I can only make passing reference to letters from As 8553, 8808, 8961, 9050, 9123, 9135 and 9191, and BRSs 35454 and 35943.

1976 HF Countries Table

Station	10m	15m	20m	40m	80m	160m	Total	Mode
BRS35608	47	132	182	153	99	31	644	cw
BRS17567	56	142	206	62	127	10	603	ssb
A8883	36	131	198	71	107	5	548	ssb
A8890	54	117	175	79	91	23	539	ssb/cw
BRS35943	3	101	166	81	125	3	479	ssb
A8312	26	106	145	67	95	23	462	ssb/cw
BRS33823	29	82	147	59	92	17	426	ssb/cw
BRS35454	14	99	164	61	79	7	424	ssb
BRS32286	10	101	132	35	92	—	393	ssb
A8849	9	60	139	52	81	12	353	ssb/cw
A9172	10	54	134	48	38	3	287	ssb
A9123	14	65	99	28	55	9	270	ssb/a.m.
A8961	4	54	122	25	42	7	254	ssb
A8808	24	59	77	27	48	3	238	ssb
BRS36208	—	8	75	21	25	1	130	ssb

80m dx scores

A slightly better response this time. The new list is given below but there must be many more listeners and transmitters with 80m worked/heard totals of 150 or more — so how about letting us know?

Listener	No	Mode
BRS32525	219	SSB
BRS17567	201	SSB
BRS35943	195	SSB
A9172	182	SSB
BRS33823	177	SSB
A8312	156	SSB

Finale

The amount of mail this time was very gratifying. Let's keep it up. Comments, table scores and 80m dx scores should reach your scribe by 1 August.

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

the month on the air

John Allaway, G3FKM*

THE RSGB is frequently taken to task for apparently taking no action with the Home Office to try to get "intruders" moved out of some of our frequency allocations. However, it does seem that there is a lack of understanding of the facts in a good many quarters.

Our bands, as at present allocated, were agreed at the Geneva ITU Conference in 1959. Not all of them were designated for exclusive amateur use, and in fact in the part of the spectrum covered in this column only 7,000 to 7,100, 14,000 to 14,250, 21,000 to 21,450, and 28,000 to 29,700kHz are intended solely for our uninterrupted use in Region 1. As emphasized in earlier *MOTA*s, 1·8 to 2MHz is only ours as secondary users; 3·5 to 3·8MHz is shared equally with the fixed and mobile services. Fixed stations in the USSR may use 14,250 to 14,350kHz. We are therefore obliged to accept the presence of other signals on these bands and cannot complain about their presence.

Included among the aims of the amateur service at WARC 1979 will be the acquisition of amateur exclusive allocations in the 1·8-2MHz and 3·5-3·8MHz bands, and to clear the whole of 14MHz. The Soviet authorities have already indicated their willingness to co-operate over the last item.

Of the many genuine intruders on 7MHz listed in a recent IARU Monitoring System monthly list, the sources were identified almost entirely as China, the USSR, Egypt, Albania and Pakistan, with the first two named being by far the worst offenders—the USSR having produced over 50 identified intruding signals. The ITU is notified monthly of this state of affairs but seems unable to control the situation.

DXCC members' meeting

G3FXB, QTHR, would like to hear from any member of the DXCC who would be interested in attending a meeting/dinner to be arranged according to response and size of demand. Anyone with the basic certificate is invited to attend.

The ARRL bicentennial celebration

This special "operating activity" will take place from 0000 24 July to 2359 25 July. Amateurs in the 50 United States will try to contact as many stations as possible and those outside contact USA stations only. Entries may be single- or multi-operator but no multi-transmitter section will be held. Each entrant may operate for no more than 36 hours—time-outs must be at least 15min in length and no more than eight are allowed. Each station may be contacted once on voice and once on other mode—no repeater contacts are allowed except via Oscar. USA amateurs will send signal report, state, and state entry number into the Union. Non-USA entrants send report and serial number (starting from 001). Final score equals number of contacts—ie there is no multiplier. Special summary and log sheets will be available from ARRL HQ in exchange for an sae and IRCs. Entries must be postmarked no later than 1 September. Amateurs outside the USA are eligible for the following awards: (1) 1,776 or more contacts, (2) 200 or more contacts, or (3) 50 or more contacts made on 50MHz or above (including Oscar). In addition, awards will be made to those with top score in each country, with all 50 states worked, and with the original 13 colonies (CT, MA, NH, RI, NJ, NY, DE, MD, PA, GA, NC, SC and VA).

G3FKM hopes to have a supply of entry forms but at the time of going to press these were not yet available.

Dxpeditions

Bill Rindone, WB7ABK, was taken ill during his stay in Nepal and returned to the USA. He hoped to be fully recovered by the time this is being read and on his way again to the Arabian Gulf area. From here he intends to travel down the coast of Africa, and believes that he will be operating from an all-time new country. At the time of writing it was being said that his funds were very low and that any contributions would be most welcome. The Northern California DX Foundation has already made a large sum available.

It is rumoured that a group of Australian amateurs intends to visit Willis Is and Mellish Reef during the latter part of July.

The previously mentioned trip by FL8OM to Abu Ail (the Red Sea island) was apparently postponed because of weather conditions. It may take place later.

PY7YS hopes to accompany a Brazilian Navy visit to Atol de Rocas and St Peter & Paul Rocks during July.

Lloyd and Iris Colvin closed down from YJ8KG on 30 May and returned to the USA for a couple of months to attend to their business affairs. Details of their Pacific expedition are as follows: VR1Z, 16/12/75 to 31/12/75 (4,000 QSOs); VR8B 1/1/76 to 18/1/76 (8,000); 3D2KG 28/1/76 to 23/2/76 (7,500); C21NI 1/3/76 to 25/3/76 (7,500); FK0KG 30/3/76 to 28/4/76 (7,500); and YJ8KG 4/5/76 to 30/5/76 (8,000). Of the 42,500 contacts half were on cw. The expedition will be resumed soon and help is sought in finding suitable places to visit (please contact YASME Foundation, PO Box 2025, Castro Valley, Calif, 94546, USA).

DX news

Barry Tiffany, G3TXX, has gone to the Solomon Is for two years. His callsign is VR4BT and further news of his operating pattern is expected soon. QSLs go to G4CRY (see "QTH Corner").

G4DWV will be in Israel from 15 July until 13 August and hopes to be active on 14, 21 and 28MHz. He will use mostly ssb and will beam towards the UK whenever on 28MHz.

The Cal-Tech Jet Propulsion Lab ARC has been given permission to use the callsign N6V during the periods which correspond with the landings of Viking 1 and Viking 2 on Mars. Probable dates are 3 to 18 July, 6 to 12 August, and 31 August to 15 September. Frequencies to be used include 3,530, 3,730, 7,030, 7,130, 14,030, 21,030, 21,130, 28,030 and 28,130kHz (cw), and 3,810, 3,930, 7,230, 14,225, 14,325, 21,360 and 28,630kHz (ssb).

Arthur Edwards, G6XJ, who is travelling on a Polish freighter to the Far East, was reported as having reached Thailand at the end of May.

JA0BXU is in Suez City as SU1JA and expects to be there for one year. 9U5DR is reported as being heard regularly at 1800 on Mondays on 14,185 or 14,205kHz. It is

*10 Knightlow Road, Birmingham B17 8QB.

QTH Corner

A9XBW	I. Cable, PO Box 425, Awali, Bahrain.
A35AM	via JR1BRV, M.Ohta, 1-10-1 Minato, Chuo, Tokyo 104, Japan.
CE9AV	via CE2MZ, Box 1137, Valparaiso, Chile.
FM7AU	via I2YAE, V. Dante 14, 21022 Azzate, Va, Italy.
HB0XAA	via WB5KEA, S/Sgt D. Miller, Det 51, 2nd Weather Wing, APO, NY, 09457, USA.
KJ6DL	via JA1OCA, CPO Box 1409, Tokyo, Japan.
KM6EA	via I2YAE (see FM7AU).
OH0AC	Box 141, SF-00131, Helsinki, Finland.
TI9WD	via TI2WD, Box 4808, San Jose, Costa Rica.
VR3AK	via KH6AHZ, 179 Aumoe Rd, Kailua, Hawaii, 96734.
VR4BT	via G4CRY, 99 Ings Rd, Redcar, Cleveland TS10 2DE.
VS5MC	via DK5JA, A. Kohten, 4152 Kempen 4, Postbox 63, W. Germany.
ex-5Z4IR	R. Jarvis, 109 Low Rd, Burwell, Cambs CB5 0EJ.
XJ3ZZ/1	via VE3BMV, G. Z. Bianarovicz, PO Box 292, Don Mills, Ont, M3C 2EO, Canada.
YJ8KG	via W6RGG, 18655 Sheffield Rd, Castro Valley, Cal, 94546, USA.
ZD7HH	via K2PAY, 642 Christie St, S. Hempstead, NY, 11550, USA.
5H3JR	via W2SNM, 2483 Third Av, E. Meadow, NY, 11554, USA.
7J1RL	via JARL, Box 377, Tokyo, Japan.

RSGB QSL Bureau, G2MI, Bromley, Kent, BR2 7NH

believed that 5H3JR is now the only active amateur in Tanzania and he asks for QSLs via W2SNM.

The latest list of stations for whom JA0CUV/1 acts as QSL manager includes VR1AA, VR1AK, VR4CW, VR8D, YJ8CW, 7X2SX, 3D6AF (not for W/K stations) and KX6MJ. Two new stations on Johnston Is have been reported—Marvin (K4KEW) is now KJ6DL and will be on the island for a year, and both he and KJ6DK have been worked on 14MHz ssb. VR3AK is located on Washington Is—which counts the same as Christmas Is (VR3) for DXCC purposes. He is active from 0400 to 0800, and for an hour later on Saturdays until his power supply is turned off. ZK1DX is due to leave the Cook Is in July for his home in New Zealand where he will become ZL3DX.

VP8MS is located in South Georgia and is reported to be active at 0100 on 3,795–3,797kHz and looking for contacts with the UK. VP8OT is also in South Georgia and was previously on the air from Alexander Is. CE9AV, in the South Shetland Is may often be found around 14,120kHz at 1700, and also on Tuesdays and Wednesdays at 0300.

Ian Cable, A9XBW, is now in charge of the Bahrain QSL Bureau which accepts cards for all A9 and MP4B calls, but not for A4, A6, A7 or earlier MP4M, MP4Q or MP4T calls.

4L5F was located in Ukraine, and 4J9B and 4J9DX in Chelyabinsk in the UA9 area. 3Z5KMB was on the air from the Youth Congress in Warsaw.

Many USA stations have been active using the "N" prefix series. Some noted so far, with QSL managers, are as follows: N1ITU–W1GNC, NE1ITU–via ARRL, NZ1ITU–K1HRV, N2ITU–WA2EAH, N3ITU–W3DOS, N4ISC–W4IMP, NQ4ITU–WB4FDT, NU4ITU–K4ZA, NS4ITU–WB4FLW, N6ITU–K6ILM, NA6ITU–W6UFJ, NV6ITU–WA6TAX, NE6ITU–WA6PDE, NK8ITU–W8RSW, N8MI–K8IDE, N9IYU–K9GSC. Other strange callsigns were WS2BSA–WB2UFG, WU4ITU–K4YFQ, WV8ITU–W8BT, WI9ANG–WA9DZL, and KH4ITU–K0CMF/4. KC7LBH (celebrating the Battle of Little Big Horn's centenary) QSLs go to WA7OBH, EQ2ITU to K4OD, and CT5ITU to ARP, PO Box 446, Oporto, Portugal.

Ian Bateman, VP8NP, has returned to the UK and is now G3ZKH. He was in Antarctica for two years during which time he worked 150 countries. He made contact on 160m with over 50 different stations located in 20 countries. Ian's place on Argentine Is has been taken by VP8OB. QSLs will be dealt with as soon as possible.

Maurice Caplan, VS5MC, who has been back in the UK for a period has now returned to Brunei. His QSL manager is now DK5JA (see "QTH Corner"). Ray Jarvis, formerly 5Z4IR/VS1HG, who is a past-president of the old RSEA, is now back in Britain and may be reached at his G2BPC address.

Kung Togashi, JA7NI, of Akita, Japan, has this fine set-up which delivers 1½kW to a dipole on 160m. Readers will not be surprised to know that he has WAC and 31 countries worked. *(Photo: W1BB)*

Contests

The 1976 Argentine Contest

0000 3 July to 2359 4 July (cw).
0000 7 August to 2359 8 August (phone).

On 3·5 to 28MHz. The object is to work as many LU stations as possible—each contact on 3·5 and 7MHz counting three points and on the other bands one point. The multipliers are the Argentinian provinces—these are indicated by the first letter after the number in the callsign. A, B and C are all Capital Federal, D and E Buenos Aires, GA/GO Chaco, GP/GZ Formosa, XA/XO Santa Cruz, and XP/XZ Tierra del Fuego—otherwise each letter represents a different province. Contacts with LU4AA count 10 points. Stations may be contacted on each band. Final score is total QSOs × total QSO points × total multipliers. Logs must give callsign, mode, band, date, time, station worked, number sent and received, province, and points claimed. Include summary sheet with full band details and signed declaration that rules of competition and radio regulations have been observed. Post logs by 30 August or 30 September respectively to: RCA, Subcomision de Concursos, PO Box 97, 1000 Buenos Aires, Argentina. Certificates will be awarded to top scorer in each country provided at least 10 LU stations have been logged.

The Colombian Independence Day Contest

0001 17 July to 2359 18 July.

Single-operator, single- or multi-band; multi-operator multi-band; 3·5 to 28MHz. Exchange RS/T plus serial number (from 001). Contacts with HK count five points, with other countries in other continents three points, in own continent two points, and in same country one point. Multiplier is total number of different countries worked on

all bands. Total score is sum of points on each band multiplied by the sum of different countries worked on each band. Separate logs should be used for each band, and multipliers indicated. A summary sheet must be included which details all scoring information. A minimum of 50 contacts must be made to be eligible for an award. Only one contact per band is allowed and cross-band/cross-mode contacts are not allowed. Send logs before 30 September to: LCRA—Concurso Independencia, c/o Contest Committee Manager, Apartado Postal 584, Bogota, Colombia.

The European DX Contest
0000 14 August—2400 15 August (cw).
0000 11 September— 2400 12 September (phone).
On 3·5 to 28MHz. Single-operator all-band and multi-operator single-transmitter sections. Only 36 hours operation permitted for single-operator entrants—12h break may be taken in up to three periods. Work non-European stations and exchange RS/T plus serial number (from 001). Stations may be worked on each band. Each QSO counts one point. Multipliers consist of ARRL countries (each call area in JA, PY, VE, VO, VK, W/K, ZL, ZS and UA9/0 also count as countries). Multipliers on 3·5MHz may be multiplied by four, on 7MHz by three, and on 14/21/28MHz by two. Additional points may be made by "QTC traffic"—reports of previous contacts made by non-European stations and passed back to a European. QTCs contain time, call and QSO number of station being reported. Each may only be reported once and not back to the originating station. Only 10 QTCs to a station are permitted. Keep a uniform list of QTCs on a separate log sheet and clearly indicate who sent them. It is suggested that DARC log sheets are used. Send large sae and ircs to WAEDC Committee, Postbox 262, D-895 Kaufbeuren, Germany. CW logs should be sent to this address before 15 September, and phone by 15 October. Please keep the following segments free from contest activity: (cw) 3,550–3,800kHz, 14,075–14,350kHz, 21,100–21,450kHz and 28,100–29,700kHz; (phone) 3,650–3,750kHz, 14,300–14,350kHz, 21,400–21,450kHz and 28,700–29,700kHz.

In the **1975 Hungarian Contest** G3SXW scored 2,662 points, G3ESF 1,788 and G5GH 61.

Awards

The Cyprus Award
Available for working stations in the Republic of Cyprus since 1 July 1962. The same station may be contacted once on each band, and 32 points are required if all contacts were on one band only, 24 if on two bands, 16 on three bands, and only 12 if four bands were involved. From the UK contacts on 1·8MHz count 8, 3·5MHz—4, 7MHz—2, 14MHz—1, 21MHz—2, 28MHz—4, 144MHz—16, and 432MHz—32. Send a certified list of QSLs (checked by G5GH) plus 10 IRCs to: Awards Manager, 5B4BM, CARS, PO Box 1267, Limassol, Cyprus.

The Northern California DX Club Bicentennial Award
For contacts during 1976 with 76 California stations who are not club members and 13 who are. Send detailed list plus five IRCs to: Jim M. Ruys, W6UZX, 3860 Pestana Way, Livermore, Cal, 94550, USA.

The Dr D. Jose Balta Elias Award
Issued by the URE in memory of their former President. European applicants need 15 points from working stations in Vilafranca del Penedes (Barcelona) between 23 May and 13 June. Each contact counts one point except those with EA3URE which counts three. Stations may be worked once on each band on each day. Exchange RS/T and serial number (from 001). Send log and own cards for stations worked to: Delegacion Local de URE, Aptdo 23, Vilafranca del Penedes, Barcelona, to arrive before 31 August. Listeners may also apply. The award is free.

The Faience Award
This is a ceramic polychromatic hand-worked award which carries the ARI and town emblems. European applicants must make at least eight contacts with stations in Faenza on either all cw or all ssb. Listeners may also apply. European stations need one contact with a "Jolly" station that counts two points (= two QSOs). No contacts are valid on contest days between 0000 and 2400. Different stations will count as "Jolly" stations at different times. Contacts must be between 1 April and 31 December. Send a copy of the log details (certified by two other amateurs) plus 20 IRCs to: Award Manager, Sezione ARI Faenza, PO Box 93, I-48018 Faenza (RA), Italy. Valid stations include I4s BBM, CQG, CXC, DBC, EAE, EAT, ECR, EGL, FSL, GCE, GSJ, GU, LEO, MNP, MZY, PWL, SKR, SEC, SJX, SLC, TMA, WPW and ZN, and IW4s AAB, ABE and ACR.

All Japan Districts (AJD)
For two-way contacts or reports from all 10 Japanese districts.

Worked All Japan (WAJA)
For contacts/confirmed reports from all 47 Japanese prefectures.

Japan Century Cities (JCC)
For contacts/confirmed reports with at least 100 cities. Separate awards are given for each additional 100 cities.

Asian DX Award (ADXA)
For contacts/confirmed reports with at least 30 Asian countries (one of which must be Japan).

Worked All Cities (WACA)
For contacts/confirmed reports with all existing cities (a list may be obtained for three IRCs).
Cards for all awards must be dated after 29 July 1952. A certified list plus eight IRCs should be sent to: Awards Manager, JARL, PO Box 377, Tokyo Central, Japan. Note that contacts with KA stations do not count, nor do those with /MM or /AM stations.

The WAGI Certificate
The cost of this award has been increased to 20 IRCs or £1 for home applicants, and 20 IRCs or $2 for overseas applicants. The custodian is still GI3CDF, QTHR, from whom full particulars may be obtained.

Here and there

G8PG reports that he has made WAC and contacted a total of 57 different countries with an input of 5W or less to his transmitter in the past three-and-a-half years. He recently contacted PY4CAX on 21MHz cw using 2·2W into a 90ft wire aerial 20ft above ground.

G4ELW has received a number of QSL cards for contacts allegedly made with him on 3·5MHz cw.

GM4DSS reports that his call is being pirated as G4DSS.

Band reports

Conditions have been quite interesting during the past month, and there have been some very good morning openings into the Pacific area on 14MHz. These seem to the writer to have been somewhat later in the year than usual. Quite a lot of activity has been noted on 28MHz and many correspondents remark that this band is worth much more investigation and use. The occasional "CQ" call when it appears to be dead can produce surprising results.

Many thanks to the following for supplying the information for this section: Gs 2HKU, 4RZ, 5JL, 3KSH, 3NKQ, GW4BLE and G4DXE; BRSs 17567, 25429 and 33761, and As 8312, 8713, 8890, 8961 and G 15045.

Stations listed in italics were using cw—the others ssb.

1·8MHz. 0000 *XJ1MX*. 0400 W1WQC/4. 2200 *9K2GB*.
3·5MHz. 0000 ZF1GC. 0300 VP2VBG. 2100 A2CJP. 2200 JY5MB, TR8CQ, TU2FH, VK9XL (?), ZS1MH, 5Z4LW, 9L1NP, 9M2FX.

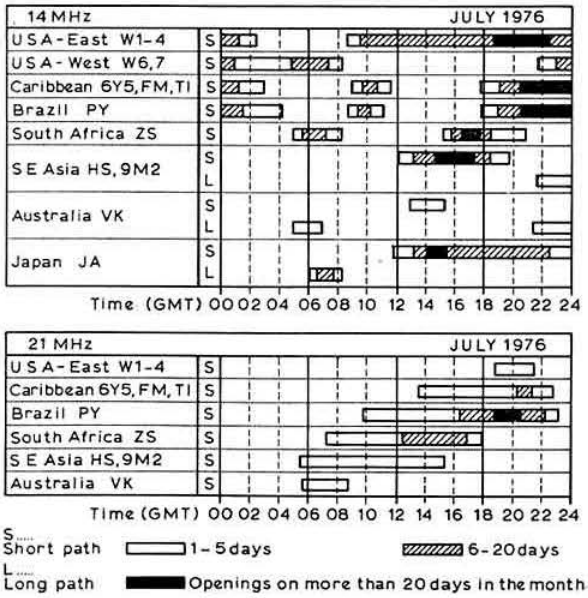
Propagation predictions

DX conditions on the hf bands are still not favourable. A small compensation for this will be the fairly frequent short-skip conditions on these bands over distances of about 500–200km.

