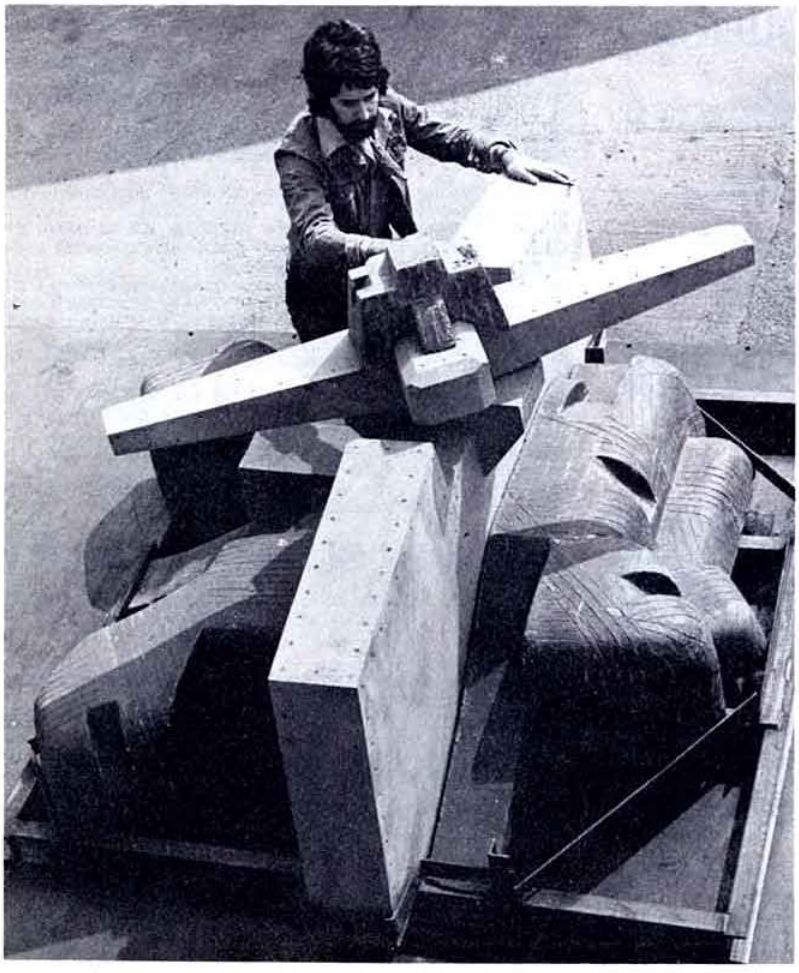
October 1976

radio communication

journal of the Radio Society of Great Britain

UNUSUAL MONUMENT FOR FLAT HOLM ISLAND



The sculpture on its lifting frame before take-off

To commemorate the first transmission of wireless signals over water, achieved by Marconi between Lavernock Point and Flat Holm Island in 1897, the unusual sculpture shown here was lifted to the island by an RAF Wessex helicopter on 27 August. The project was instigated by Barry College of Further Education and the Flat Holm Society.

Weighing 2,600lbs and measuring 4 by 7ft, the sculpture, by Tom Bird, recently won a national competition and will be permanently based on the island at the point where Marconi's station was set up. Its upper section, with a Marconi-like technological theme, represents a battleship's radar fighting top, and the base is patterned on defence installations of the first world war. Flat Holm Island has been a strategic defence point since the 19th century and is now a nature reserve.

A ceremony held prior to the airlift at the BP Sully Sports Club, Penarth—from whose playing field the helicopter took off—was attended by Mr Cyril Parsons, GW8NP, Immediate Past-President of the RSGB. During the airlift the Barry College of Further Education RS, in conjunction with the Gwent TV Group, sent the first television signals from the island.

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)
1115	3·6	G3LEQ, Knutsford (NW England)
1130	3·6	GM3EHI, Bellshill, Lanarkshire (S Scotland)
1200	3·6	GM3HGA, Aberdeen (NE Scotland)

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

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CONTENTS

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ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

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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 (ADVERTISING ONLY).

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STANDARDS

superb "3-in-one" Transceiver

YOU CAN

1 "Stick it up your jumper" (or put it in your pocket).
2 Fit it into a mini-mini car (and yet it's still easy to service).
3 Use it as a base station. EITHER WAY

for the serious FM repeater operator—there's no other choice —the STANDARD C828

(Price **£151.88** inc. VAT & 10 channels)

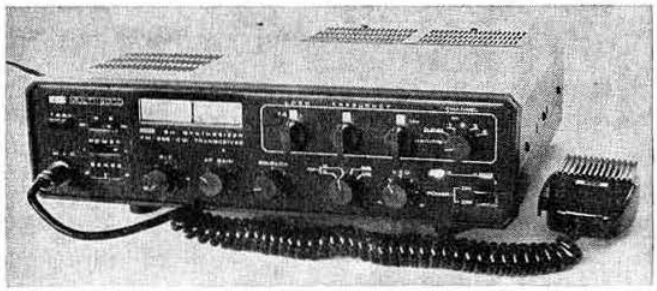
ADD A NEW DIMENSION TO YOUR HOBBY WITH SSTV

THE HAMVISION

SS-727M Monitor **£405.00**
SS-727C Camera **£303.75**
OR
SS-303M Monitor **£236.25**

is all you require to send and receive SSTV pictures when connected to your SSB transmitter (prices include VAT and carriage)

HERE IS ONE BARGAIN YOU SHOULDN'T MISS



THE FDK MULTI-2000

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

* Full cover 144-6MHz.
* VXO gives 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 **£365.62** inc. carr. (Securicor) and VAT

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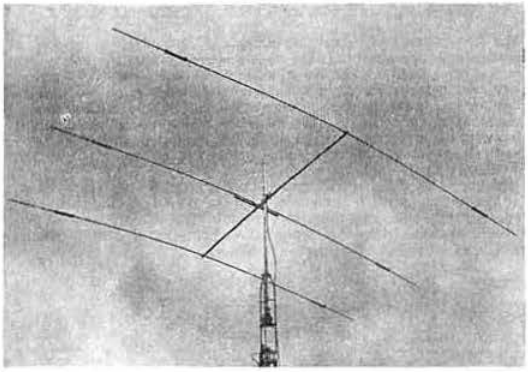
Radiate.... with WESTERN ANTENNAS

THE FIRST OF A PENETRATING RANGE OF ANTENNAS



THE 'WESTERN' PENETRATOR

DX-33 for 10-15-20m

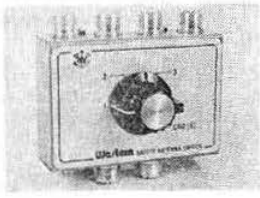
(Illustrated left) **£73.15 (inc. VAT & carr.)**

- ★ 3 elements on each band
- ★ Heavy duty 2kW rated
- ★ Gain up to 8dB
- ★ Broadband operation
- ★ Stainless steel hardware
- ★ SWR less than 1·3:1

YET ANOTHER 'WESTERN' PRODUCT WITH QUALITY UP AND SAVE £22

NEW 5-WAY ANTENNA SWITCH

- ★ Handles 1·2kW
- ★ Earths antennas not in use
- ★ Fitted Yaesu-style knob
- ★ Mounting holes for wall or equipment, £8.55 (inc. VAT/P & P)



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BN86 1:1 ferrite Balun	£13.50	TH3JNR 10–20m 3 ele	£122.62
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153BA 15m 3 element	£67.50	TH6DXX 10–20m 6 ele total	£168.75
203BA 20m 3 element	£123.75	DB1015A 10–15m 3 ele	£99.00
204BA 20m 4 element	£151.87	LC80Q 80m coil for 18V	£14.62
402BA 40m 2 element	£180.00	LA1 Lightning arrestor gas	£18.90
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14AVQ 10–40m Trap Vert.	£56.25		
18AVT/WB 10–80m Vert.	£82.12		
TH2MKIII 10–20m 2 ele	£119.25		

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D5	£12.26	D8/70cm	£13.83
D8	£16.20	PBM18/70	£16.59
5XY/2m	£12.71	MBM48/70	£18.22
8XY/2m	£15.63	MBM88/70	£24.02
10XY/2m	£21.09	12XY/70	£24.64
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8Y/2m	£0.00	PMH2/70	£5.23
10Y/2m	£16.65	PMH4/70	£10.23
Q4/2m	£12.93	PMH2/2m	£6.13
Q6/2m	£16.87	PNH2/c	£4.61
PBM10/2m	£19.57	PMH4/2m	£13.50
PBM14/2m	£24.75		

MOSLEY (prices inc. carr./VAT)

TA31 Jnr. 10–20m. Dipole. 300W. AM	£32.62
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Mustang. 10–20m. 3 ele. 1kW. AM..	£95.06

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and see what's up our sleeve for you!

NEWTRONICS BARGAIN. Still at the old price!

4BTV + RM80S. 1kW 10–80m self supporting vertical £63.00

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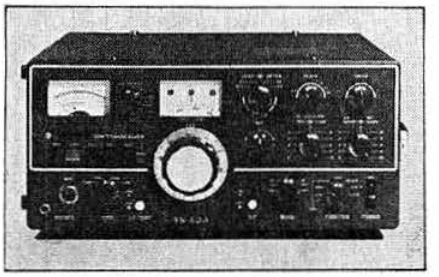
SHOWCASE 1976

Full 2 metre coverage using VFO or crystal control. All modes FM, USB, LSB, CW, AM. Mains or 12Vdc operation. Simplex, repeater and reverse repeater use without retuning—ask us what that means. 15 W TX output. 0·25 microvolt sensitivity. European standard selectivity. TRIO exclusive tuning fork access generator.
We are often asked "Why is it better than brand X?". There are many reasons, but they all stem from the basic excellence of TRIO design. The transmitter sounds better than all the others because of the high voltage supply to the driver and PA—even when operating from 12 Volts. The operator can use repeater or reverse repeater without having to touch the main tuning dial. The tone burst is automatic and operates in the repeater modes only. So many more features but you need to see for yourself. Ask us for details right now, all it costs is 30p in stamps for the full catalogue.
TRIO design and inherent quality are outstanding in this equipment and the TS700G has become the standard by which other transceivers are judged.

TS 700G
£382.50 inc. VAT



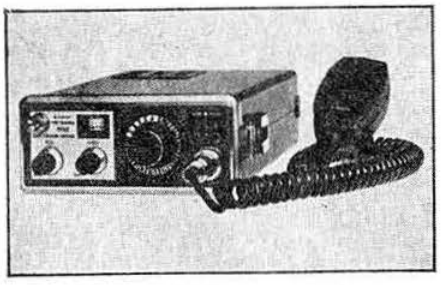
The TS 520 is another outstanding example of TRIO design excellence. It produces one of the best sounding signals on the air—just listen for yourself on any band. The TS 520 covers all bands 80-10 metres and even 2 metres using the matching TV 502 transverter. It has all the features of equipment costing a good deal more at no extra cost—AC/12 Volt operation, speech compression, 1kHz readout, VOX, calibrator, blower cooled PA using real transmitting valves, 4 function metering, etc., etc. A full range of matching units allows you to build up a station which is second to none: VFO 520, SP 520, TV 502.
Why not send for details today and find out what TRIO design is all about, or just call on us either at Matlock or one of our branches to try out the superb TS 520 system for yourself. You are in for a pleasant surprise, particularly when you realise that its nearest competitor is a much older design and costs £100 or so more than the TS 520.

TS 520
£378.00 inc. VAT

LEICESTER 1976
5th NATIONAL AMATEUR RADIO EXHIBITION
EXHIBITOR

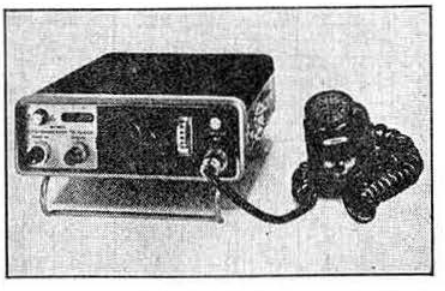
TR 2200GX
£117.00 inc. VAT

Following on the most successful handy portable line ever produced, the TR 2200GX leads the field once again. Higher performance all round with better selectivity from the receiver which is now fitted with additional crystal filters at 10.7MHz. Higher power from the transmitter at 2 Watts (optional reduction to 400 mW) and new styling to match the TR 3200 UHF transceiver. Detachable ¼ wave antenna with optional flexible heli-whip available. VFO facility for addition of external VFO30G.
Supplied complete with all accessories as the TR 3200 and factory fitted with crystals for S20, S22 and R7. Extra channels are available at a VAT inclusive price of £4.80 per channel. There is a super mobile mounting bracket available for only £9 including VAT. This is the MBIA. The same bracket will hold any of the earlier TR 2200 series and also the TR 3200. See the GX at one of our branches soon.



TR 7200G
£162.00 inc. VAT

The TR 7200G has set all 2 metre operators talking about its outstanding performance on both transmit and receive. Not only is it the best engineered transceiver on the market, but it's also the most sensitive at 0·3μV for 15dB quieting and has the cleanest transmitted signal both in and out of band (some economy transceivers simply lack the interstage filtering to ensure that the owner is not put off the air by the Home Office). Minimum TX output power of 10 Watts (normally 15 Watts when mobile) will give you the extra quiet signal into your repeater. The TRIO exclusive tuning fork access tone generator ensures repeater access first time every time even when the inside of the car is at elevated temperatures. Supplied complete with microphone, mobile mount, power lead and spare fuse, the TR 7200G also has factory fitted crystals for S20, S21, S22, R6 and R7. If ordered at the same time as the rig, we will fit three extra channels for £10 including VAT (normally £14.40) or six extra channels for £20 including VAT (normally £28.80).



SHOWCASE 1976

The newest FM handy transceiver from the TRIO range of top quality rigs for the discriminating amateur operator. Superb performance on the 70cm band, opening up new horizons for the repeater operator. 12 channel capability in the range 432–436MHz with three channels fitted (SU8, SU18, SU20). Transmitter output switched 2W/400mW and incorporating the TRIO 1750Hz tuning fork access tone generator. ¾-wave detachable antenna for high gain performance on both transmit and receive.

Supplied complete with microphone, carrying case and shoulder strap, battery charger (for optional Nicad pack) and backed by the finest service in Europe.

Also available is the quick release mobile mount MB1 for using the TR3200 in your car.

TR 3200
£148.50 inc. VAT

Following the worldwide success of the TS 700, TRIO have taken the TS 700 basic design and packaged it for 2 metres SSB mobile use.

The TR 7010 sets new standards in receiver sensitivity and low spurious emission on transit. Operating CW and SSB from 144·1–144·335MHz, the TR 7010 covers CW SSB and beacon activity, 48 5kHz channels plus VXO and RIT provide continuous coverage.

Single conversion using an IF of 10·7MHz with a superb crystal filter provides outstanding selectivity. Wide range amplified AGC and newly developed FET devices in RF amplifier and mixer stages allow maximum sensitivity to be used with freedom from overload due to adjacent signals. Single conversion transmitter with fully balanced mixer system generates a beautifully clean signal with crisp audio quality.

TR 7010
Leicester Special £160.00 inc. VAT

LEICESTER 1976

EXHIBITOR

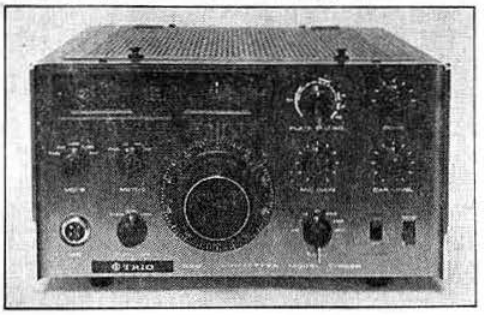
TO ALL MY FRIENDS IN THE TRADE

"FANG YOU VERY MUCH" JOHN

T 599S
Leicester Special £255.00 inc. VAT

Completely solid state except for the driver and two 6146B fan cooled PA tubes, (for that low intermod signal that means real quality), the T599S has all that you could want. All mode operation SSB, CW, AM on all bands from 80 metres to 10 metres. Built-in VOX with adjustable delay and anti-VOX. Multi position metering for complete operator information. Break-in CW with built-in sidetone generator. Dual impedance microphone input system—and of course, TRIO quality of construction with a die cast front panel and rugged casing.

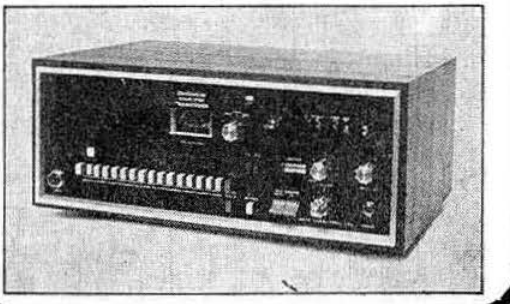
Signal quality. Guaranteed by TRIO's acknowledged leadership in the audio field; by the use of an 8 pole crystal filter; by the use of linear PA tubes and by the use of an amplified ALC system which gives signal punch without sacrificing signal quality. Measuring only 10½" × 5¼" × 12" and weighing only 25lbs, the T 599S is a real mighty mouse.



BELCOM
FS 1007P

The home station FM transceiver with everything. ★ Mains or 12V operation ★ 16 channel scanning ★ channel skipping facility ★ priority channel with front panel crystal sockets ★ manual or auto scan ★ switched high/low power ★ switched wide/narrow deviation ★ S meter ★ RF output meter ★ centre zero tuning meter ★ RX fine tuning control ★ built-in SWR bridge ★ built-in digital clock with alarm and auto switch on ★ built-in loudspeaker ★ 10W TX ★ 0·3μV sensitivity ★ superb styling and finish

A SPECIAL, SPECIAL PRICE FOR LEICESTER
SAVE UP TO £50



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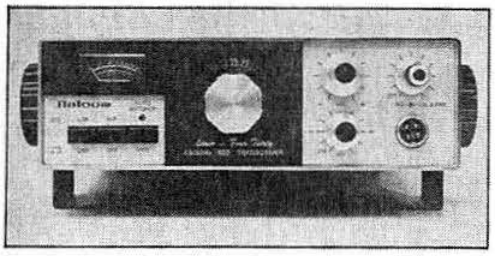
LOWECASE 1976

BELCOM
LINER 430



Two steps ahead comes the Liner 430. Already being used by us to make mobile contacts with the U.S.A., the Liner 430 opens up a whole new dimension of long distance contacts via the OSCAR satellites.

Covering two 480kHz bands in 20kHz steps and using the exclusive Belcom Auto watch system which detects the presence of a signal anywhere within VXO range without tuning. No more missing signals, and worn out fingers from control twiddling.

10 Watts output. Selectable USB/LSB/CW operation. Dual conversion using 50MHz and 7·8MHz IF's results in excellent image rejection and high sensitivity.

Truly a new dimension in amateur radio from the Liner 430.

LINER 430, £290 inc. VAT

OUR LONG SUFFERING AGENTS

Our agents are constantly amazed when someone walks into their premises and says "Fancy Lowe Electronics having a branch here, it's about time". This occurs, naturally, after the branch has been in operation for at least a year with wide publicity in our adverts.

So that there is no confusion in the future, we have full time branches in the following places:

LONDON Run by **Peter Burton, G3ZPB** at Communications House, 20 Wallington Square, Wallington, Surrey. Tel. 01-669 6700

BIRMINGHAM Run by **Peter Ward, G3XWX** at Soho House, 362–364 Soho Road, Handsworth, Birmingham. Tel. 021-554 0708

LEEDS Run by **Tom Beaumont, G4DVZ** at 27 Cookridge Street, Leeds. Tel. 0532-452657

In addition to the full time shops listed above, we also have patient part time agents who give up their evenings and weekends in order to show interested amateurs the latest expensive goodies. My heartfelt thanks to the wives who see a constant stream of visitors taking up their home life. The stalwarts in question are:

Alan GW3YSA, 35 Pen-Y-Waun, Efail Isaf, near Pontypridd.
Tel. Newtown Llantwit 3809

John G3JYG, 16 Harvard Road, Ringmer, Lewes, Sussex.
Tel. Ringmer 812071

Sim, GM3SAN, 19 Ellismuir Road, Baillieston, near Glasgow.
Tel. 041-771 0364

The Amateur's guide to nursery rhymes

Little Bo Peep has lost her bleep,
And can't get through the repeater.
So she used SSB
On one-four-four-three,
And now no repeater can beat 'er.

REMEMBER, WHEN YOU BUY EQUIPMENT FROM LOWE ELECTRONICS, YOU RECEIVE THIS HIDDEN BONUS. OUR SERVICE IS AT YOUR SERVICE.

OTHER THINGS

As you will realise, it is simply not possible to show in an advertisement of this type, all that is available from our ever-widening range of products for the radio amateur. We could not show, for instance, the TRIO TS820 (maybe when we have cleared the waiting list . . .) nor the R599S, nor the new 70cm mobile transceiver, the KF430, nor the Uniden 2020, nor the Uniden 2030, nor the AMR104 2 metre scanner, nor the 2 metre pocket receivers, nor the RAK aerials, nor the Shinwa filters, nor the complete range of Microwave Modules products, nor the J-Beam aerials, nor the keys and keyers, nor the plugs and sockets, nor the Hy-Gain range, nor the rotators, nor the complete range of TRIO station accessories—and so on and so on.

The answer of course is to come along to Leicester and see the lot all together. Alternatively, you can call at Matlock or one of our branches in order to try out any or all of the items in our catalogue. You could always send us 30p in stamps to receive sheets and sheets of information about all kinds of good things.

Remember that we operate a money-back guarantee scheme for all that we sell; we also operate the finest service system bar none; our advice is free, honest and based on the widest accumulated experience of amateur radio equipment available in this country. Those of you who are our customers will be aware of this already, those of you who may be contemplating becoming customers should ask around to find out if all we say is true—it is.

73
John Wilson
G3PCY

LOWE ELECTRONICS

119 Cavendish Road, Matlock, Derbys.
Tel. Matlock (0629) 2817 or 2430. Telex 377482.

South Midlands

ESTABLISHED 1958—OVER 18

SMC PROUDLY PRESENT

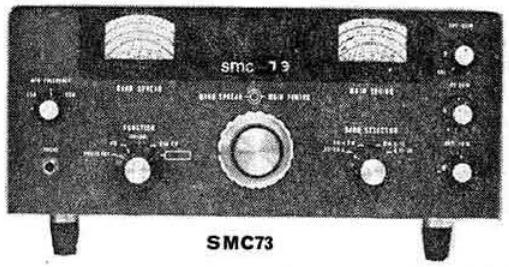
The New FT221R 2m Multimode Transceiver

The New SMC73 General Coverage receiver
The New KLM 160W 144 MHz Linear Amplifier
The New YC500, 500 MHz Frequency counter

WE LOOK FORWARD TO YOUR COMPANY AT LEICESTER TO EXAMINE OUR NEW EQUIPMENTS

The SMC73 is an all Solid State, Mains and 12V, communications receiver covering 550kHz to 30MHz (without gaps) in four ranges. Frequency readout is by two silk screened illuminated aluminium dials tuned by coaxial spun aluminium knobs, the larger for general coverage, the inner for amateur band (10-80m) band spread (set by use of internal 3.5MHz crystal calibrator).
FET's are employed in the R.F. amplifier, mixer, VFO and BFO (these latter two stages being fed from independent stabilised supplies) ensuring good sensitivity, stability (electrical and mechanical) dynamic range (helped by adjustable RF attenuator), and marked freedom from "pulling" of both the local and beat frequency oscillators. An internal loudspeaker (but with jacks for 'phones and external speaker), illuminated signal meter, SO239 (UHF) coax socket and binding posts for antenna, switchable envelope (AM) and product detectors (SSB/CW) (provision on switch for possible fitting of FM demodulator), are all features of this exciting new low price receiver.

EX-STOCK, ONLY £105 (+ VAT)



SMC73

THE DIGITAL II (FM 144-10SXRII)

The de luxe 2 metre FM transceiver with a 5kHz stepped synthesiser and bright digital readout, from 6 seven segment LEDs. Selectable 10 or 1 Watt output, for simplex or duplex (up and down shifts), across 144-146 (rx to 149MHz) from a tiny 6½" × 2" × 7½".
Easily underdash mounted with the supplied mounting bracket, or slipped in place of the broadcast wireless.
For strong signal handling and low noise the R.F. mixer, first IF (16·9MHz), second mixer (and LO) are all FET's. The front end is tuned by varicaps fed by the DC output of the P.L.L with superb selectivity provided by 15 pole(± 8kHz @ —6dB. ± 15kHz @ —70dB) Ceramic filter.
LED lamps indicate if the P.L.L. is unlocked or the squelch open. The V.C.O. is directly modulated (for exceedingly linear deviation). Unitary 6 circuit block construction (for serviceability and screening). Selective calling socket (mic/LS/PTT etc.) on rear panel.

INTRODUCTORY PRICE ONLY £225 + VAT

KP202

The handheld KP202 with its 2W of RF and ¼W of audio, immunity to image and IF breakthrough, offers performance to rival all walkie-talkies and many mobile 10W sets. The KP202 is supplied with telescopic whip, leather handle/whip case and F type plug. Accessories include automatic (R channels only) crystal tone burst (£10.00), flexi stubby antenna (£5.25), leather case (£4.40), base charger KCP2 (£10.50), set of 10 ni cads (£8.50), F to UHF adapters (£1.45), F plugs, spare whips, spare hods etc.

SIX CHANNELS FITTED S20 and S22 and any 4 of: S0, S21, S23, S24, R3, R5, R6, R7, *only* £99.50 (plus VAT)

NEW FROM SMC—AMPERE & KLM SOLID STATE LINEARS (VHF & UHF)

SSB/CW/FM, 12V DC 10W drive, RF sensing with manual override—"microstripline techniques".

NEW HIGH POWER MODEL
PA144/160/BL 160W output .. .. **£155 + VAT**

For 144 and 432MHz, RF sensing excellent bias arrangements
12V (13·8 VDC), 10W drive
13 × 5·8 × 20cm (prices + 12½% VAT)
APB82A, 145MHz, 80W output .. **£88.89**
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COAX SLIDE SWITCHES
Up to: 1kW, 1.5GHz, 0.3dB loss, 1.2 : 1 VSWR, 50dB isolation. 50 ohm 'N' or 'PL' fittings available.

EX-STOCK P & P 30p, VAT 8% only
TWS 120 1 in 2 out Nickle SO239 .. .. **£4.90**
TWS 150G 1 in 5 out Gold SO239 .. .. **£9.50**

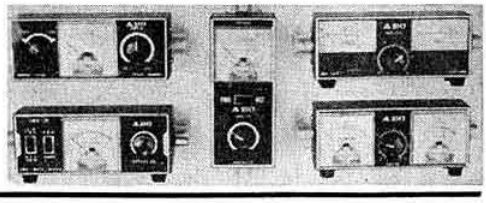
COAX RELAYS
12 VDC, 50ohm, Siver plate.
EX-Stock. P & P 30p. VAT 8% only.

	Power	Crosstalk @ 500MHz	
CX120	50W	35dB Cable entry	£8.50
CX230	300W	40dB BNC sockets	£18.25
CX600N	600W	40dB N sockets	£21.75

AEC METERS

SWR, Power, (Pr), Field Strength (F.S.) (P & P 40p, VAT 8% only)
Unless stated: SWR (±10%), 1.5 to 160MHz, 50/75Ω.

SWR10 (TLH)	single meter horizontal type	£8.15
SWR20 (BLH)	50Ω, F.S., PR 10 & 100W FSD(±10%) ..	£9.90
SWR40 (Centre)	single meter Vert. type with F.S.	£7.80
SWR50A (TRH)	SWR(±5%) 3.5MHz up, Pr to 1kW(±20%)	£9.60
SWR50 (BRH)	as SWR50A (300μA) but 100μA meters ..	£11.20



PLEASE NOTE—THESE PRICES *DO NOT* INCLUDE VAT (12½% or 8%)

Terms: Cash with order, or credit card holders just 'phone in for, if possible, same day despatch. Immediate H.P. available for card owners for amounts up to £225.00. Holders of current U.K. callsigns (where references have been provided) can be speedily cleared, or normal H.P. at competitive rates is available.

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Communications Ltd

YEARS OF PROFESSIONAL EXPERIENCE

YAESU

YAESU MUSEN

2-YEAR GUARANTEE

24-HOUR SECURICOR SERVICE

THE NEW FT221R EX-STOCK IN TOTTON

The FT221R design offers an unparalleled level of technical sophistication, combining latest state of the Art techniques with extreme reliability and ease of operation.

One look at the construction: plug in boards throughout (with presets positioned for easy access) one glance at the circuitry and you will be convinced that the FT221 may have rivals but no peers.

The final frequency is derived via single signal frequency mix from 10·7MHz. The tunable component is produced by a 133MHz voltage controlled oscillator (VCO), phased locked to the sum of; the temperature compensated 8MHz VFO (or one of the 11 fix crystals and the nonupled 14MHz band (or repeater shift) crystals). This VCO cleans the oscillator spectrum, markedly reducing spurious, both on receive and on transmit, the DC control voltage from the VCO is applied to 8 varicap diodes, in both the transmitter and the receiver, effectively electrically ganging the RF tuned circuits to the VFO and band crystals. Thus both the transmitter and receiver are always fully on resonance even when using the repeater facility. This narrow band technique further improves the transmitter output spectrum and the receiver's immunity to overload, rendering continual tweaking of preselectors obsolete.

If for any reason the VCO should not lock, the "S" meter and dial lights flash, both transmitter and the receivers' audio are disabled.

The transmitter employs; a balanced FET mixer, RF derived ALC (which is fed to the two first mosfet TX I.F. amplifiers) preventing over driving and allowing operation at full rated output on low DC supply.

The driver is generously rated and the PA stage is the newly developed 2N5591, a device with high linearity and an amazing 70W power dissipation capability that is rated by its manufacturer to withstand any VSWR irrespective of phase angle.

The sensitive receiver offers a remarkable immunity to overload. The Mosfet RF stage is AGC controlled, the FET mixer feeds a transfilter then an I.F. amplifier. This band limited signal, of the correct level, is presented to the noise blanker gate (before any serious pulse stretching occurs) and hence to either the quality crystal filter on SSB, or the 10·7MHz to 455kHz mixer for FM.

FT221

Mic supplied. Adjustable VOX. AC or 12V DC. CW sidetone. Semi break-in. 100kHz calib. 11¼" × 5¼ × 11¼". Rigid 22lb.

"S" meter/FM centre zero/PO. Clarifier IRT and IRT/ITT. 600kHz up and down shifts. 44 FIX channels (4 × 11). Fully adjustable squelch. A.M., FM, USB, LSB, CW. Dual speed VFO drive. Readout better than 1kHz. 2·4 and 12kHz bandwidths.

Designed for the serious amateur, it also offers a unique double push tone burst, repeater up and down shifts of 600kHz and any other shift (to 1MHz), a socket (mic, PPT, LS, 12V, etc.) full provisions for a linear amplifier (relay make and break and ALC sockets) with the spectrial purity that allows you to use one with a clear conscience. "The rig here is a FT221R need one say more?"

THE FRG7, GENERAL COVERAGE RECEIVER EX-STOCK

The FRG7 is a general coverage solid state receiver with specifications unparalleled in its price range. It uses a Barlow Wadley Triple-mix, drift cancelling loop for continuous, spin-tuned inclusive coverage of ·5 to 30MHz with calibration accuracy better than 5kHz. Frequency selection is accomplished by setting the RF (pre-selector and range switch), dialling up the required number of megahertz, then tuning the VFO knob as normal.

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

YC355 & THE NEW YC500 500MHz COUNTERS

YAESU now offer you the choice of 5 frequency counters with an upper frequency limit of 35Hz, 220MHz now 500MHz. This latter model is available in three versions, with an accuracy of 10 ppm (J) 1 ppm (S) 0·02 ppm (E Model). All provide an eight digit readout, (dual range system from 5 or 6 tubes), 50Ω/1MΩ switchable inputs (in the basic unit) and offer reliable operation and complete portability with built-in mains and 12V DC power supplies.

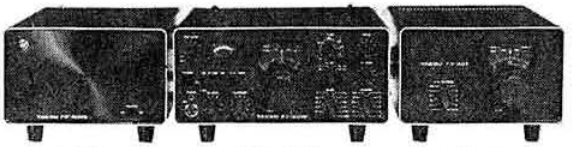
YC355D

THE FT301S—EX-STOCK IN TOTTON

The FT301S is a new solid state 12V transceiver of plug in construction, which with all options installed offers:

Top band to 10 metres (inc. 5MHz MSF) in 500kHz segments, 10W output, built-in RF speech processor, selectable 2·4 or 600Hz crystal filters, front panel controlled VOX (with MOX) and PPT, semi break-in keying (with side tone), clarifier with a separate off switch, 25kHz crystal calibrator, 1kHz readout from the dual speed VFO (100 and 16kHz per turn), single knob resonance, internal VFO or 11 crystal per segment (or external VFO with same crystal facility), 3W audio to the internal or external AC p.s.u.'s loudspeaker.

The transceiver employs a pro mix VFO and single conversion signal frequency I.F. (9MHz) uses MOSFETS in the RF and mixer stages followed directly by a roofing filter for sensitivity coupled with dynamic range.



