February 1976

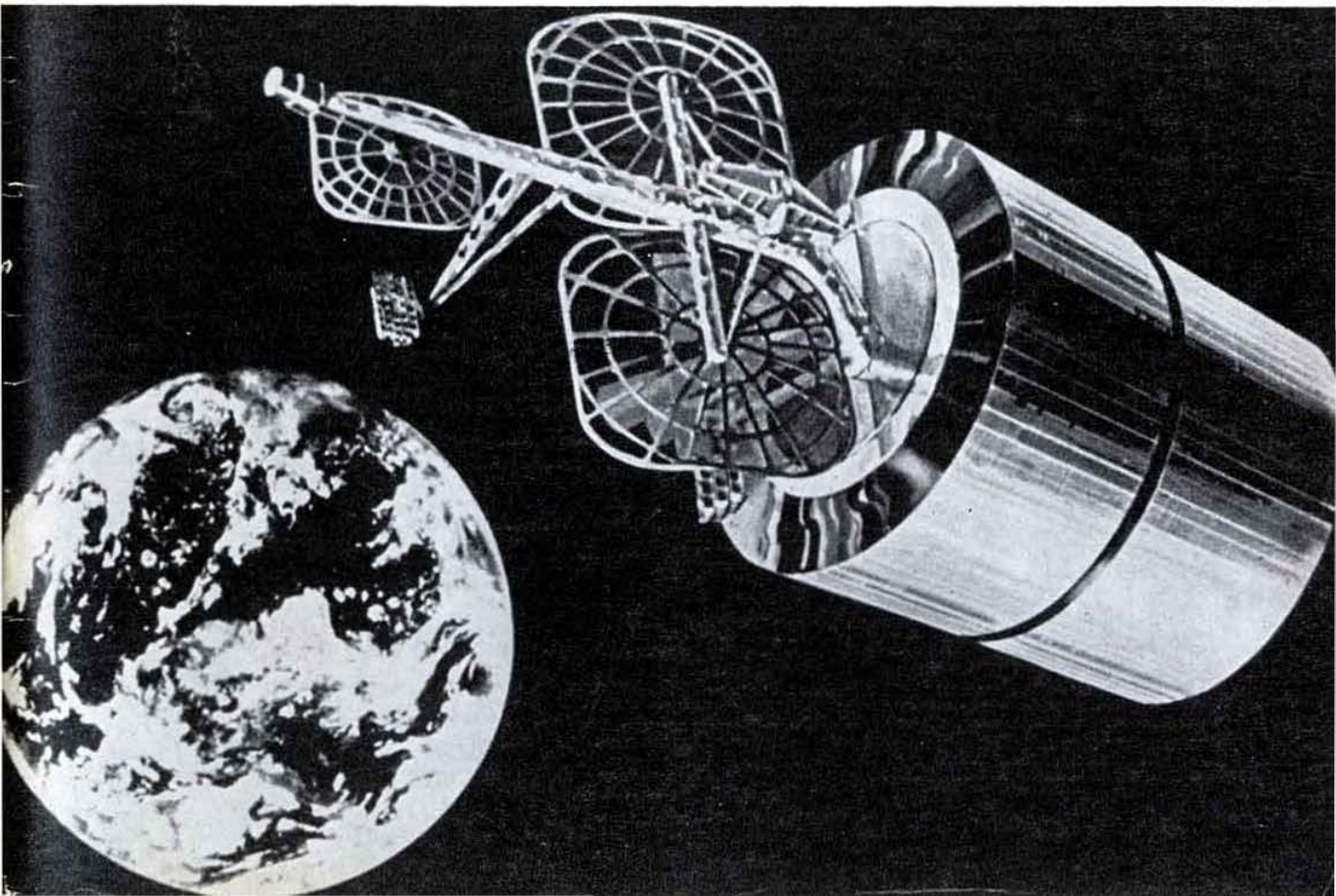
radio communication

journal of the Radio Society of Great Britain

WHAT THE ASTRONAUT SAW

The world's biggest communications satellite—successfully launched from Cape Canaveral in September 1975—is now undergoing tests and will go into service shortly over the busy Atlantic region carrying telephone calls to and from the UK, the rest of Europe, North and South America, Africa and the Middle East. The satellite is capable of carrying more than 6,000 telephone calls and two television channels at once. It is the first of a new generation of high capacity satellites to be launched over the coming years which will provide expanded global communications facilities. The satellite, which is nearly 8ft taller than a London double-decker bus, is provided by the International Telecommunications Satellite Organisation (INTELSAT) in which the UK is the second largest shareholder. UK calls will be handled by the Post Office's earth satellite station at Goonhilly, Cornwall.

A Post Office photograph



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)

radio communication

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Radio Communication **is published by The Radio Society of Great Britain as its official journal on the first Tuesday of each month and is sent free and post paid to all members of the Society**

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

19,106 copies per issue average circulation in 1975

Contributions and all correspondence concerning the **content** of *Radio Communication* should be addressed to: The Editor, *Radio Communication*, 35 Doughty Street, London WC1N 2AE. Tel 01-837 8688. (**Circulation** queries should be addressed to: The Subscriptions Department RSGB).

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

Advertising, other than Members' Ads, should be sent to the above address marked for the attention of Mr C. C. Lindsay. Tel 01-686 5839.


2m FM Mobile Transceiver
TR-7200G
The rig with all the extras built in
TUNING
POWER
TRIO
EXTERNAL VFO
VFO-30
CAL
PULL ON
CALL
2m FM TRANSCEIVER TR-7200G
SQUELCH
CALL CH
MIC
TIMER
POWER
ON
OFF
POWER SUPPLY MODEL PS-5

2 Metre FM mobile transceiver TR7200G

The TR7200G is now the best selling two metre FM mobile transceiver in Europe. It has always been a favourite all over the world among radio amateurs who demand the very best in performance and construction. Now with a complete range of accessories, the TR7200G offers the ultimate in fixed station and mobile FM operation.

Performance plus

High receiver sensitivity (typical measured performance 0·3μV for 15dB quieting) gives you a solid readable signal from long distance stations. Also it helps to combat flutter on the received signal when you are mobile in a town since the limiting threshold is superbly low. Minimum transmitter output of 10 watts (typically 14-15 when on the move) together with carefully tailored audio response and a new integrated circuit limiting amplifier gives your signal that outstanding quality that makes people listen. The matching Trio dynamic microphone supplied with the rig further adds to the signal quality and readability.

Repeater access tone

Generated by the Trio exclusive tuning fork controlled 1750 Hz oscillator. This is the tone generator that does not drift even when the interior of the transceiver is being cooked through sitting in a hot car on a summer's day. Stabilised amplitude output for constant deviation under all conditions. Access first time, every time.

Superb squelch performance

Utilising the very latest in noise signal detection techniques for a squelch sensitivity of better than 0·5μV. This simply means that you can be sure that the weakest usable signals will open the squelch when with other rigs, you always wonder if you are missing something with the squelch in operation.

Switched TX output power

1 watt or 10 watts by the touch of a button. Dial illumination colour change to indicate power level in use. Fully variable PA protection which gradually reduces power input to PA with increasing SWR. This allows you to continue operating when your mobile antenna gets wet (and rain really does change the SWR on most antennas).

Features, features

The 22 channel dial is engraved with all R and S channel numbers so you don't have to wonder "did I put R6 in chan 11 or 12?". It also, incidentally, has channels designated A, B, C, etc. for your Raynet or local frequencies. The LED under the channel number is RF powered and only lights on the channels fitted with a receiver crystal. The "on air" lamp is also RF powered but from the transmit crystals so you know precisely what crystals you have in the rig. Best engineered mobile mount on the market gives instant slide in/slide out installation with no nasty little screws to fiddle with. Just in case someone else wants to slide out your rig, there is provision for a padlock through the mounting slide to prevent it (of course he could remove the entire dashboard complete with rig). The TR7200G case is dust tight and waterproof and reflects the Trio no compromise design approach. Public address facility. Switchable receiver sensitivity. Helical front end filter, etc., etc. It's the best mobile FM transceiver on the market. Now look at the price, **£130** (VAT exc.) fitted 5 channels.

VFO 30 G External transmit/receive VFO

Matching VFO for TR7200G with same superb construction. Gives full 144-146 MHz band coverage with built-in 600 kHz repeater shift at the touch of a button. Illuminated dial and centre zero tuning meter for easy operation. Built-in calibrate facility allows accurate dial setting against TR7200G crystals. Low frequency heterodyne type VFO for first class stability under all conditions.

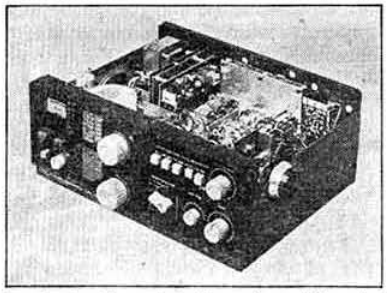
PS5 power supply

To complete the station, the PS5 allows home operation of the TR7200G from 120—240v. AC mains supplies. Electronically regulated 13·8v. DC at 3·2A with thyristor secondary protection. Built-in digital clock with 24 hour timer.

Sole Importers
Lowe Electronics
Cavendish Road
Matlock Derbyshire
Tel: Matlock 2817/2430

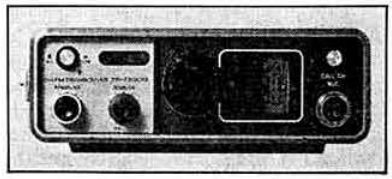
TRIO

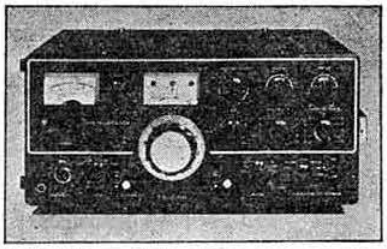
LOWE ELECTRONICS



TRIO

FOR ALL THAT'S BEST IN AMATEUR RADIO GEAR





Despite the efforts of the Chancellor to kill our hobby, the radio amateur still struggles on, beset on all sides by advertising such as mine advising him to buy a particular make or model of equipment.
How does the average chap know how to choose the dealer from whom to buy his equipment? Let me quote below the opening page of our catalogue for 1966 which was written by Bill when he laid down the basic rules by which we still run the business.

The ensuing blah is designed specifically to get between you and your wallet—which, let's face it, is the object of advertising. Just how successful I will be rather depends on whether you believe the aforesaid blah or not. After all, why on earth should you buy from me—my prices are in general about the same as anyone elses (although some things are cheaper), I don't allow any discounts nor do I cut prices, nor give fabulous allowances on trade-ins. On the face of it, I'm a dead loss and you'd be much better with "Honest Sam" who gives a good discount. However, I differ from "Honest Sam" in one or two small points. Firstly, I never, under any circumstances, ever sell anything I am not convinced is good value for money. Many's the time I've been asked for equipment which I know to be inferior and had to turn good money away because I refuse to sell it. Many's the time a chap has wanted to trade inferior equipment for new, recommended stuff. I've lost the sale because I refuse to accept inferior stuff in the trade. Even though I know I could easily sell it to some poor mug. This means that you can come to me confident that you'll not get "sold a pup". Secondly, everything I sell has an unconditional money back guarantee—if you don't think it is good value for money, you get your money back without question! Thirdly, everything I sell carries a guarantee and I have the service facilities to back it up. If you're buying fairly complex gear, by all means buy it from Honest Sam and get a quid or two off for cash, but what happens when it goes on the blink? I'd like to bet Honest Sam just doesn't want to know. I am the actual importer of virtually everything I sell and I carry spares and what I haven't got I can soon get through our Agent in Japan (Oh yes, we actually have an Agent on the spot.) In the few years I have been in business I have built up a reputation for only supplying excellent, fully tested, trouble-free gear at a reasonable price and it is a reputation I'm not anxious to lose because it's my bread and butter. The defence rests. Whether or not you believe me is up to you, but you can perhaps check by talking to someone who has bought something from me (there are one or two kicking about!).

Finally, do beware of "fabulous bargains"—I've yet to see one!

1966 BILL LOWE

I cannot say it in any better way.
73
John, G3PCY.

Incidentally, have you seen the Microwave Modules counter and 500 MHz prescaler. Using these together, you can have a frequency meter that is little more than pocket size needing only 12 Vdc to operate it.
We are pleased to have this in stock and at the price it's a steal. MMDO50 counter £66 inc. VAT: MMD500P prescaler £27 inc. VAT.

HEAD OFFICE — **119 Cavendish Road, Matlock, Derbyshire. Tel. 2817 or 2430 9 a.m. to 9 p.m.**

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John G3JYG. 16 Harvard Road, Ringmer, Lewes, Sussex. Tel. Ringmer 812071
Sim GM3SAN. 19 Ellismuir Road, Baillieston, Nr. Glasgow. Tel. 041-771 0364

OPENING HOURS: 9-5.30 TUESDAY TO SATURDAY INCLUSIVE

73 from BILL G3UBO/VE8DP, ALAN G3MME, JOHN G3PCY/5N2AAC, IAN G3ZYC

YAESU MUSEN — THE

AND NOW FROM THE YAESU LABS THE SUPERB 2 METRE PACESETTER—

FT-221 ● **Solid State Ultimate 2 Metre Transceiver with Versatile SSB/FM/CW/AM Operation**

***Latest Model**

STAR FEATURES!

★ Complete 144-148MHz coverage in 8 band segments
★ Dual rate, concentric VFO dial drive with better than 1kHz readout
★ Built-in AC & DC power supplies
★ SSB/CW/FM/A.M. operation
★ Selectable ±600kHz repeater offset
★ Built-in VOX and break-in CW
★ External tone input connector
★ Built-in 100kHz calibrator
★ Built-in effective noise blanker
★ Three way metering: S meter, power output, and FM discriminator
★ 11 crystal channels per band segment = Total 88 channel
★ SSB output 12 watts P.E.P.
FM/CW output 14 watts
A.M. output 2·5 watts
★ Built-in speaker
★ With dynamic fist microphone

Specifications

GENERAL

Frequency Range: 144-148MHz in eight 500kHz segments.
Mode: SSB (selectable USB or LSB), A.M., FM or CW.
Frequency Stability: Within 100Hz during any 30 minute period after warm-up. Not more than 20Hz with 10% line voltage variation.
Calibration Accuracy: 1kHz maximum after 100kHz calibration.
Backlash: Not more than 50Hz.
Antenna Impedance: 50 ohm unbalanced nominal.
Power Requirement: 100/110/117/200/220/234V AC, 50/60Hz, 100 VA maximum or 13·5V DC, 3A transmit maximum (11·5016·5V DC).
Size: 200(W) × 125(H) × 295(D) mm.
Weight: 8·5 kg.

RECEIVER

Sensitivity: 0·5μV for 10dB Noise plus Signal to Noise Ratio on SSB/CW. 1·0μV for 10dB Noise plus Signal to Noise Ratio with 400Hz 30% modulation on A.M. 0·75μV for 20dB quieting on FM.
Selectivity: 2·4kHz nominal bandwidth at 6dB down, 4·1kHz at 60dB down on SSB/CW/A.M. ±6kHz nominal bandwidth at 6dB down, ±12kHz at 60dB down on FM. (8kHz or 15kHz filter is available on request.)
Harmonic & Spurious Response: Image Ratio better than 60dB.
Audio Output: 2 Watts to internal or external speaker at 4 ohm impedance.
Squelch Threshold: Less than 0·3μV.
I.F. Frequencies: SSB/A.M./CW 10·7MHz, FM 10·7MHz and 455kHz.

TRANSMITTER

Spurious Radiation: −60dB.
Frequency Response: Balanced SSB 300 to 2,700Hz ±3dB. Low power A.M. better than 60%. Variable reactance FM ±5kHz maximum.
Carrier Suppression: −50dB.
Sideband Suppression: −50dB.

YAESU MUSEN KNOW THE PROBLEMS—

NAME SPEAKS FOR ITSELF!

YAESU MUSEN MISCELLANY — THE RANGE IS NOW THE LARGEST BY ANY SINGLE MANUFACTURER — HERE WE SHOW SOME EXAMPLES OF YAESU'S LEADERSHIP

The Incomparable Deluxe FT-101E

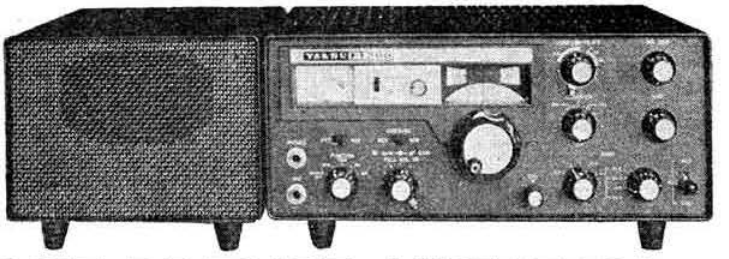
This sets the standards by which other Transceivers are judged.

High Power Base Station FT-401B ▼

The very latest version of the famous FT401. Immensely popular with many operators for its exceptional specification and powerful signal.

Low Cost Base Station FT-200 ▼

What can we say about the FT200? This has been a best-seller from the start—small wonder with such an exceptional specification at such a modest price.



AND HAVE SOME PRECISE ANSWERS!

Western

SAVE £'s £'s £'s BUY FROM 'WESTERN' HELP US AND HELP YOURSELF!!

We have so much stock that we do not really look forward to having to load it all into several vehicles when we transfer our Head Office to Lincolnshire in April, so we thought it made much better sense to give you a SPECIAL PRICE REDUCTION to reduce our stock, rather than line the pockets of the removal company! Naturally, this is a "once in a lifetime" occurrence, so do not miss this unique opportunity to get yourself a bargain! All items sold at reduced prices will carry the manufacturer's warranty, but not our free collection and delivery service on warranty claims.

YAESU

Special offers on the following items only

ANTENNAS: Jaybeam, Newtronics, Wilson ANTENNA ROTORS: CDE Communications Equipment, Atlas, Belcom, Braun, FDK, Frontier, Standard, Tempo and Yaesu Musen

MASTS: Alimasts and Telomasts TOWERS: Teletowers

Buy in confidence from 'WESTERN'

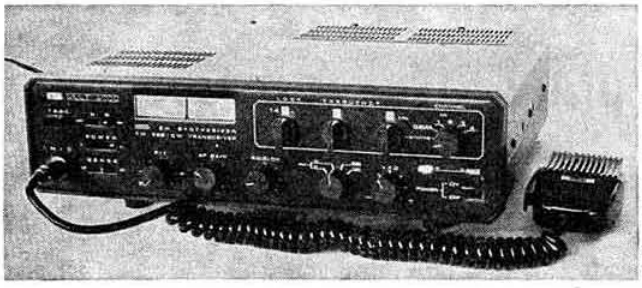
We carry extensive stocks of spares for CDE and YAESU, so when you buy from us, you will have the peace of mind that goes with knowing that your supplier can provide an efficient after sales service.

DRAKE C LINE... for excellent performance

DRAKE PRICES (inc. VAT) FREE DELIVERY

IC Receiver	£380.00	AC4 AC psu for T4XC	£80.00
IXC Receiver	£395.00	MS4 Speaker for R4B	£18.75
SSR1 Receiver	£225.00		
TR4C Transceiver	£410.00		

HERE IS ONE BARGAIN YOU SHOULDN'T MISS!



THE FDK MULTI-2000

2m SSB/FM, CW 200 Ch. SYNTHESISED AC/DC TRANSCEIVER

* Full cover 144-6 MHz.
* VXO give full coverage between 10kHz spacing.
* Rapid change of frequency and mode is possible.
* RIT (Receiver Incremental Tuning) allows receiver to be tuned without moving the transmit frequency.
* 600kHz Repeater shift works on all frequencies.
* Tone access built-in.
* Fitted narrow FM Filter.

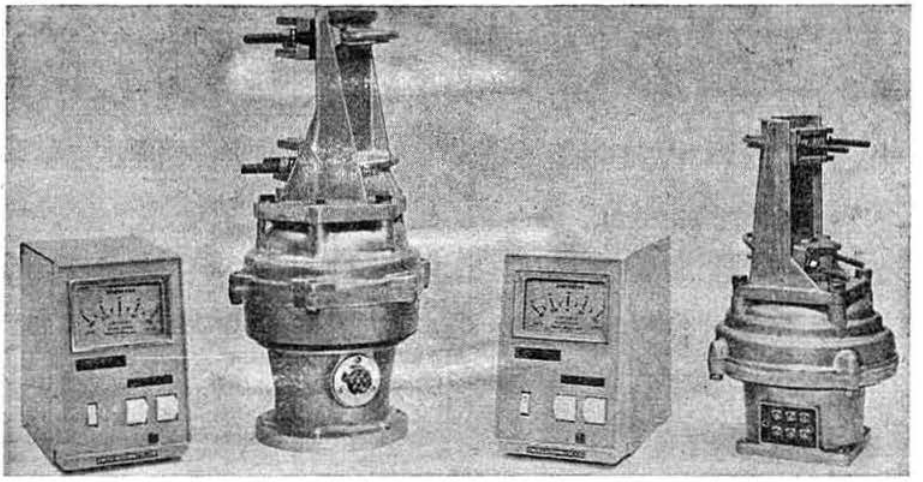
SUPERB VALUE AT **£325** inc. carriage (Securicor) and VAT

VISIT OUR NEW BRANCH AT LEICESTER

WHY NOT PAY A VISIT TO OUR BRANCH WHICH IS NOW OPEN AND HAS STOCK OF THE MAJOR ITEMS. WE ARE LOCATED INSIDE THE LARGE NEW MAY'S AUDIO AND HI-FI CENTRE, CHURCHGATE, LEICESTER.

Electronics (UK) ltd

W.E. are pleased to announce . . .
. . . an exciting new range of ANTENNA ROTORS by EMOTO ANTENNA Co.



COMPARISON OF ROTOR BRAKE TORQUE FIGURES (kg./cm.)

CDE model	Torque
AR30	575
AR40	920
CD44	1,152
HAM-2	4,025
Emoto model	
102 LBX	1,500
1100 MXX	10,000

1100MXX £115 + VAT
102LBX £55 + VAT

DOES YOUR ANTENNA TURN IN THE WIND?
DOES YOUR CONTROL UNIT 'CUT-OUT' AFTER ONLY A FEW REVOLUTIONS?
. . . then step-up to a RELIABLE EMOTO ROTOR.

We have been in the business long enough to know your requirements for a first class antenna rotor, and we have gone "over-board" for the EMOTO range! There are many brands of antenna rotors, some of them completely unsuitable for the majority of amateur applications, and for this reason we do not stock them.

Most likely your present antenna rotor will turn your antenna and hold satisfactorily, but it just will not hold it stationary under strong wind conditions; i.e. YOUR ROTOR LACKS SUFFICIENT BRAKE TORQUE, the ability to hold the antenna still whilst a gale is blowing.

HERE IS WHERE THE EMOTO SCORES.

Take a close look at the comparison figures above. Then compare the prices of all the rotors and you will have to agree that the EMOTO 102 LBX and EMOTO 1100 MXX are the best value.

Finally, EMOTO ANTENNA CO., is not a new company. They have been making rotors for many years. Have no fears about this being a new and untried product!

Having obtained samples (all rotors are individually tested by EMOTO before despatch) and had them tested by an independent authority, SOUTHAMPTON UNIVERSITY, we are now confident to recommend them as THE FINEST ROTORS AVAILABLE. The 1100 MXX received the following comment from the University: "Very rigid. NO SLACK, WELL MADE, GOOD DESIGN". NEED WE SAY MORE!

WESTERN FOR TEST EQUIPMENT

SEE OCTOBER'S ADVERT FOR FULLER DETAILS

VALVE VOLTMETER TE-65

*With new 6" full-view meter
*Compare it to any peak-to-peak V.T.V.M. made by any other manufacturer at any price.

Specification: DC V: 0-1·5-5-15-50-150-500-1500V (using HV Probe, up to 3kV). AC V: 0-1·5-5-15-50-150-500-1500V RMS. 0-1·4-4-14-40-140-400-1400-4000P-P. Resistance: Rx 10-100-1K-10K-100K-1M-10M (0·2Ω-100MΩ). Decibel: -10dB to +65dB. Power source: 105-125, 220-240V. AC, 50/60Hz. Tube Complement: 12AU7, 6AL5.

RF SIGNAL GENERATOR, TE-20D

*Factory calibrated and tested
*Dual output RF terminals
*Separater Variable Audio Output

Specification: Freq. range: 120kHz-500MHz (7 bands). Freq. accuracy: ±2%. Audio output: to 8 volt. Internal modulation: 400Hz approx. Tube: 12BH7A, 6AR5. Power source: 105-125V, 220-240V. AC, 50/60Hz, 12 watts. Employs a Xtal socket and can be used as below: (a) Self-calibration, (b) Marker generator.

TEST EQUIPMENT PRICES
(Including p. & p. and VAT)

SE-250B Injector	£3.24
SE-205A Tracer	£16.96
SE-360 Tracer/Injector	£19.17
SE-3850 Generator	£46.44
TE-15 G.D.O.	£27.00
TE-20D RF Generator	£27.00
TE-22D AF Generator	£35.64
TE-40 AC Millivoltmeter	£37.80
TE-65 VTVM	£37.80
TE-68 Insul. Tester	£48.60
TO-3 Oscilloscope	£91.80

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Alan Cameron GM3OGJ Alloa (02592) 4653

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CABLE: WESTRONICS, SOUTHAMPTON
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SMC South Midlands

ESTABLISHED 1958—OVER 17

YAESU WITH 2-YEAR GUARANTEE ONLY FROM SMC

With confidence born of long experience in Yaesu quality, S.M.C.'s guarantee (from the 1st February until further notice) is extended to 2 years covering both labour and free components (excluding valves and semi-conductors)

FREE DELIVERY WITHIN 24 HOURS

For Yaesu items over £55 by Securicor (B service) over £5 post

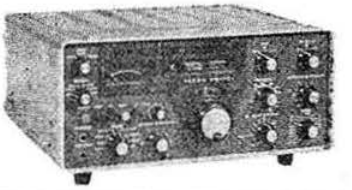
THE LARGEST RANGE EX-STOCK IN THE UK ONLY FROM SMC

SEND FOR 18-PAGE YAESU CATALOGUE & 22-PAGE STOCK/PRICE LIST
FOR FURTHER INFORMATION SEE YAESU OR SMC PREVIOUS ADVERTS

FT101 (E) EX STOCK (above) The most popular and sought after HF Transceiver in the UK. No other transceiver has kept its value so well. Not only a delight to use but an investment.