The **14MHz** band will remain the main carrier of dx traffic, especially during the night. The possibility of dx traffic via the indirect path is once more pointed out. As it is now winter in the southern hemisphere, traffic with South Africa will cease early. Central African stations, even those of Zambia and Rhodesia, will be heard longer than those in ZS. The same applies to corresponding conditions on **21MHz.** There will be no noticeable change on **7** and **3·5MHz.**

Readers will have noticed repeatedly that stations in the area indicated are not audible. This is especially the case when the time given does not correspond to the main working period of the dx countries. Contacts will be at their best if the time given in the predictions coincides with the main operating time of overseas stations. This particularly applies to countries with few amateurs.

The provisional sunspot numbers from the Swiss Federal Observatory for February, March and April 1976 were 4·6, 23·0 and 19·5 respectively. The predicted smoothed sunspot numbers for August, September and October are 7, 6 and 5 respectively.



7MHz. 0000 *VP9s HPA, IB, 9L1NP*. 0200 VP2AA, ZF1MA. 0400 *PJ8DE*. 0500 *CE3AC, CP5AXS/1*, HC2SL, *HC1XG/HC8, PJ8AS, ZLs, ZP5AL*. 0600 LUs, *XJ3XX/1* (St. Paul Is), VKs, ZLs, 9Y4s. 0700 VKs. 0800 *VE8WL*. 2100 *VK3MR*. 2200 LUs, VP9GG. 2300 HB0XAA, ZB2DL.

14MHz. 0000 ZLs. 0500 W6/W7s. 0600 A35AF, FL8OM, KJ6s CB, CF, ST2SA, ZK1DX, 7J1RL. 0700 AH3FF, KH6s, KJ6DL, KM6EA, VR3AK. 0800 FO8s BL, DH, DO, KH6s, VKs, VR8A, ZK1DL, ZLs, 5W1AX. 0900 KB6CU, KX6BU, VK9XK, VR1A, 5W1AB. 1000 OJ0MA (QSL to OH0NA). 1100 KS6DV/KB6, 7J1RL. 1300 ZD7SD. 1400 *CR5CI*, CR9AJ, ZD7SD. 1500 HS1s ALA, ALB, VS5DB. 1600 *HM2JN*, KH6ZZ, ZB30ANV, 9M6KT. 1700 HZ1TA, *KL7s*, *VE7s*, 7J1RL, 9K2EH (QSL to OZ8EH). 1800 AP2AC. 1900 CR9AJ. 2000 YJ8KG. 2100 HK0AA, W6/W7s. 2200 AJ3AA, VP1PTL. 2300 HK0AA/S, KL7s, VKs. W6/W7s.

21MHz. 0800 JAs. 0900 HZ1TA, JAs, OE6DK/YK. 1000 4J9DX. 1100 VE3APY/SU. 1200 DK5EC/ET3, JAs, *VU2BK*. 1300 JF1NZM/MM (off ZL), ZD7SD, 5N2NAS, 5X5NK. 1400 FG7AN. 1700 CE3GN, VQ9R. 1900 TR8VE, TUs, VQ9HCS, 9Q5s. 2000 CEs, LUs, PYs, 5T5OC. 2200 HC7RD.

28MHz. European signals 0600–2400. 1100 ZD7FT. 1200 HB0XAA. 1300 4Z4s. 1400 VQ9EA. 1500 EA6CE, UA9s, 5Z4LW. 1600 ELs, PYs, 9X5PT. 1700 EP2OD, LUs, UL7s, WA1STN, 9L1BH (QSL to SM3CXS). 1800 CT5ITU (QSL via ISWL), CXs, LUs, PYs, TUs, ZPs, 5B4DA, 5N2NAS, 8P6GB, *9G1GE, 9L1NP*, 9X5PT. 1900 CT3, KV4AD, 9K2EH. 2000 AJ4EHF, CE6BW, EA8ND, FG7AN, PZ1AE, 9Y4NP. 2100 LUs, PYs. 2200 HV1KV, KP4s, 9Y4OK. 2300 K4KAY.

Many thanks to all correspondents, and specially to the following for items obtained from their publications: the *West Coast DX Bulletin* (**WA6AUD**), *DX'press* (**PA0TO**), *CQ Magazine* (**W1WY**), the *Ex-G Radio Club Bulletin* (**W3HQO**), *DX News Sheet* (**Geoff Watts**), the 29 *DX Club Newsletter* (**VK6RV**), and *Long Skip* (**VE1AL/3**).

Please send all items for the **August** issue **to reach G3FKM** by **7 July,** and for **September** issue by **9 August.**

HF propagation study

Predicted hpfs (MHz × 10) For July 1976

GMT =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	117	128	157	208	253	233	228	227	235	271	228	188	117
Ascension	130	102	102	102	241	229	229	242	248	252	285	158	130
Bahrain	136	128	159	202	242	213	216	205	225	261	194	166	136
Bangkok	135	128	163	194	195	182	197	194	178	136	140	124	135
Barbados	185	133	128	115	120	182	197	199	199	197	228	242	185
Bermuda	178	128	121	102	115	172	191	191	191	191	191	191	178
Bogota	185	134	128	115	121	128	191	197	197	197	204	235	185
Buenos Aires	157	128	117	110	102	162	220	216	221	206	266	234	157
Cape Town	108	96	89	191	255	242	242	255	255	210	128	128	108
Colombo	115	128	163	202	230	200	210	201	221	255	209	180	115
Cyprus	144	121	145	187	225	216	201	192	209	242	221	183	144
Dakar	134	124	119	140	241	234	237	242	244	252	285	182	134
Denver	153	140	128	115	102	128	153	172	166	185	172	185	153
Fairbanks	153	159	153	153	153	172	172	172	172	172	178	172	153
Falklands	124	115	105	102	102	140	216	221	227	227	220	152	124
Gibraltar	112	88	88	110	157	155	140	140	145	140	182	161	112
Hong Kong	131	128	162	187	178	178	191	187	174	176	130	157	131
Honolulu	153	153	147	153	153	166	128	128	128	172	178	172	153
Iceland	106	94	112	119	131	131	131	135	136	135	131	136	106
Jamaica	183	130	128	116	126	138	186	191	191	191	196	219	183
Lagos	125	114	114	183	252	237	242	255	255	261	242	162	125
Las Palmas	147	119	119	129	208	210	197	197	204	191	249	220	147
Lima	178	136	128	115	108	108	200	202	201	199	238	242	178
Los Angeles	147	140	128	128	96	96	128	166	166	178	178	178	147
Malta	128	102	110	149	187	186	168	164	174	186	210	166	128
Mauritius	89	96	153	204	255	242	235	242	242	166	140	128	89
Mexico	172	134	121	128	134	115	166	185	185	191	178	191	172
Moscow	108	108	134	158	162	154	166	164	171	172	158	148	108
Nairobi	103	106	145	202	249	242	235	246	244	271	158	128	103
New Delhi	135	128	163	197	202	191	200	196	214	186	176	140	135
New York	172	135	128	102	128	154	180	180	181	186	178	192	172
Osaka	143	153	162	178	178	178	178	178	153	153	153	153	142
Perth	144	128	163	201	229	199	168	124	128	128	110	92	143
Rio de Janeiro	158	124	102	102	102	224	229	221	227	224	272	242	158
Salisbury	102	102	115	199	257	253	242	253	252	244	153	128	102
Seychelles	101	112	153	208	232	233	230	230	239	223	140	121	101
Singapore	138	128	163	197	202	191	200	196	155	128	126	115	138
Suva (s)	159	166	159	166	172	153	121	102	96	115	172	166	159
Suva (l)	140	128	128	159	115	115	108	121	115	108	191	216	140
Sydney (s)	131	128	162	187	178	153	128	128	133	115	101	159	131
Sydney (l)	176	133	128	121	102	94	94	105	96	96	102	187	176
Teheran	145	128	163	202	230	200	210	201	221	255	201	177	145
Vancouver	153	153	140	147	134	140	153	166	153	166	166	172	153
Wellington (s)	153	153	159	172	153	121	121	134	128	115	172	153	153
Wellington (l)	153	134	128	96	83	83	89	102	96	96	140	178	153

49th Annual General Meeting

Minutes of the 49th Annual General Meeting of the Radio Society of Great Britain, held at the Royal Society of Arts, John Adam Street, Adelphi, London WC2, on Friday 5 December 1975 commencing at 6.30pm

Present: Mr C. H. Parsons, GW8NP, *President (in the chair)*; Dr E. J. Allaway, G3FKM, *Executive Vice-President*; Mr J. O. Brown, G3DVV, *Honorary Treasurer*; Mr G. R. Jessop, G6JP, *Secretary*; Messrs D. Byrne, G3KPO; L. E. Newnham, G6NZ; W. A. Scarr, G2WS; R. F. Stevens, G2BVN; D. M. Thomas, GW3RWX; F. C. Ward, G2CVV (*members of Council*); A. W. Hutchinson (*editor*), and 150 corporate members who signed the attendance book.

The President welcomed the members of the Society to the meeting and announced that a quorum of 50 corporate members was present.

Notice convening the meeting

The President stated that the notice calling the meeting was set out on page ii of the Annual Report and Accounts which had been circulated to all members.

The Secretary read the first part of this notice and proposed that the agenda items be read as they arose in order to save time. All were in favour of this procedure.

Minutes of the 48th AGM

The minutes had been published in the June 1975 issue of *Radio Communication* and Mr J. O. Brown, G3DVV, proposed and Mr R. F. Stevens, G2BVN, seconded that the minutes be confirmed. There were no questions and the proposal was carried unanimously.

Audited Accounts and Financial Report of Council to members of the Society for the year ended 30 June 1975.

Mr M. J. Matthews, G3JFF, proposed and Mr T. L. Herdman, G6HD, seconded that the audited accounts and financial report for the year ended 30 June 1975 be adopted.

The Honorary Treasurer read the auditors' report which included a reference to the collection of late subscriptions. Mr Brown said that this was the first time the auditors had qualified their report. The reason was that early in 1975 the collection of subscriptions fell into arrears, and by the time this was brought up to date many subscriptions were paid late and were not considered by the auditors to have been paid in the year 1974–5. Mr Brown said that he did not think that in practice this made much difference as it was normal procedure to credit part of a member's subscription in one financial year and the balance in the next financial year, depending on the renewal month. Despite this, Mr Brown reported the subscription income was up by 12 per cent.

The value of Doughty Street had been taken at an estimated value to save the high cost of valuation.

Mr Brown said there was an overall deficiency of £13,000 and that he estimated a deficiency for 1975–6 of £16,000. In the first three months of 1975–6 the deficiency had been as estimated at £4,000.

Mr A. W. Rix, G3RYF, asked about the bad debts shown in the accounts. Mr Brown replied that these were mainly due to some *Radio Communication* advertisers who had not yet paid for their advertising.

Mr G. Bowden, G3YVR, said he thought it was serious for the auditors to qualify their report and expressed dissatisfaction.

Mr L. Crain, G3PED, asked why the subscription collection had been delayed. Mr G. R. Jessop (general manager) replied that the problem in the early part of 1975 had been due to unsatisfactory staffing in the subscription department during the latter part of 1974, as a result of which renewal reminders had not been sent out on time. Mr Jessop said that the position improved when Mr D. A. Findlay took over in that department in 1975 and that most outstanding subscriptions had eventually been collected.

Mr F. A. Herridge, G3IDG, asked if the persons responsible for the late collection of subscriptions had been sacked. Mr Jessop replied that Mr Findlay had been asked to take over as subscriptions manager in January 1975 and that although the subscriptions side was not in complete order, things were considerably better.

Mr R. Broadbent, G3AAJ, asked if the officials of the Society were satisfied that the records system was 90 per cent efficient. Mr Jessop said that the records were very much improved but he was not excited by the speed of the labour-intensive records system used by the Society. It was his view that a modern more easily accessible system of records should be used. With the present system it could take up to half an hour to verify whether a member had paid his subscription.

Mr D. J. Crawley, G8EAO, said he knew of two persons in his area who were still receiving *Radio Communication* although one had not paid his subscription for a year and the other had not paid for two years. Mr Jessop replied that he could not answer questions on specific subscriptions but asked anyone aware of such situations to contact the Society so that action could be taken.

Mr C. E. Newton, G2FKZ, said that in the accounts the profit on books was always given but that the expenses incurred by the Society selling these books were never shown. Mr Brown said that the gross profit on the sale of RSGB publications was shown on the published accounts, while the net profit was shown on internal records. Mr Newton said the accounts gave the impression that the Society makes a profit on its book sales but does not take into account the overheads: he suggested that publications accounts should be shown separately. Mr Brown said individual department costs were not shown in the 1974–5 published accounts.

There being no further questions, the President put the proposal to the meeting and it was carried unanimously.

Special resolution

To amend the Articles of Association so that the following article be substituted for the present article:

19. SUBSCRIPTIONS AND RESIGNATIONS OF MEMBERS

The annual subscription for Corporate members and Associates shall be such a sum as the Council may from time to time decide.

Where two or more members of a family have the same address registered with the Society, the second and subsequent members shall be eligible for reduced subscription, which shall entitle them to all privileges of their grade of membership except that of receiving a copy of each issue of the Society's journal. The annual subscription payable by such second and subsequent members shall be as determined by Council from time to time.

Upon the conditions of the preceding paragraph ceasing to apply, such members shall forthwith be required to pay the full subscription appropriate to their category of membership.

The Honorary Treasurer proposed the resolution, at the same time explaining why it was considered necessary to make this amendment. He said that at present the articles allowed a maximum subscription of £6, but with current inflation this limit was out of date. The Department of Trade had suggested and approved the removal of this top limit in line with the practice of other clubs and societies.

Mr Brown said that if the top limit were removed, Council would propose a subscription of £8 per annum for Home Corporate members which, without VAT complications, would give an increase of approximately 45 per cent. He said the last subscription increase was in 1973, and since then the average wage had also gone up by about 45 per cent. If the resolution were not passed and the subscription could not be increased above £6 the economic axe would fall first on *Radio Communication*, and the next edition of the *Radio Communication Handbook* could not be afforded.

Mr T. L. Herdman, G6HD, seconded the resolution.

Mr W. E. F. Corsham, G2UV, said he wanted to separate the proposed increase of £8 from the special resolution. The passing of the special resolution would give Council a blank cheque and would take away the authority for maximum subscription amounts from the membership. Mr Brown replied that (a): the removal of the top limit was suggested by the Department of Trade, (b) Council had the overall interests of members at heart, (c) without the removal of the top limit, in the present inflationary situation it would be necessary to call frequent extraordinary general meetings to amend the top limit in the relative article.

Mr Corsham repeated that Council were asking for a blank cheque and that it was a *fait accompli*.

Mr G. B. Packer, G3UUS, said he was in no way objecting to the rise in the subscription to £8 but suggested that the top limit be raised to say, £15, which was linked to the retail price index. Mr Brown said that as no one had put up any amendments to the special resolution it was the function of this meeting either to pass the special resolution as it stood or throw it out.

Mr L. Crane, G3PED, asked for clarification of the two points under discussion. Mr Brown said that the special resolution was to remove the top subscription limit of £6. If it were passed, Council would have the power to say what the subscription would be.

Mr D. Smith, G4DAX, said he had discussed the proposed subscription increase with members in his region and asked if the resolution could be amended so that the increase could not be greater than 60 per cent over the previous year's subscription. Mr Parsons said within the terms of the Companies Act the special resolution, with no amendments, was either to be passed or thrown out.

Mr W. E. F. Corsham, G2UV, said he opposed the motion but did not want this mixed up with the proposed increase to £8.

Mr A. R. Seabrook, G3ZQB, asked what was the existing procedure for putting up the subscription. Mr Brown replied that Council fixed the subscription within the existing £6 limit.

Mr T. L. Herdman, G6HD, said that previously Council had called an extraordinary special general meeting and a special resolution had been passed giving Council the authority to go up to £6. He said that Council had not put the subscription straight up to the maximum allowed, and as a body it was to be trusted and members should refrain from asserting otherwise.

Mr R. Ham, BRS15744, said he supported the RSGB and he trusted Council to do their best. They were right to do away with the cost of special meetings. On occasions in the past, special meetings had been called and a quorum had not been formed. Mr Ham asked how close the Society was to bankruptcy if the resolution was not passed. Mr Brown replied that it was difficult to answer that question, but added that either the size of *Radio Communication* would have to be cut or it would have to be published bi-monthly or quarterly.

The President said that he had been involved with the Society long enough to be able to look at the record of Council over the past 30 years. It was to his firsthand knowledge that a repeated fault of successive Councils had been the policy of providing maximum benefits to members while keeping subscriptions as low as possible. In the light of the current economic situation, subsidising membership had gone on far too long.

Mr N. A. Smith, G3HFO, said he trusted Council to fix a correct level of subscription in order to keep the Society solvent and that he supported the motion.

Mr G. Wright, G3VUF, said that if any member wanted to he could put up a motion at any future AGM to discuss future subscription rates. Mr Brown said this was correct as long as the proposal was put forward in the correct way.

Mr J. W. Swinnerton, G2YS, said that the way to influence the Society was through the ballot box at Council elections.

Mr C. Partridge, G8AUU, suggested a postal ballot on major issues affecting the Society.

Mr T. J. Sheedy, G8EWO, asked what was the estimated loss of members if the subscription went up. Mr Brown said a loss of members was possible but he hoped these would be encouraged to rejoin the Society.

Mr G. Packer, G3UUS, asked if the motion were defeated, how long would members have to wait until it could be put up again to the membership. Mr Brown said 21 days notice in writing would have to be given, which in practice, would probably mean a delay of three months because of the length of time it would take to organize and get the notice published in *Radio Communication*.

Mr W. J. H. Kempton, G8LN, said he had heard these arguments before in 1926 and said he was prepared to let Council decide the subscription.

Mr L. Crane, G3PED, said he was in favour of an £8 subscription but asked Council to consider all ways of increasing efficiency and saving money. He suggested withdrawing the reduced subscription to associate members.

Mr D. Smith, G4DAX, said that the discussion had gone on a long time and that basically all had confidence in Council.

Mr M. Pellatt, G4AP, said that if *Radio Communication* to younger members were cut we would lose future amateurs and that these were the people to be encouraged.

Mr L. J. Carpenter, G4CNH, said he would like to see a searching look into all costs and asked if *Radio Communication* really needed a colour on the front cover.

Mr R. F. Stevens, G2BVN, said the front cover colour cost less than £20 per issue. Mr R. L. Glaisher, G6LX, suggested the front cover of *Radio Communication* be used for advertising. Mr Stevens suggested that this was not in accord with the dignity of a national society.

Mr P. A. Thorogood, G4KD, said that the Society should accept the recommendation of the Board of Trade, and he suggested that, in future, the Society's solicitor be present at Annual General Meetings.

Mr P. Jones, G3PYU, said that there must be a Society and suggested a show of hands on the resolution.

The President put the resolution to the meeting and asked for a show of hands.

The result was: for the motion, 124;
against, 13;
abstentions, 8.

Result of Council election

The President read out the numbers of votes cast for those in the election to Council for 1976 and announced that Messrs G. M. C. Stone, D. S. Evans, C. J. Thomas, D. J. Andrews and W. A. Scarr had been duly elected. In the case of Mr Scarr, who was over 70 years of age, it was necessary for the AGM to confirm Mr Scarr's election under the Companies Act. This was put to the meeting and there was an overwhelming majority in favour of Mr Scarr serving on Council as member for Zone D.

Auditor's remuneration

Mr Brown proposed that Messrs Edward Moore & Sons be appointed auditors for the current financial year and that Council be empowered to fix their remuneration.

Mr T. F. Campbell-David, G3YMM seconded. There was an overwhelming majority in favour of the proposal.

Other business

Mr Jessop announced that in accordance with Article 14, Dr J. A. Saxton had been invited to become an Honorary Member of the Society.

The President then presented Dr Saxton with a certificate to mark the occasion.

Dr Saxton said he was honoured to accept the Honorary Membership and thanked the Society. He said he had always been extremely interested in the Society's work and activities, although he had never aspired to become an operator in the normal sense.

Mr J. W. Swinnerton, G2YS, said he did not want the meeting to close without thanking the retiring members of Council for their services, especially Mr L. Newnham, G6NZ, who had been on Council for 23 years. Mr Swinnerton wished him a long and happy retirement. Mr Newnham said he had been a member of the Society for 50 years and that if the Society ever wanted his help it could count on him.

Mr Swinnerton thanked the President for his patient conduct of the meeting.

After the AGM there was an informal discussion followed by the presentation of trophies. Details were reported in the January issue of *Radio Communication*.

Region 11 ORM and mobile rally

The Royal Lido, Prestatyn, made an ideal venue for the Region 11 ORM. The facilities provided by the Prestatyn Council in the Lido ranged from the large Exhibition Hall where the trade exhibitors had ample room to display their many bargains, to the separate RSGB meeting room for the ORM. Back-up to this was the special rally bar which provided service from 11am to 5pm as well as the standard lounge bar operating under normal licensing hours. In conjunction with the bar service, there was also available a separate dining area which offered all catering facilities from a three-course lunch to sandwiches.

At the ORM, Mr P. Hudson, GW3IEQ, Regional Representative, as chairman, opened the meeting by thanking Prestatyn Council for making available the very comprehensive facilities of the Lido, paid tribute to Mr Roy Stubbs and members of the Rhyl Amateur Radio Club for their enthusiasm and very hard work in organizing the necessary arrangements for the rally, and introduced the President, Immediate Past President and the Zonal Manager to the members present.

The President expressed his pleasure at being able to attend the meeting, having arrived hot-foot from the Crawley dinner the evening before. Mr Parsons expressed his disappointment at not being able

to visit the area last year during his term as President. Mr Thomas discussed the activities in Wales and stated that although Wales' interests were amply represented at both Council and Regional level, there was a very urgent need of nominations for Area Representatives.