FP301S FT301(S) FV301

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SOUTHAMPTON SO4 4DN

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Telex: 477351 SMCOMM G
Tel: (04216) 4938 & 2785

Northern Branch: **The Chambers No 3 The Parade, North Lane, Headingley Leeds Tel. (0532) 78 2326 Hours of business: 9-5 Tues-Sat 9-8 p.m. Thursday.**

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Peter Avill G3TPX, Darton (022 678) 2517. Ian McKechnie GM8DOX Bridge of Allan (078683) 3223. Howarth Jones GW3TMP, Pontybodkin (035 287) 846. Mervyn Anderson GI3WWY, N.I. Tandragee (0762)840656.

SOUTH MIDLANDS COMMUNICATIONS

SMC PROUDLY PRESENT The FT301D Digital Transceiver The QTR24 World Time Battery Clock

For further details send 20p stamps or large SAE for Yaesu Catalogue, Price List, etc.

ASTRO 200 REVOLUTIONARY H.F. TRANSCEIVER

To pack an entirely modular construction, 10-80m, digital readout transceiver in a box 2·8″ × 9·5″ × 12·3″ is remarkable enough, but with a 0·2μV sensitivity and 100W output from transistors with the boast of: stability better than 20Hz/hour, from an electronically tuned (press switches with no other moving parts) 100Hz digital synthesis, good RX front end filtering, TX TVI proofing, unwanted sideband at —60dB, carrier at —50dB, RIT, clarifier (±50Hz) in-built SWR bridge, semi break in CW with sidetone, etc., etc. The ASTRO 200 surely establishes a new plateau of sophistication.

THE MULTI U11 A NEW DIMENSION IN 70 cms F.M.

A unique combination of frequency control by either external VFO, 23 switchable or 4 instantly selectable auto scanning channels.

Both the Tx deviation and the Rx bandwidth are switchable accommodating 50 or 25kHz spacing.

The main dial is channel numbered (e.g. 16 = 433·4, 20 = 433·5 etc.) and is illustrated only when a channel is crystalled up. Two R.F. stages in the receiver provide great sensitivity (0·5μV for 30dB NQ). The use of a band bass first IF (CF 45 MHz) gives high image immunity and low channel crystal drift. Further conversions to 10·7 and 455 prevent IF image whilst providing good pass and skirt selectivity. The transmitter of switchable 10/1W output draws only 2·5 or 1·3A (0·6 or 0·3A Rx) and has a netting of new crystal facility.

Other features include, diode RF switching, R.I.T., "on the air" lamp, PO meter, S meter, AFP reverse polarity protection etc.

With any 8 channels from:
SU (0, 8, 12, 16, 18, 20) and RU (0, 2, 4, 6, 10, 14)

INTRODUCTORY PRICE ONLY £200 + VAT (Ex-stock)

RF SPEECH PROCESSOR KP12

Audio to audio, via 10·7MHz mains powered, illuminated meter, FT-101, FT2 plugs suitable all phone modes superb on FM.
P & P 40p (+ 8% VAT) **£53.50**

LIGHTNING ARRESTORS NSK7S

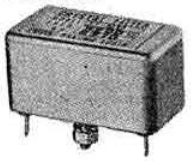
Gas discharge (90V strike), 50 ohms, SO239 fittings up to 1·1:1 VSWR, 1GHz, 0·2dB loss, 5KA, surge 5A AC.
Ex-stock, P & P 20p, VAT 8%
NSK7S low price **£7.50**

CRYSTALS & CRYSTAL FILTERS

VAT 12½%, post 20p + 8%

FILTERS—3·18, 9, 10·7MHz C.F. 350Hz, 600Hz, 2·4kHz, 12kHz. S.A.E. DETAILS

CRYSTALS—**£3.75** pair. **£2.00** single FT224, FT2AUTO, FT2FB, FT2F, TR2200, C146A, C826MB, etc., etc. and FT221, FT75, etc., etc. **£2.20** each.



QTR24 YAESU WORLD TIME CLOCK

Battery powered, gives local time around the world.

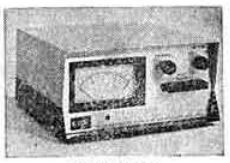
Only **£13.00** (+ 8%). This month post free.

THE RINGO RANGER ARX2, 6dB½, 144MHz, 9′ 6″ tall 1¼lb only, **£21.50** + 12½% VAT (carr. 90p + VAT)

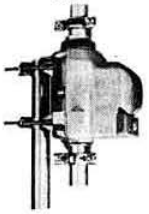
ROTATORS

Ex-stock in Totton, fast delivery. VAT-rotators 12½%. Cable and delv. 8%. Carriage (BRS or post) FREE. Securicor delivery £1 extra (mainland). All rotators supplied complete with appropriate control box and instructions.

CDE ROTORS	
AR30 light VHF/UHF	**£37.50**
AR40 VHF and light HF	**£43.50**
AR33 de-luxe AR40	**£49.75**
CD44 medium duty	**£89.00**
Ham II heavy duty	**£119.00**
STOLLE ROTORS	
2010/220 automatic	**£41.25**
BEARINGS	
CD562	**£4.25**
RZ100 Stolle (ballrace)	**£10.00**
MOUNTING KIT	
AK121 CDE to Versatower	**£3.60**
CABLE	
5 core AR30/40/33/2010 per yd	**£0.20**
8 core CD44/Ham II per yd	**£0.32**



CD44/HAM II
CDE



STOLLE 2010/220

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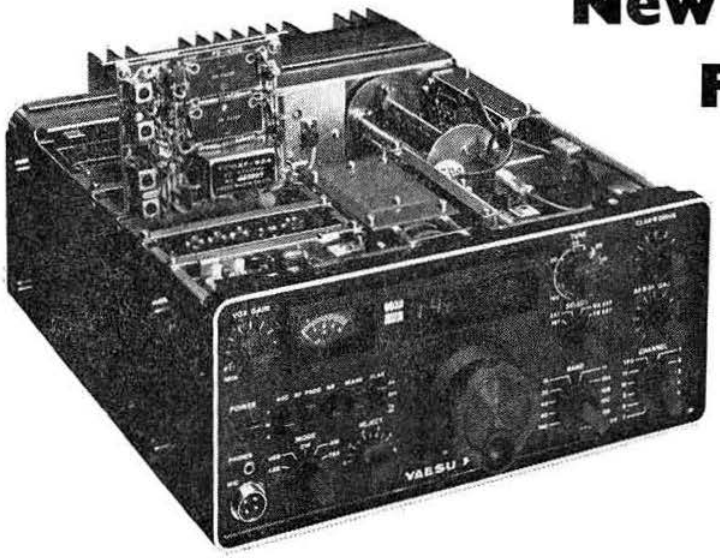
From YAESU — The Outstanding New GOLD LINE FT-301D



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ALL SOLID STATE
200W PIP
DIGITAL READOUT TRANSCEIVER

■ 6-Digit Readout ■ All Modes—SSB/CW/A.M./FSK ■ 160 thru 10 Meters ■ TX & RX Clarifier ■ RF Feedback ■ 3-Position AGC ■ Rejection Tuning (Tuneable I.F. Crystal Filter) ■ Built-in DC Power Supply ■ Optional AC Power Supply & Speaker Unit with 12 or 24 Hr. Digital Clock ■ Noise Blanker ■ RF Speech Processor ■ Computer Type Plug-In Module Construction ■ Size: 11 in (w) × 5 in (h) × 13½ in (d) ■ Light Weight: 22 lb.

The Model FT-301D is a precision-built, all solid-state, compact high performance transceiver of advanced design.

Fully solid-state using many ICs and FETs for reliability and a band tuning system with preset pass band tuning, combined with a wide-band amplifier that eliminates final amplifier tuning for band changes.

Also available as an option is an automatic (programmable) CW identifier.

Whether you judge it on price, performance or operational features, the FT-301D comes out a winner!

OUR AGENTS

Amateur Electronics,
508-514 Alum Rock Road,
Alum Rock,
Birmingham B8 3HX

South Midlands Communications Ltd.
S. M. House, Osborne Road,
Totton,
Southampton SO4 4DN

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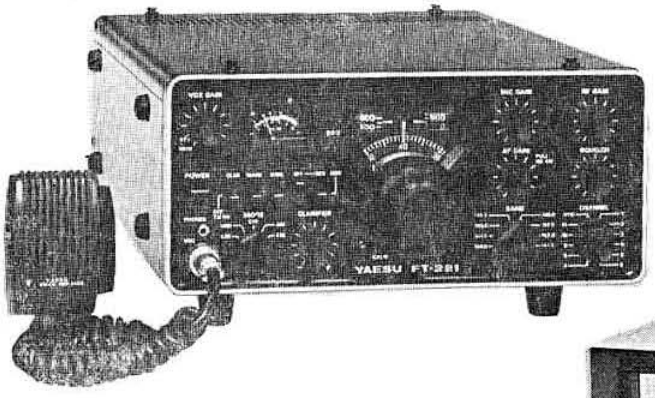
IT'S SHOW TIME AGAIN AND YOUR CHANCE TO SEE ON STAND NO. 20 AT GRANBY HALLS, LEICESTER. THAT'S BEST FROM THE FOREMOST INTERNATIONAL PRODUCTS—DON'T FORGET THAT WE ARE THE PEOPLE WORDS ALL ITEMS EXHIBITED ARE IMPORTED BY US HERE'S A FEW EXAMPLES OF WHAT YOU WILL BE



HERE'S YOUR CHANCE TO GET ONE OF THE BRAND NEW MODEL FT-221R.

YAESU

OR PERHAPS YOU HAVE DECIDED TO FOLLOW THE EXAMPLE OF COUNTLESS THOUSANDS AND SETTLE FOR AN FT-101E?

WHO KNOWS? YOU MAY BE ONE OF THE LUCKY ONES TO SECURE THE MUCH SOUGHT-AFTER FRG-7 GENERAL COVERAGE RECEIVER.

AND IF YOU DON'T MAKE IT TO LEICESTER THEN YOU CAN ALWAYS CONTACT—

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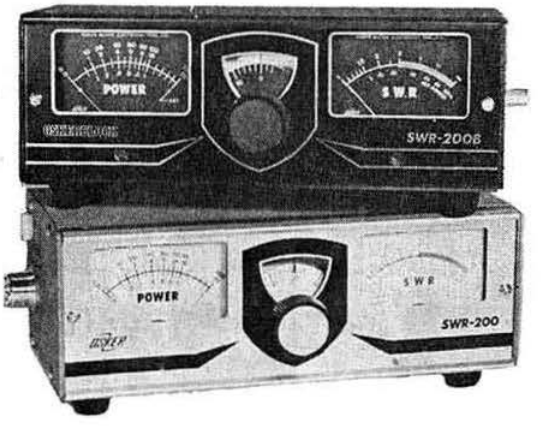
EQUIPMENT BY THE WORLD'S TOP MANUFACTURERS AMATEUR ELECTRONICS UK WILL BE FEATURING ALL MANUFACTURERS PLUS SOME OTHER EXCITING NEW WITH DIRECT AGENCY APPOINTMENTS—IN OTHER DIRECT FROM THE FACTORY—JUST TO REMIND YOU SEEING ON STAND NO. 20.

The Sensational ATLAS-210/215X

DON'T MISS THE CHANCE TO GET THE RIG EVERY-ONE'S TALKING ABOUT!

SWAN ELECTRONICS

YOU'LL NEVER GET ANOTHER OPPORTUNITY TO BUY SWAN'S 700CX 700 WATTER AT THIS PRICE!



LAST BUT NOT LEAST, MAYBE WE CAN TEMPT YOU WITH AN OSKER POWER METER OR SOME OTHER EXCELLENT STATION ACCESSORY—REMEMBER EVERY-THING ILLUSTRATED WILL BE EX STOCK WITH IMMEDIATE CREDIT FACILITIES AVAILABLE FOR YOU TO WALK AWAY WITH YOUR PURCHASE.

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IC-22A

SPECIAL OFFER

FOR A LIMITED PERIOD

(See opposite page for prices)

A special arrangement with the manufacturers enables us to offer the IC-22A, for this batch only, at a particularly attractive price. Of course these sets carry the full THANET warranty.

ISN'T IT TIME YOU TREATED YOURSELF TO AN IC-22A IN ORDER TO GET THE BEST FROM ALL THE NEW 2 METRE REPEATERS WHICH ARE OPENING UP?

WITH THE OPENING UP OF THE REPEATERS IN NORTH WALES, LANCASHIRE, BIRMINGHAM, KENT AND CORNWALL THE COVERAGE IN THE U.K. IS GROWING ALL THE TIME.

The IC-22A is the most suitable mobile rig for repeater use. Both the crystal controlled and the factory fitted R/C tone burst are arranged by us to be entirely automatic, operating only on repeater channels when a burst of tone is given at the start of each transmission. There is no need to press buttons while driving!

The audio tailoring and limiting are ideal for repeater use, giving the characteristic clear sound associated with the IC-22A and the receiver is of top quality design giving high sensitivity and hard IF limiting. The filter provides excellent adjacent channel rejection which is so important with today's 25kHz channel spacing.

In fact the IC-22A is good solid value for money. Maybe it does lack some fancy gimmicks—but it doesn't need them. The RX light comes on when a signal is received and the squelch opened—not just to tell you that there is a crystal in the socket. (You KNOW that crystals are there on the 11 most important channels). You can work the chap next to you in the car park *without* pulling any plugs out and he *won't* blow your head off! What you get is what you want—plenty of expensive crystals and a no fuss tone burst which doesn't demand that you press an extra button when driving. (The no fuss THANET warranty is worth thinking about too).

By the way, the size of the IC-22A is $2\frac{9}{32}$" high × $6\frac{1}{8}$" wide × $8\frac{1}{2}$" deep and it fits into the excellent quick release mobile mounting bracket which is supplied with the rig.

LEICESTER 1976
5th NATIONAL AMATEUR RADIO EXHIBITION
EXHIBITOR

Your IC-22A comes fitted with SIX simplex channels, SO, S20, S21, S22, S23 and S24 PLUS the FIVE U.K. Repeater channels R3, R4, R5, R6 and R7.

Look at this list and find where your nearest repeater is (those shown in capitals are already in operation.)

R3 SUFFOLK and YORKSHIRE
R4 Central Scotland, DERBYSHIRE AND CHESHIRE, DEVON and KENT.
R5 HAMPSHIRE, BIRMINGHAM and CORNWALL
R6 CAMBRIDGE, SOUTH WALES, NORTH WALES AND LANCASHIRE
R7 LONDON, WORCS., Aberdeen, N. LANCS. and W. Wales.

COMING SHORTLY FROM THE ICOM® STABLE

We are pleased to give you advance warning of the **ICOM** IC-215 which will be here in early December. It is a 3 watt 15 CHANNEL FM PORTABLE with a generous supply of crystals. It resembles the IC-202 in size and appearance and the designis to the usual high quality ICOM standard. A demonstration model and further data will be available at the Leicester show.

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ICOM®

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ICOM® IC-22A

WITH CRYSTAL CONTROLLED TONE BURST
£164.00 inc. VAT (£33.00 Deposit)
WITH FACTORY FITTED R/C TONE BURST
£158.00 inc. VAT (£32.00 Deposit)

22-channel capability—half full of crystals

Compare the advantages over its competitors:

★ Automatic crystal burst introduced on repeater channels only.
★ Frequency tailoring and clipping ideal for optimum FM.
★ Fitted with all five UK REPEATER channels.
★ Fitted with the six most used SIMPLEX channels.

WE THINK THIS IS THE BEST RIG IN THE UK FOR REPEATER USE

ICOM® IC-201

£357.75 inc. VAT (£71.75 deposit)

The luxury multi-mode rig which was described in full in our advertisement in January when it was also reviewed in *Radio Communication*. It provides full 2 metre coverage on FM, SSB and CW using its ultra stable VFO. Full facilities for repeater and reverse repeater use at the flick of a switch, built in automatic crystal controlled tone burst fitted by us, full break-in facilities on CW and VOX are but a few of the excellent facilities found on the increasingly popular IC-201. Send for further details or leave a message on our ansafone during the evenings.

ICOM® IC-202

£161.10 inc. VAT (£33.10 deposit)

The new and highly popular hand held SSB portable from ICOM. 3 watts barefoot but clean enough to drive a linear up to the legal limit. See June's RADCOM for details and August's for a review.
Linears, PSUs, N-Cads, Chargers and Desk Mic. with built in pre-amp now available.

ICOM® IC-225

With crystal controlled tone burst and reverse repeat switch
£250 inc. VAT (£50 Deposit)

With switched factory fitted R/C tone burst
£225 inc. VAT (£45 Deposit)

An **80 Channel FM** mobile rig with all 80 channels fitted. Uses an excellent phase lock loop system. Channels are at 25kHz spacing which fits in with the UK and continental channels systems giving *all* the UK simplex and repeater frequencies. A *crystal controlled* tone burst is introduced when working repeaters and reverse repeater facility is available on all channels by adding one extra 11·300MHz crystal. Ex-stock at time of going to press. **£250 inc. VAT.**

CRYSTALS FOR ICOM®

IC-22A, IC-20, IC-22, singles **£2.70**
pairs **£4.50**
IC-201 **£3.50** each
IC-30A **£6.00** pair, **£3.50** single

REVCO mobile antennas. An excellent range of $\frac{1}{4}\lambda$ antennas with a stainless steel whip and neat loading coil. The magnetic base is a beauty. All aerials are of the hinged mounted type. $\frac{1}{4}\lambda$ whip with loading coil and base **£8.00** + **£1** carriage $\frac{1}{2}\lambda$ whip with loading coil and magnetic base and 3·5 metres of cable **£17.00** + **£1** carriage magnetic base alone with 3·5 metre cable **£12.50** + **75p** carriage.

© "Stripes of Quality"

See page 747

Why not see and buy the excellent ICOM range at your nearest Thanet agent—phone for an evening or weekend demonstration.

LONDON—Terry G8BAM (01-556 9366)
SCOTLAND—Ian GM8DOX (078683 3223)
DEVON—Bob G3PQH qthr
WALES—Tony GW3FKO (0222 702972)
MIDLANDS—Tony G8AVH (021 329 2305)
CHESHIRE—Gordon G3LEQ (0565 4040)
NORTH—Peter G3TPX (022678 2517) . . . Peter has outlets in
HULL—Tony (0482 686392) and the **NORTH EAST**

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PRICES INCLUDE VAT AND DELIVERY EXCEPT WHERE STATED

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FDK for VHF "SENSITIVE YET POWERFUL"

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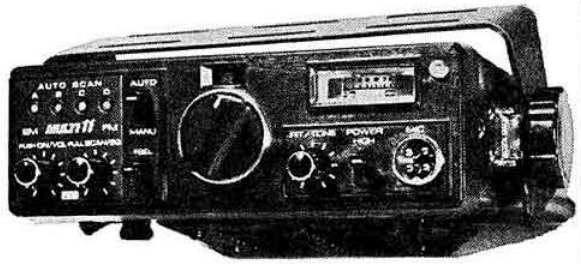
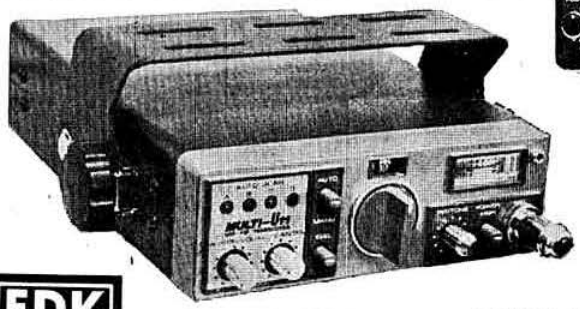


FDK for 70 cms Multi-UII



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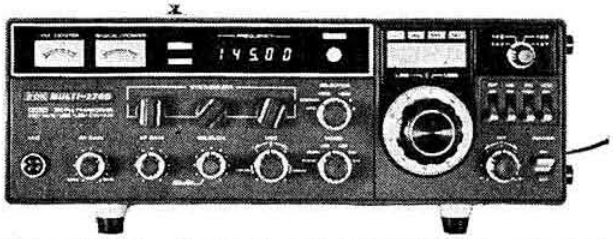

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STOP PRESS

ASPE462-3 dB Gain ⅝w UHF mobile Ant. £6.89 75p carriage. Helical Ant. for Trio TR2200GX, £3.85 plus 45p carriage. Helical Ant. for Trio TR3200, £3.35 plus 45p carriage.
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FOR AMATEURS WHO DEMAND THE BEST

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144-148 MHz 6dB gain DC Grounded Base Station Collinear.
Power capability 350W,
Length; approx. 12'
Weight: approx. 4 lbs.
Rated wind velocity: 118 mph.
Termination: Male 'N' Type Connector.
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ASPN701UK. ▶

430-440MHz 12dB Gain, DC Grounded, Base Station Collinear.
Power Capability 250W,
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Rated wind velocity 128 mph.
Termination Male 'N' Type Connector.
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MOBILE ACCESSORIES

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Gutter mount suitable for use with ASP629, ASP393 complete with 10' RG-58U cable and PL-259 connector **£7.70** plus 50p post and packing.

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No hole boot mount, suitable for ⅜" hole snap in mount, easily adaptable for other mounts. **£3.52** plus 50p post and packing.

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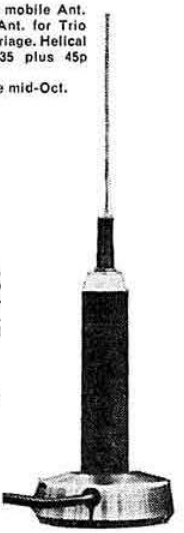

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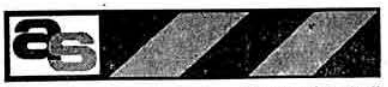

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We regret to announce that due to the falling pound, we are compelled to increase the prices of certain Antenna Specialists products by 10% as from the 1st of August 1976. The 10% increase does not affect the following products. ASP677, ASPE667, ASP655, ASPA680UK, ASPN701UK.

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Revon Electrical Services, 0272 669454

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The Amateur Radio Shop, 0484 20774
Nick Sheard, G8KLY. 0532 535143

CHESHIRE
Bredhurst Electronics, 0829 260706

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QM70 ELECTRONICS LIMITED

28/432 IOW TRANSVERTER

- ★ Full 10W rms output.
- ★ Attractively styled two-tone case.
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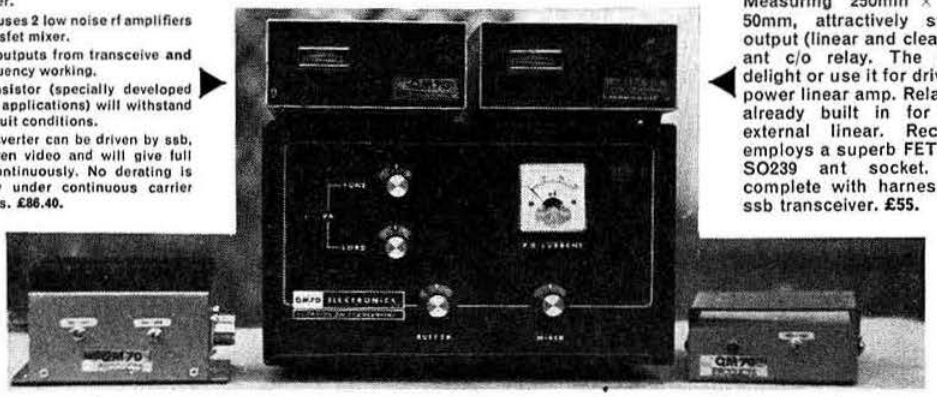
All solid state circuitry employing high gain low spurii mixer configuration. Fully metered and LEDs to indicate tx/rx condition Measuring 250mm × 125mm × 50mm, attractively styled. 2W output (linear and clean). Built-in ant c/o relay. The qrp mans delight or use it for driving a high power linear amp. Relay contacts already built in for switching external linear. Receive side employs a superb FET converter. SO239 ant socket. Supplied complete with harness for your ssb transceiver. **£55.**



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All solid state 50W rms output 2m linear amplifier. Just connect in the antenna line of your 2m transceiver and leave the rest to the built in RF sensing aerial c/o relay. Accept FM, SSB, AM and CW with switchable hang-time for SSB operation. Supplied complete with DC power cord and SO239 input and output sockets. **£49.50.**

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STOP PRESS

QM70 to release FOUR NEW pieces of equipment. See them at the Leicester Exhibition.

All UHF units are fitted BNC sockets, VHF units fitted SO239 sockets. All units fully guaranteed for 12 months. Prices include VAT and carriage to UK mainland.

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As announced last month, we are now manufacturing a 144 MHz all mode solid-state linear transverter, MMT144/28, as pictured below.

This 144 MHz unit is fully compatible with any 28 MHz drive source, and provides 10 watts continuous power output from power transistors capable of withstanding severe mismatch.

An internal aerial changeover relay of the PIN diode type is incorporated which has a through-loss of less than 0·2 dB. The combination of a low distortion balanced transmit mixer incorporating protected dual gate MOSFETS, to produce a spurious-free linear signal, and a low noise receive converter, makes the unit ideal for all modes of transmission at 144 MHz, particularly where a high degree of stability, linearity and sensitivity are of prime importance.

The use of high Q circuitry throughout ensures an extremely good spurious rejection and selectivity.

The unit is housed in a highly durable black diecast case, and all circuitry is constructed on high quality glass-fibre printed circuit board. The high power linear amplifier stages are housed in a separate internal compartment, thus ensuring excellent electrical and thermal stability.

SPECIFICATION

Frequency range: 144-146 MHz
Input modes: SSB, FM, AM or CW
Input frequency range: 28-30 MHz
DC power requirements: 12 Volts nominal
Current consumption: 2·2 Amps peak
Power output: 10 watts continuous rating
Drive requirements at 28 MHz: 500 mW or 5 mW
Relative 116 MHz output: —65 dB
Other spurious outputs: —65 dB
Receive converter gain: 30 dB
Receive converter noise figure: Better than 2·5 dB
Power connector: 5 pin DIN
RF input/output connectors: 50 ohm BNC
Size: 187 × 120 × 53 mm
Weight: 800 g

Price: £85.50 inc. VAT

LEICESTER 1976 — 5th NATIONAL AMATEUR RADIO EXHIBITOR

Any further information on this product and others from our extensive range may be obtained by contacting our sales department, who will be only too pleased to help.

Incidentally, this and all of our other products will be available and on display at the Leicester Exhibition in October.

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The national society representing all UK radio amateurs

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

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

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

EDITOR
A. W. Hutchinson

CURRENT COMMENT

"Radio Communication" changes

With the coming into use of the Society's data processor, the following changes affecting the despatch of *Radio Communication* will take place:

(1) The ability to pre-sort address labels will allow despatch under a Periodical Publishers Association contract with the Post Office. Under this, the postage paid will comprise a unit cost plus a charge based on the total weight of each mailing. This will be cheaper than the ordinary second-class rates previously charged.

(2) As the total weight and not the individual weight of each copy will be the basis of variation in postal charges, it will no longer be necessary to over-trim copies so that they do not exceed 100 or 150 gram postage weight limits. Also, it will no longer be necessary to alternate 64- and 96-page issues to average 80 pages, instead of 80 pages every month, to achieve a saving in postage.

(3) The opportunity has been taken to introduce an improved method of packaging the journal. In future, copies will be posted flat instead of folded, and totally enclosed in polythene instead of partly enclosed in a paper wrapper. This will overcome the creased and possibly torn pages of the previous system. The cost of this improvement will be more than covered by the saving in postage costs.

(4) Copies will no longer be posted by the printers but by a specialist polythene enveloping company, and to allow for transport and additional handling, the posting and publication dates will be changed. In future, the journal will be published on the first Thursday of each month and will be posted on the preceding day. It is expected that the vast majority of members will receive their copies during the week of mailing, while the date of publication will continue as at present between the 1st and 7th of the month.

(5) Because of the time required to transfer membership records to the data processor, the above changes will not be fully implemented until the November issue, although it is expected that two-thirds of this month's copies will be despatched using the new system.

A. W. Hutchinson
Editor

QTC
amateur radio news

14MHz interference
A very strong signal centred on 14,215kHz has been causing severe interference to all but the strongest transmissions. It has been heard throughout the world and is reminiscent of the signal that was connected with USSR-Cuba communication some while ago. The present transmission has been identified as a four-channel pulse (P9) emanating from a site in the area of Poltava in the Ukraine. Representations at diplomatic level have been made by several administrations and hopefully the problem will have ceased by the time that this is being read. Yet another example of how ITU regulations (which have the power of an international treaty) are breached with impunity by some.

An unwanted export
It is noted in *HR Report* that FCC agents and US marshals arrested some dozen outlaw operators during a raid in northern New Jersey on premises of those engaged in illicit 27 and 28MHz operation. The report goes on to say that a photo of the seized equipment looks like the transceiver/amplifier counter at any well equipped radio store.

Under the heading "CB radio users jam airwaves, tune in trouble" the *Ottawa Citizen* details the problems with the General Radio Service, as it is known in Canada. Department of Communications officials are quoted as saying that closing the entire band might be the only solution if things continue the way they are going. The editorial continues: "Originally designed for urgent general purpose conversations, the system has become, in the words of a department official 'a refuse pile for the dregs of the radio community whose main interest is in hearing themselves talk'." Strong sentiments, but they reflect a growing mood among government, radio enthusiasts and the public.

Raynet—repeaters—community service
Our thanks to the many Raynet groups and members who played their part (at times for long periods) in providing emergency communications for the user services during the recent heath and forest fires. Thanks also to the repeater operators and non-Raynet members for their consideration and co-operation during the periods that emergency traffic was being handled.

These provided a fine example of the amateur radio spirit and of community service by the radio amateur. Further details of Raynet action will appear in the Raynet column as soon as possible.

Facts and figures
The Home Office advises that the following numbers of amateur licences were in force at 31 August 1976:

Class A	16,054	Class B/M	2,384
Class B	6,042	Class F/M	20
Class A/M	4,215	Television	316

The callsign record received from the Home Office dated 20 August 1976 gives the latest callsigns issued in the G4 and G8 series as G4FGU and G8LTU respectively.

RSGB LECTURE
Tuesday 19 October 1976
IMAGE TRANSMISSION
Part 1: Slow scan tv
Part 2: High definition tv
by
C. Grant Dixon, G8CGK, G6AEC/T
and
Michael J. Bues, G8AAI
Institution of Electrical Engineers
Savoy Place, London WC2
Buffet tea: 6pm Lecture: 6.30pm

Another new service from the RSGB
HF and vhf operators are now able to obtain up-to-date lists of hf and vhf beacons in the UK and IARU Region 1. There are three lists:
UK beacon status list giving callsign, frequency, QTH locator, QTH, beam, erp details, and current status,
IARU Region 1 beacons giving callsigns, frequency and QTH locator,
UK repeater status list giving callsign, channel and much other information on all known UK repeater projects.

As it is anticipated that there could well be a continuing demand for these up-to-date lists, their despatch cannot be handled on a casual basis, and a nominal charge of 11p for postage and materials used will be made for each list. The lists will be up-dated every seven days to take account of status changes.

"Sounds Good" Radio London
The "Sounds Good" programme to be broadcast by Radio London from 5 to 6.30pm on 16 October will include an item of some 45min in length on amateur radio presented by the RSGB.

REGION 7 REPRESENTATIVE

Valid nominations for this appointment have been received in respect of:
Mr J. Korndorffer, G2DMR;
Mr N. A. Smith, G3HFO;
Mr M. Hearsey, G8ATK.
Corporate members residing in Region 7 (Greater London south of the Thames, and Surrey including that part of Middlesex now administered by Surrey) are invited to vote for one of these candidates by sending a postcard in the following form addressed to: The General Manager, RSGB, 35 Doughty Street, London WC1N 2AE, to arrive not later than 1 November 1976.

I, ...,
being a fully paid up corporate member of the RSGB resident in Region 7, wish to record my vote in favour of

Mr .....
as Representative for Region 7
Signed .....
Callsign or BRS number .....
Address .....
.....

A plate line pa for 432MHz

by L. WILLIAMS, G8AVX*

ONE area of amateur radio which is still very much the province of the home constructor is high-power gear for uhf operation. Unfortunately there is a widespread belief that construction of such equipment requires access to machine tools or at least a great deal of time and skill with hand tools. Certainly any amateur looking at the various published designs for coaxial or cavity amplifiers could be excused for coming to such a conclusion.

The amplifier to be described is built entirely from standard die-cast boxes and simple sheet-metal shapes. The only essential tools are drills, files and a small pair of hand shears. If a few other common hand tools such as chassis cutters are available the task will be somewhat easier but these are not essential.

The completed amplifier is capable of running full legal power in the A1, A2, A3, F1, F2 and F3 modes and up to 300W p.e.p. in linear mode. It also has possibilities as a tv vision final amplifier but the author has no experience of this mode.

Plate lines

Most published designs for uhf power amplifiers use either cavities or coaxial lines for the resonant circuits. Although cavities have undoubted attractions they are rather large when designed for 432MHz (of the order of $\lambda/2$ or 14in²). Coaxial lines of the shorted $\lambda/4$ type are much smaller but require either a lathe or considerable skill with hand tools to fabricate them. A practical alternative is the plate line. For uhf power circuits it may take the form of a flat metal plate suspended centrally in a metal box and may be considered as a flattened version of the conventional coaxial line.

