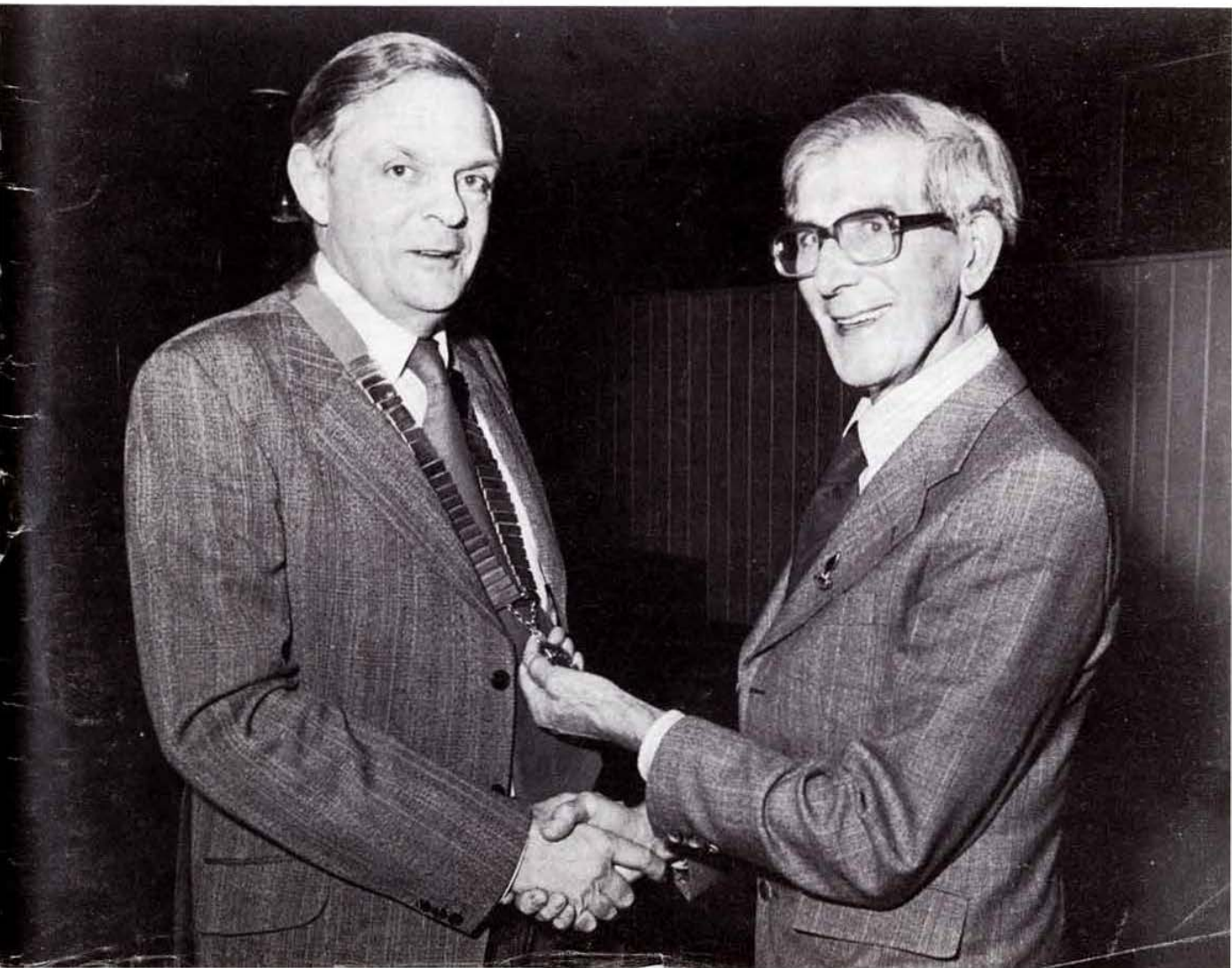
February 1979

radio communication

journal of the Radio Society of Great Britain

RSGB PRESIDENTIAL INSTALLATION 1979

John Bazley, G3HCT, being installed as 45th President *Full report on p154*



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AMATEUR RADIO BULK BUYING GROUP

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CATRONICS RTTY TERMINAL UNIT

Featuring a unique digitally controlled 'Autoprint' circuit which is a superior replacement for the 'Antispace' and 'Autostart' facilities found on some other terminal units. The terminal will ignore most CW and phone signals but will respond to a correct RTTY signal.

Tuning correctly into an RTTY signal is made simple with a single 'correctly tuned' LED plus an additional 'Mark frequency' indicator.

The FSK demodulator circuit utilises a special 'state-of-the-art' system to give excellent performance and stability at low cost.

UNITS ARE AS FOLLOWS:

CT100. Receive only RTTY Terminal Unit housed in attractively styled metal cabinet approx 9 by 7 by 2½in. with integral mains power supply. **£75.00**

CT101. Receive Unit + Hi-stability AFSK oscillator for transmission purposes. **£83.00**

CT102. Receive Unit + Teleprinter interface unit. **£84.00**

CT103. Complete terminal unit for reception and transmission with facilities for connection to Teleprinter. **£92.50**

Add £3.00 for Securicor delivery.

G3PLX RTTY VIDEO DISPLAY

(April 1977 Rad Com)

Kit (excluding modulator, keyboard and P.S.U.), **£83.55**

Set of printed circuit boards **£15.20.** Set of i.c.s. including programmed 74188s, **£65.15;** 2513, **£8.50;** AY5-1013, **£6.25;** 2102-1, **£2.85;** SN74188, **£3.40** each or ready programmed **£8.20** per pair. 7MHz Xtal, **£3.50.**

UHF Modulator kit **£11.95.**

Flashing cursor kit **£8.60.**

Diode Matrix kit **£13.25.**

Suitable mains P.S.U. Transformer £2.75.

Catronics UHF Modulator, £15.00.

NOTE regarding PROM program: The PCBs and programmed PROMs supplied by us make use of a slightly different program sequence resulting in different pin connections to those published in the 'Rad Com' article. Whilst constructors buying PROMs and PCBs from us will have no difficulty, those producing their own PCBs or having PROMs programmed elsewhere should note this important difference. A detailed modification sheet is available with the PCBs.

NEW KEYBOARD KIT

The printed circuit board is designed to take a maximum of 70 keys but may be assembled with a smaller number of keys for a simpler keyboard.

The board is not dedicated to any specific coding, allowing it to be used for any project whether it requires ASC11, Baudot or any other code. This makes it suitable for many projects including;

G3PLX RTTY VDU
Auto morse sender, etc.

The Keyswitches themselves are single pole push-to-make type and require no extra mechanical mounting arrangements.

A legend sheet is provided with each kit enabling the constructor to label the keys to suit individual requirements.

Price: only £29.00. Please add 50p for postage.

THE PLESSEY 'RADIO COMMUNICATIONS HANDBOOK'

A superb reference book on the use of Plessey i.c.s. for transmitters, receivers, High Speed Dividers and Frequency Synthesisers, includes an improved G3ZVC type T/R module using 1600 series i.c.s. **£2.20.**

NEW PLASTIC IC's from PLESSEY

New low cost version of the famous SL600 series communication ic's are now available. The plastic versions, designated SL1600 series, are in DIL8 or DIL14 packaging according to type.

	Metal		Plastic	
R.F. Amplifier	SL610C	**£2.65**	SL1610	**£1.82**
R.F. Amplifier	SL611C	**£2.65**	SL1611	**£1.82**
R.F. Amplifier	SL612C	**£2.65**	SL1612	**£1.82**
Limiting Amp.	SL613C	**£4.55**	SL1613	**£2.13**
VOGAD	SL620C	**£4.00**	—	—
AGC Generator	SL621C	**£4.00**	SL1621	**£2.45**
AF/VOGAD/Sidetone	SL622C	**£9.85**	—	—
AM/AGC/SSB	SL623C	**£7.30**	SL1623	**£2.75**
Multimode Det.	SL624C	**£3.70**	—	—
AF/VOGAD	—	—	SL1626	**£2.75**
A.F. Amplifier	SL630C	**£2.55**	SL1630	**£1.82**
Double Bal. Mod.	SL640C	**£4.45**	SL1640	**£2.13**
Receive Mixer	SL641C	**£4.45**	SL1641	**£2.13**

LOW PRICE FOR 40 WATT P.A. KIT— NOW WITH FULL GUARANTEE ON TRANSISTOR

Our 40W PA kit for FM/CW now comes complete with an attractive metal case and at the reduced price of **£19.50 inc. VAT, full guarantee on the transistor, EVEN IF IT HAS BEEN SOLDERED,** PA Transistors 2N6084 are available separately at the very competitive price of **£10.79** + 86p VAT = **£11.65.** You are wasting money if you buy these elsewhere because:

* Our prices are lower
* Our Kit transistors are fully guaranteed
* We know our products because we build, test and use them.

Add 65p post for kit.

JAYBEAM VHF AERIALS

We generally have the full range of "Jaybeam" aerials in stock as follows:

FOR 4m. Band:			**FOR 70 cms. Band:**		
4 ele.Yagi		£14.60	C8/70	8dB Colinear	£44.40
FOR 2m. Band:			D8/70	8 over 8 slot	£17.40
C5/2M.	5dB Colinear	£34.85	PBM18/70	18 ele. parabeam	£21.00
5Y/2	5 ele. Yagi	£8.65	MBM48	48 ele. multibeam	£24.50
8Y/2	8 ele. Yagi	£11.25	MBM88	88 ele. multibeam	£32.60
10Y/2	10 ele. Yagi	£24.15	12XY/70	12 ele. cross Yagi	£33.50
PBM10/2	10 ele. para-beam	£29.25	**FOR 23 cms. Band:**		
PBM14/2	14 ele. para-beam	£35.55	D15/1296	15 over 15	£26.30
5XY/2	5 ele cross Yagi	£18.00	**PHASING HARNESSES:**		
8XY/2	8 ele. cross Yagi	£22.50	PMH/2C	2m. cicular	£5.85
10XY/2	10 ele. cross Yagi	£29.80	PMH2/2M	2m. stacking	£7.70
Q4/2	4 ele. Quad	£18.65	PMH2/70	70cm. stacking	£6.60
Q6/2	6 ele. Quad	£24.75	**MASTS and ROTATORS, etc.:**		
D5/2	5 over 5 slot	£15.50	SPM	16' Portable mast	£11.20
D8/2	8 over 8 slot	£20.70	PME	4' extension	£1.90
UGP/2	Unipole	£7.95	SVMK	Vertical mount	£5.60
HO/2	Mobile "Halo"	£3.60	9502	Rotator	£50.60
HM/2	Halo & Mast	£4.35	5 way cable		yd. 22p
TAS	¼ wave whip	£14.05			

Add CARRIAGE as follows: Harnesses, Halos and UGP, 85p. Rotators and all other aerials: To: UK Mainland only, £2.50, Isle of Wight, £2.50, N. Ireland, £6.50.

All prices include VAT but please add minimum of 30p for p&p. Data—Catalogue available at 45p + large (A4) 18½p SAE
DEPT. 902, COMMUNICATIONS HOUSE, 20 WALLINGTON SQUARE, WALLINGTON, SURREY SM6 8RG
Tel: 01-669 6700 Open 9am to 5.30pm Mon to Fri, 9am to 1pm Sat. Closed for lunch 12.45 to 1.45pm

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Communications Ltd

PROFESSIONAL EXPERIENCE

YAESU

NAG 144XL

The NAG 144XL-2200 is the finest 2m Linear Amplifier of its type we have yet seen. Identical in size to the FT225, it produces about 250W RMS of clean stable out from a grounded grid 4CX 350F for a nominal 10W drive. The inbuilt PSU provides a 12V 3 amp fully protected and stabilised for 12V only exciters.

A switchable, 10db gain, low noise amplifier, coax change over relay, RF sensing and manual control, inbuilt SWR bridge, time delay on switch on, thermal cutout ALC output socket, are a few of the star features.

NAG 144XL (inc Sec Delv (But + VAT 12½%)) **£428.**

HI MOUND KEYS

HI MOUND Hand, Auto Mechanical, squeeze and paddle morse keys. This month post free worldwide. But + VAT 12½%.

HK707	Straight hand key	6", 3", 2"	£8.75
HK704	Straight hand key	6", 3", 2¼"	£11.85
HK710	Straight hand key marble plinth	6¼", 4", 4"	£20.85
HK808	Straight hand key marble plinth	6¼", 4", 2½"	£32.90
BK100	Semi automatic "Mechanical bug"	9½", 3¼", 2½"	£15.55
MK701	Small Paddle	6", 3¼", 2½"	£17.50
MK703	Small paddle marble plinth	5¾", 3", 1¼"	POA
MK704	Squeeze paddle	3¼", 2½", 1¼"	POA
MK706	Squeeze paddle dust cover	6", 2¾", 2¼"	POA

KLM PA15-160BL

The KLM range of solid state, no tune broadband, VHF & UHF linear amplifiers, are justifiably famous. It has recently been improved by adding an extra 30% cooling area (whilst maintaining the same low 2¼" profile), providing circuit breaker and reverse polarity protection, offering the choice of RF sensing or remote hard switching; proffering adjustable hang time for SSB operation and adding automatic over temperature cut out with warning leds.

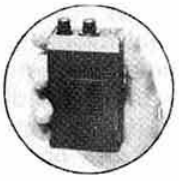
PA15 160BL. 2M 15W max drive. 160W output **£178.50** (+ VAT 12.5%).

SMC T3-170L

The SMC T3-170L is an indispensable aid to any station. The instrument is a twin (2"x1", 200μA) meter, standing wave/relative power meter capable of operating between 3·5 and 170MHz. The unit offers constant monitoring of both transmitter and antenna performance over a wide range of powers, with minimal insertion loss. The forward and reverse powers (including the VSWR) are displayed simultaneously for an instant warning of system failure. The unit is neat and compact, fitted with SO239 sockets, rubber feet, etc, it forms the perfect adjunct to any shack HF or low VHF.

T3-170L (inc P&P, worldwide but 8% VAT) **£11.25.**

SMC HF12



12 channel, FM, monitor receiver ideal for professional, SWL, repeater check, raynet, net and even the XYL. Tiny 2½" x 1½" x 4½" and light 8oz, yet sensitive, double superhet with 12kHz IF bandwidth. Any 4MHz segment between 130 and 170MHz may be covered.

c/w Mains charger earpiece, wire antenna, case, etc, etc.
All prices exclude VAT 12½%. But post free worldwide.

HF12 No xtals c/w Accessories. **£49.95**
HF12A12 Amateur Band 145MHz fitted; S(20,21,22,23,) R(0,1,2,3,4,5,6,7) **£69.95**
HF12M9 Marine Band. 156MHz fitted; 16,6,8,10,67,00,M,12,14. **£66.67**

TTE CX500

We are delighted to announce the addition of the CX500 high isolation range to our existing selection of quality coaxial relays. Over the last few years, models such as the CX120 and CX600 have established a reputation for reliability and an ability to out-perform their quoted specifications.

The range is wide, cable entry, or various coax connectors, in a large number of permutations. The body of the larger units is silver plated, the spring material is best beryllium copper, the contact material is pure silver (Ag 70%, Cu 20%, W 10%) with a 3μ gold cladding.

12V, 50Ω. 30MHz 1kW PEP 50dB iso at 15Hz 0·2dB loss at ·5GHz. Prices exclude UK VAT 8% but for this month post free worldwide. CX540D; 3BNC, CX530D; 2BNC + IN, CX520D; 3N. All **£18.50** each.

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CDE, OF THE USA, CLAIM TO SELL MORE ROTORS IN JAPAN THAN ANY OTHER MANUFACTURER

and with such a range who could be surprised?

AR20-AR22

AR20, **£34.50** + VAT post paid
AR22, **£43.50** + VAT post paid

AR33

5 preset plus manual control.
£59.00 + VAT post paid

AR30-AR40

AR30, **£41.00** + VAT post paid
AR40, **£47.50** + VAT post paid

BT1

4 preset plus manual control.
£79.50 + VAT. Securicor Del.

CD44-HAM III

CD44, **£95.00** + VAT. Sec. Del.
HAM III, **£139.00** + VAT. Sec. Del.

T2X

ULTRA HEAVY DUTY ROTOR
£215.00 + VAT. Securicor Del.

SMC is the UK distributor for CDE (10 models), Stolle (4 models), and Hy Gain (new digital controller). We also stock Ken, Channel Master, Jaybeam and Lunar products. With thousands of rotors in stock, and spares back up to match, you can be sure of getting a rotator that suits your needs and the service you deserve.

NEED A MAST? TALK TO THE PROFESSIONALS
SMC have been making masts for the Commercial Market for 21 years. We offer the widest range of masts and towers available in the UK. The brand names of Alimasts, Hamtowers, Teletowers, Telomasts and Versatowers are justifiably famous. We stock them all.

NEW!

10' SECTION 30' VERSATOWER

SMC and Strumech have combined to produce a telescopic and luffing tower of low section length capable of supporting an HF beam or several VHF Ants. The head unit accepts 2" tube and provides for a rotator. Easy single winch operation.

P30 Post mount **£229.00** + VAT 8%
BP30 Base Plate **£254.00** + CAR.

Write for full details.

20' SECTION 25-100' VERSATOWERS

Prices exclude VAT (8%) and Delivery (£15 upwards) 50 + Models, representative selection below:

POST TYPE Standard		POST TYPE Heavy Duty	
P25	£172.50	P40	£357.50
P40	£238.50	P60	£405.50
P60	£289.50		
WALL MOUNT Standard		**FIXED BASE Standard**	
W25	£138.00	FP40	£192.50
W40	£204.00	**BASE PLATE Standard**	
W60	£255.00	BP40	£269.50

STOP PRESS! – THE TIME TO ORDER
Versatower prices will be increased around 11% on 14th February. We will honour the old price for all orders taken before that date.

SOUTH MIDLANDS COMMUNICATIONS LIMITED

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BARCLAYCARD VISA

LOWE ELECTRONICS Ltd

TR3200

PEAK PORTABLE PERFORMANCE

70cm FM repeaters are now so numerous and so efficient that it's almost possible to go anywhere in the country and still be within range of one. As many operators are finding, you don't need high power to be successful, and the TR3200 70cm portable/mobile rig provides the perfect solution to the search for a go anywhere rig.

The TR3200 power output is two watts or more, switchable to 400mW, is has a really good receiver, a high gain ¼ whip antenna and top performance under all conditions. Use it portable on the internal battery pack or mobile using an external antenna and power from the car. Supplied with three channels fitted, carrying case, shoulder strap and all accessories, the TR3200 is the complete 70cm FM answer.

Drop us a line and ask for full details, or better still, come along and see the TR3200 and all the Trio range in comfort.

TRIO

TS120V

MULTUM IN PARVO

We introduce yet another exciting innovation from Trio in the new TS120V HF transceiver. Equally at home in mobile or home station situations, the TS120V packs more features into a small package than any other comparable model.

Measuring only 9½" × 3¾" × 9¼" – which is about the size of a packet of cornflakes, the TS120V can best be described as a miniature TS820. The rig covers all bands 80-10 metres – and all of 10 metres 28-30 MHz so it's ideal for transverter driving, has digital readout built in, vox, break-in CW, RIT, noise blanker and the unique Trio passband tuning system used in the 820. The power output is 10W and a matching linear will be along shortly.

The TS120V is clearly a winner for mobile operation but is equally attractive at home and is perfect for the VHF/UHF enthusiast who requires a high performance I.F. system for his transverters.

The transceiver is based on an advanced PLL system and the digital readout gives you the *correct* operating frequency at all times unlike many other rigs. Remember my previous comments about Trio attention to detail!

For ease of operation, the TS120V is unsurpassed; simply select the band required, tune the VFO to the frequency you want and there you are: no preselector or PA tuning to worry about, and a distinct safety feature for the mobile operator.