During the open meeting, questions ranged from the terms of reference of the Broughton Trophy, which excludes the participation of members from Wales, Scotland and N Ireland, to the disciplining and exclusion of stations who radiate poor-quality signals when operating in contests. There was a discussion of the members' dissatisfaction with the Society's administration. Several members stated that it took up to five or six letters to HQ before receiving a reply. Another member stated that, in his experience, if one wished to subscribe to any of the American magazines, it was far quicker and very much more reliable to write direct to the USA when one had a reply by return of post than to use the RSGB as the recognized agency in this country. The meeting listened with interest to the replies from the Council members representing the Society and recognized that there were considerable difficulties in administering the members' needs with the current resources available. Mr Parsons reminded members that if they availed themselves of the scheme of representation in existence, a large proportion of the correspondence arriving at HQ would disappear.

Among the warmly-received guests were Mr Basil O'Brien, RR Region 1, and Mrs O'Brien.

Praise was given for the very comprehensive talk-in facilities on all bands together with the noticeable back-up from M-P vhf repeater.

Special event stations

GB3CAD, 8-11 July
This station will be operated by the Catterick Garrison ARC during the Catterick Army Display. Operation will be on 80–10m cw and rtty and 2m ssb, from 1200 to 1700 daily. Details from hon sec G3WNG, QTHR.

GB3LGS, 9-10 July
Operational during Loughborough Grammar School Open Day on the evening of the 9th and all day on the 10th. It will be active on all bands 80–10m ssb/cw/a.m. and 2m fm. Commemorative QSL cards will be available. There will be many other displays, and contacts and visitors will be most welcome. Details from G4ERD, 50 Woodbrook Road, Loughborough, Leics, tel Loughborough 212583.

GB3SHQ, 19-30 July
Operational during the International Patrol Jamborette, Blair Atholl, Perthshire, on all modes 160–2m. Foxhunts will be held on 2m and there will be constructional projects. The event will be attended by some 700 Scouts. Details from GM3OWU, QTHR.

GB2MT, City of London, July
To mark the 80th anniversary of the first public demonstration of "wireless" by Marconi from the Post Office building in St Martin le Grand, City of London, on 27 July 1896, the three amateurs living in the city, G8ITS, G3COR and G8FWJ, are organizing the operation of this station. It is hoped to be operational on 80, 40 and 20m, 144 and 432MHz, Oscar 7 modes A and B, and perhaps 23 and 3cm. Assisting will be G4BWG and G3NYY.

Support has been promised by GEC-Marconi and the RSGB, and it is hoped to receive support from other directions—notably from the Lord Mayor and Corporation of the City.

GB3MRC, 31 July-1 August
The Nottingham and Plessey ARCs are operating this station during "Rail-Ex '76", an event organized by a local railway preservation concern, the Midland Railway Co, at Gregory's Rose Gardens, Stapleford. The venue is one mile from M1 junction 25 along the A52 towards Nottingham. Operation will be on 80, 20 and 2m, probably with rtty. Details from G4EKW c/o G8IPH, QTHR.

GB3WFS, 31 July-2 August
This station will be operational during the Wakefield and District Annual Flower Show, Clarence Park, Wakefield. Operation will be on 160, 80, 40, 20 and 15m cw/ssb, 2m fm/cw/ssb and 70cm ssb/cw. The station is licensed for consecutive operation on more than one band. Skeds are welcomed and QSLs will be sent. Visitors will be welcome, and licensed amateurs can operate the station on production of their licence. Details from G4AAQ, QTHR.

your opinion

The Editor
Radio Communication
Sir—Your "Current Comment" (June 1976) gives me and many other amateurs cause for concern, not only as regards the present use of the rf spectrum by radio amateurs but as to future use by them and the possible curtailment of their activities in the light of the Geneva Conference in 1979.

While no amateur worth his salt will dispute your view that irregularities are undesirable, what is at stake is the fundamental issue of the extent to which amateurs shall be entitled to use the rf spectrum.

It is my view that in general terms the standard of operating in this country is as high as anywhere in the world. If that be the case I am minded to ask just what plans are being made for the development of an observation service. With the advent of information and data banks by industry and government services there is an increasing involvement by the state and other organizations in the fundamental freedoms of the individual. As a radio amateur I am obliged to operate my equipment within the terms of my licence but, subject only to that and to the Wireless Telegraphy Act generally, my rights are unfettered. Before an observation service is set up I would suggest the following pertinent questions be answered by those propounding such a scheme:

(a) Has this suggestion emanated from HM Government or from an overseas government through the medium of an overseas amateur organization?
(b) What is the present state of the plans to which you refer and how far have they been developed?
(c) What is the projected financial implication either for Government or for the radio amateur in these plans?

Although I am unlikely to be a big objector nevertheless I resent the suggestion implied in your comment that because I object I necessarily offend.

Guy B. Moser, G3HMR

The Editor
Radio Communication
Sir—I am writing to you about the planned introduction of an observation service ("Current Comment"—June). I think it might have the opposite effect on the WARC to that intended, in that the introduction of such a service draws attention to the fact that there is "a very small minority". Unless the planned observation service has teeth, I have a feeling that the whole thing will be a waste of time and effort.

It will be very interesting to watch further developments. I hope there will be full explanations in the pages of the journal.

P. J. Halls, G4CRY

The Editor
Radio Communication
Sir—As one of the 5,000 or so amateurs licensed for mobile operation in the UK, I would like to say a heartfelt "Thank you" to Mr D.W. Morris, G3AYJ, for his superb article on the suppression of vehicle interference in the May issue.

It was a pleasure to read, compared equipment and devices at hf and vhf, and, at the end, listed all the troublespots and solutions, so that the harassed mobile operator does not have to plough through several books to find the answer to his particular problem.

Thanks again.

D. T. Mitchell, G3MQY/M

The Editor
Radio Communication
Sir—I have recently noticed that many amateurs using the 2m repeaters in this country are curiously reluctant to use phonetics when giving their callsigns. I can only assume that this is due to the fact that one tends to work the same people very often on these machines, and thus phonetics are often not necessary. However, it is very hard for itinerant users like myself to copy unfamiliar callsigns above car noise.

I think that fixed stations fail to realise sometimes that mobile operation is a far cry from a comfy chair in a quiet shack! So, gentlemen, please use phonetics when establishing contact; it makes life a lot easier, and saves much confusion!

"Rick" Sterry, G4BLT

The Editor
Radio Communication
Sir—With reference to the "Quick Tip" in the June *Technical Topics* regarding the use of potassium hydroxide pellets for revitalizing lifeless Nicad batteries, I feel that a word or two of warning may not be out of place.

The common name for potassium hydroxide is caustic potash. This is similar to—but rather worse than—its close relation caustic soda in its corrosive action on flesh, paper, wood, paint, polish and aluminium. It is not a substance to be trifled with by those with no experience in handling corrosive chemicals—one drop of its solution splashed into an eye can cause permanent blindness.

Potassium hydroxide is readily available from suppliers of laboratory equipment, but anyone contemplating its purchase ought to order safety spectacles and rubber gloves at the same time. There are about 4,000 pellets to the pound and they must be stored under airtight conditions.

All in all it might be a lot safer to invest in a set of new Nicad batteries.

M. A. Sparks, BSc, BRS24568

obituaries

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

Mr W. Burgess, G2VY
Bill Burgess died on 14 May aged 78. He was a member of the original Grimsby ARS and was the oldest amateur resident in the district. Before the Second World War he was active on 7 and 14MHz and later on 56MHz.

Mr R. Lunnon, G2RL
Ronald Lunnon died on 22 April after a long illness. Licensed in the early 'twenties, he will be remembered by many for his cw activity on the hf bands and 10m. After the advent of ssb his interest turned to vhf, and thereafter he remained active on 2m.

Mr C. T. Malkin, G5IV
Trevor Malkin died on 17 May aged 73. He was president of Barnsley & District ARC, and for many years until recently had been town representative for the area. Active on all bands from 160 to 2m, he was well known to both dx and local stations and held many certificates for dx working. He was widely respected for the help he gave many younger members in obtaining their licences.

Mr P. H. Mohamed, MBE, VS5PM
Pengiran Mohamed, who died recently, became the first holder of a VS5 callsign in 1936. A life-long cw devotee, he recently returned to the dx bands after having been QRT for many years.

Mr R. Sunter, G3DH
Robert Sunter died on 15 December 1975. He had been an RSGB member since the 'thirties, and his callsign was well known throughout the world. In recent years he was active on 80m.

Mr C. W. E. Sweet, G4ELT, G8GQK
Ted Sweet died on 12 February aged 63. He became licensed in his late fifties, and was an active member of the Plymouth RC, the Royal Naval ARS and the RSGB.

Mr R. F. Taylor, G3JVZ
Ron Taylor, who died on 1 March aged 71, was an enthusiastic swl for more than 30 years before being licensed in 1954. Mainly interested in top band, he was a regular member of an early morning net until a few days before his death.

L. E. West, ZL3RP
Les West died on 1 May aged 66. He was heard regularly on 15 and 20m.

Mr K. C. Woodman, G3EBU
Ken Woodman died on 4 April. An experienced professional operator, he passed on his knowledge by making regular slow morse transmissions aimed at helping bedfast listeners gain their licences. He was British organizer of the American Society of Wireless Pioneers.

The Society has also been informed of the deaths of:
Mr E. W. Bonson, G3JHY, and
Mr H. W. E. Prodger, G8ALU.

raynet

S.W. Law, G3PAZ *

With the holiday season well under way, the family commitments of members naturally take first place. No doubt this would account for the lack of activity on the Sunday morning 80m net. To re-cap for those who may have mislaid their notes; the net is every Sunday at 1000bst on 3·690MHz plus or minus QRM.

Errata
We apologise for an unfortunate error in the May column under "Repeaters"; the correct information should read RBO, 434·600MHz IN, 433·000MHz OUT.

Group news
The Glasgow group gained some excellent publicity at the time of the Symposium on Disaster held in the city on 13–14 April, when a paper was read by controller Terry Darke on the service provided by Raynet, its operation and availability. A local press report submitted by G8GZH, Northants, also demonstrates good liaison, Incidentally, applications for Raynet membership would be appreciated from the Corby and Kettering areas.

Raynet will be represented at the Anglia mobile rally on 18 July, reports G3AJS. We would also remind you that there will be two Raynet tables at the RSGB Radio Communication Exhibition at Alexandra Palace, 30 July–1 August.

A new group at Milton Keynes is understood to be well on the way under the controllership of R. J. Bullard, 8 The Limes, Stony Stratford, Milton Keynes. The address is given in full as Mr Bullard is not a licensed amateur. However, in order to forestall comment, he is a member of the RSGB and therefore the appointment is legitimate since a controller is, of necessity, an administrator. It is an interesting point!

It is understood that a new group is in the process of formation in Bedfordshire. South Anglia reports exercises using the 70cm band and we await results with interest. G8CAG reports that the Cambridge City group are paying great attention to establishing good liaison with user services. There is a possibility that there may well be further developments in the Grampian area. More on this at a later date.

Alan Foss, G8EAY, reports on a meeting attended by several SE controllers and also by Raynet committee member G3GJW on behalf of Kent. This GLC meeting discussed and agreed to Raynet participation in the proposed exercise "Floodproof" to be held on 4 July. User services will be in action on this date.

The Yorkshire Repeater Group have enquired into the possibility of the formation of a Raynet group using their facilities.

Lectures
Members are reminded that lecture material (and, of course, offers of assistance) are still welcome. Lectures have been given to Grafton RS (one of the oldest clubs in London) by G3GJW and to the Echelford ARS by G3PAZ. There are a number of clubs whose secretaries would be glad of an offer to round out the programme if suitable Raynet lecturers were available, so why not give it a thought? G3GJW has also lectured to the Dartford Heath DF Club, so interest is widespread and only requires a little liaison.

Developments
The Raynet Manual is due for reprint, and certain amendments to the rules are under discussion. All suggestions are welcome. Even more important are the results of the discussions with the HO with regard to changes in the regulations as they affect Raynet. (*See news item in "QTC"*).

*130 Alexandra Road, Croydon Surrey CRO 6EW.

contest news

March 144MHz Open Contest results

Some contests are a pleasure to remember; others are best forgotten. Cold weather, poor conditions and the failure of the experimental rules placed the March Open firmly in the latter category.

The 200km rule in the dx section was an attempt to encourage stations to work dx in preference to local contacts, but conditions proved too poor to give the average 10W fixed station a look-in. Some entrants were in favour of the principle of reducing the value of local contacts (though not necessarily to zero), but in retrospect it seems better to return to the normal scoring system, and let high-scoring contacts come to those who have the skill to find them in the QRM. Even with the new rule, the usual callsigns appear among the leaders: these stations will do well under any reasonable rules, as has been proved by experiments in earlier years. The adjudicators are grateful to their German counterpart DK6EI for checking some contacts in the dx section.

The local section was intended to provide a contest for those who have no access to ssb equipment, or did not wish to use it. The idea worked well in the December 1975 Fixed Contest, but not this time. A few fm stations chose to run high power in the ssb part of the band, causing severe interference and a lot of bad feeling; having heard them, more fm operators decided they would have to do the same. The average ssb operator does not object to the occasional fm signal in "his" part of the band, but cannot be expected to tolerate an S9+ fm signal calling CQ on 144·3MHz. If ever a non-ssb section is reintroduced—which is doubtful in view of the bad feeling created—then adherence to the band plan will have to be made mandatory. This will also include leaving the simplex channels on and above 145MHz clear for the use of non-contestants. Stations who showed complete disregard for the band plan gained an unfair advantage over their more considerate rivals; whether they gained any satisfaction is a matter for their own consciences.

Many entrants made comments on their cover sheets, others wrote letters, and G8JYR/P, G8CDW, G3OIT, G8GMQ and G8KYV/P sent check logs: thanks to you all. It is an unfortunate fact that there are not enough free weekends in the year to satisfy everyone with a tailor-made contest, and any attempt at a compromise may end up by pleasing no-one, as did the March Open.

G2HIF (local), *G3SEK* (dx).

DX Section-portable and /A stations

Posn	Callsign/P	Points	QRA	DX	Km
1	F0DA	2,633	ZJ21	GM8FFX/A	818
2	G8BQX	2,452	AK03	F5MF/P	747
3	GW8BHH	2,166	YM44	DC8RAA	781
4	GW3UCB	2,027	YN75	ON4PB/A	581
5	GW3WAS	2,009	YM14	ON4PB/A	555
6	G3UUS/LX	1,996	DK71	GW8BHH/P	670
7	GW3WRA	1,470	YL05	GM4DSZ	572
8	G3PMH/A	1,397	AM21	DK0HH/P	770
9	G3PIA	1,393	ZL33	DL0VI/P	650+
10	GW3OXD	1,316	YM55	—	—
11	GD3FLH	1,013	XO68	ON5NK/A	665
12	G4BWG	887	AL45	DF3GY/P	680
13	G2FJA	822	AL43	GM4DSZ	—
14	GW4BSP	756	YM04	F1DZN/P	415
15	G8DOU	717	YO78	ON5UN/P	537
16	G3XBF	702	AL21	GM4DSZ	610
17	G4EUR	684	ZL41	GM4DSZ	627
18	G8IWD	573	YK28	DC9DZA	590
19	G8GRB	498	YM28	ON5NK/A	472
20	G3GQC	469	ZN64	PA0OOS	500
21	GW3WIR	463	YM25	ON5UN/P	492
22	G4DAG	447	ZM25	—	—
23	GW8DLX	440	YM75	DC9DZA	645
24	G3GXI/A	432	YN48	F0DA/P	470
25	G3YMD/A	422	AL65	DL0CK/P	410
26	G8JXK	382	YL75	DC9DZA	640
27	G8HYF	254	ZO65	—	—
28	G4BP	224	ZO58	F0DA/P	500+
29	G8CRN	187	AM61	PA0MS/P	375
30	GW8EQJ	118	YN75	G8BQX/P	350
31	GM8AKB	104	YP14	G4EUR/P	482
32	G4ESK	73	ZM21	GM8BDX	340
33	G8HQR/A	49	YK07	G4CDN	345

DX Section—fixed stations

Posn	Callsign	Points	QRA	DX	Km
1	G4CDN	3,198	AM18	HB9AMH/P	730
2	G4BPO	2,172	AM77	F1AJD/P	738
3	GM4DSZ	1,070	YR80	F0DA/P	827
4	G4CZP	871	YO77	F0DA/P	490
5	G3UKC	807	AL56	G8HTE	440
6	G3CHN	639	YK61	F6BZJ/P	725
7	G3HOX	597	YN40	ON4PB/A	540
8	G3JXN	559	ZL39	GM4DSZ	610
9	G5YC	521	ZL50	DC8RAA	548
10	G3KMI	477	ZK04	GM4DSZ	675
11	G8AZA	454	ZO69	DC8RAA	711
12	G3GZJ	401	XK65	G4CDN	538
13	G8KJF	391	ZL30	DC8RAA	545
14	G4AEZ	384	ZL30	DJ8CP/P	590
15	G4BRO	302	ZL59	DC9DZA	465
16	G8BMP	286	ZM21	DC9DZA	575
17	G3BZU	237	ZK05	DL0CK/P	540
18	G8BEQ	202	YN50	F0DA/P	415
19	G8KME	201	YK07	—	—
20	G2BLA	182	ZL20	DK7VA/P	520
21	G8BKR	157	YL48	ON5UN/P	420
22	G8IWA	109	ZN18	F0DA/P	507
23	G8HGN	102	AL31	G4CZP	333
24	G8BVF	68	YN50	GM4DSZ	375
25=	G8ITS	51	ZL40	GW3UCB/P	270
25=	G8GII	51	—	—	—
27	G8GSH	18	ZL40	ON5UN/P	250
28	G8JAY	9	YL10	G8BQX/P	220

Local Section—portable and /A stations

Posn	Callsign/P	Points	QRA	DX	Km
1	G4BRA	1,257	ZL26	DK5PD/P	640
2	GW8FKI	374	YN63	G3XBF/P	287
3	G4DWZ/A	286	ZL40	PA0CKV/P	365
4	G3YXZ	259	ZL35	ON5UN/P	307
5	G3VGG	240	YM50	G4DSP	120
6	G8GDK	214	ZL17	F1DZN/P	229
7	G3XZW	99	YL75	G8JAZ	220
8	G8KFM/A	68	ZN18	G4BRA/P	234
9	GM8KRL	58	YP14	G6WR	145
10	G8DXD	25	YM69	G8VZ	119

Local Section—fixed stations

Posn	Callsign	Points	QRA	DX	Km
1	G3ERN	517	AL11	G3GZJ	424
2	G8ETB	387	ZL37	ON5UN/P	325
3	G3BPM	329	ZL48	EI9Q	455
4	G4DLB	296	ZM74	ON5NK/A	370
5	G8IXG	295	ZL46	ON5UN/P	310
6	G8JGE	272	ZL39	G8KNM/P	140
7	G3VWI	271	ZM54	ON5UN/P	372
8	G8KSP	254	AL41	GW3UCB/P	288
9	G6UW	252	AM61	DC9DZA	440
10	G3USF	210	YN79	G3KMI	225
11	G8HWO	169	ZL55	GW3UCB/P	225
12	G8KNW	137	ZL50	GW3WRA/P	227
13	G3ILO	136	YL29	GM4DSZ	590
14	G8IZD	78	AL41	G8BQX/P	73
15	G3WMR	76	AL41	GW3WAS/P	280
16	G8JLD	57	ZL60	G8VZ	68
17	G8FDL	56	YN38	GW8KYV/P	74
18	GW4EVX	35	YN65	G3UBX	95
19	G3ROJ	32	AL61	G8FMK	90
20	G4BBA	24	ZM39	GW3WAS/P	199

Listeners' Contest

Posn	Name	Points	QSOs logged
1	Terry Cooper, BRS28005	511	89
2	David Thorpe, A8163	314	83
3	Steve Blake, A8597	275	104*
4	Ron Thomas, BRS15822	256	58
5	Tim Charles, A8927	220	58*
6	Norman Henbrey, BRS28198	199	29
7	Michael Green, A8088	139	36
8	Neil Whiteside, A8859	116	38

* QRAs logged but no QTHs—30% deducted.

8th BARTG VHF RTTY Contest

1800-2300gmt 11 September, 0700-1200gmt 19 September

This contest, on the 144MHz and 432MHz bands, will be open to all licensed amateur radio stations in Zones 14 and 15 permitted to use rtty. Logs must be received by E. Yeomanson, G3IIR, 32 Gaynesford Road, Forest Hill, London SE23 2UQ, by 15 October 1976.

Full rules of the contest can be obtained from E. H. Double, 89 Linden Gardens, Enfield, Middlesex.

First 1·8MHz Contest 1976 results

The HF Contests Committee is pleased to record a considerable increase in the number of entries for this event compared with the other top band contests held during the past 12 months. Whether this increase was due to favourable conditions, poor tv programmes, the success of the AFS Contest held a few weeks earlier, or the longer write-up for the Second 1·8MHz Contest 1975 published just prior to this contest, we do not know! Nevertheless it is an encouraging sign that the art of cw operating has not been forsaken, particularly by the newly licensed.

The two leading stations in last November's contest repeat their success, but in reverse order. Dennis Andrews, G3MXJ, from East Sussex, tops the 56 British Isles entries with a final score of 652 points from 141 QSOs, 48 of which collected bonus points. G3MXJ used a modified SB401/SB301 combination, a 270ft centre-fed aerial at 60ft, and a 60ft loaded vertical. The runner-up was Stephen Wilson, G3VMW, of York, who also made 141 contacts but fewer bonus points. Seven "Under 18" entries were received, and the leading one was from Alan Gray, G4DJX, of St Albans. His score of 435 points came from 86 contacts made using fairly modest equipment—the transmitter was a home-brew job, the receiver an R107, and the aerial 47m long and 8m high.