Practical considerations require that the plate line should have dimensions compatible with the amplifier device to which it is to be connected and with available die-cast boxes. Electrical considerations require the characteristic impedance of the plate line to be of the order of tens of ohms. The 4CX250B valve anode radiator dimensions suggest a plate 2½in wide in a box 2in deep. Such a line will have an impedance of about 75Ω. A line of this impedance brought to resonance in the $\lambda/4$ mode by the valve output capacitance would be only about 3in long and consequently probably difficult to couple to. A $\lambda/2$ mode line which will fit very conveniently into a 7½in long box was therefore preferred for the anode line. The input capacitance of the valve is even higher than the output capacitance and therefore the case for a $\lambda/2$ line for the grid circuit is even stronger. In the case of the grid line the plate is brought closer to the earth plane to reduce its impedance and give a reasonable length for coupling. In each case the line is made shorter than the resonant length and adjusted to resonance by capacitance end loading.

Tank circuits of this type have large circulating currents at resonance which flow in the tuning capacitor. Conventional types of variable capacitor have sliding contacts in the current path which produce undesirable losses and tend to conduct rf outside the box on control shafts because the sliding contact resistance raises the shaft above ground potential. This problem has been eliminated by using thin earthed metal sheets which are adjusted by bending without sliding contacts.

Construction

The construction is shown in Figs 1 and 2 and the photographs. The anode and grid lines, Fig 2a, d, are each housed in a 7·4 by 4·4 by 2in die-cast box. The two boxes are separated by an rf dead space which contains the valve holder and screen and heater feeds.

* 25 Streetsbrook Road, Shirley, Solihull, West Midlands.

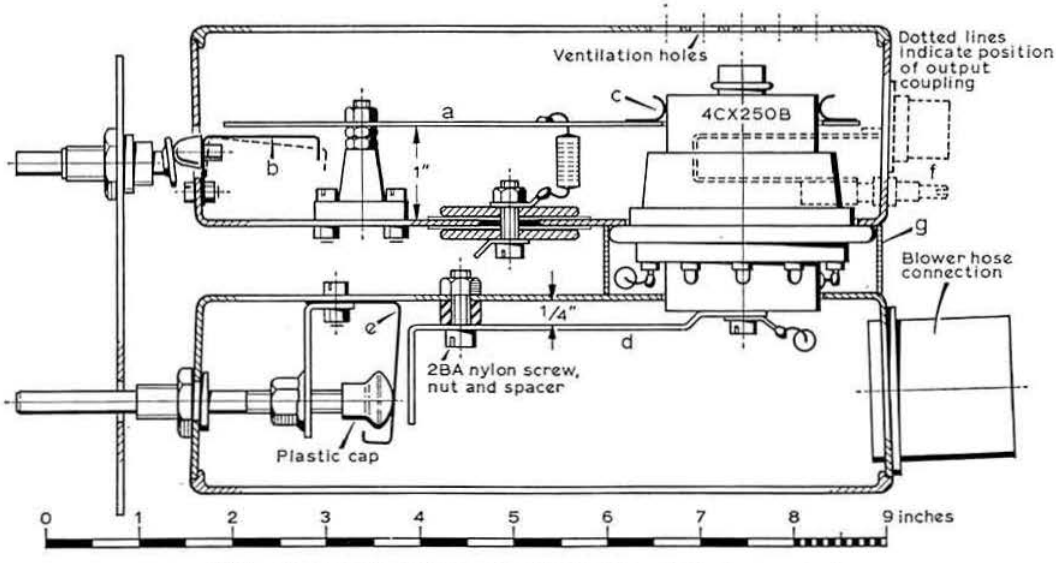


Fig 1. Section of complete assembly showing principal components

Taking the anode box first, the position of the four bushes in the corners of the rf dead space box (Fig 2g) and the centre of the valve holder are marked and the holes drilled. The two boxes are then placed base to base and the holes transferred to the grid box by drilling through the holes in the anode box. This ensures alignment of the two boxes after final assembly.

The anode line, Fig 2a, is next cut to size and drilled to take the stand-off insulators, and the clearance hole for the valve anode radiator is made. To contact the anode, contact fingering is required, and it is possible to obtain this material in the form of a pre-cut metal comb—in which case it is rolled into a cylinder and soldered to the anode line. Alternatively, the shape of Fig 2c is cut out from thin springy sheet by first drilling the 16 holes and then making connecting cuts to form the fingers. All sharp edges and burrs should be removed and then the fingers bent until the valve anode can be inserted. Photo 1 shows the anode in position.

The next step is to solder the anode contact to the anode line. Because of the large thermal capacity of the anode line this task may be done by carefully heating the components on a domestic cooker boiling ring, but do not overheat or the spring temper of the contacts will be lost. Finally all edges of the line are rounded and polished to prevent corona discharges at the high operating potentials, and the fingers adjusted so that they all bear squarely and evenly on the valve anode radiator.

The valve holder must be of the uhf type with built-in screen by-pass and ceramic chimney; the latter is fitted outside the box to give the valve the correct seated height. Insert the valve into the holder, bolt the stand-off insulator to the line and temporarily seat the line in position on the valve. The fixing holes for the stand-offs may then be marked on to the box floor. Remove the components from the box and drill the holes for the stand-offs, by-pass capacitor, tuner and output coupler.

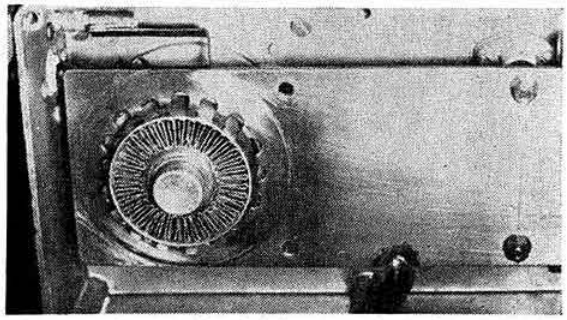


Photo 1. Close-up showing the anode in its holder and the output loop

Assemble the anode box components, starting with the anode by-pass capacitor. This item is not detailed; it consists of two sheet-metal discs bolted one on each side of the box and insulated with 0·01in polythene sheet, or two layers of 0·005in heavy gauge polythene which is the most readily available type. An insulating bush is required to pass the bolt through the box. All corners on the discs and holes should be rounded and smoothed. The capacitor plates need not be circular; rectangular plates are satisfactory providing the corners are well rounded.

The plate line tuner is arranged so that at maximum capacitance the earthed plate is parallel to the plate line with about $\frac{3}{32}$in air gap. It will be noted that the earth plate is deliberately made wider than the line and its free end is turned in. This is to eliminate high electric field gradients. To reduce capacitance the plate is deflected downward by pressure at right angles. Two methods of deflecting the tuner plates are shown; both are quite effective, Fig 2b, e.

The grid line is shown with a screw jack, Fig 1, which has a plastic cap from the end of a cheap ballpoint pen to provide a

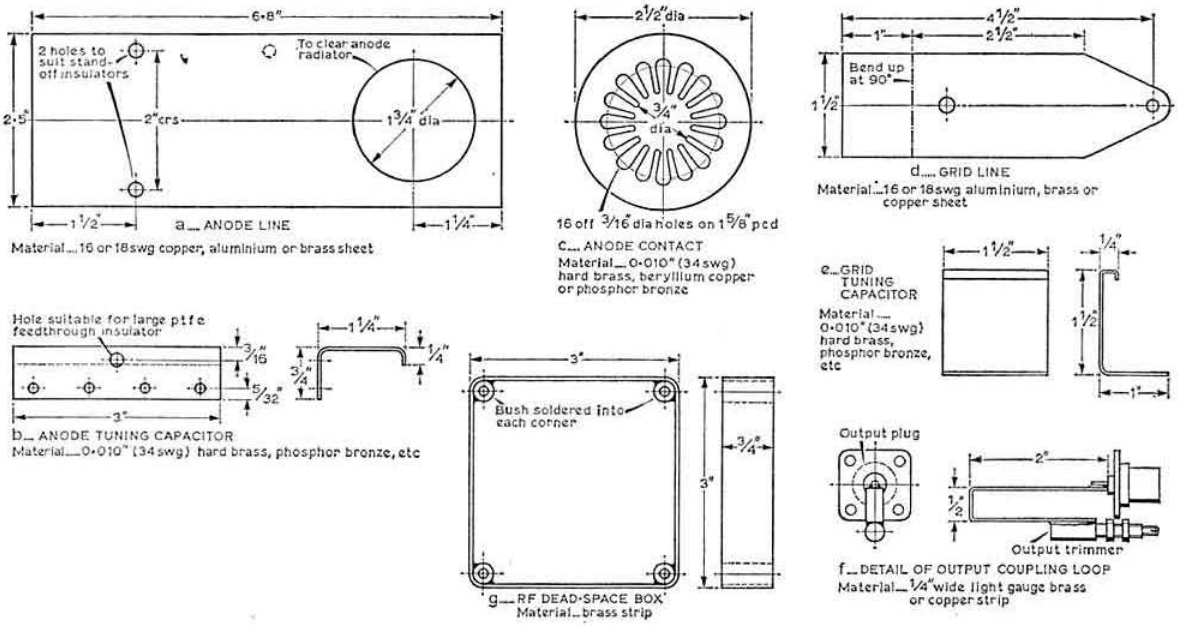


Fig 2. Details of components

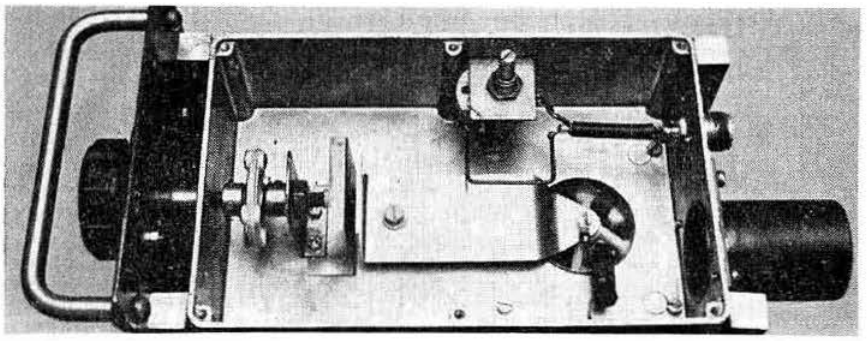


Photo 2. The grid box showing the grid line, input coupling loop and blower-hose connection

smooth contact between the screw and the plate; the nut is soldered to a bracket. In the case of the grid line, a stop to prevent the plate being jacked into contact with the line is essential because earthing the grid line shorts the grid bias and destroys the valve.

An alternative method of adjustment is shown on the anode line. A ¼in washer is filed out slightly so that it can be soldered at an angle to a ¼in shaft to form a face cam, which bears on a large ptfe feedthrough moulding inserted into the tuner plate, Fig 1. Old potentiometer bushes are used for the shaft bearings.

The output loop trimmer, Fig 2f, is a large piston type of about 4pF; small types as used in tv tuners will overheat and burn out at full power. The position of the output loop may be seen in Photo 1; it does not appear to be very critical. Low value wire-wound resistors are used as low Q chokes for the anode, grid screen and heater feeds.

The rf dead space box is fitted with two feedthroughs for the screen and heater supplies and bolted to the anode box and the valve holder wired. The four separate cathode connections must each be connected to ground by the shortest possible connections. The valve heater must be derated to 5·5V for 432MHz operation. If a 6·3V supply is to be used, a 0·33Ω 3W wire-wound resistor fitted inside the dead space box will provide the necessary volt drop.

All that then remains to be done is to drill holes in the anode box lid to allow the cooling air to exhaust, and the anode box and dead space are complete.

The grid box is simpler than the anode box but follows the same general principles. A hole is first made to accept the metal skirt on the valve holder; ideally this should be a good fit to maintain electrical continuity. The grid line is slightly cranked to enable it to connect with the valve holder grid contact and maintain ¼in clearance on the box floor. A ¼in high insulated bush and 2BA nylon bolt gives the line mechanical support.

Connection for the grid bias is from the valve holder grid connection (which approximates to the voltage node) via a wire-wound resistor; a feedthrough being provided to bring out the grid terminal. The input coupling consists of a rectangular loop of wire about 1¼ by 1in, series tuned by a 5pF air spaced trimmer. The position of the coupling loop relative to the grid line may be seen from Photo 2. The exact position is not critical. The valve is blown by pressurizing the grid box and some provision for this is required. The unit in the photograph is designed to couple to a standard vacuum cleaner hose, a very useful arrangement enabling the blower to be outside the shack.

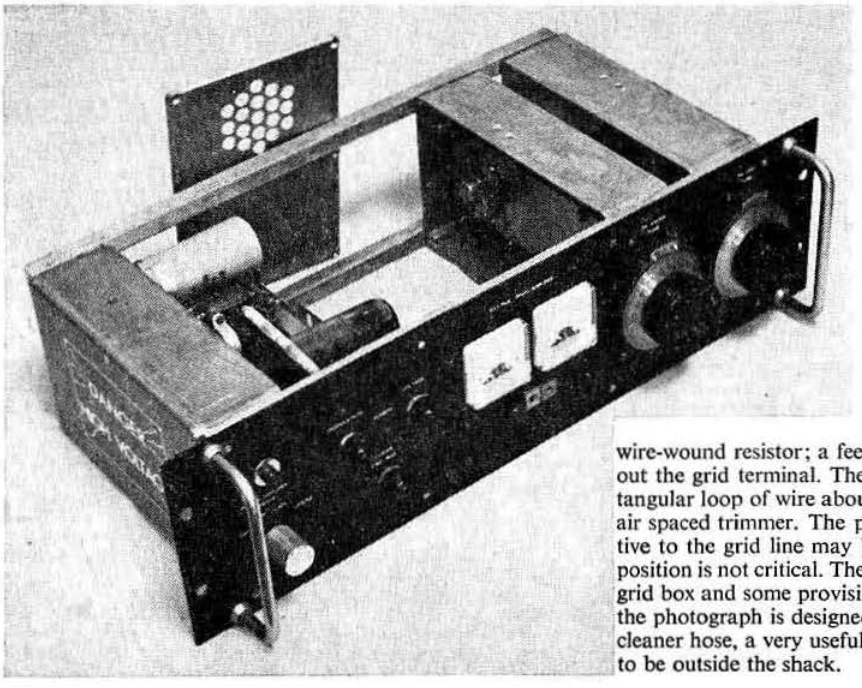


Photo 3. General view of the amplifier

Operation of the amplifier

Photo 3 shows the amplifier built into a 5¼in high, 19in rack unit with electronically regulated grid and screen supplies, switched for all modes, and the necessary metering.

The precise arrangements will depend upon the use to which the amplifier is to be put, but a few general points may be worth mentioning.

The supplies should be interlocked with the blower so that not even heaters can be switched on without air. The anode voltage supply for an amplifier of high power is usually a separate unit with independent switches and fuses, in which case electronic protection of the screen supply against loss of anode or grid voltages is advisable.

As a Class C amplifier operational at 750V and 200mA anode input with 250V on the screen and 90V fixed grid bias, it requires an input grid drive of 12 to 15W and produces a power output of around 100W when properly adjusted. Other input conditions up to 1,500V at 100mA have been tested and shown to have no advantages. Five types of valve of the 4CX250B class have been used and apart from some change in the settings of the tuners and drive requirement, little difference in performance was noted. A type 7580W showed significantly better power gain than the other types but only one sample of this type was available and it may not be typical.

It will be noted on tuning up that the screen current goes negative under some conditions and the screen supply must therefore sink or source. Linear operation will depend upon the anode supply available and it is best to consult the considerable amount of published data on this subject. As a starting point try $Vg_2 = 350V$ select $-Vg_1$ for Ia = 100mA with zero drive.

Finally, a word of caution. The potentials used can be lethal. Do not power the amplifier with the lid off. In any case, it will not tune without the lid. This raises the point of how to find the voltage node to connect the anode choke to the anode line. The answer is, with a specially modified lid, but do not bother; mid point is near enough. □

Practical design for a capacity hat loaded 14MHz mini-quad

by R. G. D. STONE, G3YDX

THE author has been interested in hf dx operation for most of the time since he was first licensed in 1969. In those days dx was much easier to work than it is now and band conditions were good—even on 28MHz. A lot of the rare ones were on cw, where low power and modest aerials could still do a good job—and there were far fewer big beams and linears in Europe than there are now. Under present conditions a bigger amplifier or a beam is necessary to achieve the same results, and as he was already running the maximum permitted power on ssb the author decided to build a beam. As his garden was too small to accept a full-sized 14MHz array, this had to be a miniaturized version.

Mini-quads and mini-Yagis were studied and the mini-quad was chosen for the following reasons:

(a) the quad, being made of wire rather than tubing, would be easier and much cheaper to build;

(b) a quad seems to have less Q than a comparably-sized Yagi—with miniaturization it was thought that a major problem would be a reduction in swr/bandwidth compared with a full-sized array, and a mini-quad would be less adversely affected than a mini-Yagi;

(c) a Yagi has to have a boom length 1·8 times greater than that of a quad for the same gain when 2-el quads and 3-el Yagis are being compared—this was felt to be a very important consideration given the small turning circle available;

(d) reduction of rain and air static on a quad because of the closed loops;

(e) the weight of a quad is likely to be less than that of a Yagi;

(f) the reduction in front:back ratio resulting from miniaturization is less for a quad than for a Yagi;

(g) if neighbour problems ensued, the spreaders could be used for their original purpose—bean poles.

The author's attention was drawn to the capacity hat loading technique described in *Technical Topics* (March 1976) where it was suggested that a 14MHz version would be about 12ft per side with the general configuration shown in Fig 1. Other small quad designs which have been published use coils to load elements to resonance, but these are lossy things and the author believes that capacity hat loading is the most efficient and easily adjusted answer to the problem.

The *TT* item gave no dimensions for the capacity hats, but after correspondence with Les Moxon, G6XN, the author decided to give the system a trial. For spreaders, 8ft bamboo canes liberally coated with varnish were used and these were attached to the boom in the usual double-X arrangement. A 6ft length of 1 by 1 by ⅛in dural angle was sawn into 18in lengths, drilled to accept 1in car exhaust clamps, and the canes firmly attached with adhesive tape reinforced with light wire to prevent it from being undone by rain and wind. Jubilee clips could be used for this application but they are expensive and tend to crush the bamboo if not carefully fitted. The spiders thus produced could accommodate about 10ft 6in of wire per side, compared with 11ft 8in per side for a *full-sized* 21MHz quad.

Trials were undertaken to build one element for resonance tests. Because the sides are a lot shorter than 12ft, the arrangement shown in Fig 1 gave resonance at too high a frequency, but eventually after cutting and trying, and some bending (a gdo helps), the sizes shown in Fig 2 resulted in

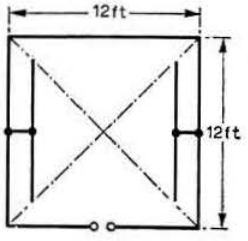


Fig 1. 12ft per side element

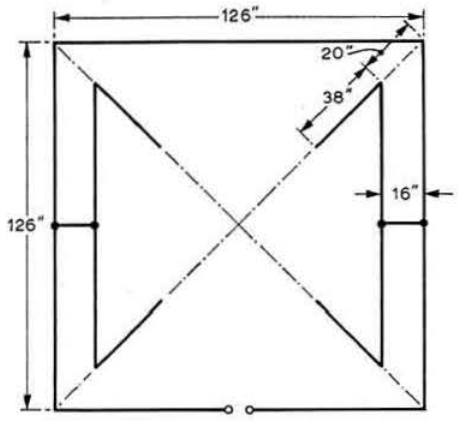


Fig 2. Element dimensions used by the author

resonance with the element in the air. Tested against a ground plane, the single-element loop did not appear to have any significant advantage, apart from possessing a deep null in the plane of the element. This null could only cope with a small proportion of the inevitable QRM on the band.

When the element was raised to its operating height the resonant frequency increased by some 150kHz. Constructors are advised to bear this effect in mind, as it will vary with the surroundings of the aerial. In the author's case the element was built parallel to, and about 8ft from, the ground. When raised, the boom height was 30ft.

The next step was to build a parasitic reflector of the same size as the driven element, but with a stub added; the boom was an 8ft 6in length of 1in outside diameter 16swg alloy tube obtained to match. Because of the reduction in impedance expected due to the smaller loop size, to some 2/5 the impedance of the full-sized quad, the addition of a parasitic element would result in a change of feedpoint impedance to below limits where acceptable direct match to coaxial feeder could be achieved. A gamma match was used to match the line to the array; 16swg wire with about 1·5in spacing, and a receiving-type 100pF variable capacitor being used. The length of the gamma section was adjusted for 14,050kHz with the array near to the ground to take into account the correction factor found necessary in the single-element tests. A gamma section length of 3ft was about right.

The mast was walked up on the back of the house, and the resonant frequency was found to be about 14,190kHz. The next job was the stub tuning. Due to a minor constructional difference in the reflector, no stub was required for what seemed to be the best front/back ratio. The author suggests that anyone constructing this array should test both elements for resonance rather than copy the dimensions from one to the other. In this small design the odd half-inch is critical.

A local station was enlisted to try to ascertain the extent of the front/back ratio. A reported 24dB was gratefully accepted and comparison tests with a ground plane began. The results are shown in Table 1 and indicate that the beam is definitely worthwhile. Not only have signal reports improved, but QRM difficulties have been reduced, which in the author's opinion is even more useful.

There are, however, some provisos which should be mentioned.

Table 1. Station reports

Station worked	Report sent Quad	Report sent GP	Report received Quad	Report received GP	Comments
LZ1PL	57	55	59+	56	
YU2BQR	59	56	59	57	"24dB f/b"
VK2LW	56	52	55	52	"Barely copyable with GP"
KA6RI	58	55	57	33	
9V1SQ	57	54	58	ZERO	
VK5WR	57	55	55	43	
ZD7FT	55	52	55	41	
ZB2CJ	59	56	59	56	
K1JHX	59	56	57	55	
9J2GJ	57	54	55	53	
KS6DV/KB6	55	53	55	54	

(1) Because of the reduction in size, the swr bandwidth of the array is reduced. This is illustrated in Fig 3. It should be noted that the array has a 2:1 swr bandwidth of about 200kHz, which is a distinct improvement over some well-known miniature beams available commercially at what seem astounding prices. The array will work on the cw end of the band with a reduction of directivity, and an atu is recommended because on 14,025kHz the swr is above 3:1. Obviously bandwidth will increase as loop size increases.

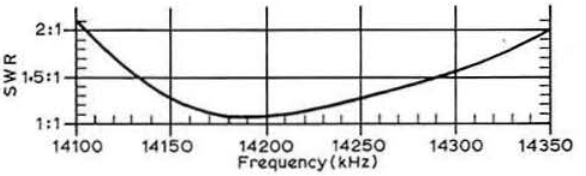


Fig 3. Graph showing reduction in swr bandwidth

(2) The gain will not be as good as that of a full-sized quad because of the reduced element size, but in fact miniaturization will only reduce it by some 0·5dB, which is hardly noticeable on the air. Front: back ratio seems to equal that of a full-sized quad; this suggests that an even smaller element may be useful for receive only.

(3) It is important that the elements are tuned very carefully or disappointing results may ensue.

(4) Bamboo canes are not very good insulators in wet weather. Eight-foot Fibreglass fishing rod blanks are available for about £1 each and should make much better insulators, as well as being much lighter and more durable.

Acknowledgements

The author wishes to thank G6XN for his technical advice, and G3XTJ and G2FLK for their help with air-testing. □

BOOK REVIEW

RTTY—the easy way, by Brian Hodgson, G3YKB. Published by BARTG. Obtainable from RSGB Publications (Sales), price 90p including postage and packing.

The aim of this 20-page booklet is to enable the newcomer to rtty to get going with the minimum of problems and offers suitable circuits and construction details. An up-to-date suppliers list is included with the booklet to cover the circuit requirements. The booklet is clear in both text and diagrams and is recommended reading for those embarking on rtty.

microwaves

Dain Evans, G3RPE*

A simple waveguide feed for short focal length dishes

The dishes that amateurs inherit are often of the short focal length type; that is, the ratio of the focal length to the diameter of the dish typically is in the region 0·25–0·3. (Note that to check a dish, measure its diameter D and the maximum depth at its centre c, when this ratio will be given by the value of $D/16c$.) A suitable feed for these dishes is the dipole/reflector type, examples of which are given in the *VHF/UHF Manual*, 3rd edn, Figs 8.131 and 8.132. Although widely used, these feeds are not particularly easy to make, and consequently the much simpler design given in Fig 1 is of great interest. G4ALN, who supplied the design information, used a 10GHz version during his recent G/ON and G/PA0 contacts on this band.

The feed is constructed by cutting two grooves in the end of a length of waveguide of appropriate size, and soldering on a circular end disc. The length of the slot formed, and also the diameter of the disc, are probably not critical within a few per cent, and the width of the slot even less so. Values for λ and λ_g for frequencies of amateur interest, together with details of suitable waveguides, are given in Table 1. Signals having the standard horizontal polarization are produced when the broad faces of the guide are vertical.

The feed can be used without any attempt to improve the match—the vswr typically is about 1·5:1. The match may be improved by conventional matching screws which preferably are fitted behind the dish as shown in order to reduce unwanted resonances. An elegant alternative method, which at the same time can be used in weatherproofing the system, is shown in the top figure. In this, a Perspex sleeve is made a sliding fit on both the end disc and the waveguide. By adjusting its position, the right proportion of power in the correct phase is fed back into the feed to cancel that reflected by the mismatch.

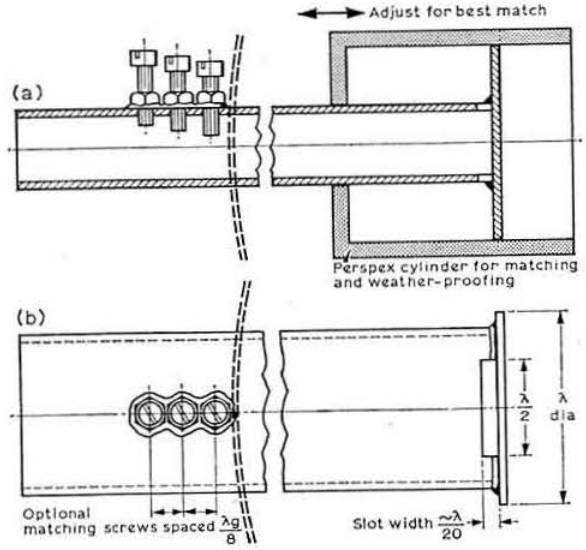


Fig 1. A simple feed for dishes having a f/D ratio of 0·25–0·3. (a) Section showing the use of an optional Perspex matching and weatherproofing sleeve; (b) side view showing alternative method using matching screws

*4 Upper Sales, Chaulden, Hemel Hempstead, Herts.

Table 1

Centre frequency (MHz)	Suitable waveguide	λ (mm)	λ_g (mm)
1,297	WG6	231	324
2,305	WG8	130	162
3,457	WG10	86·7	109
5,761	WG14	52·0	78·2
10,050	WG16	29·8	39·4
10,369	WG16	29·9	37·3
24,193	WG20	12·4	15·2

New 10GHz beacon for the London area

On 29 August the new 10GHz beacon GB3LBH produced by the Havering Radio Club started on schedule from its site at Romford, NGR 517868. In its present form the transmitter consists of a Gunn oscillator which generates 20mW on nominally 10,100MHz (actually 10,096MHz at the time of writing) which feeds an aerial of 10dB gain having a figure-8 pattern orientated E-W. The whole 10GHz unit, suitably weatherproofed, is mounted 70m asl on top of a building, with the modulated dc supplies being fed via a double-screened cable. Plans to increase the output power and the coverage of the aerial are already in hand.

The beacon is expected to cover the whole of the east London area, north to the Epping ridge, south to the North Downs and all of central London—from sites out in the clear of course. In a NW direction, the Hampstead ridge will form an obstruction. So far it has been heard locally over optical paths in the Chigwell and Ilford areas, and over a 14km non-optical path to Loughton. G4ALN will be pleased to receive further reports giving signal strength and NGR.

10GHz operating news

G3JHM spent the whole of August in the north of France and had some interesting 10GHz activity. On 1 August he operated 8km north of Cherbourg where he heard GB3IOW over the 110km path to the Isle of Wight, had a two-way contact with G3KSU/P at the same site, and worked G3VPF/P at Ringstead Bay near Weymouth over a 122km non-optical path. These contacts were repeated a week later. On 12 August a most interesting observation was made: from a site at Arromanches GB3IOW could be heard over the 145km path despite it being non-optical; at 0630 signals were 10dB above the minimum detectable level but faded over the next 4h. It seems almost certain that this enhanced propagation was associated with an elevated fog cloud observed at the French end; as this dispersed, so the signals dropped out. Well, it makes a change from humidity ducts.

On the following day G8BDJ/P on a site 7km north of Worthing was worked over a 170km non-optical path, and F1RJ worked over a 50km path to give the latter station his first contact on 10GHz. The Arromanches—Worthing contacts were repeated on 21 and 22 August, and a 145km contact was made with G3KSU/P on St Catherine's Point. This brings the latter station's score to three countries, 10 English counties and three French departments, all from one site. □

LEARNING ABOUT LOGIC by P.J.Horwood, G3FRB*

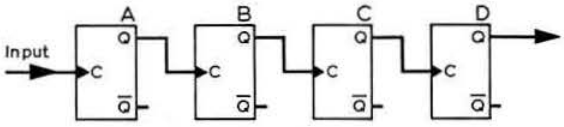
Part 5. PLL frequency synthesizer (1)

Before passing to a description of the phase-locked-loop frequency synthesizer, a little revision, or rather a fulfilment of an earlier promise (Part 2).

Positive edge triggering and the count sequence

It will be remembered that the M-S-J-K flip-flop was defined as negative-edge triggering while the basic J-K was said to be positive-edge triggered. Fig 36 shows a simplified ripple-through binary counter using the latter devices. The circuit is identical with that for M-S-J-Ks but the truth-table is not.

The first input does in fact ripple right through, putting all the Qs to 1, and each succeeding change from 0 to 1 at AQ causes flip-flop B to complement. This, of course, applies to all the other Qs when they go high. It is obvious that the count is *downwards*. A little thought indicates that if the interstage connections were made from $\bar{Q}$ to clock, the count would be upward, and conversely, if a *negative-edge* triggered group of flip-flops were connected $\bar{Q}$ to clock it would count downwards.



Input	D	C	B	A
0	0	0	0	0
15	1	1	1	1
14	1	1	1	0
13	1	1	0	1
12	1	1	0	0
11	1	0	1	1
10	1	0	1	0
9	1	0	0	1
8	1	0	0	0
7	0	1	1	1
6	0	1	1	0
5	0	1	0	1
4	0	1	0	0
3	0	0	1	1
2	0	0	1	0
1	0	0	0	1

Fig 36.

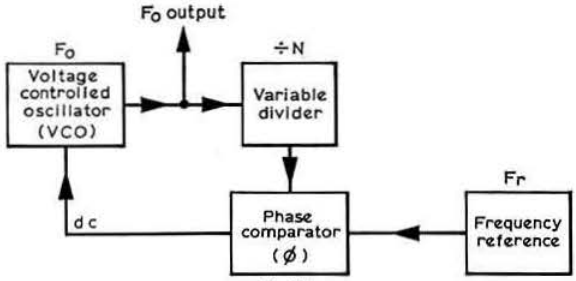


Fig 37.

The phase-locked-loop frequency synthesizer

Fig 37 shows the basic block diagram. The voltage-controlled oscillator is a conventional LC oscillator but also has a voltage-variable capacitor in parallel with the tuned circuit. Its output is required to do useful work, such as driving a mixer in a receiver or an exciter. The variable divider is now familiar. A source of high-stability oscillations is provided by the frequency reference. For the moment, the phase comparator will be considered as a device which receives two input signals and produces a dc output dependent on their difference.

This dc is applied to the varicap diode which alters the frequency of the vco. As an example, let the vco frequency Fo be 10MHz, the division N be 10, and the frequency reference Fr be 1MHz. Then Fo = NFr, and, of course, Fr = Fo/N and N = Fo/Fr. In this condition the dc output of the phase-comparator will be steady and hold the vco on 10MHz. Suppose the divider is changed to 9, then as Fr is constant the other input to the phase-comparator will be 10MHz divided by 9, and the dc output will change. In this example, the dc voltage must fall (as we shall see shortly) the varicap capacity will increase, and the vco frequency will decrease until it reaches 9MHz, when a stable condition or phase-lock is re-established. So it can be seen that the vco frequency is changed by altering the division ratio of the variable divider.

Now we must understand the operation of the varicap diode and the phase-comparator.

The varicap diode

Although during the series internal detail of ICs have been deliberately ignored, it is necessary briefly to consider the physics of a diode in order to understand its ability to become a variable capacitor. This ability is inherent in all junction diodes, but varicap diodes are specially designed to have predictable ranges of C commensurate with reasonable levels of Q. Fig 38 shows the three basic conditions of a diode, unbiased, forward biased, and reverse biased.

In (a) the N region is shown as predominantly negative, having an excess of electrons, while the P region is predominantly positive, having an excess of holes. The junction region is shown as having no charge and is analogous to the dielectric of a capacitor. If a diode were measured on a bridge it would be found to have significant capacity, as much as 100pF, depending on the construction. In fact, power diodes may have considerably greater capacity.