We at Matlock, have all fallen in love with the TS120V and we feel sure that you will too. At it's price of **£435** including V.A.T. (and including digital readout, vox, etc) we have no doubt that this transceiver will be another winner from Trio. See it soon.

TR7500 Brief Specification

Frequency range:	144-146 MHz
Channel spacing:	25kHz (other spacings available)
Repeater shift:	+ or – 600kHz (1·6MHz available)
Power output:	Nominally 15-18W
RX sensitivity:	12dB SINAD for 0·2μV or less
Tone burst:	1750Hz tuning fork. Automatic in repeater mode
Price:	**£235 inc. VAT.**

TR7500

WHY SETTLE FOR ANYTHING LESS?

The TR7500 is still the commonsense 2 metre FM mobile rig, employing as it does the straightforward channel number display which reads 20 for S20, 7 for R7 and so on, with no six digit frequencies to remember and straightforward fast access to any channel within the two metre band 144-146MHz. A scanner unit is now available from M.R.S. Communications Ltd (see address section) to further expand the TR7500 facilities.

The sharp eyes will notice that the mode switch is now different on the TR7500, having four, not three positions (marked 4, 5, N, R) and we are finding that the current equipment seems to have higher transmitter power and an improved receiver performance. Inevitably, people are calling this the TR7500B but it's really a case of a production improvement. So B it!

Why not call at your nearest authorised Trio dealer before you consider buying a 2 metre FM mobile and ask to see the TR7500(B)? Take the lid off and see what good engineering design looks like in the unbeatable TR7500 from Trio.

FOR FULL CATALOGUE SIMPLY SEND 40p IN STAMPS TO MATLOCK

LOWE ELECTRONICS Ltd

AR240

FULL COVERAGE 144–148MHz

CHANNEL SPACING 5kHz

FULLY SYNTHESIZED

+600 and −600kHz SHIFTS

1750Hz TONEBURST

1½ WATT OUTPUT

SURELY THE MOST AMAZING HAND-HELD TRANSCEIVER YET!

N E W

The AR240 is a truly staggering rig. In a small hand-held unit, you have a fully synthesised 2 metre FM transceiver covering 144–148MHz in 5kHz steps. Frequency selection is by direct reading top mounted decade switches giving instant access to any frequency in the tuning range. Power output is over 1W and the receiver sensitivity is not only excellent, it's maintained across the full tuning range by automatic voltage controlled tracking. Both up and down 600kHz repeater shifts are built in as is a 1750Hz tone burst.

What more could you ask for in a hand held, except possibly a price of **£195** including VAT?

LS707

We happily present the only 70cm multi-mode transceiver available today. The LS707 is a high quality, high performance unit which covers 430–440 MHz in ten 1 MHz bands with full VFO control. All the desirable features are included; Vox; break in CW; calibrator; noise blanker; RIT; etc. together with true all mode FM, AM, USB, LSB and CW operation.

The LS707 is built using plug-in modules, and the quality of construction is of the best. Transmitter output is nominally ten watts and the receiver is GOOD. Fixed channel operation is available and the overall impression of the LS707 is that it will satisfy the most demanding user.

Introductory price LS707 £595 inc. VAT

Matching PSU. £79.50 inc. VAT (we do have a cheaper PSU available).

HC1400 £225 inc. VAT

The HC1400 is a new powerful (30 watts) 2 metre FM transceiver for mobile/fixed station use, with a most comprehensive array of features. Using a TMS 1100 microcomputer to control all functions gives complete and easy operation of a complex transceiver.

Features include coverage from 144–148MHz in 5kHz steps; digital frequency readout of transmit and receive channels; selectable channel steps using either the all-electronic channel control or the optional remote control microphone; high power TX (30 watts plus); three memories for storing any frequencies within the tuning range for instant recall and also for programming repeater shifts of up to 4MHz wide.

Normal repeater and reverse repeater shifts are provided together with a fully automatic tone burst. It's too much to talk about in a short advertisement so why not call us and ask any questions. It's top quality, certainly; top value undoubtedly, at **£255** inc. VAT.

Remote frequency readout and remote control microphone available as options.

Goodness gracious, I seem to be taking some bashing when some amateurs talk about 12½kHz channelling, and I seem to be considered as the man who started it all. If only the people who scrutinised my scribblings in Rad Com looking for things to sneer at would spend the same effort in reading the magazine itself, they would see that adoption of 12½kHz channel spacing was an I.A.R.U. region 1 recommendation and this has been backed by the R.S.G.B. as being the way forward to providing more FM channels – nowt to do wi' me, I only pointed out that the Trio synthesised transceivers fit in very nicely with this system.

Now – as to my own point of view.

As G3PCY, a licensed radio amateur, I think that adoption of 12½kHz spacing is a retrograde step, involving as it does reduction of I.F. filter bandwidth in the amateur receiver, throwing away any advantage that FM as a mode might have over other modes, and demanding much greater frequency stability than many amateur transceivers possess. Ponder the thought that with deviation lowered to suit 12½kHz spacing, even AM would be better for communication, particularly in weak signal areas and we go on ignoring the most effective methods of amateur communication, namely SSB and CW!

That's my personal view, but it does not alter the fact that in the larger cities there are often times when there are no vacant simplex channels on which to have a contact. Under these circumstances, the IARU/RSGB approach makes good sense!

HEAD OFFICE AND SERVICE CENTRE

119 CAVENDISH ROAD, MATLOCK, DERBYS. TEL: 0629-2817 or 2430. TELEX 377482. OPEN 9–5.30 TUES–SAT. PHONE IN 9am-9pm.

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

FOR FULL LIST OF AUTHORISED DEALERS AND AGENTS SEE NEXT PAGE

WATERS & STANTON ELECTRONICS

FDK PALM II

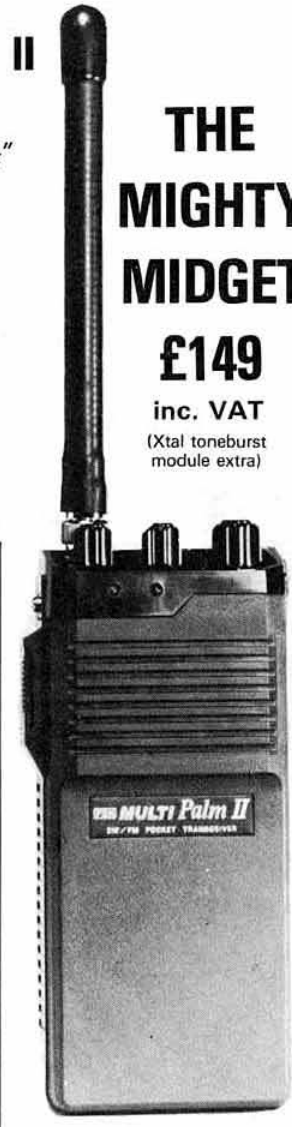
2M FM

SIZE: 6" × 2½" × 1¾"

WEIGHT: 1lb 3oz

COMPARE ITS VALUE
COMPARE ITS FEATURES

- ★ Smallest hand-held available
- ★ Over one watt output
- ★ AC charger included
- ★ 6 channel capability
- ★ Simplex or ± 600kHz switch
- ★ BNC aerial socket
- ★ Flexible whip supplied
- ★ S0/20/22 supplied
- ★ Extra channels cost £2.50!
- ★ Xtal controlled tone-burst
- ★ Ni-cad battery pack supplied
- ★ High quality condenser microphone



THE MIGHTY MIDGET

£149

inc. VAT

(Xtal toneburst module extra)

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FDK THE MOST ADVANCED FM RIG!

MULTI 800D-25 WATTS

now includes remote frequency control microphone at no extra charge!

£289 inc. VAT (Remote display £19.95)

Send SAE for brochure

FDK 70 cm FM!

MULTI U-11 OF COURSE

IN STOCK NOW

Now's the chance to join the fun on 70cms. With the ever-growing number of 70cms repeaters coming on the air, it makes sense to consider 70cms as the ideal mobile band. Good strong signals (aided of course by the U-11 hot front end and 12 watts output) no QRM and a lot of new friends to meet. The U-11 has lead the way from the start and is now regarded as THE rig for 70cms. We can supply the U-11 fitted with all of the following channels:
RB0, RB2, RB4, RB6, RB10, RB14, SU8, SU16, SU18, SU20 at **£5.90 per channel.**

£299 inc. VAT (fitted 10 channels)

WATERS & STANTON ELECTRONICS

TM56B AMATEUR/MARINE VHF MONITOR RECEIVER

230V AV
12V DC
10 channels fitted
12 channels + 4 autoscans

A PLEASURE TO OWN
Tune into the exciting world of amateur radio with this advanced monitor receiver. Listen to your local amateur radio stations both fixed and mobile, direct or through your local repeaters. From the comfort of your fireside chair, using the built-in 230 volt. AC power supply, this receiver will open up the whole new world of VHF Amateur Radio for you. Alternatively the necessary hardware supplied enables you to power the TM56B from your car radio battery for true mobile operation.

GREAT VALUE
Little wonder that the first two shipments of these beautifully engineered receivers were sold out within weeks of the advertisements appearing. We really are amazed at their superb performance at such a low price.

SOUND DESIGN
The design is well and truly tried and tested, and the circuitry is almost identical to the receiver section of the FDK mobile transceivers. Both sensitivity and selectivity leave nothing to be desired and the auto-scan enables the popular calling channels to be continually monitored for activity.

NO HIDDEN EXTRAS
The receiver is supplied complete with all leads, circuit diagram, crystals for channels S0, 20, 21, 22, 23, R3, 4, 5, 6, and 7 plus space for a further 6 channels, making 16 in all. An additional matching desk top aerial is also available at £2.50 extra.

£104 including delivery and VAT. (Marine £113)

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All modes are provided AM FM SSB and CW. For SSB operation VOX is included and for CW, fast break-in is provided with completely adjustable side tone. The 2700 can be used at home with its internal 230v AC PSU or taken out to the local high spot and run from 12v DC. This really has to be the QSO machine that you will never tire of.

BEAUTIFUL TO OPERATE—BEAUTIFUL TO HEAR
The transmitted audio quality of the 2700 is second to none. Its crisp, clear, quality effects the manufacturer's knowledge that a clean signal sells more products! The Optimised 16·9MHz 8-pole crystal filter gives clean SSB signals and good selectivity. On FM, direct modulation of the VCO gives smooth but penetrating audio. Typical power output is 16 watts but the flip of a switch and you have 1 watt on all modes. (An internal adjustment permits the power to be adjusted from approx 1 watt to 6 watts for driving linears or transverters.) The Multi-2700 has a built-in receiver RF pre-amp—no problems here with a deaf receiver.

DUAL VFO CONTROL
Until you have handled the Multi-2700 you cannot appreciate the advantages of dual vfo control. the conventional analogue VFO with its dual speed silky smooth feel, permits accurate tuning on all modes with 1kHz readout. It also covers a complete 1MHz segment at a time resulting in minimum band switching. The flip of a switch and you have full synthesized control of your transceiver. The bright LED display allows the transceiver to be immediately set to any 2 metre channel. A VXO control ensures the synthesizer can be used equally well on SSB, CW or FM. The versatility of dual vfo control is quite amazing. For example: use the analogue vfo at the SSB end of the band and the synthesizer on the FM channels; set the synthesizer to the "sked" frequency and continue normal operation of the analogue VFO; set analogue VFO to DX frequency whilst continuing normal tuning of the adjacent frequencies on the analogue VFO—the combinations are endless. repeater shifts are completely taken care of. The Multi-2700 has +/−600kHz shifts and 1·6MHz for 70cms operation.

ITS VERSATILITY IS ENDLESS
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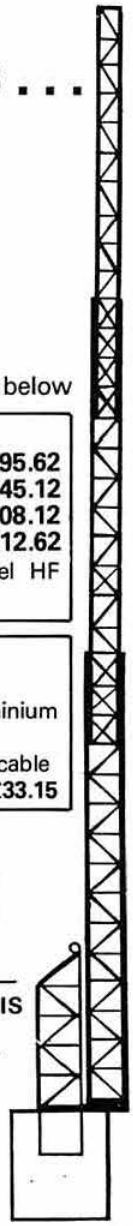

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FROM NORTH. Leave M6 at Junction 6 (Spaghetti) and follow left fork down to traffic island beneath motorway complex. Take third turning off to Lichfield. One mile further on follow A4040 to the right and within 100 yds. veer again to the right, approximately one mile further on brings you to the Fox & Goose. Turn right and see preceding directions.

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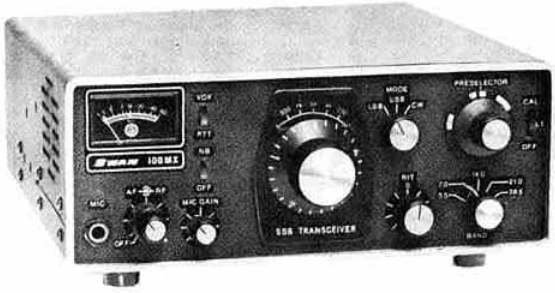

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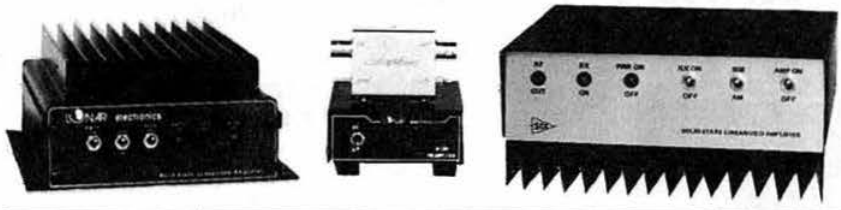

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PATRON: HRH The Prince Philip, Duke of Edinburgh, KG

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Region 18 Cleveland, Durham, Northumberland, Tyne & Wear.
Region 19 Greater London north of River Thames, Hertfordshire.
Region 20 Avon, Gloucester, Somerset.

QTC
amateur radio news

RAE, May 1979

This examination will take place on Monday 14 May 1979, and will be the first of the new multiple-choice type of RAE. Examination centres organized by the RSGB will be located in London and Derby. Application forms to take the RAE at these centres are obtainable from, and must be returned to: Local Exam Secretary (RAE 765), RSGB, 35 Doughty Street, London WC1N 2AE.

The closing date for registration of completed application forms is Monday 26 February 1979. The fee, to be sent with the completed form, is £10.

Callsigns

In accordance with the Radio Regulations the following callsign series have been allocated provisionally by the ITU: T2A–T2Z, Tuvalu; Y2A–Y9Z, German Democratic Republic.

"Circuit design with NAND and NOR"

The author regrets he made a mistake in the early part of this article (*Radio Communication* Dec 1978) when giving an example of simplifying the algebra. The expression to be realized should read

$$A.B.(C+\overline{D})+A.E+E.\overline{A}.$$

This simplifies to

$$A.B.(C+\overline{D})+E$$

because $A+\overline{A}=1$, and not as stated. The rest of the argument stands.

In the summary, section 8, there should also be a "." at the head of the column above NOR.

Pull the chain on this letter

Several members have received copies of a chain letter originating in Tennessee, USA, via radio amateurs in Australia. The letter claims to be reserved for radio amateurs only, and offers a substantial cash reward to those who pay a fee and copy the letter to other radio amateurs so that the chain is not broken.

Only the gullible will fall for this "get rich quick" scheme, but members who have not yet met this type of operation are reminded of an old axiom—"A fool and his money are soon parted". They are recommended to break the chain and destroy the letter—having first removed the overseas stamp for the benefit of some keen stamp collector or other worthy cause.

Stolen equipment

On 31 December a Trio TS700G, serial 312561, was stolen from a car parked at the Brant Inn, Groby, Leicester. Above and to the left of the vfo dial is a red led which comes on with the toneburst. Information to G8NMR, QTHR, or the Leicester police.

In February/March 1978, a KW204, serial T389, was lost or stolen while in transit via British Rail between Kent and Cheshire. The owner is G4GHB, QTHR, and he would be grateful for any information regarding its whereabouts.

Yeovil ARC anniversary events

On 21 February 1954, G3CMH (Yeovil ARC) made what is believed to be the first long-distance short-wave contact in Britain using a transistor transmitter. (See *World at their Fingertips*, p254, and *RSGB Bulletin* April 1957, p46.)

To commemorate this contact, the Yeovil ARC will hold the following three events at their headquarters, Hut 101, Houndstone Camp, Yeovil, Somerset:

(1) 21 February 1979, 1340gmt. An attempt to re-create the event exactly 25 years from the time it took place.

(2) 22 February 1979, 2030gmt. A detailed lecture by G3MYM describing the technical and historic aspects of the 1954 event.

(3) 25 February 1979. An afternoon special event station, G3CMH, using an equivalent 30mW cw transistor transmitter on the 3·5MHz band. Special commemorative QSL cards will be issued.

Further details from G3MYM, QTHR.

Sutton & Cheam RS annual dinner dance

The 31st annual dinner and dance of the Sutton & Cheam Radio Society will take place at the Woodstock Hotel, Stonecot Hill, Sutton, Surrey, on Saturday 24 March 1979. The guest of honour will be the President of the RSGB, Mr J. Bazley, G3HCT.

Tickets are available on application to G. W. Brind, G4CMU, 26 Grange Meadow, Banstead, Surrey SM7 3RD.

Correspondent wanted

A technical engineer of Rank-Xerox, France, would like to correspond and have schedules with an amateur employed by Rank-Xerox UK. He is J. P. Carron, F6BPC, Rue du Clos Halleux, St Aubin Celloville 76520, France.

REGION 4 REPRESENTATIVE

Valid nominations for this appointment have been received in respect of:

N. J. H. Grassby, BSc, C4CPY. Nominated by J. D. Garner, G3ZJG; C. D. Craythorne, G3PBC; R. Newstead, G3CWI; J. L. Lewis, G3MYI; J. W. Smith, G3ZJS.

R. L. Senter, G4BFY. Nominated by A. E. Trigg, BRS38862; A. Wilson, G3JHS; P. C. Swann, G3WWX; I. Lumb, BRS34230; K. Draycott, G3UQT.

M. Shardlow, G3SZJ. Nominated by P. Cook, G4FFH; J. Shardlow, G4EYM; C. Doughty, BRS34012; R. H. Webster, BRS30300; K. Griffin, G4HDP.

Corporate members residing in Region 4 (Derbyshire, all that part of Humberside south of River Humber, Leicestershire, Lincolnshire, Nottinghamshire) 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 15 March 1979.

I,.....

being a fully paid-up corporate member of the RSGB resident in Region 4, wish to record my vote in favour of

Mr.....

as representative for Region 4

Signed.....

Callsign or BRS number.....

Address.....

Newcastle Personal Computer Society

The above society has recently been formed to promote personal computing in the Newcastle area. The secretary is Dr W. G. Allen, Dept of Electrical Engineering & Physical Electronics, Newcastle upon Tyne Polytechnic, Ellison Place, Newcastle upon Tyne NE1 8ST.

Meetings are held on the first Tuesday in each month, and usually comprise a lecture, informal discussions and the demonstration of a particular microprocessor system. Several members of this new society are also RSGB members.

"Sounds Vintage"

A new magazine, *Sounds Vintage*, has been launched exclusively for "vintage" enthusiasts. It is being published bi-monthly, and will cater for those interested in a wide field of subjects relating to sounds of yesterday.

Among the areas covered are vintage wireless equipment, gramophones and cylinder machines, records and cylinders, vintage amplifiers, and pre-war literature. There will also be stories of the pioneers and of companies involved in the manufacture of the hardware and software since the early days.

The first issue was published on 15 January and consisted of a 32-page A4 presentation. An illustrated brochure/subscription form is available on request with an sae. A sample copy of issue No 1 is also available for 65p. The annual subscription is £5.80.