FAST MAIL-ORDER
CALLERS WELCOME

NEW EASY ROUTE From the M3 onto the Winchester Bypass towards the new M27 onto the M271 brings you to within 1 mile of S.M.C. at Totton, where we are always pleased to see you, offer a cup of tea or coffee, advice or demonstrate our full range.



FR101 EX STOCK (SD above). The ultimate in base station combination when used with the FL101 transmitter. 4 versions to choose from, the Standard or Deluxe, or either in digital form.

FT221

FT224

2 METRES. From the all mode and versatile FT221 to the 8 channel Auto Yaesu and SMC, the unequalled experience in 2m. Phone, call, or write for full details.

SIG 80R

NEW LOW YAESU MUSEN PRICES (includes FREE Securicor Delivery)

HF TRANSCEIVERS	
FT75B 120W PIP VXO	£165.00
FP75B AC PSU/speaker	£42.00
DC75B 12V DC PSU	£42.00
FT-101B 230V AC/12C DC	£360.00
FT-101EX Economy "101"	£325.00
FT-101EE "E" less Clipper	£360.00
FT-101E De Luxe	£395.00
FT200B 10-80m	£205.00
FP200B AC/PSU/Speaker	£50.00
FT-401B CW/A.M./SSB	£330.00
FT-401 QRO base station	P.O.A
FT-501 Digital readout	£375.00
FP-501 AC/PSU/Speaker	£55.00
HF TRANSMITTERS	
FL-101 10-160m	£275.00
HF RECEIVERS	
FR-101S Single filter	£270.00
FR-101D 4 filters 2/4m	£350.00
FR-101DS Dig. standard	£345.00
FR-101DD De luxe digital	£425.00
REMOTE VFO's	
FV50C VFO for FT-75 (B)	£39.00
FV101B for 101B	£52.00
VF200 VFO for FT200 (B)	£45.00
TEST EQUIPMENT	
YC35DD 220MHz AC/DC	£135.00
YC355 35MHz AC/DC	£105.00
YO-100 Monitor scope	£105.00
YP150 Power meter	£42.00
YC601 Digital Readout	£95.00
VHF TRANSCEIVERS	
FT2 AUTO FM autotune	£215.00
FT-221 Multimode 2m	£318.00
FT-224 FM24 channel	£135.00
FT-620B 6m CW/A.M./SSB	£220.00
FTC212 70MHz FM	£190.00
Sigmasizer 80R 80ch.	£225.00
Sigmasizer 200 200 channel	£180.00
FP2AC AC PSU 12V out.	£37.00
VHF TRANSVERTERS	
FTV250B 144MHz	£115.00
FTV650B Modified 70MHz	£100.00
LINEAR AMPLIFIERS	
FL2000B 1·2kW PIP	£230.00
FL2100B 1·2kW IPI	£230.00
ACCESSORIES	
SP*01 Speakers	£15.00
SP*01PB Phone Patch	£34.75
XF30A A.M. Filter	£18.00
XF30C CW Filter	£18.00
XF30D FM Filter	£18.00
XF103 CW Filter	£22.00
XF90C CW Filter	£18.00
XF90B A.M. Filter	£18.00
MMB101 Mobile Mount	£11.00
MMBAuto Mobile Mount	£7.50
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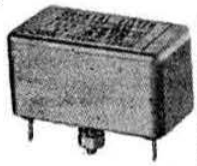

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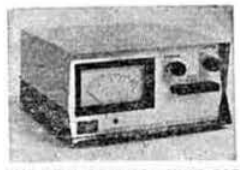

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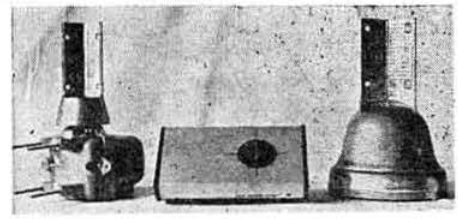

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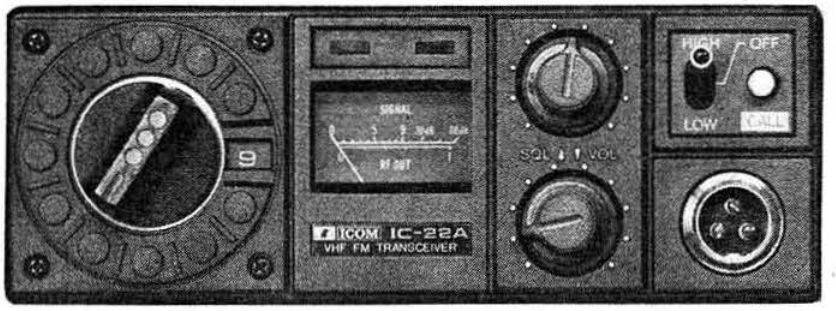

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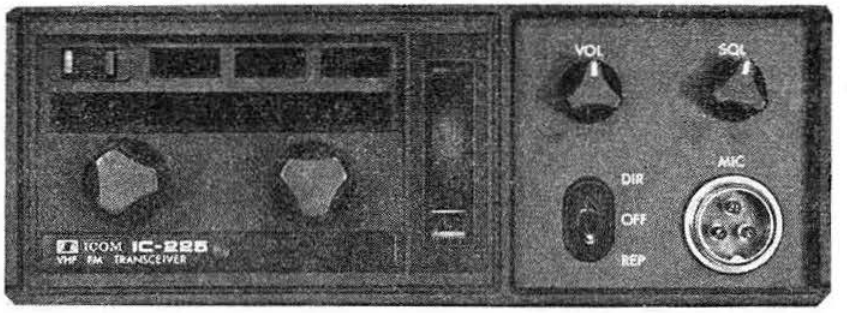

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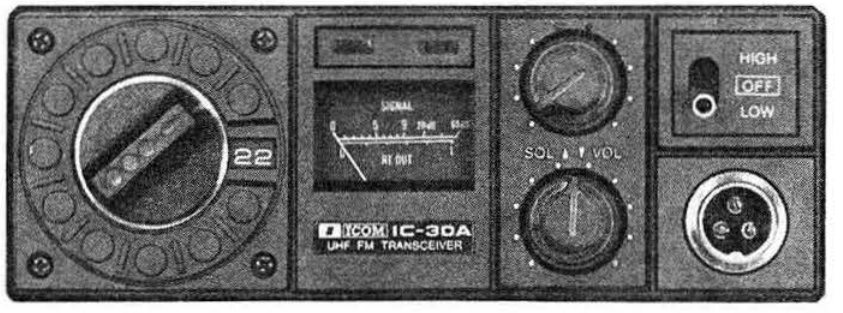

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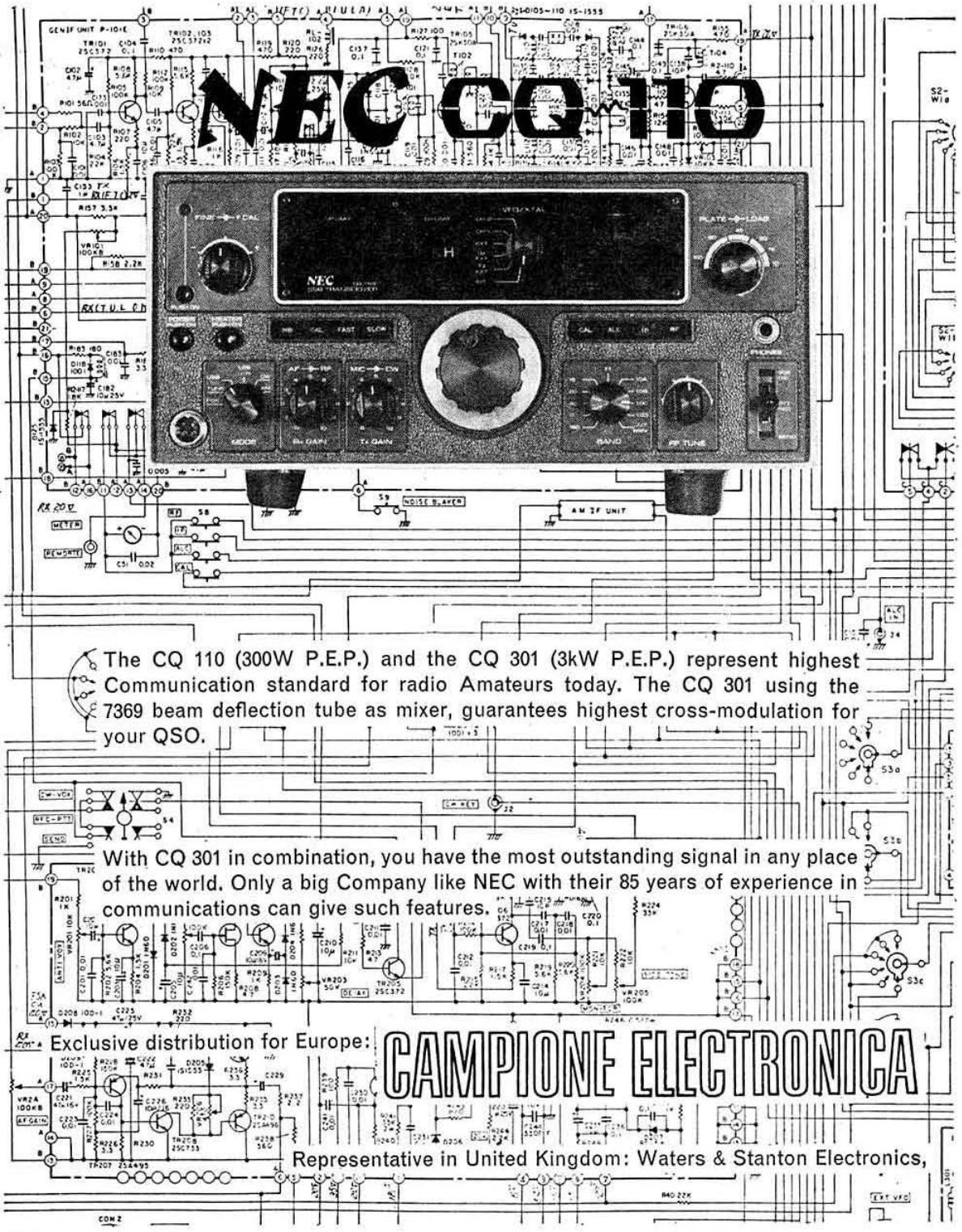

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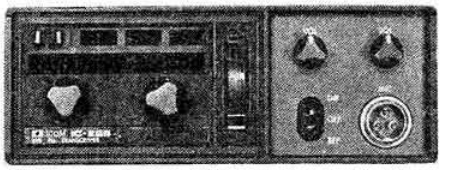

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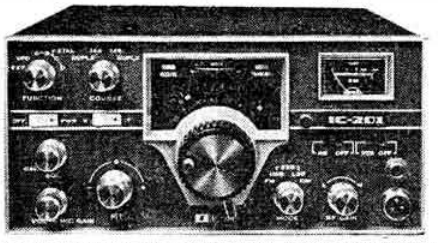

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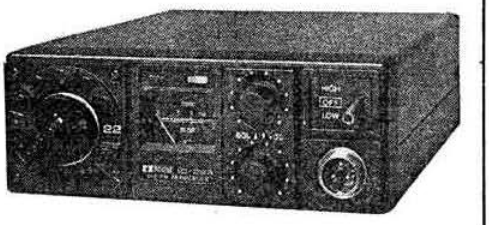

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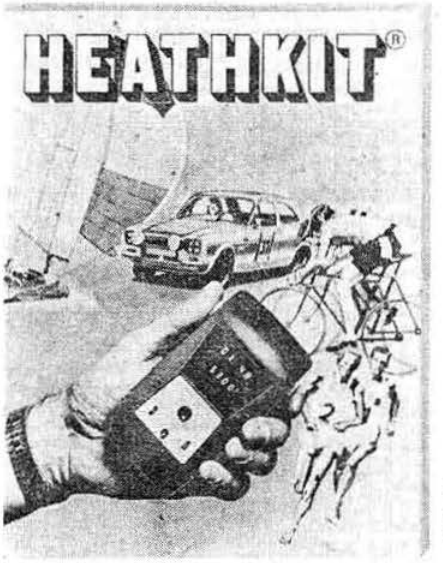

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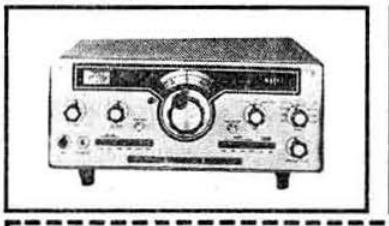

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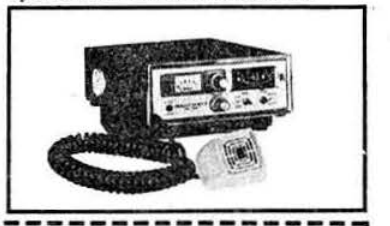

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CQ de RSGB

You and your Society

How much do you know about *your* Society—the RSGB? Probably not as much as you should. Perhaps you have not taken enough trouble to find out—perhaps the Society has not told you enough about itself.

The Society exists to make amateur radio more interesting and worthwhile and to safeguard the amateur bands. The more you participate in its affairs, the more exciting and stimulating will the hobby become.

In a Society whose members number many thousands, it is all too easy for the individual to feel that he does not matter and that the Society could get on just as well without him. If everyone thought in this way there would be no Society, for the individual members *are* the Society and no person, whatever his rank, is more than *one member*.

Getting to know the others

No one gets the most out of a hobby by pursuing it alone. This is particularly true of amateur radio, and fortunately in the RSGB excellent opportunities exist for getting to know other amateurs through the local societies and RSGB groups which meet regularly in all parts of the country. For the vast majority of members there is an active body within reasonable travelling distance and membership is obtainable at a nominal fee. In these local societies a wealth of information and expertise is freely available and nothing is more likely to make amateur radio come alive than the friendships which membership of a local society inevitably brings.

Doing something worthwhile

In this article there is only space to mention one other aspect of membership. Every radio enthusiast, whether short-wave listener or licensed transmitter, may, through the Society, take part in experiments, contests, investigations and the like which not only give the hobby real and lasting interest but enable some of the participants to make genuine contributions to the development of the science.

It is regrettable though that many of those who obtain transmitting licences today fail to understand that there is more in amateur radio than buying a receiver and a transmitter and talking endlessly into a microphone. While there is undoubtedly a fascination in being able to talk to other amateurs hundreds of miles away, the majority of licence holders derive their greatest pleasure from designing their own stations and using them for specific observations, tests, contests and the like, which are the essence of the hobby and the main purpose for which the licence is granted.

The future of amateur radio and of the RSGB depends to a great extent on the careful preservation of this concept of the role of the amateur. *W.A.S.*

QTC
amateur radio news

432MHz band
The RSGB has again asked for the removal of the restrictions at present applying to the 430-432MHz part of the band. In reply the Home Office states that the restrictions still apply and are likely to continue for many years. Efforts to obtain the use of spot frequencies have also been unsuccessful.

144MHz band
Footnote 4 to the schedule of the amateur (sound) licence contains a list of frequencies to be avoided. In October 1974 the list was reduced to three frequencies only, viz 144·000, 144·54 and 144·9MHz. It appears that licences now being issued still contain the original list of 11 spot frequencies, eight of which may be disregarded.

Facts and figures
The Home Office advises that the following numbers of amateur licences were in force at 30 November 1975:

Class A	15,739	Class B/M	2,073
Class B	5,684	Television	298
Class A/M	3,892		

The callsign record received from the Home Office dated 19 December 1975 gives the latest callsigns issued in the G4 and G8 series as G4EQG and G8LDN respectively.

At the end of November 1975 RSGB membership totalled 19,157 made up of 16,068 UK corporate, 1,131 UK associate and 1,958 overseas members.

National VHF Convention, 8-9 May 1976
For the first time the annual National VHF Convention will be held this year at Brunel University, Uxbridge, Middlesex. Full details of this two-day event will be published next month, but in the meantime those who would like to book single-room accommodation on the University campus for the night of Saturday/Sunday 8/9 May may do so by sending payment to RSGB, 35 Doughty Street, London WC1N 2AE, marked clearly for the attention of "Dept DAE-9". Single-room accommodation overnight, which includes breakfast, costs £3.50 per room.

Repeater news
The Repeater Working Group has produced a revised frequency plan for 432MHz repeaters (reluctantly departing from the system currently being used by GB3PY) following Home Office advice that the restrictions between 430 and 432MHz in the north of England could not be lifted and that no spot frequencies could be allocated. To avoid two different systems for input channels it is now being proposed that 432MHz repeater output channels should be located in the 433·0–433·5MHz range and that all inputs should be 1·6MHz high. This utilizes the IARU system but reversed to aid tv operators. Further information appears in *Repeater Report* obtainable from the RSGB on receipt of an sae.

"Radio Communication" circulation
The audited total average circulation of "Radio Communication" during 1975, as certified by the Audit Bureau of Circulations, was 19,106 copies per issue.

This shows an increase of 1,290 over the 1974 figure, and an increase of 2,152 over the first ABC audited figure of 16,954 for 1970.

The overall location plan for 432MHz repeaters will be finalized at the next meeting of the RWG and, it is hoped, passed to the Home Office this month.

An open meeting of the RWG will be held on 24 April at the University of Aston, Birmingham. Details and tickets are obtainable from G8AMD, QTHR, and applications should give the number and callsigns of group members.

East London RSGB Group to fold
The following is the text of a communication dated 7 January 1976 received from the East London RSGB Group:

It was resolved by the elected committee of chairman, treasurer and three committee members at a committee meeting held on 6 January, 1976 that:

(1) The East London Group of the RSGB who meet at the "Wanstead House", The Green, Wanstead E11 shall cease to exist as a group as from the third Sunday in March 1976. That date being the last meeting, the minutes of the AGM and final accounts will be read.
(2) All monies being at that time in group funds will be donated to the RSGB, 35 Doughty Street, WC1, without reserve, this being the correct procedure.
(3) All cups and trophies to be held by one or more respected licensed amateurs in the group area; these to be returned should the group reform and are required by the reformed group within a period not exceeding five years after which the said trophies become the property of the holder.

The above action is being taken due to the following reasons:

(a) General apathy of the East London amateur fraternity shown in the non-regular attendance at meetings of at least 98 per cent of the area membership.
(b) The lack of response to obtaining a secretary for correspondence of group business on a long term basis.
(c) The lack of committee members coming forward to serve voluntarily.
(d) The lack of support from affiliated groups and Societies within the area to these meetings.

It is regretted that this action is necessary but the committee is now in an embarrassed position, with no help whatsoever from members present at the December AGM. The average non-regular attendance at meetings over the past year has been 30 of which only seven have been regular.

R. Broadbent, G3AAJ, chairman;
T. Rice, BRS29770, treasurer;
R. Cuttbush, G4ADK;
D. Jones, G3ZZK;
M. Toms, BRS31976.

Communications '76
Registration forms and programme details are now available for "Communications Equipment and Systems", a conference which is being held as part of Communications '76, the third in a series of international exhibitions. The conference is being organized by the Institution of Electrical Engineers and will take place at the Metropole Convention Centre, Brighton, between 8 and 11 June 1976. Further information is available from the IEE Conference Department, Savoy Place, London WC2R 0BL.

New prefixes

The ITU has provisionally allocated the following callsign series: D4A-D4Z Cape Verde (Rep of); D5A-D5Z Liberia (Rep of).

DARC Constance meeting

Expansion and regulations have forced the DARC to seek a new site to replace that previously used for the well-known Bodensee-Treffen. For 1976 the exhibition and meeting will be held at the IBO exhibition grounds in Friedrichshafen on 25-27 June. There will be the usual features and exhibition floor space of over 10,000m² is available. For further information about HAMRADIO '76 write to DARC, PO Box 1155, D-3507 Baunatal 1, FR of Germany.

New PO earth station

The first phase of the project for a new satellite earth station near Madley in Herefordshire will commence in the near future. Initially one aerial will be built and equipped but planning is for an eventual six aerials. The first aerial will go into service in 1978 working with a satellite over the Indian Ocean. The search for a site has been going on for some time and Madley is an electrically quiet area with ground stable enough to carry buildings and aerials. Marconi Communications Systems have been invited to tender as main contractor for the provision of the first earth terminal which will have a 120ft high dish.

"Keeping track of Oscar"

The booklet containing the series of articles on tracking Oscar by Bill Browning, G2AOX, has been reprinted and copies are now available from RSGB Publications (Sales) price 30p including postage.

The information remains relevant to Oscars 6 and 7 and is applicable to any satellite in a sun-synchronous polar orbit.

Midlands luncheon club

It is proposed to form a Midlands members luncheon club. Would all those who would be interested in joining such a club please contact P. A. Miles, 28 Scotch Orchard, Brownsfield Park Estate, Lichfield, Staffs.

RAF radio ex-apprentices' reunion

A reunion of ex-apprentices of Flowerdown, Cranwell and Locking is being arranged for 2/3 March 1976 at No 1 Radio School, RAF Locking, on the occasion of the pass-out ceremony of the currently planned apprentice entries, No 122 entry of technician apprentices.

It is hoped that many ex-apprentices of the three schools will gather together at 1RS for this occasion. All interested personnel are invited to apply for information to: The Project Officer, No 122 Entry Pass Out Ceremony and ex-Apprentice Reunion, RAF Locking, Weston-super-Mare, Avon BS24 7AA.

The National Wireless Museum

The National Wireless Museum is situated at Arreton Manor, Arreton, Nr Newport, Isle of Wight and will be open to visitors from Spring 1976. The old manor already houses a superb collection of dolls, dolls houses and toys—as well as a folk museum of domestic and agricultural by-gones.

The National Wireless Museum has numerous vintage receivers dating back to the first world war and the start of broadcasting in the early 'twenties. The visitor can examine a collection of those very early receivers, the classic crystal sets —requiring a very steady hand, great patience and an element of luck to adjust the cat's whisker to receive station 2LO (the only station). Also of great interest is a very rare pleated paper loudspeaker from France, to complement the early exhibits of valve receivers using bright emitter valves, and the first horn loudspeakers with early headphones. All these gems are over half a century old. Also featured here are some very early 405-line television receivers of the type capable of receiving the first television broadcasts from London in the 'thirties.

The majority of these old sets have been painstakingly renovated by radio amateurs and members of the Radio Amateur Invalid and Bedfast Club.

The National Wireless Museum was until recently situated in South Lincolnshire, but remains under the auspices of the Wireless Preservation Society which is exclusively devoted to the collection, preservation and restoration of electronic, wireless, television and sound equipment for purely cultural, educational and historic purposes. It is a non-profitmaking organization, all work being voluntary and all collectors, organizers and officers are honorary.

The present officers include: president, Mr W. K. E. Geddes, MA, CEng, MIEE, who is in charge of the radio collection at the Science Museum, London; vice-president, Mr F. C. Ward, G2CVV, past-president of the RSGB; chairman, Mr D. Hoult, G4OO, chairman of the Spalding ARS; vice-chairman, Mr W. Carter, G2NJ; secretary and museum curator, Mr D. Byrne, G3KPO, F0BNM, RSGB Council member.

The museum would be grateful for the donation of additional items, and would especially appreciate old wireless books and magazines, catalogues etc to assist in classifying exhibits. All communications to Mr D. Byrne, Alveston Manor, Luccombe Road, Shanklin, IoW. Tel. 0903862586.

University of Sheffield vlf project

The Physics Department, University of Sheffield, is seeking assistance with an experiment connected with its vlf programme, and they would be pleased to hear from any amateurs on the north-west side of Scotland who would be prepared to assist. It would be desirable that they have facilities for 80m ssb. The experiment will be performed during April/May 1976 and would involve only a minimal personal effort from the volunteers.

Anyone interested should contact Alan Strong, G3WXI, QTHR, tel 0742 78555 ext 290 (office), or 074-15-2609 (home).

Rita and Tom Shepherd, G3NOB and G3HPJ, secretary and treasurer respectively of RAIBC, at the Bromsgrove ARC picnic in August 1975. *Photo: G3GBS*

A simple af rtty terminal

by A. GSCHWINDT, HA5WH*

THE use of pll ICs in amateur radio circuits has been on the increase in the last few years. This article describes an rtty terminal based on a pll design.

Basic considerations

A low-cost design was achieved by the introduction of the following simplifications:

(a) Reception of stations with a frequency shift of 170Hz only.

(b) Generation of an afsk signal in one mark-space configuration (mark frequency is higher), the mark-space frequency changing being carried out by the transmitter sideband switch if necessary.

The block schematic diagram of the terminal is shown in Fig 1. The input impedance is 8Ω to match the impedance of the receiver af output stage. In the reception mode a band-pass filter is switched in to reduce the af bandwidth, but if the receiver has a bandwidth less than 500Hz this filter is not necessary.

The heart of the system is a pll ic which demodulates the afsk signals during reception and which generates afsk signals during transmissions, in both cases at approximately 1kHz. The demodulated signal is filtered by an RC network and then amplified by an operational amplifier acting as a comparator. This comparator drives a switching transistor which controls the magnet of the machine.

For visual tuning indication two LEDs are used to indicate the dc output voltage of the post-demodulator amplifier.

During transmission the input of the pll circuit is grounded and its vco is controlled by the machine. Buffer amplifiers are used to interface the transmitter contact and vco input. A closed loop is used to drive the machine during transmission by the transmitted signal and also for control purposes.

The output of the vco is an audio signal with a triangular waveform. A special circuit converts this to a low-distortion sine-wave signal for the transmitter modulator input, with a maximum amplitude of 600mV peak-to-peak. The waveform of the start-stop signals is transient-free due to the analogue modulation of the vco.