In the contest for the Maitland Trophy, Andrew Givens, GM3YOR, has narrowly beaten GM3CFS by just 24 points. In the Overseas Section, which received only moderate support although several other European stations including EI and DL were active, the winner is Petr Douders, OK1DKW, who worked 37 British Isles stations, and the runner-up PA0QRP. Special mention must be made of the good check log received from SWL D. Sharred, A8312, from Birmingham. He would like to see the introduction of an SWL Section to the 1·8MHz contests; so would the HF Contests Committee but recent indications are that there would be very little support.

Subject to Council approval, the Somerset Trophy will be presented to G3MXJ, and the Maitland Trophy to GM3YOR. Certificates of merit will be sent to the three leading stations in each section, and the leading entrants "Under 18".

G3NKS

British Isles Section

Posn	Callsign	Code	Points	Posn	Callsign	Code	Points
1	G3MXJ	SXE	652	29	GM3YOR/P	HLD	369
2	G3VMW	YSN	632	30	G3ZON	LDN	364
3	G4BUE	SXE	627	31	G3ZNH	WLT	349
4	G3RPB	LDN	578	32	G3UQW	KNT	346
5	G3SJJ	NOT	563	33	G3KKQ	SRY	335
	G3YMC	BRK	563	34	G3EHF*	SXE	331
7	G6BQ	KNT	555	35	G4CMY	GLR	307
8	G3PDL	HBS	544	36	G3HTI	HBS	303
9	G3ORH	KNT	535	37	G4ALG	BRK	299
10	G3XSC	ESX	531	38	GW3GWX	GDD	288
11	G3RBP	CNL	523		G4CCQ	KNT	288
12	G4ANS	NOT	519	40	G4CNY	HWR	284
13	G3SJE	LDN	493	41	G3YYF	SXE	272
14	G3TR	SXW	492	42	G4DVB*	KNT	266
15	G3KTZ	LDN	477	43	G4ENV/A*	LDN	262
16	G3LCH	LDN	476	44	G3XSY	YSW	258
17	G4BXT	KNT	466		G3ZDD	SRY	258
18	G4BWP	BFD	454		G3ZNF	LEC	258
19	GI3JEX	DWN	446	47	G3WQK/A	SXE	256
	GM3CFS	HLD	446	48	G4BXN/A	YSS	253
21	G3IGZ	LDN	435	49	G3ATF	DVN	241
	G4DJX*	HFD	435	50	G2FNK	SRY	220
23	GW3XNS	GDD	434	51	G8VF	MCH	207
24	G3XWZ	NOT	408	52	G3FVW	YSN	205
25	G3GC	LDN	398	53	G8QZ	DYS	200
26	G4CEN	HPH	393	54	G4ESC*	SXE	179
27	G4CWH*	SRY	377	55	G2XP	SRY	138
28	G3TXF	ESX	371	56	G4DRS*	BFD	97
				57	G3ULY	CBA	67

* "Under 18"

Check logs gratefully acknowledged from G2BTO, G3USE, G4BVH, GW3JI and A8312.

Overseas Section

Posn	Callsign	Points	Posn	Callsign	Points
1	OK1DKW	204	6	OK1AXD	147
2	PA0QRP	181	7	OK2PGF	144
3	OK1DDL	179	8	PA0MBD	98
4	OK1DJK	165	9	OK3CEG	95
5	OK2PAW	153	10	HB9NO	20

Maitland Trophy

Posn	Callsign	2nd 1·8MHz 1975	1st 1·8MHz 1976	Total
1	GM3YOR	546	369	915
2	GM3CFS	446	442	891

April 70MHz Open Contest results

Conditions were similar to those for the 1975 contest, and were described as "the worst ever", and the weather "miserable". Scores were similar to last year's but they were accumulated from fewer contacts, which tends to suggest that conditions this year were slightly better but activity was down. Many well-known callsigns were missing from the logs and the small number of entries received for both sections confirms the lower activity.

Comments about the rules were few, which is a pity since constructive comment is a feedback in the process of tailoring a contest to meet the requirements of the customer. The only worthwhile comment was made by GW3ONP/P, who thinks that the contest should last 24h because it is not worthwhile to go portable for an 8h contest. G3JYP reinforced the 24h argument—he thinks that a dx station requires the extra time to winkle out his contacts. The view adopted by the VHF Contests Committee for this contest was that 8h was sufficient time to work all the active stations now that co-channel working is commonplace. G3TWG and G4ARD/P found this duration to their liking, confirming the committee's decision.

FIXED STATIONS

Posn	Callsign	Points	QSOs	QTH	Best dx	Km
1	G3OHH	343	58	YN79	GM4BQA/P	320
2	G3RJX	283	51	ZM31	GM4BQA/P	365
3	G3OIT	278	61	AL33	G3WOS/P	400
4	G4AEQ	240	38	YN48	G4ASR/P	435
5	G4AGE	236	42	ZN64	G3XCS	350
6	G3XDY	225	40	AM77	GW3ONP/P	303
7	G3JYP	186	22	YO38	G3LCH/P	415
8	G4AZS	184	34	YM27	GM4DMZ/A	225
9	G3BW	176	20	YO33	G3LCH/P	440
10	G5DF	174	28	ZL45	GM4DMZ/A	440
11	G4AEZ	160	34	ZL30	G4ASR/P	413
12	G3RWM	138	26	ZM32	G4ASR/P	320
13	G5UM	137	30	ZM35	GM4DMZ/A	285
14	G3TWG	125	35	ZL37	G3NEO	220
15	G5HD	123	23	ZK02	G4ASR/P	290
16	G3BTO	117	31	ZL55	G3OHH	210
	G3TAA	117	37	AL41	GW3ONP/P	249
18	G3TAL	89	17	ZK14	G4AGE	260
19	G4CQZ	75	29	ZL19	G3XCS	—
20	G3HBG	52	14	ZL60	G3OHH	260
21	GM3YOR	49	17	YQ65	GW3ONP/P	417
22	G3WFM	43	21	ZL30	G3LCH/P	110

Check log received from G3GZJ.

PORTABLE STATIONS

Posn	Callsign	Score	QSOs	QTH	Best dx	Km
1	GW3WRA/P	605	77	YL05	GM3BQA/P	445
2	GW3ONP/P	535	68	YM44	GM3BQA/P	444
3	G3PIA/P	427	72	ZL33	GM4DMZ/A	401
4	G4ARD/P	409	71	ZL18	GM4DMZ/A	410
5	G3LCH/P	328	58	ZK05	G3BW	425
6	G3PFM/P	322	54	YK09	G3JY/P	403
7	GW3UKV/P	308	44	YM33	G3DAH	341
8	G3OUT/P	300	36	YM46	G4ASR/P	410
9	G3SVL/P	268	57	ZL57	G3BW	405
10	G3WOS/P	223	29	YO29	G3OIT	385
11	GM4DMZ/A	218	24	YO02	G5DF	420
12	G3WKS/P	209	49	AL73	G3AUS	308
13	G4ASR/P	179	17	XK63	G4AEQ	435
14	G4DZO/P	146	16	AK12	G3OHH	310
15	G4CRC/P	144	14	XK63	G3NEO	420
16	G3RQZ/P	69	27	AL60	GW3WRA/P	225

May 432MHz Open Contest results

There was more activity than usual but a number of portable, as well as fixed, stations which appeared in the logs did not send in entries—why? Scrutiny of the contact times showed that most stations closed down from about 0000 to 0600: maybe this was due to the realization of general poor conditions.

SSB is now the mode, with linears greater than 100W output, with some stations using the more recent selected type transistors in the first rf stage. Combination of a group of Multibeams is the favoured aerial system for portable. By the comments noted the majority of operators enjoyed the contest—one said never again. A number of complaints that operators would not work cross mode; this caused bitter comment. Altogether a good set of logs, and our thanks to the leading portable station for their computer log printout accompanied by the distance and direction analysis, a good cross check for the adjudicator.

The 1951 Council Cup is awarded to GW3UBX/P, subject to Council approval, and a certificate goes to GW3UCB/P. Certificates

also go to G3JXN and G3KMS as the leading fixed stations, and Roy Thomas, BRS15822, with a score of 86 goes into the listeners' table. *G8ACJ*

FIXED SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G3JXN	256	69	ZL39E	G3SFG/P	315
2	G3KMS	184	33	YN38A	G8AGU/P	293
3	G3BW	149	19	YO33G	G4CQR	430
4	G8AZA	148	24	ZO69H	G3BHW	340
	G3NKL	148	32	YN17C	G3PMH/A	268
6	GD2HDZ	122	16	XO68B	G3PMH/A	380
7	G8GP	112	30	ZL50B	G3KMS	291
8	G8KJF	102	48	ZL30C	GW3UCB/P	255
9	G3RQZ	99	27	ZL50G	GW3UCB/P	273
10	G5DF	96	22	ZL45B	ON5UN/P	315
11	G8EOP	95	25	ZN22C	G3PMH/A	—
12	G3LCH	88	32	ZL50G	ON5UN/P	266
13	G3SVY	82	38	ZL50E	ON5UN/P	250
14	G3OHC	79	27	ZM31C	G8AGU/P	220
15	G3HCW	61	17	ZN24C	G3JXN	270
16	G3EHM	59	20	YM10A	G8AGU/P	240
17	G3KMI	47	13	ZK04G	ON5UN/P	345
18	G8HBQ	45	17	ZN13G	GW3UCB/P	—
19	G8HVY	32	10	YK28C	GC8AAZ	155
20	G8IWA	23	9	ZN18C	G8LOW/P	112
21	GM8BKE	22	4	YP09F	GW3UCB/P	330
	G3UFY	22	18	ZL50J	G4ALE/P	33
23	G8HGN	21	15	AL31C	G4ALE/P	80
24	G8FDL	17	8	YN38J	GW3UBX/P	120
25	G8BKR	16	8	YL48H	GW3UBX/P	110
26	G8CTT	12	10	AL4IJ	G4ARD/P	60
27	G8KNW	11	9	ZL50D	G4ARD/P	63
28	G3ILO	6	2	YL29G	GW3UBX/P	—

PORTABLE SECTION

Posn	Callsign/P	Points	QSOs	QRA	Best dx	Km
1	GW3UBX	692	106	YM44D	ON6DH	538
2	GW3UCB	657	103	YN75F	ON5UN/P	517
3	GW8AWM	644	93	YM54D	ON6DH	530
4	G3PMH/A	605	111	AM71F	PA0NYM/P	390
5	G8AGU	503	62	YL72H	ON5UN/P	510
6	G3XDY	482	73	ZN49J	G3AUS	395
7	G4ARD	439	109	ZL18H	GD2HDZ	360
8	G8LOW	344	85	ZN73E	ON5UN/P	425
9	G4ALE	262	50	ZK20A	PA0MS/P	375
10	G3SFG	218	40	ZO46F	G3JXN	323
11	G3ISO	149	39	ZK07H	F1CF	320
12	GW3NNF	139	21	XN49E	ON5UN/P	620
13	G4ASE	135	31	ZM16J	ON5UN/P	375
14	G8AYY	135	39	ZN71H	G8AGU/P	270
	G4APD	119	41	ZM45D	GW8AWM/P	147
16	GW8BXJ	65	21	YL25A	G4ARD/P	178

April 1976 1·3GHz Open Contest results

Poor propagation and low activity combined to make this a frustrating contest for those who had expended much effort in developing and setting up efficient station equipment. Whereas the VHF Contests Committee cannot do much about the former it has been agreed to try to improve the latter next year by considering that this contest run concurrently with part of the Spring 432MHz event.

The results show a clear win for last year's winner, G3WDG, in the portable section, and for G3JXN in the fixed section. Certificates go to both. *G3VPK*

FIXED SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km	Pwr out
1	G3JXN	827	20	ZL39	G4BPO/P	127	15
2	G3HCW	380	7	ZN24	G4BEL	177	5
3	G3NHE	342	6	ZN54	G8EOP	42	5
4	G8EOP	322	6	ZN22	G3ZIV	50	6
5	G3FYX	240	5	YL38	G8AGU/P	135	10
6	G8IFT	223	3	YM50	G4BEL	150	4
7	G3NKL	160	4	YN17	G3FNQ	36	40*
8	G3TQF	102	2	ZM24	G4BEL	99	10*
9	G8BKR	83	2	YL48	GW8ADP/P	45	3
10	G8CTT	68	5	AL41	G3JXN	28	2

PORTABLE SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km	Pwr out
1	G3WDG	2,093	21	ZL52	G3LQR	236	60*
2	G4BPO	1,075	11	AM67	G3WDG/P	214	60*
3	G3WIR	956	16	ZL26	GW8ADP/P	150	0·5
4	G8IDZ	502	10	ZL60	G3WDG/P	112	5
5	GW8ADP	418	7	YL25	G3WIR/P	135	50*
6	G3RQZ	390	9	AL52	G3WDG/P	97	3
7	GW8BXJ	370	6	YL25	G3WIR/P	144	3
8	G2DSP	227	3	ZK08	G3GDR	89	5

* SSB used.

3·5/7MHz Low Power Contest 1976 results

The clear winner of this year's event is again Philip Bagshaw, G3NEO, and David Sergeant, G3YMC, takes second place having been 13th last year. A. J. Gould, G3JKY, moves up one to third position. Scores were higher this year but many of last year's contestants failed to put in an appearance so that the total entry dropped from 26 to 16. The standard of most logs was very good with most entries on RSGB Contest Log Sheets and the points lost were mostly due to errors in reports or serial numbers.

The inclusion of 7MHz was not a success, partly because of an unexpected clash with a YU/DL contest and also because conditions did not favour inter-G working. It did not significantly affect the results, with only three stations submitting scores on that band, although several others mentioned having tried their luck without success.

It is clear that the points differential is still biased against the 5W stations and that another means of attracting entries from further afield is required. Both of these factors can probably be rectified by the introduction of a multiplier based on counties/countries as suggested by some entrants. Comments with the logs are gratefully acknowledged.

Subject to the approval of Council, Philip Bagshaw will be awarded the 1930 Committee Cup.

Posn	Callsign	Power(W)	3·5	7	Points	QSOs	TX	Antenna
1	G3NEO	1	6,133	—	6,133	62	EC91	Dip
2	G3YMC	1	5,300	—	5,300	53	2 x 2N2476	180 ft lw
3	G3JKY/P	0.55	4,533	—	4,533	46	2N706	Dip
4	G3XZX	0·87	4,100	—	4,100	41	BFY51	Inv-L
5	G8PG	1,2.	3,100	150	3,250	35	2N3053	130 ft
6	G4CZB/A	1	3,200	—	3,200	33	2 x BFY51	Dip
7	G3RQZ	1	3,100	—	3,100	31	EL91	80 ft ef
8	G3DNF	1.9	1,900	—	1,900	39	TTX	90 ft ef
9	G3AIO	2	1,700	—	1,700	34	—	100 ft ef
10	G3UYM	2	1,283	—	1,283	28	BD123	70 ft ef
11	G4AYS	0·4	1,266	—	1,266	14	BFY51	120 ft ef
12	G4DDX	1·9	1,250	—	1,250	27	BD132	W3DZZ
13	GW3CW	4·5	1,160	—	1,160	58	ECL82	Inv-V
14	G3HTI	5	580	20	600	30	Command	135 ft ef
15	G4BWP	5	594	—	594	30	6AQ5	VS1AA
16	G4DDL	3	—	220	220	12	HW7	65 ft ef

Check log acknowledged with thanks from G3NYA.

7MHz Contest 1976 rules

Licensed amateurs and SWLs throughout the world are invited to take part in these contests for single-operator stations (no multi-operator participation allowed). Log and cover sheets may be obtained from RSGB, 35 Doughty Street, London WC1N 2AE; UK members should enclose a large sae.

Entries must be addressed to: The HF Contests Committee, c/o J. Bazley, G3HCT, Brooklands, Ullenhall, Solihull, West Midlands B95 5NW, England, to arrive no later than 17 December for the phone contest and by 31 December for the cw contest. British Isles logs must be postmarked no later than 10 November and 24 November respectively.

It is extremely important that entries are sent only to the above address—those sent elsewhere may suffer delay or disqualification.

TRANSMITTING SECTION

1. The general rules for RSGB hf contests, published in the January 1976 issue of *Radio Communication*, will apply.

2. When. Phone contest from 1200gmt 16 October to 1200gmt 17 October 1976.

CW contest from 1200gmt 6 November to 1200gmt 7 November 1976.

3. British Isles entrants must be members of the RSGB.

4. Contacts. CW contest—A1 only, phone contest a.m. and ssb. Reports and serial numbers must be exchanged (the latter to start from 001).

5. Scoring. British Isles stations may not work each other for points. They score five points for contacts with Europe and 15 for those outside Europe. They may also count 20 bonus points for each different country worked (as per the RSGB Countries List). In the case of VE, VK, W/K, ZL and ZS, each call area will count as a country for this purpose.

Overseas stations in Europe score five points for each contact with the British Isles, those outside Europe 15 points. All may claim a bonus of 20 points for each British Isles numerical prefix worked

(ie G2, G3, G4, G5, G6, G8, GC2, GC3, GC4, GC5, GC6, GC8, GD2, GD3, GD4, GD5, GD6, GD8, G12, G13, G14, G15, G16, G18, GM2, GM3, GM4, GM5, GM6, GM8, GW2, GW3, GW4, GW5, GW6 and GW8). Contacts with stations using GB prefixes will not count for bonus points.

6. Awards. The Thomas (G6QB) Memorial Trophy will be awarded to the leading British Isles entrant in the cw section. Certificates will be awarded to entrants placed first, second and third in the UK, European and the rest-of-the-world sections.

RECEIVING SECTION

Rules (1), (2) and (3) for the transmitting section apply.

British Isles entrants should only log overseas stations in contact with British Isles stations and must record the report and serial number given by the overseas station and the time in gmt. European stations logged count five points, outside Europe 15 points. The bonuses mentioned in (5) above also apply to this section. No more than 20 QSOs made by any one British Isles station may be logged.

Overseas listeners should log British Isles stations and must record the reports and serial numbers given, and the time in gmt. European listeners claim five points per QSO logged, others 15. A bonus of 50 points may be claimed for each British Isles country and numerical prefix logged. GB prefixes do not count, and not more than 20 QSOs made by the same British station may be logged.

Awards. Certificates will be awarded to the leading entrants in each section.

70MHz Open Contest rules

1900-2300 and 0700-1500gmt, 7/8 August.
All entries and checklogs to: VHF Contests Committee, c/o G4CUT, 59 Harewood Road, Chelmsford, Essex CM1 3DH.

The following general rules, published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8a, 9a, 10a, 11-22.

The VHF Manager's Trophy will be awarded to the leading station.

Listeners' Contest. Rules 1-6 will apply.

DF Qualifying Event Coventry

Date: 11 July 1976.
Map: OS Sheet 140 (Leicester & Coventry).
Assembly: 1300bst for start at 1320bst.
Location: Lay-by on A445 approximately four miles SE of Coventry. NGR 373727.

Intending competitors should notify G. Whenham, Lavernock, Chapel Street, Bishops Itchington, Leamington Spa, Warks, (tel 0926-612-806) as soon as possible of the numbers in their parties requiring tea.

This event is being run in conjunction with the Rugby Shield & Cup competition: the shield will be awarded to the overall winner and the cup to the highest placed Rugby Radio Club member.

DF Qualifying Event Oxford

Date: 18 July 1976.
Map: OS Sheet 164 (Oxford).
Assembly: 1300bst for start at 1320bst.
Location: College Farm, Pinchgate, Bletchingdon, Oxford, 1¼ miles east of Bletchingdon NGR 522173. Approach from west only.

Will intending competitors please notify the organizer, R. J. Pearce Boby, at the above address (tel Bletchingdon 767), indicating the number requiring tea.

DF Qualifying Event Salisbury

Date: 1 August 1976.
Map: OS Sheet 184 (Salisbury and The Plain), 1–50,000 series.
Assembly: 1300bst for start at 1320bst.
Location: NGR 092285 (two miles south of Wilton)

Intending competitors please notify A. Newman (G2FIX), 74 Victoria Road, Wilton, Nr Salisbury, Wilts SP2 QOY, as soon as possible of the number in their party requiring tea.

Contests calendar

11 July	DF Qualifying Event Coventry (Rules in July issue)
18 July	3·5MHz FD (Rules in June issue)
18 July	DF Qualifying Event Oxford (Rules in July issue)
25 July	144MHz QRP (Rules in June issue)
1 August	DF Qualifying Event Salisbury (Rules in July issue)
7-8 August	70MHz Portable & Listeners (Trophy) (Rules in July issue)
22 August	DF Qualifying Event Slade
4-5 September	144MHz Open & Listeners (Trophy)
4-5 September	SSB FD (Rules in May issue)
12 September	DF Final High Wycombe
2-3 October	UHF/SHF (Rules in May issue)
9-10 October	21/28MHz (Rules in May issue)
16-17 October	7MHz CW (Rules in July issue)
24 October	70MHz Fixed
Oct-Nov	432MHz Cumulatives
6-7 November	144MHz CW
6-7 November	7MHz Phone
13-14 November	Second 1·8MHz
5 December	144MHz Fixed

Mobile rallies calendar

4 July	Upton Mobile Rally, The Hill Junior High School, Upton-on-Severn. Talk-in on 2m fm and ssb, G3GJL and G8JC. Trade stands, model aircraft, model steam train, bring and buy, children's games and fancy dress competition, strawberry picking and good canteen. Further details from G3TQD, QTHR.
18 July	Cornish Radio Amateur Club Rally, Cornwall Technical College, Camborne (venue to be confirmed). Details from G3NKE, QTHR.
18 July	Anglian Mobile Rally, Stanway School, Colchester.
7 August	Air Day at HMS *Daedalus*, Lee-on-the-Solent, Hampshire. Talk-in on 2 and 160. Details from G3JMG, QTHR.
15 August	Derby & D ARS Rally, Rykneld Schools, Derby. Details from G3FGY, QTHR.
15 August	Pembroke RSGBG "Bucket & Spade Party", Regency Hall, Saundersfoot. Rally opens 10am. Talk-in on all bands and modes, mainly 2m fm S20, S22, etc, and ssb 144·300MHz. Free car parking and refreshments at nominal charges. The hall is a few minutes' walk from the beach. Details from GW3XJQ, QTHR.
22 August	Preston & ARS Mobile Rally, Walton-le-Dale County Secondary School, Preston.
22 August	RAIBC Picnic and Mobile Rally in association with Southampton RSGB Group, The Fairground, Broadlands Estate, Romsey, Hants.
29 August	Torbay ARS Rally, change of venue to Haldon Racecourse, A38, nr Exeter. Talk-in stations and signs to guide to new venue. Details from G3GDW, QTHR.
19 September	North Ulster RSGB Group Mobile Rally, Castle grounds, Antrim. Details from GI8AYZ, QTHR.