All enquiries concerning *Sounds Vintage* should be made to 28 Chestwood Close, Billericay, Essex.

Amateur radio tv programme

It is planned that a 30min programme will be shown on BBC2 on Thursday 22 February at approximately 11pm. For further news please check the GB2RS news bulletins.

Amateur radio in American summer camps

by RICHARD MUNN

Do you want to pass on your knowledge and skills to active, enthusiastic American children? Have you ever wanted to see more of the world than your transceiver? Then Bunacamp 79 could be for you. The British Universities North America Club (BUNAC) has openings for amateur radio counsellors to work during the summer of 1979.

Summer camps are part of American culture; during the summer vacation, thousands of children pack their bags and spend eight to nine weeks in beautiful parts of the countryside participating in activities arranged by the camp staff. Virtually all camps are situated by a lake, and are surrounded by thousands of acres of thick forest land. The children, aged 6 to 16, and counsellors live together in wooden cabins, so it is easy to realize that one must have a liking for children and all the peculiarities that go with them! The activities are mainly outdoors and include all major sports and camping, and in some camps excellent facilities exist for indoor programmes such as music, drama, art and crafts and amateur radio. Last year 1,300 people took part in the scheme, and this year the number is expected to be greater.

Ian Abel, G3ZHI, who has operated the amateur radio programme in Camp Greylock, Massachusetts, has spent two summers in America, and is enthusiastic about returning this year. "From my own experience, the job itself is great," he says; although he would be the first to agree that it can be mentally and physically exhausting. He outlines the facilities by saying:

"Most camps have a beam, transceiver and linear, so contacts are not difficult to make. The job entails operating and letting the kids speak to other amateurs (it is legal in the USA), phone patching, teaching morse and electronics, plus building electrical kits and projects.

"You do have to obtain a Federal Communications Aliens Permit, but this presents no problem to a full licence holder, which you must be to participate in the amateur radio programme; although there are also vacancies for people to work purely on electronics."

A word of warning, however; you must be at least 19½ and prepared to spend eight to nine weeks, from mid-June until at least the end of August, in America. For a £37 deposit, Bunacamp will arrange a round-trip flight and necessary visa for you; board and lodging, laundry facilities and spending money of $195, or $220 if over 21, are supplied by the camp which employs you. There is also the opportunity to travel around America for one to five weeks after camp.

Ian rounds off his experiences by saying: "I thoroughly recommend it as a great way to spend a summer, and when you are off duty you can enjoy all the other facilities which the camp has to offer."

If you are interested in the scheme, and would like further details, contact Richard Munn, Bunacamp, 30/31 Store St, London WC1E 7BS. Tel: 01-637 7686. □

Ladder crystal filter design

by J. A. HARDCASTLE, G3JIR*

Editorial note

This is a significant and important article, including original concepts and ideas of the author as well as a unique review of past work. Although it may appear a shade restrained and mathematical at first glance, it is a practical article that tells an amateur just how to build a high-performance hf filter at a fraction of the cost of a commercial unit—yet with virtually no constructional problems, even for newcomers who read the article carefully.

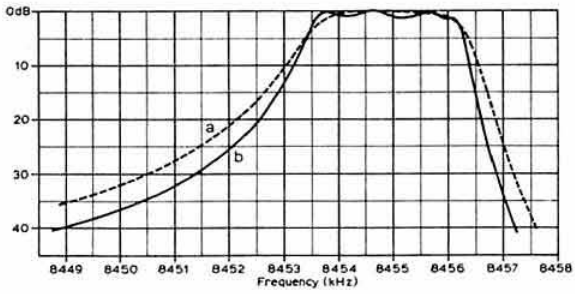
Introduction

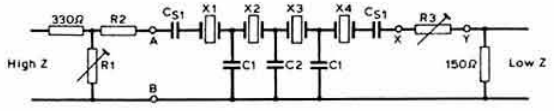
In the four previous articles on ladder crystal filters [1] experimental results were presented without any accompanying theoretical analysis, since the practical difficulties of measuring crystal parameters accurately would have made this information valueless to most radio amateurs.

However, a simple measuring procedure has now been devised which, in conjunction with a set of capacitor coefficients, allows the construction of filters of pre-determined bandwidth. Sets of design coefficients for filters using up to eight crystals are given and accompanied by a description of their derivation.

Frequency response

Fig 1 shows two frequency response curves, the first is known as the maximally flat or Butterworth response, and the second as the equi-ripple or Chebyshev response. Ideally the number of positive peaks in this latter response should equal the number of crystals, and be of equal amplitude over the whole passband. However, in practice, fewer peaks than expected are usually found, due to some having merged with each other, and the ripple amplitude usually increases towards the band edges due to the crystals and capacitors having a finite and unequal Q; these effects being particularly marked in higher order filters.





	R1 + R2	R2	R3	C1	C2	CS1
a	1625Ω	1kΩ	1625Ω	18p	27p	27p
b	706Ω	180Ω	706Ω	18p	22p	22p

Fig 1. Frequency responses of two typical 4-crystal filters, (a) Butterworth, (b) Chebyshev. The Butterworth filter bandwidth is actually 2,369Hz and the whole response has been scaled-up to allow direct comparison with the 2,762Hz bandwidth Chebyshev filter

In applications where some passband ripple is acceptable, the Chebyshev response is preferred because it has a steeper rate of cut-off and requires a lower impedance circuit than an equivalent Butterworth filter. This latter factor can be a decided advantage in circumstances which would otherwise require impracticably small capacitors.

Filter design coefficients

It has been shown previously [2,3], for Butterworth filters, that much of the labour can be taken out of filter design if each capacitor is assigned a coefficient, determining its relationship with its neighbours; and hence the filter frequency response.

Fig 2 gives design coefficients for 3rd, 4th, 6th and 8th-order Chebyshev filters which have been calculated from formulas published by P. Amstutz [4]. Actual capacitor values are derived from these coefficients by applying the formula

$$C = \frac{k \times 10^6}{2\pi f R} \qquad (1)$$

where k = capacitor coefficient
f = filter centre frequency (MHz)
R = circuit impedance (ohms)
C = capacitance (pF)

In hf ladder networks it is advantageous to use shunt capacitors rather than series capacitors because this allows stray capacitance to be absorbed and allowed for in the physical components. Fig 2 shows these Type 2 filters where the input and output series capacitors have been transformed into their shunt equivalents. Unfortunately this requires an increase in circuit impedance which may not always be convenient, in which case the Type 1 filter must be used.

Filter bandwidth

One of the most important parts of a filter specification is its bandwidth, and Dishal's procedure [5] allows this to be determined from a knowledge of the crystal's equivalent series inductance which, as was said previously, is a difficult parameter to measure, and the subsequent calculations are lengthy.

Previously, a disadvantage of the simplified capacitor coefficients method has been the need to make several trial filters before the required bandwidth could be attained; however, it has now been found that these initial trials can be simplified by making systematic measurements on a 2nd-order filter. These results are then applied to whichever higher order design is required.

*82 Acacia Avenue, Huyton, Liverpool L36 5TP.

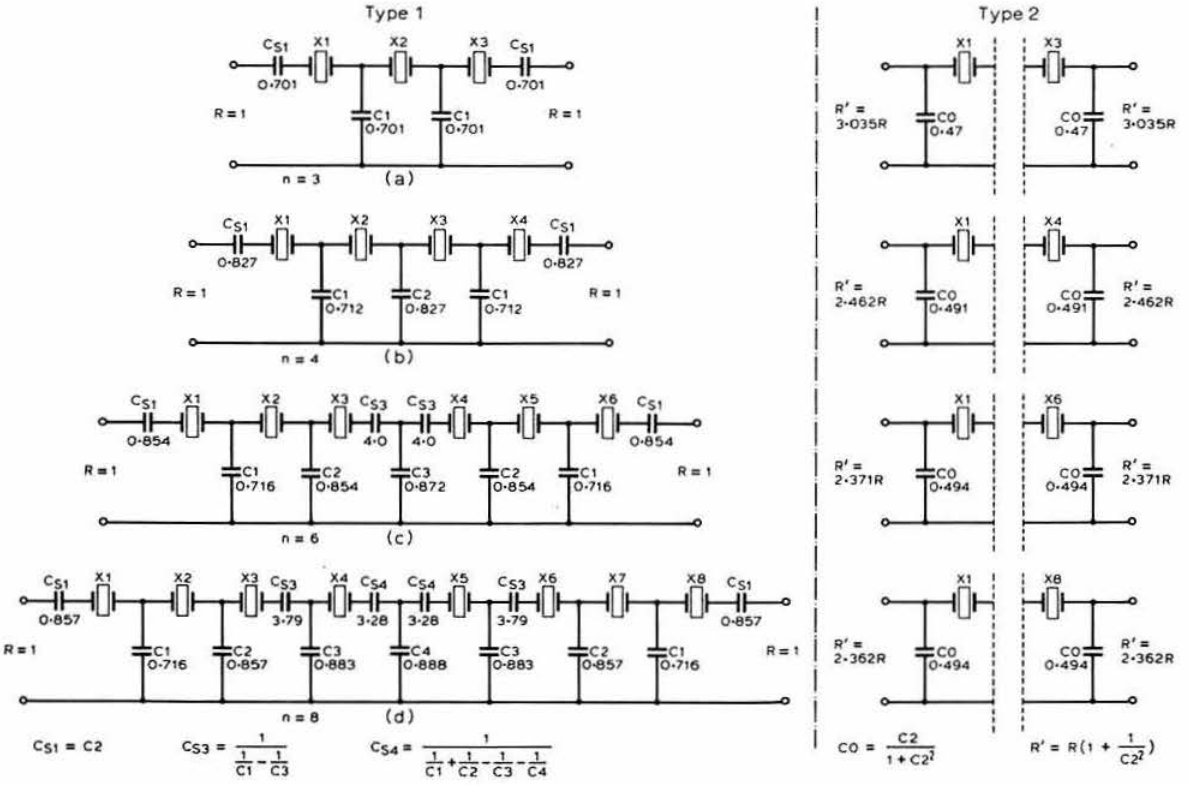


Fig 2. Design coefficients for Chebyshev filters

Initial tests

The test filter is connected as shown in Fig 3, and its frequency response and bandwidth measured using the filter test set described previously [1]. Choice of an initial value for capacitor C is arbitrary, but a value of 33pF would be suitable for many crystals. The test impedance may then be calculated by transposing equation (1).

$$R = \frac{k \times 10^6}{2\pi fC} \qquad (2)$$

$$= \frac{0{\cdot}613 \times 10^6}{2\pi \times 8{\cdot}454 \times 33} = 349{\cdot}7\Omega$$

The test set input and output impedances are now set to this value. To set the input impedance, measure across A–B while adjusting R3; to set the output impedance, measure across points X and Y and adjust R4. The different input and output circuits are necessitated by the test set's particular circuit arrangements.

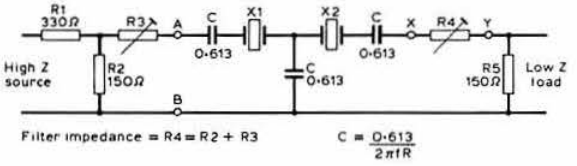


Fig 3. Preliminary tests to determine filter bandwidth use this circuit in conjunction with the filter test set (see text)

A typical frequency response curve obtained by this method, Fig 4, is seen to have a dip of very nearly the theoretical ldB in the centre. Ideally the peaks on either side should be equal, but rarely are, due to minor differences between the two crystals. However, the most important parameter, the bandwidth, is well defined and easily measured because the response is falling rapidly at the 3dB-down points.

Filter bandwidth has been found to be inversely proportional to the square root of the coupling capacitance, and once an

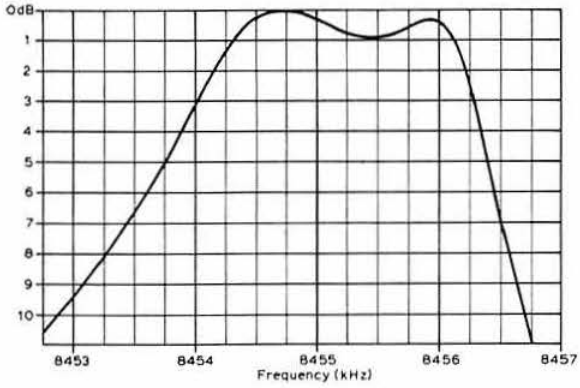


Fig 4. A typical test filter response. The dip in the centre of the passband is 0·9dB and the bandwidth 2,287Hz. Ideally both peaks would be equal and the central dip 1dB

initial measurement has been made a very close approximation to the correct capacitance may be calculated from (3).

$$C_2 = C_1 \times \left(\frac{BW_1}{BW_2}\right)^2 \quad (3)$$

where C_1 and BW_1 are the capacitance and bandwidth found in the first measurement, and BW_2 is the design objective.

Equation (2) is used again to determine the new value of impedance to be used with C_2. If these components prove to give the desired bandwidth, this impedance is used to calculate the required higher order filter from the coefficients given in Fig 2.

Design example

A 6th-order Chebyshev filter will now be designed to illustrate the application of the procedures described so far.

From Table 1 the components giving the bandwidth nearest to 2,400Hz are selected and C_2 calculated.

$$C_2 = C_1 \times \left(\frac{BW_1}{BW_2}\right)^2 = 18 \times \left(\frac{2287}{2400}\right)^2 = 16{\cdot}34\text{pF}$$

The new circuit impedance is then calculated

$$R = \frac{k \times 10^6}{2\pi f C} = \frac{0{\cdot}613 \times 10^6}{2\pi \times 8{\cdot}454 \times 16{\cdot}34} = 706\Omega$$

Using this value for R, the filter capacitors can be calculated from the coefficients given in Fig 2

$$C_1 = \frac{k_1 \times 10^6}{2\pi f R} = \frac{0{\cdot}7159 \times 10^6}{2\pi \times 8{\cdot}454 \times 706} = 19{\cdot}1\text{pF}$$

Similarly $C_2 = 22{\cdot}7$pF, $C_3 = 23{\cdot}2$pF and $C_{S3} = 106{\cdot}7$pF. This filter was constructed using miniature wire-ended crystals and preferred value capacitors and is shown, with its frequency response, in Fig 5. Note that the bandwidth at −3dB is 2,580Hz, which is considered to be sufficiently close to the design objective for amateur purposes.

Components

Choice of crystals is largely limited to whatever is available cheaply, but it has been found that the miniature wire-ended crystals require a circuit impedance which is higher than for HC6U types. Although very satisfactory filters have been made using these miniature types, the high impedance circuit is more vulnerable to stray capacitance and some individual capacitance trimming may be necessary to achieve the best performance. Therefore, when available, HC6U crystals are preferred.

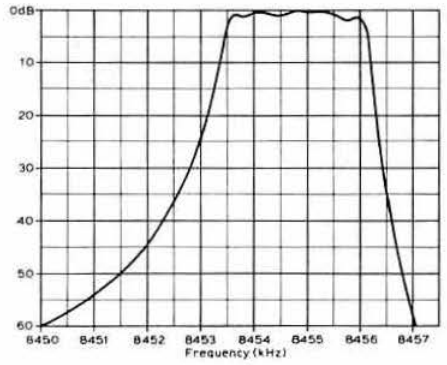


Table 1. Test measurements made on a pair of crystals using various capacitors (C) and circuit impedances (R). In each case R was calculated from equation (2)

R (Ω)	C (pF)	f_1 (kHz)	f_2 (kHz)	Bandwidth (Hz)	Ripple (dB)
769	15	8,454·198	8,456·742	2,544	1·3
641	18	8,454·001	8,456·288	2,287	0·9
525	22	8,453·837	8,455·912	2,075	0·8
427	27	8,453·742	8,455·611	1,869	0·9
350	33	8,453·660	8,455·333	1,673	0·9

Capacitors may be polystyrene or silvered mica types. Where very small capacitances are called for, a trimmer may be adjusted to the required value or a short piece of miniature coaxial cable may be cut to the required length [6].

The evolution of a ladder crystal filter

Fig 6 shows successive stages in the evolution of a ladder crystal filter. The initial low-pass prototype, Fig 6(a), is converted into a bandpass filter, Fig 6(b), by adding an inductor to parallel-resonate each shunt capacitor to the centre frequency. Similarly each series inductor is series resonated by adding a series capacitor.

The next stage of the process uses an impedance inverter, Fig 6(c), which converts a shunt, parallel-resonant circuit into a series, series-resonant circuit. Although the impedance inverter uses a negative capacitor in its series arms, this is later absorbed by other, more positive capacitors, so there are no physically unrealizable capacitors in the final design.

This procedure was described by S. B. Cohn [7] for use in the design of coupled resonator filters and was applied to crystal filters by P. Amstutz [4] by assuming that, for narrow-band filters, the series resonant circuit within the dotted line in Fig 6(e) is approximated with sufficient accuracy by a piezoelectric crystal.

Chebyshev filter coefficient calculation

The Amstutz calculations may be illustrated by the following calculation of the coefficients for a 3rd-order filter.

Let the ripple amplitude be a = dB
and e = 2·718
and n = number of crystals

$$\text{calculate } m = \frac{a}{8{\cdot}686}$$

$$s = e^m$$

$$t = \frac{1}{n} \operatorname{arctanh} \frac{1}{s}$$

If a = 1dB and n = 3 then t = 0·476.

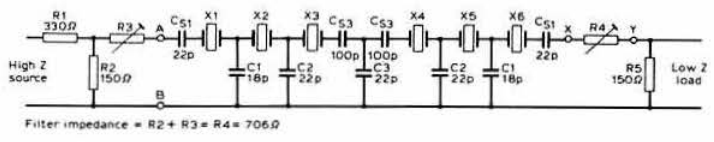


Fig 5. 6-pole Chebyshev filter. The bandwidth at −3dB is 2,581Hz and at −60dB is 7,002Hz. Note that there are only five peaks in the passband instead of the theoretical six

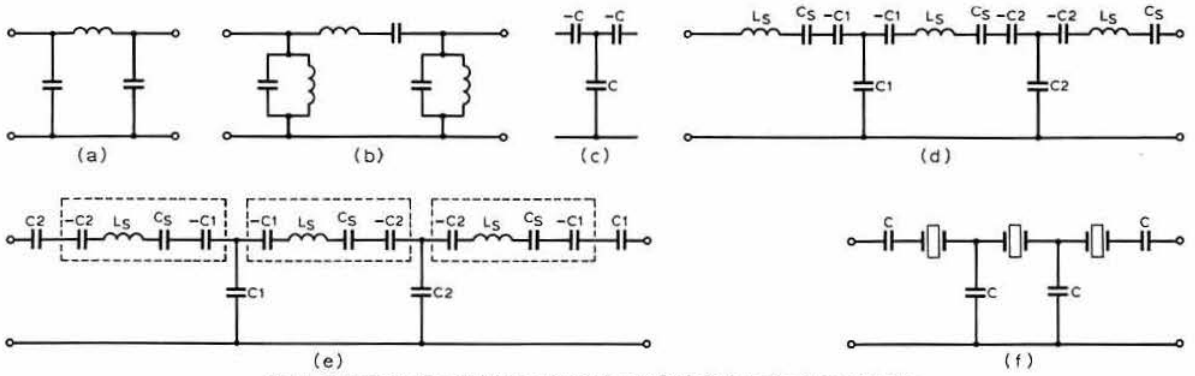


Fig 6. Stages in the evolution of the theoretical design of a 3-crystal filter

The circuit impedance coefficient is now calculated from

$$R = \frac{\sinh t}{\sin\left(\frac{180}{2n}\right)} = 0{\cdot}988 \qquad (4)$$

and the coupling capacitor coefficients are calculated from

$$C_b = \sqrt{\frac{\cos\left(\frac{180}{n}\right) - \cos\left(\frac{360\,b}{n}\right)}{\cosh 2t - \cos\left(\frac{360\,b}{n}\right)}} \qquad (5)$$

for b = 1, 2, ——— (n − 1)

Hence $C_1 = 0{\cdot}7092$ and $C_2 = 0{\cdot}7092$.