Circuit description (Fig 2)

Reception

The input is bridged by a 12Ω resistor to serve as a suitable load for the receiver output stage. This resistor is not required if a loudspeaker or low-impedance headphones are used for audio control.

The af filter on the input has an inductively-coupled band-pass configuration with a bandwidth of about 270Hz. The loaded Qs are adjusted to the correct values by external resistors. The response curve of the filter is given in Fig 3. Of course, any other filter is suitable if it has the required bandwidth. However, the input circuit may need to be modified depending on the filter terminations. The output of the filter can be used to feed an external af amplifier and the filtered audio signal would also be useful for cw reception.

The pll loop is a Signetics NE562B. Its input is protected by two diodes which limit the input voltage to 14V peak-to-peak. The loop filter in the pll ic is connected to pins 13 and 14. The values of the associated components are determined by the data speed received by the terminal.

The free-running frequency of the oscillator is determined by the resistors and capacitor connected between pins 5 and 6. This frequency should be tuned to the centre frequency of the filter in the zero input signal condition.

The demodulated signal appears on pin 9. It is low-pass filtered by a 20kΩ resistor and a 100nF capacitor, and the high dc content of the signal is compensated for by a potential divider connected to the other input of the post-demodulation amplifier. This amplifier has a low-pass characteristic because a feedback capacitor is inserted between its inverting input and output. It gives about 22V peak-to-peak output for 170Hz shift. The start-stop inverter configuration is produced by two potential dividers which are changed by the "normal"/"inverted" switch. The machine relay is controlled by a switching transistor. Its base is energized only at signal levels above +10V, due to the presence of the zener diode, and this arrangement ensures distortion-free control. A switch is used to select the steady start-stop working condition.

The tuning indication is provided by two LEDs driven by a complementary emitter follower. One of them lights if the output voltage of the post-demodulation amplifier is above +15V, the other if it is below about +6V. In practice this

* Budapesti Muszaki Egyetem, Garami erno ter 3, Budapest 11, Hungary.

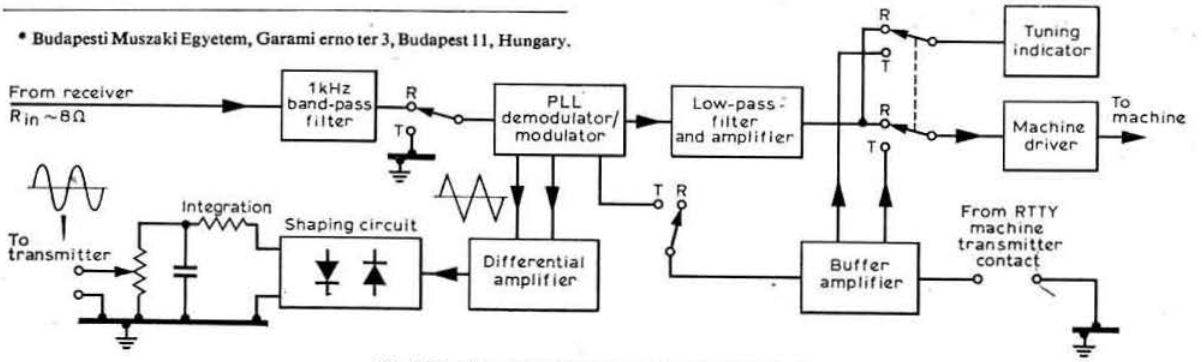

Fig 1 Block schematic diagram of the terminal

circuit makes receiver tuning easy. Any LED is suitable if it draws a current of 40-50mA.

A relay with four contacts for the t/r switches is used because this remote control means that only one pair of wires and one switch are required, for example, on the machine.

The adjustment of the receiver system is best carried out

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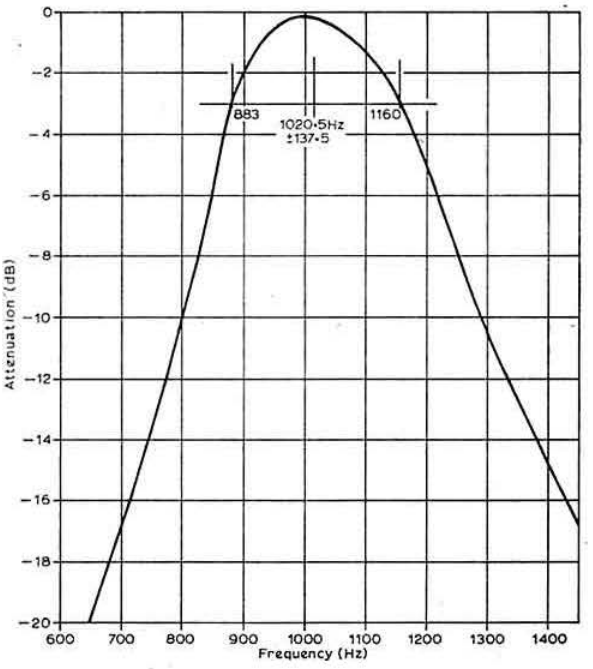

Fig 3. Response curve of the input filter

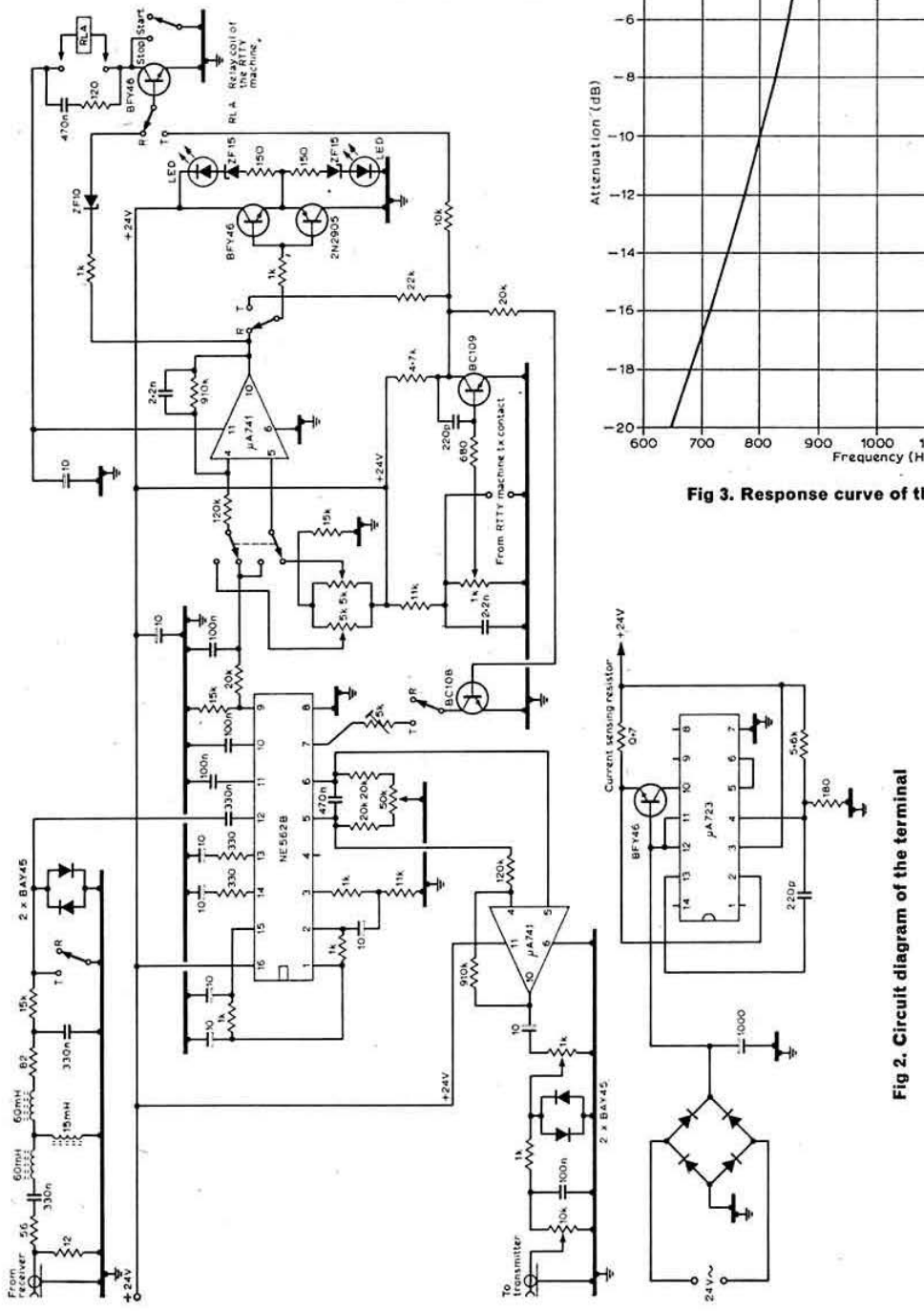

Fig 2. Circuit diagram of the terminal

An experimenter's mast

by L. B. UPHILL, G3UCE*

THE author is currently interested in experimenting with miniature hf beams, and he decided it would be very convenient to have a mast which could easily be raised and lowered for adjustments etc. While working on this idea it was realized that it would be comparatively easy to incorporate a rotation system as well. At this time a 21ft iron scaffold pole fastened to the side of the house was in use and it was decided to use this in spite of its rather heavy weight. Substitution of an alloy pole here would no doubt make the final system even better and easier to use.

Three other items were required, each necessitating a trip to the local blacksmith. The first item was a heavy-duty bracket to fasten on the wall under the eaves (in the author's case the bracket is 17ft above ground). The second item was a wheel (of at least 1ft in diameter) which would slide over the scaffold pole and which would carry one or two turns of a nylon rope round its circumference. It also had to be capable of being fastened to the pole at the same height as the operator's shack window.

The third item needed was a heavy-duty U-bracket with a 1ft length of $\frac{5}{8}$in diameter rod welded to it underneath. This was to be sunk into some concrete to take the weight of the whole assembly and to hold the base secure when lowering the aerial. The author found on his scrap heap two pieces of heavy-duty pipe about 18in long that would just slide over the scaffold pole, and these were used as the bearings for its rotation.

The top bracket (see Fig 1) was quite heavy when finished and required four Rawlbolts ($\frac{3}{8}$in) to hold it to the wall. The dimensions of this bracket had to be such that it would hold the mast far enough off the wall to clear the gutter and also give clearance to the rotating wheel fixed lower down. The bracket end housing the sleeve when the bolt was in place also had to be a good secure fit to prevent rattling in high winds. It would be better for this end to be too large than too small as it can easily be padded to make it a tight fit.

The bottom U-bracket was easily made. The blacksmith made a very heavy-duty job of it in fact by welding three pieces of metal together and then welding on the 1ft piece of $\frac{5}{8}$in rod underneath (see Fig 1). This method of holding the base does enable the rod to twist when lowering the aerial, so as to avoid any obstacles that might be in the way on the ground.

The third item, the wheel, was more of a problem. It had to fit on the scaffold pole and be capable of carrying preferably two strands of nylon rope (washing line) side by side. Two complete turns of the rope round the wheel ensure that rope and wheel are always in contact throughout a complete revolution. This stops any slipping and makes sure that a given movement of the rope inside the shack always leads to the same amount of rotation of the aerial.

The blacksmith actually made the wheel from scratch but it should be possible to obtain a suitable alternative if necessary. The diameter needs to be 10-12in in order to facilitate turning by the weight of a brick or the pull of a strong arm! A bigger wheel would make rotation easier, but it would require more rope and a longer drop space for the brick. The wheel would also have to be further away from the wall for adequate clearance.

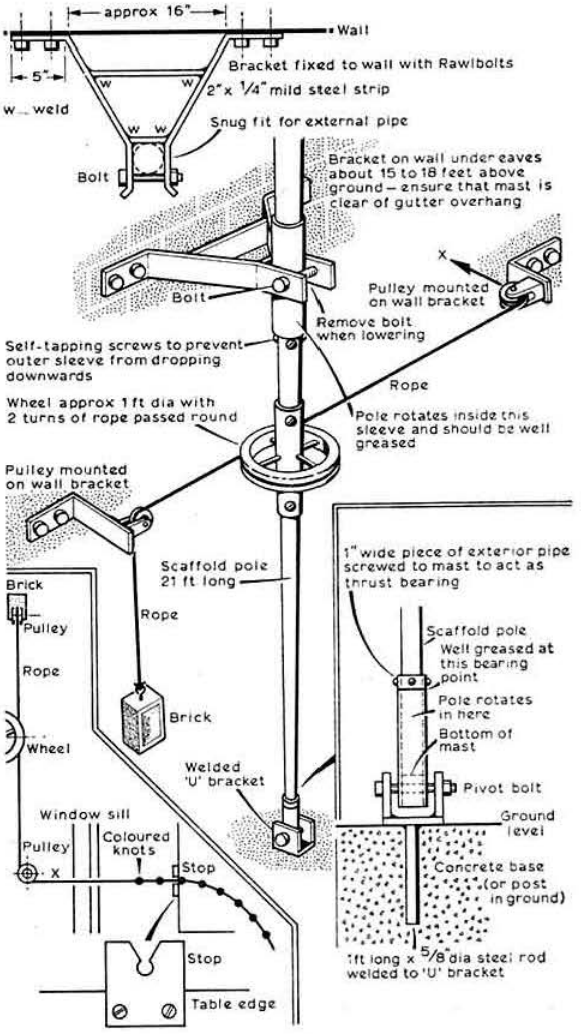

Fig 1. Constructional details

To stop the bottom of the scaffold pole from rubbing on the horizontal bolt a piece of the external sleeving (1in) was cut from one of the sleeves and fastened to the pole with self-tapping screws. This prevented the pole going right to the bottom of the sleeve. The assembly thus became a crude thrust bearing requiring adequate greasing between the two

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rubbing surfaces. The top sleeve, which fits into the bracket and which is held with a 3in bolt, is prevented from sliding down the pole by three self-tapping screws in the pole underneath the sleeve. With proper greasing inside the two sleeves, one brick (to the author's great surprise) was quite sufficient to turn the heavy pole and aerial in the opposite direction. Of course, with roller bearings this could be easier still.

The shack end of the nylon clothes line had knots tied every 2in, any particular knot being held in a plastic V-shaped bracket on the bench: Fig 1. The knots were colour-coded with paint so that, for example, to point the beam due north, the cord is simply pulled until the blue knot can be slipped in the V-bracket, it being held securely by the opposing pull of the brick weight.

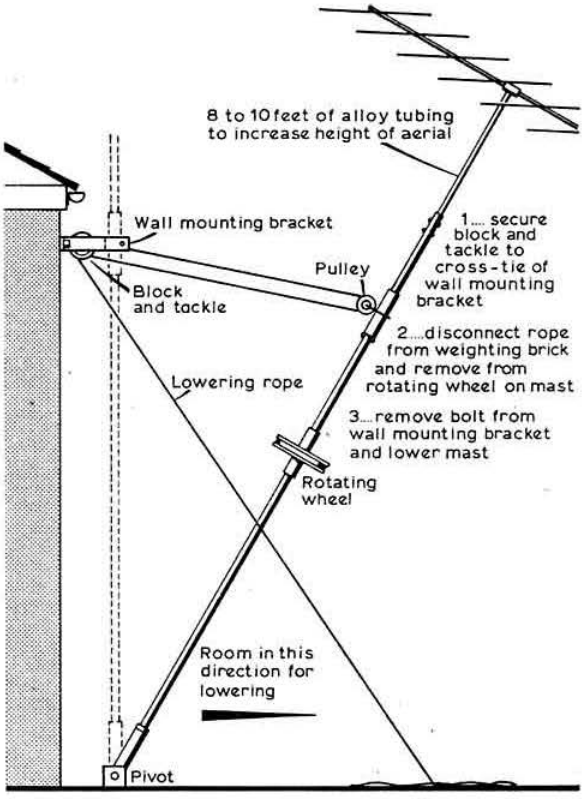

Fig 2. Lowering the mast and aerial

The length of rope to be pulled to turn the wheel through 360° is 38in (circumference = $2\pi r$), and knots at 2in intervals allow 19 possible positions, each giving a 19° variation in aerial bearing. In practice it is easy to pull the aerial quickly round on to a station, swivel either side quickly for maximum signal and then lock it in position with the nearest knot.

Lowering the aerial (Fig 2) means a climb up a ladder to remove the bolt at 17ft above ground, connecting block and tackle, removing brick and rope from the wheel, and lowering down. □

A simple af rtty terminal

Continued from p117

using an audio generator. The af filter is first adjusted and its centre frequency set. The second step is to tune the free-running frequency of the vco to the same frequency under zero input signal conditions. Then the generator is connected to the input, the af signal locked on the vco and the dividers at the input of the post-demodulation amplifier adjusted so as to produce about 22V peak-to-peak at its output when the af generator is tuned 85Hz higher or lower than the centre frequency.

The machine-driver circuit should then be checked. It should be found that the relay in the machine is switched to its previous condition during the crossing of the centre frequency by the af generator output.

Transmission

During transmission the vco is controlled by the contact of the machine relay. The frequency shift can be adjusted by a potentiometer connected to pin 7 of the NE562B. A closed loop on the receiver section of the machine is used to monitor the transmission and the magnet driver transistor is controlled from the buffer stage of the transmitter contact.

Half-triangle waveforms appear between pins 5 and 6 of the NE562B and ground, and the 50kΩ potentiometer is used to adjust their symmetry. The two signals are summed by an operational amplifier so as to obtain a true triangle waveform, and this is then converted into a sine wave by the silicon diode shaper. The 1kΩ potentiometer is adjusted for lowest distortion.

The higher-frequency components of the signal are attenuated by the 1kΩ and 100nF integrating network. Careful adjustment gives an output signal with an amplitude of 200mV and a distortion lower than one per cent. The output level is adjusted by a 10kΩ potentiometer.

The 24V power supply for the terminal was also suitable for a Siemens line printer.

Conclusion

The terminal has been tested using an FT250 transceiver. More than 100 contacts have been made and the unit is still working perfectly.

An audio amplifier ic (SGS TBA810) was added to facilitate tuning because although this operation was quite simple with LEDs, they did require more practice on the part of the operator to learn the correct procedure. □

BOOK REVIEW

"Radio Valve and Semiconductor Data"

The tenth and latest edition of this well-known reference book contains characteristics of more than 1,000 valves and CRTs and some 10,000 transistors, diodes and associated devices. First published in 1949, the book is an invaluable aid when seeking details of the proliferation of semiconductors now existing. The author is A. M. Ball and the book is published by Newnes-Butterworth. Limp bound in A4 size, the cover price is £2 and it will be available shortly from RSGB Publications (Sales) at £2.35 including packing and postage.

Principles and characteristics of FETs

by C. BUDD, A7884*

THE field-effect device was first described in 1952 by W. Shockley, co-inventor of the better known bipolar transistor. Since then, the advantages of the fet over the bipolar device have been recognized and exploited and, while it would be wrong to say that the fet could usurp the bipolar transistor, there are many small-signal applications in which the fet is decidedly superior. The two main advantages of the fet over the bipolar transistor, as will be explained later, are a far greater input resistance and a superior noise performance.

Construction and operation

A schematic view of a fet is shown in Fig 1. The device consists of a block of n-type semiconductor material, known as the channel, into which is diffused a p-type region known as the gate. Ohmic (non-rectifying) connections are made to the ends of the channel and to the gate region. These are known as the source, gate and drain connections. Fig 2 shows a sectional view through the device in the plane of the three connections alongside the most widely-used circuit symbol for the fet.

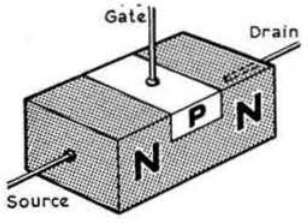

Fig 1. Schematic view of a fet

The n-type channel and the p-type gate region form a pn junction and a depletion layer is naturally formed. If the gate is made negative with respect to the source the gate-channel junction will be reverse-biased and the depletion layer will grow, since a greater voltage will be capable of sweeping away a larger number of charge carriers. The depletion layer will spread into the channel as the gate source voltage is increased until, at a reverse-bias voltage known as the pinch-off voltage (denoted by V_p), the entire width of the channel will be occupied by the depletion region.

Imagine that there is zero gate-source bias (gate and source terminals connected together) and a voltage is applied between the drain and the source so that the drain is made positive. The n-type material of which the channel is composed is of fairly high conductivity and a current of perhaps 15mA (for, say, 10V drain-source voltage) will flow. One might suppose that the channel would act as a simple resistance but this is not the case, as will be explained later.

Now consider the effect of reverse-biasing the gate-channel junction by making the gate-source voltage negative. The depletion layer will expand and restrict the flow of current through the channel. Thus, as the gate-source voltage increases in the negative direction, the drain current decreases. Because the gate-channel junction is reverse-biased it presents a very high resistance to a signal applied between source and gate, and the gate current will be very small, typically a few tens of nanoamps. Therefore a useful current may be controlled by a voltage source from which a negligible current will be drawn. In more practical terms, if the device is used as an amplifier it will have a very high input resistance.

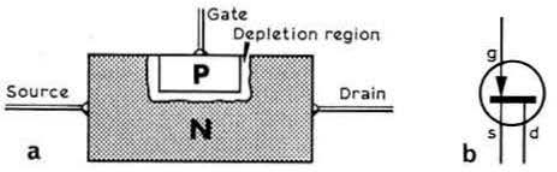

Fig 2. Section through the device of Fig 1, and circuit symbol

Characteristics

Fig 3 shows the relationship between drain-source voltage and drain current for a fet with zero gate-source bias. The drain-source voltage is denoted by V_{ds} and the drain current by I_d. As may be seen from the figure, the drain current is proportional to the applied voltage over a very small range of voltage only (V_{ds} less than 3 or 4V). Beyond this limited range the current levels out to an approximately constant value. The reason for this is that, even with zero gate-source voltage, the depletion region will spread into the channel when drain current flows because the gate-channel junction is reverse-biased by the voltage dropped along the length of the channel between gate and source. Since the gate-source voltage is fixed at zero, greater spreading of the depletion region will occur at the drain end of the channel as shown in Fig 4. Eventually a point is reached beyond which any attempt to increase the current flowing is neutralized by an increase in the size of the depletion region. The net effect is that for drain-source voltages greater than a few volts, the drain current is approximately constant. The saturation value of drain current, with zero gate-source voltage, is denoted by I_{dss}. A more detailed analysis will show that the drain current is approximately constant for values of V_{ds} beyond the pinch-off voltage (referred to earlier) which may be 3 or 4V.

As might be expected, the effect of a negative gate-source voltage is to decrease the "saturation" value of I_d. This

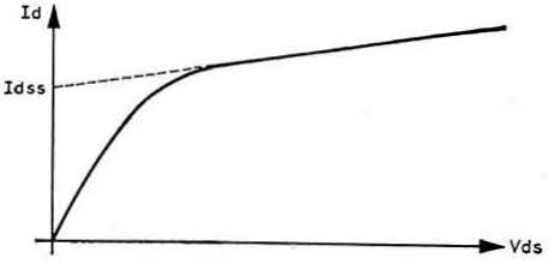

Fig 3. Graph of V_{ds} against I_d

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saturation effect should not be confused with saturation in bipolar transistors, which is completely different in both cause and effect. Fig 6 shows the relationship between V_{gs} and I_d for a fixed value of V_{ds} greater than V_p. As may be seen, the rate of decrease of I_d with V_{gs} is approximately constant for values of V_{gs} less than V_p. This rate of change is denoted by g_m and is called the mutual conductance of the device. Because g_m does vary slightly with V_{gs}, data sheets usually quote g_{mo}, the value of g_m with $V_{gs} = 0$.

Several points must now be made clear. First, there are no objections in principle to making the drain of a fet negative with respect to the source, so that the drain current is made to flow in the opposite direction to that in which we have so far assumed it to flow. However, it is simpler to call one terminal the source and the other the drain, and assume the charge carriers to leave the former and travel to the latter, than to regard the two as interchangeable. Second, the gate is always held more negative than the source, for the obvious reason that if the gate-channel junction were to become forward-biased a fairly large current would flow in the gate terminal, the input resistance would drop and serious distortion of an amplified signal would occur. The third point that should be made is that the region of Fig 3 in which the drain current is constant is often referred to as the pinch-off region, although, strictly speaking, pinch-off occurs only when the channel is completely blocked by the depletion region and the drain current is zero.

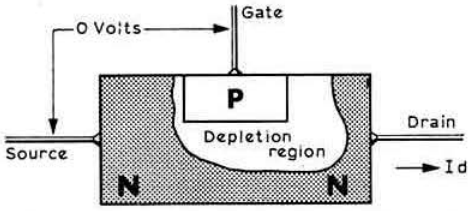

Fig 4. When drain current is flowing, the depletion region will spread into the channel even at zero gate source voltage

The fet, then, is a device in which a very small current (the gate current) controls a much larger one (the drain current). In other words, the device has current gain and may be used as an amplifier. There are two types of fet: the most common is the junction fet which has been described here, but there is also a device known as the mosfet in which a metal gate is insulated from the channel by a very thin layer of insulating material. But there are further complications, for there are two types of junction fet. There is the n-channel device, described here and so named for obvious reasons, and there is the complementary p-channel device in which the channel is composed of p-type material and the polarities of the applied voltages are reversed.

At present, p-channel devices are about twice as expensive as n-channel devices of comparable performance.

Applications

It is painfully evident from the manufacturer's data sheet for any typical fet that the possible spread in characteristics between individual specimens of a particular device can be very large. Indeed, the only difference between an expensive device and a cheap one will often be that the expensive one has a smaller guaranteed spread of characteristics. It has already been said that a fet used as an amplifier will generally

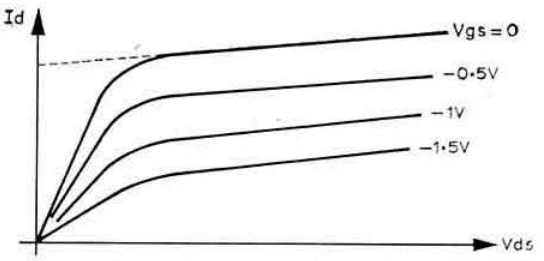

Fig 5. Graph of V_{ds} against I_d for negative values of V_{gs}

have a much larger input resistance than a bipolar transistor. The other great advantage of the fet is that it generates less noise than the bipolar transistor. The reason for this is that the operation of the fet relies on the control of majority carrier flow in the channel, whereas the bipolar transistor relies on the injection of minority carriers into the base region.