Looking ahead

30 July-1 August—RSGB Radio Communication Exhibition, Alexandra Palace, London.
18 September—British Amateur Television Club Convention, University of Leeds.
26 September—Welsh Amateur Radio Convention, Oakdale Community College, Blackwood, Gwent.
16-17 October—JOTA 1976. JOTA Scout camp and radio teach-in at HMS *Mercury*.
28-30 October—ARRA Exhibition, Granby Halls, Leicester.
24 April 1977—NRSA Convention, Belle Vue, Manchester.

club news

RSGB affiliated societies and clubs, and RSGB groups, are invited to submit items for inclusion in "Club News" to their regional representatives (not direct to the editor).

Items of news and dates of forthcoming events should reach RRs by 31 August for the September issue.

REGION 1—RR B. O'Brien, G2AMV, "Tanglewood", Anthony's Way, Heswall, Wirral, Merseyside L60 0BP.

Ainsdale (AARC)—15, 29 July, 12, 26 Aug, 9 Sept. 8.15pm. Ainsdale Scout Headquarters. Further details from G2CUZ.

Blackburn (East Lancs ARC)—2 Sept (Surplus equipment sale). 7.30pm. YMCA, Blackburn. Visitors are welcome. Sec G4CGT.

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

Bolton (B&DARS)—Third Wednesday in each month, 8pm. Clarence Hotel, Bradshawgate. Sec G4AQB.

Bury (BRS)—Main meeting on the second Tuesday in each month. RAE classes and morse instruction every Tuesday as well as an informal meeting of club members. Mosses Community Centre, Cecil Street, Bury. Sec John Clifford, G4BVE, 10 Arley Avenue, Bury, tel 061-764 3466.

Carlisle (C&DARS)—Mondays, 7.30pm. Currock House, Lediard Avenue, Currock, Carlisle. A very full programme of lectures and demonstrations have been arranged for the coming months. Full details from G8DVD.

Chester (C&DARS)—Tuesdays, 8pm, except first Tuesday in month. YMCA, Chester. Full details from GW8DMR.

Douglas IoM (IoM ARS)—Mondays fortnightly, Highlander Inn, Crosby. Visitors welcome. Sec GD2HDZ, tel Laxey 465.

Eccles (E&DARC)—Tuesdays, 8pm. Bridgwater School, Worsley, Manchester. Club 2m net, 11am Sundays on 145·66MHz. All visitors and prospective members welcome. Sec G4AEQ.

Lancaster University (UoLARS)—Wednesdays, 8pm. Furness College. RAE and morse classes. Visits and skeds on hf and 2m with the club station G8DOU and G3ZBY are welcome. Enquiries to John Morris, G4ANB, Dept of Physics.

Leyland (LHARG)—Second Monday in each month, 7.30pm. "Rose & Crown", Ulnes Walton, Leyland. Details from G3XII.

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

Liverpool (North Liverpool RC)—Tuesdays, 8.30pm. Informal meetings. "Nags Head", Thornton, Crosby, Liverpool 23. Visitors welcome. Sec R. B. Porter, 11 Cranmore Avenue, Crosby, Liverpool L23 0QD.

Liverpool University (UoLARS)—Details of meetings from J. M. Pagett, G8IAV, c/o The Students Union.

Manchester (M&DARS)—Wednesdays, 7.30pm. 203 Droylesden Road, Newton Heath, Manchester 10. Sec G8IYX.

Manchester (South Manchester RC)—At the AGM on 14 May the following were elected as committee members: G4AUR, chairman; G3WFT, vice chairman; G8GDM, hon sec; G8KGM, hon treasurer; G3SMM, vhf member; G3SVW, G4AOK, and G3VIW, ordinary senior members; G8LQO, junior member. G3UTL has decided to retire after being treasurer for ten years. Congratulations to G3RVQ, who was elected an honorary life member of the club in appreciation of all he has done for it. He has put up with the club shack on his land, and without the facilities he has made available the club would not be what it is today. 9 July (Mini direction finding contest), 16 July (Visit by Microwave Modules Ltd), 23 July (VHF night on the air), 30 July ("Nucleonics" by G8GDM), 6 Aug (Activity night), 13 Aug (" Power supply units" by G4AUR), 20 Aug (Activity night), 27 Aug ("Frequency counter" by G3SMT, winner of homebrew contest). Fridays, 8pm. Sale Moor Community Centre, Norris Road, Sale, Cheshire. Morse practice precedes the lectures. Hon sec G8GDM.

Manchester University (MUARS—G3VUM). Interested parties should contact G4AOS, QTHR.

University of Manchester (Uom—IoS&TARS)—G3CXX is active on all hf bands and G8FOT on 2m and perhaps 23cm. Items for club magazine/newsletter, or letters from intending members gratefully received by G8GOS.

North Western Repeater Group—Third Thursday of each month, 8pm. "Grey Mare", Blackburn. Meetings open to all interested. Full details from G8HQW.

Preston (PARS)—15, 29 July, 12, 26 Aug, 9 Sept. Morse practice 7.30pm, main meeting 8pm. "Windsor Castle" (private room), St Paul's Square, Preston. Sec G8KTM.

Salford (Dial House RS)—Wednesdays, 5.30-9.30pm. Dial House, W45, 55 Portland Street, Manchester M60 1BA. Net channel 145·25MHz a.m.—most members are now mobile on this channel, and the club station G3WDH now monitors this frequency every club night for calls from any other station. Sec G8JCN.

Stockport (SRS)—Second and fourth Wednesdays in each month, 8pm. Blossoms Hotel, Buxton Road, Stockport. Sec G3FYE.

Thornton Cleveleys (TCARS)—First and third Wednesdays in each month, 8pm, morse practice from 7.30pm. St John Ambulance Hall, Fleetwood Road North (next to "Gardener's Arms"), Thornton. Details from sec G8OY.

UK FM Group (Western)—Net night each Monday, 9.30pm on 145·600MHz. Details from G3LEQ, tel Knutsford 4040.

Warrington (W&DARS)—Tuesdays, 7.45pm. Grappenhall Community Centre, Bellhouse Lane, Grappenhall. Sec J. Weaver, c/o Grappenhall Community Centre.

Wigan (W&DARS)—First and third Wednesdays of each month. Poolstock Cricket Club, Keats Avenue, Poolstock. Sec A. Cunliffe, G4EII, 50 Langholm Road, Garswood, Wigan.

Winsford (Mid-Cheshire ARC)—Wednesdays. Technical Activities Centre, rear of Verdin Buildings, Verdin Comprehensive School, Grange Lane, Winsford. RAE class 7pm to 8pm. Morse class every third Wednesday. Net nights 160m Mondays, 8pm, 2m (fm) Tuesdays, 8pm. Sec G8HAV.

Wirral (WARS)—First and third Wednesdays in each month, 7.45pm. Sports and Recreation Centre, Grange Road West, Claughton, Birkenhead. Sec G3DLF.

The 1977 North West Amateur Radio Convention will be held on 17-18 September 1977. Its format will be similar to that used with great success for the first two conventions. Further details will become available early next year. Enquiries to J. R. Morris, Dept of Physics, University of Lancaster.

GD3KGC has been elected area representative for the Isle of Man.

REGION 2—RR R. C. Andreang, G4CMT, 6 Beech Avenue, Bilton, Hull, North Humberside.

Barnsley (B&DARS)—Fourth Friday in each month, 7.30pm. King George Hotel, Peel Street, Barnsley. Hon sec G3LRP.

Goole (G&DARS)—Fridays, 7.30pm (during school term only). Goole Grammar School. Full details from chairman G3VBI.

Halifax (Northern Heights ARS)—7.45pm. Peat Pitts Inn, Ogden, Halifax (four miles north of Halifax Town Hall). Hon sec G3MDW.

Hull (H&DARS)—Fridays, 7.30pm. Change of venue to rear of Dorchester Hotel, Beverley Road, Hull. More details in September issue.

Leeds (White Rose RS)—Wednesdays, 7.30pm (lectures start 8pm). New members and visitors welcome. Hon sec G3VTY.

Otley (Radio & Electronics Society)—Change of venue from 2 June to "The Three Horseshoes", Bridge Street, Otley. Hon sec J. H. Marchbank, 116 Brooklands Lane, Menston, Ilkley, West Yorks LS29 6PJ.

Scarborough (SARS)—Fridays, 7.30pm. Scarborough Technical College, Corby Road, Scarborough. Local and visiting amateurs most welcome. Holiday visitors write to hon sec Charles Whitaker, 1 Rye Field Close, Eastfield, Scarborough.

Sheffield (SU & PRS)—Thursdays during term time, 5.30pm. "The Phoenix", Charles Street. Details from A. Marvin, G8CZO, 74 Kirkstone Road, Sheffield S6 2PP.

York (YARS)—3 July (Exhibition station GB2JRS, Joseph Rowntree School, New Earswick), 13-15 July (Exhibition station GB2GYS, Great Yorkshire Show, Harrogate), 14 Aug (Exhibition station GB2TS, Tollerton Show, Tollerton, nr York). Fridays, 7.30pm (except for the third Friday in the month). United Services Clubroom, 61 Micklegate, York. Visitors always welcome. Hon sec G3WVO.

The Region 2 Representative thanks all club secretaries for their co-operation in compiling the above information and asks that any affiliated societies not mentioned contact him immediately.

REGION 3—RR H. S. Pinchin, G3VPE, 61 Cole Bank Road, Hall Green, Birmingham B28 8EZ.

Birmingham (Midland ARS)—20 July (Equipment demonstration by Amateur Electronics UK), 17 Aug. 8pm. Room 110, University of Aston, Gosta Green, Birmingham. G3ZKQ.

Birmingham (Slade R&SS)—9, 23 July, 6, 20 Aug, 3 Sept. 8pm. The Committee Room, Church House, Erdington, Birmingham. G8GRC.
Birmingham (South Birmingham RS)—7 July, 4 Aug, 1 Sept. 8pm. Hampstead House, Fairfax Road, West Heath, Birmingham B31 3QY. G8BHE.
Birmingham (Birmingham University RS)—Every Tuesday during term, 7.30pm. Students' Union. G3IUB, QTHR. Sec G4BVF.
Bromsgrove (B&DARC)—3 July (GB2BRC at Sanders Park), 3-4 July (VHF NFD), 9 July (Natter-nite), 13 Aug (Comparison of FT101 and TS520). 8pm. Avoncroft Art Centre, Bromsgrove. G8JTK.
Coventry (CARS)—Fridays, 8pm, Baden Powell House, St Nicholas Street, Radford, Coventry. G8DMI.
Coventry Technical College (CTCARS)—Mondays, 7pm. Morse classes and rtty included in club activities. Winfray Annexe of the College. G8ISJ.
Dudley (DARC)—Second and fourth Tuesdays in each month. 7.45pm. Central Library, Dudley. G4BFT.
Hereford (HARS)—First and third Fridays in each month. Civil Defence HQ, Gaol Street, Hereford. G4CNY.
Lichfield (LARS)—First Monday and third Tuesday in each month. 8pm. Swan Hotel. Tuesday meetings are natternites. Sunday net 1200 bst, 21·150MHz. G3NLY.
Lichfield (Chad RC)—Fortnightly, commencing 1 July. Swan Hotel. G4ESK/G8FBL.
Mid-Warwickshire (MWARS)—First and third Mondays in each month. 8pm. 61 Emscote Road, Warwick. G8CXL.
Redditch (RRC)—Second and fourth Thursday in each month. 8pm. The Old People's Centre, Park Road, Redditch. G3EVT.
Solihull (SARS)—20 July (Film show), 17 Aug ("Marconi and the radio pioneers" by Dr Naylor Strong, G2RQ). 7.30pm. The Manor House, High Street, Solihull. G4AXW.
Stoke-on-Trent (S-on-TARS)—Thursdays, 7.30pm. 2A Racecourse Road, Oakhill, Stoke-on-Trent. G4CWN.
Stoke-on-Trent (North Staffs ARS)—Mondays, 7.30pm. Lectures, natter-nites, hf and vhf stations. Harold Clowes Community Centre, Bentilee, Stoke-on-Trent. G8KVM.
Stourbridge (S&DARS)—6 July, 3 Aug, 7 Sept (Informals, 9pm, at "Shrubbery Cottage" public house, Heath Lane, Stourbridge), 19 July, 16 Aug. 7.45pm. Longlands School, Brook Street, Stourbridge. G4CLX.
Sutton Coldfield (SCRS)—12 July (Natter-nite), 26 July ("Electricity—its generation and transmission" by G3IGI). No meetings in Aug. 7.30pm. Central Youth HQ, Clifton Road, Sutton Coldfield. Sec Norman Sanderson, 130 Willmott Road, Sutton Coldfield B75 5NW.
Telford (T&DARS)—Wednesdays, 7.30pm. Phoenix Centre, Webb Crescent, Dawley. G4AXZ.
Willenhall (W&DARS)—Alternate Wednesdays. Morse classes available at the end of each meeting. "The Three Crowns", Stafford Street, Willenhall. G3YHN, XYL.
Wolverhampton (WARS)—5 July ("Repeaters" by G3PWJ), 10 July (Demonstration of amateur radio at Elloes School), 12 July (Natter-nite), 19 July, 2, 9, 16, 23 Aug. 8pm. Neachells Cottage, Danescourt Road, Stockwell End, Tettenhall, Wolverhampton WV9 9PH. G8BSR.
Worcester (W&DARC)—4 July (Upton radio rally), 5 July (Ragchew evening), 17 July, 2, 21 Aug ("RSGB" by G3VPE), 6 Sept. 8pm. "The Old Pheasant", New Street, Worcester. G4BXS.
The Coventry Technical College ARS will be running RAE and morse classes. Details from J. Witt, G8ISJ, Department of Electrical Engineering, Coventry Technical College, Butts, Coventry CV1 3GD.

REGION 4—RR T. Darn, G3FGY, Sandham Lane, Ripley, Derbys.

Derby (D&DARS)—7 July (Surplus sale), 14 July (Open evening), 21 July (Direction finding), 28 July (Open evening), 4 Aug (Surplus sale), 11 August (Rykneld School), 14 Aug (Derby radio rally), 25 Aug (Open evening). The Clubroom, 119 Green Lane, Derby. Morse classes are held on Fridays at 7pm. Any announcements concerning the open evenings will be broadcast on Radio Derby. G2CVV.
Derby (NHCAARG)—Fridays, 7.30pm. Nunsfield House, Boulton Lane, Alvaston, Derby. G4CTZ.
Leicester (LRS)—Monday evenings. Gilroes Estate Cottage, Groby Road, Leicester. Morse practice 8-8.30pm. G3TQF.
Mansfield (MARS)—First Friday in each month, 7.45pm. The New Inn, Westgate, Mansfield. G3XWZ.
Melton Mowbray (MMARS)—Details from G3NVK.
Nottingham (ARCoN)—8 July (Forum), 15 July ("Aerials" by G4AFJ), 22, 29 July (Activity nights), 31 July-1 Aug (Operation of GB3MRC at "Rail—ex 76" at Gregory's Rose Gardens, Stapleford), 5 Aug (Forum), 12, 19, 26 Aug (Activity nights). 7.30pm. Sherwood Community Centre, Mansfield Road, Nottingham.

REGION 5—RR P. F. Chilcott, G4BBA, 258 Coneygree Road, Peterborough PE2 8LR.

Bedford (B&DARC)—Thursdays, 8pm. United Services Club, The Broadway. Sec G8FMG.
Cambridge (C&DARC)—Fridays, 7.30pm. Corporation Yard, Victoria Road. Sec G3YRZ.
Corby (CTCARG)—Mondays, 7.30pm. Corby Technical College. Clubhouse and GB3CI in college grounds. Visitors welcome.
Dunstable (DDRC)—Fridays, 8pm. Chews House, 77 High Street South. Sec G3WXS.
March (M&DRAS)—Tuesdays, 7.30pm. 2 Grays Lane. Sec G8GNE.
Northampton (NRC)—15 July (Visit to Corby Steel Works), 26 Aug ("Construction techniques" by G8DLZ, RSGB construction trophy winner). 8pm. Spencer Dallington Community Centre, Tintern Avenue, Gladstone Road. Sec G8GHZ.
Peterborough (GPARC)—Fourth Thursday in each month, 7.30pm. Southfields Infants School, Stanground. Details from G4BBA, tel 65213.
Peterborough (PR&ES)—16 July (Films), 6-8 Aug (GB3IWA on river embankment), 20 Aug (Open question and answer meeting). 7.30pm. Scout Hut, Occupation Road, off Lincoln Road. Sec G3EEL.
Shefford (S&DARS)—Thursdays, 8pm. Church Hall. Sec G3TAZ.
G8AQP and G8GRT are forming a club in the Huntingdon area and interested persons should contact them.

REGION 6—RR D. C. Andrews, G4CWB, 63 Bulmershe Rd, Reading, Berks RG1 5RH.

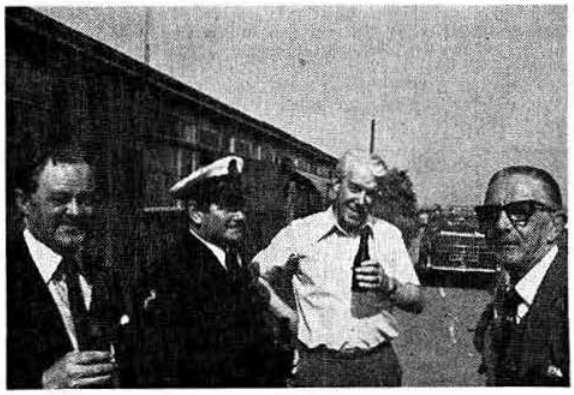
Banbury (BARS)—Fridays, 7.30pm. 43 North Bar, Banbury. New members and visitors welcome. Details from sec G3LTN, tel Banbury 710623.
Bracknell (BARC)—First and third Mondays in each month (other Mondays morse evenings). Cooper's Hill Centre, near railway station. Sec G3YMC.
Burnham Beeches (BBRC)—First Monday in each month, 8pm. Hedgerley Scout HQ. Further details from sec, tel Farnham Common 2609.
Maidenhead (M&DARC)—1 July (Demonstration of commercial equipment), 20 July ("Amateur radio in Germany" by Eric Palmer, G3FVC, and "An expedition to LG5LG" by Steve Rawlings, G4ALG, and Dave Vizard, G3UKS). 7.30pm. British Red Cross Hall, The Crescent, Maidenhead. Sec G4ALG.
Milton Keynes (MK&DRS)—Second Monday in each month, 8pm. Lovatt Hall, Silver Street, Newport Pagnell. Details from sec G8JYW, YMCA, 4 Cheyne Walk, Northampton.
Newbury (N&DARS)—First Monday in each month, 7.30pm. Newbury College of Further Education, Oxford Road, Newbury. Everyone most welcome. Sec G4EFE, tel 0635 45747.
Oxford (O&DARS)—Second and fourth Wednesdays in each month, 7.30pm. Civil Service Sports Club, Marston Road, Oxford. Visitors welcome. Sec G8PX.
Reading (RARC)—First and third Tuesdays in each month, 8pm. "White Horse", Emmer Green, Caversham, Reading. Details from sec G4CCC.

REGION 7—Contributed by R. S. Hewes, G3TDR, 24 Brightside Avenue, Laleham, Staines, Middx.

Addiscombe (AARC)—Tuesdays, 9pm. "Spread Eagle", Portland Road, South Norwood. Sec G4CZB.
Ashford, Middlesex (Echelford ARS)—12 July (Surplus equipment sale). Second Monday and last Thursday in each month, 7.30 for 8pm. St Martin's Court, Kingston Crescent, Ashford. Sec G3TDR, tel Staines 56513.
Bexley Heath (North Kent RS)—Second and fourth Thursdays in each month, 8pm. St Mary's Institute, 2 North Cray Road, Bexley. Sec G4ARQ.
Coulsdon (CATS)—First Thursday in each month, 8pm. 10th Purley Scout Headquarters (opposite Rickman Hill), Chipstead Valley Road, Coulsdon. Third Monday in each month, 8pm. 1st Purley Scout Headquarters, Purley Park Road, Purley. Sec G8KMJ, tel 01-657 2548.