The filter now appears as in Fig 7(a). This is normalized for a circuit impedance of 1Ω by dividing the impedance by 0·988 and multiplying all the capacitors by the same amount, with the result shown in Fig 7(b).

As mentioned earlier, the series input capacitors may be replaced by shunt capacitors, C_0 in Fig 7 (c), and these are derived by the simple calculation shown in this diagram. In this example the impedance is increased by 3·035 by the circuit rearrangement. Colin [8] and F6BQP [3] took this calculation one stage further by again normalizing for an impedance of 1Ω, but this has not been done here in order to preserve the simple relationship between the Type 1 filter and the test filter.

Butterworth filters

It is not necessary to give full details of the derivation of Butterworth filter coefficients because they follow a similar procedure to the previous paragraph. However, for completeness, the Amstutz formulas are given below so that anyone who wishes may confirm for themselves the coefficients published previously.

$$C_b = \sqrt{\frac{\cos\left(\frac{180}{n}\right) - \cos\left(\frac{360\,b}{n}\right)}{2}} \qquad (6)$$

for b = 1, 2 ——— (n − 1)

$$R = \frac{1}{\sin\left(\frac{90}{n}\right)} \qquad (7)$$

Conclusion

Design coefficients have been presented for a range of filters which should satisfy most amateur requirements. They have been tested by constructing filters using 2, 3, 4, 6 and 8 crystals, and the results of these measurements confirm that they behave in a virtually identical manner to filters made from Dishal's design. However, it must be noted that this simplified design method is limited to filters having relatively symmetrical frequency characteristics, and single sideband filters must be designed using Dishal's more comprehensive design.

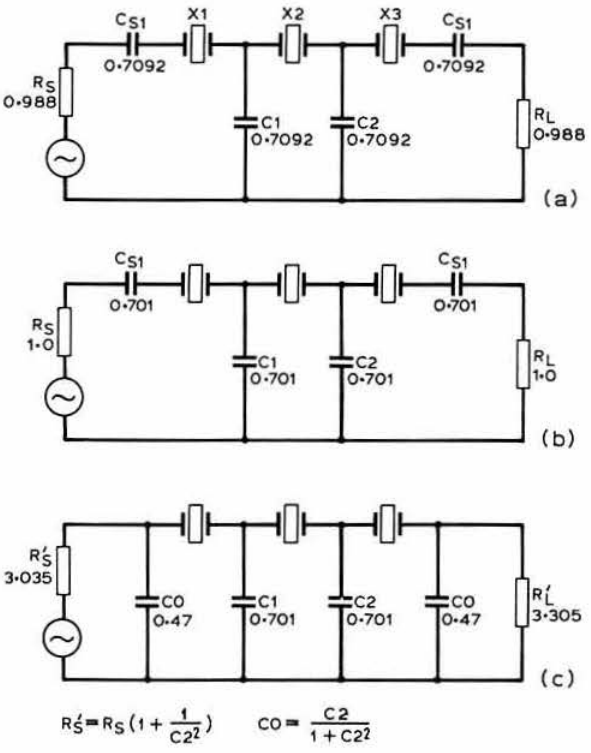


Fig 7. Three stages in the calculation of a set of design coefficients. (a) Coefficients obtained from equations (4) and (5). (b) Coefficients for the Type 1 filter normalized for 1Ω impedance. (c) Coefficients for the Type 2 filter

Now that most of the experimental element has been removed from this simple procedure it is hoped that more amateurs, particularly beginners, will be encouraged to construct their own filters, especially when inflation has placed commercial products almost beyond reach.

Acknowledgements

It is wished to acknowledge the many sources of information listed in the references, all have made their own contribution to an understanding of ladder crystal filters, without which the simplified method of predicting filter bandwidth could not have been developed.

It is also wished to acknowledge the expert assistance of Miss A. E. Howarth for carrying out literature searches and making translations.

References

[1] "Some experiments with high frequency ladder crystal filters", J. A. Hardcastle, G3JIR. *Radio Communication* December 1976, January, February and September 1977.

[2] "Formulas for the calculation of narrow bandpass filters with identical piezoelectric crystals and maximally flat attenuation behaviour", J. E. Colin (in French). *Cables and Transmission,* Vol 22, April 1968, pp132–5.

[3] "Crystal ladder filters", J. Pochet, F6BQP. In "Technical Topics" *Radio Communication* September 1976; *Wireless World* July 1977.

[4] "Narrow band filters", P. Amstutz (in French). *Cables and Transmission,* Vol 21, April 1967, pp88–97.

[5] "Modern network theory design of single sideband crystal ladder filters", M. Dishal. *Proc IEEE,* Vol 53, September 1965, pp1205–16.

[6] "Technical Topics", J. P. Hawker. *Radio Communication* September 1977, p693.

[7] "Direct coupled resonator filters", S. B. Cohn. *Proc IRE* February 1957.

[8] "Narrow bandpass filters using identical crystals designed by the image parameter method", J. E. Colin (in French). *Cables and Transmission,* Vol 21, April 1967, pp132–5.

[9] "Modern filter theory and design", editors G. C. Temes and S. K. Mitra, Chapter 4 "Crystal and ceramic filters", G. Szentirmai.

[10] Private communication, J. Haine, ex-G8CEG, 22 April 1977. □

Power transformers with low voltage secondaries

by G. C. OXLEY, G8MW*

Introduction

Transistors usually operate at lower voltages and higher currents than thermionic valves, but new transformers are costly, and are not always available to suit particular requirements. The heater and ht windings of old mains transformers can sometimes be removed without disturbing the primary windings, and the required secondary winding can then be wound on by hand. Much design data has been rendered out-of-date by the adoption of SI units and the use of newer insulating materials.

Core size

Fig 1 shows the power handling capacity of transformers for different cross-sections of core; these are conservative ratings.

Because the core is laminated, the actual cross-section of the iron will be approximately 10 per cent less than the physical area. As an example, a 2·54 by 2·54cm core (1in by 1in) will only have an iron area of 5·9cm^2 (0·9in^2).

Turns per volt

The number of turns needed depends upon the cross-sectional area of the core, the mains frequency, and the magnetic flux density. A frequency of 50Hz, sine wave, and a flux density of 0·8Wb/m is assumed. Table 1 gives the number of turns per volt for the different core sizes.

*Osterwald, Littlemoor, Ashover, Chesterfield, Derbyshire.

Wire size

The windings must be able to carry the required current without over-heating or damaging the insulation; newer insulating materials allow higher temperatures. The thicker the wire the smaller the I^2R loss, but this means fewer turns in a given space. Current densities quoted in various handbooks are given as 1,000, 1,500, 1,750 and even 3,000 A/in^2; the metric values of 2·5, 3 and 3·5A/mm^2 are much easier to deal with, 2·5A/mm^2 corresponds roughly to 1,600A/in^2, and this value

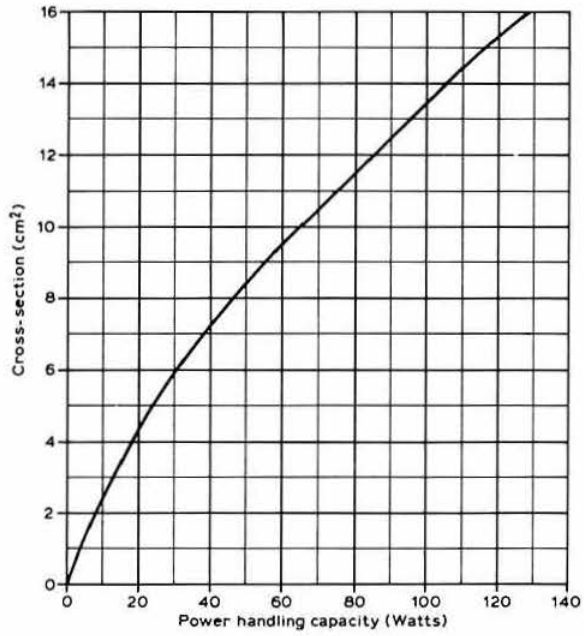


Fig 1. Power handling capacity of transformers for different cross-sections of core

Table 1

Cross-sectional area cm²	Cross-sectional area in²	Turns per volt
	0·5	14
4	0·62	11
	0·7	10
6	0·93	7·5
8	1·25	5·6
	1·5	4·7
12	1·85	3·8
16	2·5	2·8
20	3·1	2·3
24	3·7	1·9
	4	1·8

Table 2

Diameter mm	Wire Cross-sectional area mm²	Nearest swg	Current carrying capacity 2·5A/mm²	3A/mm²
0·25	0·05	34	100mA	150mA
0·315	0·08		200mA	240mA
0·4	0·13	28	325mA	390mA
0·5	0·2		500mA	600mA
0·56	0·25	24	625mA	750mA
0·71	0·4	22	1,000mA	1,200mA
0·8	0·5	21	1·25A	1·5A
1·0	0·8	20	2A	2·4A
1·25	1·2	18	3A	3·6A
1·5	1·8	16	4·5A	5·4A
2·0	3·25	14	8·1A	9·75A
2·5	5	12	12·5A	15A

is recommended, for reasons given later. When a single- or double-layer winding is exposed to the air (on the outside of the spool) one of the higher figures can be used; Table 2 sets out some typical values.

Example: wire diameter 0·71mm, wire cross-sectional area 0·5mm², therefore current at 3A/mm² = 1·5A.

One supplier gives a figure around 4A/mm². This is admissible if the windings are on the outside, can be kept cool, and are supplying a resistive load.

Power factor and waveform

Some of the energy supplied to a transformer is returned to the mains, and is represented by the reactive component of the primary current—one ought really to speak of the rating of a transformer in volt-amps. This reactive current, although comparatively small, does help to heat up the windings, and about

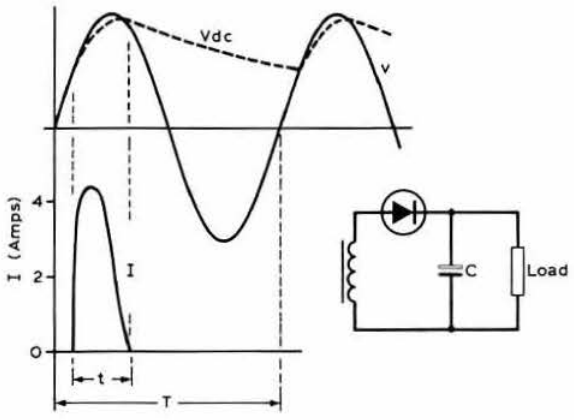


Fig 2. With a large reservoir capacitor and a half-wave rectifier, current only flows during time t over the period of one whole cycle T

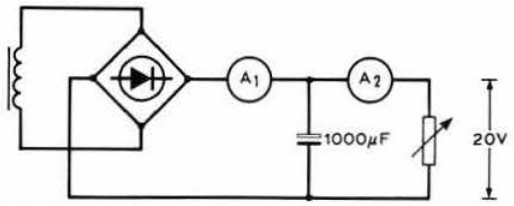


Fig 3. Circuit to show the heating effect of a pulse current

five per cent should be allowed for this when choosing the size of wire.

A more serious consideration is the rms value of pulses supplying a rectifier which has a large reservoir capacitor. As an example, consider a half-wave rectifier: Fig 2 shows that, over a period of one whole cycle T, current only flows during time t. To make the calculations easier, but nonetheless valid, let the pulse of current be a square-wave of amplitude 4A. The average value over the whole cycle will be 1A; because T = 4t. This is the current which would be read on a moving-coil meter.

The square-root of the mean of the squares of the instantaneous values of current, rms, will be

$$\sqrt{4^2 \div 4} = 2A$$

The heating effect of this current is four times that of the average value of current.

Full-wave (bridge) rectification, with as small a reservoir capacitor as possible, will keep the transformer loading within its rating. A further advantage of full-wave rectification is that the transformer core does not become magnetically polarized; this reduces switching transients.

In the experimental circuit shown in Fig 3, A1 is a 0–5A moving iron ammeter which reads rms values, and A2 is a moving coil ammeter (Avometer). The load resistor was adjusted until A2 read 3A, and the reading on A1 was 4·2A. The heating effect of this pulse current is just about double that of the rms value of a sine-wave. This is the reason why the recommended wire sizes are on the conservative side.

Practical considerations

Insulate between layers using thin sheets of paper. Cut plastic adhesive tape lengthwise and use to cover the windings close to the cheeks of the bobbin. The final layer can be doped with polyurethane varnish.

The core should be clamped as tightly as possible and then given a coat of black paint.

After the old secondary windings have been removed, an electrostatic screen may be found interposed between the primary and secondary windings. This may be of copper or aluminium foil and is usually connected to the core and to earth. The ends of the screen must be insulated, otherwise the screen may form a short-circuited turn. Two layers of good insulating tape should be wound over the primary. A further two layers should be wound over the screen. This screen helps prevent mains-borne interference.

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Practical Design of Small Motors and Transformers, E. Molloy.

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A Rugby, MSF, time-code clock

by N. S. HOULT, G4CIK*

THIS design uses the coded transmissions from the MSF transmitter at Rugby on 60kHz as the basis of a highly accurate, though comparatively simple, clock, with the advantages that it is self-setting and so does not need continuous power—thus making it useful for portable operation. The Rugby transmitter is in the standard frequency service, and no special licence is required to receive and make use of its transmissions.

Code

The transmitter sends the time of day in two codes: a fast one which contains the complete time, date and month and is sent every minute in the second following that minute, and a slow one which sends the same data (and also the year) at 1 bit/s in the time leading up to the minute. The slow code, being less susceptible to interference, is the one used here. Brief details of the code as it affects the operation of this clock are shown in Fig 1; each bit is sent as an interruption of carrier, a "0" being a 100ms break and a "1" 200ms. Thus by sampling the signal at 150ms(±50ms) after the start of each interruption, the data sent in that second may be determined. In fact, additional data, including a bst/gmt indication and parity checks, are sent in some seconds in the period 200ms to 300ms after the second, but that information is not used here. Full details of the transmission are contained in [1].

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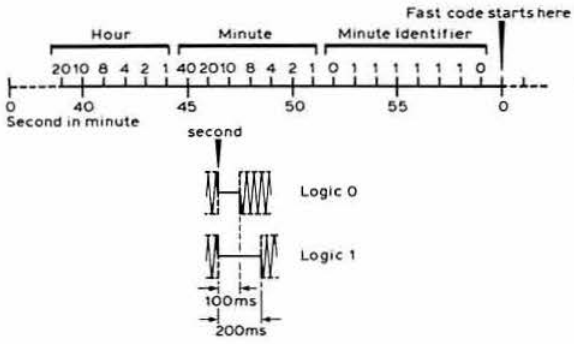


Fig 1. Format of the relevant part of the slow code

Receiver

The signal from MSF is very strong in most parts of the country, so a very sensitive receiver is not needed, and a ferrite rod antenna will, in general, pick up an adequate signal. As the data is only sent at 1 bit/s, a very narrow bandwidth receiver may be used to reduce noise and interference if necessary, and this suggests the use of a phase-locked loop. During development, however, it was found that, with conventional pll ics, the antenna picked up enough of the pll oscillator signal to cause the receiver to lock onto itself; this effect has also been noticed on a commercial receiver of similar design. Therefore, it was decided to use a stereo decoder ic as the phase-locked loop, since in these the oscillator runs at four times the input frequency (the 19kHz pilot tone in their normal application); this was found to cure the problem completely. It should be noted that these ics are not specified to operate at the frequency at which they are used in this circuit; however, all those tested by the author were found to perform satisfactorily.

Fig 2 shows the circuit diagram of the receiver section. The signal from the ferrite rod L1 is transformed to a low impedance by the source-follower TR1 and amplified by TR2 before being fed to the phase-locked loop IC1. Output is taken from the "stereo pilot light" output of IC1 and is inverted and changed in level by TR3 before being fed to the decoder.

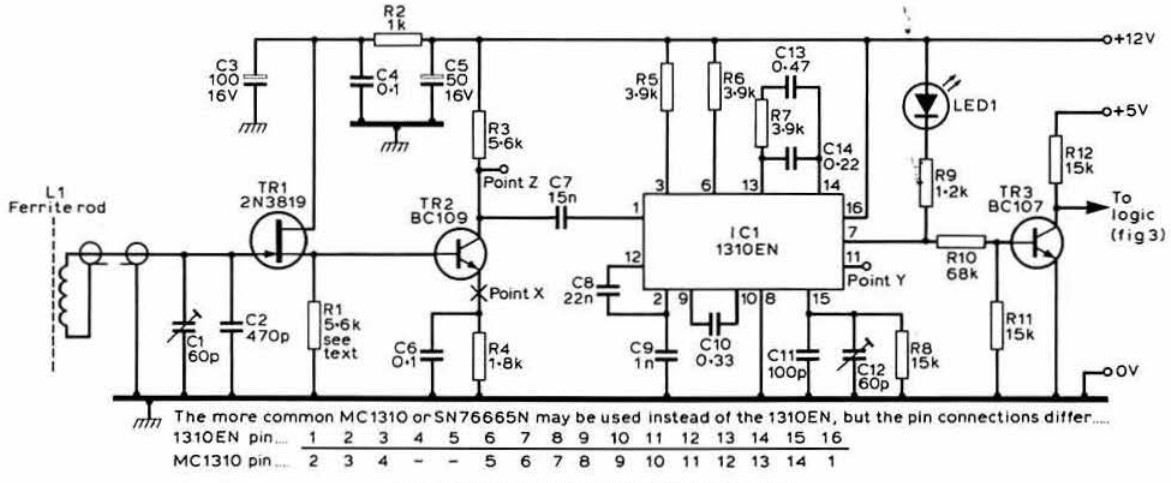


Fig 2. Circuit diagram of the receiver section

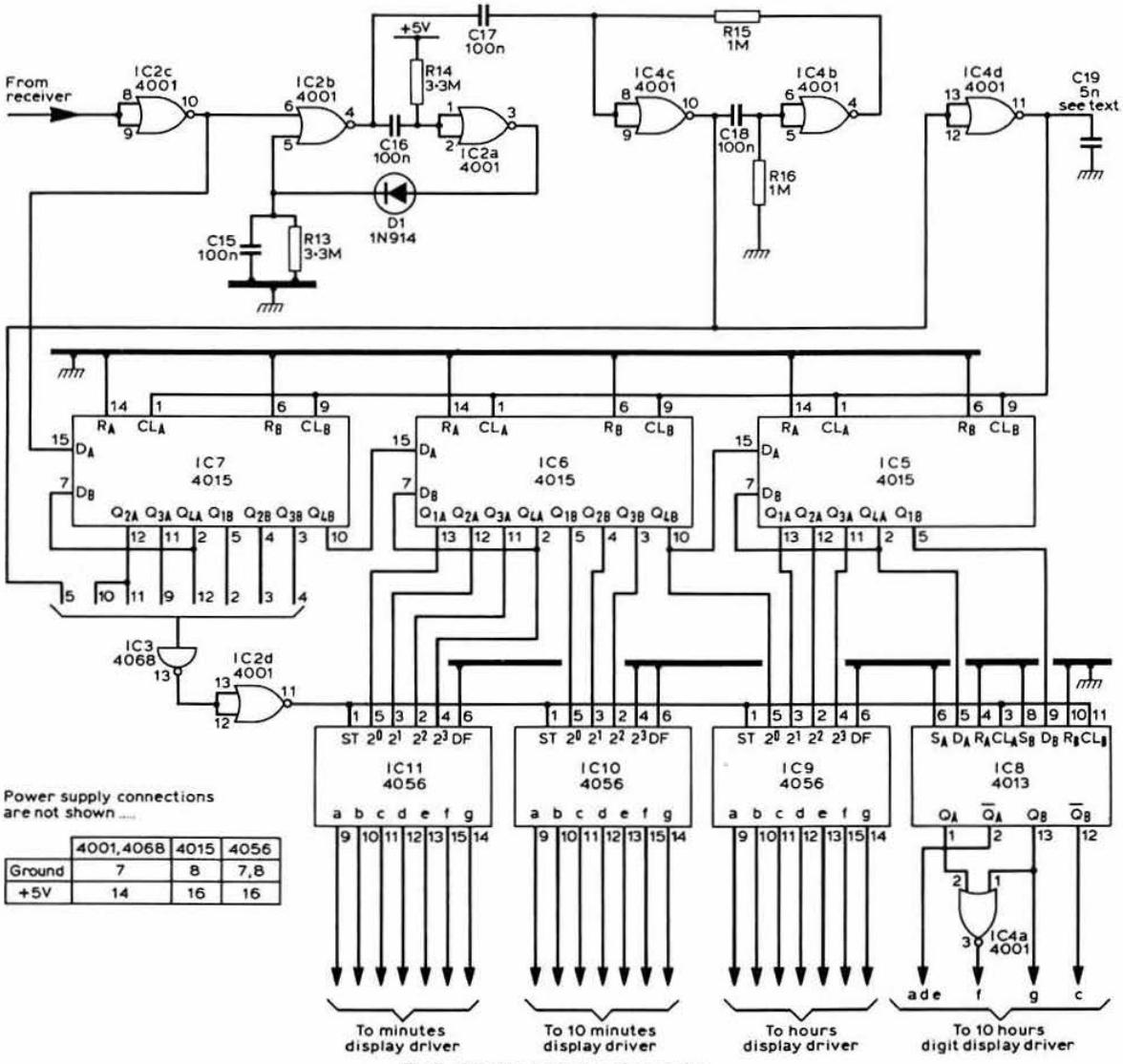
The ferrite rod provides the only selectivity before the pll, and care should be taken to achieve a reasonable Q: a figure of about 100 was measured for the author's antenna. The operating point of the first two stages is set by R1, and, as fets vary a lot in characteristics, this component may need adjustment to bring the voltage at point Z to a suitable value (5–9V).