In the fet, the controlled current flows along a long, thin channel of semiconductor material, while in the bipolar transistor it flows across a short, broad base region. For this reason it is not convenient to produce FETs that can conduct as much current, and therefore handle as much power, as a bipolar power transistor. This limits the fet to small-signal applications and means that the bipolar transistor still reigns supreme in the realm of power amplifier stages.

With these advantages and disadvantages in mind, let us consider to what use we can put FETs. The most obvious application is a small-signal amplifier with a high input impedance, for example as a preamplifier for a crystal microphone or a ceramic pickup. The biasing method employed for FETs is, as a rule, similar to that employed for valves. For normal operation, the gate must be made more negative than the source and the gate-source voltage must bias the device to a linear part of the $V_{gs} - I_d$ curve (such as point P in Fig 6). Clearly it would be inconvenient to connect the source to ground and have a negative supply line of just a few volts, in addition to the positive supply line of perhaps 12V, simply to satisfy the bias requirements of the one device. What is normally done is to connect the gate to ground through a very large resistance (there will be zero voltage drop across this resistance, since the gate current is negligible) and make the source the requisite number of volts positive with respect to ground. The way this is done is illustrated in Fig 7, which is the circuit of a small-signal fet amplifier. The source current of several milliamps flowing through R_S results in a voltage drop which makes the source positive with respect to earth.

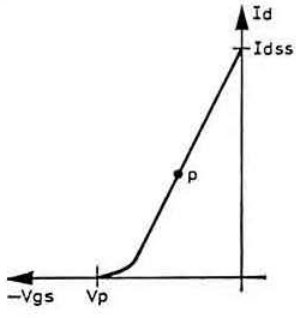

Fig 6. Graph of V_{gs} against I_d for constant V_{ds} greater than V_p

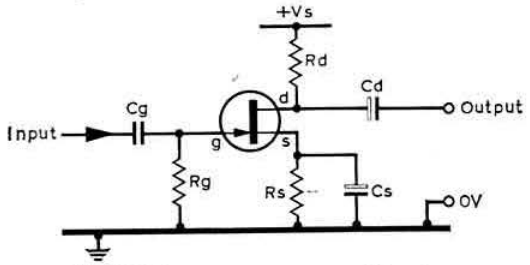

Fig 7. FET common source amplifier stage

There are two good points about this method of biasing (apart from its simplicity). First, if the source current were to rise or fall unintentionally because of a change in temperature, for example, the consequent change of source voltage will be of the correct polarity to restore the status quo by increasing the bias voltage. The circuit is to a certain extent, therefore, self-stabilizing. Second, the input is at ground potential, if we ignore C_g, which is an advantage in some applications. R_d in Fig 7 is adjusted so that the voltage of the drain is approximately midway between that of the source and the supply voltage, thus giving the stage the maximum possible output voltage swing.

The stabilizing action of the source resistor, properly considered, is a form of negative feedback. The purpose of the capacitor in parallel with the source resistor is to ground the source from the point of view of signals so that negative feedback at signal frequencies, which would reduce the gain of the stage, cannot occur. C_g and C_d serve simply as dc blocking capacitors. The configuration in Fig 7 is known as the common source configuration, since both the output and the input are connected, through C_s, to the source. As one might guess, there also exist a common gate configuration and a source follower. The circuit configuration of Fig 7 may be used successfully at audio frequencies, but will be almost useless at rf because of the Miller effect. This limitation may be overcome by using a cascode configuration (as with valves), by using a dual-gate mosfet or by neutralizing the drain-gate capacitance.

Returning to the circuit of Fig 7, if we call the drain current I_d and the supply voltage V_s we have:

$$R_s = \frac{I_{dss} - I_d}{g_{mo}\, I_d} \text{ and } R_d = \frac{V_s}{2I_d}$$

Voltage gain $= g_{mo}\, R_d$. Output resistance $= R_d$.

Typically, the drain current would be between 1 and 5mA and the gate resistor R_g would be of the order of 1MΩ. The foregoing assumes that the decrease in drain current is proportional to the gate-source bias, in other words that the mutual conductance is constant. In fact this is not exactly the case, although the above formulas are sufficiently accurate for most practical applications.

In the fet, the current flowing along the channel at a particular drain-source voltage is controlled by the gate-source bias. In this sense, the fet can be regarded as a voltage-controlled variable resistance, the "resistance" of the channel being controlled by the voltage applied between gate and source. Of course some care is needed when speaking of the "resistance" of the channel because, as we have seen, the relationship between drain current and drain-source voltage is non-linear. Thus, a fet may be used, for example, as a high-speed switch or as a means of controlling the gain of an amplifier in a speech compressor. Because the reverse-biased gate-channel junction represents a very high resistance, the fet will draw very little current from the controlling signal.

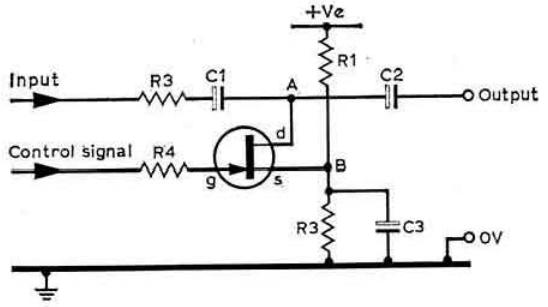

Fig 8. A fet used as a voltage-controlled attenuator

A typical practical arrangement is shown in Fig 8. The values of R1 and R2 are arranged so that when the control voltage is at ground the channel is just pinched off and the effective resistance between points A and B is infinite. By increasing the control voltage the reverse bias is made less and less and the effective resistance between A and B is decreased. Therefore, the attenuation of the circuit is controlled by a small voltage applied to the gate and we have a fast-acting variable attenuator with no moving parts. Because the channel behaves non-linearly, some care must be taken in using a fet as a voltage-controlled resistance to ensure that the controlled signal does not suffer distortion.

Conclusions

That, then, is the field-effect transistor. This is intended merely as an introductory article, and more detailed information can be obtained elsewhere. We have said very little about the insulated-gate MOSFETS which are even more versatile than the junction devices and even nearer in circuit design terms to the valve. The fet should not be considered as an opponent to the bipolar transistor, but rather as a complementary device with many advantages not possessed by the bipolar transistor, though lacking some of the good points of the earlier device.

NEW PRODUCT

Cushcraft CX-1000 28MHz aerial

The Cushcraft CX-1000 is a vertical telescopic aerial fed with 52Ω coaxial cable which offers one possible solution to those unable for space reasons to erect a beam or crossed dipoles for reception of the 29MHz Oscar 6 and 7 downlink. The aerial is suitable for mounting on a 1⅜in-diameter mast and is said to be tunable from 28 to above 30MHz. Present basic price (plus VAT) is £22.20. Further information can be obtained from South Midlands Communications Ltd, Osborne Road, Totton, Southampton SO4 4DN. Tel 4930/2785.

microwaves

Dain Evans, G3RPE*

Microwave round table

The fifth microwave round table will be held on 15 February at the IBA Engineering Headquarters, Crawley Court, which is five miles NW of Winchester and about a mile off the A272. The main topic will be the "in-between" bands, 2·3, 3·4 and 5·7GHz. Contributions of design information and of equipment for display will be welcome.

A simplified 10GHz Gunn oscillator

Three of the Gunn oscillators described in the review article in the May 1974 issue of *Radio Communication* (p 288), the G8APP design, that due to G3WJG, and the modified G8APP/G3WJG version, were all based on the same design concept. The writer has had direct experience of about a dozen oscillators of this type, mainly the third, and all have worked most reliably. They also have the advantage that little setting up is required, the tuning range can be changed fairly easily, and the degree of coupling between the oscillator and the external circuitry can readily be adjusted to alter the balance between output power and oscillator stability.

The design shown in Fig 1 is a fourth version which is also due to G8APP. It is intended for low-power Gunn diodes dissipating about 1W and generating 5-20mW of rf: more powerful diodes would require a better heat sink. Its main feature is the simplified dc decoupling arrangement. The dc feed is decoupled within the waveguide by the small capacitor formed between the end face of the diode pillar and the inside wall of the guide. The dielectric used in this position must be mechanically strong: ptfe, mica and Melinex (which is sometimes used for covering books) are all suitable. The feed is also decoupled by the capacitor formed between the top disc and the outside face of the waveguide. The radius of this disc is made $\lambda/4$ at the oscillator frequency so that the impedance to rf at its outer edge appears very high. Its physical radius is $\lambda/4\sqrt{\mu}$ where μ is the dielectric constant of the insulation. The mechanical stress on this insulation is low and materials such as polythene or Sellotape can be used. This method of decoupling has proved in practice to be as effective as more complicated systems.

In constructing the cavity, it is better to drill the $\frac{3}{32}$in hole centrally through both top and bottom walls of the guide to ensure accurate alignment, and then to open out the lower hole to take the 2BA thread. It is important that the $\frac{1}{16}$in hole in the 2BA screw which takes one end of the diode should be exactly central otherwise the diode may be sheared as the screw is rotated. Care should be taken to remove burrs, especially from the areas in contact with the diode and the insulation. The rf short is preferably made a tight sliding fit in the guide otherwise it must be bolted in place after adjustment. The iris plate, and the spacer plate if fitted, should be flat in order to maintain the Q of the cavity: these plates are best *sawn* from sheet rather than cut by tinsmith's shears.

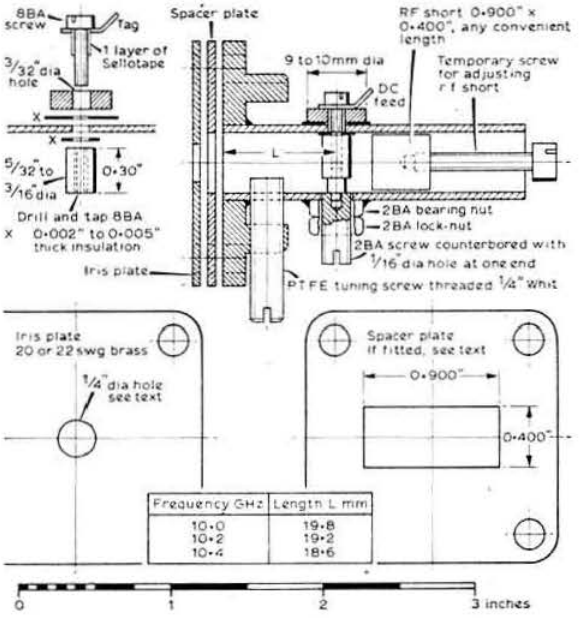

Fig 1. Construction of the Gunn oscillator

The frequency of oscillation is set mainly by the distance between the Gunn diode and the iris plate. This length is close to $\lambda_g/2$ at the frequency, and these data are given in the figure. If the frequency is too low it can be raised by grinding back the face of the flange using emery paper on a rigid base: if too high, a spacer plate can be fitted between the flange of the oscillator and the iris plate. In both cases the shift in frequency is about 300MHz/mm.

The oscillator is fine tuned by the ptfe screw, a method which appears to be most reliable. With a $\frac{1}{4}$in Whitworth thread (approximately 6mm diameter, 1·2mm pitch), the tuning rate is about 100MHz/turn, which is ideal when a slow-motion drive is used. Smaller or finer threads will give a proportionately lower tuning rate. Except when the screw just enters the waveguide or approaches the further wall, the tuning rate is reasonably linear—in the writer's case for over 600MHz. Nylon or Perspex screws may be used but the minimum should enter the cavity as these materials are rather lossy.

The oscillator is set up by spacing the rf short a few millimetres from the diode pillar and applying about 7V from a suitable supply (for example, see *Microwaves*, April 1974, p 240). The applied voltage is increased, typically up to 12V maximum, until rf is generated and the oscillator will tune and re-start reliably. The position of the short can then be optimized. Slightly more power may be obtained with the short spaced a further $\lambda_g/2$, ie 20mm, from the diode pillar.

The diameter of the iris is a compromise. Usually, if its size is increased more power will be obtained, although the stability of the oscillator may suffer. If a relatively potent oscillator is to be used for a local oscillator of a receiver it may be possible to reduce the size of the iris, which could well improve the stability of the oscillator as well as extend its tuning range. □

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technical topics

Pat Hawker, G3VA

TRY as I may, there just seems no particular pattern or connecting links between this month's items on which to base any penetrating introductory remarks. So, pausing only to hope that among them you will find something of interest or practical use, I get straight down to business.

Low noise crystal oscillator

The importance of achieving high spectral purity (ie low-noise sidebands and low-harmonic output) in oscillators, particularly those used for frequency synthesizers or for frequency conversion (to avoid reciprocal mixing) has been mentioned many times in *TT* and is now well recognized as an important consideration in modern equipment design.

In this connection, Gian Moda, I2SWX, draws attention to another idea from the fertile brain of Ulrich Rohde, DJ2LR/W2, as published in *Electronic Design*, 21, 11 October 1975. This is a crystal oscillator arrangement in which the crystal not only forms the frequency-control device but also a low-pass filter to band-limit the noise output and suppress harmonics, without any substantial sacrifice of stability but at fairly low output: Fig 1.

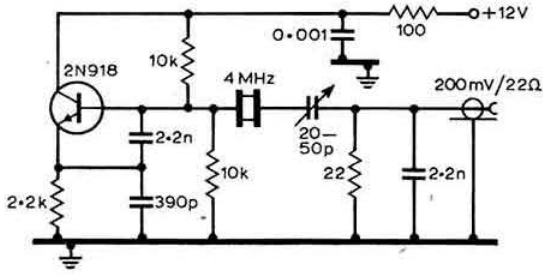


Fig 1. Low-noise and low-harmonic output is claimed by DJ2LR for this crystal oscillator in which the crystal not only acts as the frequency controlling element but also forms a low-pass filter. High spectral purity is particularly important for such applications as the master oscillator of a frequency synthesizer or for reducing reciprocal mixing in high performance receivers

DJ2LR points out that conventional crystal oscillators, despite the high Q of the crystal, are still very noisy and produce many spurious signals, mainly because of the large-signal characteristics of the transistor in the circuit. The arrangement of Fig 1 is claimed to provide two significant advantages. First, the noise bandwidth is limited to less than 100Hz; secondly all higher harmonics are substantially suppressed (for example 60dB down for the third harmonic of a 4MHz fundamental). He provides a photograph of the output on a sweep-frequency analyzer which shows that the circuit is capable of an impressive degree of spectral purity.

Portable helical-mode hf aerial

Recently (*TT* November 1975) a design stemming from PA0TBE was presented of a 144MHz "HB9CV" beam based on a number of tubular elements that can be readily dismantled and then "almost fits a briefcase". One of those who have since made up this design and found it very satisfactory is Bill Scarr, G2WS.

This month we reproduce an hf design by J. Seakins, ZL1BDY (*Break-in* September 1975) which is similarly capable of being carried in a briefcase, yet when put together provides an effective low-cost vertical for 3·5MHz and other bands, using the well-established principle of a short helical-mode whip. Work previously reported on this type of aerial for vhf suggests that the effective radiation can approach to within 5 or 6dB of a full-size quarter-wave vertical provided that a really good earth is used.

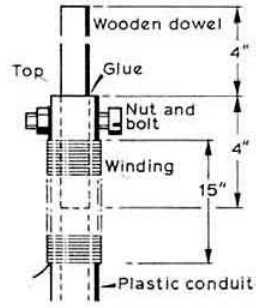


Fig 2. One section of ZL1BDY's portable hf helical-mode aerial wound on short sections of ¾in electrician's plastic conduit which can be readily assembled by means of the dowel joints

The aerial is wound on a series of five 16in lengths of ¾in plastic conduit as used by electricians: Figs 2 and 3. Into one end of each length of tubing is inserted an 8in length of wooden dowel, glued into position with 4in lengths protruding, and with a hole drilled for a nut and bolt to strengthen the joint and to provide tie points or terminals for one end of each winding. The top section has only a 4in length of dowelling, mounted flush with the top, and to this is mounted a standard 3ft telescopic whip aerial to provide fine tuning. Finally each section is finished with a covering of plastic tape.

Then to assemble, the top section is pushed on to the dowel of the next section and the lead from the bottom of the winding attached to the nut and bolt, and so on until the aerial is complete, representing for 3·5MHz an overall length of 6ft 3in of conduit plus the 3ft telescopic whip. Weight is about 2lb.

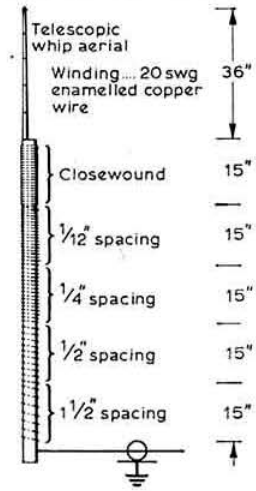


Fig 3. The assembled 3·5 MHz helical-mode quarter-wave aerial consisting of five 15in sections of conduit plus a 3ft telescopic whip section for fine tuning. Note that the aerial must be used with the *best-possible* earth connection

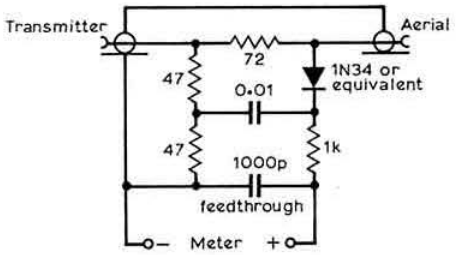


Fig 4. Resistance-type swr bridge suitable for adjusting a ZL1BDY or other aerials when required for low-power operation. The external multimeter should have a sensitivity of at least 1,000 Ω/V with an fsd range of 5 to 10V. Full details of this type of swr meter appeared in *The Radio Amateur's Handbook*, circa 1961

ZL1BDY points out that it may often be required to operate such an aerial at low power for portable work and in such circumstances a conventional coaxial swr bridge is likely to prove too insensitive and he therefore uses a resistance bridge unit (former *ARRL Handbook* design) constructed in a wedding cake tin: Fig 4.

Then, to tune the aerial, mount the bridge in the feeder, attach any pocket multimeter to the meter terminals, and with the transmitter on the desired operating frequency adjust the whip section for minimum meter reading. Finally, as ZL1BDY puts it, "remove the bridge from the feeder and begin the serious job of working the dx".

Grey-line or twilight boundary dx

In the January 1973 *TT* reference was made to the large increases in hf signal strength in the antipodes which occurs on European signals just before local sunrise, and attention was drawn to the value of the "twilight girdle" when seeking dx contacts, particularly on 3·5MHz. The value of this approach had been strikingly shown by Norman O'Brien, G3LP, and we were able to provide twilight boundary maps and a local time of sunset chart (both since reproduced in *Amateur Radio Techniques*). Subsequently I found that another useful chart appears in the large *The Times Atlas of the World* (1972 Edn) pXXXIII which can often be found in local libraries. This provides time of sunrise and sunset for any location throughout the year.

John Bazley, G3HCT, has recently drawn attention to an article in *CQ* (September 1975) by Dale Hope, K6UA, and Peter Dalton, W6NLZ, which draws further attention to the twilight boundary or, as they call it, the "grey-line" method of dxing on 3·5MHz "without a giant antenna or loss of sleep". This again emphasizes the value of simultaneous sunrise and sunset locations with signals travelling along the great circle route which represents the edge of the band of twilight during a period of roughly ±30min from sunrise and ±30min from sunset. The authors show that with a globe, a cut-out piece of cardboard and a grey-line table of angles/dates it is possible to ascertain the likely twilight dx areas.

However, John Bazley, after attempting for quite some time to cut exactly the right-size hole in his piece of cardboard, realized that there was a far simpler way of solving the problem. This is to use a great circle map centred on the UK (or wherever you operate from) and just place a straight edge through the centre within the 23° segments (using the appropriate angle for the date) and one can then immediately

Abridged grey-line table

More detailed information is provided in *CQ* September 1975 or from tables showing the latitude at which the sun is directly overhead, etc.

1 Jan	23° S	26 Mar	1° N	3 Jul	22° N	26 Sep	1° S
21 Jan	20° S	3 Apr	4° N	28 Jul	18° N	4 Oct	4° S
8 Feb	15° S	16 Apr	9° N	12 Aug	14° N	17 Oct	9° S
18 Feb	12° S	25 Apr	12° N	22 Aug	11° N	25 Oct	12° S
26 Feb	9° S	1 May	14° N	31 Aug	8° N	1 Nov	15° S
3 Mar	7° S	12 May	17° N	5 Sep	6° N	10 Nov	17° S
11 Mar	4° S	26 May	20° N	13 Sep	3° N	27 Nov	21° S
23 Mar	0°	21 Jun	23° N	23 Sep	0°	23 Dec	23° S

Sunrise and sunset represents the same angle but with a reversal of north and south.

read off the twilight boundary. If you are in any doubt as to which way to select the angle, it may be found useful to refer to the small maps in the 1973 *TT* or *ART5*.

In using twilight techniques it should be appreciated that a useful degree of tolerance is involved so that very precise times and angles are not crucial to success. It is perhaps worth recalling that the most famous amateur contacts from the UK—when in October 1924 British and New Zealand amateurs broke all records in becoming the first truly to "girdle the world"—were made along what was virtually a twilight path. These contacts came about not, as is often supposed, by chance but as the result of planning based on the realisation that because of the 12h time difference and the already observed peaking of dx signals at sunrise and sunset, a particularly promising path exists between the UK and parts of New Zealand during the latter part of October.

Component lead shaper

With early radios now often "collectors' items", highest regard usually goes to those 'twenties models where every wire seemed to be set out in precise right-angles and extremely heavy wire. On the principle that if you wait long enough fashion will surely repeat itself, a modern requirement in equipment construction is once again to bend component leads into neat right-angles, this time so that they can fit through the holes in printed circuit boards with sergeant-major precision.

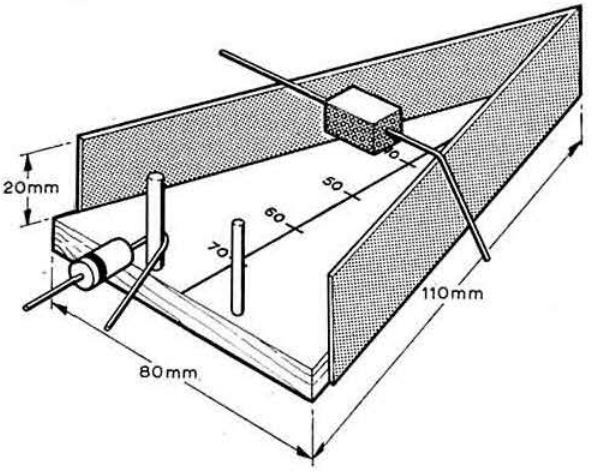


Fig 5. Simple jig for shaping component leads before fitting to printed-circuit boards. Dimensions in millimetres

In *Break-in* (October 1975) "K.L." describes a simple jig that helps shape leads for insertion in PCBs to produce a professional looking job. He reports it as proving the simplest and most useful of several methods tried; dimensions are given only as a guide and the side pieces can be made of aluminium, Formica or almost any strong material. The base is made of thick wood (eg 10 or 12mm thick) and numbers on the centre line correspond to the distance in millimetres between the holes in the pcb. In use the component is simply placed across the diverging sides at the right distance apart and then the leads bent down over the sides.

Leads of components to be mounted vertically can be formed around the "pillars" shown at the base of the triangle; these can be nails cut off to suitable length and using different sizes to provide a choice of loop radius.

All very simple—but then the simplest ideas are often the most useful.

Mobile explosion hazards?

For many years it has been recognized that the operation of a radio transmitter in areas where blasting operations are being carried out represents some degree of hazard owing to the possibility of small electrical sparks; similarly that this can, under special circumstances, cause explosions due to the ignition of a flammable gas mixture. But until recently there has been little qualitative guidance that would allow an amateur to assess whether such risks are largely theoretical or whether they demand to be taken seriously.

As a result of a suggestion by R. J. Redding, G3VMR, I have had a chance to read two papers presented recently to IEE and IERE conferences following experimental work carried out at the Postgraduate School of Electrical and Electronic Engineering, University of Bradford: "The possibility of ignition in flammable atmospheres due to mobile radio transmitters" and "The ignition hazard due to radio radiation from radio transmitters" both by G. H. Butcher, P. S. Excell and D. P. Howson.

These papers explain that, in effect, ignition of explosive mixtures can be due to any sparks which may be produced by natural wires or metallic structures forming resonant aerials; that this is most likely to occur at frequencies from 3MHz upwards; and that as frequency increases there will be a tendency for any sparks to be maintained over a longer period, reducing the power needed for ignition to occur.

The following are among the conclusions of these two papers, from which it will be seen that particular stress is placed on the fact that amateur mobile transmitters may occasionally be operated at relatively high power compared to commercial vhf two-way communications (surprisingly no mention is made of military hf equipment which can similarly use high power); the authors further stress the absolute importance of never operating a transmitter while a car is being refuelled.

To quote the Bradford team directly:

"Low-power fixed transmitters (eg Post Office microwave links) can be disregarded as a hazard source since their aerials are invariably located well above ground and the power flux density will be harmless at any reasonably approachable point. Mobile transmitters, however, raise special problems owing to their unpredictable location. In general it can be said that commercial vehicle-mounted vhf transmitters (25W maximum permitted radiated power in the UK) create no more hazard than the ignition system of the vehicle itself. Hand-portable transmitters usually do not radiate more than 1W and present no hazard (although we recommend that the aerial be insulated as a precaution against direct arcing); higher-powered manpack sets should be regarded with circumspection in any hazardous environment. Amateurs are permitted to operate transmitters radiating up to 400W p.e.p., and these may be fixed or vehicle-mounted. Although the hazard represented is probably small, we do feel that proximity to explosion-hazarded installations should be taken into account when granting licences for fixed amateur stations, and that a lower maximum power should be stipulated for vehicle-borne amateur transmitters.