Cray Valley (CVRS)—15 July (Surplus sale), 5 Aug ("Digital logic, part 2, applications" by G3FRB), 19 Aug (Natter-night). 8pm. Eltham United Reformed Church Hall, 1 Court Road, London SE9. Sec G3YWO.
Croydon (Surrey Radio Contact Club)—7 July, 4 Aug (being arranged). 7.30 for 8pm. "The Ship Inn", Croydon, Surrey. Sec G3FWR, tel 01-657 3258.
Crystal Palace (CP&DRC)—17 July ("The RSGB QSL Bureau" by G2MI), 21 Aug ("Aerials" by G3XFT). 8pm. Emmanuel Church Hall, Barry Road, London SE22. Sec G4AVV, tel 01-653 4340.
Guildford (G&DRS)—23 July (Oscar), 13 Aug (Morse). 8pm. Model Engineering Headquarters, Stoke Park, Guildford. Sec G4BHQ.
Kingston (K&DARS)—Second Wednesday in each month, 8pm. Tolworth Scout Hut, Stirling Walk, Raeburn Avenue, Surbiton. PRO G3HVW.
New Cross (Clifton ARS)—Fridays, 8pm. 225 New Cross Road, London SE14. Details from R. A. Hinton, 58 Camilla Road, Bermondsey, London SE16.
Reigate (RATS)—First Tuesday in each month (natter-nite), 8.30pm. "Marquis of Granby", Hooley Lane, Redhill. Third Tuesday in each month (lecture night), 8pm. Constitutional Centre, Warwick Road, Redhill. AGM results: chairman, G3VLH; vice-chairman, G4DMO; sec, G3XSZ; treasurer, G8AMU; programme sec, D. Harding; contests sec, G8HQJ; committee member, G3KAX. Latest transfer from Class B to Class A—G8KGB now licensed as G4FBI. Sec G3XSZ, tel Reigate 43130.
Sutton & Cheam (SCRS)—20 July ("Single conversion receivers" by Robin Hewes, G3TDR), Aug (Junk sale, date to be confirmed). 7.30pm. Sutton College of Liberal Arts, Cheam Road, Sutton. Sec G4BOX.
Thames Ditton (Thames Valley ARTS)—6 July ("Single conversion receivers" by Robin Hewes, G3TDR), 3 Aug (A breath of fresh air on random aspects of amateur radio presented in a lighthearted manner by Dr Foster, G3KQR). 8pm. The Conference Room, Giggs Hill Green Library, Giggs Hill Road, Thames Ditton. Sec G3ZNW.
Wimbledon (W&DRS)—Second and last Fridays in each month, 8pm. St John Ambulance HQ. 124 Kingston Road, Wimbledon SW19. Sec G3XTC, tel 01-664 3698.

REGION 8—RR D. N. T. Williams, G3MDO, "Seletar", New House Lane, Thanington, Canterbury, Kent.
Burgess Hill (Mid-Sussex ARS)—15 July ("Batteries" by Alan Kirby), 29 July (Junk sale).
Canterbury (East Kent RS)—Room 2, Westgate Hall, Canterbury. Details from G8GHH.
Chichester (C&DARC)—First Tuesday and third Thursday in each month. Lancastrian School, Basin Road, Chichester. Details from T. M. Allen, G4ETU, tel 0234 88069.
Crawley (CARC)—United Reform Church Hall, Ifield, Crawley. Details from G3MGL.



Among the 3-400 visitors to the Barry Radio Society's Welsh Mobile Rally were (l to r) Councillor Peter Jones, GW3HAW; Councillor John Wells, GW8KZA; Dan Adams, GW3VBP; Councillor Weir

Dartford (DHDFC)—Details from J. W. Everist, 15 Westharold, Swanley, Kent.
Dover (South-East Kent YMCAARC)—First and third Wednesdays in each month. Details from G8DRS.
Eastbourne (Southdown ARS)—17–18 July (Polgate Steam Engine Rally), 2 Aug (Open-air events on Butts Brow). Victoria Hotel, Latimer Road, Eastbourne. Further details from PRO G3LFZ.
Horsham (HARC)—First Wednesday in each month. Civil Defence HQ, Moons Lane, Brighton Road, Horsham. Details from G3NPF.
Maidstone (MYMCAARS)—"Y" Sports Centre, Maidstone. First and third Fridays devoted to the beginner.
Medway (MARTS)—Fridays, 7.30pm. "Aurora Hotel", Gillingham. Details from G3XZS.
Worthing (W&DARC)—Adult Education Centre, Union Place, Worthing. Details from G3LQI.

REGION 9—RR H. W. Leonard, G4UZ, 4 Start Bay Park, Strete, Dartmouth TQ6 0RY.
Camborne (Cornish RAC)—5 Aug ("VHF" by G4DMU), 2 Sept ("My favourite aerials" by G3NPB). 7.30pm. SWEB Clubroom, Pool, Camborne. Cornish net every Sunday at 11am on 3·685MHz. G3NPB is the new chairman and G4EIK the new sec. Details from G3NKE, tel Camborne 2419.
Exeter (EARS)—The club is still in existence but has lost its meeting place. Details from Jack Bawden, 232 Exwick Road, Exeter EX4 2BA.
Newquay (N&DARS)—Alternate Wednesdays, 7.45pm. Treviglas School, Newquay. Details from G8GOR, tel Newquay 4168.
North Devon (NDRC)—Second and fourth Wednesdays in each month. Meetings held alternately at G4CG and G2FKO. Details from G4CG.
Plymouth (PRC)—First and third Tuesdays in each month, 7.30pm. Virginia House, Bretonside, Plymouth. Visitors always welcome. Sec G8JES, 36 Higher Mowles, Higher Compton, Plymouth PL3 6NE.
Saltash (S&DARC)—16 July (River trip to Calstock, 6.15pm). First and third Fridays in each month, 7.30pm. Burraton Toc-H Hall, Saltash. Sec G4DHA, tel Saltash 3219.
Torbay (TARS)—29 Aug (Mobile rally, Haldon Racecourse, nr Exeter). Fridays, with special meeting on last Saturday in each month, 7.30pm. Rear of 94 Belgrave Road, Torquay. Visitors most welcome. Torbay net every day at 9.30am. on 3·758MHz. G3UIQ.

REGION 10—RR R. G. Barrett, GW8HEZ, 23 Carshalton Road, Beddau, Pontypridd, Glam.
Barry (BCoFRS)—Thursdays, 8pm. Barry Rugby Football Club, Reservoir Road, Barry. Details from sec GW3VBP.
Blackwood (BARS)—Fridays, 7pm. Oakdale Community Centre, Oakdale, Nr Blackwood. Details from sec GW3KYA.
Bridgend (Glamorgan VHF/UHF Group)—20 July, 17 Aug. 7.30pm. NCB Social Club, Tondu, nr Bridgend. Details from sec GW8HEZ.
Cardiff (CRSGBG)—Second Monday in each month, 7.30pm. The Pantmawr Inn, Pantmawr Estate, Cardiff. Details from sec GW3VOW.

Cyril Parsons, GW8NP, Immediate Past-President of the RSGB, and RSGB Council member Dave Thomas, GW3RWX, were guest speakers at a recent meeting of the newly-formed Newport ARS, and are shown here with club officials. Left to right: GW3YTJ, chairman; GW8NP; GW8IQC, treasurer; BRS36474, secretary; GW3RWX; GW8KZN, committee member

Merthyr (Hoover ARS)—Mondays, 7.30pm. Hoover Social Club, Pentrebach, Merthyr. Details from sec GW8HHY, QTHR.
Newport (NARC)—Mondays, 7pm. Adult Education Centre, Brynglas Road, Newport, Gwent. Details from sec GW3YKZ.
Pembroke (PRSGBG)—15 Aug (Saundersfoot bucket and spade party, 10am at the Regency Hall, Saundersfoot. Talk-in on 2m using S20, S22, etc). Details from GW3XJQ.
Pontypool (PRSGBG)—Tuesdays, 7pm. Educational Settlement, Park Hill Road, Pontypool. Details from GW3JBH.
Port Talbot (British Steel Corporation ARS)—Thursdays, 7.30pm. BSC Sports and Social Club, Margam. Details from GW3ACF.
Rhondda (RARS)—Every other Thursday, 7.20pm. Transpprt Employee's Club, Porth. Details from GW3PHH.
Sully (S&DSWC)—Tuesdays, 7pm, Sully Bowls & Social Club, 59 South Road, Sully. Details from GW8JHF.
Swansea (SARC)—Tuesdays fortnightly, 7.30pm. The Commercial Inn, Killay. Details from sec GW4AYJ.

REGION 11—RR P. H. Hudson, GW3IEQ, Silhill, Dinas Dinlle, Llandrog, Caernarvon LL54 5TW.
Bangor (UCNWARS)—Thursdays, 7.30pm. Small lecture theatre, School of Engineering Science. Students who may be enrolling at the university are invited to contact sec D. Atkinson, G8DRE.
Conway Valley (CVARC)—Second Thursday in each month. The Quaries, Llandulas, Colwyn Bay. Newcomers and visitors welcome.
Rhyl (R&DARC)—Second Tuesday in each month. Lecture room, Ambulance Station, Coast Road, Rhyl. Newcomers and visitors welcome.
The Region 11 ORM and Mobile Rally took place on 15 May. The event was held at the Royal Lido, Prestatyn, and was officially opened by Mr C. H. Parsons, GW8NP, RSGB Immediate Past-President. A full report appears on p535.

REGION 12—RR Frank Hall, GM8BZX, 45 Priory Cottages, Lunanhead, Forfar, Angus DD8 3NR.
Aberdeen (ARS)—Friday evenings. Clubrooms, rear of 91 Crown Street, Aberdeen. Sec GM4BKV.
Dundee (Kingsway Technical College ARC)—Wednesdays, 6.30pm. Kingsway Technical College. Sec Robert Officer, 23 Sherbrook Place, Dundee.
Inverness (Queen's Own Cameron Highlanders Memorial Youth Club, Radio Section)—Sec W. M. Begg, 68 Tomnahurich Street, Inverness.
Lerwick (RC)—Wednesday evenings. Annsbrae House, Lerwick. Sec GM3HTH.
Sven Weber, GM8ACC, has offered to act as Islands area representative and is awaiting the completion of nomination forms.
Robert Dixon, GM3ZDH, has been appointed Highlands area representative.
Members of Dundee Kingsway Technical College ARC are investigating the possibility of holding this year's Scottish VHF Convention in Dundee. When details are confirmed a further announcement will be made.

REGION 13—RR Rev S. J. Smith, GM4DNM, St Ninian's, 6 Derran Drive, Cardenden, Fife KY5 0JG.
Berwick (BARS)—Last Sunday in each month, 7pm. Tweed View Hotel. Further details from GM8IIO.
Dunfermline (DARS)—Second Wednesday in each month, 7pm. CCTV Studios, Pittencrieff School, Maitland Street, Dunfermline. Further details from GM8HEY.
Edinburgh (Lothians RS)—Second and fourth Thursdays in each month. Adult Education Centre, Riddles Court, High Street. Details from sec GM8BGF.
Edinburgh (Pioneer Club)—Tuesdays, 7.30pm. Church Hall, Ravenscroft Place, Gilmerton. Further details from GM4BWT.
Glenrothes (G&DARC)—First Sunday in each month and Wednesdays, 7.30pm. Old Nursery Buildings, Leslie, Fife. Sec GM3YOR.
St Andrews University (UStAARS)—Details from GM4BGA, Dept of Physics, North Haugh, St Andrews, Fife.

REGION 14—RR A. J. Mitchell, GM3UDL, 7 Limetree Crescent, Newton Mearns, Glasgow G77 5BJ.
Ardeer (ARCARS)—Thursdays, 7.30pm. Ardeer Recreation Club, Stevenston, Ayrshire. Details from GM8BOM.
Ayr (ARC)—Every second Sunday evening. Community Leisure Centre, 24 Wellington Square, Ayr. Details from GM3THI.
Falkirk (F&DRSGBG)—Temperance Cafe, Lint Riggs, Falkirk. Details from GM3OQI.
Glasgow (West of Scotland ARS)—Fridays, 7.30pm. 22 Robertson Street. Programme and other details from hon sec G. Milne, GM4BLO.
Greenock (G&DARC)—Tuesdays and Fridays, 7.30pm. 22 Inverkip Street, Greenock. Details from GM3LYI.
Motherwell (Mid-Lanark ARS)—Fridays, with alternate meetings informal. Morse classes every other Friday. Wrangholm Hall Community Centre, Jerviston Street. Further details from GM3KMG, tel Hamilton 28759.

REGION 15—RR H. J. Campbell, GI8FOK, 26 Kilcoole Park, Belfast BT14 8LB.
Ballymena (BRC)—Tuesdays, 8pm. 86 Old Cullybackey Road, Ballymena. RAE and morse classes. Fridays, club night; Sundays, special projects, 3pm.
Bangor (B&DARS)—3 Sept (AGM). 8pm. Redcliff Hotel, Seacliff Road, Bangor. Hon sec D. Steele, GI4EMS, 59 Donaghadee Road, Millisle, Co Down.
Belfast (QUoBRC)—Tuesdays, 8pm. Queen's University Radio Club, 37 Fitzwilliam Street, Belfast. All welcome.
Belfast (CoBYMCARC)—The club is active on the air from 7.30pm on Tuesdays and 2.30pm on Saturdays. Meetings at same times. 7 Brunswick Street, Belfast. Hon sec D. Kane.
Belfast (BRSGBG)—15 Sept (AGM). 8pm. 90 Belmont Road, Belfast. Come along and let us hear your ideas for the winter programme. For further details contact GI8FOK.
Mid-Ulster RSGB Group—5 Sept (AGM). All visitors very welcome. 3pm. At QTH of GI4BAC. Hon sec M. Anderson, GI3WWY, 32 Knockview Drive, Tandragee, Craigavon, Co Armagh.
North Ulster (NURSGBG)—19 Sept (Mobile rally, Antrim town). Further details from GI8AYZ.

REGION 16—RR R. E. G. Kendall, G8BNE, "Wesley", Ranworth Road, Hemblington Corner, Blofield, Norwich NR13 4PJ.
Chelmsford (CARS)—First Tuesday in each month, 7.30pm. Marconi College, Arbour Lane, Chelmsford. Details from B. G. Tew, G3WFF, 334 Gloucester Avenue, Chelmsford.
Colchester (CRA)—Wednesdays, 7.30pm. Stanway School, Colchester. Sec T. A. Mills, G3YAI, 75 Lymington Avenue, Clacton-on-Sea.
Great Yarmouth (GYRS)—Last Thursday in each month. 67 Southdown Road, Great Yarmouth. Details from G3NHU.
Harlow (H&DRS)—Tuesdays, 8pm. Mark Hall Barn, First Avenue, Harlow, Essex. Details from G3WUX.
Ipswich (IRC)—Details from J. Gee, G4BAV, 35 Neath Drive, Stoke Park, Ipswich.
Loughton (L&DRS)—Second and fourth Fridays in each month, 8pm. Loughton Hall, near Debden Station. Sec G4CMD.
Lowestoft (L&DARC)—Twice weekly, 7.30pm. YMCA, Park Road, Lowestoft. Details from G4AJO.
Martlesham (MRS)—Details from G. Murchie, G8AXU, Post Office Research Centre, Martlesham.
Norwich (Norfolk ARC)—7 July ("Basic transmitter (2)" by G2CDX/G4EOL), 14 July (Informal and practical), 21 July ("What is audiology?"—talk and videotape), 28 July (Informal and practical), 4 Aug ("Basic transmitter (3)"), 11 Aug ("Contest working" by G3VYG), 18 Aug (Informal and practical), 25 Aug ("Basic transmitter"—demonstration), 1 Sept ("Care and use of hand tools" by G8IDP). 7.45pm. Crome Community Centre, Telegraph Lane East, Norwich. Details from G4EOL.
Norwich (U of East Anglia R&EC)—Details from P. Gowen, G3IOR.
Stowmarket (S&DARS)—Details from K. J. Bertrard, 35 Curwen Road, Stowmarket.
Vange (VARS)—Thursdays, 8pm. Youth Hall, Barstable Tenants Community Association, Long Riding, Basildon. Details from Mrs D. Thompson, 10 Feering Row, Basildon SS14 1TE.

REGION 17—RR L. Hawkyard, G5HD, 100 Shirley High Street, Southampton, Hants.

Basingstoke (BARC)—First Saturday and third Wednesday in each month, 7.30pm. Chineham House, Popley, Basingstoke. Sec G3CBU.

Basingstoke (UKFM Group, Southern)—First Wednesday in each month, 8pm. Chineham House, Popley, Basingstoke. Sec Mrs J. Payne (xyl of G3ZRM), tel Aldershot 26108.

Bournemouth (Wessex ARG)—First Tuesday in each month 7.30pm. Portman Hotel, Ashley Road, Boscombe. Sec G8BBN.

Chippenham (C&DARC)—Tuesdays, 7.30pm. The Boys High School, Hardenhuish Lane, Chippenham. G3UFN.

Fareham (F&DARC)—Wednesdays, 7.30pm. Porchester Community Centre, Room 9. Sec D. Thompson, tel Fareham 2799.

Farnborough (F&DRS)—Second and fourth Wednesdays in each month, 7.30pm. Railway Enthusiasts' Club, Access Road, off Hawley Lane, Farnborough. Sec G8KUY.

Guernsey (GRES)—Tuesdays, 8pm. The Lodge, La Corbinerie Oberlands, St Martin's, Guernsey.

Horndean (H&DARC)—Second Thursday in each month, 7.30pm. Merchiston Hall, Horndean. Net Sundays 6.30pm. 21·40MHz. Sec G4CHO.

Jersey (JARS)—Sundays, 1030am, and Fridays, 8pm. Le Hocq Tower, St Clement, Jersey. Sec Mary McTaggart, 19 Parade Road, St Helier.

Portsmouth (P&DRC)—Wednesdays, 7.30pm. Portsmouth Community Centre, Malins Road, Buckland, Portsmouth. G3CNO.

Salisbury (SR&ES)—Tuesdays, 7.30pm. Salisbury Activity Centre, Wilton Road. Sec G2FIX.

Southampton University (SUARC)—Tuesday evenings, also informal meetings every lunchtime in the clubroom, Old Union Building. The club celebrates its 21st birthday in September and a reunion is planned. Ex-members are asked to contact sec T. Williams, G3YOZ.

Southampton (SRSGBG)—Second Saturday in each month, Lanchester Building, Southamtpon University; Wednesdays, the clubroom, Kent Road; both at 7.30pm. AR G4COM.

South Dorset (SDRS)—First Tuesday in each month, 7.30pm. Lecture Hall, S Dorset Technical College, Newstead Road, Weymouth. G3WAO.

Swindon (SD&ARC)—Alternate Wednesdays, 7.45pm. Clubroom above Coldharbour Public House, Blunsdon, just north of Swindon. Sec G8KWC.

West Dorset (WDARG)—First Friday in each month, 8pm. British Legion Club Hall, Dorchester. Sec G8GHU.

Winchester (WARC)—First and third Fridays in each month, 7.30pm. Antrim House, St Cross Road, Winchester. G4BKE.

REGION 18—RR P. J. Fay, G3AKG, 5 Harland Way, The Glebe, Washington, Tyne & Wear NE38 7RB.

Easington (AR&EC)—Tuesdays and Thursdays, 7.30pm. Easington Village Workmen's Club (3 minutes from A19). CW practice, 80 and 160m operation. ATV can be received on 405 lines. RAE instruction if required. Club engaged in Washington Old Hall project at present. Sec G3VSS.

Hartlepool (HRC)—Mondays, 7.30pm. Methodist Church Hall, Grange Road. Sec G3NWU, 73 Eamont Gardens, Hartlepool.

Middlesbrough (PORC)—Sec G8CDP, 200 Marton Road, Middlesbrough.

Morpeth (Northumbria RC)—Thursdays, 7.30pm. Old Wheatsheaf Yard, Morpeth. Sec G4AVO, 19 Park Road, Lynemouth, Morpeth.

Newcastle (Tyne & Wear Repeater Group)—A list of local amateurs who are willing to act as local controllers will be made out as soon as possible and sent to RSGB HQ. Any amateur interested in joining this repeater group should contact the sec John McGee, G8GUP, QTHR, for place and times of meetings.

South Shields (SSD&RS)—Fridays, 7.30pm. Trinity House. Old and new members welcome. Sec G8BQF, 67 Lauderdale Avenue, Kings Estate, Wallsend.

Sunderland (SARS)—First and third Tuesdays in each month. Leisure Centre, Stockton St, Sunderland. Sec G4DQA.

REGION 19—RR D. S. Smith, G4DAX, 151 Hamperhill Lane, Oxhey, Watford, Herts.

Acton, Brentford & Chiswick (ABCRC)—20 July ("Versatower erection" by G3CCD), 17 Aug (G3CCD as F0UT in France). 7.30pm, Chiswick T.ade & Social Club, 66 High Road, Chiswick.

Barking (BR&ES)—Mondays (Constructional), Wednesdays (CCTV techniques), Thursdays (Informal). Morse classes Tuesdays. 7.30pm. Westbury Recreation Centre, Westbury School, Ripple Road, Barking, Essex. Sec G8JEG, tel 01-599 1103.

Cheshunt (CDRC)—Wednesdays, 7pm for 8pm. Rosedale Sports Club, Andrews Lane, Cheshunt, Herts.

Chingford (Silverthorn RC)—Fridays, 7.30pm. Friday Hill House, Simmonds Lane, Chingford E4. Visitors very welcome. Sec G4AJA, tel 01-529 2282.

East London RSGB Group (Wanstead)—19 Sept (Business meeting), 17 Oct ("TVI"), 21 Nov ("Test equipment and its uses in advanced electronics"), 19 Dec (AGM and junk sale).

Harrow (RSH)—Fridays, 8pm. Sea Cadets HQ, Woodlands Road, Harrow. Sec G3KDL, tel 01-902 2570.

Havering (H&DARC)—Wednesdays, 8pm. British Legion Club, Western Road, Romford.

Holloway (Grafton RS)—Fridays, 7.30pm. Archway School Annex, Whittington School, Highgate Hill, N19. Details from John Hitchins, 46 Granville Road, Finchley N12. Tel 01-346 2744.

Ilford RSGB Group—Thursdays, 8pm. 50 Mortlake Road. Ilford, Essex.