If the gain of the receiver is found to be excessive, it may be reduced by inserting a resistor of a few hundred ohms at point X.

Decoding and display

The logic section is constructed in cmos to reduce power dissipation and package count. The circuit is shown in Fig 3, and the mode of operation is as follows: ICs 5, 6 and 7 form a 24-bit shift register, whose input is derived from the receiver output via an inverter IC2c, so that its value 150ms after each second is the data sent in that second. Therefore, if the shift register is clocked at this time, the data from the receiver will be shifted into it. This is the function of the monostables IC2b,a and IC4c,b; the former provides a 500ms "latch out" to prevent the double pulses, which are sometimes sent just after the minute (see [1]), from triggering the shift register twice, while the latter provides the 150ms delay. As neither of the times is particularly critical, 10 per cent components are adequate in the monostables. The circuits are compensated against variation in the characteristics of the ics and (to some extent) against temperature changes; for details of their mode of operation, see [2].

The result of the above circuitry is that after the 59th second of the minute, the first shift register (IC7) contains the minute



	4001,4068	4015	4056
Ground	7	8	7,8
+5V	14	16	16

Fig 3. Circuit of the decoder section

Components list

R1, 3	5·6kΩ	**R9**	1·2kΩ
R2, 45	1kΩ	**R10**	68kΩ
R4	1·8kΩ	**R13, 14**	3·3MΩ
R5, 6, 7	3·9kΩ	**R15, 16**	1MΩ
R8, 11, 12	15kΩ	**R17-44**	270Ω
	All above resistors are 1/4W		
R46	12Ω 3W wirewound		
C1, 12	60pF film trimmer		
C2	470pF polystyrene		
C3	100μF 16V electrolytic		
C4, 6, 21, 22	0·1μF ceramic disc		
C5	50μF 16V electrolytic		
C7	15nF plastic		
C8	22nF plastic		
C9	1nF		
C10	0·33μF plastic		
C11	100pF polystyrene		
C13	0·47μF plastic or tantalum		
C14	0·22μF plastic		
C15-18	0·1μF plastic		
C19	5nF ceramic		
C20	1,000μF 16V electrolytic		
D1	1N914		
D2	1A bridge, eg NKT D1100G		
D3	1A diode, eg ISO20		
LED1	Any small led		
LED2-5	FND500 or TIL322		
TR1	2N3819		
TR2, 4-28	BC109		
TR3	BC107		
IC1	1310EN, MC1310 or SN76665N		
IC2, 4	4001 (A or UB preferred)		
IC3	4068		
IC5-7	4015		
IC8	4013		
IC9-11	4056		
IC12	78LO5		
T1	4·5V + 4·5V 6VA; RS Components 207-188		
PL1	6-pin chassis-mounted plug		

marker 01111110, while the other two hold the required time. The output of the 150ms monostable (IC4c,b) is gated with the middle six outputs of IC7 in the AND gate formed by IC3 and IC2d, and this provides the pulse to transfer the data from the shift register outputs to the decoders ICs 8-11 on the next second pulse. Conventional decoders/latches are used for the minutes, 10 minutes and hours digits but, as the 10 hours digit

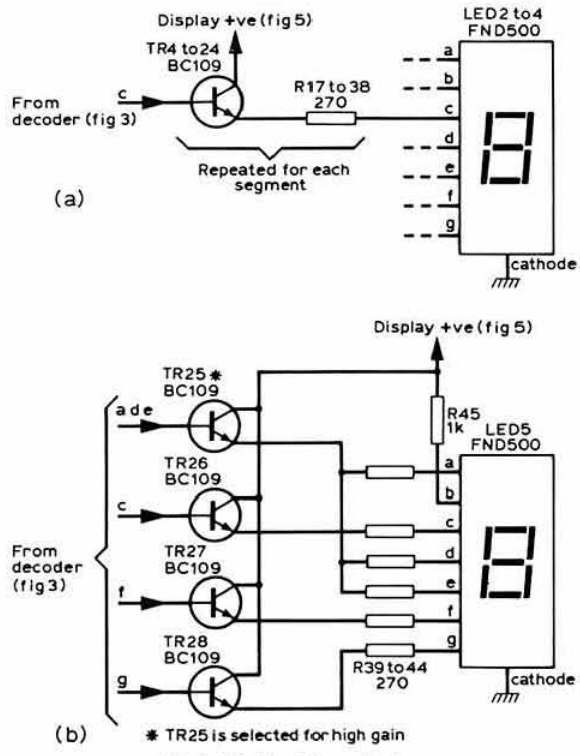
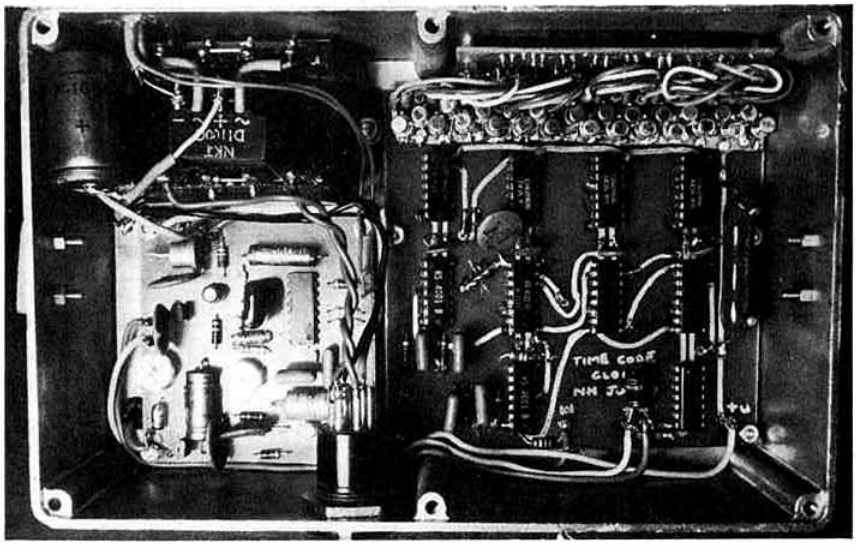


Fig 4. Display driver circuitry



Interior view of the prototype clock

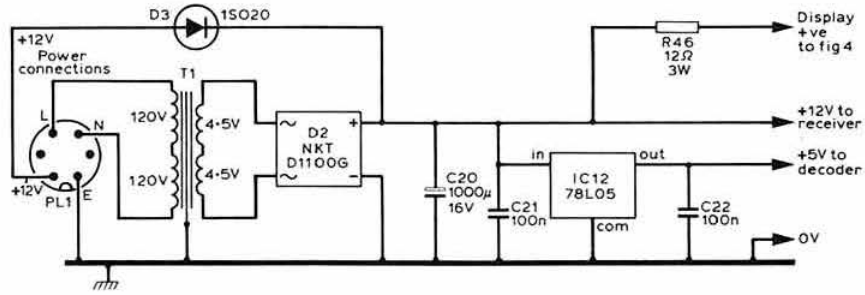


Fig 5. Power supply

only has to display 0,1 or 2, a single NOR gate is used for the decoding, with a dual-D flip-flop providing the latch function.

The decoder outputs cannot drive led displays directly, (they were designed primarily for liquid crystal displays) and so they are buffered; see Fig 4. The emitter followers, TRs 4–28, may be any reasonably high gain npn transistor, but TR25, which has to drive three segments instead of one, should be selected for good h_{FE}; a BC109 is particularly suitable. Note that segment b of the 10 hours digit is always on; resistor R45 may be varied if necessary to give this segment the same brightness as the others. While needing a lot of transistors, this output circuit has the advantage that the displays may be run from the unstabilized +12V line, reducing the drain on the +5V stabilized supply which feeds the logic. However, 4511 ics could be used instead of the 4056s and emitter followers if desired (but note that the pin connections differ, and the 5V stabilizer in the power supply would need changing for a higher current type).

Power supply

That used by the author is shown in Fig 5, and provides for both mains and 12V dc operation, with reverse-polarity protection in the latter case. However, almost any supply capable of giving 5V stabilized at a few milliamps and 12V at 700mA will be satisfactory. Not shown on the circuit diagrams are the power supply decoupling capacitors on the logic board: there should be three or four of these, of about 10nF, distributed around the board, and also an electrolytic of about 100μF if the 5V stabilizer is not nearby.

Construction

It is advisable to build the receiver section on a printed circuit board to ensure stability, and a suitable layout is shown in Figs 6 and 7. This layout also includes part of the power supply circuit, the rest of this being mounted directly on the mains transformer; see the photograph.

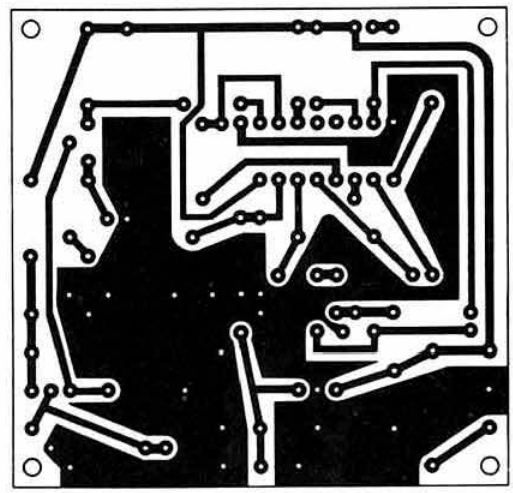


Fig 6. Underside view of the receiver and power supply board. Note that the connections for IC1 are correct for the 1310EN but will need changing if the MC1310/SN76665N is used

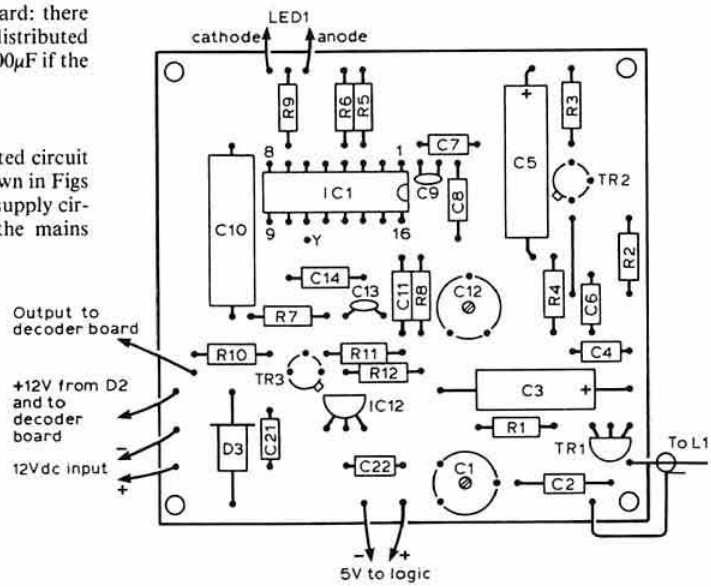


Fig 7. Top view of receiver and power supply board. TR1 and IC1 have their flats towards the top of the diagram

The layout of the decoder and display section is not at all critical, and any convenient form of construction may be used; however, suitable printed circuit layouts are shown in Figs 8, 9 and 10. Note that a double-sided board is used for the decoder.

If the clock is to be used near a transmitter, screening is desirable to minimize rf pick-up; this is most easily done by mounting the clock in a die-cast box (Eddystone 6827P) as shown in the photograph. The pcb layouts given are designed with this in mind, and the ferrite rod may be fitted on top and used as a carrying handle.

Setting up

Although possible without any test equipment, setting up is easiest with the use of an oscilloscope. First connect the 'scope to point Y in the receiver, short-circuit the antenna and adjust C12 to give a frequency of 60kHz, changing C11 if necessary to bring this within the range of adjustment. Next transfer the 'scope to TR2 collector, remove the short-circuit across the antenna, and some 60kHz signal from MSF should be observed. This should be peaked by adjusting C1 (and L1 if necessary). Generally some hundreds of millivolts of signal should be seen. MSF may be distinguished from other signals, noise and interference by its regular keying.

Alternatively, the pll frequency may be set on a frequency counter and the antenna-tuned circuit aligned with a gdo or signal generator, but in view of the narrow bandwidth it is best to make the final adjustments using the received signal—by rotating the receiver until the signal is just too weak to cause the pll to lock (shown by LED1 not lighting) and then adjusting C1 to try to achieve lock again.

Refinements

This clock was designed to be the simplest possible way of using the transmissions from MSF, so many refinements are possible. If noise on the received signal proves troublesome, and changing the gain as described earlier does not provide a cure, a low-pass filter between the receiver and decoder may help; an active filter with a cut-off frequency of 10Hz would be suitable, but note that it would have to be followed by a Schmitt trigger as the edges of the signal waveform would be considerably degraded.

A seconds display could easily be added by counting the pulses from the monostable IC2a,b using a dual bcd counter, the pulse from IC3 being used to reset the counter each minute.

Conclusion

The prototype has been in use now for a year, at various sites and from various power sources, and has proved very useful in contest operation. It has been found somewhat sensitive to varying mains voltage when supplied from a generator, but otherwise very reliable; the main drawback is that the display is bst rather than gmt, but this does not cause much inconvenience.

As far away as the south coast, the ferrite rod antenna has proved adequate, but when operated from south-west Ireland it

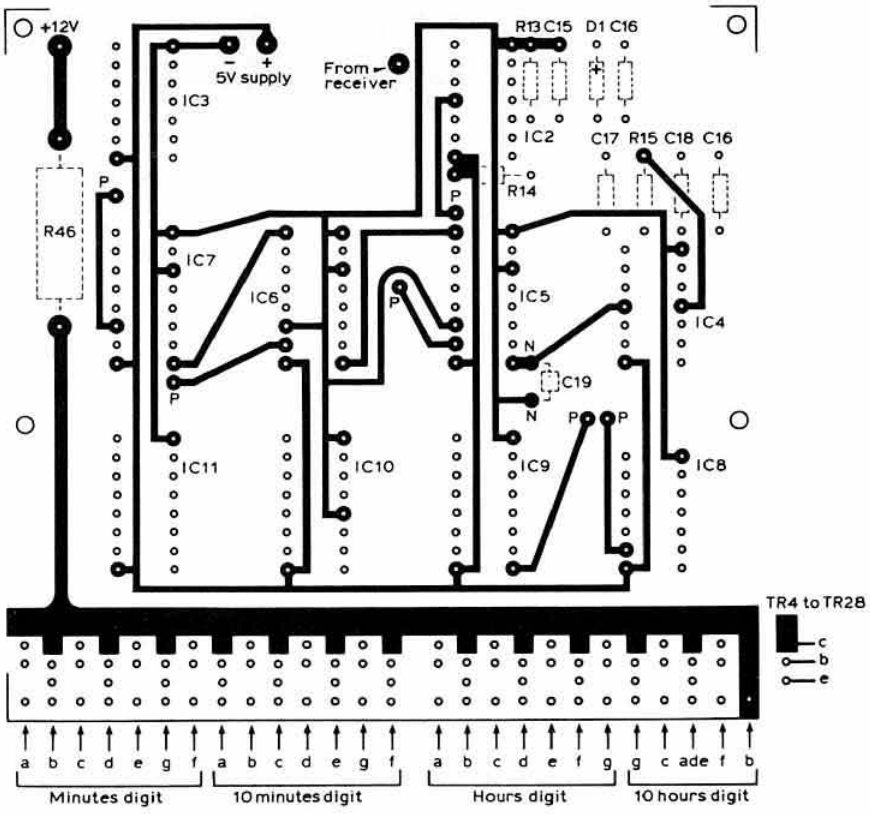


Fig 8. Top of the decoder pcb. Points P are links through the board. Points N are soldered to the top of the board; holes are not drilled for them. All ics have pin 1 towards the lower right-hand corner of the diagram

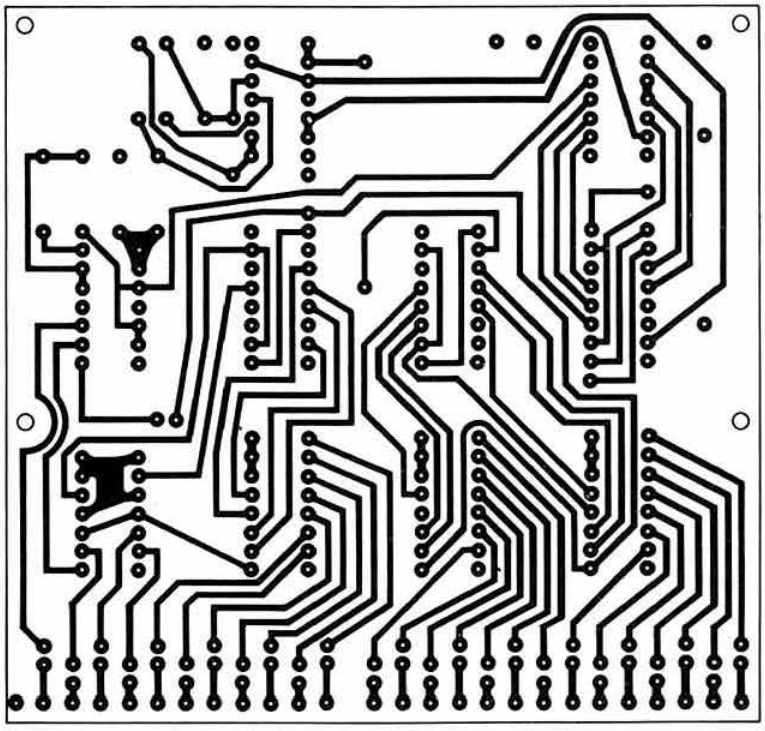


Fig 9. Underside of the decoder board

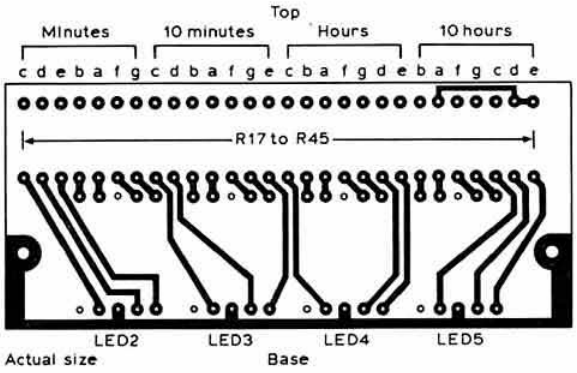


Fig 10. The display pcb, back view. The input leads are soldered directly to the copper side of the board

was found necessary to add an external wire antenna, connected to the gate of TR1, to receive sufficient signal; if operation at this range from Rugby is required it would be desirable to add a socket for this purpose.