"An additional hazard with mobile transmitters which we have discovered in practical tests concerns the fuelling of a vehicle containing an operating transmitter, or parked close to another vehicle containing one. With hf mobile transmitters there is a substantial ground return current which is coupled normally through the vehicle-ground capacitance. If, however, a metallic route for this is provided (and all petrol pump nozzles are required to be bonded to ground to eliminate electrostatic hazards) a spark can be drawn, the probability being that this will occur at the most hazardous point, viz between the fuel nozzle and the tank inlet.

"Existing injunctions not to operate a transmitter while fuelling a vehicle containing it need to be strengthened: transmitters should not be operated anywhere within fuelling stations. Possibly electro-mechanical interlocks could be applied to advantage here.

"Plant engineers who deal with flammable atmospheres should be made aware of the potential hazards of mobile transmitters and due account taken of the proximity of nearby roads.

"There is a case for restricting the power of vehicle-borne amateur transmitters to a lower level."

These views, of course, will not be welcomed by amateurs with high-power mobile rigs who can point to a good safety record over many years; however, they clearly deserve to be taken seriously. Of course with high-power hf mobile the radiation efficiency of aerials on the lower frequencies is usually very low, thus reducing the local power flux. On the other hand the effective radiated power from an hf or vhf beam, particularly for fixed stations, may represent much more than 0·4kW erp. But the danger of operating *any* transmitter in or near the forecourt of a garage seems important and sensible safety precautions essential.

Field strength near transmitters

A question that arises not only in estimating possible radiation hazards but also in dealing with tvi and more particularly afi (audio-frequency interference) is the manner in which the field strength of an amateur transmitter varies with distance in the immediate vicinity of the aerial. Many estimates tend to rely on classic propagation formulas which generally assume a "point-source" of radiation. While such formulas may be entirely satisfactory when calculating the far field, Barry Priestley, G3JGO, is concerned that they may seriously mislead an amateur wishing to estimate local field strengths. He writes:

"It does not seem to be widely appreciated that the field strength does not continue to increase with decreasing distance in the manner suggested by the far field formula—in fact such formulas postulate an infinite field at zero distance which would be interesting to see! In practice there is a distance within which the increase in field strength is halted: Fig 6 is simplified from *Microwave Engineers Handbook* and

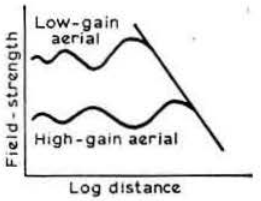


Fig 6. Simplified diagram showing how field strength varies with distance in the vicinity of a transmitter, showing the difference between low and high gain aerials

this shows that the threshold distance is greater for a high gain aerial than for a low gain aerial. This suggests that when dealing with a case of afi there may be considerable advantage in running a high-gain aerial and relatively low power since the near field is reduced and the far field is confined to the main beam rather than all the way round, as in the case of a dipole or halo."

At hf where elements are much longer, near field strength is recognized as being a misleading measure of the far field radiation and a number of writers have drawn attention to the errors that may arise from attempting to determine gain and radiation patterns on the basis of local ground-wave radiation.

Better "all-wave" receivers

From the mid-'thirties to about the mid-'fifties, a feature of consumer domestic radio was the so-called "all-wave" receiver which in practice usually meant including a waveband of about 18–50m in an otherwise standard circuit—and then printing on the dial exotic names of distant short-wave stations that few owners ever succeeded in tuning in. With a few exceptions, these sets gave limited performance on hf due to lack of bandspread, image reception virtually as strong as that of the true signal, oscillator drift and ineffective agc. Perhaps the most memorable feature of such designs was that they did fairly often succeed in introducing their owners to 7MHz phone transmissions and through this to amateur radio. Serious interest in hf reception has always in the past tended to be restricted to the enthusiasts or to overseas markets where expatriate listeners were prepared to learn the peculiarities of "short waves" and to demand rather better designs than those marketed in the UK.

For the past 20 years or so virtually no consistent attempt has been made in the UK to interest the average listener in hf reception and the handful of specialized designs for the enthusiasts (eg Barlow Wadley, Braun, Grundig, Zenith etc) have tended to become pretty high-priced. It is not surprising that sometimes hf broadcasting seems to have become largely a question of governments talking to the monitoring posts of other governments!

But, of late, in one country "short waves" have been booming. Just as Japan now has far more amateurs than any other country, so in the last year or so there has developed there an impressive taste for hf listening (a good pointer is the vastly increased number of letters being received at Bush House from Japan).

This has meant that some ingenious new designs for mf/hf/vhf broadcast receivers have been developed, and some of these now give broadcast listeners many of the facilities of a reasonably good communications receiver without adding all that much to the cost.

A description of a new Sony receiver, intended to sell in the United States for less than $100, is given in *Electronics* (27 November 1975). For hf this becomes a double-superhet with both a general coverage hf oscillator and a second oscillator providing bandspread tuning over ±150kHz. The first i.f. uses the 300kHz bandpass of the 10·7MHz vhf/fm i.f. strip, and the signal is then converted down to 455kHz using the variable second oscillator. By including a crystal calibrator having 0·25MHz markers, the receiver, despite its fairly normal broadcast dial, can be set to within about 2–3kHz of any required frequency on any of the three wide-coverage hf bands extending up to about 28MHz—the main dial calibration having to be sufficiently accurate only to distinguish the correct 0·25MHz marker. The first hf mixer is a double-balanced mixer, with up-conversion on the lower frequency bands; an input attenuator ("dx-local" switch) minimizes overloading the front-end with extremely strong signals; a product detector and bfo is included. It is not known whether the stability of the oscillators is really good enough for ssb reception, but clearly many of the features are not those found in the usual "all-wave" broadcast receiver.

The ingenuity of the designer has, it would seem, been to provide within the framework of a conventional a.m./fm portable receiver many of the facilities expected of a general coverage communications receiver without letting the cost go through the roof. And many of these design features, such as the use of 10·7MHz "bandpass" i.f. transformers and the two variable oscillators, could be used by home-constructors.

AGC in receivers and transceivers

The December *TT* contained some comments from Jan Martin Noeding, LA8AK (ex-G5BFV), on the effect of agc arrangements on the intermodulation performance of communication receivers. But this dealt with only one aspect of this subject and LA8AK feels that in many transceivers and receivers relatively little attention has been paid to the design of good agc. He has studied the agc circuits of some dozens of equipments and is convinced that generally the attack time is too long, causing the demodulation system to overload at the onset of transmission. A very simple solution, he suggests, is to be found in the design of a number of Drake equipments, where a resistor of between 10–33kΩ is added in series with the time-constant capacitor.

He has tried this technique in several receivers and found it to have a beneficial effect on the sound quality of speech; another benefit is that the vox circuit is less likely to trigger on received signals; antivox controls may be much easier to adjust or their use abandoned.

LA8AK indicates that this technique has been applied also to some alc circuits, resulting in more punch in the transmitted signal and the reduction of distortion in the power amplifier.

A simplified form of the Drake-type agc circuit using a BC108 has been tried in two receivers, making it easy to obtain only a 2dB change in audio level for about 100–110dB change in rf input; having about −20V on the emitter there is no need for more than about two gain-controlled valve stages; indeed as a 2dB output change is much better than is needed in practice it becomes possible to waste some of the control range in delaying the agc to the rf amplifier. In the Drake 2B and Trio TS500 (maximum sensitivity) a 2V delay will make the rf amplifier controlled for input levels just above 0dB μV.

With such arrangements LA8AK suggests that the rf gain control hardly seems necessary! He has tried hang-agc systems such as those based on the SL620/21 but considers these can be awkward to use since they can result in the loss of weak signals when tuning over the band.

4-2-70

Martin Dann, G3NHE*

FM channel

In November 1974 we commented on a booklet called *The International VHF-FM Guide*, compiled and produced by Julian Baldwin, G3UHK, and Kris Partridge, G8AUU. We have now received the 1976 edition of this useful and informative guide, which will undoubtedly be of interest to anyone using fm, either at home or abroad. The new edition has been expanded to 48 pages, giving coverage of such new countries as Australia, New Zealand and Canada, as well as increasing the UK section from 6 to 11 pages. Reciprocal licensing details are given for 24 countries, foreign repeater details have been updated, and UK repeaters, both operational and planned, are dealt with at length. The guide costs 45p plus 10p p & p, and is obtainable from G3UHK, QTHR.

VHF-TV

John Wood, G6AHT/T (G3YQC), writing in *CQ-TV*, the journal of the British Amateur TV Club, comments on the need for a 2m calling channel for tv purposes. While it is difficult to choose a channel to suit everybody, he feels that 144·75MHz is a reasonable choice, and is therefore proposing that frequency as an all-mode tv calling channel.

During the post-Christmas opening, G8CGK (Ross-on-Wye) raised F1BYM near Bordeaux who, although unable to receive sstv himself, was kind enough to alert another Bordeaux station, F1BUU. The result was the satisfactory exchange of pictures on 144·23MHz, a fair haul for this mode. Grant Dixon comments that 144·23MHz seems to have been adopted as the sstv calling channel in the UK, and despite several calls on the official calling channel during the lift, the Frenchman was his only contact.

Contest comment

"Diabolical", says G3DAO, and, indeed, the VHF Contests Committee has not won many friends among cw users by dropping the January 144MHz cw event from the 1976 calendar. It had seemed, from comment accompanying the results of last year's event, that the idea of following a 144MHz cw contest on Saturday evening by a 70MHz cw contest on the Sunday morning, had met with more favour than disapproval, but the 1976 January contest was 70MHz only.

To gauge the amount of cw activity, the writer stuck to this mode during the 7 December 144MHz fixed station contest, and was pleasantly surprised to be kept busy for the whole of the 8h event. Conditions for this contest were only moderate with a good deal of QSB on distant stations, but activity was good, and scores around 200 were heard toward the end.

December also saw the last of the 1975 Autumn Cumulatives, with some confusion being caused by the unexplained 10-day gap between the last two, instead of the usual eight days. Ironically, a lot of the competitive edge was taken off the last six of the seven cumulative periods by the excellence of conditions during the first period when, undoubtedly, the whole event was decided.

GM8DMZ tells us that the South of Scotland VHF/UHF Contest Group will, as in past years, be operating from the Mull of Galloway during contests in 1976. The group has a pair of 4CX250Bs to two 14-el Parabeams for 144MHz, and on 432MHz a pair of '250Bs are under construction, with four 88-el Multibeams as the aerial system. On 70MHz the existing transverter is due for replacement by a more compact rig using a single 4CX250B in the final. Callsigns used are GM4DMZ (the club call), GM8DMZ, GM3WOJ and GM8HXQ.

VHF listening

Harold Meerza, BRS34348, whose 432MHz Senior Receiving Award No 1 is reported in this issue, is joined on the 70cm band by Norman Henbrey, BRS28198, of Rye in E Sussex. Norman has a Microwave Modules converter in front of an FRDX400 receiver, and a 46-el Multibeam. Norman also listens on 4m, and on 2m where the recent excellent conditions have boosted his county tally to the point where an FMD claim is imminent. BRS28198 found conditions on 6/7 December particularly good to the west, enabling him to collect several G and GW counties, as well as GI3GXP for a new country on 2m.

Sked spot

G8CMU, whose normal operation is from a portable site in Salop, was surprised by the number of stations who told him during the 144MHz Fixed Station Contest that he was their first Salop station. In case there are others who are finding this county difficult to work, Mike offers skeds, at weekends (preferably Sundays), on 2m fm or ssb to anyone who cares to write to him, QTHR.

Meteor scatter

G3WZT reports that the October Orionids and November Leonids produced rather poor results, with very short, weak bursts. However, John Matthews did manage to complete a QSO with YZ3ZV on 21 October, and with I4PWL on 15 November. John found the December Geminids very good this year, with the peak on the 14th around 2200-2300gmt, in a southerly direction. Bursts received from EA4AO in Madrid were up to S9 in strength and 5s in duration, and contacts with the Spanish station were completed on 12 and 14 December. Two completed QSOs were made with SM3BYA in IV06j on 13 December, and one with I4EAT on the same date.

G3WZT comments that reflections were excellent all round, providing care was taken to calculate the best time for any given direction. John also heard UA9GL, SP9JC, SP2DX and YU3ZV during the Geminids.

After almost two years of exclusive 432MHz and 1·3GHz activity, Chris Bartram, G4DGU, has returned to 144MHz, mainly to try his hand at meteor scatter. He has met with some success, having worked SM and SP by this mode. During the Quadrantids Chris managed a complete QSO with SM5LE, and also exchanged reports with UC2AAB (locator square NN) but unfortunately missed the final R, so cannot claim a contact.

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

DX news

The high-pressure system which drifted from west to east off the south of the country brought lively conditions on vhf/uhf at the end of December. The best direction of the opening started towards the south-west, and moved through south to south-east, and even north-east for a while. The best of the lift occurred on 27 December, when the HB9HB beacon was audible in the north all day. On 432MHz the writer was able to work down to locator square AD in the Pyrenees, and OE2CAL/2 was a good signal during the evening. Several HB9s were in evidence on 144MHz, as well as OE, EA and, later, SP stations.

Down in West Sussex, the best day of the opening was agreed by G3DAO to have been the 27th, when not only was HB9HB between S6 and 9 all day, but the LX0LX and F3YM beacons were also audible on 144MHz. Peter got the impression that towards the latter part of Saturday the opening had a tendency to swing around to a north-easterly direction, when OZ8SL fell to the G3DAO key. EA2LA and EA2LL were also worked on cw, while on the Sunday morning G3DAO had contacts with OZ, SP, SM and various German and French stations. Although the band appeared to have returned to normal by Sunday tea-time, Peter noted a mini-opening at about 2230gmt, when he worked DM2CSJ (in FK08c), DL0VT (DL68h), SP5JC (KM56f), DJ4FY (FM52h) and DM2BYE (HM53a); by 0030gmt all was again quiet on the band.

G8IPV of Norwich first noticed signs of an opening several days earlier when, on 21 December, he was hearing several signals from the Continent. The following day he could hear DK1KO and OZ6OL carrying out eme tests with K6QEH. On the 25th G3IPV was copying DK5QY radiating as a beacon on 144·04MHz for most of the morning; as it was on 27 December, this time on 144·08MHz. On the same day HB9ASA and HB9OF were logged on 144MHz, as was the Swiss beacon. Conditions in Norwich on 28 December remained good to the east and north-east and cw brought G8IPV contacts with OZ, SM and SP.

It seems that DL7QY in Berlin was on the edge of the opening, but Claus managed several 144MHz cw and ssb contacts into the UK on 27 December, but heard nothing on 432MHz. He noted that signals from northern France were stronger than those from southern G. Claus also reports working GM3JFG and GW5YB on cw during the 9 November auroral opening.

Awards

144MHz Transmitting: No 469 to G8KDV, who becomes the first G8K – – to win this award; No 470 to G8JAY; No 471 to GW4CQT; No 472 to G8HWQ; No 473 to G8CCV; No 474 to GM6UW/P, the Cambridge University expedition station; No 475 to G3UKC and No 476 to G8ITS.

Microwave 10GHz: No 20 to G3JHM/P and No 21 to GW8FJG/P.

432MHz Senior Receiving: enthusiasm and intelligent listening by BRS34348, Harold Meerza of Chatham in Kent, have earned him the first-ever 432MHz Senior Receiving Award. Congratulations to Harold, and let us hope that his achievement will encourage other listeners to follow his example.

The success of G8ITS in gaining 144MHz Transmitting Award No 476 is worth special mention due to the difficulties involved. George claims to be the only station active from the City of London itself, and his beam is surreptitiously mounted on the south-facing balcony of his first-floor flat. As the building acts as a highly effective screen to the north, all G8ITS's contacts in this direction are achieved by reflection, which really is doing things the hard way!

On 1 January the new FMD Awards came into effect, details of which were published on p556 of the July 1975 issue of *Radio Communication*. However, members waiting for confirmation of contacts made prior to 1 January 1976 are reminded that these will still be valid for claiming the old award.

Another reminder that would seem to be worth repeating is that FMD claims, and requests for claim forms, should go to the VHF Awards Manager, G5UM, and *not* to the writer—and please remember to include return postage.

Class B

Last month's suggestions concerning the possible restricted use of cw by Class B licensees has excited much comment. However, the proposal has already been considered by the (then) MPT and Home Office and rejected due to the difficulties of monitoring a cw transmission where the callsign cannot be identified because of poor sending. Interference from 144MHz to the aircraft frequencies around 135MHz has been experienced in the past, and identification and suppression of interference must be swift where safety of life could be involved.

Mass-produced problem

Repeatability is a desirable feature in a mass-produced product (inasmuch as any item for the amateur radio market can be said to be mass produced) but unfortunately it is sometimes an unforeseen snag that is repeated. Such seems to be the reason for a good deal of disquiet in the area served by the Barnsley repeater, GB3NA, where it has been found that Liner 2s, when operated on Channel 31, have a spurious output on the repeater input frequency of 145·075MHz. It is not being suggested that this output is not many decibels down on the main signal, but nevertheless it is strong enough in the case of the better-sited stations to activate the repeater. It may be that a simple adjustment is all that is necessary to remove this problem, and we shall be happy to pass on any useful suggestions received. In the meantime, it is to be hoped that good sense and tolerance will prevail while the trouble is being resolved.

All fall down . . .

. . . which is what, we hope, did not happen to readers' aerial systems, towers, garden sheds etc during the 2 January gale. The G3NHE aerial system did not escape unscathed, although things could have been worse.

Miscellany

A welcome appearance on 432MHz ssb was made by GW8BXQ of Pembroke Dock (XL26g) during the December lift—a good time to pick to come onto the band!

G3IIR, chairman of the British Amateur Teleprinter Group, points out that the recognized frequency for rtty on 4m has for many years been 70·56MHz, not 70·6MHz as stated in the December issue.

Finally, items for the March issue should reach G3NHE by 4 February, and for the April issue by 6 March.

the month on the air

John Allaway, G3FKM*

ALTHOUGH the change from a.m. to ssb suppressed-carrier telephony has resulted in greater communication efficiency, it has in fact resulted in some loss of recruitment to the amateur radio ranks. The writer wonders how many of us were originally attracted to the existence of amateurs by hearing them (on a.m.) on an all-wave receiver. It is unlikely that this source of recruitment is very large now that ssb is so commonly used. This makes the activities of the Scout movement at its jamborees even more valuable, as by these events a number of young people are first introduced to amateur radio in a responsible way.

G4BMR wishes it to be known that he will be abroad for about six months, and that anyone hearing his call may draw his own conclusions.

DX news

Officers of the YASME Foundation elected in November last are as follows: president, W6AM; vice-president, Danny Weil (VP2VB/MM); sec/treasurer, W6RGG; and directors W6DOD, W6KG, W6OAT, W0MLY, WA5LES, KV4AA, JA1KSO, OH2BH and VK2EO. Younger readers may be interested to know that Danny Weil, VP2VB, an Englishman, built a small boat—the *YASME*—in 1954 and in it he visited and operated from 26 rare dx locations during a period of nine years.

VR4DX will be leaving the Solomon Is during April and returning to his home in the UK. KB6CU should have left Canton Is by now; he is the last KB6 licence holder and it is believed that the USA military installations on the island are being closed down. KA1MI, located on Minami Torishima (formerly Marcus Is), leaves this month; he has been heard around 1030 just below 14,200kHz. KC6AQ, located in the W Caroline Is, operates on 14, 21 and 28MHz, and will soon be on 3·5 and 7MHz. He has been reported on 21,278kHz and asks for QSLs via WA6AHF.

VQ9CP is located on D'Arros Is, which is one of the Amirantes group. It is 20 miles from Desroches Is but in fact counts as Seychelles for DXCC credit.

It is believed that Sombrero Is (located NW of Anguilla) may possibly qualify for DXCC status. It seems that it is neither part of the British Virgin Is nor claimed by Anguilla.

Those who would like a contact with Nepal may like to know that Father Moran, 9N1MM, is often to be found in the vicinity of 14,255kHz around 1400–1500.

9K2DC has returned to the USA, and all QSL requests should be sent to: W. F. English, WA4GLA, H & MS-20, GSE, MCCRTG-20, Cherry Point, NC, 28533, USA. Bill may return to Kuwait later.

Official Bulletin No 567 from ARRL announced two additions to the DXCC Countries List—Sable Is (VX9) and St Paul Is (VY0). The addition of the former is because it is separately administered from adjacent territory, and the latter—although administered by the same authority as VX9 is separated from it by "foreign" land. Contacts made after 15 November 1945 are valid, and QSL cards may be submitted for DXCC credit starting on 1 February. An additional note says that no credit will be given for any operations from either island unless it has been established that landing and operation were carried out with permission from the proper authority.

Official Bulletin No 568 from the same source lists the members of the DX Advisory Committee for 1976: chairman is K5FVA, and members VE3QA, W1DAL, K2BZT, W3BWZ, K4IKR, W6NJU, W7YTN, WA8ZDF, W9KNI and K0HUD.

The Federation of Amateur Radio Societies of India has advised that the special callsign prefix VU7 will henceforth be used by amateurs located in Andaman, Nicobar, and Lakshdweep (Laccadive) Is.

There will be a special amateur radio station on the air from the site of Ghana's 3rd International Trade Fair from 1 to 15 February. Activity will cover all bands, but the callsign is not yet known.

Top band news

VK3CZ reported hearing G3ZYY at 1853 on 8 December at RST54/59, but no contact resulted. Arthur points out that he is active almost daily at sunrise (his time) and transmits on 1,802·5kHz.

December *QST* listed some beacons and their frequencies, and band conditions can be estimated by their presence. In addition to DHJ on 1,830kHz, WCC (2,036kHz) and WNU (2,048kHz)—both on the east coast and KPH (2,054kHz) on the west coast of the USA, were mentioned.

A reminder that the "dx window" is used by most stations trying to make dx contacts on 160m.. This is the band 1,825-1,830kHz, and during times when long-distance contacts are possible other users are asked to try to avoid this area of the band if at all possible, please. (USA and Canadian stations usually transmit between 1,800 and 1,808kHz).

Just before going to press it was learned that VK3CZ had contact with G3ZYY on 20 December, and with OK1ATP, G3XVY, G3ZEM and EI8N on 31 December—all within 20 minutes and at signal strengths up to RST579—his best-ever European contacts. VK6HD also reported contacts with DJ0YD, HB9RM, OH2BM, OH6DX and GD4BEG.

G3ORP advises dx stations to use 1,802-1,803kHz as these frequencies are usually interference free. 1,801 and 1,805-1,806kHz are also quite good, but 1,801·7 and 1,804kHz should be avoided.

Dxpeditions

A number of reports are circulating concerning possible expeditions to several rare dx locations, but no hard facts have been established at the time of writing.

Alex Mootoo, 3B8DA is expecting to commence a tour of duty on St Brandon Is as 3B7DA during March or April.

A35AF is rumoured to be interested in paying visits to Niue (ZK2) and Tuvalu (VR8).

K5QHS has announced the possibility of some operation from Bajo Nuevo (HK0) and Serrana Bank (KS4). April is mentioned as a likely time for this to take place.

* 10 Knightlow Road, Birmingham B17 8QB.

Dr Terence Langdon, G3MHV/W6 (also VE7CBG and XE0MHV), (left) visited Venezuela recently and met Ica (YV5CKR) and her husband Ladis (YV5CIZ) who are both keen dxers

According to the *West Coast DX Bulletin* WB5LSU/TI2 is contemplating a four-day stay on San Felix Is (CE0X), and a similar visit to Juan Fernandez Is (CE0Z) later. The same source also suggests that plans are afoot for an expedition to the S Sandwich Is (VP8) late in the year.

PY7YS did not visit St Peter and Paul Rocks or Atol das Rocas as he intended late in 1975. This event may now take place this month.

Nordjamb 75

The report on the 14th World Jamboree which was held in Norway has been received. Amateur radio played a prominent part, with Scouts taking part in "foxhunting", construction of simple equipment, and maintaining contact with Scouts elsewhere through the special station LC1J. As LA5CH says—"The interest developed during a Scout radio contact may well get the boy started on to something of his own within the field of electronics . . . " More than 50 instructors were available, and separate stations for ssb, cw, rtty, sstv and vhf were on the air. Contacts were also made via Oscar, and via LA5JR—a special Jamboree repeater. There were 107 licensed Scouts present from 19 different countries. A total of 2,362 contacts were made with 105 different countries in the 10 days 28 July to 7 August.

Contests

The Ten-Ten QSO Party

0001 14 February to 2400 15 February.

Any mode, but only one contact per station. Exchange RS/T, name and QTH. One point per contact. Send logs to Grace Dunlap, K5MRU, Box 445, La Feria, TX, 78559, USA. This contest is organized by the Ten-Ten International Net of S California, and non-members are invited to take part, submit a log, and apply for membership. It may be interesting to see what propagation there will be in Europe at the time of this event.

Awards

The PACC Award

For confirmed contacts with Netherlands stations since 31 May 1945. A minimum of 100 different PA/PE/PI stations must have been worked, and stickers are available for 200 and 300. A list showing full details of the contacts certified by the awards manager of a national society (eg G5GH) but not the QSL cards, plus seven IRCs, should be sent to Traffic Bureau VERON, c/o PA0MOD, Dashorst 18, Leusden, Netherlands. Note that contacts made during the PACC contest may be claimed without QSL confirmation provided that they can be confirmed from logs sent in by the PA stations concerned.

The Listeners Century Club

Issued along similar lines to the PACC Award, and submit a certified list of confirmed reception of at least 100 Netherlands stations. The fee is also seven IRCs. No mention is made of reception in the PACC contest being accepted in lieu of QSLs in G3FKM's copy of the rules.