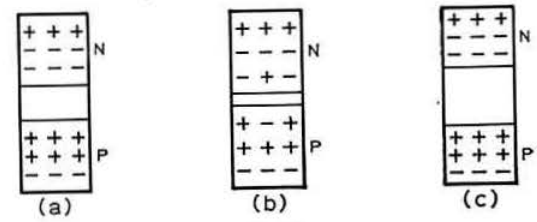


Fig 38.

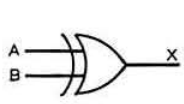
* 14 Main Road, Hextable, Swanley, Kent.

Diagram (b) shows the diode forward biased, a current is formed by electrons and holes crossing the junction region. Reverse bias in (c) causes the electrons and holes to be drawn back to opposite ends, the junction region is increased in width and therefore the effective C is reduced. The varicap can be seen to be a device whose capacity can be made to change by an applied voltage. If this voltage were to be alternating, C would change in sympathy and cause frequency modulation if applied to a self-excited oscillator. However, in the phase-locked-loop frequency synthesizer, frequency modulation is highly undesirable and later we shall see how a low-pass filter is needed to prevent it.

The phase comparator

Two frequencies could be identical and yet have a phase difference. It is this phase difference which is detected and used to generate a dc voltage which itself is used to control an oscillator frequency via a varicap diode.

It is necessary to reintroduce a gate mentioned in Part 1, the exclusive OR. To save readers the need to refer back, the symbol and truth-table are repeated in Fig 39.



A	B	X
0	0	0
1	0	1
0	1	1
1	1	0

Fig 39.

Now let us consider two 1:1 mark/space ratio square waves applied to A and B. Fig 40 shows that when both signals are in phase the output is permanently low. (A and B = 0), whereas when 180° out of phase the output is permanently high. (A or B = 1). Note carefully that a phase difference of 90° produces a 1:1 mark/space ratio wave at *twice* the input frequency.

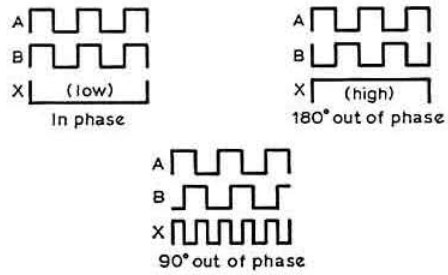


Fig 40.

Similarly, if the phase difference is less than 90°, the mark/space ratio will be less than 1:1, and when greater than 90° the mark/space ratio will be greater than 1:1.

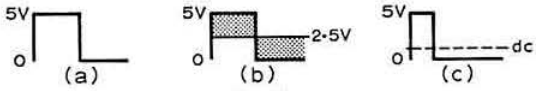


Fig 41.

What is the purpose of all this? Consider Fig 41 (a).

A single square wave of 1:1 ratio with voltage limits of 0 and 5V is shown. If such a signal is integrated the average dc level will be 2·5V. This can be achieved by passing it through a filter with a cut-off lower than the signal's frequency. In visual terms it can be considered as shown in (b). The upper half of the first half cycle fits neatly into the space provided by the second half cycle, producing a mean dc level of 2·5V. Note this cannot be achieved simply by using a reservoir capacitor because, assuming no load current, it would charge to the peak voltage of 5V. This has some similarity to the dc output of a mains power supply rectifier when followed by a capacity input filter and a choke input filter. The actual cut-off frequency of the filter is important and affects two matters, ripple and capture range. Using the mains filter analogy again, if the cut-off is not low enough—for instance, not enough inductance in the filter choke—there will be excessive ripple on the dc, and hum will result. In the case of the phase-locked-loop, the ripple will cause frequency modulation of the vco. Unfortunately a low cut-off frequency also means a narrow capture range, so we have two conflicting requirements of the filter, but we shall return to capture range and filter design later.

Now look at (c). The mark/space ratio is less than unity and the average dc level is lower. On an area comparison basis, more than half of the positive-going half-cycle would be needed to produce a mean dc level, and this would be less than 2·5V. Any further explanation to confirm that the dc output of a phase comparator and filter will vary as the phase difference between the two input signals varies should be unnecessary.

The author recently addressed a local radio club on matters arising from the earlier parts of this series and was able to demonstrate some methods of modifying the counting sequence of the basic binary counter. Perhaps one day it will be possible to distribute *Radio Communication* as a videotape, in the meantime words must suffice, but if readers who are still following this series (and the author hopes the majority are) would care to write on any points he would be glad to answer them in a subsequent article. Next month's will be the last regular part of this series, when the description of the phase-locked-loop frequency synthesizer will be completed. □

RAE COURSES 1976-7

The following list gives details of RAE courses which commenced in September but were received too late for inclusion in the lists published in the August and September issues.

December 1976 RAE. Listen to GB2RS on 10 October.

Bristol. Twyford House, High Street, Shirehampton. Includes morse instruction.

Chippenham. Chippenham Technical College, Cocklebury Road, Chippenham SN15 3QD. Details from G. C. Peck at the college, tel 0249 50501.

Coventry. Coventry Technical College, Butts, Coventry. Tuesdays, 7-9pm, commenced 14 September. Late enrolments possible until class full. Details from G8FFN, QTHR.

Croydon. Haling Manor High School, Kendra Hall Road, South Croydon. Tutor, P. L. A. Burton, G3ZPB. Thursdays, 7.30-9.30pm.

Edinburgh. Leith Nautical College, 59 Commercial Street, Leith. Mondays and Thursdays, 6.30-9pm, commenced 23 September. Includes morse. Late enrolment welcome. Fee £4.50. Details from the college, tel 031-554 4903.

Glasgow. Glasgow College of Nautical Studies, 21 Thistle Street, Glasgow C5. Tuesdays and Thursdays, 7-9.30pm, commenced 7 September. Fee £3, free to students under 18 as of 1 August.

London (Islington). Debeauvoir Evening Institute, Tottenham Road, Ballspond Road, London N1. Beginners Mondays and Wednesdays, advanced Tuesdays and Thursdays, commenced 20 September. Enrolment 13 September through to October. Details from senior instructor Fred Barnes, G3AGP, tel 01-864 5311 ext 2283 day, 01-361 9737 night.

technical topics

Pat Hawker, G3VA

INHERENT in the international definition of amateur radio is the continued role of the amateur in carrying out "technical investigations" and so helping to advance the art or science of two-way radio communication. One way in which radio communication can still be improved is by achieving in practice the advantages that theory tells us exist in certain forms of signalling, modulation and demodulation, whether this be for two-tone a.m. rtty (see below), synchronous demodulators, or dsbsc. Such engineers as Costas, Haviland, Panter and Gosling have shown that, potentially, the most effective mode for speech communication (especially in non-channelized amateur bands) would be dsbsc. Further, contrary to a widely accepted belief, as many dsbsc as ssb stations could operate effectively in a non-channelized band.

Achievement of the full potential of dsbsc requires further development of advanced forms of synchronous demodulation, including such techniques as binaural synchronous systems, although in the meantime dsbsc signals are fully compatible with ssb and can be demodulated effectively on any receiver suitable for ssb. In amateur usage the system is also regarded as a useful intermediate step between a.m. and ssb, allowing older a.m. transmitters to be readily converted for suppressed carrier operation.

Yet the Home Office has now ruled that British amateurs may no longer use dsbsc—surely an odd, uncharacteristic decision which cannot be justified by the statement that dsbsc signals cannot be effectively monitored. Elsewhere ("World of amateur radio", *Wireless World*, October) I appeal to the Home Office to think again. Unless licensing authorities give amateurs reasonably free scope to experiment with the less conventional modes how on earth can we claim to be carrying out "technical investigations"?

Safety and your rig

It is very easy to become careless over questions of electrical safety by thinking that any dangers are self evident. Maybe they are—to you. I still have on my conscience an injury suffered some years ago by a family cat—and I then learned from the vet that domestic pets are often victims of electric shock. There are no statistics on this to stir us into extra care, but it is not something you want to happen twice. And it is not only pets who may not recognize danger.

As C. J. Henderson, ZL2TBH, points out in a detailed guide to safe construction practice (*Break-in*, March 1976): "Some points may seem pedantic, beyond confirmation or outside the bounds of possibility. However, even these must be food for thought. A reasoned departure from 'the book' may often be satisfactory, whereas the products of ignorance can only be safe by chance."

He points out that fortunately electrical casualties and fires associated with amateur activity have been exceedingly rare to date, but that "I have seen hair-raising home set-ups made both by beginners and those who should know better. I save a shudder for each of my past sins and for a lot of older commercial equipment . . . in the event of a mishap both the law and the insurance company may take an interest." He considers that not only should safety standards—which in New Zealand are carefully defined—be used as guidelines but that mains and high-voltage circuits should also be fully protected from contact while equipment is being tested and modified.

ZL2TBH's article runs to several pages and it is possible here only to note some of his points. For instance, a list of "general requirements" that are by no means always observed:

(1) All requirements must be met with all screws loosened a quarter-turn. This means that live parts, and parts near live parts, will usually require two-point fixings.

(2) All requirements should be met under any conditions of single mechanical failure (eg one screw loosened and adrift inside the equipment or one lead broken off its termination). This should apply whether or not the mains earth is connected. The "lead adrift" case can be met by securing leads together for mutual support.

(3) All requirements should be met when a "standard finger" is applied with a force up to 50N (11 lbf) at maximum fault temperature. This implies restricting the size of ventilation holes to a maximum of 8mm ($\frac{5}{16}$in) diameter, and making sure that no live part is less than 10mm inside the holes when the cover is forced inwards. Ventilation slots should be restricted to 4mm ($\frac{5}{32}$in) width.

(4) The requirements should be met after any internal part or wiring has been moved with a force of up to 2N (0·4 lbf).

(5) Live wiring must not touch any moving parts when shifted by a force up to 2N (0·4 lbf). For reliability all wiring should meet the above requirements.

(6) No short-circuit or arcing should be caused by insertion of screws. Holes should preferably be located so that screws of excess length will not cause damage or hazard.

While these recommendations may not coincide with the various British safety standards they seem a useful basis. Among ZL2TBH's many other points is the need to provide at least minimum clearances and creepage distances of live points, maintained under single mechanical failure. He notes that wood does not qualify for insulation.

Live points should be accessible only by the use of a tool (a recommendation frequently not met by panel-mounted fuseholders). Warning labels should be fixed to removable covers. "Live points" are defined as any point with a potential difference of more than 34V relative to earth and from which a current exceeding 0·7mA may flow.

Protection against fire should include the provision that no part shall reach a temperature such that flames or sustained smouldering can occur during fault conditions: if in doubt avoid use of insulation materials that can be melted around high-voltage parts (wax and most thermoplastics burn well).

ZL2TBH lists also some points that affect not only safety but also reliability of the equipment, as follows:

Design home-station gear for 45°C ambient. This allows a margin for installation in racks, shelves and other places with restricted ventilation. Then ventilate to the maximum extent possible! Every 1°C of operating temperature will approximately double the failure rate of a sound design. Portable gear should be capable of taking 55°C (and that means also home-station gear used on field days). Mobiles require a rating of over 65°C.

Transistors: Never exceed any ratings. If in doubt stay *below* Vceo. Do not be misled by 25°C power ratings: work it out from thermal resistance *including* mounting. Remember that a heat sink of less than 5°C/W is already getting physically large.

Resistors: Watch ratings. Avoid high-value carbon-film types in high-voltage circuits. Composition types are better in this situation. Metal and metal-oxide types are quiet and reliable, but watch solder-point temperatures. Derate in confined situations.

Capacitors: Beware of *current* ratings in ceramic types; regard any heating as suspicious. Metallized foil types should not be subjected to large discharge currents (over 400mA). However, metal plus polyester foil (ie separate metal foil) types are suitable for large pulses. For ac mains and large-amplitude pulses, use mixed-dielectric types if available. Only 250V *ac* rated capacitors should be used in any mains wiring.

Lamps: Under-running filament lamps by 10 per cent will increase life by 3·5 times (and conversely). Low-voltage high-current types are more reliable. Some intermittent rfi may be caused by adjacent turns of a filament shorting together.

Valves: Those who established "icas" (intermittent commercial and amateur service) ratings did not have contests in mind!

Finally, just a few more of the points mentioned by ZL2TBH: "output" sockets should be marked and designed so that "input" plugs cannot be inserted. Power cords should be securely anchored with live wiring wrapped around terminal eyelets before being soldered. Headphones should not be connected to points more than 34V relative to earth. Mains wiring should have insulation over 0·4mm thick; normal hook-up wire does not have guaranteed insulation so that mains cable should be used inside equipment as well as for power cords. No live part should retain greater than 0·02mC charge (eg 40V on 0·47μF) after covers are removed. Note that switches of American or Japanese origin may be rated only for 125V ac. Power cords must be securely anchored, the earth lead remaining slack even when the other leads are under tension. Live wiring should be wrapped around terminal eyelets before being soldered. The mains current that may flow to earth under normal operation should not exceed 0·7mA peak; the mains current that flows to earth via an aerial connection should not exceed 0·4mA peak. The former condition is achieved by limiting mains-filter capacitance from each line to earth to 0·005μF.

The modern amateur station with fully enclosed units is infinitely less hazardous than those of yesteryear; paradoxically, however, the absence of obvious danger can result in less awareness of remaining hazards.

Linear cmos amplifiers

The very first introduction in *TT* to low-cost integrated circuits appeared as long ago as January 1967. In essence it explained how the then new plastic-encapsulated *digital* logic devices could be used for such linear or *analogue* applications as rf and i.f. small-signal amplifiers as well as for their intended digital applications. Since then a lot of applications, both analogue and digital, have fallen firmly into the integrated-circuit world—or at least into that part of the ic world that is based on bipolar devices.

For, despite the increasing use of mosfet techniques in the now popular cmos-type integrated circuits, such devices have tended to remain firmly in the digital field. But need this always be the case? One amateur who does not think so is

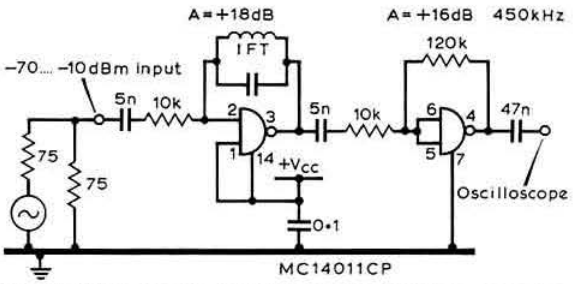


Fig 1. LA8AK's experimental set-up for testing the use of cmos integrated circuits as linear "operational amplifiers" at 450kHz. Total gain 34dB (at −60dBm input level). Test instruments used: Wandel & Goltermann PS-6 as level oscillator; Tektronic type 422 oscilloscope

Jan Martin Noeding, LA8AK/G5BFV, technical editor of the Norwegian *Amatør Radio*. He writes:

"Some time ago I discovered that devices containing cmos NAND gates, such as the MC14011CP or CD4011AE, will act as operational amplifiers (op-amps) if the input is self-biased using a feedback resistor from the output. After having successfully tried this arrangement at af, and learning that G8ENN uses the CD4007 as a linear amplifier at 60kHz, I decided to try this approach at 450kHz. Although the CD-4007 has a simpler gate arrangement and would probably be easier to operate linearly, my own experiments were with the MC14011. This seems to perform very well in the test set-up shown in Fig 1 and the output waveform seems a very satisfactory sinewave so long as the amplifier does not saturate. As with the well-known 741 op-amp, saturation occurs when the supply voltage is too low for the voltage swing.

"My experimental circuit was made using a piece of Veroboard and appears stable although no attempt has been made to use it for very low level signals (below — 60dBm). The tuned amplifier uses a subminiature Japanese ift. The gain is 18dB and the second stage provides a further 16dB gain. It might be possible to optimize component values and so increase gain, but the arrangement was intended only as a test bed to check whether cmos gates could be used in an i.f. amplifier."

Two-tone rtty?

My reference to the Siemens 12·5 baud rtty system (*TT* July) has stirred up a number of letters on various aspects of rtty, including a plea from Jim Evans, G3VDB, that we should hesitate before plunging into another speed. It has taken, he says, many years to get the 45/50 baud discussion finally settled and no doubt the use of 75 bauds in the USA may cause the question of that speed to be raised here.

Before opting for another speed he feels that more might be done to explore the limits of the existing 7·5 unit standard. "Very early in my rtty career," he comments, "I was convinced by an article by J. V. Beard and A. J. Wheeldon (Marconi's *Point-to-Point telecommunication*, June 1960, pp20-48) that two-tone a.m. transmission of rtty might offer vast improvement over fsk in the conditions that exist on amateur bands: selective fading, poor signal-to-noise, and general interference."

His letter led me to compare this 1960 article with two later discussions on rtty modes—the book *High frequency communications* by J. A. Betts (1967) and the paper "The choice of multi-channel telegraph systems for use on hf radio links"

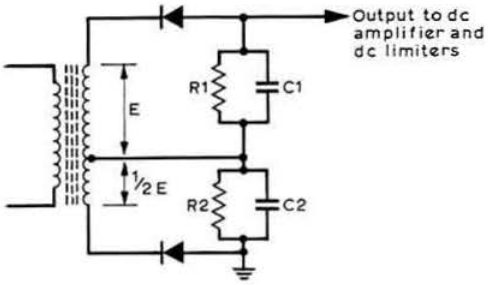


Fig 2. Basic slide-back detector for rtty a.m. signals or cw signals (from the 1960 paper by Beard and Wheeldon)

by P. M. Ridout and L. K. Wheeler (IEE 1963 convention on hf communications)—both of which deploy a number of arguments *against* two-tone transmission. However, these are concerned primarily with the very different conditions of commercial circuits using diversity reception etc, and the original arguments of Beard and Wheeldon certainly still appear to carry conviction for *amateur* operation.

G3VDB believes that in amateur conditions two-tone mode could be equivalent to a 10-15dB improvement in signal/noise ratio provided that certain conditions are fulfilled; yet he finds few other amateurs aware of the possibilities. He writes:

"I have been playing around in my limited spare time with a two-tone tu since 1970 and am now at the stage where I know where the problems are; all I need now is a few years of free time to prove the techniques and design round the problems! At present my recommendations are:

"(1) Two or three time-constants are necessary to cater for the variations in selective fading. The signal can only fade 8dB per time constant for the threshold correction circuits (slide back Fig 2) to be able to follow and if the time constants are made the order of seconds as some suggest then even minor fading causes trouble. I feel that 500ms, 250ms and about 60ms (for really bad flutter) are fairly close to optimum.

"(2) When the short time-constants are in use, severe character distortion is introduced if the post-demodulation filter is kept to the optimum value of 25Hz. This should be broadened in the ratio of the shortening of the slide back, to alleviate this effect.

"(3) It is desirable to keep the keying rate up (with short time constants) to keep them charged. This is quite a problem in amateur communication since you never know what is at the other end of the link. Therefore either learn to type, use tape or build some fairly simple logic to insert 'idle' characters of either letters/figures shift as appropriate or 'character 31' —all space. This idea was suggested by G4CUE some years ago.

"We can then come to the *pièce de résistance*: by crystal controlling the said piece of logic circuit we can generate proper synchronous (7½ unit start stop) transmissions which are compatible with existing practice, but which any 'digital gadget fanatic' can receive with a lower error rate by throwing away the start and stop elements. We would then be in the best possible position to compete with a slow rate 12·5 baud system."

G3VDB also believes that some people in the rtty field are being persuaded to spend a small fortune on digital ic devices (fifos/silos and microprocessors) in the belief that they will dramatically improve their reception. Such techniques, he considers, have a use in easing operational problems of code conversion and speed conversion to and from 45/50 or 45/75 bauds, but he feels it should be remembered that once distortion is 50 per cent no amount of digital processing, short of a major computer program, will recover the information.

G3VDB is also not convinced that rtty really is bad in comparison with cw. Could it be, he asks, that rtty *looks* much worse with overprinting, missed figure/letter shifts, corrupt characters and the like whereas the cw operator sorts out the information before writing it down: the essential information in an amateur contact will often come through on rtty in spite of an apparently high error rate. While G3VDB may well have a point, the early papers on Piccolo do include some illuminating comparisons between cw and rtty for the reception of traffic. On the other hand these papers do include some interesting comments on a two-tone instead of 32-tone Piccolo system that seem to bear out G3VDB's belief in two-tone a.m. systems.

G3VDB also feels that it might be possible to add some simple form of error correction to 7·5 unit synchronous start/stop transmission without destroying the basic plain language content of the messages required to meet Home Office approval—although he thinks this might be getting into the realm of microprocessors and beyond the limits of what most amateurs are prepared to spend on their hobby.

Another ic desoldering aid

A few months ago a desoldering aid capable of coping with multi-pin integrated circuits was suggested by ZS5GQ (*TT* June 1976). A rather different way of tackling the same problem was noticed recently in *Radio-REF* in a note by F8CV but apparently originating with F9BL. This suggests that good results can be achieved by using a standard, stainless hypodermic needle with the point ground down to avoid the risk of scratches. It then forms, in effect, a thin tube with a diameter sufficient to fit over the ic leads. The procedure is to heat and liquify the solder fastening a pin, using the soldering iron, then when molten the needle is gently introduced turning it gently between the fingers, until the ic lead is separated from the solder by the thin wall of the needle; the soldering iron is then removed. According to F8CV the solder will not "take" to the stainless steel needle so that when cold, the needle can be withdrawn and the lead left free. The process is repeated on all the ic leads, allowing the device to be removed from the printed circuit board. Not having much knowledge of hypodermic needles, I do not know how to specify the size of needle required to fit over an ic lead: so if anyone tries the idea and it works perhaps they would pass on the necessary information to the rest of us.

The PA0RCH twin aerial

A little more than two years ago (*TT* March 1974) attention was drawn to what seemed a very useful technique for reducing ground losses of short vertical aerials, such as whips or top-loaded monopoles, particularly those used on the lower hf bands such as 1·8 and 3·5MHz. This was achieved by the use of multiple elements, a revival by Fort Monmouth of an idea first put forward in 1920.

This item noted that ground losses of hf aerials near ground are reduced if the conventional single element is replaced by

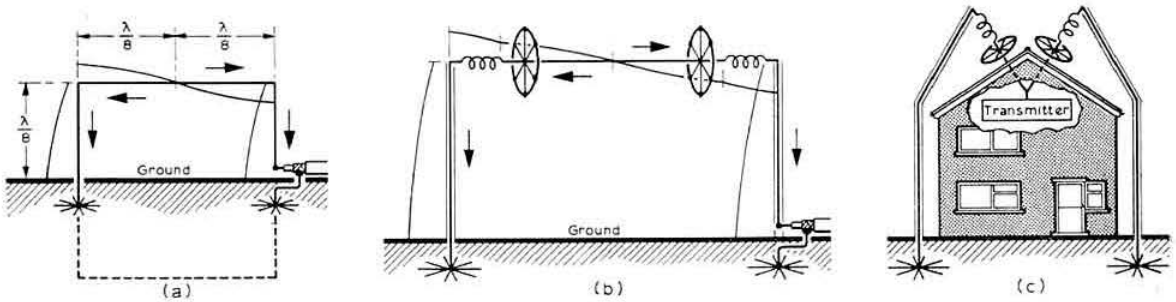


Fig 3. The development of the PA0RCH twin-vertical or shortened half-quad. (a) Basic half-quad element arrangement using one half-wavelength of wire. (b) As (a) but with physical dimensions reduced by LC loading as in the original PA0RCH vertical described in *TT* March 1974. (c) Voltage-fed version useful where transmitter is on upper storey and the aerial reaches over the house

an array of two to four (or even more) elements spaced about 0·1λ apart. For example, at low hf, two driven elements will provide nearly 3dB (four elements nearly 6dB) more radiation than a single element, quite apart from any possible directional gain resulting from the use of an array.

Very little feedback was ever received on this item (although discussions with Ron Glaisher, G6LX, suggested that his experiences with multiple element verticals were in line with the Fort Monmouth experiments). It was not until glancing through the August 1976 issue of *Electron* that we have seen an aerial design specifically based on this technique.

This is the PA0RCH twin aerial developed by R. Cornet, PA0RCH, using as his basic structure two of his LC loaded short verticals for 1·8MHz using plastic drain pipes and "top hat" loading (*TT* May 1974). He shows how a "half-quad" arrangement can be used to take advantage of twin verticals as shown in Fig 3(a) with two λ/8 verticals and λ/4 joining section, current fed from coaxial cable at the base of one vertical. He then uses two of his short verticals to reduce the physical dimensions of this arrangement (Fig 3(b)), joining these together over the top of his house where voltage-feeding is convenient from a transmitter in the attic or upper storey (Fig 3(c)).

But do not forget that even with a twin system ground losses still need to be kept as low as possible by using extensive earth systems around each vertical. The idea could, of course, be extended to three or four short verticals spaced around the four sides of a building.

The "double-bazooka" knocked

The double-bazooka or double-coaxial dipole described in August *TT* was introduced in a low-key manner which I hope made clear that I felt some of the claims made for this aerial should not be taken too seriously. By coincidence this point was made strongly in the August issue of *Ham Radio* in a 14-page article by Walt Maxwell, W2DU, "A revealing analysis of the coaxial dipole antenna". In effect, like *Punch* on marriage, the 14 pages add up to the single word "don't". Perhaps not quite "don't ever" since W2DU admits that it can increase bandwidth moderately (though not if fed with 50Ω cable), but he seems to feel that the improvement is almost never worth the cost of the extra coaxial cable (though of course many amateurs have odd lengths around without having to buy any specially) and could be achieved more effectively at lower cost in other ways: eg the fan-shaped bow-tie arrangement using gradually diverging wire elements.

Incidentally, due to a last-minute proof correction that went wrong the dimension of the W2EEY coaxial section was given in August *TT* as 372/f when the figure should have been 326/f. Kris Partridge, G8AUU, points out that I did not make it clear that this gives the dimensions in *feet* and takes the opportunity of suggesting that *TT* should go fully metric—something which on the whole I feel should be put off until the day when we think naturally in metres and centimetres, which I certainly do not do at present. It is my practice to keep to whatever unit, feet or metres, is given in the source, since this eliminates a possible chance of error in making conversions. G8AUU also chides me with using "formulas" rather than formulae; perhaps he is right but on the other hand I have a positive dislike of using "antennae" instead of antennas, and not entirely because it reminds me of those school years of struggling with Latin! After all we do not spell Rome as Roma or Prague as Praha.

RF connectors

As frequencies increase so does the importance of having good rf connections between different lengths of coaxial cable or between the cable and the equipment. On hf almost anything goes; vhf will tolerate a good deal of abuse; but above about 300MHz it rapidly becomes essential to ensure that the connector does not present an impedance discontinuity. For instance, a connector designed for use with 50Ω cable will introduce a significant swr when used with 75Ω cable. Similarly an incorrectly-assembled connector, or even careless soldering, with too much or too little solder, can affect the impedance and give rise to unsatisfactory performance, especially with miniature connectors. For a long time braid attachment consisted of clamping the braid to the connector but today other techniques are often the preferred method, with particular emphasis on crimping. In this technique the braid is positioned between the connector body on the inside and a crimping tool is then used to secure the connector to the cable braid. It should be noted that such assemblies cannot normally be repaired if a fault develops, and that special crimping tools are required. Some years ago G4ANQ pointed out that the common practice of tv installation engineers of terminating feeder cable to the plug with a pinch fit (crimping) of the centre lead could subsequently lead to a non-linear connection (in effect a small diode in series with the aerial lead) which could give rise to tvi.

Most of the other comments derive from a survey of American rf connector practice in *Electronic Design* 11, 24 May 1976. □

4-2-70

Martin Dann, G3NHE*

DX news

Although many of us, as we survey yellowing lawns, withered flower beds and grimy cars, would be happy to endure the poor radio conditions that prolonged rain would no doubt bring, August has nevertheless been an exciting month as far as tropospheric propagation is concerned. As the main direction of the lift drifted slowly with the movement of the high pressure system covering much of Western Europe during the period, so dx from France, through Germany and Poland to Norway became commonplace, and achievements which would normally merit special comment have become run-of-the-mill. We were amused to hear one 2m amateur calling "CQ local only" and later complaining that he needed a month of flat conditions to catch up on his QSLing!

An example of the high level of Continental activity is provided by Bob Matthews, G3ZNZ, of Driffield, who between 8 and 20 August worked no fewer than 256 non-UK stations on 144MHz. These included LA, SP, SM0, SM6, SM7, DL, DM, OZ, F and PA, and equipment used was a Europa to a 5-el quad, 75ft asl.

FM users were not left out, as G3ZEG of Lincolnshire will testify. Being located only inches above sea level, Lee Bennett had previously worked only one station outside his own county, and the only repeater audible, GB3NA at Barnsley, is too weak to access. Despite this, on 15 August using 15W of fm on channel S20, and a $\frac{5}{8}\lambda$ ground-plane, G3ZEG raised first PA9ARH and then OZ8NR, both at 5 and 6 both ways and has now worked more countries than counties on the band.

G8KDL of London also specializes in fm, and mentions the dates 6, 17, 19 and 20 August as being particularly good on 144MHz. Steve Whitt uses 15W of fm to a 7-el cubical quad, which he put to good use during this period, working 28 different Continentals direct, including PA, DL, ON and F. Steve found conditions to be at their best between midnight and 4am, when most of his dx was worked. He also heard several repeaters, including GB3KR, GB3PO, ON0BT, PI3ALK and PI3AMR. The most notable contacts made by G8KDL were on 20 August at 0329gmt when $\frac{1}{2}$W to his beam was sufficient to work DB5YW via the Bendheim repeater, DB0VQ, and at 0200gmt the following morning a 500km direct contact with DJ5PN was completed on channel S23 using $\frac{1}{4}$W to a hand-held indoor $\lambda/4$ whip.

Not everyone found conditions to their liking, for despite his successes during the sporadic-E openings, G3XCS has been most frustrated during the August tropo lifts. From his location in Saltash, Cornwall, Colin has been hearing other G stations as close to him as Avon and Dorset, working strings of Scandinavians and Germans without any trace of the dx being audible in Cornwall.

The keen ears of Harold Meerza, BRS34348, miss little from his QTH in Chatham. For Harold the high spot of the August lift occurred on 25 August at about 2150gmt, when he copied SM5CCY (QRA square HS) at 5/9 on 432MHz, and at 559 on the next band up while the Swede was in contact with G3ZEZ. BRS34348 found conditions early in the mornings quite amazing, with very strong beacon signals but, of course, little activity. Harold's feelings as the weather broke were of relief—not just for the rain that fell, but for the chance to get a rest from radio!

As well as some excellent work on 1·3GHz (including first GI/G, GI/GD and GI/GM) GI3VPK/P, ably supported by GI8AYZ, gave many stations their first GI on 432MHz during VHF NFD. Operating from XO11a, near Larne in Co Antrim, Willie also made the first 432MHz GI/ON contact when he worked ON5UN/P. Equipment on this band ran 250W p.e.p. output to a 68-el multibeam.

FM channel

Located at Bushey Heath, Hertfordshire (ZL29f), GB3HR is the north-west station of the London uhf repeater network, the design, construction and maintenance of the repeater being the responsibility of the South-West Hertfordshire UHF Group. The station operates on channel RB14 (434·95MHz input, 433·35MHz output) and runs 3W erp, although the licence is for 10W erp. The transmit aerial is a single folded dipole, while for receive a colinear array of four folded dipoles is used: all aerials are vertically polarized.

The group say that fixed stations are welcome to use GB3HR, but are requested to give priority to mobile stations. It is also requested that the minimum rf output power necessary to access the repeater be used, and that users announce their location, aerial and erp to assist the group (who will be continuously monitoring) in deciding whether any modifications or improvements are necessary.

In Scotland, plans are under way to introduce two uhf repeaters, one (GB3ED) in Edinburgh, and GB3GL in Glasgow. Two independent groups have been formed and initial discussions on possible sites have already been held. Meanwhile the latest estimate for the operation of GB3CS, the central Scotland repeater, is late September.

While on holiday in Belfast in August, G3LEQ found conditions towards Wales on the 11th very good on 432MHz. From a site 450ft asl, Gordon raised several GWs through the Llanddulas repeater GB3LL using a car-mounted $\frac{5}{8}\lambda$ whip. The good conditions continued well into the evening, and the path on 144MHz also proved excellent. Several contacts with G and GW were made through the Moel-y-Parc repeater, GB3MP, again using a $\frac{5}{8}\lambda$ whip aerial. G3LEQ reports that GI8LBP/M was so impressed by the results on 432MHz that he rushed off to purchase the necessary crystals—good news for those who have noticed the silence from GI on this band.

Gordon Adams made use of his time in Ireland to set up skeds on 144·75 and 144·9MHz fm with GI3TLT and EI2W for 9pm on Monday evenings. Anyone is welcome to join in, and it is hoped that fm (and perhaps even a.m.) signals will soon be regularly crossing the Irish Sea in this underpopulated part of the band.

The UK FM Group (Western) has submitted plans to the RSGB for a Chester 432MHz repeater, GB3CR, and for a Liverpool repeater, GB3LI. It has been agreed that the Liverpool device will be on channel RB10, with Chester on RB6. The group is also hoping that consideration will be given to a proposal for a 432/144MHz linear repeater, GB3LR.