Acknowledgements

The author is grateful to Cambridge University Engineering Department for the use of its test equipment, and to G4BNE for helping to test the receiver design.

Reference

[1] "Time Coded Transmission", *Wireless World* July 1978, p66.
[2] RCA COS/MOS Data Book. □

NEW PRODUCT

Templates

One of the most time consuming tasks for the home constructor is the accurate marking of holes prior to drilling. A series of templates offered by Graig Electronic Services is intended to remove the pain and strain associated with this exercise. The templates comprise a range of dry rub-on type transfers which are far more durable than normal and will withstand harsh treatment during the metal working processes. They will also withstand the acids used in etching printed circuits. They come in two colours: black for use on bright metal, and orange for use on dark surfaces. At present the templates are available in the following ranges:

ER01 bnc rf sockets
ER02 uhf series sockets
ER03 Belling-Lee rf sockets
ER04 din audio sockets
ER05 xlr xm sockets
ER06 IEC mains sockets
ER07 PO type 1000 lever switches
ER08 transistor T03 mountings

For the average home constructor without model shop facilities, these templates are the most useful addition to the available range of aids seen for a long time. The cost is about 45p per sheet. The number of transfers per sheet varies according to the size of the component involved, for the bnc rf sockets there are 24 transfers per sheet. Enquiries regarding the templates should be directed to Jee Distribution Ltd, 244 Bath Road, Hayes, Middx UB3 5AX.

technical topics

Pat Hawker, G3VA

WITH professional equipment it is increasingly being recognized that the true cost of any new unit is the initial cost plus the cost of maintaining (and powering) it over its operational lifetime; furthermore one has to take into account the economics not only of mtbf (mean time between failures) but also mttr (mean time to repair) and, for some equipments, the fault-recognition time, the waiting-for-service time, and the like. Of course the amateur is seldom in a position to assess all such factors and often buys his gear on the basis of his (or his friends') assessment of the "brand name", country of origin and the like. It has to be accepted that building in reliability costs money, though this may be more than recouped later by the lower maintenance costs.

Keep it working

An article that discusses how reliability and maintainability can be designed into equipment—"Build equipment that keeps working" by Henry B. Cary, *Electronic Design* 10, 10 May 1978—is aimed primarily at data processing equipment but nevertheless contains some generally useful ideas, freely adapted in the following notes to apply to amateur radio type of equipment.

To reduce the failure rate: (a) reduce the number of components (except to provide judicious redundancy); (b) de-rate components but do not under-rate them; (c) select components having known low failure rates; (d) reduce temperature stresses (if necessary provide cooling); and (e) protect wire insulation.

To make equipment easy to maintain: plan for easy access to every component and consider using modules, servicing-orientated cabling, quick-disconnect cable terminations and well identified components. Where possible incorporate error indication and detection (led indicators, test points, etc) and keep servicing documentation. Depluggable modules can help, especially if replacement modules are readily available (but ensure connectors, plugs-and-sockets etc, are as trouble-free as possible and are handled carefully).

Table 1. Normalized random failure rate percentages for various types of resistors, coils and transformers as a function of power stresses at 25°C

% rated power	Deposited carbon	Wire-wound	Carbon composition	Inductors/ transformers
30	6·6	7·5	6·0	20·5
40	10·0	10·5	9·0	26·0
50	14·0	15·5	13·5	32·5
60	21·5	22·2	20·5	40·5
70	31·0	32·5	30·0	51·5
80	46·0	47·0	46·0	63·5
90	66·6	70·0	68·0	80·0

Notes: For each 10°C rise in operating temperature multiply carbon composition and wire-wound resistor failure rates by 2·0 and the deposited carbon resistor and the inductor/transformer failure rate by 1·5. (Source: *Electronic Design*)

Table 2. Normalized random failure rate percentages for various types of capacitors as a function of voltage stresses at 25°C

% rated voltage	Mylar	Mica	Ceramic	Paper, polystyrene and high-stability
30	3·0	5·0	7·5	2·0
40	5·0	7·5	11·5	4·0
50	9·0	12·0	16·0	7·0
60	15·0	19·0	24·0	13·0
70	24·5	29·0	34·0	22·0
80	42·5	44·0	50·0	37·0
90	63·5	67·5	71·5	61·0

Notes: Multiply all capacitor failure rates by 1·6 for each 10°C rise in operating temperature. (Source: *Electronic Design*)

Modules should be small and functionally simple; preferably separate components having anticipated high failure rates from those of known reliability. Cable layout is important and should distinguish between ac, rf and dc wiring; twist or shield ac lines; minimize length of ac/rf lines; provide only a single earth point in power distribution systems. Intermittent faults in cables and cabling can be difficult to trace so try not to disturb cabling and keep it away from sharp edges. Wire "insulation" can short-circuit to chassis, etc, due to "cold flowing" of insulation (pressing, pinching or stressing wires can make them more susceptible to this fault). Incorporate plenty of test points.

Resistors run at 50 per cent of rated power last, on average, seven times longer than those run at their full rating: see Table 1. Some components, such as relays, may suffer from excessive derating and, for example, heavily rated relay contacts when operated at considerable reduced current tend to show increased contact resistance (although when operated at *very* low current may perform well). Use any spare relay contacts to parallel critical switching operations.

Effect of temperature on semiconductor life is dramatic: failure rate of power transistors tends to double for a 10°C increase in junction temperature; ic devices are also susceptible to large changes in substrate temperature, eg, a 40°C rise may increase bonding failures as much as 10 times. Remember junction and substrate temperatures will tend to be considerably higher than ambient temperatures owing to the power dissipated in the devices. Place power transistors, leds, ic devices and other temperature-sensitive components in coolest possible environments away from heat-generating devices and where there are no ventilating air currents.

The *Electronic Design* article also emphasizes a point we have made before in discussing "semi-professional" designs: keep them simple if you want to keep them working.

Aperiodic crystal filter and sidetone bfo

Stan Tempest, G3GSZ, is one of several readers who have welcomed the re-appearance in *TT*, and elsewhere in *Radio Communication*, of designs based on thermionic devices: valves, tubes, call them what you will. He writes:

"Now that home-brewed valve receivers are being talked about again, I thought I might mention two aspects of my own receiver which may be novel to some readers.

"For the sake of stability, I use an old BC348 chassis converted to cover only 1·8 to 2·0MHz and then used with a switched converter for the other hf bands (cw only). For the i.f. section I have inserted two aperiodic stages using 465kHz crystals and employing 12AX7, and based on the circuit that appears in *Radio Communication Handbook* and *ART*. The selectivity is remarkable, although broad enough to prevent ringing. To gild the lily I also have a built-in MFJ audio filter. The design is based throughout on double-triode valves, except for the af output stage (EL32).

"Apart from this rarely-used form of crystal filter, I have found that a second bfo (with the pitch controlled from the front panel and arranged to provide a comfortable signal when keyed in parallel with the transmitter) makes an excellent sidetone monitor. Since I use grid-block keying, a simple connection, suitably decoupled, from the earthy end of the grid leak of this extra bfo to the live side of the key provides a clean and non-tiring note when transmitting (during which all receiver stages prior to the first i.f. stage are disabled). It takes only a little time to become used to manipulating the separate knob in order to vary the keying tone, instead of having to fiddle with the main knob. It also means that one can readily excercise the fist while waiting in the queue for a rare dx station! I imagine the same basic system could easily be adapted for cathode-keyed transmitters; in the case of commercial black boxes an outboard unit with output injected into the i.f. chain would seeem possible, to take advantage of this form of cheap and easy sidetone monitor."

Converter for lf/mf/1.8MHz

Several converters providing high-performance reception on 1·8MHz for use with any of the many hf equipments that do not cover the band have appeared recently. For example, there is a good design fully described in *QST* with bandpass front-end rf stage. However, a much simpler design (Fig 1) by Eduard Nolte, DJ9NY, in *CQ-DL* No 7, 1978, should be capable of comparable performance over the range 0·1 to 2MHz when using equipment tuning between 28·1 and 30MHz. This uses a low-cost 28MHz oscillator crystal of a type sold in Germany for about four marks and intended for use in rf-energized hi-fi loudspeakers. There is no reason why other tuning ranges and local oscillator frequencies should not be used. The unit is based on one of the commercially-manufactured double-balanced mixer packages, such as the MD108, SRA1, IE500 etc. Preselector for 1·8MHz and optional attenuator are also shown in the diagram.

Three-state logic-level indicator

Several logic level indicators and probes for checking digital logic circuits have already been described in *TT*, but a rather different approach is outlined by Albert Roth in *Electronic Design* 21, October 11, 1978. His arrangement (Fig 2) provides an inexpensive three-state logic-level indicator built around an LM324 quad op-amp, and should prove well suited to testing three-state ttl and cmos circuits. The indicator operates with supply voltage between 5 and 15V, without adjustment, and could replace a more expensive logic-level probe, either as a single unit or in a bank of circuits to form a complete circuit board test fixture.

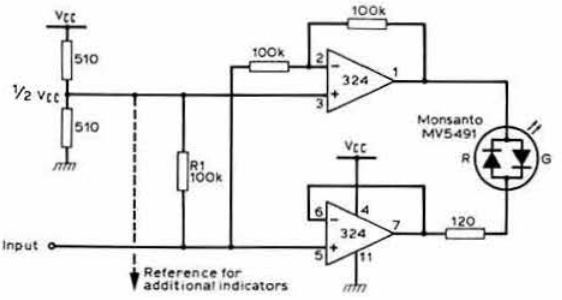


Fig 2. Three-state logic-level indicator (*Electronic Design*)

The LM324 needs only a single supply voltage and has enough output current to drive a sensitive red/green led indicator (Monsanto MV5491 devices are specified in the American circuit). This indicator contains two chips moulded into a translucent dome, and in the arrangement shown glows red for a high, green for a low, and stays dark for an open circuit or high-impedance input.

The upper op-amp functions as a unity-gain inverter referred to 0·5Vcc rather than earth. A floating input, pulled to 0·5Vcc by R1, is a "no signal" condition, and output of the op-amp is 0·5Vcc. The lower op-amp provides a unity-gain buffer; its output for a floating input is also 0·5Vcc. When the two outputs are the same, the indicator sees no differential voltage and remains dark. But if the input goes high, the output of the upper op-amp approaches zero, while output of the lower op-amp approaches Vcc. This results in a differential voltage approaching Vcc and the red led lights. If the input goes low, the differential voltage is similarly approaching Vcc but with

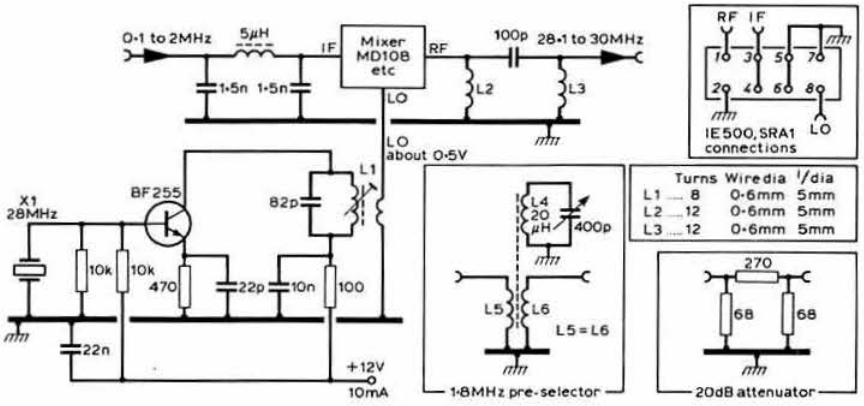


Fig 1. DJ9NY's converter covers the range 0·1 to 2MHz and provides output on 28·1 to 30MHz together with optional preselector for 1·8MHz. It uses a double-balanced mixer (eg MD108, SRA1, IE500 etc)

reversed polarity so that the green led lights. As indicated on the diagram, a single voltage divider to produce 0·5Vcc can be used for a number of such devices with each LM324 providing four op-amps, sufficient for two indicators.

The 120Ω resistor limits the indicator current at higher supply voltages. The forward voltage of the red led is 3·5V and that of the green led 2V.

Cmos el-bug for portable use

In *CQ-DL*, No 7, 1978, Urs Hadorn, HB9ABO, describes a cmos-type electronic keyer with low-power consumption, making it suitable for portable operation. The logic arrangement is derived directly from an old keyer using resistor-transistor-logic (rtl) described some 10 years ago in *QST* (April 1968). It has, however, been updated by using cmos devices, so reducing power consumption to a modest 2mA at 9V (supply voltage can be from 3 to 15V). The keyer is intended for speeds at from 4·5 to 50baud, maintaining a constant dit-dah timing relationship independent of the keying rate. The original article (in German) provides both technical discussion and full constructional details, but it is hoped that the circuit diagram (Fig 3) will at least allow readers to investigate this simple keyer for themselves.

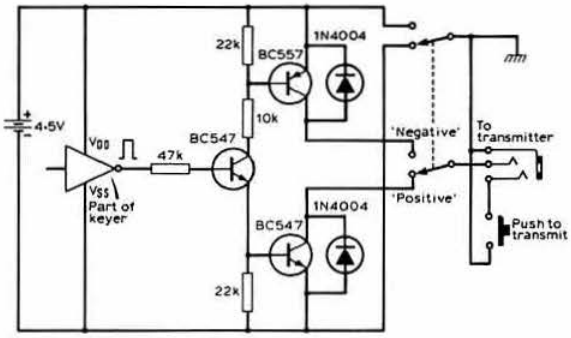


Fig 4. LA8AK's dual polarity keying adaptor

"wrong" position for tuning (ie key-down situation) since the protection diode conducts. The specified transistors will withstand voltages up to 50V. If higher voltages are encountered, it should prove possible to find an alternative complementary pair of devices.

LA8AK mounted a switch on the paddle for "transmit", and finds this results in easy operation since he has no wish to use the vox for cw. The arrangement has been tested and no problems of rfi experienced, even though he runs 200W input on 144MHz and a Trio TS-820 on hf. However, should rf troubles be encountered it would be possible to use a simple low-pass filter, consisting of two 1nF capacitors and a 100Ω rf choke, inserted between the switch and the jack.

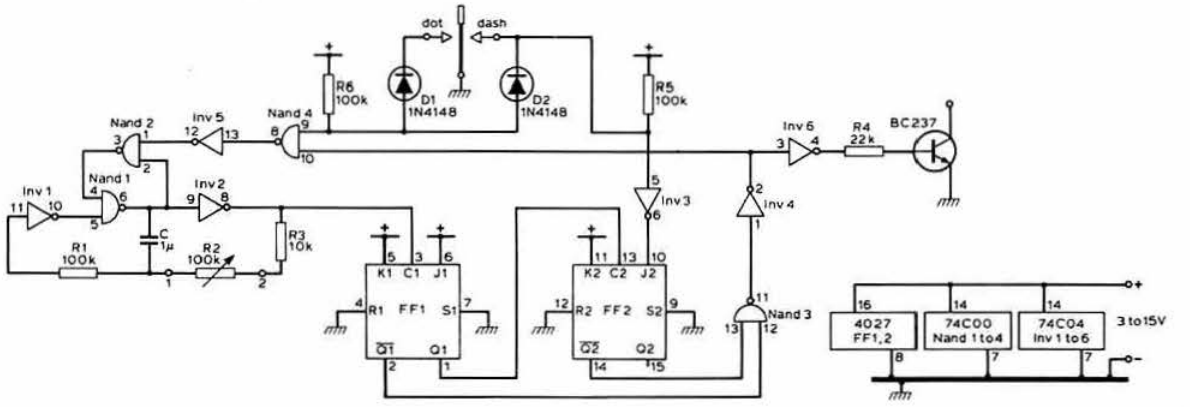


Fig 3. Cmos el-bug suitable for portable use

Dual polarity keying for cmos

From Jan Martin Noeding, LA8AK, comes a note on the question of dual polarity keying circuits for use with cmos keyers. He writes: "Dual polarity keying seems to trouble the constructor of electronic keyers, particularly when working with cmos devices. Often they seem to end up using a relay to key the different transmitters with which the keyer may be used; this can develop into a complicated design in order to enable a keyer intended for 'positive' keying (ie the keying of a positive voltage as in cathode keying) to be used also in conjunction with a transmitter using grid-blocking keying ('negative' keying). And most dual polarity designs have too much current drain to be used with cmos-type systems."

LA8AK has, however, found the arrangement of Fig 4 satisfactory; it also requires very little additional current drain. The total drain from the 4·5V battery, including three cmos devices in the keyer proper, has been measured at 1·5mA, so that a battery will last a long time, possibly years.

A switch selects the "mode" and it is possible to use the

Harmonic microwave/uhf mixer

In *TT* of July 1977 attention was drawn to a paper "Harmonic mixing with an anti-parallel diode pair" (*IEEE Trans on Microwave Theory and Techniques*, Vol MTT-23, No 8, August 1975). This paper shows that the harmonic mixer of the type used by RA3AAE for his direct-conversion receiver (*TT* April and July 1977, etc) also appears to have applications at much higher frequencies. The IEEE paper (by Cohn, Degenford and Newman) included experimental data relating to the use of such mixers at 12GHz and 55GHz, and elsewhere I have subsequently suggested that this approach may prove useful for low-cost 12GHz television receivers for direct tv reception from

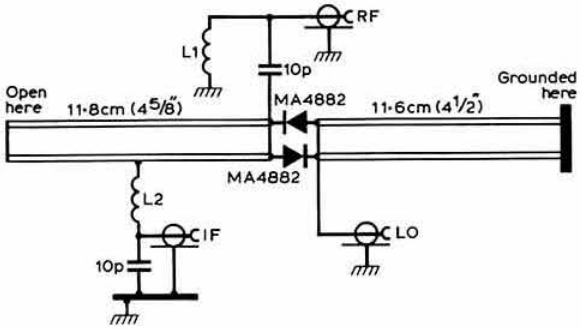


Fig 5. Schematic diagram of twin-diode 1·3GHz mixer. The half wavelength lines are 5mm (3/16in) wide and mounted 1·5mm (1/16in) above the ground plane. The line on the right must be connected to the ground plane, while the one on the left remains open. Since the local-oscillator frequency is approximately half that of the input rf, the grounded half-wave line looks like an open circuit to the local-oscillator port and like a low impedance to the rf port. L1 3cm (1in) No 28 awg (0·3mm) wire; L2 15 turns No 32 awg (0·2mm) wire wound to a diameter of 1·5mm (1/16in). (Source: *Ham Radio*)

space satellites (*IBA Technical Review* No 11, July 1978, and *Wireless World* January 1979).

It is therefore interesting to find the same basic configuration in an article "Twin-diode mixer—a new microwave mixer" by Jim Dietrich, WA0RDX (*Ham Radio* October 1978, pp84-86) with the following introduction: "This article describes a new microwave mixer, unique in that it has few parts and does not require boards or complicated metalwork. You can build it in a minimum of time and with confidence of having a good mixer when you're done. The 1,296MHz model to be described has a 6·4dB noise figure, including a 1·2dB i.f. noise figure. Other features include: (1) Very low local-oscillator power requirement (−3dBm); (2) Local oscillator frequency half that normally used; (3) No dc return is necessary; (4) There is no tuning; (5) There is high isolation between all ports."