QTH Corner

A4XGH	PO Box 980, Muscat.
C5AJ	via DL7AH, H. Lillenthal, Thalhof, 8031 Gilching, W Germany.
C31LZ	PO Box 35, Andorra.
G4BMR	via BRS33658, 42 Studland Park, Westbury, Wilts BA13 3HL.
KC4AAA	D. Seeley, USARP, S Pole Stn, c/o FPO, San Francisco, Cal, 96692, USA.
KC4USX	Hamshack, VXE6, FPO, San Francisco, Cal, 96601, USA.
VP1BJ	via G4CZJ, J. B. Jenkins, 18 Hawthorn Drive, Topcliffe Barracks, Thirsk, N Yorks.
ZB2X	via OH3XZ, J. Saloranta, Eino Leinonk 7-A-9, SF-13130, Hameenlinna 13, Finland.
ZC4RH	now G3ZDW, 45 Sheepwalk, Swinderley, Nr Lincoln LN6 9PX.
3D6 Bureau	D. M. Goldman, 3D6BG, PO Box 21, Ezulwini, Swaziland.
3V8DQ	W2GHK, Box 7388, Newark, NJ, 07107, USA.
3V8WO	W4NJF, 1416 Rutland Drive, Virginia Beach, Va, 23454, USA.
5B4PW	via G3CZY, C. J. Twose, 4 Story Road, Chichester, Sussex.

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

Band reports

Conditions on the lower frequency bands have been exceptionally good during the past month, with 3·5MHz being especially interesting during the afternoons with "grey line" propagation from the USA and signals from the Far East.

(Continued on p133)

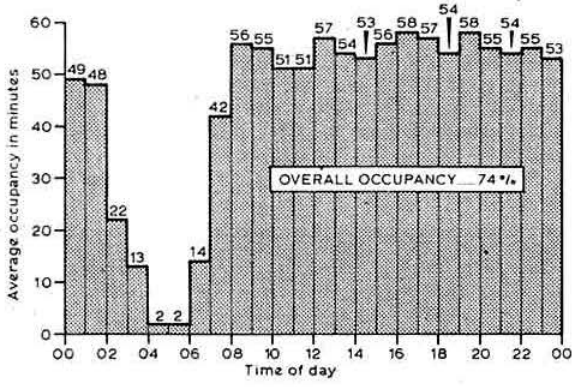
At the annual dinner of the Radio Society of Bermuda held on 16 October 1975, Ed Kelly, VP9GE, (right) was presented with a trophy by ARRL Director Bob Booth, W3PS. Ed had been elected Amateur of the Year for his considerable services to amateur radio in Bermuda

Repeater occupancy

by W. BLANCHARD, G3JKV*

PROBABLY one of the first things a newcomer to the fm repeater business is likely to notice, particularly in the London area, is the tremendous occupancy. Gone are the good old days when it was only polite to wait for a QSO to finish before breaking in on the channel—now one either gets in during the few seconds allocated—irrespective of anyone else—or not at all. However, regardless of what one may think of the merits or demerits of repeaters, their existence is a fact of life in amateur radio today and, like many other innovations, are probably on the whole for the better provided they are used wisely.

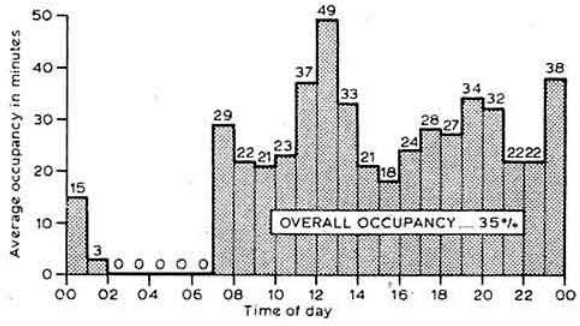
It may seem at times that GB3LO in particular is in almost constant use, and it was a desire to see just how heavily used it really is that led to an attempt to measure its on-air time throughout the 24 hours (later extended to GB3SN as well). The set-up was quite simple—a receiver left running on the channel had its agc line coupled to a chart recorder, producing a continuous trace which could later be analysed in terms of on/off time. With a little practice it was found that the trace could even be interpreted in terms of the type of signal triggering the repeater, but one of the really interesting things that would be nice to know—the ratio of fixed to mobile stations using repeaters—proved impossible to evaluate in this particular exercise.



GB3LO 2-11 November 1975 average occupancy

Just one single day's recording might have been unrepresentative, so an average of several days was used to construct the charts reproduced here. Examination of the records in the process of obtaining the numerical data for these charts revealed some interesting points not shown by the charts themselves.

In the case of GB3LO, the "night-birds" who contributed to the rather surprisingly high occupancy even at 4am seem to be a very small number, since the records show that the repeater was transmitting continuously on several of these contacts for as much as 45min at a time. This is rarely achieved during the day because, although the ultimate occupancy is higher, there are many momentary breaks of carrier due to Mode 2 or 3 operation in turn caused by the large number of stations attempting access. (This is why occupancy never actually reaches 60min even during the busiest hours) Continuous transmission for 45min can only be achieved by two stations expert in the use of the repeater—but there is always the possibility that they were test transmissions.



GB3SN 11-17 November 1975 average occupancy

The 2min occupancies at 5am and 6am were caused by what appeared to be spurious triggers—at least, all that appeared to be happening was that the repeater would come on for a few seconds without transmitting anything other than a "K" and occasionally its own callsign. The actual number of these "spurious" triggers was remarkably constant from day to day and did not appear to be just someone using the small hours to test equipment.

From the GB3LO occupancy chart several interesting deductions can be made. The peak at 8am to 9am appears to show that this is the time most mobile operators are going to work—not very surprising in view of the average starting time of 9am for work and colleges, but the peak at 4pm to 5pm, if interpreted the same way, would appear to show that amateur mobile operators, at least, are in the lucky position of being able to stop work at 4pm. Or could it be simply that most amateur mobile operators are in the age group still attending colleges?

The chart for GB3SN does not show this so much. Its early morning peak is at 7am to 8am, and the afternoon peak at 5pm to 6pm which is what one might expect for most normal workers.

Both charts show another peak between noon and 1pm, presumably due to operators having a quick QSO in their lunch hour, although here again this does not correspond too well with the usual 1pm to 2pm lunch hour. Students again?

In the evening, both charts show a peak at between 7pm and 8pm, followed by a steady fall-off, although GB3SN shows a rather surprising peak between 11pm and midnight. But this is followed by a very rapid fall-off to zero by 2am, whereas GB3LO is still occupied almost at daytime intensity right up to 2am. Part of the famous night-life of the capital, perhaps?

The regular callsigns put out by GB3SN every 122s when not being triggered, have been ignored in calculating its on-air time.

Overall, GB3LO is actually on the air for about 74 per cent of the total time, while GB3SN is on for 35 per cent of the time. Both these include the night hours, of course, but if the

* The Trundle, Tower Hill, Dorking, Surrey.

usual "operating" hours of 7am to midnight only are considered, then these figures become almost exactly 90 per cent and 47 per cent. Nobody can complain about underutilization, in fact there appears to be a clear case on these figures for a second vhf repeater in the London area.

In view of the occasional remarks that one or the other repeater is off-frequency, both frequencies were measured several times. Apart from the few cycles drift which is only to be expected at these frequencies, both repeaters were very close to nominal. GB3LO was on average only 10Hz high off-frequency, while GB3SN was about 100Hz high.

The design and operation of both repeaters reflects great credit on those concerned—perhaps the other UK repeaters operate just as well, but they cannot be heard at the author's QTH. It is a pity that not all amateur signals are as technically excellent.

NEW PRODUCT

From the Heathkit catalogue

The latest Heathkit catalogue is now available to callers from the London Heathkit Centre, 233 Tottenham Court Road, London W1. Postal enquiries should be accompanied by a 10p stamp and addressed to Heath (Gloucester) Ltd, Bristol Road, Gloucester, GL2 6EE.

Among the new kits available are a number of direct interest to radio amateurs, and others of general interest, eg to those who are car owners.

The **HW-104** is an ssb transceiver kit covering 3·5 to 29MHz, entirely solid state and with broadband tuning. The cost including 25 per cent VAT and UK delivery is £490.

The **HW-8** is a cw transceiver kit covering portions of the 3·5, 7 and 14MHz bands with vfo control and a new direct conversion receiver. Price (inc VAT and delivery) is £108. It is hoped to publish a review of this equipment in *Radio Communication* in the near future.

A hand-held 144MHz transceiver, the **HW-2021**, offers 1W output and a simplex-offset switch giving one receive and two transmit channels for each crystal installed. Built-in battery saver, rechargeable battery pack and battery charger come as part of the standard kit. Price of the HW-2021 is £144 with a carrying case as an optional extra.

The **IM-4100** is a new 30MHz five-digit frequency counter and timer kit selling at £78. Featuring good sensitivity, a built-in attenuator and 12V or ac mains operation, this equipment would seem to be an obvious choice for many hf applications.

Claimed to be the world's first programmable digital stop watch, the **GB-1201E** kit is a sophisticated device with many obvious uses. With seven functions and an accuracy of up to 0·01s it is not possible to outline applications in the space available. However, a kit has been made available to RSGB for review and further comment will appear in due course. At first sight it would seem that the equipment can be made the basis of an Oscar orbital timing system. Price of the GB-1201E is £74.50.

For car owners there is a vehicle alarm kit, the **GD-1157**. This is claimed to offer total protection and resists tampering. With an increasing number of thefts from unattended cars now reported, particularly those with obvious communication equipment, the cost of £18.80 for the basic kit would seem to be a good investment.

The **CI-1079** is a digital tachometer containing 10 ICs and featuring a two-digit readout. Installation would seem to be easy with just one connection to the ignition coil. A matching unit to the Heath digital car clock, the CI-1079 is priced at £31.80. Also described in the new catalogue is the **CO-2500** a 12in-screen professional ignition analyser.

The month on the air

(Continued from p131

Very many thanks to the following for sending in logs from which this section has been compiled: G2CDT, G2HKU, G3HB, G4RZ, G5JL; G3s KSH, LPS, NKQ, ORP, and YMC; BRSs 17567, 31301 and 35608; and As 7056, 8313, 8428, and 8946.

Stations listed in italics were using cw, the rest ssb.

1·8MHz. 0000 KP4AST, *W8LRL, PY1RO.* **0200** *K4ERO/HC, KV4FZ, KZ5AA, PJ2VD.* **0300** *W5HWZ.* **0500** *W5WZQ, WA9EYY.* **0600** *HK0BKX, K9YWO, PY1RO, W0NFL.* **0700** *YN1DW.* **0800** *W2DEO.* **1900** *VK3CZ.* **2100** *JA3ONB*—(1,908kHz peaking RST579), *VK6HD, XN1KE.* **2300** EA8CR, *9H1AV.*

3·5MHz. 0000 AP2KS, VE7EL, VP2MAI, K6BCE. **0600** VE7EL. **0700** VP1BJ, VR8A, W7KW, *YV1AD.* **0800** OX3OO, K6QHC, W7NCO, ZLs. **0900** K7OXB, ZLs. **1400** JA2AAQ, VS6DO, W6NLZ. **1500** JA4DLP, JA6BSM. **1600** JAs, VR4DX, VU2GDG, ZL2BT, ZL4KE. **1900** JY9CR, SM0AGD/TA2, *9K2DR.* **2000** JAs, VE1XU/SU. **2100** FP8DX, *JAs,* ST2SA. **2200** A4XVI (QSL to GM4DLG), *C5AJ,* CR9AK, JA8OSM, *JA9YBA.* **2300** JA6BSM, JT0OAQ (QSL to UY5LK), VP2ABC, 8P6AE, 9M2FK.

7MHz. 0000 *CE8AA, FY7AK, PZ9AB* (Box 20, Moengo, Surinam), *9J2WR.* **0100** *VU2s JN, RQ.* **0300** *KL7AI.* **0700** *ZB2X.* **0800** JAs, *JT1AO,* VKs, VR4DX, ZLs. **1100** *JA3FKD.* **1400** FM7AQ (QSL I2YAE), *JAs, 4W9GR* (QSL to DK4PP). **1500** JAs. **1600** *VE7UJ, VU2LO, W6/W7s, 9V1SR.* **1700** *SM0AGD/TA2.* **1800** *FB8YC,* TR8SS. **2000** *A2CBW* (QSL to DK3KD), FG7TD (QSL to F6BFA), *FG0CGV/FS* (QSL to K4GKD), KC4AAC (QSL to K7ODK), *VKs, 3V8DQ.* **2200** *EP2OD, FM7AN, VP5GS, ZD8TM, ZE1JV, 5R8AC* (QSL to W3ABC). **2300** *JT0OAQ.*

14MHz. 0000 KC4AAC, VP8OL. **0800** *VR8B.* **0900** FK8CJ, *KC4AAC,* P29s, *TA1ZB, WA2BIH/TU,* ZD7SD. **1000** FK8BG. **1100** VE7DSR, 4S7DA, 9N1MM. **1200** EA9FG. **1300** HC8GI, KG6AAY. **1800** FR7ZL/G. **1900** 3B8DA.

21MHz. 0900 ZD7FT. **1000** A9XU, TJ1EZ, TR8VE, VK, VQ9HCS. **1100** VKs, ZLs. **1300** VP2MIR. **1400** FR7s, FR7ZL/G, 5N2NAS. **1500** C5AJ, W5. **1600** VP8OR.

28MHz. 1500 ZE2JV. **1600** W2, W3, W8DMY, WB8BNV (all during ARRL 28MHz test).

Many thanks to all correspondents, and also to the authors of the following for items obtained from their publications: **DX'press** (*PA0TO*), the **Ex-G Radio Club Bulletin** (*W3HQO*), **DX News Sheet** (*Geoff Watts*), the **29 DX Club Newsletter** (*VK6WA*), the **DXers Magazine** (*W4BPD*), **Long Skip** (*VE1AL/3*), and the **West Coast DX Bulletin** (*WA6AUD*).

Please send all items for **March** issue **to reach G3FKM** no later than **4 February,** and for **April** issue by **7 March.**

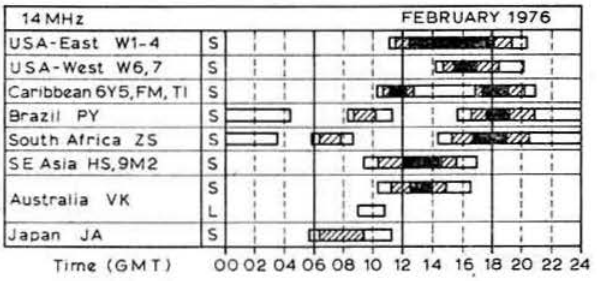
Propagation predictions

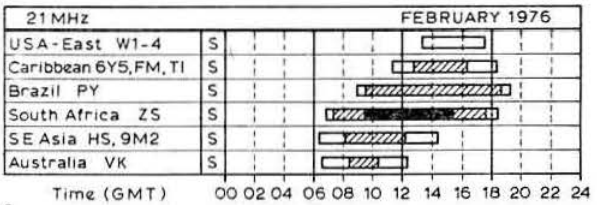
During February the winter conditions come slowly to an end, days lengthen and towards the end of the month **14** and **21MHz** will remain open longer than in previous months. There is very little sunspot activity and **28MHz** will be of little practical use for dx. Only between 1000 and 1530gmt in exceptional circumstances will Africa be heard, and chances for traffic with South America between 1300 and 1600gmt are even less. This low solar activity will also be noticed on **21MHz**. Only Africa will be heard with certainty, and eastern North America only on very favourable days with above average MUFs. Probably no traffic will be possible with western North America, Hawaii, Alaska and Japan. These are not very encouraging prospects for the forthcoming ARRL DX Contest.

Conditions on **14MHz** will greatly improve towards the end of the month, as days will be longer and the band will remain open for a few hours after sunset. Only from about May onward will this band remain open all night for dx. Chances for dx via the indirect path will decrease from now on. Traffic with Hawaii and Alaska will only be possible on favourable days on 14MHz between 1700 and 1830gmt.

During the present conditions there will be little interference from static on **7** and **3·5MHz** so these bands will often be open for dx. QRM permitting, eastern North America will be heard on 7MHz from about 2100gmt. During the latter half of the night traffic on this band will be interrupted, as will 3·5MHz also from time to time. Local traffic will be almost impossible during the latter half of the night.

The provisional sunspot number for December 1975 from the Swiss Federal Observatory was 7·5. Except for the first week of the month solar activity was virtually nil. The predicted smoothed sunspot numbers for April, May and June are 8, 7 and 6 respectively.





The RSGB Intruder Watch —its history and function within the IARU Monitoring System

by C. J. THOMAS, G3PSM

LITTLE has been publicized in recent times of the work carried out by the RSGB Intruder Watch, and even less has been said of its role within the International Amateur Radio Union Monitoring System. Its history goes back to the early days of amateur radio and the problems that grew with the expansion of commercial and service communications. From the beginning the amateur frequencies were the first to be "requisitioned" when needed by professional users, and this position existed until 1927 when official allocations were introduced. However, there remained the problems of moving commercial users out of the amateur allocations and preventing new "intrusions" by administrations who considered that the Radio Regulations did not apply to them.

In 1948, the late John Clarricoats, G6CL, suggested that groups of members should send reports of non-amateur transmissions on the exclusive amateur bands to RSGB HQ for onward transmission to the Post Office. But it was not until early 1954 that the Post Office, under pressure, agreed to forward complaints based on these reports to the various administrations concerned.

The subject of intruders was again raised at the IARU Region 1 Conference in 1956, and resulting from this the first "Intruder Watch" was formed by the RSGB. Many of this group of selected amateurs had previous experience in this form of work and an efficient organization was soon in operation. Other national societies began to take an interest in the work of the RSGB Intruder Watch, and soon the ARRL Intruder Watch programme came into being.

Progress was slow, both from the amateur side and in the telecommunication administrations' attitude to the subject. It was apparent that many administrations considered the IW organization merely a "flash in the pan" from a group of amateurs with nothing better to do with their time, and were slow to respond. Recognition from the amateur fraternity was also slow, with many amateurs considering that the work was a waste of time and all very pointless. However, intruders continued to be logged and reported, and eventually the flow of information made the various administrations realise that here was something to think about, and that a few amateurs were in fact prepared to look after their own interests.

The author became honorary organizer of the RSGB IW in 1967, and he considered that influence on administrations would be increased if the various national societies reporting intruders could show a united front to the problem. Consequently, following the 1969 IARU Region 1 Conference, the RSGB undertook to liaise with these societies, to assist with the formation of new national Intruder Watches and to examine and filter reports from individual monitoring stations. The result was a document prepared for the 1972 conference in the Netherlands which proposed the official formation of the IARU Monitoring System within Region 1. The proposal was accepted in principle and the RSGB was again asked to carry out the ideas laid down in the prepared document, the author being appointed co-ordinator for Region 1.

To draw attention to the number of intruders that existed on the amateur bands, a 47-page document was produced which listed all those heard during 1973. This document listed 1,170 different intruders of which the country of origin of 718 were identified. A similar document covering 1974 was contemplated, but the recently-introduced *Intruder Monthly Summary* by now contained all this information. The *IMS* is now distributed to all participating IWs, national societies in the countries of identified intruders, as well as telecommunications administrations and other interested bodies.

In a recent conversation with the author, the Secretary-General of the International Telecommunication Union paid tribute to the work carried out by the IARUMS and the indivIdual IW organizations, and he also commented on the knowledge of transmission types that was evident in the work being carried out.

What then of the future, and where does the RSGB feature in the future of the IARUMS. First, it is essential that the manpower of the RSGB IW is increased. With the first major frequency allocation conference in 20 years looming large on the horizon, the Society must flex its muscles and show the commercial organizations that it does care enough about the amateur bands to register complaints regarding their misuse. It is anticipated that shortly the duties of IARUMS regional co-ordinator and RSGB IW honorary organizer will be separated. This will give the author more time to concentrate on the strengthening of the international scene, and give his successor more time to devote to the RSGB IW.

Think on this: if you have a good receiver capable of measuring a frequency to an accuracy of ±1kHz, can copy cw at a steady 20 words/min or possess specialized receiving equipment, have a good knowledge of foreign languages, or possess knowledge of foreign procedures, then you can be of use to the RSGB Intruder Watch. **Help to protect your bands or they may be lost to us in 1979.**

THE RSGB DOES ITS BIT—DO YOU DO YOURS?

contest news

2nd 1·8MHz Contest 1975 results

The entry for this event appears to have levelled off following a gradual decline from the 90 odd around 10 years ago. This is pleasing because, whenever a contest is showing decline, the committee must, as with the double station section of NFD, take a long, hard look at its future, possibly resulting in its demise. It was noted that approximately 170 UK stations were active during the contest, showing that only a quarter of those active had sufficient interest, or thought their activities good enough, to warrant entering. The overseas section had better response, possibly due, in part, to the fact that a Continental event was on at the same time. Over 30 overseas stations were worked, including PA, DL and OE, and over a third entered or sent check logs.

A number of stations got confused by unexpected county codes appearing from, presumably, non-RSGB members; more than one produced his own version of an existing code while another made up a code for a county which no longer exists!

The winner of the UK section, Stephen Wilson, G3VMW, of York, used a modified KW Vespa to a dipole, and an AR88D. He made a total of 131 contacts, of which only one was a duplicate and points were lost on only three. In second place came a winner of some years back, Dennis Andrews, G3MXJ, of Uckfield, Sussex, using a modified SB401 to a half-wave inverted-V with a modified SB301 receiver. Of 133 contacts he had no duplicates and two which lost points. These compare with a station somewhat further down the table who made just over 100 contacts but lost more than 50 points in the process. This was partly due to apparent misuse of the callbook, which misfired as a result of the county boundary changes! The overseas certificate goes to Mr J. R. Bartlett, EI2BB, of Co Dublin, who with an HX50A, FRDX400 and a halfwave inverted-V made 65 UK contacts with lost points on only three.

Colin Smithers, G4CWH, of Sutton, Surrey, wins the certificate for the highest-placed entrant under 18 years, and at 16 he was also the youngest entrant. Andrew Givens, GM3YOR, of Kirkaldy, leads the field for the Maitland Trophy, the awarding of which also depends upon the 1st 1·8MHz Contest 1976.

Of the checklogs, the most unexpected came from Fabrizio Fanari, IS0-57890 (Sardinia), who reported hearing about 50 Gs although he was only able to log 15 contacts due to QRM/N and QSB. Checklogs are also gratefully acknowledged from G3LHN, G3ULY, G3USQ, G4BXN/A, G6BQ, A8312, OK3KFO, OL3ASW and OL9CFE.

Subject to Council approval, the Victor Desmond Trophy will be awarded to Stephen Wilson, G3VMW.

UK section

Posn	Callsign	Points	Posn	Callsign	Points
1	G3VMW	630	23	GW3XNS	391
2	G3MXJ	618	24	G4BXT	375
3	G3ORH	580	25	G3XWZ	366
4	G3FXB	555	26	G3FJE/A	363 (G4BWP)
5	G4BUE	554	27	G3SVW/A	361
6	GM3YOR	546	28	G3GC	344
7	G4EOK	519 (G3HZL)	29	G3YRZ	332
8	G3YMC	518	30	G4BVH/A	323
9	G3ORP	498	31	G3HTI	300
10	G3TIR	487	32	G4BOU	283
11	G3XSC	480	33	G3VDF	280
12	G3SYM	464	34	G4ENV	267*
13	G4ANS	461	35	G3ATF	258
14	GI3JEX	451	36	G3ZNH	256
15	GM3CFS	445	37	G4CMY	254
16	G3SKC	444	38	G4CSC	242*
17	G3SJE	422	39	G2BTO	241
18	G4CWH	416*	40	G3TLF	229
19	G3KTZ	411	41	G8QZ	228
20	G4CNY	408	42	G3KSH	211
21	G4DJX	406*	43	G4ALG	206
22	G3LCH	397	44	G4IV	186

* Under 18 Years.

Overseas section

Posn	Callsign	Points	Posn	Callsign	Points
1	EI2BB	348	6	OL5ARR/P	44
2	OK1HAS	276	7	OK3CFT	38
3	OK3KFF	128	8	OK2PAW	19
4	OK1DJK	103	9	OK1HBT	8
5	OK1AXD	84			

432MHz Open Contest results

G3WXI summed up this contest: "Rain and snow, cold, low pressure, windy, propagation poor, activity pathetically low". There is little else to add, except to thank all the entrants for their trouble and to congratulate GW3UCB/P and G3NNG on making the best of the very poor conditions.

G3SEK

Posn	Callsign	Points	QSOs	QTH	Best dx	Km
1	GW3UCB/P	179	37	YM05	G3DAH	342
2	G3NNG	155	41	ZL23	G3BHW	200+
3	G3NHE	74	23	ZN54	G5DF	210
4	G8DKK	70	36	ZL36	G3BHW	155
5	G3OHM	62	24	ZM41	G3WXI/A	117
6	GW4DHK/P	47	15	YL25	GW3UCB/P	139
7	G5DF	44	17	ZL45	G3NHE	210
8	GW4ALE/P	37	9	YM75	G3WOS	126
9	G8DCA	26	10	ZK10	G3DY	177
10	G5UM	18	6	ZM35	GW3UCB/P	138
11	G8FDL	10	6	YN28	G3BW	126
12	G8GRF/P	6	2	YK23	GW4DHK/P	110
13	G5HD	1	1	ZK02	G3KMI	50—

Thanks to GM8DOX/P for a check log.

144MHz Open Contest rules

1600-1600, 6-7 March

All entries and check logs to: VHF Contests Committee, c/o G3SEK, 83 Portway, Didcot, Oxon OX11 0BA.

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.

In effect there will be two separate contests, each with fixed and portable sections. Entrants **must** state which section they are entering.

A. "DX". All modes may be used. Only contacts over 200km will count for points: contacts which prove to have been less than 200km should be logged and appropriate serial numbers given. Entrants should give brief location information when calling.

B. "Local". Entrants may not use ssb but may make cross-mode contacts. There is no distance limitation.

These rules are all experimental and comments would be welcomed.

144MHz Listeners Contest rules

There will be no separate sections for this contest. Listeners contest rules, as published in the January issue of *Radio Communication*, will apply.