Another repeater recently coming into operation is GB3ME located in Rugby (ZM54b) and using channel RB6

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

(434·75MHz input and 433·15MHz output). The time-out period is 1min and access is by a 1,750 ± 45Hz tone. For the technically minded the equipment consists of a suitably modified ITT base station with the timing in the control circuit being derived from a 1MHz crystal oscillator and a chain of 7490 divide-by-10 ICs. The callsign generator consists of four 74150 data selector ICs with a further 74150 being used for the "K" generator. The tone oscillator uses two NE555 function generator ICs, and in the event of a mains power failure the repeater automatically changes to battery operation, the "K" being replaced by a "B" to indicate the fact.

A different view of repeater operation was experienced by G8BI when he operated through the Granada repeater on channel R1 from a site 125 miles away in Gibraltar. Using 0·5W to a dipole, Bob worked all over EA7, and half-way up to Madrid, although, as he points out, with the repeater located some 3,500m asl one would expect good results.

Meteor scatter

G3SEK of Didcot reports good successes during the July Aquarids and August Perseids, although he found the latter a little disappointing. Ian learned later though, that he had been heard and called by UW3YS in Moscow, but QRM prevented a QSO. During the Aquarids, YU3ZV (HG30d), I4EAT (FE60f) and I4PWL (FE60f) were worked, two of these being random contacts. During the Perseids Ian worked SM3FGL (IV53g), YU3ZV, SM0DRV/5 (HR06c), I2MBC (EF16j), SM2CKR (KX12g), UT5DL (LI32a) and SM5BFK (IT49d). Two of these were the result of random CQ calls. G3SEK recorded a number of other calls during this shower, which is an indication of the amount of activity now on this mode.

We were called to task recently for inferring that m-s was an exotic and difficult mode. It is quite obvious from the results that stations like G3SEK are achieving, without resorting to equipment beyond the average vhf amateur's capabilities, that we were wrong to suggest any special difficulty, and we happily recant! However, this is not to detract from the dedication of exponents of this mode, who are in the forefront of serious amateur experimentation.

Beacon news

The new solid-state transmitter for GB3CTC on 144·915MHz has been heard at good strength in the north, and appears to be a couple of decibels up on the old beacon. The 2·5min keying cycle for the Cornish beacon includes identification (de GB3CTC) every 15sec for the first 105sec at 12wpm fsk. At 120sec the carrier cuts and the beacon transmits on A1, "de GB3CTC QRA XK64a" at 12wpm. From 140sec to the end of the cycle there is a 10sec silence until the commencement of the next cycle. The old valve transmitter on 144·128MHz will continue for a limited period until the new beacon is fully established. It is interesting to note that applications for 70 and 432MHz beacons at GB3CTC have been submitted to the Home Office.

The Durham beacon, GB3DM, should be on the air shortly on 144·935MHz. The transmitter has been repaired and converted, and the aerials replaced after the old ones had been found to be in a sad state of repair after several years operation.

Finally, good news for those in the north who find it such a useful indicator, GB3GEC should be in operation on the new frequency of 432·85MHz within a month or two.

UK VHF BEACONS

Callsign	MHz	QTH	ERP	Antenna	Direction	ASL	Mode
GB3SX	70·685	AL71d	16W	Halo	Omni	168	F1
GB3SU	70·695	ZN61a	20W	Turnstile	Omni	440	F1, A1
GB3GI	144·137	XO41j	40W	2 × 4-el	NE/SE in turn	191	F1
GB3VHF	144·150	AL52j	40W	5-el	NW	268	F1
GB3CTC	144·915	XK64a	75W	2 × clover leaf	Omni	122	F1, A1
GB3DM	144·937	ZO12a	50W	2 × 5-el	N and S simultaneously		
GB3ANG	144·977	YQ35c	20W	4-el	160°	900	F1
GB3SC	432·890	ZM31b	60W	2 × 8-over-8	N and SE simultaneously	270	F1
GB3EM	432·910	ZN32b	50W	8-over-8	150°	600	F1
GB3DD	1,296·050	ZL18b	1W	2-el	NW	58(agl)	F1
GB3IOW	10,100·000	ZK34a	0·8W	Slotted waveguide	Omni	250	F2

Low-power happenings

G3XBM of Burwell continues his good work on QRP, and while on holiday in Barnsley in mid-August completed a two-way QSO with ON1SC (QRA CK38a). Roger was using fm on channel S22 from his hand-held 1W transceiver, and $\lambda/2$ aerial; report received was 5&5 and the distance worked out at 580km. Later, using the same gear, G3XBM accessed GB3PI from Barnsley, but found this something of an anti-climax!

Contest news

Conditions for the 144MHz contest on 4/5 September were above average without being spectacular. There was good activity from the Continent, and the north-south path was also good. A leading station was G3PMH/P, who, operating from the rare AN locator square, had amassed over 500 contacts by the end of the event. The March Group took the opportunity to also activate 432MHz from this sought-after QRA, and G4BEL/P provided many "square-hunters" with a new one on this band.

Sporadic-E

F8SH is the VHF Sporadic-E Propagation Co-ordinator for Region 1 of IARU, and he would very much like to receive reports from UK amateurs who participated in the series of openings this summer. The writer will be pleased to forward any reports he receives, but for anyone wishing to contact F8SH directly his address is 6 Rue de Pont-Hélé, 22700 Perros-Guirec, France.

Finale

Two years ago the writer introduced his first *4-2-70* with the words "may our association be a long and happy one", and at that time there appeared to be no reason why it should not be. Since then, however, circumstances have changed considerably, and your scribe finds himself embarking on a new career demanding much more of his time and attention. Although an effort has been made to continue over the past few months, it has become apparent that the pen must be passed to someone who can devote more time to *4-2-70* than the writer can at present.

If our association has not been a long one, it *has* been a happy one as far as the writer is concerned and he would like to thank all those who have supported the column over the last two years. Perhaps G3NHE might now find time to appear on the bands occasionally, and looks forward to keeping in touch with you all, 4, 2 or 70! □

the month on the air

John Allaway, G3FKM *

Scouting affairs

Les Mitchell, G3BHK, has informed the writer that the special station which was intended to operate from Nigeria—5N2BSJ—was unable to do so as the site could not be prepared because of heavy rains. The event will probably be held in April 1977.

The Norwegian and Swedish Scouts have made arrangements with their licensing authorities for callsigns with the "SS" suffix to be reserved for Scout stations at special events —eg LA2SS or SK3SS would be instantly identifiable as Scout stations. An even more interesting fact is that more and more authorities are allowing unlicensed Scouts to speak over the air while the equipment is under the control of a qualified person. Sweden, Norway and Denmark previously allowed this, the Netherlands granted the facility last year, and now France has agreed—this appears to be a real breakthrough.

G3BHK himself is to be congratulated on being awarded the Silver Wolf—the highest Scout award in the UK—by our Chief Scout, Sir William Gladstone—"in recognition of services of the most exceptional character, and in particular the instigation of the Jamboree-on-the Air". Nic Holter, LA5CH, has been awarded the Golden Key by NRRL for his radio Scouting work. He was responsible for the overall organization of the World Jamboree radio activities at Lillehammer last year (LC1J).

During the 1976 Jamboree-on-the-Air on 16 and 17 October it has been agreed that Scout sstv stations will look for each other at 1030 and 1830 each day on 14,235kHz.

News from overseas

Don Radley, 9G1GE/G4ABI, will be leaving Ghana permanently during October, thus ending a period of over nine years of operating from Africa—9G1GE from 1967 to 1969, 9J2GE from 1969 to 1974, and finally as 9G1GE again from 1974. Operation during this time has been primarily cw and he has given many stations their first cw contact with Ghana and Zambia. Don hopes to be back on the air soon after transferring to Athens in November. He would like to thank all the many friends that he made in Ghana and Zambia, and also the many overseas friends made through regular contacts on the air. QSLs for 9G1GE and most 9J2GE contacts may be obtained from his QSL manager (and brother-in-law) G3USE (see "QTH Corner").

Peter Halls, G4CRY, has received news that VR4BT's equipment has arrived in the Solomon Is and that he had made contacts with W, VE, JA and VK using a borrowed KWM2A and a dipole. He now has rtty equipment and believes that this may be the first VR4 activity on that mode.

* 10 Knightlow Road, Birmingham B17 8QB.

DX news

Readers will be interested to know that Bob White—who has dealt with DXCC matters for many years—has now been promoted to manage the new ARRL outgoing QSL bureau. Bob has always dealt with his task in an exemplary manner and has earned the thanks of many. DXCC has now been taken over by Dave Newkirk, WA1VCG.

USA amateurs obtaining novice licences will no longer be issued with WN or other special prefixes. The amount of work involved in the changeover to a permanent call in due course has proved to be too great and in future they will be given a normal call. Those already having special prefixes before 1 October will be changed over gradually. It seems that WD calls are now being issued.

K6KA recently visited Turkey and reports that there are now six amateurs there. He believes that the Istanbul Radio Club has official recognition and can issue licences, but advises that it is still wise not to mention amateur radio in correspondence. Generally speaking those who have TA1 calls are in Europe and TA2s in Asia. TA1HY is moving to Sweden and has sold his equipment to TA1ZB who lives in Bakiroy. TA1ZB is currently quite active. TA1MB prefers contacts in French, he has a friend, TA2QR. TA1MB QSLs for contacts before 1976 should be sent to W5QPX but logs are only received intermittently. WA1EUO is now his QSL manager.

JH1KSB/JD1 has been active from Minami Tori Shima, but moved to Ogasawara Is on 25 August. He will be there until 30 October and should be on the air most days. He has been reported on 14MHz cw from around 0630.

ZK1BA operated as ZK1BA/P from Manihiki Is during July, and thinks that he may go there again at approximately six-monthly intervals.

VS5DB has been working into Europe on 7MHz cw (around 7,008kHz) at 2300. Maurice Caplan, VS5MC, was in the UK on leave during August, but is now back in Brunei.

Mel Ellis, C21ME, hoped to be active on all bands during September and may still be on the air from Nauru. VK9JA, who is located on Norfolk Is, has been worked recently on 14MHz ssb.

West Coast DX Bulletin reports the death of John Martin, VK3JW, who will be remembered as one of those who first activated Mellish Reef as VK9JW, in July 1972. He had been contemplating another visit to Mellish in 1977.

Alan, G3UKP, is currently on Masirah and using the callsign A4XGQ. He will be there for a year. Sid May, G4CTQ, ex-VP2KH, is also in the same area and licensed as A4XGB. It is believed that A7XA is HRH HH Shaikh Abdul Azia Bin Khalifa Al-Thani—he seems to like operating /M and has been noted on 14,275kHz at 2030.

Those needing a QSL card from Sable Is may care to search their logs for a previous contact with VE1ASE. It seems that he was on the island as long ago as 1966, and that he still has his logs and a supply of QSL cards. His current address is: R. Burke, 68 Iroquois Av, Oromocto, NB, E2V 2A1, Canada.

Guy, FR7ZL, operated from Tromelin Is from 27 July to 24 September, and not from the Europa Is group as originally expected. XT2AG has an SB101 and HA14 and has been heard on 14,294kHz around 2100 recently.

VK2FT has a new FT101E and is believed to have ideas of a visit to Lord Howe Is; no details are available at time of writing. P29MM says that anyone who would like a contact with Papua New Guinea should look for him around 14,210kHz between 1100 and 1400—he is active almost daily.

QTH Corner

A4XGB	via G4CTQ, S. T. May, 77 Chaucer Drive, Lincoln.
A4XGQ	via G3UKP.
C21ME	via WA5OCN, 10703 Dunlap, Houston, Texas, 77096, USA.
C31JY	via DL6VW, W. Gierlach, Petersenstr 3, 5000 Koeln 91, W Germany.
C31KH	via DJ9NT, H. Keush, Bruehistr 39, 5104 Eilendorf Kr Aachen, W Germany.
C31KI	
C31KJ	
C31KM	
C31KN	
CT4AT	Don Riebhof, US Embassy, APO, New York, NY, 09678, USA.
JH1KSB/JD1	via JE3AFS.
KG6SZ	via JA1EMX, M. Kobayshi, 4-32-1 Kokuryo, Chofu, Tokyo, Japan.
N4V	NASA, Hampton, Va, 23665, USA.
P29MM	via K4MQG, R. G. Dixon, 801 Chelwood Pl, Charlotte, NC 28210, USA.
PJ9CDC	W1CDC, 43 Dover Rd, Manchester, Conn, 06040, USA.
PY0AW	PY6SL, PO Box 31, 40000 Salvador, Bahia, Brazil.
WA6EGL/VQ9	via W4FLA, 2011 NW 86th Terrace, Pembroke Pines, Fla, 33024, USA.
VR3AN	via K6VIB, 6646 Clifford Ct, San Jose, Cal, 95129, USA.
XT2AG	D. Francois, BP 743, Ouagadougou, Voltaic Rep.
YJ8KW	via G3YSV, 1 Jer Lane, Great Horton, Bradford 7, Yorks.
YM0AA	WB7ABK, 3049 Doris Ct, Lake Oswego, Oregon, 97034, USA.
ZK1BA	T. Grantham, Box 269, Raratonga, Cook Is.

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

Peter, VP8MS, keeps a regular schedule with a group of W4s each Sunday at 1530 on 14,265kHz. He also uses 3,795kHz on Fridays and Saturdays at 0300. Europeans looking for a S Georgia contact might monitor his 14,265kHz frequency at this time.

Independence from the Republic of South Africa will be given to the Transkei homeland on 26 October. Special ceremonies will take place in Umtata and indications are that Transkei will be an addition to the DXCC list in due course.

Strange prefixes continue to appear on the bands, particularly from the USA. A few noted recently (followed by QSL source) are as follows: KC9WD (WB9NEH), KP8USC (W8KAJ), KX6BCF (W8BQV), N9TRF (W9LT), NC4M (W4CQ), NS0DAK (K0CXL), WF4WBC (WB0OYX), WM3PEN (WA3RCA), WS2JRA (K2AA) and WW9WWW (WA9UEK). 4ASM was active from Mexico and celebrated a Scout anniversary, and 4J6A was heard operating from UG6. The special station on the air from the JARL 50th anniversary "Hamvention" in late September had the callsign 8J2HAM.

Contests

The OK DX Contest

0000 to 2400 14 November.

1·8 to 28MHz, both phone and cw, but no cross-band/cross-mode contacts allowed. Exchanges consist of RS/T followed by ITU zone number (UK is 28). Contacts with Czechoslovakia count three points, with other countries one point. Own country may only be contacted for multiplier credit and not for QSO points. The multiplier is the number of ITU zones worked on each band totalled together. Entries may be single-operator all-band or single-band, or multi-operator multi-band. A separate log should be kept for each band and should indicate date and time, station worked, numbers sent and received, points claimed, and an indication if a new multiplier. A summary sheet showing how the final score was arrived at and a declaration that the station was operated in accordance with the contest rules and amateur regulations in the entrant's country should be signed and included with the log sheets. Entries should be submitted before 31 December to: Central Radio Club, PO Box 69, 113 27 Praha 1, Czechoslovakia.

"Grey line" propagation

Enthusiastic lower frequency dxers are aware that it is a great help to know exact sunset and sunrise times when trying to forecast the best time for long-distance contacts—especially on 3·5 and 1·8MHz. ON4UN has made a computer program which consists of 96 pages of print-out giving exact sunrise and sunset times for all DXCC countries, all 48 continental US states, all Canadian provinces, and Australian call areas, in intervals of 15 days throughout the year.

The general rule for dx at lower frequencies is that there are two short path peaks—one around sunrise at the station at the eastern end of the path, and the second when sunset is at the western end of the path. A long path peak means a peak at sunrise with the station at the western end of the path, or at sunset with the station at the eastern end of the path. A long path contact is only possible if sunrise at the western end is later than sunset at the eastern end.

Copies of these computer runs, plus two pages of explanation and examples (totalling 99 pages) are available from John Devoldere, ON4UN, Peelstraat 215, 9220 Merelbeke, Belgium. The price is 420 B.Fr or $10. Each order will be accompanied by a "personal" print-out showing sunset and sunrise times of the purchaser's location—if possible please include exact co-ordinates of this when ordering. (Orders for three copies cost $25, for five $40, and for 10 $75).

Norwegian training transmissions

Norwegian army amateur stations will make morse training transmissions at 10 to 35wpm from 1645 to 1955gmt on Mondays and Thursdays between 4 October and 16 December. Callsigns and approximate frequencies will be LJ3X, 3,570kHz; LJ3Y, 3,560kHz; LJ3Z, 3,575kHz.

A clear frequency would be appreciated, and signal reports addressed to: LA1P, Christen Syverud, Molkte Moes vei 1, Oslo 8, Norway, would be welcome.

Awards

Applicants for ARRL awards are no longer required to pay a fee—that is, unless they are non-members living in the USA or Canada. In future only a sum sufficient to pay for return of the QSL cards by registered mail need be submitted. In the case of WAS this is $3, DXCC $4, 5BWAS $4.50, and 5BDXCC $7.

The Balaton Diploma

This attractive certificate is awarded to those who have contacted stations near Lake Balaton since 1 January 1967. European applicants require 30 "points"—at least two contacts must have been with members of the Radio Club Siofok (HA2RM, HA3s GJ, GQ, HE, KGJ, KHL). Contacts with these count five points, with HA2s KRL, KRQ, KSC, RL, YRC, and HA3s KGV, KHB and GO three points, and with other stations in Veszprem or Somogy count one point. These are identified by having callsigns beginning with HA2KR, HA2KS, HA2YR, HA2YS, HA2R, HA2S, HA3KG, HA3KH, HA3YG, HA3G and HA3H. Any frequency band or mode may have been used. Submit a log extract (certified by two licensed amateurs) plus 10 IRCs to: Radio Club, H-8601 Siofok, PO Box 78, Hungary.

Band reports

There is still no sign that sunspot activity has as yet reached its low point, and conditions have generally reflected this fact. G3KSH reports that propagation into VK and ZL has been much better on 7MHz than on 14MHz.

Unfortunately the severe interference emanating from the Soviet Union, which has been making 14MHz almost useless from time to time, was still being heard at the time of writing.

Many thanks to the following for items used in compiling this section: G2ASF, G2HKU, G4RZ, G5JL; G3s KSH, LOL, UOL, G4s DSE, DXE and EAN; BRS17567, A8713 and A8961.

Stations listed in italics were using cw.

3·5MHz. **0000** CE3EZ, KV4, VP2AA, VP2MPC. **0100** PY1RO, VP8OB, ZB2FX. **0200** UL7IBC. **0500** HI8RDD. **0700** *ZB2BD*. **2000** *JT0OAQ*. **2200** FM7AV, ZE2KF, ZS5LB. **2300** HZ1AB, JY9HQ, OX3RA, 5Z4GX, 9M2PV.

7MHz. **0400** HK. **0500** *FG7AS*, FO8EX, VE2AQS/TG9, VK, YV, ZL1–ZL4. **0600** *KX6BW*, VK7. **1900** JA. **2000** A4XGQ, G3ZRS/MM. **2100** *JA*. **2300** 6W8FP.

14MHz. **0500** *KC4AAC*. **0600** FO8EX. **0700** KH6, *K4II/KS6*, KX6BU. **0800** KJ6DL, KL7, TA2BR, VE7, VR3AK, W7, 3D2AJ, 3D2CM, 5W1AX. **0900** FW8CO, KM6EA, 9L1BH. **1000** KJ6DL, W7WJP. **1200** P29RJ, VS6. **1300** P29PN, YB8ACK. **1500** A7XA, *4W1RC* (QSL to G3YZO). **1700** A6XR (QSL to G4CHP), KG6SX. **1800** AP2AL. **1900** EA9s FC, FE, FH, PY0AW, VE5. **2000** JY, OA4OS, VK5, VP8HZ, XT2AP, 9Y4. **2100** *HK0BKX*, VP8NK. **2200** C6AEY, VK. **2300** TR8RS, VP1MPW, VP2SV.

21MHz. **0700** *5R8AK*. **0800** *JA*. **0900** VQ9HCS. **1000** 9V1SV. **1100** JA. **1700** VQ9EA, 5N2NAS.

28MHz. **0900** EA9EO, HV3SJ. **1700** 4X4, 7X4MD. **1800** CE, CX, EL, LU, PY. **1900** CE, EA8, HC, LU, PY, 8W8, ZP, 8R1. **2000** CX, LU, PY, PZ, YV, 8R. **2100** HC, VE3, VP2LAW, W3.

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

Please send all items for the **November** issue **to reach G3FKM** no later than **6 October**, and for **December** by **10 November**.

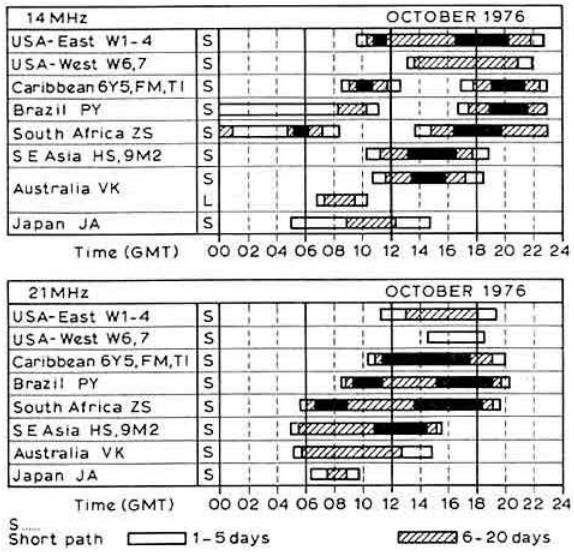
Propagation predictions

Conditions on the hf bands are at their best during October and November. Because of still very low solar activity no real improvement will show on **28MHz**. Short skip traffic over distances of about 1,800-2,000km came to an end in September, and only now and again will this possibility now occur. Compared with the summer months there will be an improvement in conditions for traffic with eastern North America and Japan. Western North America will only be heard occasionally. On the whole, short skip conditions on both 28 and **21MHz** will be better from Southern Europe than from countries further north.

On **14MHz**, traffic with all continents will be possible. Compared with the summer months, traffic with Australia and New Zealand will improve considerably. DX will not be interrupted by European QRM as short skip traffic will have declined on this band. Traffic via the indirect path will be possible now and again; it will improve considerably in November. On favourable days traffic with KH6 will be possible on 14MHz from about 1630 to 1800gmt.

The **7MHz** band will be the main carrier of dx after about 2200gmt. Basically dx on this band and on **3·5MHz** will always be possible if the greater part of the path lies in darkness. This is most important for 3·5MHz. Longer nights and decline of static as well as the low sunspot activity all favour dx on 3·5MHz. The band will be interrupted repeatedly by the dead zone during the latter half of the night.

The provisional sunspot number from the Swiss Federal Observatory for July 1976 was 2·1 following a month of virtually no solar activity. The predicted smoothed monthly numbers for November, December and January are 4, 3 and 3 respectively.



HF PROPAGATION STUDY

Predicted HPFs (MHz × 10) for October 1976

GMT =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	152	148	148	276	328	342	329	335	304	201	167	153	152
Ascension	162	159	145	143	310	337	345	329	359	300	204	168	162
Bahrain	144	143	145	265	318	331	318	317	271	185	158	145	144
Bangkok	135	124	130	234	285	307	295	252	202	181	139	135	135
Barbados	145	131	128	116	136	248	309	308	308	299	234	168	145
Bermuda	143	122	115	105	117	215	272	281	288	280	224	169	143
Bogota	144	125	124	111	136	158	295	305	304	291	237	172	144
Buenos Aires	154	145	139	134	174	301	331	319	324	309	230	166	154
Cape Town	161	159	145	216	321	357	347	351	368	270	180	168	161
Colombo	140	139	144	263	313	326	310	307	239	201	153	143	140
Cyprus	135	135	129	233	293	310	300	296	268	206	155	139	135
Dakar	154	150	141	143	300	322	337	323	337	301	213	163	154
Denver	140	120	107	105	105	110	139	208	242	232	186	154	140
Fairbanks	139	119	111	116	135	135	135	141	153	171	163	140	139
Falklands	155	150	140	136	194	289	305	321	326	304	224	166	155
Gibraltar	96	96	86	92	190	211	218	211	208	178	133	103	96
Hong Kong	133	107	121	210	256	285	229	176	157	152	139	135	133
Honolulu	134	119	111	111	139	125	135	135	150	191	164	140	134
Iceland	100	82	81	81	133	168	187	183	178	157	122	101	100
Jamaica	143	121	115	111	136	161	282	284	290	282	225	167	143
Lagos	163	161	145	171	323	352	347	342	373	284	187	168	163
Las Palmas	136	134	121	126	253	284	303	291	293	261	195	147	136
Lima	147	136	130	122	144	168	313	310	313	304	235	168	147
Los Angeles	140	120	112	105	122	111	111	181	243	225	185	148	140
Malta	114	112	101	150	238	256	256	247	239	188	144	119	114
Mauritius	150	145	149	275	332	345	338	343	315	224	172	157	150
Mexico	141	121	107	105	126	139	183	257	267	256	201	155	141
Moscow	114	93	92	155	216	246	246	232	201	169	120	115	114
Nairobi	154	155	145	271	332	348	340	350	331	235	173	161	154
New Delhi	135	133	135	253	301	312	300	265	174	155	140	136	135
New York	141	120	112	111	111	168	243	260	268	256	206	158	141
Osaka	135	112	115	167	220	197	172	143	139	136	133	138	135
Perth	140	139	144	262	312	321	284	235	208	196	149	141	140
Rio de Janeiro	157	149	140	136	206	308	328	321	326	305	227	166	157
Salisbury	159	157	147	255	331	355	342	352	351	252	176	166	159
Seychelles	149	145	149	275	323	336	331	343	309	221	169	155	149
Singapore	135	133	135	253	301	312	300	285	234	192	140	136	135
Suva (s)	126	120	117	133	183	210	230	209	163	169	145	135	126
Suva (l)	163	161	148	164	235	186	174	158	134	196	191	171	163
Sydney (s)	133	107	121	210	256	276	232	220	202	145	139	135	133
Sydney (l)	148	136	130	124	209	159	143	140	115	152	195	167	148
Teheran	140	139	144	263	313	326	310	307	239	194	150	143	140
Vancouver	139	120	111	111	111	116	111	153	182	196	171	141	139
Wellington (s)	125	114	111	161	210	238	216	196	147	155	143	134	125
Wellington (l)	157	148	144	141	176	143	140	136	136	182	204	163	157

BOOK REVIEW

The ARRL Electronics Data Book. Edited by Doug DeMaw, W1CER. New *QST* format. 128 pages, abundantly illustrated. Obtainable shortly from RSGB Publications (Sales), 35 Doughty Street, London WCIN 2AE. Price £2.95 including postage and packing.

A new technical publication by the ARRL must arouse interest in all radio enthusiasts both amateur and professional, and indeed this paperback production has been "written for all technical levels from the beginner to the degreed engineer".

Those who are active in experimental work and design, and what true amateur is not, know the wide dispersal of useful information over reference books, technical journals, cuttings and notebooks, which do not always offer instant access, or perhaps sufficient coverage, and the frequent frustration which is created. This book should do a great deal to prevent this. It is a collection of essential data which will be a comfort to have at hand.

The book has 10 chapters, or groupings, which are titled Math Aids and Tables, Time and Frequency, Radio-Frequency Circuit Data, L, C and R Networks, Transformers, Filter Design, Antennas and Feed Systems, Catalog of Solid State Circuits, Construction and Testing Data, Data *Potpourri*, with a useful Index.

Relevant simple equations are given in all chapters, with examples worked out to show how the solutions are obtained. The catalogue of proven solid state circuits shows 77 individual arrangements, with typical values and type identification. Another notable chapter deals with modern filter design and covers two- and three-pole Butterworth derivations for most frequencies of amateur interest. Broad and narrow-band transformer design gets generous practical coverage. References to larger treatments are frequently given in the text.

This assembly of formulas, nomographs, data charts, tables, and explanations of terms and methods is as useful as it is interesting, and will be a welcome addition to the amateur's bookshelf.

T. P. A.

Sherwood 76, GB2BS

A total of 873 Scouts and Guides from Nottinghamshire and adjacent counties, together with 293 Scouts and 220 Guides plus leaders from overseas, took part in this eight-day international Scout/Guide camp at Newark-on-Trent. Countries represented were Sweden, Norway, Finland, France, Germany, USA, Malta, New Zealand and Czechoslovakia.

While the camp was assembling and the tents being pitched on Saturday 24 July on the Newark & Notts showground the local amateurs were busy setting up GB2BS in a permanent building which was to become the activities centre of the camp. The triple aim of the station was:

(1) To provide world-wide coverage of the event throughout the whole week while band conditions allowed.

(2) To give visiting amateurs a chance to combine amateur radio with Scouting/Guiding.

(3) To give all and sundry a chance to see amateur radio in operation, and most important of all to involve as far as possible young Scouts and Guides in the working of a modern amateur communications centre.

The term "communications centre" is used since GB2BS comprised four booths each with its own stations so that any licensed amateur was welcome to come in and operate a station: at times all four were in operation simultaneously. No attempt was made to treat the event as a competition; the idea was to spread the common aims of Scout/Guiding and amateur radio, namely communication between and goodwill to all nations and all races.

The rigs were a KW2000A working into an 80m dipole, an FT220 operating on 2m, an FT101B plus SB200 linear feeding a TA33 Jnr rotary beam, and an FTDX400 working into a 40m dipole; all supplied by members of the East Notts Contest Group. This was supplemented by a good visual display in the form of maps, literature, QSL cards etc. The station operators were: G3YCT, G3JNK, G3SHY, G4APM, G8GFC, G4DFU, G8EHX, G3UXH, G3RTO and others.

Many contacts were made and thanks are extended to the many amateurs at home and abroad who helped to make it such a success by giving up a few minutes of their time to work the event. *G3JNK*

SOCIETY AWARDS

Council has approved the following awards for 1976.

ROTAB Cup for outstanding and consistent dx work to Mr P. A. Miles, G3KDB;

Calcutta Key for outstanding service to international friendship through amateur radio to Mr B. Clark, 9J2CL/G3VCL;

Founders Cup for services to the Society to Mr I. Jackson, G3OHX;

Norman Keith Adams Prize for the most original article contributed to *Radio Communication* during the year to Mr F. Charman, G6CJ, and R. Harris, G3OTK, for "Subjective selectivity and stereocode" published in September 1975;

Courtenay Price Trophy for outstanding technical development in the field of amateur radio during the year to Mr P. Blair, G3LTF, for his work on 1·3GHz ssb;

Wortley-Talbot Trophy for outstanding experimental work in the field of amateur radio to Mr. L. Moxon, G6XN, for his work on aerials reported in "Technical Topics", January 1976;

Ostermeyer Trophy for the most meritorious description of a piece of home-constructed radio or electronic equipment published in *Radio Communication* during the year to Mr C. S. Gare, G3WOS, for "A 70 to 432MHz transmitter converter" published in November 1975.

Looking ahead

16-17 October—JOTA 1976. JOTA Scout camp and radio teach-in at HMS *Mercury*.
28-30 October—ARRA Exhibition, Granby Halls, Leicester.
3 December—RSGB AGM, Royal Society of Arts, John Adam Street, London WC2.

1977
22 January—RSGB Presidential Installation.
24 April—NRSA Convention, Belle Vue, Manchester.
6-8 May—RSGB International Radio Communication Exhibition and Convention, Alexandra Palace, London.
17-18 September—NW Amateur Radio Convention, University of Lancaster.

Contests calendar

9-10 October	21/28MHz (Rules in May issue)
16-17 October	7MHz Phone (Rules in July issue)
24 October	70MHz Fixed (Rules in August issue)
11, 19, 27 October, 4, 12, 20, 28 November	432MHz Cumulative (Rules in September issue)
6-7 November	144MHz CW (Rules in September issue)
6-7 November	7MHz CW (Rules in July issue)
13-14 November	Second 1·8MHz (Rules in October issue)
5 December	144MHz Fixed

Mobile rallies calendar

1977

3 April	White Rose Rally, Lawnswood School, Leeds.
12 June	Longleat Mobile Rally. Details nearer the date.
7 August	RSGB National Mobile Rally, Woburn Abbey.

North Staffordshire Polytechnic ARS

MINI-CONVENTION

6.30 to 10pm, 16 October 1976

Four lectures (two streams)

Demonstrations **Licensed bar** **G3VZI Talk-in**

Tickets (with map and programme) 35p from NSPARS, Lab D2, North Staffordshire Polytechnic, Beaconside, Stafford. **Numbers limited due to space.**

VHF NFD 1976 RESULTS

WINNER: March & District RAS

RUNNER-UP: Martlesham RS and Ipswich RC

BAND WINNERS		COUNTRY WINNERS	
70MHz	GD3YEO/P	**G**	March & District RAS
144MHz	G8GBY/P	**GC**	South Dorset RS
432MHz	G6UQ/P	**GD**	Isle of Man ARS
1·3GHz	G3DY/P	**GI**	North Ulster Plus CG
		GM	Border ARS
		GW	Albright & Wilson/ Caesaromagus

HAVING made the difficult decision to move VHF NFD from September to July, the VHF Contests Committee was hoping for fine weather and good conditions to give the contest a favourable start on its new weekend. In the event our expectations were greatly exceeded—for some people. Conditions were highly selective, with stations in eastern Britain enjoying a superb opening to the Continent which was largely denied to their competitors further west. The March & District RAS had already proved their ability to win VHF NFD in poor conditions from their Fenland site, and this year they were completely unassailable. The selective conditions evicted many of the traditional occupants of high places in the results tables, but this in no way detracts from the performance of the eastern groups who seized their unaccustomed chance. It is particularly unusual to find two Scottish groups in the top 10—and native Scots at that—while the weekend Welshmen could manage no better than 12th.