The WA0RDX mixer is based on half-wave lines and is shown, with basic constructional details, in Fig 5. WA0RDX claims that it can be used at higher microwave frequencies by simply scaling the half-wavelength lines, and that it exceeds the performance of most available doubly-balanced mixers by producing a 6·4dB noise figure, nearly 40dB isolation between all ports, and low oscillator injection. The article includes a general review of mixer theory and details of how the evaluation of this mixer was carried out.

It thus provides further confirmation that this anti-parallel diode harmonic mixer arrangement is worth considering for almost any frequency from the hf of RA3AAE to the 55GHz of Cohn *et al*! One point not mentioned by WA0RDX is that it is desirable to use diodes of reasonably well-matched characteristics.

Using high-power amplifiers on 432MHz

John H. Nelson, G4FRX, of Cambrian Electronics (accredited Eimac agents) is more than a little disturbed by the continued discussion concerning instability in 432MHz linear amplifiers using the 4CX250 series of high-power valves (*TT* June and December 1978). He comments, with acerbity, as follows:

"Considering that this series of valves has been around for almost 30 years, I never cease to be amazed at the old wives' tales, mystique, awe and what-have-you that still surrounds their use in high-power amplifiers . . . a professional approach is surely essential to a linear which is going to provide an erp of several kilowatts.

"The *only* base for a 4CX250B-series valve that will work really satisfactorily at 432MHz is the SK620A. *It really is.* At 432MHz the usual *vhf* base, the SK600, simply cannot meet the required conditions for completely stable operation. Why do amateurs insist on *not* using the SK620A? I know the average amateur is impecunious and starts muttering 'what a rip-off' when told the price of the correct base—and is encouraged in this by being told by certain types at rallies that any old base is 'a vhf base, perfectly ok for 70cm'.

"It is the same with secondhand valves: the 4CX250B is seldom thrown out of professional equipment because of low emission: more usually it is because of some secondary emission problem (control grid or screen grid), and this can be the cause of all sorts of funny effects on stability and linearity unless it is appreciated just what is happening.

"I quite realize that I have an axe to grind and that a pair of new valves, bases and chimneys will set an amateur back about £90. But with materials and bases designed for 432MHz this is likely to result in far less trouble for the user and for other users of the band. I have little sympathy for those who try to build really high-power vhf/uhf apparatus on the 'pink-string-and-sealing-wax' principle and then wonder why all is not well.

"For those willing to tackle the job properly, I for one would be delighted to provide helpful, fair, professional advice or sympathy . . . by the way the 4CX250R often works better on 432MHz than the 4CX250B."

Well, that is straight enough—though it would be a sad day if every amateur were to accept the principle that there is no place in the hobby for trying to do for a few pounds what the professionals would accept as costing far, far more. The trouble comes, as G4FRX implies, when we do not know or do not recognize exactly *why* the professional has been forced to adopt a particular approach, and then try to use substitutes that just will not do the job required of them. On the other hand, it may sometimes be possible to produce a homebrew substitute at low cost *provided that this is designed and made with equal care and knowledge as the original.*

Radiation resistance of medium loops

Some time ago (June 1977) the question was raised in *TT* of the radiation resistance of medium-sized loop-type antennas, using material from A. Richtscheid (*IEEE Trans on Ant & Prop*), Des Vance, GI3XZM and Les Moxon, G6XN. This led to correspondence in which certain features of the computer calculations of A. Richtscheid were questioned both by GI3XZM and G6XN as not being borne out by practical experience. Somehow, at the time, this further material got squeezed out and one result is that readers may have been left with a misleading impression of the radiation resistance of non-circular medium-sized loop antennas.

So belatedly I am including this month some estimates made in 1977 by GI3XZM, based on what he described as a "pick and shovel method" (that is in relation to the use of a computer). In fact he integrated a sine current curve around the loop and compared this with the corresponding integral for a dipole, assuming its radiation resistance to be 72Ω. Although these represent "un-proven" calculations, the results seem to

Shape	Wire length	Name	Radiation resistance (R_R)
	1λ	Folded dipole, half-wave	288Ω
	½λ	Folded dipole, quarter-wave	12·7Ω
	1λ	Quad (single element)	145Ω
	½λ	½ wave quad, side-fed	7Ω
	½λ	Levy quad, G6XN	6Ω
	⅜λ	⅜ wave delta, equilateral, side-fed	1·4Ω
	⅜λ	⅜ wave delta, equilateral, apex-fed	0·87Ω
	½λ	½ wave delta, right-angled, side-fed	10Ω
	½λ	½ wave delta, right-angled, apex-fed	7·5Ω
	½λ	½ wave, trapezium, GI3XZM	10Ω
	¾λ	¾ wave, trapezium, GI3XZM	85Ω

Fig 6. Estimated radiation resistances of loop-type antennas as calculated by GI3XZM using "pick and shovel" technique

constitute a useful guide to this class of antenna, as well as overcoming some of the anomalies of the computer analysis: see Fig 6.

Broadband 1:1 balun

Over many years there has raged a rather strident debate about when and where it is worth using a "balun" (balanced/unbalanced transformer) when feeding dipole-type antennas from coaxial cable feeders. The debate has been acerbated by the modern dislike of using balanced transmission line in the mistaken belief that open-wire lines radiate and coaxial cable does not. In fact the opposite may be true, which is why balanced line can sometimes help reduce tvi.

The balun-fed dipole element is not always the answer; as VK2BXF pointed out (*TT* January 1975), one needs to approach the modern wideband ferrite balun with caution. He commented: "If one were cynical one might wonder why commercial baluns have large cooling fins . . . these baluns are greatly over-rated for transmitting purposes and usually offer

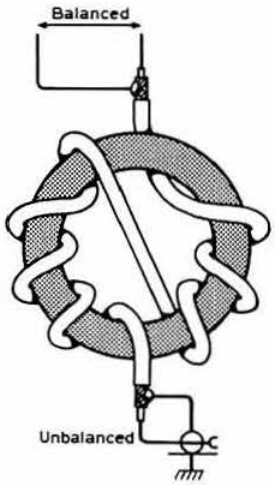


Fig 7. W1JR's hf broadband balun

no improvement in radiation efficiency . . . the most they do is to cause dipoles, etc, to fire at right angles to the run of the wire . . . commercial baluns often exhibit high losses at certain frequencies within the span of frequencies advertised as flat."

Despite these rather gloomy prognostications, there is a demand for baluns *at the transmitter end* of the feeder in order to facilitate the use of balanced line with transmitters having unbalanced output. A recent design for a simple and efficient hf broadband balun by Joe Reisert, W1JR (*Ham Radio* September 1978, pp12–15) uses an improved high-permeability ferrite toroid core on which is wound a short length (12 turns, 36–40in of cable) of thin coaxial cable of the required impedance. The W1JR unit (Fig 7) uses the Indiana General F568-1 Q1 core with RG-141/U cable; it covers 3·5 to 30MHz (with reduced efficiency on 1·8MHz). For use over 7–30MHz, 10 turns of cable should prove sufficient, and TC9 core material might prove more suitable for lower frequencies. With RG141/U cable the unit is designed for 50Ω impedance, but W1JR makes it clear that other impedances may be selected provided the turns impedance on the lowest frequency band is at least 10 times the cable impedance. The design can be used at vhf if attention is paid to layout and lead lengths. W1JR states: "The beauty of this type of balun is that it does not introduce any additional reactive components to the feedline."

The balun as described by W1JR is intended primarily for use directly at the dipole element, but there seems to be no reason why this approach should not be adopted instead to power a balanced transmission line from the unbalanced output of the typical modern transmitter. Such short lengths of cable, however, do require the use of a high-permeability core material.

Steam radio and the Resistance

In *TT* (October 1977) I listed some of the wartime techniques used to keep secret communications links open in the absence of mains power—or where it was undesirable to use the mains in view of the location technique of selectively switching off mains power in different districts, buildings and apartments. Power sources for recharging batteries included bicycle generators, wind generators, the "beach chair" pedal

generator, thermo-couple chargers and even steam-driven generators.

An interesting reference to these now rare steam generators appears in *Amateur Radio* (November 1978) in some notes compiled by R. Champness, VK3UG, on the Type 3 Mk2 and Type A Mk3 equipments which were, in effect, Australian versions of the B2 and B2 Minor suitcase transmitter-receivers. Considerable use was made of clandestine hf links in the Pacific theatre of operations by such organizations as the Coast Watchers who reported enemy shipping movements from islands deep within occupied zones. To quote VK3UG:

"A variety of methods was used to charge the 6V batteries, including wind generators, hand generators, pedal and cycle-adaptor generators, petrol-driven generators and, last but not least, a steam-power generator. The steam generator consisted of a boiler which was suspended in a brazier, coupled to a twin-cylinder steam engine which was connected directly to the generator. At a steam pressure of 30-35lb a 6V battery could be charged at 4A. The unit consumed some 2 litres of water and burnt 7-9kg of wood per hour so it was not particularly 'economic'. I saw one of these steam generators a few years ago at a steam rally in Wanina, 25km east of Melbourne."

It seems a pity that, apart from some private collections, little real attempt has been made in the UK to bring together a truly representative collection of wartime clandestine radio equipment, including such items as SOE's Paraset, B1, B2, B2 Minor, A Mk2 (A2), A Mk3 (A3) and 450MHz S-phone; Polish AP4 and BP3 sets; SIS/MI6's Mark 3, 4, 7, 15, 21 etc; the American OSS transmitter-receivers which I seem to recall were unusual in having several switched wavebands to provide long-range working up to about 18MHz; and the comparable German and Russian equipment. There was also a lot of equipment actually built inside occupied Europe by the Danes, Poles (who even operated 1kW high-speed "burst" systems from inside Poland), Dutch, etc.

Dick Rollema, PA0SE, recently sent me a translation of some notes by the late PA0AA about the tragic (and yet at times highly effective) "binnenlandse radiodienst" (internal radio service) which with volunteer cw operators (amateurs and professionals but without specialist UK training), and using Dutch-built equipment such as push-pull power oscillators disguised as diathermy equipment, linked the occupied north of Holland with Eindhoven from September 1944 to the end of the war in Europe. Many of these OD/RVV stations were catastrophically lost: operators were sometimes shot immediately—with, or in front of, their families; others were executed after imprisonment or ended their lives in the concentration camps. Only a few survived. Yet repeatedly other operators took over the work and, indeed, handled the traffic that led directly to the ending of the war in Holland.

As M. R. D. Foot has written: "If you can say 'I am not under fire; I am not under torture; I am not on the run; if I hear a noise at six in the morning, I know it is a neighbour or a milkman, not the secret police' . . . then you owe it, in a larger degree than most historians have so far allowed, to the Resistance."

Resistance radio, I would suggest with humility, owed much to the techniques and not infrequently to the human contribution of pre-war amateurs; nobody was more vulnerable than the "pianists" who played their instruments "in the field" while subject to highly-skilled direction-finding (not only of transmitters but even of the local oscillators of the receivers). As has been said: "Without these links we would have been groping in the dark"—Ultra not withstanding.

Overload shutdown with scr substitute

Cedric Marshall, G3YRN, was interested to see the VK5KI quick-shutdown regulated power supply (*TT* December 1978, p1026) as, at the time, he was just completing an overload-protected supply, also based on the LM723 ic regulator, but using a rather different approach that provides the option of automatic restoration when the overload is removed; it also uses a pair of bipolar transistors as a substitute for an scr (thyristor). G3YRN writes:

"I suspect that VK5KI found, as I did, that the on-chip current sensing transistor could be used only to provide a moderate degree of current foldback. When I looked around for an alternative approach I was intrigued to find that the Signetics 550 regulator ic uses a current sensing amplifier which is identical to the 'scr substitute' configuration featured in several editions of *Amateur Radio Techniques* (eg p214 in *ART5* or p232 in *ART6*). As the 550 does not seem to be readily available from UK suppliers, I decided to simulate this arrangement using the LM723 and a pair of external resistors. The arrangement finally adopted is shown in Fig 8.

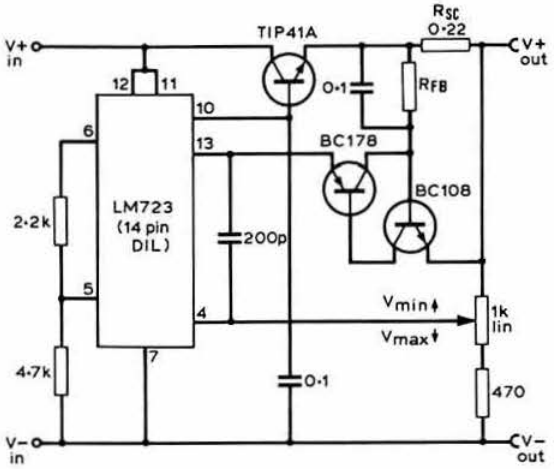


Fig 8. G3YRN's 5 to 15V 1·5A regulated power supply with overload protection

"The substitute-scr triggers with about 0·35V across R_{SC}, but its current is below the hold-on value if R_{FB} is *below* a certain critical value. When R_{FB} is at or above this value, the voltage developed across it (as the collector load of the BC178) is sufficient to supplement the voltage across R_{SC} and to drive the 'scr' above its hold-on current.

"The critical value can be found by using a 10kΩ variable resistor. It can also be shown that the circuit acts as a simple current limiter when R_{FB} is zero, and how the short-circuit current reduces almost to zero as the critical value is approached.

"Thus the circuit can be arranged to lock-out on overload with R_{FB} just above the critical value, in which case a manual reset facility must be provided with a push-to-make switch across R_{FB}. Alternatively the circuit will automatically reset if R_{FB} is just below the critical value, but a small amount of short-circuit current must be tolerated for a reliable reset.

"In my case I settled for about 50mA, with R_{FB} equal to 3·7kΩ. Finally I would strongly recommend that the series-pass

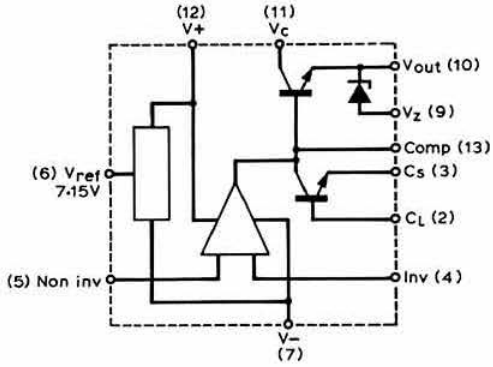


Fig 9. Internal elements of LM723 (14-pin dil package)

transistor used is checked for actual current gain. The value of h_{FE} falls off rapidly as the current increases; the maximum drive capability of the LM723 is 150mA and the maximum dissipation is 800mW."

Variable bandwidth notch filter

A potentially useful notch filter using a Wien bridge arrangement in conjunction with a unity-gain op-amp has been described in *Electronics* (7 December 1978, p124) by Dominique Fellot. His circuit (Fig 10) is claimed to provide a notch depth of nearly 60dB, has tunable centre frequency and is capable of continuously adjustable bandwidth. Such a filter would thus seem to have very useful characteristics as part of a receiver's audio processing system, or for other similar applications: since it is stated to operate up to about 200kHz, it could also be used at the low i.f. used in some multi-conversion receivers.

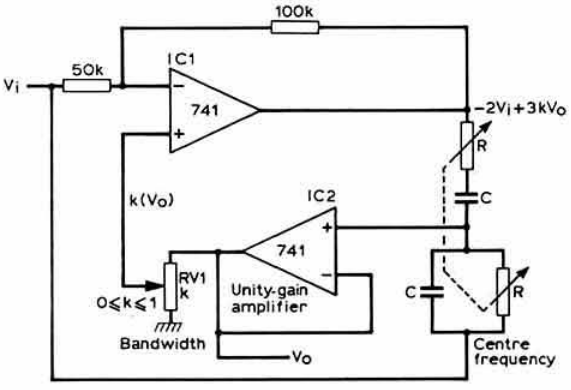


Fig 10. Tunable notch filter of continuously variable bandwidth. (Source: *Electronics*)

The centre frequency is determined by $1/2\pi$ RC, and can be tuned using ganged potentiometers and fixed capacitors; as customary with Wien bridge circuits, care should be taken to achieve reasonably accurate tracking of the two RC time constants.

200kHz Droitwich standard ideas

David Pearson, GM3TLA, recalls that during 1977 (March, July, October) three items appeared in *TT* discussing the question of simple frequency standards based on processing the 200kHz broadcast carrier from Droitwich. He made the following experiments using a receiver similar to that described by G3VTJ (*TT* July 1977) and feels these would be of general interest:

(1) Integrated circuit devices such as the SN76660N and TBA120 do not seem particularly good as limiters for amplitude modulated signals. They do not limit about the mean value of the input, there being some dc offset. As a result, amplitude modulation of the input produces a limited output having a varying mark-space ratio: see Fig 11. This effect can be seen easily using an oscilloscope to monitor the output waveform. It was possible to remove the dc offset by connecting a resistor with a value of about 100kΩ from pin 13 to ground, the precise value being chosen to minimize the modulation of the output. GM3TLA notes that in some cases the resistor may need to be connected from pin 2 to ground; his tests were restricted to one of each ic device mentioned above.

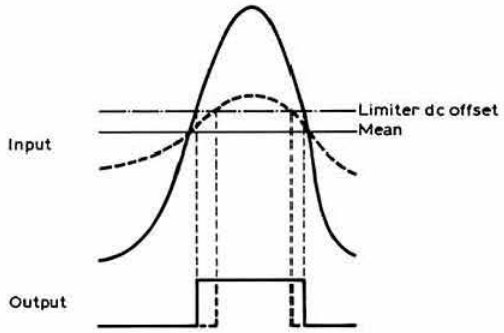


Fig 11. Showing how changing the input amplitude to rf-type ic limiters may alter output mark-space ratios

(2) Instead of using limiters made for radio use, it is possible to employ a comparator ic. He has tried the 710, but more modern types such as the μa760 or NE521 would have better performance and more convenient power supplies. All these can provide the interface from analogue (rf) to digital circuitry, which the fm radio limiters do not offer. Again the dc offset

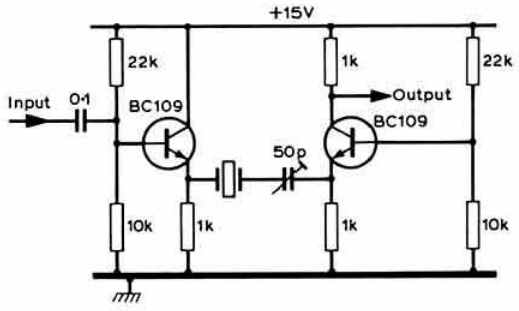


Fig 12. Crystal filter arrangement used by GM3TLA in 200kHz frequency standard

problem exists, but standard circuit designs using these comparators permit the offset to be trimmed out. The 710 is adequate for 200kHz reception.

(3) A narrow bandwidth 200kHz filter is needed. Fig 12 shows a circuit arrangement used by GM3TLA with a standard crystal from Interface Quartz Devices Ltd. From measurements made on this circuit, GM3TLA considers the bandwidth to be about 6Hz and the crystal series resistance about 1,500Ω. The shunt capacitance of the crystal could be neutralized by converting the input BC109 into a phase-splitter and connecting a neutralizing capacitor from its collector to the junction of the crystal and the 50pF trimmer. GM3TLA was suspicious of the temperature stability, but thorough heating with a hair dryer failed to show any problems. The type BC109 transistors were used for convenience, although no doubt many other transistors would work equally well.