National Field Day 1976

The HF Contests Committee regrets that it is not possible to publish the rules for the 1976 NFD in this issue as planned, but they will appear next month. However, groups wishing to obtain an advance copy of the rules for 1976 and the application form (HFC 10/76) are invited to send a 9in by 4in sae to the RSGB HF Contests Committee, c/o D. Thom, G3NKS, 20 Bramble Close, Copthorne, Crawley, West Sussex RH10 3QB. The envelope should be marked "NFD 76" in the top left hand corner.

This year's NFD will take place over the weekend 12-13 June.

Affiliated societies—contest operating

In order to dispel any doubts arising from this item under "Council Proceedings" on page 60 last month, the rule is that non-members of the RSGB cannot take part in RSGB contests except as members of affiliated societies taking part in affiliated society contests.

7th BARTG VHF RTTY Contest results

This contest attracted a larger entry than in 1974, and although there was a greater number of "G" operators there were no entries from the north of the country. Of the 21 entrants, G8LT, G3VPC, G3YKB, G3PLX, G3OUF, G4AFQ, G3OLM, G8JUG, G3SBV, G3IIR and G8GOJ occupied positions 6 to 12, 14, 17, 20 and 21 respectively. Other stations active during the contest included G8ISI, G4DCT, G3PAQ, G4DSY, G3PMC, G8IZD, G3ZWW and G8CST.

BARTG Spring RTTY Contest rules

0200 gmt 27 March—0200 gmt 29 March

The rules for this contest are the same as for last year's contest, published in the December 1974 issue of *Radio Communication*, except that logs should contain: date, time gmt, callsign of station worked, RST report and message number as sent, RST report and message number as received and exchange points claimed.

All logs must be received by 31 May 1976 to qualify, and should be sent to Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middlesex EN1 4DX, from whom full details may be obtained.

Contests calendar

7-8 February	ARRL DX (Phone)
8 February	432MHz Open (Rules in January issue)
14-15 February	First 1·8MHz (Rules in January issue)
21-22 February	ARRL DX (CW)
28-29 February	French (Phone)
6-7 March	ARRL DX (Phone)
6-7 March	144MHz Open & Listeners (Rules in February issue)
6-7 March	ARRL DX (Phone)
13-14 March	Commonwealth (Rules in November issue)
20-21 March	ARRL DX (CW)
27-28 March	CQ WW WPX SSB
27-29 March	BARTG Spring RTTY
3-4 April	70MHz Open
11 April	3·5MHz LP
24-25 April	1·3GHz Open (Trophy)
24-25 April	PACC
24-25 April	Bermuda Phone
1-2 May	432MHz Open & Listeners (Trophy)
8-9 May	Bermuda CW
29-30 May	144MHz Portable
12-13 June	HF NFD
19-20 June	Microwave
26-27 June	Summer 1·8MHz
3-4 July	VHF NFD & Listeners
18 July	3·5MHz FD
25 July	144MHz QRP
7-8 August	70MHz Portable & Listeners (Trophy)
4-5 September	144MHz Open & Listeners (Trophy)
4-5 September	SSB FD
2-3 October	UHF/SHF
9-10 October	21/28MHz
16-17 October	7MHz CW
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

obituaries

Mr C. V. M. Bamsey, G2FRP

Vic Bamsey died on 4 November 1975 at the age of 76. He was a founder-member of the Grafton Radio Society, of which he was honorary treasurer for many years in its early days.

Mr F. W. Crabtree, G3BK

Frank Crabtree, who died on 29 December 1975 aged 66, was first licensed around 1936. He was at one time RSGB town representative for March, an early authority on the design of mobile aerials and designer of the "Countryman" 160/80m transceiver.

He was a former president of both the Cambridge & D ARC and the March & D ARS, and recently had been active on 80 to 2m.

Mr H. R. B. Gautby, G6GA

Ray Gautby died on 25 November 1975. He was a long-standing regular member of the Rotary Net and was well known by rotarians at home and abroad.

Mr B. B. Wilson, VE6MC (ex VE6AJY/G3LXG)

Brian Wilson, who was a former secretary of the Tees-side ARC, died in his mid-forties recently. His interests were wide ranging from 160m to uhf, and as a member of the Edmonton DX Club he was often to be heard on 20m.

We have also been informed of the death of **Mr L. S. Wright, GM3AIM**, who died on 27 November 1975.

A "G" in "VE3"

by Dr A. C. GEE, G2UK*

SCIENTIFIC disciplines, be they professional or amateur, greatly overlap these days, so it must not be considered too unusual that a radio amateur should time a visit to Canada to coincide with a meeting of the International Union of Amateur Astronomers. Lectures and visits scheduled for this week-long convention at MacMaster University, Hamilton, Ontario, suggested that sufficient interest would be provided to make attending worthwhile for one whose primary interest was amateur radio, not astronomy. This, in fact, proved to be the case. Having been invited to submit a paper to the convention the author decided to see how an audience devoted primarily to optical astronomy would react to a little "space" interest, in the form of a lecture devoted to the Oscars and the activities of AMSAT.

Somewhat to the author's surprise, his lecture was very well accepted. It consisted of an account of the Oscars from 1 to 7, with slides showing construction, launching, personalities and equipment for orbit prediction. So great was the interest, in fact, that Ken Chilton, Canada's answer to Patrick Moore, who was the convention secretary, asked the author to repeat the lecture on his tv astronomical programme "The sky tonight".

In this context the author read with interest and complete agreement the comment, under the heading, "Amateur radio represented at astronomical exhibition", *Radio Communication* September 1975, p672, referring to an exhibition put on by Ron Ham at the Newtonian Observatory of the Astronomical Society of Worthing, "It surprised many of the visitors to know that the world of amateur radio was so well established in the satellite field". This was certainly the author's experience, the amateur astronomers at the convention being greatly surprised at the inroads made into the professional's space activities by the radio amateur fraternity. It has always been the author's wish to visit Ron Ham's radio observatory and see the equipment there. So far, circumstances have prevented this, so it was with particular pleasure that arrangements were made for him to visit one of the local amateur astronomers of the Hamilton Astronomical Centre, who runs a similar radio observatory.

The author also wanted to take the opportunity of a visit to Canada to visit one or two personalities closely associated with the Oscar project. Accordingly, contact had previously been made with Randy Smith, VE2BYG/VE3, and Larry Kayser, VE3QB, and invitations to spend weekends with them gratefully accepted. Randy runs the control network for Oscars 6 and 7 as well as operating one of the Oscar control stations himself. So a visit to his QTH in Barrie was a wonderful opportunity to see all that this involves.

It is not generally appreciated just how much dedicated effort has to be put into carrying out these duties. To start with, virtually every orbit has to be checked out, and even now that much automation has been introduced into the station, a lot of self-discipline has to be exercised to ensure that control is exercised over both Oscars to give the best balance between user-time and what is best for the satellites! An eight-unit rtty-type paper tape system is in use at present for providing a good degree of automation, but a microprocessor is nearly completed which, when functioning, will help to take out still further the chore of being constantly available for control procedures. A very big hand should be given to those very few amateurs who have given so much of their time and liberty to ensuring that our satellites are properly cared for during their orbits in space.

At Larry Kayser's QTH in Ottawa there was much conversation about Oscars, their future, present difficulties and so on.

Noel Eaton, VE3CJ, president of the IARU, lived not far from the author's son, viz Burlington, Ont, so it was a must to arrange a visit to his most attractive QTH overlooking Lake Ontario.

*"East Keal", Romany Road, Oulton Broad, Lowestoft, Suffolk.

your opinion

The Editor
Radio Communication
Sir—The development of amateur radio as seen by W3ASK and W1RU was just the stuff to sock it to 'em at the Forum, ("Your Opinion", November) so before we all get too big for our hats here is the development of amateur radio as seen by your average old G3-whats-his-call down the road, who is usually getting his ears bent about the tvi or cranking out a dipole via the clothes line while 'ASK and gang put up satellites and break out of old frontiers.

SSB phone was a reality in pro communications in 1938, but amateur-wise did not really begin to get going until just after the second world war when the arrival of cheap rocks by the score coincided with the development of the clever broadband audio shifters. Early experimenters were usually greeted with the comments "It splatters," "It's hard to tune," "It doesn't sound natural," and "I'd rather you didn't do it on THIS band!"

Most of those on the air at that time were, however, what I would term real radio amateurs. Much of the gear was made up in the garden shed, and the rest was broadly speaking compatible with the home-brew gear albeit that it usually looked nicer. With no big money being poured into amateur communication, the technology progressed at the nice, easy pace dictated by Mr Average Ham.

It is strange that the decline of amateur radio should run roughly parallel with the coming of ssb phone, but this is pure coincidence. It just so happened that the availability of cheap filters and ease of small-quantity mass production with PCBs coincided with old Joe Public getting more cash in his pocket. So, a new item for the consumer was put on to the market, the ssb amateur radiotelephone. Along with it came the retailers, the smart advertising and the Amateur Radio Retailers Association. Despite the rather dubious fact that all amateur radiotelephones seemed to cost an identical amount from every dealer, the kids had been shown the candy, and boy, how they bought it. Little boxes from Japan popularized ssb on the amateur bands, the motive was profit, little else had much to do with it!

Credit where it is due; the bought radiotelephones were, in the main, a lot better than the rigs we used to make (all right, what *I* used to make!). The big trouble was that with the push of the commercial enterprises behind it amateur radio technology advanced too fast for the ordinary amateur to keep up with. By the mid-'sixties amateur radio had virtually ceased to exist on 20m. By the early 'seventies 10, 15, 20 and 40m became unusable as far as amateur radio was concerned. In place of amateur radio a new hobby had emerged, namely amateur radiotelephone operating. To keep up with the "state of the art" (a term of the box era if ever I heard one) required the would-be amateur to design and construct equipment compatible with modern pro communications technique in the back garden shed. Although doubtless many have, by far the majority settled for becoming radiotelephone operators instead, and who can blame them. I know of more than one fully qualified electronics design engineer who has opted for buying his box. Let's face it, home R & D to today's standards is expensive.

Genuine amateur radio in the early 'seventies had tended to move towards 160, 80 and 2m. A good deal of it still on a.m. at that! The more progressive tried to encourage a bit of ssb on 2m and were soon told "We don't want that there 'ere!" Fixed channel fm was also frowned upon (anti-social, remember!), but with the falling prices of vhf power devices the writing was on the wall. The same people who were the first to moan about the anti-social fixed-channel behaviour soon came up with their "Yes-we-have-no-bananas FT whatevers and Liner Spews". Once again it seems all rigs and modes are banned till you can buy them from Japan.

Should any extra air-space become available, let us try and reserve some for amateur radio, where the rigs will be treated like porno film, ie it is an offence to make them and sell at a profit. The bands we have now sound like CB—every one of them!

S. M. Dyke, G3ROZ

The Editor
Radio Communication
Sir—Reference the letter from G4DAX and "Current Comment" in the November issue of *Radio Communication*.

I have not seen "eye to eye" with many of the policies adopted by the RSGB over the 44 years I have been a member. However, in spite of this, I am a firm believer that if it were not for the RSGB we would not enjoy half the privileges we now have. Without such an organization amateur radio as we know it could be dead within a decade.

Please, therefore, as a token of appreciation of what the RSGB has done for amateur radio, accept the enclosed cheque for £25 to "top up" my life membership.

William James, G6XM

The Editor
Radio Communication
Sir—I would like to take this opportunity to thank those concerned for their help and guidance in overcoming what to me was a helpless situation, I refer to tvi and its shortcomings. Handled in the right way by those who know what to say, who to say it to, and when to say it, it is surprising what can be achieved.

My hope is that those who read this will not give up, but seek the advice that is available to them and to play it cool.

My regards to the Interference Committee.

John Bundock, G4CJQ

Special event station

Stevenage Leisure Centre, 13 February
To mark the official opening of the Stevenage Leisure Centre on 13 February, the Stevenage & D ARS intends to establish a radio link with amateurs in Stevenage's "twin-town" of Engleheim, and to demonstrate the working of an amateur radio station and display other exhibits in the reception area of the Leisure Centre.

Looking ahead

13 March—National FM Convention, Brunel University, Uxbridge, Middlesex. Details in March issue.
25 April—Northern Radio Societies Association Convention, Belle Vue, Manchester.
8-9 May—National VHF/UHF Conference, Brunel University, Uxbridge, Middlesex.
28-30 October—Amateur Radio Retailers Association Exhibition, Granby Halls, Leicester.

Mobile rallies calendar

28 March—White Rose Rally, Lawnswood School, Leeds.
25 April—North Midlands Mobile Rally, Drayton Manor Park, Tamworth. Details from G8DEM QTHR.
23 May—Northern Mobile Rally, Victoria Park Hall, Keighley, Yorkshire.
30 May—Hull DARS Mobile Rally, College of Agriculture, Bishop Burton, Near Beverley. Details from G3AGX QTHR.
13 June—Elvaston Castle Rally, near Derby. Further details from P. Neal, G3WFU.
18 July—Cornish Radio Amateur Club Rally, Cornwall Technical College, Camborne (venue to be confirmed). Details from G3NKE QTHR.
30 July—1 August—National Mobile Rally, Alexandra Palace, London N22.
15 August—Derby & D ARS Rally, Rykneld Schools, Derby. Details from G3FGY QTHR.
29 August—Torbay ARS Rally. (Venue to be arranged).

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 each issue of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 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

Electroniques valve hamband front-end, c/w 1·6MHz osc coil, three 85kHz IFTs, 85kHz bfo coil, data sheet, complete, £15. Tel Bolton (0204) 55549.

Redifon GR286 Mk 2 international unit and private deck, both working on 2m with tx xtals for S20, S22 and R7, tx 10W o/p plus full duplex facility: international unit, 28 xtal-controlled channels plus tunable rx, £50; private deck, seven channels a.m./fm, £20. S. Marsh, 8 Cerise Road, London SE15 5HQ. Tel 01-732 0668.

Panda PR120V table-top 100W tx, cw/a.m. 80 to 10m, £25 ono. G3SMS, QTHR.

KWM2, mains psu, ext vfo, spkr, digital clock, mint. Pair 4CX250Bs with bases and chimneys, £15. 70cm cavity integral 4CX250F and base, £16. 1½in and 2½in CRTs, £5 each. Mains blower for 4CX250, £5. GI3CDF, QTHR. Tel Newtownards 812449.

TE15 gdo, suit G8, brand new, £18. G3HSC morse records, complete course, £3. 144MHz converter, 2-4MHz i.f., £12. Telford bandpass filter, £4. PR40 preselector, £8. All as new. Lafayette HE-40 rx, suit beginner, £10. G8JKA, QTHR. Tel 4094 after 6pm.

144MHz tx, a.m./cw, 100W, £30. 4CX250s, £3. Base chimney units, £3. Two each large blower motor, mint, £5. Meters, basic 1mA fsd, 75p each. Transformer 6V, 5V, 400-0-400, 250mA, £2 each. 10H 250mA chokes, £1 each. G3LTN, QTHR. Tel Banbury 710623.

Cornwall QRA XK39f, modern three-bedroom detached QTH with garage, 660ft asl, 19 countries on 144MHz, 120ft garden, sale includes aerials, fitted carpets etc, £14,950. Quinn, Sanwood, Slipper Hill, Coads Green, Launceston, Cornwall. Tel Coads Green 405.

Liner 2, with mosfet preamp, good cond., £125. G8GAH, QTHR.

Variac, 5A, £10. 8XY/2M crossed polarized aerial plus phasing harness, £13. 22 Glebe Lane, Buckden, Huntingdon, Cambs. Tel Huntingdon 810033.

G2DAF linear, int psu, QY4-400, cabinet 19in by 10in by 13in, £45. Eddystone 898 dial, unused, £10. 1,250–0–1,250 280mA potted, primary 117–234V, £9. 625–350–0–350–625 250mA plus lt, £3.50. Mullard 5–10 amp and preamp on chassis, £4.50. 11 The Oval, Henlow, Beds.

KW Viceroy Mk3, gc, £65. Buyer collect. G4BFB, QTHR.

18AVT/WB, vgc, used only on rare occasions, garden too small for radials, offers. G3BDS, QTHR. Tel Worc 424722.

Eddystone EC10, recently aligned, £40. Buyer collect or arrange carriage. *Wanted:* Case for Eddystone S640 rx. Also 144 to 432 tripler, anything considered, but must be capable of handling 14W input. Salisbury, 28 Dyke Street, Brymbo, Wrexham, Clwyd.

FT401, exc cond, fitted cw filter, set spare valves, £240. Mosley 3-el triband beam 2kW p.e.p., £26. TE-701 bridge, £12. GM3CFS, QTHR. Tel John O'Groats 277.

G-whip multimobile for 10, 15, 20 with 80m coil and whip with base, little used, £20. Hamgear PM2, £4. J-Beam halo, £1. Codar Multiband Six, £10. GW4BIQ, QTHR. Tel Bishopston (044 128) 3245.

Navy com rx 100335, 60kHz to 30MHz with mains psu, vgc, £45. Hewlett Packard 524B freq counter, 220MHz, £45. TF801A vhf sig gen, requires overhaul, £18. LG50 tx, £7. Prefer collect. Tel Biggleswade 313945.

Unstarted kits: G3ZVC ssb tx/rx (XF9B filter) and 12V/6V regulator/audio stage, £60. Eddystone 898 dial, £7. HB dc/dc inverter, 750V, 500V, 350V, 125V, £15. HB 12V/15W modulator, £8. Electroniques hamband front-end, 1·6MHz i.f., £8. 70MHz transistor tx, 12V/10W, four xtals, £12. Tel Harpenden 4905.

Large steel tabernacle, buyer remove, £5. 44 Second World War German army/naval valves, £2. 22 lengths 1in by 3ft 2in Perspex tubing, 10p length. Add postage or collect. G4XF, QTHR. Tel 0634 31772.

Wavemeter Class D No 2, calibration tables, some spare valves, handbook, £10. *Wanted:* Avo 8/9, good cond. G4BLZ, QTHR. Tel Lee-on-Solent 550721.

50ft tower, raising motor and remote control unit, sturdy-made job, bargain at £50, buyer collects. Magnum Six for S-line or KWM-2, offers. Seco aerial tester, £12. Katsumi MC-701 processor, £6. Various USA mobile aerials, Webster Bandspanner, sae details. G3DAM, QTHR.

Trio TR7010 144MHz tx/rx, coverage 144·100–144·299, plus preamp, comp with manual and mobile mount, £165. 5/5 slot-fed J-Beam aerial (144MHz), as new, £5. G4DDE, QTHR.

Trio TS520, bought new in August 1975, still under manufacturer's guarantee, little used, £310 ono. G4DYT, 13 Lynholmes Road, Matlock, Derbys. Tel Alfreton 2134.

FR50B, mint cond, £65, would consider exchange for suitable sstv equip. Microwaves 144MHz converter, 28–30 i.f., £12. Xtals HC25U, 12·1080, two off, £2·50 each. A. Doherty, 16 Crock-Na-Mac Square, Portrush, Co Antrim. Tel Portrush 2716.

Complete Drake station. R-4C, 10–160m, 500Hz, nb. T-4XC, 10–160m. AC-4. L-4B. Spare pair 3-500. W-4 wattmeter. Offers. *Wanted:* E-Type Jaguar, prefer V12, two-plus-two, px, cash adjustment. Hughes, 67 Penlan Crescent, Uplands, Swansea SA2 0RL.

FT101, 10–160m plus fan, Hustler 80m whip with mountings, £300 ono. G3SJW, QTHR. Tel 01-868 6017.

AR88LF, good cond, with spare parts and handbook, £25. Heathkit DX40U and VF1U, £25. Creed 7B with psu and silence cover, £20. DL6EQ rtty terminal unit, assembled pc boards, £5. W1191 wavemeter, spare valves and mains psu, £7.50. GM3SRV, QTHR.

Eddystone 880/2 high-stability rx, 0·5 to 30·5MHz in 30 ranges, handbook and most spare valves, exchange for good hf tx/rx or discuss cash offer. All letters answered. G3ZSL, QTHR.

QRP tx/rx HW7, and ac psu, mint cond, £33 the pair. G4BJZ, QTHR. Tel 021-706 4000.

Pye Cambridge AM1OD, very clean cond, latest rf board on 145MHz single channel, supplied with tx/rx xtals for 145·5, £25. G4BLI, QTHR. Tel 051-722 9538.

Heathkit DX40 tx, property of late amateur. 169 Paulhan Street, Bolton, Lancs. Tel 62520 after 6pm.

Inoue IC700 tx/rx, mosfet front-end, £127. Buyer collects. G3RGC, QTHR. Tel Grimsby 70098 after 6pm.

Microwave Modules a.m./fm tx, xtalled on six channels including 145·00, 145·5 complete with vfo and mic, £36 postage paid. GW3TMP, QTHR. Tel Pontybodkin (035 287) 846.

HW7 QRP tx/rx, with psu, £25. BC221AF with psu, £20. SWR meter, £5. SW717G rx, slight fault, £20. KW traps, as new, £5. *Wanted:* Liner 2, about £100. P. Kelly, 30B Roughdale Avenue, Southdene, Kirkby, Merseyside L32 7QW.

FT220 vhf tx/rx, later model, reliable, £230 ono. Also EC10 Mk1, updated to Mk 2, fm detector, £35 or free with FT220. Tel Bath 29017.

Speech processor, May 72 *Rad Comm* design, self-contained battery, in die-cast box 4¾in by 3¾in, matching mic and calibrator clipping level 0–18dB, Output stereo jack suiting 401 etc, £10. Plessey ICs, new, four each of 610C, 621C, £1 each. 640C, 641C, £1.50 each. Plus postage. G3IZJ, QTHR. Tel 48561.

Trio QR666 rx, as new, £125, or will part exchange for all modes or ssb tx/rx, with cash adjustment either way. G4CHG, QTHR. Tel Cheadle (Staffs) 3798.

Two AM10B Cambridges, one six channel (xtals for 145 and 145·5), one single channel (xtals for 145), exc cond, £30 each. Liner 2, £125 ono. Jaybeam 5λ/8 aerial, £4.50. Buyer collect. G3TIN, QTHR. Tel Bloxwich 403145.

Morse key Hi-Mound HK 708, as new, very little used, plus jack plug, £4.50. G4DLW, QTHR. Tel Thorton-le-Moors 433.

100pF variable capacitors, ball bearings each end, unused, ideal for vfo, £1 for box of four post paid. G2DXK, QTHR.

Liner 2, with preamp, £135. G8AEV a.m. tx with vfo, £25. Heathkit HR10B, 10/80m, factory checked, £35. Unused 144MHz linear (Linear 40), £35. Carriage extra. GM8JFE, QTHR. Tel Hawick 3441.

FT2F xtals: 145·800, 144·800 144·600, £2.50 pair. Eddystone 670C gen cov a.m. rx, £40. *Wanted:* Robust heavy-duty tripod, also microwave components, why? G8FGD, QTHR. Tel 0272 562984.

Eddystone 888A, exc, £65. KW2000C tx/rx, ssb, 80m only, xtal control, fault on tx hence £50. Buyer collects. G3ORU, QTHR. Tel Sheffield 363155.

DX40U 10/80m tx with VF1U 10/160m vfo, both Heathkit, cheap—best genuine offers taken. *Wanted:* KW107 atu, will exchange, why? G3WMP, QTHR.

Heathkit HA-14 linear with mains psu, £100 including 24h Securicor delivery. Collins 455kHz mechanical filter plus 456·5kHz xtal, £12. 100kHz oscillator modules, 5V dc supply, £4. 38,666kHz xtals, £2. All postpaid. P. Smith, 49 Hucknall Avenue, Ashgate, Chesterfield, Derbyshire.

Liner 2, with preamp and psu, good cond, £120. G8KME, 55 Combe Street Lane, Yeovil BA21 3PD. Tel Yeovil 4773.

Hy-Gain TH6DXX, 6el, 10–15–20, never used, £148·75 new, £110. Ham-M rotator, brand new, £112.50 new, £90. Hy-Gain 18AVT, 10–15–20 vertical (in use), £65 new, £42. Remote vfo FV401, as new, £65 new, £42. Prices include Securicor deliveries. G2KG, QTHR. Tel 038-677 320.

SSB exciter/linear amplifier module, ex-eqpt, 1·6–4MHz, A3J/A3H usb, output stage pair BD123, size 5 by 6 by 1·5in, £20. Avel-Lindberg dc/dc converter 24V dc to 750V/350mA, bias, heater, screen supplies etc, for three 6146Bs, £10. All items carriage paid. G3JMJ, QTHR. Tel 073-271 3467.

Mini products 3-el three-band beam, plus AR22 rotator, both little used, £60 the pair. G3YFZ, The Square, Kingswear, South Devon. Tel Kingswear 511 daytime or Kingswear 446 evenings.

High-band Pye PTB25AM, £8. 2007V with xtals for 145·0MHz, £8. Low-band PTB25AM, £7. 2007V, £3. AM25T, £10. Vanguards with carriers but no control units or mics. 10 Hill Top Road, Cheltenham.

Omega noise bridge TE7-01, mint, £9. Radatec, receives signals in G-band, mint, £6. Cetron 572B, unused, £8. Postage extra on all items. G5FH, QTHR. Tel 04252 5974.

Trio JR310 rx, as new, no mods, inc manual, £67. G3YPS, QTHR.

144MHz linear, pair 4CV250Bs, silver-plated lines, easy 400W p.e.p., 1,100W cw, beautiful professional construction, comp with 1·5kV psu, all ready to go, £125. TS500, PS500, VFO5D, superb, new 6146Bs, low-power o/p for transverter, no other mods, £125. Tel Basingstoke 67063.

PR30 rf preselector, £4. RQ10 Q-multiplier, £5. Mains transformer, 12V 9A etc, £6. Bridge rectifier, 75p. R1155 rx plus psu, £5. GM4DQK, QTHR. Tel 031-333 3611.

Yaesu FR50B, FL50B, YO846 hand mic, xtal calibrator, exc cond, £120. Will split. G4DYL, QTHR. Tel Crewe 582027.