The bands

As usual **70MHz** was the Cinderella. Since the band can provide reliable contact between almost all competitors regardless of conditions, the final result tends to depend as much on geography as on equipment or operating skill. This year's winner was the Isle of Man group, operating from probably the best 70MHz contest site in the world, a peak rejoicing in the name of Cronk-ny-Irrey-Laa. Runner-up was the South Dorset RS expedition to Alderney, which also enjoyed a remote site with sea paths in all important directions. Even the once-a-year stations have caught up with the change to ssb, but there were still many once-a-year operators who were taken aback by the way in which the regulars switch from ssb to cw with total lack of inhibition. The results show that many groups let themselves down badly by too little effort on this band.

If you can copy a weak signal in the fifth layer of QRM, and speak in square waves for 24 hours, **144MHz** is the band for you—there is plenty of company. Even in normal conditions the initiative on this band seems to be slipping away from the Welsh portables to stations which can work into the Continent more easily—so congratulations to the Hull station which took top place against very strong competition.

Leading **432MHz** station was G6UQ/P, alias G8BCG and friends, who led the field by making more contacts than anyone else, from a site further west than most of the high scorers. Second came the March station G4BEL/P, and third a fine solo performance from GM8BDX who made almost all his points before closing down for a little sleep.

1·3GHz was wide open to the Continent as the "best dx" column shows. Many contacts were made direct from CQ calls on 1·3GHz as the high signal levels relaxed the normal need for precise beam heading. Some operators even had to deal with pile-ups! This has prompted some groups at least to consider loosening the connection between 1·3GHz and 432MHz, though this could bring problems if conditions are poor next year. One group with four stations found its 432MHz operators too busy to call CQ for 1·3GHz.

The new date

Despite the hot and humid weather punctuated by thunderstorms, most groups concede that July is the better weekend for the contest, because of the Continental activity and longer daylight hours. It is not necessarily the best weekend for all individuals concerned, though the number of entries is almost exactly the same as the number of multi-band entries in 1975. A few groups felt themselves unable to take part because of the proximity of HF NFD or because their usual site was under standing crops. The decision to change the date was taken because the committee believed it would provide most people with a better contest; this has proved to be the case, so VHF NFD will almost certainly continue to be held in July. Adherents of September may take grim pleasure in learning that sites of four committee members were visited by violent thunderstorms: evidently they have support in high places!

Final results table

When all the VHF NFD entries have been received they are sorted by bands, and each band checked as a separate contest. Then the corrected scores are recombined to give the final results table. Since each band has a different potential for scoring points, who deserves to be the overall winner? At present the policy of the organizers is to try and make each band count equally, for VHF NFD is expressly a multi-band contest which should promote activity on all four bands without favouring or detracting from any one. One-band partisans may not agree, but their views cancel out!

Up to now we have tried to equalize the scores by a system of multipliers based on performance in recent years. The good conditions of 1976 illustrate the weakness in trying to fix the multipliers in advance: scores on the uhf bands are closely related to conditions, while 70MHz scores are hardly affected. Good conditions favour the higher bands, poor conditions the lower.

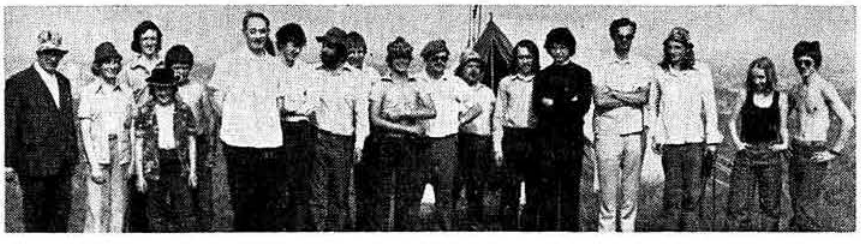
The VHF Contests Committee is always open to suggestions for improving the scoring system, although regrettably few survive the tests of fairness and practicability.

One suggested solution to the problem is worth airing for comment. That is to weight all bands equally by dividing each station's score by that of the band leader. The resulting "performance figure" ranges from 1·00 for the band leader down to zero for a non-entrant, and is not affected by conditions prevailing on the day. The overall score of each group is the sum of its performance figures on the bands it has used. The author has calculated the effect of this proposal on the top 20 places in 1975 and 1976, and surprisingly it makes little difference to the positions of most groups. However, it gives a better deal to the more remote groups who can do well on the lower bands but cannot yet benefit from the 1·3GHz activity in the south. Unfortunately the analyses are too long to print here, so anyone who wishes to comment can send an sae to the author to obtain a copy.

As yet this is only a proposal, which may be rejected for a variety of reasons—not least the effort involved in calculating (or computing) the final results table. The matter will be open for comment until a decision has to be taken early in 1977, and whatever is decided will be an attempt to make all bands count more equally than at present. This year's table shows what your group will need to do.

Conclusion

Success in VHF NFD is never easy or accidental. Leading stations need a combination of effective and reliable equipment, good operators, accurate logging, a good site and at least an even break with band conditions. Congratulations to all those who "got it together" on the day, and commiserations to those whose best-laid plans failed to work out. Roll on VHF NFD 1977. *G3SEK*



Members of Birmingham RS at their contest site

OVERALL RESULTS

Posn	Club/Group	Points	Position in band 70MHz	144MHz	432MHz	1·3GHz
1	March & D RAS	35,870	21	3	2	1
2	Martlesham RS & Ipswich RC	28,534	61	5	5	2
3	South Dorset RS	24,107	2	10	13	3
4	Hull & DARS	22,810	44	1	16	6
5	Stockport RS & South Manchester	22,574	18	22	1	37
6	Scunthorpe ARC	22,053	52	11	9	4
7	Border ARS	20,624	12	19	3	—
8	Doncaster Coll of Technology	20,085	23	47	6	11
9	Crystal Palace & DRC	19,937	64	27	7	10
10	Glenrothes & DRC	18,619	53	8	4	38
11	Leicester RS	18,292	33	16	18	7
12	Albright & Wilson/Caesaromagus	16,760	22	9	11	31
13	Reading ARC	16,687	38	36	27	5
14	Bracknell ARC	16,415	31	20	31	8
15	Great Lumley ARS	16,214	6	7	12	—
16	Dunstable Downs RC	15,860	49	84	10	14
17	Norfolk VHF CG	15,757	16	2	25	—
18	ARC of Nottingham	15,577	40	33	17	15
19	Salop ARS	14,749	41	23	28	13
20	Addiscombe ARC	14,709	66	26	21	32
21	Southgate RC	14,506	7	31	26	21
22	Surrey RCC	14,342	39	44	14	23
23	RS of Harrow "A"	13,399	36	46	48	9
24	AERE Harwell ARC	13,169	33	24	38	18
25	Hereford CG	13,101	15	30	45	19
26	Westmorland & Fylde VHFG	12,475	5	58	15	—
27	Wulfrun CG	12,346	13	13	36	36
28	Me & My Friends	12,136	26	14	22	—
29	Bexley & Medway VHF/UHFG	12,018	—	50	8	—
30	North Ulster Plus CG	11,756	4	54	34	29
31	Cray Valley RS	11,174	14	38	50	25
32	Farnborough & DRS	10,648	48	56	33	24
33	Verulam ARC	10,646	24	52	39	27
34	Hemel Hempstead Gp	10,487	45	12	37	—
35	Southampton RSGBG	10,398	65	34	58	17
36	West Kent ARS	10,337	50	41	52	22
37	Southdown ARS "B"	10,209	—	4	32	—
38	South Birmingham RS	9,946	76	78	41	16
39	Severnside CG	9,852	51	28	46	34
40	Grafton RS	9,532	57	69	35	28
41	Hope CG	9,300	74	51	19	49
42	Sutton & Cheam RS	9,168	54	77	23	45
43	Lothians RS	9,105	17	42	44	—
44	Ebor Gp	8,848	3	6	—	—
45	Guildford & DRS	8,588	42	43	40	—
46	Mid-Cheshire ARC	8,260	27	29	57	—
47	Clifton ARS	8,158	69	68	47	30
48	491 ATC	7,841	—	39	42	32
49	GM8BOW & GM8JYZ	7,736	—	17	43	—
50	Slade RS	7,582	37	60	49	—
51	Northampton RC	7,494	70	91	29	47
52	Banbury ARS	7,374	—	80	30	35
53	Burnham Beeches RC	6,753	63	81	60	33
54	Southdown ARS "A"	6,674	67	61	51	—
55	Caterham RG	6,509	29	85	56	—
56	Isle of Man ARS	6,469	1	49	—	—
57	Bury Alternative CG	6,285	8	25	—	—
58	Bedford UHF Gp	6,041	81	48	73	26
59	Mansfield ARS	5,971	29	70	65	—
60	Chichester & DARC	5,739	78	32	69	39
61	Wessex ARG	5,732	43	66	70	43
62	Pembroke CG	5,700	25	86	64	—
63	Ayr ARG	5,694	28	40	76	—
	Eccles & DRC	5,694	—	—	24	—
65	Mid-Sussex ARS	5,656	75	59	55	—
66	Newquay & DARS	5,650	9	35	—	—
67	Last Minute CG	5,553	59	97	54	—
68	Racal ARG	5,525	35	21	—	—
69	Cornish ARC VHF Gp	5,459	19	67	75	—
70	NE London VHF Gp	5,205	—	53	53	—
71	Guernsey RES	4,957	10	87	83	—
72	Vectis VHF Gp	4,791	32	—	61	—
73	Luton VHF Gp	4,627	62	63	80	46
74	G4KF CG/Chester & DARS	4,434	20	55	—	—
75	Shefford & DARS	4,277	47	45	87	—
76	Pioneer RC	4,272	80	15	—	—
77	Chard RC	4,222	75	59	—	—
78	Spalding & DARS	4,067	77	37	82	—
79	Worthing & DARC	3,919	—	65	68	44
80	Bangor & DARS	3,893	11	96	—	—
81	Echelford ARS	3,782	58	90	78	—
82	Rugby ATS	3,574	72	99	67	—
83	Harlut CG	3,507	—	18	94	—
84	West Dorset ARG	3,501	—	89	63	—
85	Havering & DARC	3,469	82	76	71	—
86	Kingston & DARS	3,463	—	79	66	—
87	Jersey ARS	3,422	—	94	62	—
88	Bournemouth & Poole VHF Gp	3,369	56	62	—	—
89	ATV ARS	3,203	60	64	—	—
90	Nunsfield House ARG	2,801	55	102	88	41
91	Yeovil ARC	2,647	—	82	74	—
92	RAF Sealand ARC	2,568	—	72	84	42
93	Gtr Peterborough ARC	2,352	71	73	—	—
94	Milton Keynes ARS	1,971	84	98	76	—
95	Peterborough RES	1,964	—	57	93	48
96	Coventry ARS	1,660	68	101	—	—
97	Basingstoke ARC	1,558	79	88	—	—
98	Harlow Gp	1,486	—	71	92	—
99	G8HJD/P	1,390	—	92	86	—
100	M. Gawthorpe and Friends	1,240	—	83	92	—
101	Norweb Electricity ARS	1,155	—	103	78	—
102	Luton Venture Scouts	1,126	—	93	91	—
103	Torbay ARS	1,079	—	95	88	—
104	P. T. Gaskin	956	—	—	85	40
105	RS of Harrow "B"	902	83	100	—	—

70MHz band results

Posn	Callsign(/P)	Points	QSOs	QRA	Best dx	Km
1	GD3YEO	4,461	123	XO67	GC4ASO/P	525
2	GC3VPF	4,122	116	YJ30	GM3JNW/P	674
3	G3UUT	3,927	121	ZO55	G4CRC/P	547
4	GI3KVD	3,546	80	XO11	GC4ASO/P	635
5	G3FDW	3,446	96	YO29	GC4ASO/P	594
6	G4CJG	3,357	98	ZO22	GC4ASO/P	577
7	G4ASR	3,240	98	ZO46	GC4ASO/P	564
8	GM4AOS	3,126	69	XP52	GC3VPF/P	660
9	G4ADV	3,060	73	XK54	GM3YOR/P	660
10	GC4ASO	3,030	79	XJ47	GM4BYF/P	645
11	GI3TLT	3,012	76	XO32	GC3VPF/P	620
12	GM3JNW	2,952	70	YP18	GC3VPF/P	660
13	GW3WCS	2,937	109	YM44	GM3YOR/P	425
14	G3TAA	2,907	113	ZK21	GM3JNW/P	582
15	GW4CNY	2,850	116	YL05	GM3YOR/P	493
16	G3ZIG	2,832	100	AM06	G4ADV/P	515
17	GM4BYF	2,778	73	YP42	GC4ASO/P	668
18	G3ZOD	2,700	117	ZN61	GC3VPF/P	400
19	G4CRC	2,622	60	XK63	GM3JNW/P	645
20	G4KF	2,547	122	ZN61	GC4ASO/P	405
21	G3VCV	2,535	110	AM51	GM4DMZ/P	505
22	GW3UEY	2,448	102	YM55	GM3YOR/P	430
23	G4BZD	2,355	91	ZN44	GC4ASO/P	553
24	G3LXP	2,340	121	ZM80	GM3WIL/P	500
25	GW3XJQ	2,334	75	XL07	GM3YOR/P	486
26	G3TAL	2,331	80	ZO56	G4ADV/P	554
27	G4DBX	2,316	114	YN79	—	—
28	GM3WIL	2,313	67	XO19	GC4ASO/P	570
29	G4AAH	2,292	104	ZN74	G4CRC/P	425
	G4APL	2,292	82	ZL60	GM4AOS/P	580
31	G4DDL	2,286	120	ZL26	GM3YOR/P	530
32	G3WIE	2,223	97	ZK25	GM4AOS/P	599
33	G3NAQ	2,202	110	ZL33	GM3YOR/P	525
	G3HYH	2,202	110	ZM36	GM3YOR/P	—
35	G3XOX	2,199	115	ZL53	GM4AOS/P	517
36	G3MLS	2,169	105	ZK10	GM3JNW/P	569
37	G3XBY	2,148	106	YM50	GM3YOR/P	425
38	G3ULT	2,106	105	ZL54	GM4AOS/P	530
39	G3KGA	2,094	88	AL66	GD3YEO/P	510
40	G3EKW	2,085	100	ZM04	—	—
41	G4AZS	2,073	111	YM48	GM4AOS/P	370
42	G3PJX	2,055	105	ZL69	GM4AOS/P	555
43	G3NIL	1,998	82	YK19	GM4AOS/P	547
44	G3AMW	1,938	86	ZN18	GC3VPF/P	472
45	G3RXQ	1,920	100	ZL26	GM4AOS/P	515
46	G3SJV	1,899	80	AK03	GI3KVD/P	634
47	G4BWP	1,884	103	ZM79	GM4AOS/P	500
48	G3XCH	1,875	103	ZL66	GM4AOS/P	559
49	G4DDC	1,872	94	ZL18	GI3KVD/P	460
50	G3WKS	1,863	87	AL73	GM3JNW/P	465
51	GW3SXY	1,848	80	YL25	GM4AOS/P	653
52	G4CDF	1,758	72	ZN49	GC3VPF/P	450
53	GM3YOR	1,749	50	YQ64	G4CNC/P	651
54	G3LCH	1,743	101	ZL60	GI3KVD/P	530
55	G3ZBI	1,692	84	ZN71	G4CRC/P	397
	G3VOB	1,692	68	YK09	GM4AOS/P	542
57	G3ZKE	1,668	84	AL02	GI3KVD/P	515
58	G3TDR	1,614	94	ZL66	GI3TLT/P	530
59	G3SNN	1,602	82	ZL01	GM4AOS/P	458
60	GW3GZS	1,575	63	YL14	GM3YOR/P	495
61	G4DKX	1,557	67	AM67	GM4BYF/P	485
62	G3WOS	1,548	81	ZL08	GM4BYF/P	505
63	G4AZP	1,464	83	ZL26	GI3KVD/P	475
64	G3OOU	1,455	65	AL45	GI3KVD/P	580
65	G4COM	1,443	73	ZL52	GM4AOS/P	520
66	G3WRR	1,341	82	AL51	GM3JNW/P	580
67	G4AOL	1,320	71	AK11	GD3YEO/P	475
68	G2ASF	1,152	58	ZM63	GM3YOR/P	468
69	G3WMR	1,104	89	AL52	GI3KVD/P	570

Posn	Callsign(/P)	Points	QSOs	QRA	Best dx	Km
70	G3XTT	993	55	ZM45	GM4BYF/P	440
71	G4DJZ	945	53	ZM40	GD3YEO/P	345
72	G3BXF	909	55	ZM54	G4ADV/P	370
73	G3UVS	892	38	YK21	GM4AOS/P	540
74	G4DSN	846	54	AL54	G4ADV/P	420
75	G3RXJ	822	46	ZK10	GD3YEO/P	460
76	G6KI	741	51	YM50	GC4ASO/P	—
77	G3VPR	648	37	ZN70	G3MLS/P	275
78	G3ISO*	570	37	ZK07	GD3YEO/P	440
79	G3CBU	474	34	ZL55	GD3YEO/P	—
80	GM4BWT	453	21	YP49	G3VCV/P	382
81	G4FEV	387	33	ZM78	G3UUT/P	257
82	G3KFW	384	38	AL31	G3UUT/P	322
83	G4AUF	339	25	ZL10	G3UUT/P	270
84	G4AFN	54	6	ZM76	G4KF/P	140
Listener:	BRS15822	840	60	ZL40	GD3YEO/P	440
						G3XHU

144MHz band results

Posn	Callsign(/P)	Points	QSOs	QRA	Best dx	Km
1	G8GBY	7,499	508	ZN18	DC7GS	980
2	G4BEW	7,279	506	AM06	SM4EKV	1,130
3	G3PMH	5,906	485	AM51	SM7FJE	935
4	G8BQX	5,343	461	AK03	OZ1BOD	820
5	G4BPO	5,317	419	AM67	SJ8JH	931
6	G8HYF	4,921	373	ZO55	DM7AO	910
7	G8JEW	4,853	300	ZO22	DK1BW/P	1,002
8	GM3OLK	4,586	225	YQ64	DL7IC/P	1,080
9	GW3OXD	4,289	404	YM55	SM7FJE	1,130
10	GC3SDS	4,214	379	YJ30	FIDFH/P	770
11	G4CDC	4,169	319	ZN49	DM2ARE/P	975
12	G3UZF	4,043	455	ZL26	DK2ZF	802
13	GW8BHM	3,990	390	YM44	SM7FJE	1,132
14	G3SHK	3,937	283	ZO56	DM7AO	923
15	GM4AVH	3,819	219	YP49	SM7FJE	925
16	G3LRS	3,659	374	ZM36	DC7CG/P	970
17	GM8BOW	3,596	145	YQ18	DM7AO	1,080
18	G8GDK	3,501	327	ZL17	DK0UK	949
19	GM8IIO	3,464	187	YP18	DL0RL/P	935
20	G4BRA	3,384	461	ZL26	SM7FJE	1,059
21	G3RAC	3,326	376	ZL53	SM7FJE	1,111
22	G3UHF	3,311	350	ZN61	SM7FJE	1,010
23	G3SRT	3,304	338	YM48	SM7FJE	1,080
24	G3PIA	3,188	368	ZL33	DK7OH/P	850
25	GM4BVE	3,160	235	XP52	GC3SDS/P	660
26	G4ALE	3,021	359	AL51	OZ5QF/A	775
27	G4BWG	2,930	292	AL45	OZ5TE	795
28	GW5BI	2,914	317	YL25	DK0HF/P	776
29	G3ZTT	2,901	356	YN79	DC7BO	—
30	GW3WRA	2,881	307	YL05	SM7FJE	1,130
31	G3SFG	2,794	217	ZO46	OZ60L	828
32	G3IZD	2,785	322	ZK07	DK2ZF	820
33	G6CW	2,680	325	ZM04	SM7FJE	1,003
34	G8FAB	2,661	336	ZL52	OZ5QF/A	803
35	G3XC	2,590	205	XK54	F1DGD	820
36	G4CCC	2,531	384	ZL54	DC2LS	857
37	G4DSP	2,507	249	ZN60	SM7FJE	890
38	G8FCV	2,325	273	ZK21	DL0KF	895
39	G4ELO	2,289	315	ZM64	DL0SP/P	960
40	GM3KJF	2,271	198	XO19	PA0CKV/P	680
41	G4DIX	2,250	265	AL73	OZ5TE	838
42	GM4DIJ	2,217	205	YP42	DL0VW	999
43	G6GS	2,171	286	ZL69	OZ6OL	910
44	G3ODY	2,154	258	AL66	OZ9HBO	764
45	G3FJE	2,141	281	ZM79	DK0UK	895
46	G3EFX	2,051	267	ZK10	OZ5TE	886
47	G3UER	2,050	189	ZN44	SM7FJE	940
48	G8KPR	2,032	258	ZM78	DC8TK	615
49	GD3FLH	2,008	200	XO67	PA0GTV/P	730
50	G2FJA	1,974	231	AL43	OZ5TE	825
51	G3SPJ	1,970	216	AL54	OZ9MBO	750
52	G3VER	1,911	255	ZM80	DK2ZF	730
53	G3XBF	1,893	239	AL21	DL0KF/P	760
54	GI6YM	1,889	174	XO11	PA0CKV/P	776
55	G8GIZ	1,887	231	ZN61	SM7FJE	1,010
56	G4EFY	1,885	289	ZL66	DL0KF	806
57	G3DQW	1,882	229	ZM39	LA8OJ	812
58	G3JYP	1,859	141	YO29	DK0OH/P	812
59	G3ZMS	1,756	226	ZK10	OZ9HBO	820
60	G8GLU	1,684	200	YM50	DL6CA/P	660
61	G3XUS	1,682	219	AK11	OZ9HBO	812
62	G3PFM	1,677	218	YK09	DL0KF	902
63	G8CDL	1,659	203	ZL08	OZ6OL	858
64	GW4ATV	1,628	198	YL14	PA0WGL	675
65	G8DHE	1,627	221	ZK09	OZ5TE	902
66	G8ASX	1,520	209	YK19	GM4DIJ/P	506
67	G4DWB	1,505	119	XK63	PA0CIS	645
68	G3GHN	1,476	204	AL52	OZ1OF	802
69	G3AFT	1,450	213	AL02	DL0KF	690
70	G3GQC	1,447	184	ZN74	DL0SB/P	788
71	G8AJR	1,438	196	AL11	DL0SH/P	686
72	GM3NTI	1,422	142	XO28	ON5UN/P	686
73	G4EHW	1,407	164	ZM40	DK2ZF	720
74	G3ULN	1,406	157	YK21	ON4PB/A	585
75	G4CAR	1,390	184	ZM32	DC8TK	694
76	G8HRC	1,333	201	AL31	OZ5TE	854
77	G4BOX	1,329	234	ZL60	OZ5TE	—
78	G3OHM	1,272	202	YM50	OZ5QF/A	770
79	G3KIN	1,243	201	ZL59	OZ5TE	898
80	G4DLB	1,239	190	ZM73	DB2BL/P	695
81	G3WIR	1,224	187	ZL26	DL0JL/P	623
82	G3CMH	1,183	154	YK05	DJ9CZ	650
83	G8FEK	1,168	124	ZN07	DL0VW	720
84	G8DDC	1,165	189	ZL18	GM8FFX	575
85	G4AKG	1,163	183	ZL60	OZ6OL	890
86	GW2OP	1,110	129	XL07	ON5HW/P	635
87	GC3HFN	1,087	117	YJ47	GM3KJF/P	595
88	G3TCR	1,084	182	ZL55	GM4BVE/P	520
89	G8IWD	1,071	144	YK28	FICMB/P	565
90	G3UES	1,070	181	ZL66	DL0KF/P	770
91	G8LED	1,049	179	ZM45	SM7FJE	940
92	G8HJD	1,024	122	ZM27	DL0VW	900
93	G8KRS	1,018	164	ZL19	DK2ZF	782
94	GC3DVC	986	101	YJ70	PA0CKV/P	560
95	G3NJA	935	110	YK55	ON5HW/P	575
96	GI3XRQ	881	94	XO32	G6GS/P	510
97	G8JAY	819	108	ZL01	DC8TK	723
98	G8IVK	813	140	ZM76	DB2BL/P	630
99	G4APD	721	123	ZM54	DJ6CA/P	615
100	G8JMR	563	122	ZL10	DC9DZA	440
101	G4DSF	508	98	ZM63	GM4BVE/P	457
102	G3EEO	500	95	ZM71	ON4PB/A	508
103	G3XST	57	34	YN28	GM3NTI/P	203

Check logs from: G3NYY/P, G3USE, G3VIJ, G4BRO, G8CDW, G8FEO/P, G8ITS, G8DAZ/P (single-band entry).

144MHz LISTENERS RESULTS

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	A9183	426	102	ZN49j	SM6FIG	821
2	A8932	360	68	YN40e	DC9DZA	657
						G3VPK

432MHz band results

Posn	Callsign(/P)	Points	QSOs	QRA	Best dx	Km
1	G6UQ	15,798	222	ZN61	DM2BYE	1,070
2	G4BEL	14,760	202	AM51	DM2BYE	946
3	GM8BDX	14,208	101	YP18	DK7KY	1,065
4	GM3OXX	11,580	76	YQ64	DC9CSA	1,080
5	G4CFI	11,070	156	AM67	SK6AB	916
6	G3WHL	10,776	116	ZN44	DL7QY	955
7	G3FZL	10,404	138	AL45	LA8OJ	980
8	G8CXI	10,044	155	AL43	SM6FYJ	985
9	G4CCH	8,816	123	ZN49	DC9CSA	890
10	G4ARD	8,814	159	ZL18	DK1KR	765
11	GW3SLJ	8,550	123	YM54	SM6FYJ	1,120
12	G4EBN	8,004	77	ZO22	SM7AVJ	945
13	GC4CNV	7,572	106	YJ30	DK1KR	994
14	G8TB	7,338	125	AL66	SK6AB	1,012
15	G8GIW	7,170	83	YO29	SM6FYJ	950
16	G8GLM	6,978	80	ZN18	SM6FYJ	920
17	G8IUT	6,966	—	ZM04	—	—
18	G3TQF	6,594	126	ZM36	SM6FHZ	955
19	G3XPU	6,462	102	AL54	SK6AB	985
20	G8AGU	6,378	97	YK21	PA0JCA	720
21	G4CDY	5,898	123	AL51	SM6FYJ	1,050
22	G8CLY	5,868	71	ZO56	DK0CO	806
23	G4CQR	5,710	113	ZL60	SM6FYJ	1,048
24	G8GXI	5,694	67	ZN31	DK1KR	808
25	G8ECN	5,646	72	AM06	SM6FYJ	840
26	G4AEZ	5,612	76	ZO46	DF7QF	637
27	G3AKF	5,580	120	ZL54	DK1KR	835
28	G4AZV	5,250	105	YM48	DC1XC	854
29	G3XTT	5,130	98	ZM45	SM6FYJ	1,080
30	G3LTN	5,079	110	ZM73	OZ1UHS/DC1XC	780
31	G4DDK	4,992	114	ZL26	DC1XC	777
32	G3YYF	4,866	79	AK03	SM6FYJ	1,020
33	G4DKN	4,656	98	ZL66	DC0LY	794
34	GI3VPK	4,644	56	XO11	ON5UN/P	760
35	G4DWZ	4,548	104	AL02	DJ2YF	612
36	GW3UBX	4,530	95	YM44	PA0MS	594
37	G8ART	4,524	104	ZL26	DC1XC	745
38	G3NNG	4,434	92	ZL33	DC1XC	820
39	G3WFM	4,428	100	ZM80	DC0LY	680
40	G3TLM	4,362	106	ZL69	SK6AB	1,045
41	G8IFT	4,276	97	YM50	DC1XC	811
42	G3ITH	4,182	95	ZM64	DC1XC	760
43	GM8JYZ	4,140	45	YQ18	DM2CFG	1,013
44	GM3HAM	4,110	45	YP42	DC1XC	912
45	GW4BBB	4,098	83	YL05	DC1XC	882

Posn	Callsign(/P)	Points	QSOs	QRA	Best dx	Km
46	GW6YB	4,008	90	YL25	DC6MV	638
47	G3RQZ	3,984	88	AL52	SM6FYJ	1,020
48	G3HBR	3,858	84	ZK10	SK6AB	1,094
49	G3SRS	3,750	73	YM50	OZ1AED	820
50	G8AYN	3,720	84	ZK21	G8GIW	462
51	G3WQK	3,672	80	AK11	DC1XC	730
52	G4BOO	3,414	75	AL73	SM6FHZ	983
53	G4DDP	3,312	72	AL21	DC1XC	740
54	G4ERP	3,132	82	ZL01	DL9GS	613
55	G3WPO	3,078	88	ZK10	SK6AB	1,067
56	G3TWJ	3,054	79	ZL60	DC1XC	725
57	G4EGA	3,024	72	YN79	PA0CKV	504
58	G5HD	2,946	82	ZL52	DL9GS	610
59	G4DYP	2,832	62	ZM32	OZ1UHS	753
60	G3XSO	2,802	73	ZL26	DC1XC	757
61	G3RND	2,568	62	ZK25	PA0VCA	532
62	GC8EZA	2,436	40	YJ70	PA0MS/P	575
63	G8DJW	2,430	57	YK28	PA0ANS	610
64	GW4CBR	2,256	42	XL07	GM3HAM	389
65	G3GRL	2,232	38	ZN74	SM6FYJ	960
66	G8KIN	2,220	68	ZL59	DC1XC	750
67	G3BXF	1,944	54	ZM54	PA0JC/P	490
68	G8GCP	1,902	61	ZK09	PA0NYM/P	440
69	G2DSP	1,818	57	ZK07	PA0JCA/P	495
70	G8BBN	1,776	42	YK19	PA0ANS	623
71	G8DPB	1,752	47	AL31	PA0OOS	474
72	GW3JQA	1,638	33	XM17	GC8EZA	440
73	G8FMG	1,570	54	ZM78	PA0JCA	450
74	G3XFW	1,464	38	YK05	PA0JCA	670
75	G4DMY	1,332	20	XK63	GI3VPK	505
76	GM3THI	1,110	23	XO19	G4BEL/P	390
77	G8CXT	1,104	46	ZM76	PA0VV	350
78	G2HDJ	1,098	38	ZL66	PA0JCA	480
	G8FDL	1,098	32	YN28	PA0LPN/P	567
80	G8EIK	1,080	74	ZL08	PA0LPN/P	455
81	G8FAT	1,014	19	ZL40	DB2BP/A	610
82	G8KMY	912	10	ZN60	DC1XC	760
83	GC3YIZ	840	20	YJ47	GW4CBR/P	310
84	GM3ITZ	702	16	XO28	G4DMY/P	503
85	G8AYY	486	17	ZN71	GC4CNV/P	365
86	G8HJD	366	13	ZM27	PA0VHA	375
87	G4EIY	252	18	ZM79	PA0VHA/P	290
88	G8KGC	144	10	ZN71	G8AIM	80
	G8IUI	144	8	YK33	GC4CNV/P	130
90	G8IXK	108	4	ZL19	PA0VHA	303
91	G4ERG	72	4	ZN07	G8HJD/P	140
92	G8AJR	48	6	AL11	G4BEL/P	57
	G3DQW	48	4	ZM39	G4EIY/P	66
94	G8GWO	6	1	ZL17	—	—
Listener:	BRS31038	624	20	YN75	ON5UN/P	603

G2HIF

1·3GHz band results

Posn	Callsign(/P)	Points	QSOs	QRA	Best dx	Km
1	G3DY	12,669	62	AM51	OZ1UHS/P	666
2	G3XDY	10,590	50	AM67	OZ1UHS/P	635
3	GC3EGV	8,199	24	YJ30	DL1LB	758
4	G4CCH	7,310	30	ZN49	DK0CO/P	725
5	G4DGU	6,470	42	ZL54	PA0CKV/P	495
6	G3PQY	6,395	22	ZN18	OZ1UHS/P	620
7	G3TQF	5,837	34	ZM36	PA0APD/P	456
8	G4AUC	5,753	39	ZL26	DL1LB	583
9	G3HBR	5,321	29	ZK10	OZ1UHS/P	795
10	G3FZL	5,148	25	AL45	SM6ESG	945
11	G3WHL	4,902	26	ZN44	OZ1UHS/P	678
12	G3SJX	4,449	32	AL51	DL1LB	535
13	G3UQH	4,122	30	YM48	PA0VTW	572
14	G4CPE	4,009	31	ZL18	PA0VTW	440
15	G8IUT	3,846	25	ZM04	PA0NYM/P	506
16	G8GDZ	3,657	30	YM50	ON5UN/P	411
17	G3SOU	3,348	27	ZL52	PA0FWS	356
18	G3NNG	3,345	25	ZL33	PA0NYM	517
19	GW3ZUL	3,272	23	YL05	ON5UN/P	462
20	G8AGU	3,243	14	YK21	GI3VPK/P	483
21	G4AEZ	2,850	14	ZO46	PA0FWS	448
22	G4BOO	2,810	17	AL73	OZ1UHS/P	750
23	G8TB	2,756	20	AL66	PA0VTW	373
24	G4DKN	2,232	20	ZL66	PA0VTW	487
25	G3RCV	2,222	18	ZK21	G3DY/P	241
26	G3WTP	2,052	20	ZM78	G8AGU/P	275
27	G3WFM	1,967	18	ZM80	PA0NYM/P	385
28	G4DWZ	1,866	13	AL02	PA0VTW	385
29	GI3VPK	1,677	6	XO11	G3DY/P	486
30	G3RQZ	1,594	19	AL52	G4CCH/P	229
31	GW3SLJ	1,473	13	YM54	G8AGU/P	182
32	G3ITH	1,370	17	ZM64	GW3SLJ/P	135
33	G4ACL	1,263	17	ZL26	GW8ADP/P	145
34	GW8ADP	1,082	10	YL25	G4ACL/P	145
35	G4EBF	1,056	13	ZM73	G3XDY/P	187
36	GW3ONP	889	8	YM44	G4DGU/P	178
37	G3FVA	765	12	ZN61	G3LQR	155
38	GM8DOX	704	1	YQ64	OZ1UHS/P	704
39	G4ETU	566	10	ZK07	G3RCV/P	91
40	G8AYY	470	6	ZN71	GW3SLJ/P	122
41	G8KGC	465	6	ZN71	G4CPE/P	152
42	GM3ITZ	444	3	XO28	G3KMS	183
43	G3RZV	438	5	YK19	GC3EGV/P	135
44	G8GPZ	390	5	ZK09	GC3EGV/P	175
45	G4CQR	384	6	ZL60	G3XDY/P	137
46	G8EIK	340	5	ZL08	G3TQF/P	80
47	G8DLZ	322	5	ZM45	G3UQH/P	117
48	G3DQW	34	1	ZM39	G3DY/P	34
49	G3XPU	22	1	AL54	G4BOO/P	22

G5HD

OTHER CONTEST NEWS

The Commonwealth Contest 1976 results

TROPHY WINNERS	
Senior Rose Bowl	L. Sawkins, VE7CC
Junior Rose Bowl	D. E. C. Lockyer, VR1AA
Col Thomas Rose Bowl	A. J. Slater, G3FXB
Receiving Rose Bowl	E. W. Trebilcock, BCRS195

The name may have changed, but the contest remains the same. This would appear to sum up the overwhelming sentiment among entrants this year. Although there was no repetition of the excellent conditions of 1975, we were glad to receive a healthy number of logs for this year's contest. A complete turnaround in results put the majority of top placings in the Pacific area, contrasting with last year when the honours went to Europe and North America.