Islington (Sherbourne RC)—Mondays 7–9pm (RAE and club activities), Thursdays 7–10pm (CW class, building, etc). KW2000E available for licensed members. White Lion Youth Centre, White Lion Street, London N1. Sec Freda Young, 5 Old Well House, The Grove, London N6.

Northolt (British Airways European Division ARS)—First Monday in each month. Trident Club, Western Avenue, Northolt, Middlesex. This club is open to non-BA employees by invitation. Contact G3OUF, tel Amersham 21573 for details. Civil Aviation Sunday net at 1100-1200gmt on 3·68MHz, listen for G3NAF or G3BEA.

South Kensington (Baden Powell House Scout ARG)—Third Tuesday in each month, 8pm. Baden Powell House, Queensgate, South Kensington.

Southgate (SRC)—Second Thursday in each month, 8pm. The Green, Winchmore Hill, N21. Sec G4AEZ, tel 01-336 7166.

St Albans (Verulam ARC)—22 July ("70/23cm ssb" by G3DAH), 26 Aug ("Construction of digital frequency counters"). 7.30pm. Market Hall, St Albans, Herts.

Stevenage (S&DARS)—First and third Thursday in each month, 8pm. Hawker Siddeley Dynamics Ltd, Gunnels Wood Road. Sec Paul Tewkesbury, 267 York Road.

UK FM Group (London)—Second Tuesday in each month, 7.30 for 8pm. Grove Park Hotel, Junction Bolton/Spencer Roads, Grove Park, Chiswick.

REGION 20—RR G. Mather, G3GKA, 8 Hills Close, Keynsham, Bristol.

Bath (B&DRG)—Mondays, 8.30pm. Church of the Ascension, Claude Avenue, Oldfield Park, Bath. Further information from John Noden, Flat 4, 30 Paragon, Bath BA1 5LY.

Bristol (BRSGBG)—26 July ("Test equipment" by H. L. Gibson, G8CGA), 22 Aug (Bristol mobile picnic, Ashton Court), 23 Aug ("Home constructed equipment"). 7pm. Becket Hall, St Thomas Street, Bristol 1. Sec G3ULJ.

Bristol (BARC)—Tuesdays, 7.30pm. The University Settlement, Barton Hill, Bristol 5. Sec G8HAZ.

Bristol (Shirehampton ARC)—Fridays, 7.30pm. Twyford House, Shirehampton. New members most welcome. G4BWB.

Bristol (BUARS)—Most Saturdays during term time, 2.30pm. Dept of Physics, Royal Fort, Tyndall Avenue, Bristol 8. Full details from G3WDG.

Cheltenham (CRSGBG)—First Thursday in each month, 8pm. The Old Bakery, Chester Walk, Cheltenham. Sec G3KII.

Gloucester (GARS)—First Thursday in each month, 8pm. Oddfellows Club, Barton St, Gloucester. Remaining Thursdays informal club night. G4AYM, The Chequers Bridge Centre, Painswick Road, Gloucester 8. Sec G3MA.

Taunton (T&DARS)—Fridays. 7.30pm. Jelalaband Barracks, The Mount, Taunton. Sec G. Swetman, "Little Copse", Monkton Heathfield, Taunton. Tel West Monkton 298.

Weston-super-Mare (WsMRS)—Second Friday in each month, 7.30pm. Room Lewis M2, Worle School, New Bristol Road, Worle. G3PQE.

Yeovil (YARS)—15 July ("Pulse arithmetic" by G3MYM), 29 July ("How the layers were formed" by G3MYM). Thursdays, 7.30pm. Morse classes each Friday, 7.30pm. RAE class by G3MYM, if required. The Youth Centre, 31 The Park. Yeovil. Sec G3NOF.

RSGB SLOW MORSE PRACTICE TRANSMISSIONS

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

Clock time	Callsign	MHz	Mode	Town
Sundays				
0900	G3WNR	145·600 omni-direc	F2/F3	South Shields, T & W
0930*	G3LEQ	1·815	A2/A3	
		44·250	A1/A3J	Knutsford, Cheshire
		145·250	F2/F3	
		433·250	F2/F3	
1015	G3CGD	1·875	A1/A3	Cheltenham, Glos
1030	G3NPB	1·875	A1	St Ives, Cornwall
1030	G3LR	1·810	A1	Accrington, Lancs
1030	G4DKK	1·970	A2/A3	Caterham, Surrey
1100	G2FXA	1·900	A1/A3	Stockton-on-Tees
1130	G3BLS	1·920	A1/A3	Osney, Oxford.
1130	G3WYW	144·300 to SE	A1/A3	Newcastle upon Tyne
1200	G3HVI	144·100 omni-directional	A2/A3	Stoke-on-Trent, Staffs
1230	GC4CHY	144·500 to north	A1/A3J	St Peter Port, CI
1500	G4EHW	144·250 omni-directional	A1/A3J	Peterborough
1815	G4DVZ	1·915	A1/A3J	Leeds, Yorks
1830	G3NCZ	1·920	A1/A3	Blackburn, Lancs

* Re-commences 19 September

Clock time	Callsign	MHz	Mode	Town
Mondays				
1800	G3SWR	1·980	A1/A3	Birmingham
1830	G3VBI	1·910	A1/A3	Goole, Yorks
1930	G3RAF	1·910		
		3·590	A1	Locking, Som
		144·024		
1930	GI3SXG	3·575	A1/A3J	Newtownards, Co Down
2000	G3IBJ	1·910	A1/A3	Southampton, Hants
2000	G3XWZ	1·910	A1/A3J	Mansfield, Notts
2030	G3ASR/A	1·875	A2/A3	Harrow, Middlesex
2030	G3KGU	1·915	A1/A3	Theydon Bois, Essex
2130	G3LQI	145·300	F2/F3	Lancing, Sussex
Tuesdays				
1800	G3SWR	1·940	A1/A3	Birmingham
1830	G4BNA	3·590	A1	Swindon, Wilts
1930	G3RAF	1·920	A2	
		3·550	A2	Locking, Som
		145·475	A2 or F2	
2000	G4AEU	1·910	A1/A3	Southampton, Hants
2045	GM3CRY	3·550	A1/A3J	St Andrews, Fife
2045	G4AEU	145·550 omni-directional vertical	F2/F3	Southampton, Hants
2130	GM3UAG	145·800 to south		Ellon, Aberdeenshire
Wednesdays				
1930	G3RAF	1·910		
		3·590	A1	Locking, Som
		144·024		
2000	G8QU	1·970	A1	London N22
2000	G3BPE	1·975	A1/A3	Bexley, Kent
2000	G3SWP	144·200 omni-directional	A2/A3J	Doncaster, Yorks
2000	G4EHW	144·250 omni-directional	A1/A3J	Peterborough
2015	G3WVJ	1·845	A1/A3	Staines, Middlesex
2100	G3HVI	144·100 omni-directional	A2/A3	Stoke-on-Trent, Staffs
Thursdays				
1800	G3SWR	1·980	A1/A3	Birmingham
1830	G4BNA	3·590	A1	Swindon, Wilts
1830	G3NC	1·968	A1	Swindon, Wilts
1900	G3YEI	1·850	A1	Fleetwood, Lancs
1900	G3BLS	1·920	A1/A3	Osney, Oxford.
1930	G3RAF	1·920	A2	
		3·550	A2	Locking, Som
		145·475	A2 or F2	
2130	GM4CAU	145·800 to north		Aberdeen
2130	G3LQI	145·300	F2/F3	Lancing, Sussex

Clock time	Callsign	MHz	Mode	Town
Fridays				
1800	G3SWR	1·940	A1/A3	Birmingham
1900	G3NPB	1·875	A1	St Ives, Cornwall
1900	GC4CHY	144·500 to north	A1/A3J	St Peter Port, CI
1930	G3PQF	144·360 to north-east	F2/F3	Farnborough, Hants
1930	G3RAF	1·920	A2	
		3·550	A2	Locking, Som
		144·475	A2 or F2	
2000	G4EHW	144·250 omni-directional	A1/A3J	Peterborough
Saturdays				
0930	G2FNK	1·930	A1/A3J	Staines, Middlesex

G3BZU morse proficiency transmissions at 15, 20, 25, 30, 35 and 40wpm are made at 2000 clock time on the first Tuesday of each month on a frequency of 3·520MHz. For 100 per cent copy at 15wpm a certificate is awarded, and endorsement stickers are available for 100 per cent copy at the higher speeds. A charge of 15p or three IRCs is made for the basic certificate, and 5p or one IRC for each endorsement sticker claimed. All claims should be sent to—The QRQ Manager, RNARS, HMS *Mercury*, Leydene, Petersfield, Hants.

From the transmissions organizer

The Editor
Radio Communication

Sir—Regrettably Mr Wylie's appeal in the March issue, for help in mastering the morse code by additional slow morse transmissions in the west of Scotland, met with no response. Many more operators are needed to give adequate coverage of the British Isles, especially in the rural areas. Unfortunately the revised list published in that very same issue contained 22 fewer transmissions. If the service is to be effective, more volunteers who are willing to make practice transmissions on a regular basis are desperately required.

On the other side of the coin, the listeners must play their part by letting the operators know that their transmissions are being used. Nothing is more soul destroying than to pound out slow morse to an unknown or non-existent audience. Typical of many of the letters I receive as organizer of the service is the following from Mr Bassford, G3YZB:

"Will you please delete my call from the list of RSGB Slow Morse Transmissions. For all the occasions I did this on a Monday evening, I did not get one report or request, so I consider that I have been wasting my time."

Many like Mr Wylie would like to be helped in getting their Class A licence. Have those who used the service to get their licence a "debt" to repay?

M. A. C. MacBrayne, G3KGU

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed in alternate issues of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 50p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

The closing date for each issue is the 1st of the preceding month, but no guarantee of inclusion in a specific issue can be given. Valid advertisements not published in the issue following receipt will be held over until the next issue.

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale. Advertisements may be edited or abbreviated as necessary.

Post to: MEMBERS' ADS, "RADIO COMMUNICATION", 35 DOUGHTY STREET, LONDON WC1N 2AE.

FOR SALE

CR100, exc rx, with extra CR100, not wkg, for spare parts, with spare valves, manual, £30. 4CX250B, £5. Pairs 813s, £6. Pair 807s, £4. 832, £3. *Wanted*: Data for Motorola 975136AO2 double tetrode, similar to QQVO7-50. G8GHU, QTHR.

Jaybeam 14-el Parabeam, little used, vgc, £12 + carr. Morris. Tel 0244 818252.

Heath Monitorscope and scanalyser, vgc, £70 ono the pair. G3VGH, QTHR. Tel York 769245 after 10pm.

Heathkit HW101 tx/rx, HP23B psu, 400Hz cw filter, £165. 153BA Hy-gain 15m monoband beam, £30. RL Drake AC4 psu for TR4, T4X, etc, £50. Tel Middleton Stoney 202.

2m converter, 28-30MHz, £14. Codar T28 transistor rx, 160-80, internal spkr, £12. Both + postage. *Wanted:* Pre-1935 components and mags, etc. P. G. Morgan, 21 Trafalgar Road, Portslade, Brighton, E Sussex. Tel 0273 415305.

Swan 500C tx/rx, just rejuvenated by dealer, 400W p.e.p. input, rig, psu and cables, £260. Eagle mains valve voltmeter, £20. G4CKL, QTHR. Tel Mansfield 23801.

Trio 2200G, exc cond, fitted S0 and S20 to S24, R3 to R7, auto toneburst on repeaters, helical whip, nicads, usual extras, £100. Buyer collects or arranges carr. G4DKB, QTHR. Tel Billericay 3935.

Trio 9R59DS rx, immac cond. OA2, xtal calibrator, manual, list of mods, hardly used, comp with manufacturer's package, £42. Can arrange BRS delivery. Tel 041-776 2707.

Creed 7B, cover and trolley. ATM demodulator, phase shift scopes and psu in 19in rack, £25 the lot. FR50B + spkr, £55. DX4OU + VF1, £10. All buyer collects. Laker. Tel Calne (Wilts) 813084 most evenings.

FT277 (FT101B), £300. Collins 75S1 rx, 32S1 tx, £300 the pair. Philips electronic burglar alarm, LHD1100 + 2 LHD3000 Remotes, £30. Mullard valve tester, offers. EL84s, 50p. PC88, £1. PC86, £1. EY86, 50p, new and boxed. Tel Brookwood 6875.

B44 tx, comp, £10. Xtal calibrator mains, £15. PO3000 relay, new, h/d and normal, offers. Cossor EL3585 tape recorder transistor, good cond, £10. G8ALM, QTHR.

RTTY Creed 75 t/p with reperf attachment, model no 75RP, rx Mk4 with automatic tx 6S/6M, all on desk unit with control panel, desk will dismantle, 13 spare tapes, 1 spare roll, manual, wiring diagrams, whole unit comp 240V ac, good wkg cond, little used for past few years, £65, buyer collects. G8KCB, 313 Wyndhurst Road, Stechford, Birmingham B33 9DL.

Liner 2 + p/a and cw mod h/b psu, £95. Emoto rotator, £45. QM70 2m amp, 50W, fm/a.m./ssb, £25. Heath HM2102 vhf swr/wattmeter, 50Ω, factory calibrated, £15. KW103 swr/wattmeter, 50Ω, £10. GM3XNE, QTHR. Tel 0294 67326.

Standard C146A 2W hand-held 2m tx/rx, with CMP-08 mic, helical aerial, nicad charger, xtals for S0, S20, S22, R6 and reverse R6, good cond, £90. G8IMI, QTHR. Tel Haverhill 2852 evenings.

2m Parabeam, £10. 2m 8-el, £5. Advance E2 sig gen, £15. 45ft alloy mast, coupler, rigging, £20. T4188 tx, £10. Marconi aircraft tx, £10. Variable psu, 50-300V, £7. 50Ω dummy load/wattmeter, £3. Trio TX599, £180. JR599/SP599, £180. Trio 7200, £110. KW E-zee match, £15. KW p.e.p. meter, £10. Heathkit swr, £5. KW lpf, £5. 2m transverter, £55. KW trap dipole, balun, feeder, £20. Plus much more. G4EAK. Tel Ruislip 39741.

Storno Southern CQM-13C-12, £14. Ex-army 62SET, £8.50. Yamaha RD200, 5,900 miles, vgc, £270. PSU, 18V dc, 10A, £16.50. H/B morse tester, £5. "Casset" player, £9. Army rations, £5. Scrap rxs, £4. Tatty valve tester, £21. G8LLA. Tel Watford 21688 after 6.30pm.

HW32A, comp with spkr, mic, xtal calibrator and ac power supply, £65. Marconi CR150/2 rx, wkg but needs attention, offers. Buyers inspect/collect. G4AQJ, QTHR. Tel 0682 68510.

Drake R4B, 160-10m, new valves, aligned on the nose, no spkr, £190. Buyer collects. G3XOM, QTHR. Tel 0322 522612 after 6.30pm.

AR88D, original good cond throughout with S-meter, manual, spare valves, £30 ono. Prinz 550 astronomical telescope, 600x, comp with tripod and all accessories, little used, ideal for student bargain, £15. G8EPE, QTHR. Tel 021-705 7158.

Professional type 25ft 2-section galvanised steel tower, very strong with welded ladder rungs, £20 ono. Buyer collects. 2m 6 over 6, £4. Dash mount transistor Ranger, wkg 2m, £4. *Wanted:* Rotator for vhf beams. G8FMC, QTHR.

Going OAP. Heath Mohican, £15. STC RX4 comm rx without cabinet, £15. RX1B aircraft rx, £4. FT241 filter xtals, 25p. TA33Jr 10/15/20 beam, £30. 45ft telomast with steel rigging and stakes, £30. Collect or pay carr. G3HHZ, QTHR.

Pye Bantam, immac cond, hiband a.m. 12½kHz, no mods, inc mic, carrying case, shoulder strap, aerial, manual, £55 ono. G4DHK, QTHR. Tel Bristol 553767.

Clearout for new equipment. Collins TCS tx. Vanguard KW2000 tx (both hf bands). Heathkit Twoer tx/rx. 2 aerial traps. Hitachi TRK 60E radio recorder. Tape recorder, 2-track reel to reel. G3TRG, QTHR. Tel 021-558 2634.

Swan 500C, realigned and refurbished by dealer, receipt for work available, £250. G4CKL, QTHR. Tel Mansfield 23801.

KW2000B, ac psu, fitted socket with low level o/p and c/o switching for transverter, £180. 2m Mosfet preamp, £4.50. 2m Mosfet converter, 28–30MHz, £12. CMOS toneburst, adjustable o/p and frequency, £3. G4EBI, QTHR. Tel 01-231 0879.

RTTY 7B/RPs, £18. 7Bs, £14. Autos 6S6, £5 or exchange for decent 2m gear. Can deliver reasonable distance. G8JLT, 3 Menson Drive, Hatfield, Doncaster. Tel 0302 842788.

Realistic DX-150A fet gen cov comm rx, vgc, £60. Microwave Modules 144MHz converter, 2-4MHz i.f., £12. AM25B, converted 2m fm with toneburst, xtals, etc, £22. Valve voltmeter, £10. All ono. Many more smaller items. Tel 0572 55114.

Exchange Star SR700A triple conversion calibrator, notch filter, etc, superb rx, for best cw stamp collection. G4BHM, QTHR. Tel Leeds 664833.

Unused EMI 9677C 1in separate mesh vidicon tube with scan coils, frame/line oscillator coils, output transformers, offers near half price. Many other components, sae list. Walshaw, Sadgill, Longsleddale, Kendal, Cumbria LA8 9BE.

Trio TS900 tx/rx, ac psu, comp with CW900 filter, hand mic, headset, as new, mint cond, very little used, £430 ono, cash. 13 Astbury Crescent, Bridge Hall Estate, Adswood, Stockport, Cheshire. Tel 061-429 7692.

70cm Microwave Modules converter 28/30, £14. 70cm varactor tripler BAY96, £12. 4m fet converter 2/2·7, £9. TVI filters for uhf TVs, £1.15. BSR mains tape recorder and mic, £6.50. Mains 2m 50W a.m. tx, £20, carr extra. SAE enquiries. G4DFE, QTHR.

KW2000E with ac psu, perf, realigned by KW, £295. HQ1 Minibeam, as new, few weeks use, £55. GM3GJB, 49 Shannon Drive, Falkirk. Tel 23608.

KW600, £75. Creed 7B and ST6 with psu in wkg order + 7B for spares, £40. 7TR/3, £8. 6S6, £8. Will deliver 50 miles. G3SCH, QTHR. Tel Tarporley 2254.

Comp station: Sphinx tx, ssb 160, 80, 20. LG50 tx, cw 80–10. Trio 9R59D rx and matching spkr. Class D wavemeter. Delta control unit. £75 the lot. G3JPX, QTHR. Tel Canvey Island 63004.

Trio 9R54DE + matching spkr, £35. Bourne, G4ETK, 29 Elliman Avenue, Slough, Berks. Tel Slough 29984.

Liner 2, vgc, PA3 preamp fitted, comp with mobile mount and manual, £115. Going fm. Gill Apperly, G8KPA, 35 Denise Drive, Harborne, Birmingham B17 0BN. Tel 021-427 7104 evenings.

Liner 2, cw, mic, manual, £115 Cambridge a.m. boot mount with mic, cable, control panel, £15. G8ATA, QTHR.

Europa 2m transverter alloy knobs, aerial c/o relay and preamp, exc cond, £70. Sony Airband monitor rx, as new, £25. Copal 24hr digital clock, black, £4. G3URE, QTHR. Tel 08-426 3044 home, 5311 office.

Sommerkamp FT227 (FT101), + cw filter, £260. Yaesu FRDX400, 160–10m, 2m, fm/a.m./ssb/cw filter, £160. Redifon GR410 ssb cw tx/rx, 2–16MHz, manual, £45. BC221 calibration chart, main psu, £20. National solid state battery/mains tape recorder, type 4015, £25. Bradley transistorized multimeter CT471C, £20. Frequency counter timer by ESI, nuclear type 224, new, boxed, £45. Eddystone 770R 20-165MHz a.m./fm/cw rx, £85. G8JEW, QTHR. Tel North Shields 79887.

Marconi synthesizer 3786A, 5MHz to 19·9999MHz in 100Hz steps. Hybrid with handbook, needs 240V ac 250V dc 1MHz reference, £150 ono. Prefer buyer collect. W15AM, new, handbooks, £2.50. PF2FMH, PF3FMH and Europa service sheets, £1.20. G8DLF, QTHR. Tel Northampton 491479.

HW17A 2m tx/rx, good cond, improved mod 12V mobile psu, cables, £35 ono. 12in good mains spkr, 15Ω, 25W, £5. Operators unit vhf LRU113, 118·0–131·9, 34 xtals, FT241/243, £5. Antique Maw and Thompson shock treatment set, comp, dated 18/4/01, offers. Antique Drake and Coram volt/amp test set, offers. G8KPN, QTHR. Tel 01-997 5947 after 5pm.

Mint KW Atlanta 300W ac psu, used 1hr this year, manual, mic, reasonable offer secures. Rayer, Reddings, Longdon Heath, Upton-on-Severn.

70cm power varactors, 15W out, 70cm for 30W in, 2m, £6. Power transistors, 2N3773, 10W, 70cm, £2.50. PT4176D, 30/40W, 2m, £1.50. BLY36, 12W, 2m, £1.50. 38·666MHz xtals, £1.50. Nice modern meters 1mA, 500μA, 5mA, £2. 25 North Close, Medmenham, Marlow.

Jason band 2 rx less psu, £5. MW valve portable rx, 70p. Tape recorder, needs slight mechanical attention, £1. 10 loudspkrs, £1. 20 transformers, £1. New valves, 4X250B, £2. QQVO3-10, £1.20. 6BW6, 50p. G8KDL, QTHR. Tel 01-203 3138.