Portable Microwave Modules rx, fm plus ssb mods, matching 1W a.m./fm tx, six channels plus PI, £60 ono complete. Solarscope CD711S, dual beam, long-persistence screen, £15. G3XTQ, 5 Station Road, Sandy, Beds. Tel 81740.

Cossor CR100 (B28) rx, 60kHz to 30MHz, with circuit, instructions for "hotting up", some spare valves, £12. Tel Lancing 65449.

Microwave Modules a.m. tx and rx, £40 the pair. Heath IB102 175MHz freq scaler, £25. G8EYY, QTHR.

Pye Vanguard, tunable on 144MHz, with control box and psu (half built), for this reason asking only £25 ono. HRO coil packs, £1.75 each. Two Pye Rangers half converted to 144MHz, £8. Many components. Little Hickmans, Fordcombe, Tunbridge Wells. Tel Fordcombe 312.

Complete 144MHz station. Vanguard AM25B, tx ok, £15. CR100, manual, working but needs attn, £10. G4BBP converter, 28–30, £8. Three xtals 145·8, 145·46, 145·92, £3. 12V h/duty battery, £8. £40 the lot or sell separately. GM4DQK, QTHR. Tel 031-333 3611.

Splendid brass GPO type morse key by Muirhead, circa 1915, £20. Two 811As, new, boxed, £4 each. Jap dynamic mic DM501, as new, boxed, £4. Xtal mic on stand D104, £4. G3AO, QTHR. Tel Chinley 639 (anytime).

Heathkit spectrum analyser model SB-620 in exc cond, £65 ono. Minibeam HQ1 hybrid quad aerial for 20/15/10m, works well but slightly damaged although repairable, £30 bargain, no offers. Tel Camberley (0276) 21702 evenings.

RTTY Creed teleprinter equipment. 7B teleprinter, complete but needs check-over. 7PN/4 tape perforator (GPO perf 45), almost new cond. Teleprinter desk (80-0-80 psu built in). Would trade for Hornby (two rail) 00 gauge model railway or why? SAE all enquiries. G8EPI, QTHR.

Standard C140, 144MHz fm mobile tx/rx, with CV110 vfo, Bantex 5λ/8 magnetic mount whip, fitted six channels, c/w mic and mobile mount, £140 ono. Buyer collects. G4AQK, QTHR. Tel Wroughton 813466.

Car needs tax and tyres, so selling TW Phase 2 transverter, £50. Microwave Modules converters, 70, 144 and 432MHz, 28MHz o/p, smart case and psu, £45. Eddystone 888A, £55. All good cond, carriage extra or could deliver. G4BMM, QTHR. Tel Luton 35617.

ICOM IC-22 tx/rx, 12 months old, nine channels, 48, 50, S20–24, LO, SN, unmodified and complete original accessories, £125, or exchange Liner 2, 144·1–34, sensible mods only. Wickstead, G8IXB, QTHR. Tel Maidenhead 26010 evenings.

KW lpf, 75Ω, £10–50. Heathkit manuals GR-78 rx SW717G rx, £1 each. 1943 edition *Amateur Radio Handbook,* offers. USAF radar circuit analysis handbook, £1.50. *Wanted:* Codar AT5 and/or T28. GI3YMT, QTHR. Tel Belfast 644688.

Eddystone 840C gen cov rx, mint, £48. Heathkit SW717 gen cov rx with manual, £20. Lowe 144MHz monitor rx, channels GB3LO, 145·00, S21, S22, £26. Cash only, buyer collects. G8JQX, QTHR. Tel 01-648 6117.

Yaesu Sigmasizer 200/80, modified 25kHz-spaced fm, 80-channel tx/rx, 10W output, with mic and mobile mounting bracket, exc cond, £160 ono. P. Valteris, 1 Grove Cottage, Chetnole, nr Sherborne, Dorset DT9 6PB.

BC221 frequency meter, stab psu, with cal, charts, £20. Buyer collects. Codar PR30X rf preselector, £5. Tel Bristol 772804.

Airborne fm tx, 15W 156MHz, transistor inverter, £5. Philips battery mono cassette deck, unused, £4. Belling L1821 four-line mains filter, 250V 6A, 100dB atten 50kHz to 10GHz, £7. Marconi TF1102 amplitude modulator, £7. Printed circuit motors, 20V dc nominal, high torque with variable speed, low inertia 140mm dia by 56mm, shaft 12mm dia, weight 7·5lb, £3.50, postage £1. Mains radio interference filters, single line, 250V ac 10A, £1.50 pair, postage 50p. SAE list. G3YLQ, QTHR. Tel Luton 25595.

Liner 2, new April 1975, little used, fitted PA3 preamp, otherwise untouched and unmodded complete with two power leads, mobile mount, handbook, spare bulbs and fuse, original packing, £135. Carriage extra. G8GTP, QTHR. Tel 061-766 6269.

Heathkit HD-10 keyer, £15. CT54 vvm, £10. Marconi bridge, £18. 13A scope, £18. 144MHz mosfet converter, £10. Homebrew 144MHz, tx, £16. Selmer rhythm box, £45. TW communicator 144MHz tx/rx, £40. Qty *SW Magazines, Rad Comms, QSTs.* Offers. G4CRM, QTHR. Tel Waterlooville 52442.

Hammarlund HX-50 ssb/a.m./cw vfo tx, 80-10m, 230W p.e.p., sked on 80m anytime, £100 ono. B2 tx, offers. G3MSV, QTHR. Tel Kentisbeare 426.

FRDX400S, 160m–2m, Trio spkr, new valves, £180. *Wanted:* Telford TC7 Mk 2 rx. Bell-shaped rotator. High-band radiotelephone for conversion to 144MHz. Microwave modules 144MHz converter, 28–30MHz i.f. Falkner, 22 Queensway, Wellingborough, Northants. Tel 0933 226761.

Westminster W15AM, working on 145, manual, £30 collected. F2F xtals for 144·40/·48/·60/·80, £2.50 per pair. Also one pair Cambridge 10D for 70·26, G3TFN, QTHR. Tel 061-761 2952.

FRDX400, complete with 144MHz and 50MHz converters, cw and wideband a.m. filters, fm unit, notch filter etc, selling due to purchase of FR101, immac cond, numerous spare new valves and Securicor delivery included, £159. G4BVH, QTHR. Tel Brighton 504634.

JR310, cal, full 28–30, top band, vgc, £65. Vanguard hi-band complete, tx working 144MHz, £10. U10B, xtalled working 433·2MHz, complete, £35. *Wanted:* PF1 tx strip. 432MHz beam. RX nicad for PF1. Telford TC7. Liner 2. G8GHZ, QTHR. Tel Northampton 61794.

Liner 2, PA3 preamp, manual etc, exc, £125. R115E Liner mains psu, £14. Xtals HC6/U 38·6667MHz, 1·00000MHz, £1.50. 8·018, 8·021, 8·047, 75p. Yaesu type mic plugs or sockets, 75p. *Wanted:* Storno control box 144MHz QRO linear. G8FIH, QTHR. Tel 01-841 6425.

TW 144MHz Communicator with spkr and cables, £25 ono. Prefer buyer collects. Also unused QY3-125, offers over £3. G8ML, QTHR. Tel 0242 56094.

FT401, as new, £200. Samson ETM2b-S electronic keyer, £30. Sykes, Windrush, Oakley Road, Cheltenham. Tel Glos 59935.

Liner 2, PA3 mic, cables, mobile mount, R112 ac psu, £130 or sensible offer. GW8GAV, QTHR.

Trio TR-7200G, only three months old, 13 xtal channels fitted: R5, R6, R7, reverse R5, RR6, RR7, S20 to S24, 144·48, 145·0 complete with accessories, boxed as new, £165. G4DPT, 76 Clevelands Avenue, Cheltenham, Glos GL50 4PS. Tel Cheltenham 38942.

Brandenburg 250V stab PSUs. Creed 25 Mk4 eight-hole tape punches. Valve set for 62 set, and some other parts. 5CP1 tube. 807, EL38, 6AQ5 valves. QY3-125 bases (and others). Octal line skts. Lots more junk, sae enquiries. G4BUO, QTHR.

DC200 psu, £40. Europa 70MHz, £60. Both items used few hours portable, as brand new, free 70MHz 4-el Jaybeam with Europa or will exchange 144MHz fm gear, why? G3UHH, QTHR. Tel Watton 238 after 10pm.

Steel tower, lattice, self supporting, 23–31ft, includes base and hardware, £25. Buyer collects. G5BFO, QTHR. Tel 01-205 2784.

Little-used FT101 Mk2, FV101, FP101, no mods, sensible offers invited for complete rig. G3ZSQ, QTHR. Tel (0274) 598433.

Unused 6146s, £1.25 postpaid. For callers only—Anglian tx/rx 10–160m, all xtals, TT21 pa, £160. AR88D with S-meter and ext fm conv, £65. 144MHz gear—F27AM, £40. AM10D with ext vfo, £30. Many other items. G2PU, QTHR. Tel 0223 870454.

TW Twomobile transistor rx, 144–146MHz, plus mains psu, £16. Midland swr and field strength meter, £3.20. 27 Old Manor Way, Cosham, Hants.

18AVT, 80m section needs cleaning, otherwise perfect, nearest offer to £35 secures. G3NDO, QTHR. Tel 07016 5121.

KW Valiant, 160–10m, 60W, with most parts necessary for psu, £25. G3YIS, QTHR. Tel 01-697 2136.

Marconi 2500 rx and rf drive unit, 2–24MHz double conversion, i.f. strip separate, permeability tuned, 1,820kHz and 110kHz with circuits, will separate, £9 each, or £16.50 pair. Redfern, 24 St Brides View, Roch, Haverfordwest, Dyfed. Tel Camrose 544.

Barlow-Wadley XCR30 rx, remarkable performance, £100. J. Alis, 7 Hillside Avenue, Wembley, Middx.

Redifon GR286 International rt, 10W fm output, 28 channels, xtalled and working S20, other frequencies available, complete in 19in case, mic, new 6-el 75Ω Jaybeam with mast, immac cond throughout, £40. Tel 01-733 3995 after 6pm.

Hallicrafters FPM/300 Mk2. Safari tx/rx. Save over £100 on list price, 8–10m, built-in psu (mains and 12V), **nearest £325.** Fan, manual, mobile mounting kit with dc lead. G3PLI, QTHR. Tel Bradford (0274) 29692 day, or Bingley (09766) 5218 evenings.

70cm tx, 100W + inc audio/video mod, £100. 2 by 26in Philips colour rx, £50 each. 2m trans'vr Heathkit, £40. Creed 75 teleprinter and decoder 8-punch tape unit, £100. Pye remote pan/tilt unit, £50. What offers. Tel 01-352 1412.

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FM sig gen TF955, TF1066 or similar. Radford low-distortion meter. Attenuator TF1073B. Modern precision audio oscillator. TF868B universal bridge. Xtal voltmeter. Fletcher, 62 Moorbridge Lane, Stapleford, Nottingham. Tel 0602 397446.

FL50B tx, in good cond, will collect. All offers acknowledged. R. J. Wallace, 26 Broadheath Drive, Chislehurst, Kent. Tel 01-467 9033.

TW Communicator. G4CNB, QTHR. Tel 0621 782388.

Alternator, any voltage, 50Hz, 1 or 2kVA, faulty or good, state price or exchange requirements. Unwin, 91 High Street, Long Buckby, Northampton.

Reasonably modern adf or vor ex-aircraft RXs. Cash and will collect, please reverse charge. Tel 0432 6280 daytime.

Exchange FT2F, 11 channels, for 144MHz hand-held. Also exchange Liner 2 with preamp, very little use, no mods, for FT75 DC. Circuits Siemens FUHEU, FUHEB. G3VVB, QTHR. Tel Slough 28014.

KW2000A, 2000B, HW100, HW101 or SB101 urgently required. G3MYX ,QTHR. Tel 0303 57991.

"Ham Radio Antenna" (possibly not exact title) by H. Stanley, published price offered. H. Stephens, 46 Burgh Old Road, Skegness, Lincs.

Accommodation in or around Wandsworth, London, area. Young man, 18, working in Wandsworth from January 1976 requires lodgings as soon as possible. Any offers to G8HAY, 39 Cross Street, Wombwell, Barnsley, South Yorkshire S73 0LJ.

KW2000 with ac psu and preferably dc psu also, or Atlas 180 tx/rx complete. Must be in A1 cond. G3HBZ, QTHR. Tel Sunbury-on-Thames 82262.

Gen cov rx, CR100, AR88LF or similar, good cond for novice RSGB member. J. Penzer, "Sea Cot", Canal Foot, Ulverston, Cumbria. Tel Ulverston 54073.

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Cards for valve tester Mullard E7600 from 400 upwards. Digital frequency meter. *For sale:* Grampian mono amp, pair EL84s, needs output transformer, £4. Various transformers. Record player, £5. D. A. Griggs, 5 Collingwood Avenue, Muswell Hill, London N10. Tel 01-883 3474.

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KW Valiant psu and 500V 500mA mains transformer. *For sale: Radio Communication Handbook,* £2.75. B. Lewis, 10 Filey Road, St Annes-on-Sea, FY8 3EZ. Tel St Annes 722652.

Early and old pre-war radios, components, valves, books, especially telegraphy and telephony, history of telegraphy and telephony. Wireless magazines, *Radio Press, Wireless Press, Valve Car Radios,* pre-1932 *Wireless Worlds,* bound. C. Sawyer, 210 Gordon Avenue, Camberley, Surrey. Tel Camberley (0276) 29460.

KW107 or KW109. Shure 444 mic. Fergus. Tel Stoke (0782) 29798 (office) or 617106 (home).

Buy or borrow manual or full photostat copy of Mohican. Postage paid. *For sale:* Manuals Eddystone 640, National HRO. F. Powell, 13 Wykeham Street, Scarborough, North Yorkshire YO12 7SA.

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R206 rx, preferably in good cond. Nigel Roberts, "Westwold", Burrows Lane, Prescot, Merseyside L34 6JW. Tel 051-426 6145.

Wanted dead or alive! HMV dog, answers to name of "Nipper". Also Voight corner horn, very old spkrs, tx/rx (especially spark), valves, components, wireless books, magazines, catalogues for National Wireless Museum. Collection arranged. Byrne, Alverstone Manor Hotel, Shanklin. Tel Shanklin 2586.

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Handbook and circuit diagrams for AR88D, Codar AT5, KW160. Details of PW-frame aerial. All to buy or borrow. G4BKM, QTHR. Tel 01-568 8497 daytime or 01-892 7641 evenings.

G2DAF rx, pref Mk2. Dummy load 50Ω. Elec keyer. AT5. Details to M. J. Cooke, 76 Falcon Road West, Norwich NR7 8NY.

Early Dowsett handbook for wireless telegraphists. Also mint HW7. GM2HFV, QTHR.

Manual and circuit diagram for the S32A Serviscope. A. J. Humphriss, 14 Fosseway Crescent, Tredington, nr Shipston-on-Stour, Warwickshire CV36 4NX.

Tx/rx: Yaesu FTDX401, FTDX560, KW2000A, KW2000E plus ac psu, must be in good cond. Also diagram for TCS rx. Tel 061-437 7899. G3YJF, QTHR.

Books and advice on Hall-effect devices and their various uses or titles of books, authors and publishers. Mullard high speed valve tester, complete with cards, instructions etc, or other make. H. H. Seymour, 74 Harold Estate, Pages Walk, London SE1 4HW.

Liner 2 ssb tx/rx, must be in very good cond, no mods. Matching R115E psu also reqd. Write giving details to GI8IFP, QTHR.

CR100/2 manual. Advice on simple roof-top aerial and type of headphones required by beginner. Details and price to E. G. Bergius, Fearnoch, Kilfinan, Argyll PA21 2EP.

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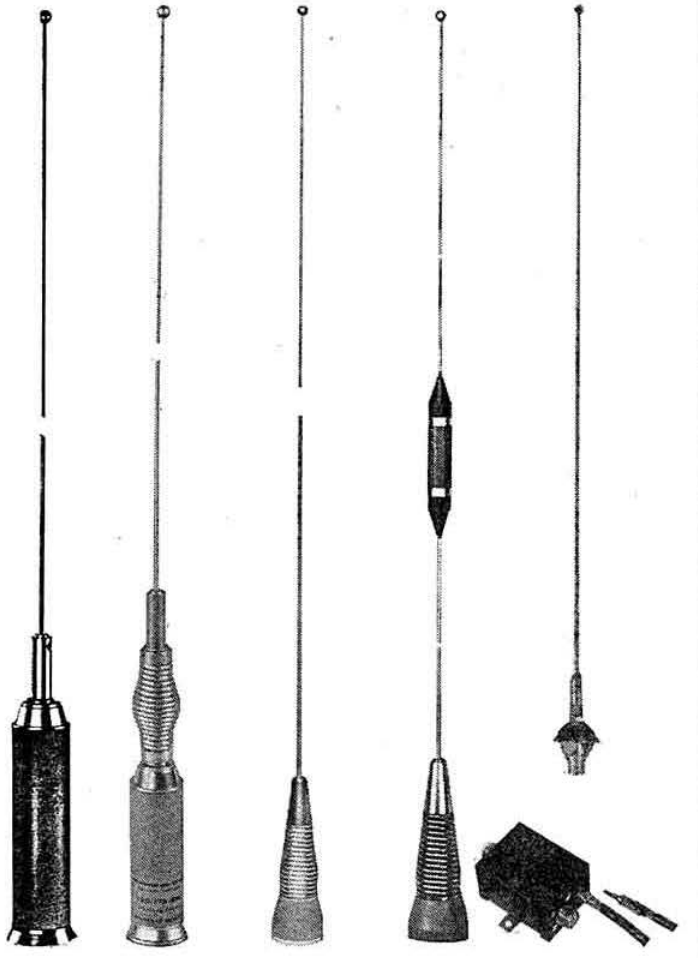

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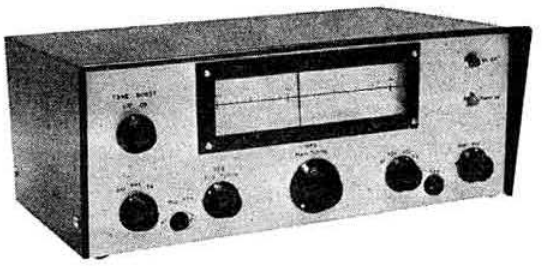

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Selected FETs give a noise figure of —3·5dB and a gain of 18dB. Size: 2½" × 1½" × 4". This unit is also available on other frequencies, e.g. 400MHz region for satellite or radio astronomy use, for which it was originally developed. Price: **£11.25**—ex-stock.

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This unit has been produced to satisfy the constant demand for a compact matching unit to meet the critical load requirement of the modern P.A. Receivers are also becoming more sensitive to aerial matching and our Z match can of course be used to match the aerial to your receiver. The units have been tested at 2KW CW output power into a Bird Termaline Wattmeter/Dummy load. The aerial connections can be used with balanced or unbalanced feeders and the connectors are screw terminals for wire aerials AND SO239s for co-ax fed aerials. Price is only **£29.50.**

All prices include 25% VAT and delivery. 12 months guarantee on all units. We offer same day COD (£50 limit) ACCESS, BARCLAYCARD, H.P. or C.W.O.
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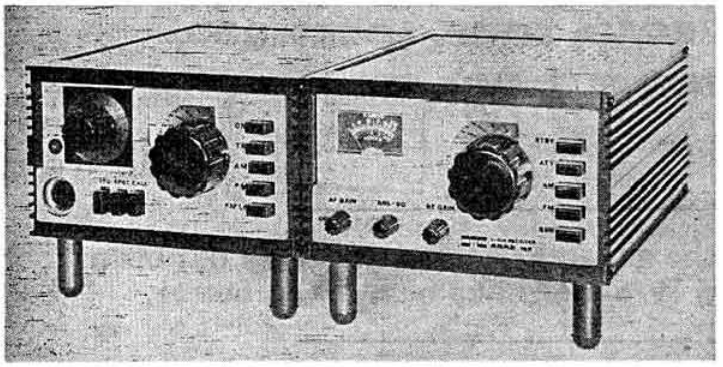

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Planet Speech Processer ★ ★ ★	£35.00	,, 50p
Tech. Associates Audio Filter ★ ★	£32.50	,, 50p
Tech. Associates Speech Compresser ★	£28.12	,, 50p
Drake Low Pass Filter ★ ★ ★ ★	£15.00	,, 50p
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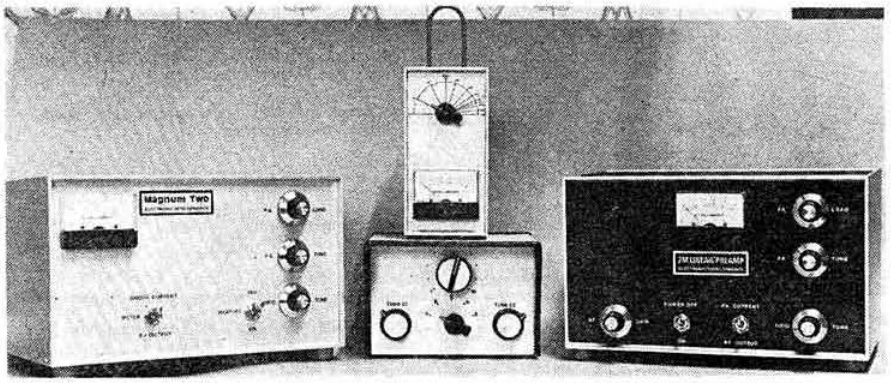

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SWAN 500 Transceiver	£320
YAESU FL2100B Linear	£210
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PANDA PR20 Tx (Buyer collects)	£25
EDDYSTONE 730/6 Rx	£135
SWAN 300B with dc psu	£300
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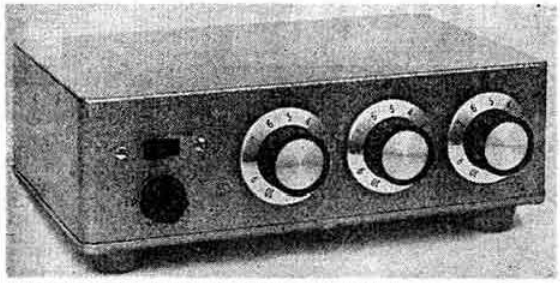

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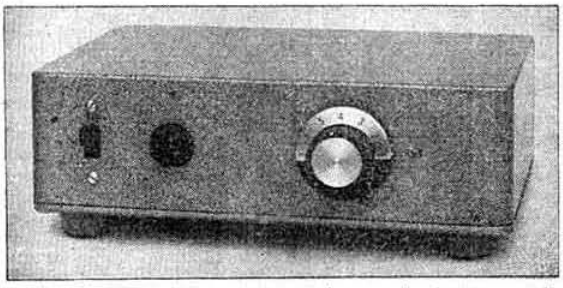
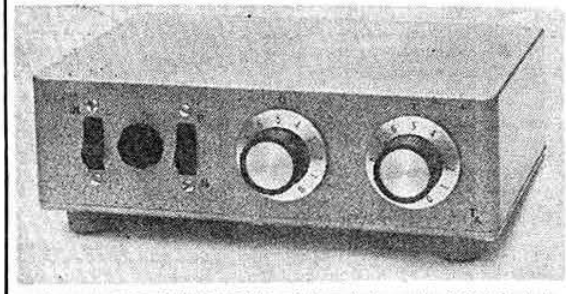


R.X. AUDIO FILTER ★ 9 integrated circuits ★ covers ssb and cw in one unit ★ built in loudspeaker amplifier ★ headphone socket ★ 8 positions of filter ★ high pass—2·5kHz-2·00kHz-1·5kHz-200Hz-180Hz-110Hz-80Hz ★ no mods to equipment, goes between rx and loudspeaker ★ bypass switch allows unit to be left in circuit ★ makes the superb rx better and the poorest rx superb ★ runs from internal PP9 type battery ★ no ringing when in circuit ★ your rx volume control controls the audio o/p of the filter. **£26.00 + VAT.**



R.X. PEAK & NOTCH FILTER This unit clears that annoying Q.R.M. ★ simple to use ★ goes between RX and loudspeaker ★ built in loudspeaker amp ★ headphone socket ★ bypass switch ★ can be tuned from front panel either H.F. or L.F. to clear the Q.R.M. ★ can be used in series with our famous bandpass filter ★ a real aid to todays crowded bands ★ all integrated circuits ★ runs from internal PP9 battery. Don't put up with Q.R.M. Notch it out! **£26.00 + VAT.**

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For 70cms we carry SB8 (433·2) and RB14 (GB3PY) and will bring RB10 into stock as soon as it is approved by the H.O. These are stocked for Pye Pocketfone PF1, UHF Cambridge U10B, UHF Westminster W15U, UHF Base Stn. U450 and Storno CQL/CQM 662.

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Tx	12·0833	12·1000	12·1250	12·1271	12·1292	12·1313	12·1333	12·1500
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Rx	14·9222	14·9444	14·9778	14·9806	14·9833	14·9861	14·9889	15·0111
Rx	44·7667	44·8333	44·9333	44·9417	44·9500	44·9583	44·9667	45·0333
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It sounds fantastic but its true, with Model FL1 in circuit you can simply forget about heterodyne interference (audio whistles). In its automatic notch mode the filter will automatically locate and remove an interfering whistle in your receiver's audio output, usually in less than one second. No more fiddling with manual notch filters, the advanced Datong circuitry does it faster and better and automatically.
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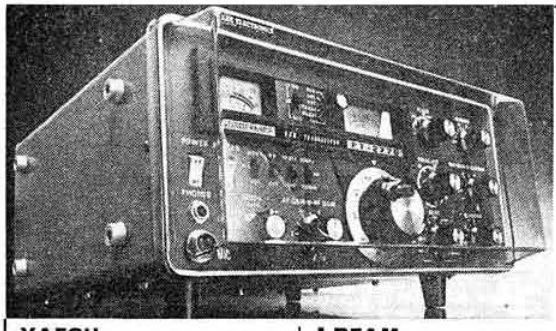

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