Once again we were delighted to welcome the large number of entries from Australia but were rather disappointed to note the continued reduction in support for the listeners section. Can it be that this is a symptom of a decline in cw interest?

Top placing this year goes to Lee Sawkins, VE7CC, with D. Lockyer, VR1AA in second place. The latter result is somewhat amazing as Danny notes in his log that he did not hear or work a single G throughout the entire contest! He must also be one of the few high placings in recent years not to have used a beam.

The leader in the UK section and winner for the fourth year in succession of the Col Thomas Rose Bowl is Al Slater, G3FXB. His overall position of 9th compared with 2nd in 1975, together with a reduction in his score of over 1,000 points, reflects how depressed conditions were in Europe.

The only single-band section to attract any significant number of entries was 14MHz. The home and overseas leaders were Stuart Jesson, G4CNY, and M. Werry, VP2MJ, respectively. The small entry in the receiving section in no way detracts from the win by Eric Trebilcock, BCRS195, of the Receiving Rose Bowl in his 35th year of participation.

Comments

Many thanks to those who took the opportunity to either congratulate or castigate the HF Contests Committee on the rules. Herewith a few extracts: "I have refrained from spoiling the cover sheet with comments on conditions"—9H1CH. "Most pleasing to find the contest had not really changed. Long live BERU!"—VK2BPN. "If I hadn't gone to a cheese and wine party I would have had a decent score!"—ZB2CJ. "This MUST be the bottom. Of five G stations heard, only one worked"—ZL1HV. "Would have managed more if some lid had not collided with the power pole down the road"—VK7BC. "Please make it 24 or 36 hours out of 48"—G5WP. "One of my best in 35 BERUs"—BCRS195. "Once again, another enjoyable contest marred only by the awful conditions"—G3FXB.

The main point of comment in logs regarding the rules related to the duration of the contest. There is some feeling that we should revert to 48 hours with rest periods. This possibility was discussed by the committee last year and again this year, and after much discussion it has been decided to leave things as they are for the 1977 contest. We feel that a 48-hour duration puts a great strain on VK/ZL entrants where the contest would extend well into Monday morning. Additionally, it is felt that this contest is one of the most demanding in the contests calendar, not only in terms of equipment but also in terms of propagation knowledge required and, most important of all, in the experience of the operator. These considerations are possibly what give this contest its unique appeal.

The other area of comment concerned CQ calls. The first few hours revealed the die-hards persisting with BERU and the more forward-looking with CC. We have it on good authority that the gentleman who sent CQ RU is not connected with any rugby organization! However, within a short period everyone seemed to have standardized on CQ BERU and no doubt this will be the pattern for the future.

Congratulations to the trophy and certificate winners. Many thanks to all who sent logs. We hope that next year will see some improvement in band conditions and that the number of entries will begin to increase. *D. J. A.*

HOW THE LEADERS MADE THEIR SCORES

	3·5MHz QSOs/ Bonus	7MHz QSOs/ Bonus	14MHz QSOs/ Bonus	21MHz QSOs/ Bonus	28MHz QSOs/ Bonus	TX	RX	Ants
VE7CC	49/33	61/35	119/52	36/27	0/0	No details given		
VR1AA	46/33	50/32	74/43	25/24	8/6	FT101	FT101	W3DZZ trap dipole
VK3MR	36/31	99/34	106/42	9/9	0/0	FTDX401	FTDX401	Rhombics TH6DXX
VE3BMV	34/26	80/49	166/35	0/0	0/0	T4XB	R4B	402BA inv-V
VE7UZ	37/27	48/35	78/42	19/18	0/0	Home-brew	R4C	Quad bi-squares
ZL2BCO	41/31	64/36	60/37	17/13	0/0	FTDX401	FTDX401	3-el beam dipoles
G3FXB	23/19	33/26	77/52	11/11	4/4	FLDX500	FRDX400 FT101	Quad slopers TH6DXX
G3MXJ	12/11	24/17	67/51	12/12	3/3	SB401	SB301	vertical delta loop

TRANSMITTING SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	VE7CC*	4,188	51	G3PVA††	1,000
2	VR1AA*	3,755	52	VE2WW	994
3	VK3MR*	3,377	53	VE3IR	965
4	VE3BMV**	3,345	54	G3KSH	955
5	VE7UZ	3,322	55	G3ESF	860
6	ZL2BCO**	3,227	56	VP2MJ*††	851
7	VE6WX**	3,147	57	G3NKS	850
8	VK2BPN**	3,028	58	VK3YK	823
9	G3FXB*	2,939	59	VK5KL	810
10	VK5NO**	2,937	60	VK3RJ††	790
11	ZL3GQ**	2,725	61	G2FYT	750
12	9J2BO**	2,714	62	VK2XQ	743
13	G3MXJ*	2,587	63	VK4UA	736
14	9H1CH**	2,551	64	VE2QS	711
15	VK4XA**	2,535	65	VK3XU	705
16	XJ5RA**	2,302	66	G6RC	703
17	5Z4LW**	2,191	67	G3KAA	683
18	G6CJ*	2,161	68	G3IAS	650
19	ZL2BR	2,142	69	VK4MY††	635
20	VK7BC**	2,132		VK8ZZ**††	635
21	G5WP	2,127	71	G3EBH	631
22	ZB2CJ**	1,963	72	VK2NS	619
23	9G1LZ**	1,946	73	GM4GK	610
24	9J2CL	1,875	74	G8QZ	603
25	G4BUE	1,873	75	G2HLU	600
26	VK3ZC	1,845		G3VDL	600
27	G2QT	1,837	77	VK2HC	588
28	G5RI	1,801	78	G5ND††	583
29	ZL1HV**	1,800	79	GM3CFS††	581
30	VE2WA**	1,717	80	VE7AZG	554
31	VK3XB	1,701	81	VK2YB	535
32	G4BKI/VP9**	1,591	82	VK2HW	533
33	G3DYY	1,545	83	G3TMA	526
34	9G1GE	1,468	84	VP2MB††	516
35	VK7CH	1,428	85	P29EJ**††	490
36	VE1EP**	1,350	86	VK7RY	477
37	G3SXW	1,348	87	G2AJB	389
38	VK5DL	1,319	88	VK5FM†	359
39	G3IGW	1,313	89	G3YBH	321
40	VK5KO	1,298		VE5NN†	321
41	VK7HE	1,248	91	VK3CG	311
42	VK3CM	1,181	92	G3JKY	285
43	VK7JB	1,174	93	G3ZDW††	255
44	VK7OB	1,154	94	G8DI	230
45	VE3AKG*†	1,119	95	VK5FG††	209
46	VE2AYY	1,105	96	VK2GT	176
47	VE1EK	1,075	97	GM3WRN††	175
48	G4CNY*††	1,071	98	VK5HO	150
49	ZE3JO**	1,065	99	VK4XJ††	140
50	VK3KS	1,029	100	G2BLA††	50

RECEIVING SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	BCRS195*	2,145	2	BRS15822*	1,630

Check logs gratefully acknowledged from G4BBA, G6NK, GW3SB, VE2EHF, VE3DCT, VE3EK and VE3HRP.

* Certificate of merit winner.
** Commemorative certificate winner.
† 7MHz single-band entry.
†† 14MHz single-band entry.

Summer 1·8MHz Contest results

The 1976 Summer 1·8MHz Contest was won by single entrant GD4BEG, with another single entrant G3SVW, who operated from a /A location near Macclesfield, Cheshire, in second place. The White Rose Radio Society working from their club station near Leeds were third. The best of the overseas entrants was OK1DKW with 209 checked points.

Despite high temperatures, static levels were at a low state and a number of entrants made contact with several VE and W stations. From an analysis of the 54 logs received, it seems that well over 120 stations participated in the contest by giving points to entrants.

GD4BEG used a homebrew transmitter with a R4C receiver working into a pair of 120ft phased vertical aerials mounted over an extensive ground system comprising three miles of buried radials. G3SVW used a KW2000B and a dipole at 70ft, while a FT101B and a 290ft end-fed wire at 80ft was used at G3XEP. Although many of the entrants reported using commercial gear, there were still quite a few who used home-built transmitters or transverters.

The HF Contests Committee wishes to thank all the entrants who commented on the contest and those who sent in check logs. From the many comments received it seems that the current rules and scope of the contest are well liked and should be continued in their present form. Several entrants asked if the date could be changed to early July to avoid a clash with vhf contests. The committee will look into this, as the close proximity to both the VHF NFD (on its new date) and HF NFD are appreciated.

UK SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	GD4BEG	571	19	G4DJX	374
2	G3SVW/A	536	20	G3WQK	369
3	G3XEP	510	21	G3FJE/A	361
4	G3ORH	487	22	G4ALG/P	359
5	G3TIR	486	23	G3XWZ	326
6	G4BUE	480	24	G4CEN	319
7	G3YMC	447	25	G3SYM	316
8	G4BXT	446	26	G3VZG	314
9	G3LCH	426	27	G4CSC	307
10	G4CNY	409	28	G4BRK	296
11	GM3CFS	406	29	G3TLF	283
12	G3WRA	398	30	G3VFD/A	272
13	G4BMK	396	31	G3NKS	248
14	G3KOR	391	32	G3ZDD	239
15	G3GC	389	33	GM4EJI	228
16	GW3XNS	381	34	G4ERW	214
17	G3OZM	376	35	G4CIK	197
18	G3OVL	375	36	G4BBA	114

OVERSEAS SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	OK1DKW	209	6	DJ7TE	102
2	DJ8WL	192	7	OE1TKW	89
3	OK1DCF	140	8	DM0CFT	71
4	OK2PGU	127	9	DM2AAG	20
5	DL1BA	103			

Check logs: G3NYA, G3USE, G4DJY, G5RM, G6BQ, G6LX, A8312, OL5AUK, W4YY/Europe.

2nd 1·8MHz Contest 1976 rules

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

2. When. 2100gmt Saturday 13 November to 0200gmt Sunday 14 November 1976.

3. Eligible entrants. Single-operator stations only. British Isles entrants must be members of the RSGB.

4. Sections. (a) British Isles stations. (b) Overseas stations including EI.

5. Contacts. CW (A1) only in the 1·8-2·0MHz band. In addition to RST and serial number, the British Isles stations should send the appropriate county/region code letters as published in the January 1976 issue of *Radio Communication*.

6. Scoring.

(a) British Isles section. Three points for each contact, with a bonus of five points for the first contact with each county/region and each country outside the British Isles.

(b) Overseas section. Three points for each contact with a station in the British Isles (not EI) with a bonus of five points for the first contact with each county/region.

7. Logs. Column 5 to be headed "Code Received". Entries to be sent to RSGB HF Contests Committee, c/o D. S. Booty, 139 Petersfield Avenue, Staines, Middlesex TW18 1DH.

8. Awards. The Victor Desmond Trophy will be awarded to the leading British Isles entry. The Maitland Trophy will be awarded to

the Scottish station scoring the highest aggregate number of points in this contest combined with the 1st 1·8MHz Contest 1977. Certificates of merit will be sent to the runner-up and the third placed entry in section (a) and to the first three stations in the overseas section (b) and to the leading station in each overseas country.

A certificate of merit will also be sent to the highest-placed contestant whose 18th birthday falls on or after 13 November 1976, operating from the main address as shown on the entrant's licence. Entries qualifying for this award should state "Under 18" at the top of the cover sheet and give their date of birth.

144MHz QRP Contest results

The fourth annual QRP Contest was acclaimed a success, many contestants were surprised that despite average propagation, except for sporadic-E before and at the start, that dx could easily be heard and worked without the heavies around. There seems to be an opinion that a number of contests should be limited to 20W. Comments were received for the possible improvement of future QRP, ie QTH, height and various power level multipliers. One group had site occupancy problems; check your chosen site for permission and other groups. The VHF Contests Committee now has an established contest in the calendar, similar to the annual 3·5MHz QRP.

As the number of entries has increased, see rule 4a, the contest has been split and consequently certificates go to winners and runners-up in each section. Power has not been entered in a table column as contestants quoted either input, output, or within the limits on an in-line power meter. The adjudicator accepts the power levels within the spirit of the contest.

Check logs acknowledged: G4BXN/P, G8BKR, G8DLX, GM8GEC and G8KLO. *G8ACJ*

FIXED

Posn	Callsign	Points	QSOs	QTH	Best dx	Km
1	GD8EXI	895	82	XO77	G3JVJ/P	495
2	G4ASR	525	127	AL22	GD8EXI	421
3	G8FUL	484	104	ZL58	G4CJG	400
4	G4APL	431	97	ZL60	GD8EXI	440
5	G4DWB	353	57	XK63	GM8GEC/P	580
6	G8CJI	244	88	AL31	GD8EXI	432
7	G8GIH	225	54	ZN28	G8JXK/P	350
8	G3XFW	224	46	YK07	EI9Q	330
9	G8ETB	223	65	ZL37	FICRP/P	390
10	G4APA	210	62	ZL47	G8IWA/P	330
11	G4CIK	154	36	ZM14	GM8BEQ/P	—
12	G3ILO	124	32	YL29	EI9Q	380
13	G3NEO	122	26	ZN54	GM8FFX	406
14	G8KAX	72	36	AL32	GW3WRA/P	233
15	G8IFT	56	22	YM50	G3ORA/P	140

PORTABLE

Posn	Callsign	Points	QSOs	QTH	Best dx	Km
1	GW3WRA	1,150	156	YLO5	IT9TAI	1,983
2	G3PIA	972	171	ZL33	PA0DUO	501
3	GW3UCB	948	160	YN75	GM4DTH/P	434
4	G3ORA	867	120	YL68	G8FIC	409
5	G3JVJ	798	124	AK12	GD8EXI	503
6	G8FAT	590	90	ZL27	GM8GEC/P	455
7	G8IZY	581	134	ZL80	GD8EXI	472
8	G8IWA	535	83	ZO46	G8JXK/P	408
	G8JXK	535	77	YK05	G8IWA/P	408
10	G4ELO	520	104	ZM64	GM8FFX	540
11	G8CEZ	506	94	YK30	G8CGK/P	435
12	GW3MGS	498	90	YL25	F1CRP/P	343
13	G8IWD	394	77	YK28	—	—
14	G3SDS	388	70	YK28	GD8EXI	417
15	G3LZQ	344	64	ZN18	G8JXK/P	363
16	G8KGI	331	71	ZK05	GD8EXI	420
17	G4CRC	319	49	XK64	GM8GEC/P	610
18	GC4DWZ	310	43	YJ48	G8JHL	445
19	G3PQY	308	52	ZN18	F1CRP	610
20	GM4DZO	276	47	XP35	G6XM	482
21	G3SAD	272	78	ZL10	GD8EXI	387
22	GM8KYL	225	41	XP45	G3PIA/P	495
23	G8FDL	179	47	YN28	GM8FFX	377
24	G8JXV	141	65	ZL60	GW3UCB/P	275
25	GM4DTH	132	26	YQ08	GW3UCB/P	425
26	G3PJT	97	25	XK66	GW4ENB/P	310
27	G3XWZ	74	36	ZN64	G8FAT/P	175

Log from G8HQR/P, 294 points, not accepted; rule 20B.

3·5MHz Field Day 1976 results

Double last year's entry and many thoughtful comments appear to indicate a welcome revival of interest in this contest. The perfect weather reduced the number of fixed stations worked but with the increased portable activity the leading scores are similar to those achieved in 1975.

The leading station, G3KTZ/P, was operated by G3KTZ and G3RPB from a school playing field near Bounds Green station, N11. The driver stages of a Ten-Tec Triton II were used to feed a double-sized G5RV aerial. Second place once again goes to the Mansfield RS, G3GQC/P, operated by G3DBZ and G3XWZ. Congratulations to a recent Class A licensee, G4FAM/P, who made third place with his first essay on 3·5MHz.

Comments: "Why exchange locations?"; "Exchange county code letters in addition to place names"; "Frequency limits a good idea"; "Confining operation between 3,510 and 3,550kHz contributed to a heavy degree of interference"; "Get those electronic keys down to a speed I can read!"; "Radio gear, operator, victuals all carried by bicycle".

Subject to Council approval, the Houston-Fergus Trophy will be awarded to the G3RPB/G3KTZ partnership. *G3IAS*

Posn	Callsign/P	Location	Contacts	Points	Operators
1	G3KTZ	London	89	656	2
2	G3GQC	Mansfield	73	567	2
3	G4FAM	Bromley	69	548	1
4	G4DDX	Weston	66	547	2
5	G4EHF	Brighton	66	509	1
6	G3JKY	Bromley	58	487	1
7	G8DV	Southam	55	485	1
8	G3BTO	Hannington	54	450	1
	G4DDL	Bracknell	60	450	2
10	G3IFF	Havant	45	412	1
11	G3EJF	Barden	45	345	1
12	G2RO	Beeson	31	305	1
13	G3SGH	Wye	37	294	1
14	G3UJG	Wool	33	290	1
15	G3NEO	Todwick	25	272	1
16	G4CDD	High Flats	31	225	2
17	G3OEP	Lound	25	180	1
18	G6ZG	Lound	24	173	1
19	G3LMG	Clawton	16	130	1
20	G4EHX	Risley	10	75	2

Check logs from G3IAS/P, G3YMC, G3ZDW and G6GH are acknowledged with thanks. Thirty portable callsigns appear in the logs.

Chelmsford DF Qualifying Event results

Fifteen teams assembled in and around the *Hare and Hounds* south-west of Colchester for the fifth qualifying round.

Station A, G4AZN/P, was located in scrubland near Wivenhoe approximately six miles from the start, and Station B, G3KPJ/P, was located on the south side of the Blackwater river near a dismantled railway bridge west of Maldon.

As expected, most competitors chose to locate Station B first, and most found themselves on the wrong side of the river. As it was close to low tide, most teams were able to make the rather muddy journey across the river to reach the transmitter.

As 1600 approached, several teams appeared at the vicinity of Station A and the mad rush came at the 1600 fixed transmission. Once again several teams arrived on the wrong side of the River Colne, but this was now a much more formidable obstacle and no one chanced crossing.

After the event tea was served at Essex University, and the Mid-Essex DF Trophy was presented to Ian Butson as the highest-placed entrant from the Colchester, Chelmsford and Basildon clubs.

The Chelmsford club would like to thank all those who took part or helped to make the event a success.

			Time of arrival	
Posn	Name	Club	Station A	Station B
1	W. North	Chiltern	1559	1437½
2	I. Butson	Chelmsford	1601	1438
3	E. Mollart	Oxford	1601½	1437
4	P. Tyler	Oxford	1445	1602
5	C. McEwen	Chelmsford	1604	1457½
6	T. Gage	Oxford	1613	1440
7	G. Whenham	Coventry	1613½	1507
8	D. Newman	Slade	1624	1457
9	W. Dix	Chelmsford	—	1514
10	W. Pechey	Chelmsford	1521	—
11	P. Wells	Dartford	1526	—
12	D. Gething	University of Essex	1544	—
13	R. Brocks	Chelmsford	1547	—
14	P. Woollett	Dartford	—	1608

One team failed to find either transmitter.
Subject to confirmation, I. Butson and C. McEwen qualify for the Final.

Because of shortage of space, the results of the Oxford and Salisbury DF Qualifying Events have been held over until next month.

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed in alternate issues of *Radio Communication*, or on a postcard similarly laid out. Each must be accompanied by a recent *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 50p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

The closing date for each issue is the 1st of the preceding month, but no guarantee of inclusion in a specific issue can be given. Valid advertisements not published in the issue following receipt will be held over until the next issue.

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale. Advertisements may be edited or abbreviated as necessary.

Post to: MEMBERS' ADS, "RADIO COMMUNICATION", 35 DOUGHTY STREET, LONDON WC1N 2AE.

FOR SALE

FV101 remote vfo for FT101, £35 ono. *Wanted:* RF board, wkg and aligned on 2m to suit Pye Cambridge AM10D. Pair of bases for 807. Peter Mahood, 55 Watling Street, Uddingston, Glasgow G71 6DN. Tel Uddingston 812309.

Heathkit SB101, cw filter, £105. IB1101 counter, £85. IM102 multimeter, £125. IG37 fm stereo generator, £50. All professionally built. Philips PM3231, dc 15MHz, dual beam scope, £110. 4CX250Bs, 2m aerials, TA33Jr elements, etc. Offers. Buyer collects. G3UAW. Tel Aldbourne 558.

Heath scope OS1, manual, £20. Labgear cross hatch generator CM6004PG, £28. Degausser E5186, £5. Field strength meter, mains E5108, £15. Cambridge boot, cables, control, mic, h/b, not converted, £25. Reslosound hi-fi ribbon, mic, RBH/T, TT100, unused, £15. G3XKA. Tel Woking 73620.

Drake 2B matching spkr, calibrator, multiplier and manual, £90. Electroniques valved coil pack. QP166 160-10m, £9. J. Wilkes, 7 Testwood Crescent, Totton, Southampton SO4 3NJ.

Liner 2 with preamp, mobile mount, good cond, £90 for quick sale. Carr extra. G8DFZ, QTHR. Tel 09434 3083 evenings.

Set of manuals ICS RAE course, £15. Racal RA63 ssb adaptor, £40. BC221, £20. All near offers. *Wanted:* VFO and xtals for Icom IC21. Tx or tx/rx for hf bands. Mal, 13 Elmstead Road, Erith, Kent.

Creed 54RP, vgc, 2F reader, 7B, solid state terminal/control unit, pll demod, afsk, fsk, ttl logic, neat, circuit, £65. G3ZVC 9MHz tx/rx, £60. Or wkg in 80m, 12V, 70W tx/rx, £80. HF plus 80m G-whip, £17. G3VPX. Tel Ashton in Makerfield 74876.

12AVQ, £9. Jap bug-key, £2.50. Two "Bud" split-stator capacitors, 250 μμF, ·05in airgap, 75p each. *Bulletins,* 1955-66, 50p, per volume plus free pick of odd earlier copies. Buyers collect. G3IMK, QTHR. Tel 01-397 6924.

Yaesu FT2 auto, mains/12V, fitted 48, S0, S20, S21, S22, R5, R6, R7, preamp, xtals 145·32, 144·60, R4 input, all leads and Bantex ⅜ whip, ready to go, £140. Cossor CC8/2 Mk2, manual, £2.50. Tech TE15 gdo, £15. Joystick, no tuner, £2.50. 898 dial drive, £2.50. 2m Halo with mast, £1.50. G8BPV, QTHR. Tel 0242 27148.

Heathkit SB101, plus h/b psu, Heath swr bridge, Shure mic, h/b, prof built linear, 4 811As in grounded grid, spare valves, etc, £250 ono. G3MBM, QTHR. Tel Cambridge 860178.

ETM3 mains squeeze keyer, £30. 36ft lattice tower, two sections, 15ft, plus grillage, total height 35ft. G4CJY, 78 Carver Hill Road, High Wycombe. Tel 0494 30018.

Pye FM10FRX base station rx, manual, exc cond, wkg on 144MHz with xtals for R7 and S23, £20. Pentax 200mm F4 lens, case, etc, as new, £70. G8GHX, QTHR. Tel 021-358 5762.

Property of deceased amateurs. Trio 9R59DS, £45. LM13 USN freq meter, £12. Carr by arrangement. Quantity xtals. sae for list. G3CBU, QTHR. Tel Basingstoke 58921.

Viscount parts, tx and rx boards on 2m, £10 each. Tx and rx boards, low band, £8 each. Audio boards, £5 set. Cases, £1.50. Mic, £1. Control box with mic, £4.50. G4CCN, QTHR. Tel 0305 5987.

Sentinel converter, 2m, 28-30MHz, £12.50. MM varactor, 70cm, £12.50. HF balun, 75Ω:75Ω, £4, Wightraps, £1.75. Eddystone spkr, £1.75. Ranger 4m a.m., £4.50. Offers considered. G4CCN, QTHR. Tel 0305 5987.

G2DAF Mk1 rx, professionally built. Philpots metal work. Eddystone 898 dial. Technical data, £25. Buyer collects. G3XPX, QTHR. Tel Tunbridge Wells 29761 evenings, 01-632 4331 day.

Trio JR599 Custom Special all band communications rx, little used and as new. Foster. Tel Lytham 733910.

IC202, as new, £135. Redifon GR270, 10W fm on 2m with control gear, £30. FT101, Mk2, mods by agent, £300. UHF Cambridges, ok for 432MHz with control gear, one without battery lead, £33 each. GM3BQA, QTHR. Tel North Berwick 2519.

Mohican GC-IU gen cov rx, 0·5-30MHz, first class cond, mains/battery, internal mains, stabilizer, power unit, handbook, £30. Buyer collects or arranges delivery. G3ISP, QTHR. Tel 0632 834162 after 8pm.

150W cw tx, psu, leads, £30. Creed teleprinter, model 7E, £17. CFS rtty adaptor, psu, 80+80V, £10. Transistor intercom, not wkg, £2. A. West, G4EDE, 29 Halfmoon Lane, Herne Hill, London SE24. Tel 01-274 2708.

Pair of duplex crossband Rangers, tx 4, rx 2, rx 4, tx 2, with ,call alarm, handset, internal mains psu, xtalled, tuned, on 2/4m, ideal for two local amateurs requiring duplex r/t link, £20 ono. G4ANW, G4AZC, 16 Chestnut Drive, Broadstairs, Kent.

Swan Cygnet 300B rx, with mic, instruction books, vswr bridge, multiband trap dipole with coax, Swan ICAF audio filter unit, all as new, no trades, going uhf, £280 ono. G5BDE, 74 Church Lane, Gorleston, Gt Yarmouth NR31 7BG.

IC22A, fitted xtal controlled toneburst, plus Bantex FG whip and magnetic mount, £130. G3DBU, QTHR.

HQ1, £35. Transformer 2,250V c/t, 0·56A, £5. G3NSU, 140 Pudsey Road, Greenthorpe, Leeds 12. Tel 630661.

RTTY comp station, sell or exchange for rx, test gear, QRP, why? Wager, 29 York Road, Loughborough, Leics. Tel Loughborough 61032.

8E Yagi, 35 yards 50Ω coaxial cable, £10.50. Buyer collects. G. Thompson, G8KLI, 49 Widney Avenue, Birmingham B29 6QE. Tel 021-472 4678.

Hallicrafters S27 rx, 27-140MHz, £12 ono. Hudson FM208 low band tx/rx, less xtals and handbook, £20 ono. Buyer collects or arranges carr. M. Barson, 31 Aldbourne Road, Burnham, Bucks SL1 7NJ. Tel Burnham 3756.

Stolle multimatic rotator, 2030/220, 5Y/2m Yagi, £30. Class D wavemeter, mod for mains supply, £8. H/B mosfet 2m converter, i.f. 2-4MHz. All in top cond. G4ESA/G8JTO, QTHR. Tel Portsmouth 28688.

FT2FB 2m tx/rx, xtals fitted S0, S20, S21, S22, S23, R5, R6, R7, 144·48, 144·60, £105. *Wanted:* 70cm transverter, MM, QM70 or similar. G3NPZ, QTHR. Tel Titchfield 43894.

Liner 2, fitted preamp and extended range, £115 plus carr. G8CGK, QTHR.

FTDX560 plus fan. YD844, mic works well, good cond, £200 inc spare pa and others. Handbook, Technical Associates speech compressor free with above or £12. Prefer buyer collect. Going FT101E. G4AKG, QTHR. Tel 01-686 1756.

FT75, comp ac and dc power packs, as new, £220. TC7 Telford tunable i.f., as new, £45. G5VH, QTHR. Tel Leicester 463197.

HM102 swr and power meter, £18 ono. Shure 444 mic, £15 ono. Mullard uhf tuner ELC1043/06, £4. Mono fm tuner, varicap tuned, £20. *Wanted:* Details for converting Cossor Companion low band fm to high band fm. G4DPZ, QTHR.

Heathkit SW717, gen cov, manual, vgc, well-constructed and stable, has performed well as tunable i.f. for 2m. GM8DKB, QTHR. Tel 031-334 1189 after 7pm.

Liner 2, preamp, accessories, £120. IC stabilizer psu, 13·8V 6A, 6/12/24V discriminator meter, £10. AR40 rotator, £32. 6-el quad, £12. Both as new. SWR50 bridge, £6. The lot £175. Mags, books, junk, filters, etc. SAE list. G8IXB, QTHR. Tel Maidenhead 26010.

FT200 with ac power supply, xtals for all 10m, ptt mic, manual, £230. Trio TR7010 2m ssb tx/rx, ptt mic, Belcom ac power supply, £170. G3WDI, QTHR. Tel 0502 63216.

QM70 2FM70 transverter, consisting of 2m to 70cm tripler and 70cm to 2m converter, brand new, never used, £47. G8BXJ, QTHR. Tel Bristol 695839.

Large 80Ω carbon resistor dummy load. Very good slow motion dial with switch to normal. Spaced tuning condenser. 100mA meter, 2½in. Valves, 50 inc some difficult. RSGB car badge. Reasonable offers or £5 lot. Postage extra. G2ANB, QTHR. Tel Hockley 3276.

Geloso 209R rx, comp, clean, handbook, but not wkg. Would exchange for HRO MX or 5T with as few mods as possible. PSU not needed. G3ZTE, QTHR.

Clearing shack. Icom IC21, as new, manual, £60. Heathkit HW17A, manual, £15. Ferrograph 4AN with ribbon, mic, manual, £10. Sinclair Project 60 filters, etc, manual, £10. Sentinel 2m converter, free to purchaser. G8DBM, QTHR. Tel 090-484 329 after 7pm.

Racal 213 ISB adaptor, professional sideband adaptor for RA117 but also usable with RA17, £25. Racal 37 If converter, lw/mw adaptor, rough cond but wkg, £20. Pair Pye Pocketphones, xtalled for 433·20MHz, £23. Link Electronics 625 line solid state tv camera, cw manual, f lens and 6ch Pye 18in monitor, Vidicone, rack focusable for extreme close focus work, £65. All ono. P.A. Bleiker, 48 Seeleys Road, Beaconsfield, Bucks.

100W modulator PPKT88 UM3, £10. Dynatron 6ft rack, £10. 3ft rack, £5. Heathkit GR64, £19 ono. Woden 750V 250mA, £4. Many trans suitable linears, sae for list. HF pi-tank, £2. Tuned lines, 2m pa enclosed, £3. G3CBU, QTHR. Tel Basingstoke 58921.

Liner 2, fitted with preamp, £125 ono. Trio JR310, fitted with 10AZ filter, vgc, £75 ono. *Wanted:* Eddystone EC10 Mk1, any cond. *Radio Amateurs Handbook,* G8KAP. Tel Raughton Head 389 anytime.

70cm solid state pa unit, 12-15V, 6·5W in 28W out, rf sensed t-r switching, £40. Storno manuals CQM611, CQM631 series, £1 each. FT221, immac cond, with original packing and accessories, six months old, £295. Pye Pocketphones 1 tx/rx, operational 433·2MHz, less nicads, £31 pair. G4EWR, QTHR. Tel 04866 4681.