Xtals, 1 each, HC25U 17575, 17518·9, 17562·5, 17621·8, 18006·4, 18050, 18062·5, 18042·7, 17621·9, HC6U 53·275, FT243 6050, £1 each. Send sae for varied list of manufacturers' surplus bargains. GM8APX, Dall, Rannoch PH17 2QH. Tel 08822 379.

KW2000 with ac power supply, new 6146, vgc, £115. Ultra Cub with xtals R7, S20 and deac, £33. G4DAT, QTHR. Tel 01-546 7481 office hours.

Viceroy 3A with Dow-key aerial relay, exc cond, £70. *Wanted:* CW filter for SB301. Stone. Tel 01-357 3232 office hours.

Drake 2B with ls, Q multiplier, auto transformer, manual, £90. Heathkit HW202 with t/b and ac p/s, £110, delivery extra. G2BVN, QTHR.

Trio 2200G, 6ch, nicads, mains psu. Eddystone EC10. Heathkit HD1250 transistor gdo. Unused pcb for *Wireless World* 2m pa. Handi-Cambridge case. Joystick atu. Send for details of these and many other items. G8IYK, 13 Hodgebower, Ironbridge, Telford, Salop.

Liner 2, 144·1–33MHz, professionally fitted PA3 preamp, inc all accessories, £115 ono for quick sale. G8FWV, 25 Churchcroft Road, Northampton NN7 2PG. Tel 0604 862040.

4m 3el Jaybeam, £4.50. 4m G&D converter, 28 i.f., £7.50. 4m G&D tx with modulator kit, £10. Pye Cambridge tx, xtals, circuit diagram, £10. Pye Westminster, £3. Mic/headset unit, £5. QP166 converter, 10–160m, 1·6 i.f., £7. FM tuner, £5. TV patt/gen PG64, £9. G3HJG, QTHR. Tel 061-748 7585.

Trio TS700, mint cond, £285 plus carr. Stolle RZ100 bearing, new, £3. G8CEX, QTHR.

Eddystone EA12, immac, £160. B2 suitcase spy tx/rx, £15. APT psu, 0–500V 500mA, 0–250V regulated, 500V 500mA unregulated, all variable. 6·3V 5A Marconi TF867 standard sig gen, £100. SAE for list, shack clearance. G3MHS, QTHR. Tel Sedgley 73465.

FTDX401-B tx/rx, new August, used on receive only few hours, £300. G4APR, QTHR. Tel 0296 85824.

2 rf ammeters 3A, 1 rf 350mA, £4 each. QQVO6-40, £4.50 each. B7G 20MHz xtals, £2.50 each. Photomultiplier 931A with base, £5. Base for 931A, £1.10. H/B swr meter for vhf/uhf, £6. QQVO3-20A, £4.50. G3RND, QTHR.

Trio TR2200G with 8 xtals. Heathkit HA201 2m amp. Heathkit IO18U scope. Telford TC7 rx. MM converters 28/144, 29/432. MM a.m. tx with 6 xtals. Garex twomobile. Low band Pye fm base station, offers. G8HPD, QTHR. Tel Wheathampstead 3307.

Heathkit HW100 with ac psu, £95 ono. 2m × 8 and 4m × 4 beams, £4 each. Swanco CSE 160m tx, £10. *Wanted:* 2m gear for mobile or base. G3UQY, 73 Elizabeth Drive, Sticklepath, Barnstaple. Tel Barnstaple 71900.

BC640 vhf tx, 100–156MHz, 50W output in 6ft rack/cabinet, comp, inc mains variac, mint cond. Sensible offers only please. Buyer collects. G3NSJ, 22 Glynde Crescent, Bognor Regis. Tel Bognor Regis 23625.

9R59DS + OA2 and 200kHz calibrator, £50. TCS12 tx, fair, needs 1 pa valve, £5. Army diversity aerial switch, 14 valve, £2.50. Double xtals 28·4667MHz + 28·6444MHz, £2.50. Phillips X40 + X40A kits, £15 pair. Valves KT66, £1 pair. KT33, 75p pair. 8018s, 6N7s, 6K7s, 6J5G, 5R4GY, etc. 25–50p per valve. Send list of wants. All ono plus carr. Someone please buy or swop lot for decent 2m tx/rx. R. Mackean, Lowood, Lyndhurst Road, Liverpool 18. Tel 051-724 1209 after 6pm.

Heathkit HW7, £30. Eagle K110, swr/power meter, £5. Burns 456 FMD1, £5. Sinclair DM2, £40. Pair mid band a.m. BCC sets, nicads, charger, etc, £50. Shure mic 202, £5. Jaybeam Quad 4-el + rotator, £20. Fabulous Heathkit MR1010, offers over £100. Tel 01-858 1448.

Trio 7200G + vfo 2m tx/rx, £180 ono, will split. Telford TC9 vfo 2m tx, vgc, £80 ono. G8KDC, QTHR. Tel Orpington 22443.

Clear QTH, 250ft asl, 170 countries 14MHz 1975, 3 bedrooms, 2 reception, bathroom, large cellars, fitted carpets, large garden, part flat roof, Mustang, 137ft wire, no tvi, 5 miles Torbay, £17,000 or offers. G3FUT, QTHR. Tel Newton Abbot 4542.

Trio 2000G, S20, 21, 22, R5, 6, 7, nicads, charger, mic, case, automatic toneburst, spare whip, perf order, £95. Mains psu, 300V 80mA, £10. 20W audio amp, 2 × EL84 output, class B mains, £15. £110 the lot. G8FWJ. Tel 01-253 0329.

Lattice Tower, two 15ft sections + shaft giving total height of 36ft, hinged custom built grillage, £40. G4CJY, QTHR. Tel 0494-444417/30018.

Property of late G3RLP: Sommerkamp FTDX505, mint cond, spkr, Raymart band checker SWR50, £250 or offers, will split. Mrs Derrington. Tel Scaynes Hill 498.

QM70 2FM70 144–70, £32. Elcomatic 4 pen recorder, offers. Elizabethan 20W stereo amp and matching stereo tuner, £30. 3 pairs transducers, list £4.99 pair, 75p a pair. High band Cub with 3 deacs on GB3LO, £30. *Wanted:* Trio 310, clean. 24 Thornwood Road, London SE13 5RG.

2m Pye base station, £25. Ground plane, £5. ⅝ vertical, roof mtg, £8. ± 12/24V twin stabilizer supply, 0·25A, £5. 350V 100mA 250V 50mA 6·3V 4A, £5. HF linear, 200W, 2XT21 and psu, £25. 9MHz ssb module. GM4BOA, QTHR. Tel 03553 2097.

TS700, 12 months old, as new, £295. Securicor delivered. *Wanted:* Pocketphones PF2, PF3 or PF5 with circuits, approved wide deviation radio mic, eg Audio RMS9. G8JPI, QTHR. Tel 061-872 2431 ext 2896.

Telomast, lower 40ft, with rigging kit, £20. Prop-pitch motor, £5. All + carr. GM6MS, QTHR. Tel Lesmahagow 2827.

50W RMS power amp with psu, £12. 6 + 6W power/preamp with psu, bass, treble, £4. 42–50V 5A mains transformer, £4 ono. 60mH 5A choke, 75p. Mark Spurgeon, 72 Kidbrooke Grove, London SE3 OLG. Tel 01-858 5831 after 6pm.

12 new valves, 20p each, please enquire. Portable tape recorder, 2-speed, £7.50. STD8 cine camera £9. Super-8 cine camera, 3 : 1 zoom, £24. 160m to mW converter, £2.50. KW lpf 50Ω, 50p. 75Ω lpf, 75p. Linstead 24V 8A ac/dc psu with smoothing unit, £18. Codar AT5 tx with 250S mains psu, £25. Ten-tec synchrodyne rx, new cond, £22. Comp set spare valves for AT5 tx, £1 or free with tx and psu. G3UUO, QTHR. Tel Cirencester 3389 after 6.30pm.

HW32A tx/rx, handbook, Heath checked, earth h/b psu. AC h/b psu, 6m, cables, all good cond, £50. G3OOQ, QTHR. Tel 0789 5973.

Eddystone EC10 Mk1 af filter, BFO agc, ideal portable rx. Pye Ranger, unmoded. VHF long and medium wave rx with stereo amp and mains power supply. 20in tv, b/w, wkg, needs attention. 8mm equipment. Offers. G8KOM. Tel Littlewick Green 2453.

FR50B rx, very little used, £65. G4BSU, Ivy Cottage, Croxton, Hunts. Tel Croxton 371.

FT101 Mk2, 10/160m, little used, KW Z-match, swr meter, £300. JR310 calibrator, top band, £65. IO–12U scope, £38. Hustler MO2 20m whip, bumper mount, as new, £18. Buyer collects or arranges delivery. G4AGT. Tel 0297 32002 business hours.

B & K lf oscillator type 1019. Advance H1 audio oscillator. Airmec 10kV ionization tester. Cambridge pot volt box. Hudson FM208 with 6ch + mains power pack. Offers. G3FAU, QTHR. Tel 0438 52932.

Akai 4000D stereo tape deck, in good wkg order, £55 ono. Three 7in tapes + empty spool, £7. Buyer collects. Tel Ingrebourne 46276.

FT2 auto scanning tx/rx, 12–240V cw, mobile mounting bracket, fully xtalled, 8ch, £140. G8ALO, QTHR. Tel 021-354 9736.

Honda E300E generator, little used, £80. HRO rx, all coils inc bs and psu, £20. UHER 4000S portable recorder, £35. KW low pass filter, 75Ω, £3. G3VGW, QTHR. Tel Derby 672245.

FT501 + **psu,** £300. FL2000B linear, £150. G4DAW, 479 Wellingborough Road, Northampton. Tel Northampton 714821 anytime.

Heathkit RA1 rx, £25 ono. G3KIP, QTHR. Tel 0892 23836.
2000E, as new. Galaxy Mk2, good cond. 109 match, as new. KW1000 linear, good cond. KW2000A, overhauled KW. Wide spaced variable capacitors. Cambridge noise bridge. Offers, will split. G3ZLN, QTHR. Tel Ipswich 55200.
Comp rtty rx station. Hammarlund SP600 JX10, revalved, handbook. TV CV89, vgc. Printers Creed 75 Mk4. Klienschmidt type TT-98B/FG with keyboard, both vgc. All can be seen wkg. £200. Buyer inspects and collects. 2 Station Road, Cowfold, nr Horsham, Sussex.
Versatower P60, £200. Yaesu FRDX400, £175. Europa 2m transverter, £60. G4AWO. Tel Harpenden 3888.
Heathkit model HWA-17-1 dc power supply, comp with cables, sockets, manual, £10. GI8FYP, 14 Casaeldona Crescent, Belfast BT6 9RE. Tel Belfast 54473.
Trio TS520 fitted cw filter, spare pa valves, handbook, £300. Drake R4C fitted FL500, FL1500 filters, two extra xtals, MS4 spkr, handbook, both exc cond in original cartons, £300. Price inc delivery 100 miles radius. G3GHB, QTHR. Tel Inkberrow 792582.
Drake DC4 psu cw cable harness, Hustler foldover mast, ball mount, mounting kit, resonators RM10, RM15, £100. G3JLB, QTHR. Tel Gravesend 4694.
IC22 with 20ch xtals, nearly new, half price. SSB base/mobile CB 27MHz, made by SBE for USA market, 24ch synthesizer, brand new, all semiconductor, tx/rx, manual, £50. G6YP, QTHR. Tel 01-699 8652.
X-band 200mW (yes, 0·2W) Gunn diode with gen tested and wkg, in exchange for a BXY41 SRD or possibly a BXY35A. Will consider other offers. Bruno Hewitt, G8IPY, 12 Thameside, Teddington, Middlesex TW11 9PW. Tel 01-977 1982.
Standard vfo type CV110, unused, fits C828, C140 tx/rxs, £20. Pye uhf base tx, not wkg but with xtal for 70cm and circuit, £5. *Wanted:* High band Ultra Cub or similar. G8AGR, QTHR.
FT75 WID ac/dc psu, mic, leads, good cond, £140. *Wanted:* Swan 350, NCX5, KW2000, etc. G3SGS, 14 Norwich Street, Hingham, Norfolk. Tel Hingham 787.
1974 DX/USA callbooks, + supplements effectively 1975, £2.50 each. Plessey 641C, 621C, £1 each. 610C, 75p each. 2 each unused. UHF braid breaker high pass tvi filter as Feb 74 *RadCom*, £1. 813, £2. ICPI/DH3 91 1in crt + base, £1. All + postage. G3IZJ, QTHR.
Collins quality mechanical filters, F455, FO5, 500Hz cw, £12.50. F455, Z19, 2·6kHz ssb, £12.50. Akai GXC-40-T stereo cassette player with inbuilt stereo fm radio, 5W channel output, comp with bookshelf loudspkrs, good value, £95. G3WZT, QTHR. Tel Partridge Green 710565.
Multi 2000 by FDK, 2m ssb/fm/cw 200ch synthesized ac/dc tx/rx in mint cond, best offer secures. G3UDR, QTHR. Tel Bidford on Avon 2781.

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HT transformer around 1000V, say 750mA upwards. Roller inductor, say 30µH. Dual section 200pF per section tx, variable. Offers within easy distance please. G4DWK, QTHR. Tel 0277 215411.
G2DAF Mk 2 rx, as Nov/Dec 73 *RadCom*, wkg if possible but not averse to one being incomplete or needing rebuilding. Trevor Pendleton, 14 Suthers Road, Kegworth, Derbys. Tel Kegworth 2734.
2m all mode tx/rx. Heathkit SB200, spkr, spectrum analyser, wattmeter, tower. KW2000, Vespa, AR88. *For sale:* Airmec millivoltmeter type 784, as new, with probe, manual. Offers. GW3MHW, QTHR.
12V converter transformer for Storno Viscount psu. 6ch switch for dash mount Cambridge. G8BKX, QTHR.
Drake R4C in mint cond. G4BMX, QTHR. Tel 045-388 3808.
Urgent, HRO gen cov coil, 3·5-7·0MHz. Any other gen cov or bandspread coils for amateur bands. G3EGV, QTHR.
"Ham's Interpreter" wanted by ham retiring early because of illness. £1 offered. Codar T28, original with book. GI3GRD, QTHR.
Wanted by cw fanatic: hf bands tx, DX100U, KW Vespa or similar, must have good T9 note. *For sale:* BC221 with psu, charts, exc, £15. Trio JR500S rx, fair, £20. EC10 Mk1 rx, £25. G4ENV. Tel 01-205 9172.
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U30 uhf Vanguard, must be comp, preferably unmod. Germany military tx/rx, especially E52 series made by Lorenz and others around 1941 onwards. G8LIU. Tel Uxbridge 30006.
1·6MHz Q multiplier and balanced armature earphones, Brown's A type or ex-government units, single units ok. W. Handy, 105 Humber Avenue, Coventry. Tel Coventry 22201.
Pye Cambridge AM10B, AM10D. Vanguard AM25T, 6ch, high or mid band, prefer unmod, but any reasonable cond considered providing comp control box, mic, spkr, etc. Your price paid, all replies acknowledged. GM3OFT, 11 Jedburgh Gardens, Glasgow. Tel 041-946 0441.
Pye Bantam or similar portable, must be converted to 145MHz or easily convertible, in good cond. Kerr Hunter, GM8KYL, 61 Bellwood Road, Milton Bridge, Midlothian EH26 0QN. Tel Penicuik 72399.
PT4176D (2N4128) vhf power transistor. Slow motion dial for vfo. Coaxial relays. 2 off 2N441 or equivalent. PNP TO36 case. All letters answered. G8GED, QTHR. Tel 01-575 1454 after 6pm.
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Bamboo poles for hf Quad, 12–15ft long, 1·5in dia. G3SJX, QTHR. Tel 01–656 9054.
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Urgent, circuit manual for Jason VVM, your price. 5 gang variable ex-31 set. Kokusai or Collins filters 455kHz. G3ESB, QTHR. Tel Derby 671536.
Swop Omega noise bridge TE701, as new, for Marconi TF975 absorption wavemeter, or buy. G5LH, 82 Weardale Avenue, Forest Hall, Newcastle upon Tyne NE12 0HY. Tel Newcastle 662490.
Any information on Cossor scope model 2100, manual, circuit diagram, etc, buy or borrow. All replies answered. G4BSH, QTHR.
IC22 or IC22A or similar fm mobile rig. Mid band a.m. equipment. Cambridge or similar rig. Top band gear, transverter, separates, why? HF ATU and low pass filter. Storno Viscount xtal changeover board. G8HPE, QTHR. Tel Romford 45733.
HF whip with gutter or stack mount, Triband or Joystick preferred, must be in wkg order, regret can only pay around £5. Dave Austin, 13 Ridgehill Grove, Sheffield S12 2GJ, Yorks.
G2DAF Mk2 rx, coils, switches, variable caps, unfinished project, etc, or why for this design. Information on availability of source for ready wound coils, etc. All letters answered. G8HLJ, QTHR. Tel 051 653 0767.
AMSAT-UK member about to become mature student at Aston University, Birmingham, requires digs locally with amateur radio flavour. David Walland. Tel 0379 852548 after 6.30pm or 0603 56161 ext 2241 day.

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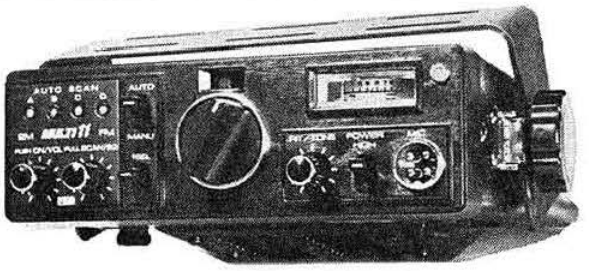

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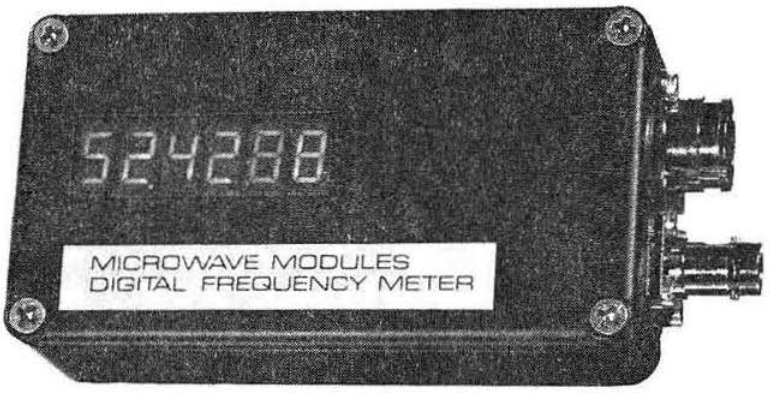

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This unit, by providing just the basic counting facility with no gimmicks or frills, is available at a breakthrough low price as detailed below.

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Frequency ranges:	0·45–50MHz, 50–500MHz	
Sensitivity:	Better than 50mV over 50MHz range Better than 200mV over 500 MHz range	
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Power connector:	5 pin 270° locking DIN. (Plug supplied).	
Accuracy at 50MHz:	± 100Hz	
Accuracy at 500MHz:	± 1KHz	

The unit is reverse polarity protected and the RF input is diode protected.

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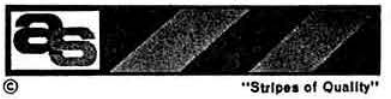

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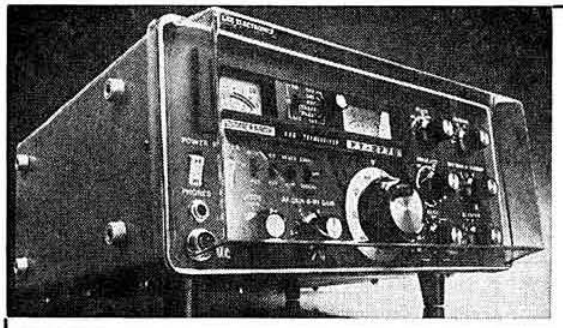

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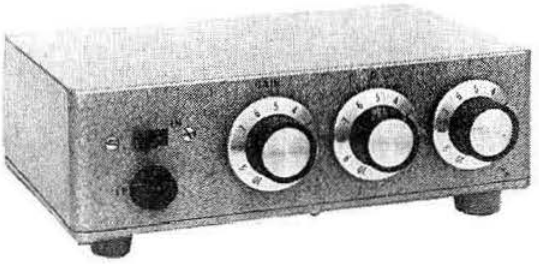

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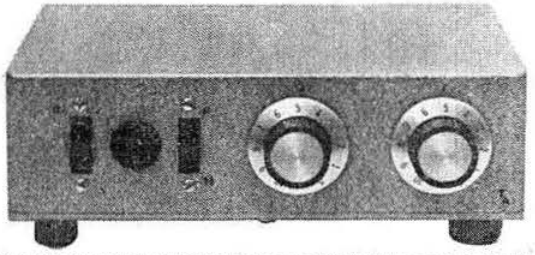

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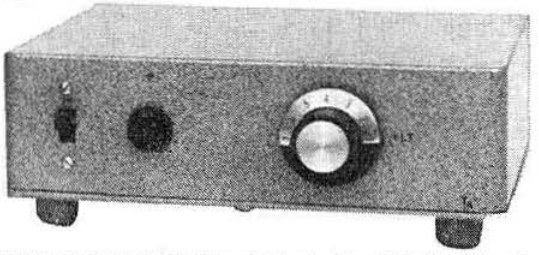

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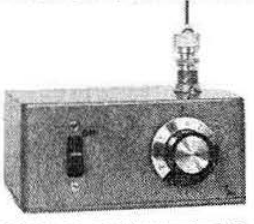

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