Robot camera and monitor, £400. Good cond 101 vfo, £45. Heath 610 scope, £45. Liner 2, new cond, £130. *Wanted:* HW12A. 80m single bander. Mobile supply. Tel 041-778 5040.

Yaesu FRDX400, exc amateur rx, mint cond, manual, £120. Eddystone 840C gen cov, good cond, £19. Joystick and tuner, £12. HRO, many gen and bandpass coils, needs slight attention, £12. G3AIU, QTHR. Tel Hatfield 61251.

Trio TS500, exc cond, comp psu, spkr, new pair pa valves, 500kHz xtal calibrator, manual, £150 or consider exchange for 2m fm equipment. Tel 0509 67309.

Pye Westminster W15AM, all transistor, a.m./fm, tunes 144-146, transmits 144·825, 145·00, 145·5, a.m., mic, spkr, manuals W15AM, W15FM, £55. G8ARV 2m tx, 3W out, fully mod, professionally built, £10. Nuvistor 2m converter, 4-6MHz, £4. 4m converter, £3. G3VCJ, QTHR.

Yaesu FR50B, exc cond, with 160m and xtal calibrator, £65 ono. GM3FAO, 25 Doonholm Road, Alloway, Ayr.

9R59DS rx, 0·55-30MHz, good cond, with i.f. gain control and mains stabilizer, £40. Vanguard AM25B 6ch fm tx, fitted S0, S20, £35. Hartley 13A scope, dual trace, probe, etc, £20. G4EZE. Tel Newcastle 615652.

DJ6ZZ frequency counter board, tested to 70MHz. 2m converter less xtal. 600MHz ÷ 10 ic with gen. Used 170V Nixies. 7490, 7473, 74141, plus many components and valves. Offers. G3XFW, QTHR.

TH3Jr three band beam, £60. CD44 rotator, £50. Both only nine months use. Catronics digital frequency meter, seven digit, reads to 180MHz at least, £90. Maunder, 57 Lea Road, Dronfield, Sheffield S18 6SD. Tel Dronfield 412775.

Heath TS23 stereo amp, 3W rms per channel, £9.50. HW30 tx only, room for conversion to fm, £9.50. Junk box inc 6-40 plus base, 4in 1mA meter, 8in ls, £3.50. Buyers collect. G3SAO. Tel 061-652 6529.

IC22A, as new, boxed, 10ch fitted (20 xtals), ic toneburst, adjustable one minute timeout warning tone, £158. G3XFB, QTHR. Tel Brewood 850033.

FR50B rx, with calibrator, £65. Heath GR64 gen cov rx with GD125 Q-multiplier, £25. Joystick vfa with Joymatch atu, £10. Sentinel 2m converter, 2-4MHz i.f., £10. G4EDJ, QTHR. Tel 02302 2232.

Heathkit DX100U a.m./cw tx, with spare mod valves, £25. Buyer collects or pays carr. G6QI, QTHR. Tel Mullion 240546.

Brand new KW traps, pair, and SMC deluxe dipole insulator, coaxial fittings, £6.50. 250 + 250 split-stator, £2.25. R209 rx, front-end comp, 1-20MHz, £4.50. Two Collins 20W potted mod transistors, 75p each. Xtals galore, mostly 10X/FT243, 1·8-9·5MHz, 30p each. State requirements. *Wanted:* FT243 xtals 8000-8006. G3MI, 32 Germain Street, Chesham, Bucks.

KW Atlanta, ac power supply, low pass filter, Shure PT mic, rf indicator, £210 ono. Bowers, 113 Lincoln Avenue, Newcastle, Staffs ST5 3AR.

Pair 813s, £4.50. Hudson FM118 h/b fm mains tx, £10. Cossor h/b fm mains tx, £12.50. Two Pye h/b a.m. AM25B, each £10. New 4-el 4m Jaybeam, £6. Sony CVC2000B cctv cameras, three new, £65 each. Murphy h/b a.m. mains base tx/rx, £12.50. G3CON, QTHR. Tel Cheltenham 54357.

Liner 2, mobile mount, preamp, mic, etc, £100. MM 70/2MHz converter, £12. DA1 el-bug, 0-60wpm. Offers. G3YPP, QTHR.

Datong model F1 frequency agile filter, little used, £45. Eagle VV meter model K142, instruction manual, little used, £25. Tavasu aerial loading coils, 160-10, £27. BC221 with power supply, £23. Postage extra on all items. 50MHz scope Tektronix, with delayed time base, 53/5HL plug in, manual, vgc, £150 ono. G3SUU, QTHR. Tel Shipley 594317 anytime.

Liner 2, with extra coverage 144·100-144·530. RF gain control Cambridge with tx on 145 and 145·5. Offers. JR500s, £40 ono. *Wanted:* Tech TE15 gdo. AR30 rotator. G8LKF, 180 Victoria Street, Hartshill, Stoke-on-Trent, Staffs ST4 6HD.

Heath OS2, £27. Eddystone spkr, £5. HRO dial/drive, £5. Vitavox xtal fist mic, £3. Stabilized supplies, Ether 12V 5A, £10. APT 12V ½A, £6. Nicad 12V, £5. Meters—1½in round 500μA 5mA 2in square. 50μA 150mA 750mA 500mA/TC 2in round. 100μA 200μA, all £1. 2mV and 3dB, £2. 10μA Weston relay, £2. 3in round, 6mA/TC, £3. Postage extra. Swan Cygnet 270, £175. Yaesu FT2/FP2, £55. Europa, £50. Burns xtal calibrator with PSM1, new, £25. 18AVT, new, £35. Top band communicator, £20. National VTVM, £10. RCA TE149, £7. All plus carr. Bedford, 1 Radnor Court, Redhill RH1 6BZ.

IC22, with channels S0, S20, S21, S22, S23, R5, R7 fitted, as new, £120. ARAC102 10/2m rx, new cond, £80. B40 rx, £35 ono. Buyer collects. G8IRJ, QTHR. Tel Steyning 814089.

Marconi tx AD307, 2-24MHz, a.m./cw, 100W, in three cases, rx, modulator, pa, with service manual, untested. 19 set, wkg, handbook, psu. BNRS course. £40 ono the lot. Delivered. G4ESX, 3 Birch Polygon, Manchester M14 5HX. Tel 061-224 0020.

Comp aerial system tower, with internal rotating mast, heavy duty turning gear, total height 48ft, comp 2 by 10XY, 2m, 2 by 68-el 70cm trap dipole, 20.15.10, all rotatable, bargain, £100. Buyer dismantles, collects. G2HCG, Shaldon Pines, Church Brampton, Northampton. Tel 843767.

Heathkit SB101, HP23A mains psu, SB600 spkr, GH12A mic, KW lpf, all cables, connectors, handbooks, exc cond, £200 ono. Codar AT5, T28, 12 m/s mobile supply, 12 r/c mobile rcu, 160m Tavasu whip, cables and instructions, £30. G3YXZ, QTHR. Tel 01-866 7900 after 5.30pm.

Pye handset, £1.25. Parmeko transformer mains, 450-0-450V 250mA, £3. Cossor 6ch control box, £1. Xtal filter ITT 923A, 10·7MHz, £1.25. 2C39A valve, £1. One each xtals 6050, 6075, 60p each. 72·5MHz xtal HC25U (G3TDZ tx), £1.50. G8FHN, QTHR. Tel Medway 63365.

Drake SPR4 broadcast and amateur xtals, fitted. AL4 loop aerial, manual, first £220 cash takes. Alis, 7 Hillside Avenue, Wembley, London. Tel 01-902 4358 evenings.

IC22A, mint, 11ch inc all repeaters, xtal controlled toneburst, £160. G3GNR, QTHR. Tel 0409 23301.

Cossor 343 wobbulator, manual, immac, £20. Hickock USA valve tester, all data, manual, mint, £18. CD514 lightweight scope, 4in flat tube, dc 10MHz, manual, immac, £30. All carr extra. HRO spares, coils, etc, manuals 5T, 50T. SAE list. *Wanted:* KW107. G3GUU, QTHR.

Joystick vfa, 111A atu, unused, £15. Socket set in metal case, 11 Whit, 11 af, 13mm, plug socket, universal joint, 5-10in extensions, T-bar, reversible ratchet, speedbrace, £15. "Clairwood", Kings Road, Dereham, Norfolk. Tel 0362 2790.

Yaesu FL50B ssb/cw tx, with matching vfo FV50, exc mic but comp with manuals, £75. Trio JR310 rx with top band and 10AZ diode switched mechanical filter, £65. Both exc cond. Buyer collects. G4EJT, QTHR. Tel Great Missenden 4694.

Standard SRC146A handheld, 5 xtals, charger, nicads, two aerials, perf, £105 ono. M. J. White, GW8IQC, 5 Marlow Close, Rogerstone, Newport, Gwent. Tel Rhiwderin 4708 evenings.

Light duty Solenoids, 240V and 50V ac, various, £1 to £1.50. IC22, 10ch, exc order, £120. Sentinel mf converter, £10. McMurdo plugs and sockets, 4 to 25 pins, 50p to £2. 230/240V ac relays. Three sets of ch/over heavy duty contacts, ok switching ht on linears, etc, 2 types —chassis mount, £1.20. Plug-in with base, £1.35. Micro switches, 15p. Slow motion motors, 230/240V ac, small, £1.20. Counters, 1-999, 999, 230/240V ac. Impulse type, £1.50. All post paid. G8ESK, QTHR. Tel Bradford 45611.

KW2000B, ac psu, little used, mint cond, boxed, £225. G3XFB, QTHR. Tel Brewood 850033.

Save almost £100—SB104, HP1144 and SB604 untouched kits, no time to build, £530. Unused immac FT101B, £325. G3RJS, 1/101 White Hart Lane, Barnes, London SW13. Tel 01-878 5442.

STC ARAC102 2/10m rx, a.m./fm/ssb, 12V operation, comp with leads, etc, mint cond, £75. Would consider part exchange on either IC22A, TR7200G, TR2200GX, in similar cond. D. S. Marshall, Shelwyn, Nut Orchard, Twyning, Tewkesbury, Glos. Tel Tewkesbury 294082 after 6.30pm.

Liner 2, Burns preamp, vgc, with accessories. G3FZL, QTHR. Tel 01-699 6940 evenings.

FT101 Mk1, cw filter, fan, FV101, SP101, £295. FT2 auto, £130. Datong rf clipper, £32. 18AVT/WB, £30. AR22R rotator, £16. Shure 444, £11. Spacemark sstv boards, £4.50. Drake W4 rf wattmeter, £30. GW3SFC, QTHR. Tel 068-588 4880.

TS700, exc cond, selling only for funds, nearest to £260 acceptable. G8FRE, QTHR.

Shack clearance. R107 rx, 1·2-17MHz. KW Valiant and power supply. Pye 2m base station. HRO rx. Tiger a.m. tx. Heavy duty power pack, 200/400V. Meissner oscillator. Reasonable offers please. Buyer collects. G3KDL, QTHR. Tel 01-902 2570.

Hammarlund SP600JX, handbook, no cabinet, good cond, £60. Jaybeam 2 × 10-el crossed aerial, 144MHz, unused, £10 ono. G3MBN, QTHR. Tel 0225 810621.

Going mobile. TA33Jr, £45. 500W o/p linear, *RadCom* design, 3-spare PL509, front panel matches FL50/FT250, £45. Three morse records, £2. QQVO-640, £3 or swop for 4CX250B valve base. *Wanted:* FT101/FT101B for much-travelled technician. G4DXX, QTHR. Tel Carnforth 4274 after 7pm.

FT2-FB, fitted narrow i.f. filter and eight current channels, £95 ono. G8IRL, QTHR. Tel Ashtead 73065.

FT200 and FP200, all of 10m, £190. Matching transverter, 3-20 pa, slight drive problem, £25. Mains voltage stabilizer, 25A, £15. Voltage stabilizer transformer, 240/12·5V 1·5A, £3. PSU, 0-50V 20A, £10. Creed Deskfax facsimile tx/rx, £10. G8CXT, QTHR.

KW2000B ac psu, standby tx/rx, little used, mint cond, £210. GE autotransformer, 230/115V 1KVA, £7. New variac 2A, £7.50. BC221 psu, £5. Two new 230/6V 6A 2000V insulation transformers, £2 each. All plus carr. GD3TIU, QTHR. Tel 06245 442.

Belcom 2m linear with blower, as new, £150 ono. 14-el Parabeam, £8. G3TDZ tx/rx, faulty, 72·5 xtal, £6. Tamron zoom lens, 80-250mm, with uv filter, will adapt to any slr, as new, £85. *Wanted:* Creed model 54. G8IAT. Tel 0254 884719 evenings.

9·5-12GHz wavemeter, 1½in diameter micrometer head, accurate to within 5% of commercial GPO type meter, two available, £15 each. G8DPB, QTHR. Tel 01-592 8536.

"RSGB Bulletin", "RadCom", from Sept 1962 to Dec 1975, comp or by volume. Offers. Tel 0727 67387.

Parabolic dish, 3ch waveguide feed and flexible waveguide on h/b tripod, 2ft 6in diameter, £8. Or inc two good Gunn diodes, £10 the lot. Prefer buyer collects. G3MWQ, QTHR. Tel Telford 55735.

AR40 rotator, warranted for 11 months. 15m control cable. 47ft UR57 75Ω coaxial. 20ft by 2in by $\frac{1}{16}$in ali pole. 8ft by 2in by $\frac{1}{16}$in ali pole. 5ft by 1½in by ⅛in ali pole. £40 the lot. Buyer collects. Call after 5.30pm, Monday-Friday, Saturday after midday. D. Wooller, 67 Royal Sussex Crescent, Eastbourne, Sussex.

Toneburst, cmos type, 1,750Hz, adjustable o/p and frequency, zener stabilized, reverse polarity protected, on pcb 1¾ by 2in, £3. 2m mosfet preamp, 3dB noise figure, 18dB gain, all coils screened, on pcb 1¾ by 1½in, £3.50. Both new and tested. G4EBI, QTHR. Tel 01-231 0879.

RTTY Creed 75 t/p, reperforator attachment, model no 75RP RX4 MK with automatic tx, 6S/6M desk unit with control panel, 13 spare rolls of tape, one roll of paper spare, manual and wiring diagrams, good cond, little use in last few years. Offers. Buyer collects. G8KCB, 313 Wyndhurst Road, Stechford, Birmingham B33 9DL.

Solartron scope CT380, dc 13MHz, £60. Telford TC9 2m tx, £50. Cambridge AM10D highband, £15. 5-el quad for 2m, £6. G8KDC, QTHR. Tel Orpington 22443.

Pye Cambridge IM10 MCU6, toned 2m, £30 ono. G3YIS, QTHR. Tel 01-697 2136.

RAE comp ICS course, all manuals, £20 plus postage. Henderson, 53 Dumyat Drive, Falkirk, Scotland. Tel Falkirk 25559.

"RadCom", comp volumes, £1 each. Buyer collects or pays postage. *Wanted:* Odd xtals for TR2200, why? 70cm gear. All letters answered. J.K. Harvey, G8KLO, c/o G3VGG, QTHR. Tel Bromsgrove 76941.

Storno Viscount radiophone, wkg on 2m, xtalled for S20, S22, mosfet preamp, modern control equipment and mic, in appearance brand new, all cables, etc. Buyer to inspect and collect. Morecroft, 11 Deacon Avenue, Swinton, Manchester.

Pye Cambridge, S0, S20, S22, R7, plus R7 i/p rx xtal, switched a.m. or fm mods from G8GTP article, mic, handbook plus mod book, wkg, very clean cond, £35. G4ALD, QTHR. Tel Gravesend 69357 evenings.

Heathkit HW100 ssb tx/rx, ac psu, £125 ono. Heathkit Mohican rx, £20. 40W vfo controlled 144MHz fm tx with toneburst and ac psu, £25. G3LYP, QTHR. Tel High Wycombe 881298.

Labgear LSM100P mobile tx/rx, ssb/a.m., 2-15MHz, 12V dc i/p, 100W p.e.p. o/p, solid state except Q heat pa, cables, manual, £50. Mullard tx/rx, ssb/a.m., 2-20MHz, auto manual tuning with T1488 linear, 7180 atu, h/b psus, £50. Eddystone EC10, £45. G3ZDB. Tel Epsom 24814.

AR88LF, exc cond, xtal calibrator, £50 ono. *Wanted:* amateur band rx, FR50B, JR310 or similar. Pref part exchange. G8JGY, QTHR. Tel 01-946 9262.

FT401, exc cond, £250 ono. Can deliver up to 50 miles. G3YYP, QTHR. Tel 061-795 0920.

FT101B, as new, £320. Multi-mobile aerial, 10, 15, 20 and 80m. Offers. GM3WPA, QTHR.

Transverter, 28/144 40W, h/b cw psus, £45. DJ6ZZ 28/432 transverter, £6. Pocketphone tx on 433·2 with nicad, £15. *Wanted:* 70MHz converter, 28MHz i.f., prefer MM or swop. G3XOF, QTHR. Tel 0283 813782.

9R59DE Trio. Sentinel 2m converter, 2-4MHz i.f. Both immac cond. Many other goodies, prices on application. Martin. Tel 01-340 2098 after 6.30pm.

VLF rx, £8.50. Ex-USN brand new TS110/AP, covers about 2-3GHz, 20μA meter, elaborate Vernier tuning, coaxial cables, plugs, dipole aerial, £6. *Wanted:* REU 101/300C. Display unit, 1, 10, 21·4/30MHz. VHF rx. Wright, 249 Sandy Lane, Hindley, Wigan. Tel 0942 55948.

KW Atlanta tx/rx, exc, psu, external vfo, Shure mic, KW103 swr meter, cooling fan, DL6SW 2m converter, 2m transverter, manual and circuits, £200. Tel Northampton 47907.

FT101B, new April 1976, comp with G3LLL clipper and 10/15/20/80 G-whips, £370. Buyer collects or pays carr. Tel 061-761 2952.

Jaybeam 10-el Yagi, £9 ono. Silicon pnp transistors, MEO493, f_t^2 = 750MHz, BV_{ce}^2 = 12V, 10 only, 15p each. Power transistors, AUY10 (pnp), suitable 160m pa, £1 pair. Weber carburettor, type 36DCD, £12 ono. G8CHE, QTHR. Tel 01-953 2030 ext 3278.

Trio QR666 gen cov rx, xtal calibrator, £120. Pocketphones, one tx and one rx, aligned and wkg on 432·2 cw, xtals and two sets batteries, £40. 13 Ash Road, Three Bridges, Crawley, Sussex.

From the effects of a deceased amateur. KW204, Shure mic, KW101 swr meter, £200. Trio JR599 rx, as new, with spkr, £165. Joystick Joymatch, 2m ground plane, BC221 charts, psu, Avo valve tester. G4EGI. Tel Brentwood 214423. Or G3XPU. Tel Brentwood 217294.

Telford TC9 Mk2, fm/a.m., 10W, with swr meter. Telford TC7 fm/ssb/a.m. with G8AEV 2m converter and band searcher unit, £60 ono. Will split. Various Pye manuals, photocopies, Bantam, Cambridge, Vanguard, etc. G8LAE, 10 St Andrews Close, Old Windsor, Berks SL4 2QU.

Sig gen type SEI106, 5·5-55MHz, 1μV-0·1V, 75Ω attenuated, cw mod, £15 ono. Mod transformer Woden UM2, £4. Buyer collects. G3JNM, QTHR. Tel 0204 43999.

FT75, for sale or exchange Liner 2 with cash adjustment. 15 xtals, FV50B vfo, dc psu, £150. 2m converter, £5. G-whip, £20. H/B atu, £3. FM Cambridge on S20, £30. G4DSO, QTHR. Tel Pangbourne 2119.

Heathkit Mohican, £25. G3ZVC board QC1246AX, wkg, £60. TW 2m converter, 1·8-3·8MHz, £3. Jaybeam 2m 8-el, £4. G8ARV exciter and pa, £4. Pye base cabinet and panels, £3. Large tx psu, £3. 2m Halo, £1. Miscellaneous components, valves, sae details. G4CVA. Tel Mansfield 28373.

30 years of "RadCom" and "SWM", first good offer secures. Buyer collects. Mono radiogram, vgc, first good offer secures. Buyer collects. G4BC, QTHR.

WANTED

We are an ATC squadron with limited funds trying to set up a radio station. Can anyone help with spare Cambridge rx, tx, etc. F/Lt P. Hook, 38 Walgrave Close, West Heath, Congleton, Cheshire.

KW Vespa, or h/b type JR310. *For sale:* MM 5W tx. Swop for Vespa or JR310. Will pay cash adjustment. Walker, 16 Himley Road, Clayton, Manchester M11 4JF.

Reliable rx, no mods, fb cond, must cover 160-10, a.m./ssb/cw, consider anything up to £100. Have no transport so must be handy for viewing. 75Ω dummy load. G3WXT, QTHR.

Early telegraph instruments, morse keys. VK4SS, 35 Whynot Street, West End, Brisbane, Queensland 4101, Australia.

Drake or R4 series rx. GI3KYP, QTHR. Tel Belfast 658333.

Heathkit cw 400Hz xtal filter, SBA301-2. *For sale:* 2·1kHz deluxe ssb filter, SBA310-2, or exchange for above. Manual for Hammarlund HQ-170A, £3. M.S. Soo, G4DAK, QTHR. Tel 01-242 4433 ext 313.

Accommodation for recent graduate starting work at Eatonbank, Congleton, Cheshire. G8KWR, 58 Sevenfields, Highworth, Swindon, Wilts. Tel 0793 763614.
GDO for hf bands. G3SHS, QTHR. Tel Potters Bar 58058.
Newly-licensed pauper needs hf bands rx selective enough for cw work up to £30 at most. CR100 circuit or manual to get one going. J. Forsey, G4ETS, 36 Sibland Road, Thornbury, Bristol BS12 2EP. Tel Thornbury 416988.
Four 8/8 70cm slots. 75Ω Delta match. G3WKF, QTHR.
DX4OU transformer. G3POJ, QTHR. Tel Nottingham 273601.
RAIBC member awaiting G8 wants IC2F, FT2F, etc, tx/rx. Must be 100% fb cond. Price to G4EVY, c/o G8EPI, QTHR.
Accessory filters for Collins 75S-3B rx. State type numbers, price. G3DAM, PO Box 10, Evesham, Worcs.
Tx only, 160-10m, FL50B or similar, newish valve job preferred in reasonable car range to view. G4CZD, QTHR. Tel Gravesend 61252.
Two Pye a.m. Bantams, high or low band, comp. GM3ZDG, QTHR. Tel 0463 791347 after 6pm.
HF beam, 2 or 3-el, similar to TA32 or TA33. Rotator and desk controller. Heathkit HW202 2m fm rig. Willing to collect. G4EME, 3 Vampire Road, Manby, nr Louth, Lincs LN11 8TX.
Mohican or similar rx. DF loop HRO rx, any cond, Any HRO spares, coils etc, QRP rig, HW7 or similar. Paddle type key and trap vertical aerial. Can collect. G3VXS, QTHR. Tel 0782 625661.
FV101, FL2100B required urgently, advise cond and price. KW E-Zee match. For disposal/swop, TA33 40ft mast, steel telescopic 10XY 2m beam, 8-el 2m beam. G4DYY, 11 Heath Lane, West Bromwich, West Midlands. Tel 021-588 2043.

obituaries

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

Mr S. R. Boakes, G3HXN
Syd Boakes died on 14 August at the age of 60. He devoted nearly his whole life to the amateur radio fraternity, and was well known for his courteous service for many years with Heath (Gloucester) Ltd and latterly with Western Electronics (UK) Ltd. He also gave unstintingly of his time to RAIBC.

Mr F. S. Brigham, G2FXB
Stan Brigham died on 17 July aged 70. For many years he was an ardent dxer on 20m cw.

Mr I. McKenzie, GM3FGJ
Ian McKenzie died on 12 August. He obtained his licence shortly after the second world war and was one of the pioneers on vhf in the Lothians area.

Mr R. Norman, G4AVW
Robert Norman died on 9 August aged 33. His main interests were home construction and top band cw.

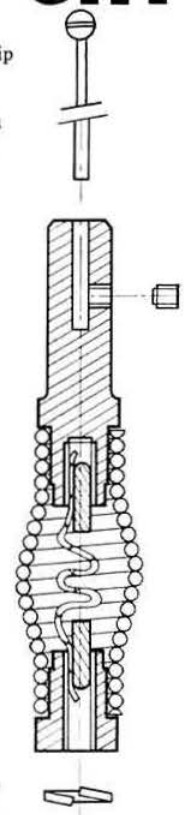
Mr F. C. Powell, BRS18461
Fred Powell, who died on 30 August aged 68, was a member of Scarborough ARS. A keen listener, he often entered contests and gained a number of certificates and awards.

this antenna's no whip-off!

A 5/8 Wave 'Stainless Steel' Mobile Whip Antenna – precision manufactured to this standard of excellence for LESS THAN £10 is good value by any stretch of imagination. Look at these features and judge for yourself.

* Non-corrosive waterproof fixing.
* Detachable for car wash and against theft.
* Nominal coverage 130–174 MHz VHF.
* Strong (tensile strength 90–100 tons per sq. in.) shock spring mounting at base, heavily braided through shock spring to maintain electrical length.
* Loading coil to match electrically at 50Ω and resonant at desired frequency.
* Only 10mm hole required for fixing.
* Supplied with blank cover, 2BA Allen Key and cutting chart (for desired frequency).

ELECTRICAL SPECIFICATION
Gain: +3dB relative to ¼ wave.
Bandwidth: 5MHz
Power Rating: 100W
Frequency Range: 130–174MHz
V.S.W.R.: Better than 1.5:1
Input Impedance: 50Ω nom.

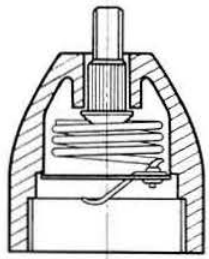


undeniable value

£8-10 +12½% VAT

A 1/4 wave model is also available priced at £3-65 + 12½% VAT. Blank cover 50p extra.

These antennae plus a multitude of other interesting equipment, components and construction kits may be found in Doram's new Edition 3 catalogue price 60p inc. p&p and Doram's construction kit brochure 25p inc. p&p or both together for a special reduced price of 70p inc. p&p.



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1μA battery drain—Why switch off?

●Self-completing dots/dashes/spaces. ● Can be used either as normal electronic keyer or as an iambic-mode squeeze keyer. ● 8-50 wpm. ● Constant 3:1 dash-dot ratio. ● 6 C-MOS ICs and 4 transistors. ● Plug-in PCB. ● Long battery life—typically 1μA drain when idling—Built-in batteryholder for 4 × 1·5V batteries (but will work over 3-10V range). ● PCB has both a reed relay (250V, 0·5A, 25W max) and a switching transistor (300V, 30mA max) —either keying method can be used ● Has the well-known fully-adjustable Samson precision keying lever assembly. ● Operate/Tune button. ● Sidetone oscillator. ● Grey case 4″ × 2″ × 6″. **£54.15**

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These two all solid state transverters for 2 metres and 70cms developed for the export market are now available to the UK amateur.

The Europa S.S. is the solid state 2 metre model.
The Europa 70 for use on 70cms.

Both give 10 watts output using the latest type of SOE transistors, rated to withstand infinite load mismatches.

Noise figure on 2 metres is 2dB, on 70cm, I.F. 28-30MHz.

Size of each is 8½" × 2½" front panel, 6" deep. The case is a very attractive "wrap round" style and the METER indicates P.A. collector current to keep a check on correct operation.

They contain a rectifier and smoothing circuit so that you can feed them with 12V AC at 2 amps peak. DC may also be fed in, of course.

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THE SSM "IAMBIC" AUTOMATIC MORSE KEYER

Uses the latest C MOS technology. It can be used with a twin paddle key for squeeze operation. Its self completing dots, dot memory, dashes and spaces are all digitally derived from a single IC timebase to ensure correct ratios.

The keyer has sidetone which can be switched OFF. 9V battery operation and reed relay keyed output.

SSM Iambic Automatic Keyer, Price: **£30.00 + VAT = £33.75.**

A beautifully engineered twin paddle key to compliment our keyer also available. Price: **£10.00 + VAT = £11.25.**

EUROPA B

Our high power transverter (2 metre or 4 metre) is more in demand than ever and remains in full production. Price: **£97.00 + VAT = £109.15.** See previous adverts for more data.

SSM Z MATCH 80-10 METRES

2KW at 50ohms—now a very popular unit. Price: **£24.89 + VAT = £28.00.**

CONVERTERS for 70cms, 2 metres, 4 metres

Sentinel 2 metres converters, IFs, 2-4MHz, 4-6MHz, 28-30MHz, Price; **£18.00 incl. VAT.**

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Sentinel 2 metre converter kit IF 28-30MHz. Price: **£11.50 incl. VAT.**

Sentinel MF. Price: **£20.00 incl. VAT.**

SM70 70cms converter IF 144-146MHz. Price: **£18.00 incl. VAT. NEW**

70cm—28-30MHz converter. Noise figure—3dB. Gain—30dB. Price: **£18.00 incl. VAT.**

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- ★ This pre-amplifier uses a selected low noise FET to provide the ultimate in sensitivity and selectivity.
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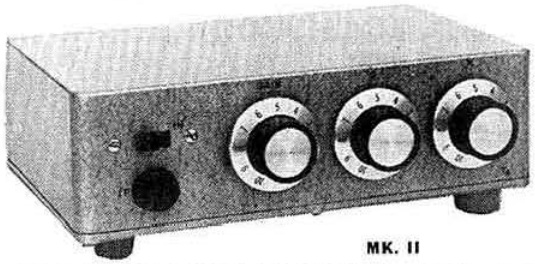
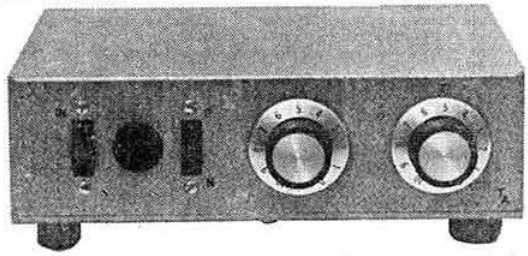


MK. II

AUDIO COMPRESSOR ★ Suitable for SSB/AM/FM ★ pure compression, no clipping! ★ 24 to 26dBs of compression, with less than 1% distortion ★ fast attack time in the order of 200 microseconds ★ variable decay time, on front panel ★ variable noise gate on front panel prevents ambient noise level tripping vox or being tx in pauses in speech ★ all functions routed to output in "off" position ★ goes between mic and tx no mods involved ★ these compressors have been tested alongside commercial rf clippers, the only difference at the receiving end was superior audio quality, **£21.00** + VAT (12½%) + 50p P. & P.

PRINTED CIRCUIT MODULE A.C.1. Assembled and tested including all pots **£11.50** + 12½% VAT.



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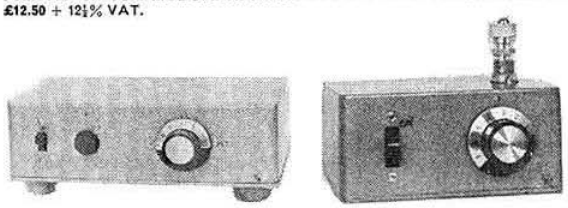
RX BAND PASS FILTER ★ 9 integrated circuits ★ 1 watt o/p stage ★ headphone socket ★ 8 switched positions of filter ★ high pass—2·5kHz-2·00Hz-1·5kHz-200Hz-110Hz-80Hz ★ Bandwidths selected for optimum readability on AM, SSB, FM, CW ★ giving the operator total control over bandwidth and QRM conditions ★ makes the poor RX superb and the superb RX better ★ runs from internal PP9 battery or any supply from 9V to 15V, **£23.00** + VAT (12½%) + 50p P. & P. *(Below, left)*

PRINTED CIRCUIT MODULE B.P.I. Assembled and tested in 8 way rotary Switch, **£12.50** + 12½% VAT.



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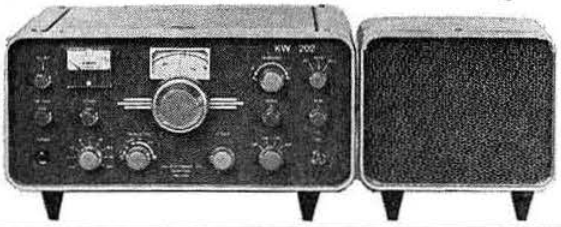

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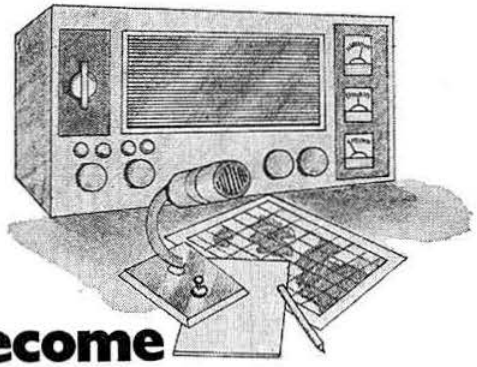

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250 w p e p OR for the SWL

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SURPLUS CRYSTALS FOR SALE
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