Initial access toneburst unit

Nigel V. Hewlett, G8JFT, and Brian Fenwick, G8BTC, have recently developed a hand-portable transceiver for use with the GB3SR 144MHz repeater. The need arose for a simple toneburst activated only for initial access (the GB3SR logic is tone activated and thenceforth carrier operated) and requiring no external switches on the miniscule front panel, but instead operated by a double press on the push-to-talk button: see Fig 13.

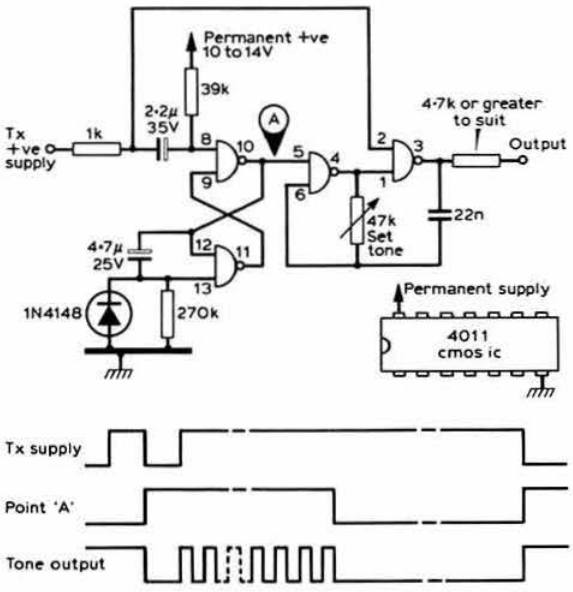


Fig 13. Initial access toneburst unit developed by G8JFT and G8BTC operated by double press on the push-to-talk button of a hand-portable transceiver

The tone pulse lasts 500 – 700ms, but since it originates from the moment the transmitter goes off only about 300 – 500ms are transmitted as the ptt button is rekeyed. The circuit requires a reasonably constant (but not regulated) supply as it is slightly voltage dependent. It consumes negligible current when not active and can be built in a square inch of board with room to spare. □

4-2-70

Graham Knight, GM8FFX*

THIS month's vhf pages start with a tribute to Sam Harris, W1FZJ, who died in Puerto Rico at the end of last year. Sam was a vhf pioneer in the true sense of the word—he was the operator at the east coast end of the first amateur moonbounce contact between W1BU and W6HB in California. W1BU was the callsign of the famed Rhododendron Swamp Society which, under Sam's direction, went on to work KH6UK in Hawaii, thus establishing the first inter-continental QSO. Later in the same year, 1960, contacts with HB9RG in Switzerland and VK3ATN in Australia proved that worldwide dx was possible on the vhf bands by moonbounce. Sam led the way for the present high level of eme activity which now spans all the continents, but even 20 years later no British station has eme capability on 144, 432 and 1,296MHz as Sam had in those pioneering days.

Sam Harris is credited with the first commercial application of parametric amplifiers, and had been associated with the Arecibo Space Research Station for the past 12 years. He wrote many articles which emphasized his calculated and scientific approach to new vhf discoveries, and he was a past vhf editor of both *73* and *QST*. Dana Atchley, W1CF, the president of Microwave Associates once said, "Sam's success was due to his always thinking big—using high power and huge antennas."

Sam did have some of the biggest amateur antennas, some so large that they were mounted on a circular railway track on which a small locomotive chugged its way round to rotate the beam. This system worked well until one day the engine jumped the track and took off into the woods. While at *QST* he coined a phrase which is still often quoted today: "If your antenna stayed up last winter it wasn't big enough". Sam had a ZL-special for 1·8MHz and a bi-square for 3·8MHz, and he used these low frequency bands to arrange moonbounce tests throughout the world. These arrangements could easily have been made on 14MHz but, typically, Sam liked doing things by the more difficult routes.

On a personal note, as a schoolboy long before I became GM8FFX, I sent my first-ever listener report to Sam Harris who replied by return. Later I helped Sam by sending recordings of test signals, and over the ensuing years he took time off from his other activities to send photographs of the dish at Arecibo and, during visits to America, to talk on the air of his latest vhf experiments. These ranged from moonbounce to pulsars and to creating artificial auroras. A friend from those early moonbounce days, Fred Collins, W1FC, phoned *4-2-70* after W1FZJ's death had been announced and summed up the feelings of the many vhf amateurs who have written in since by saying, "He opened up vhf to the world." To Sam's wife Helen, W1HOY, and his son Pat, W1HIV, we pass on the condolences of many European vhf operators.

Microprocessor keyer for GB3VHF

A new microprocessor keyer for GB3VHF at Wrotham in Kent has been built by G4BAU. It uses a Z80 microprocessor to produce a cw and rtty signal which feeds into the oscillator stage of the transmitter, resulting in frequency-shift keying of the transmitter output. The unit is crystal controlled and provides an output of 12wpm on cw at speeds of up to 50 bauds on rtty. Designers of future keyers will be keen to know that the unit takes just 200mA, and when connected to the oscillator the keying voltages are as follows:

Mark (cw and rtty)	10·5V	144·92500MHz
Space (rtty)	8·8V	144·92483MHz
Space (cw)	2·0V	144·92415MHz

The keying information is contained in a microprocessor program stored in a prom. As a result almost any keying sequence of virtually any length is possible. The unit has initially been programmed by G4BAU to the following sequence:

(gap) 15 seconds Mark
(cw) GB3VHF
(rtty) GB3VHF Wrotham, Kent AL52j 51 19 11N 00 17 20E
(gap) 15 seconds Mark
(cw) GB3VHF
(gap) 15 seconds Mark
(cw) GB3VHF
(gap) 15 seconds Mark
(cw) GB3VHF
(gap) 15 seconds Mark
(cw) GB3VHF

The whole sequence repeats approximately every 2·5min, with the latitude and longitude being sent only during the rtty sequence. The beacon keeper at GB3VHF is, of course, Brian Bower, G3COJ, and he hopes to have the G4BAU microprocessor keyer installed soon.

Transequatorial propagation

Professor Martin Harrison, G3USF, of Keele University, who is a member of the RSGB Propagation Studies Committee has received tape recordings from Roland Whiting, 5B4WR, of his first-ever 144MHz te QSO. G3USF has kindly sent *4-2-70* a copy tape of this historic contact which took place at 1800gmt on 10 April 1978 between 5B4WR and ZE2JV. The recorded signals certainly sound unusual—at times almost auroral. Operators familiar with tone-A cw signals would find many similar characteristics on these recordings made many thousands of miles from the auroral zones. The tape also records the rapid flutter and fading on the te signals as described by 5B4WR in August's *4-2-70*. Since that earlier report, 5B4WR has measured the rapidity of this fading on the 50MHz signals received by te from the ZE2JV beacon in Rhodesia. On several occasions this fading has occurred at a regular and recurring rate of 33 cycles per second. Various explanations have appeared in print about this flutter-fade phenomenon, including the recent articles by W1JR in October '78 *QST* and by DJ3KR in December's *Radio Communication*.

Professor Harrison states that 5B4WR and ZE2JV are continuing with their transequatorial experiments and soon he hopes to be able to compare the 5B4-ZE2 recordings with tapes made in other parts of the world. Reports indicate that the flutter and fade characteristics are less noticeable on the te path between YV5ZZ and LU7AAT.

A great deal of scientific interest has been expressed in the amateur transequatorial tests, and the complete dates of reception of the ZE2JV beacon in Cyprus by 5B4WR are now available for the period April to October 1978. These are: 8, 9,

*PO Box 49, Aberdeen AB9 8JA

10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 24, 25, 26, 27, 28, 29 April; 3, 4, 6, 7, 9, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26 May; 1, 2, 3, 4, 5, 10, 11, 12, 21 June; 1, 2, 7, 10, 15, 21, 22, 30 July; 15 August; 15, 16, 17, 18, 19, 20, 21 September; and 1, 2, 10, 11, 14, 15, 16, 17, 18, 19 October.

This is the first time all these dates have been published and they will doubtless make fascinating reading to members who have access to the solar and geomagnetic information for the same period. They certainly do not correspond with the dates of auroral openings, and the single opening for the month of August has no current explanation. We look forward to publishing further te theories from readers, meantime we congratulate 5B4WR and ZE2JV on the success of their trans-equatorial tests. It is truly a remarkable achievement for two amateurs to record and document the fact that on 144MHz a path of 5,978km is open on 72 separate days in a single six-month period.

Beacon information

Brian Bower, G3COJ, the IARU Region 1 beacon co-ordinator, has kindly sent along the information that the crystal is now available to permit GB3GI to move frequency up the band to 144·945MHz. A crystal is awaited to allow GB3VHF to QSY to 144·925MHz. The beacon at ZB2VHF on 50·004MHz will soon be changed to a solid-state device and moved to a good location at the top of the Rock. The 50MHz beacon is at present located at Jimmy Brunson's home QTH which is screened by the Rock towards South Africa. Once it is relocated it will be interesting to find out how often the 50MHz path is open to the south. Even from its present location, ZB2VHF on 50·004MHz has been heard by PY1RO in Brazil, and by LU3EX and LU7DJZ in Venezuela. ZE1AN reports that the ZS6DN beacon is actually on 144·134MHz and not 144·130MHz as reported earlier. Several operators report hearing pings and bursts from OY6VHF on 144·885MHz during the Geminids meteor shower.

50MHz news

PY1RO, in Brazil, worked ZB2BL recently and copied the ZB2BL beacon signals between 2200 and 2300gmt on 1 November. PY1RO is hoping to get permission to operate a 24-hour-a-day beacon on this band in the near future. It is hoped to give further details of this project in next month's *4-2-70,* but the proposed frequency is 50·005MHz. ZS5TR is also reported as having started a beacon project for this band.

Since SMIRK (the Six Metre International Radio Klub) was first mentioned in *4-2-70,* a number of operators have asked for further details of this organization. SWL D. Smith, BRS31301, near Dartford in Kent, is one of those interested in joining SMIRK as he is an avid listener on 28MHz and would like to extend his range to the 50MHz band. He has already ordered a 50MHz Microwave Modules converter and is looking forward to this year's transatlantic tests to Europe. Roger Hargreaves, G3OHH, at Mow Cop in Staffordshire, is another keen to join SMIRK, especially as he already has a beam antenna and receive facilities for 50MHz. GD3UMW, G4ATI, G4FNF and GM4DSZ are also equipped for reception on 50MHz and all four can transmit on 28MHz for crossband contacts should the mufs go high enough in the next few months.

SMIRK membership is available from Ray Clark, K5ZMS, 7158 Stone Fence Drive, San Antonio, Texas 78227. Associate membership is available to non-USA operators for a once-only payment of US$4. SMIRK now has 2,990 members in 36 countries throughout the world. It is doing a marvellous job of promoting international activity on the 50MHz band, and even sponsors its own SMIRK dxpeditions to rare places. During a phone call to *4-2-70,* K5ZMS said he would be very glad to enrol anyone interested in 50MHz in Europe. He also said that signals from Europe in the 41 and 51MHz bands had been heard in San Antonio on 13 December. Are any *4-2-70* readers receiving signals from the USA? Television signals from Europe were received in Australia last year, so the possibilities of vhf dx on this band are almost without limit.

GM8FFX, third from left, with members of St Andrew's University Astronomical Society to whom he gave a talk entitled "Astronomy and vhf amateur radio"

FMD SUPREME AWARD HOLDERS

No	Callsign	Rating	No	Callsign	Rating
1	G3MCS	2 snr + 1 23cm (1970)	14	G3EHM	2 snr + 1 23cm (1976)
2	G5NU	3 snr (1972)	15	G3BW	3 snr (1976)
3	G3ZYC	3 snr (1973)	16	G3OHC	3 snr (1976)
4	G3COJ	3 snr (1973)	17	G3FIJ	3 snr (1977)
5	G4BEL	2 snr + 1 23cm (1973)	18	G4AGE	3 snr (1977)
6	G5DF	3 snr (1974)	19	G8GP**	3 snr (1977)
7	G3DAH*	2 snr + 1 23cm (1974)	20	G4CMT	3 snr (1977)
8	G3ZMD	3 snr (1974)	21	G3OSS	3 snr (1978)
9	G3NHE**	3 snr (1974)	22	G3CO	3 snr (1978)
10	GD2HDZ	3 snr (1975)	23	G8IL	3 snr (1978)
11	G5UM	3 snr (1975)	24	G4BYP	3 snr (1978)
12	G3XBY	3 snr (1975)	25	G3HCW	2 snr + 1 23cm (1978)
13	G3JXN	2 snr + 1 23cm (1976)			

* = 70MHz Senior subsequently earned
** = 1,296MHz Standard Award subsequently earned

Awards

Three 70MHz certificates have been issued in quick succession by the vhf awards manager, G5UM. They were No 132 to G4ERX in Essex, No 133 to G3BTO of Hampshire, and a separate award, No 134, to G3BTO for his portable activities. The last two awards were endorsed "CW only" and the vhf awards manager will, on request, endorse certificates this way. Standard Transmitting Award No 520 went to G8LWP for his work on 144MHz, and 144MHz Senior No 133 was attained by Ray Elliot, G4ERX.

Details were given in last month's *4-2-70* of the new QTH Squares Award which is now obtainable along with the FMD Awards. Members who are collecting cards for the Standard, Senior and Supreme Awards need not feel that their imminent claims will be invalidated. It is anticipated that the previously available awards will continue alongside the new QTH Square Award for a considerable time.

A list of all the holders of the Supreme Award appears on this page. It will be noted that five were issued in 1978 and that so far no Class B operator has claimed a Supreme.

Meteor scatter

A very hoarse Alistair Simpson, GM8NCM, telephoned the *4-2-70* telephone answering machine to say he had been quite successful on meteor scatter ssb during the Geminids meteor shower. He had just finished six hours of operating during which he had been speaking for almost 50 per cent of the time. A 1,259km contact with DJ3TF in FJ50g took almost two hours to complete between 0400 and 0553gmt on 13 December. Next day, a contact with SM3FGL (IV53g) at a distance of 1,264km took just 21min to complete, and a 1,647km QSO with YU3TCD (GF37d) took 25min. These long-distance ms contacts took place on the morning of 14 December close to the time of the predicted maximum number of meteors to be seen by visual observers. Later in the evening, contacts were completed with DC7UT in GM37c, and with I1KTC in EF44g at a distance of 1,445km. Some operators were disappointed with the Geminids, and most found contacts were only possible over the above two-day period.

Dave Redman, G8HYQ, worked OE5VHL on sideband ms, and reports hearing very strong bursts from OE3LBC and DF6NA. Clive Morton, G4CMV, at Leeds, took just 10 min to complete an ssb contact with SM3COL in IW square. G4CMV also had a most interesting contact with EA6BW to give him another new country on 144MHz. There is not much chance of working the Balearic Islands under normal circumstances, so Clive was indeed fortunate to work EA6BW. The contact took between 0400 and 0530gmt, and 2 6 reports were exchanged, with G4CMV receiving all his details in 15 bursts and 8 pings. Some European stations had set up long-distance schedules with stations as far away as UA3LBO, but so far no successful completed contacts have been reported to *4-2-70*.

Repeater status report

Many changes have taken place since the last repeater report was published in December 1977. At that time there was a Home Office embargo on all repeater licensing, but following representations this ruling was rescinded. In September 1978, 19 more 433MHz repeaters were licensed, including GB3PT the first British rtty repeater. As a result of further negotiations the Home Office licensed the outstanding Phase 2 144MHz units. Many of these recently-licensed units are now on the air and the status of all repeaters and of the outstanding repeater applications are detailed in the table on page i of the supplement.

It is interesting to note that the RSGB is now the licensee for 104 repeaters, 80 of which are fully operational and the remaining 24 licensed but not yet on the air. It is regretted that a few units which have been licensed for more than a year are not yet operational; this matter is receiving the attention of the VHF Committee and its Repeater Working Group. Of the 139 repeater applications currently on file at RSGB headquarters, 35 are not yet licensed. In one case, GB3AT, the licence was refused by the Home Office, and the GB3SA proposal has been withdrawn by the group itself. Apart from the microwave, crossband and other special case applications, only one recently received proposal is unlicensed, for a 432MHz repeater for Wolverhampton.

Considering the number of repeaters and potential users, surprisingly few letters are sent to *4-2-70* about repeaters, eg only one photograph from a repeater group in the last 2½ years. The Society and repeater groups certainly do come in for a great deal of unwarranted criticism from some repeater users. These complainants forget the work done by the various RSGB committees and, in particular, that done by the telecommunications liaison officer, before their local repeater even obtained a licence. Some groups have reported a decline in membership once the repeater is on the air, and this suggests that users can forget that maintaining a repeater in service is a continuous operation which deserves the support of regular users.

70MHz

The 70MHz band seems to be enjoying a considerable upsurge in activity. Many operators are finding signals reflected by the aurora much easier to read on this band, and some operators have been making meteor scatter contacts. Colin Woolf, G3SPJ, in London, worked Iain McHardy, GM3JFG, in far away Fortrose, by ms, and both operators have told *4-2-70* about the strong bursts which enabled these contacts to take place. GM3JFG was simultaneously monitoring on 144MHz, and reports much stronger and longer bursts on the lower band.

G3UUT, G4AEZ, G4GED, GM4DIJ and GM3WOJ all state that they are looking for stations on 70MHz and are willing to keep schedules with them. Brian Howie, GM4DIJ, along with other members of the Lothians Radio Society, has been very

active on 70MHz; he reports that G stations often break into their local contacts. GM3YOR, in Kirkcaldy, and EI6AS have also been very active on 70MHz, with many *4-2-70* correspondents mentioning their outstanding signals.

CW activity nights

Edmund Ramm, DK3UZ, writes to say he stared with disbelief at a recent item about Monday nights being cw activity nights. Apparently it has been the practice for the last eight years to hold the German 144MHz activity nights on Tuesdays. Edmund suggests that all the European vhf managers choose the same cw activity night at the next IARU Region 1 conference. DK3UZ makes the very good point that this would result in a considerable increase in cw activity if a co-ordinated day was chosen.

DK3UZ also sends further information about the AGCW-DL Awards which were detailed in *4-2-70* in November 1978. The 125-CW Award is for vhf contacts only, but all the other awards are obtainable for all-band cw operation. DK3UZ finds the CW-1000 a particularly difficult award to achieve, even for those operators active in cw contests.

Auroral reports

Many of the auroras which have occurred recently have been weak and confined to stations in Scotland and Northern Ireland. The most recent dates to be added to the calendar printed in *4-2-70* (September 1978) are as follows: visual displays observed on 11, 18, 25 and 30 December, and radio events occurred on 18, 19, 20, 24, 25, 26, 28, 29 and 30 December. Many of these events were forecast in the solar and geomagnetic reports prepared by G2FKZ and broadcast in the GB2RS News Bulletin. Reports are still coming about the large-scale event on 25 November; Stuart Lindsay, G3ZCE, of Stockport, stayed on cw throughout this event and was rewarded with many contacts, including DF2ZL (DK50d), DK2AM (EN41g), LA6HL (CS09j), PA0ZWR (CM72j), SM0CPA (IT60j), SM1BSA (JR22e) and, best of all, SP2GGZ in QTH square JO43c. Stuart was very pleased to participate in this aurora as his location at YN50a is poor for normal tropospheric dx; during the event he worked six new countries with just 50W of cw.

The beginning of December was very quiet for auroras, with very low levels of geomagnetic activity. A visual aurora which was seen as far south as Northern Ireland was observed on 11 December, a day on which the Ap figure was 1. Although no radio event was reported on this day, the visual reports caused some head scratching at the QTH of auroral co-ordinator Charlie Newton, G2FKZ. He was already thinking about some of the dates already published in the auroral calendar, as radio events had been reported which did not coincide with the usual changes in the magnetic indices. The radio events which did not fit the usual pattern were mainly confined to northern stations, and on some of those occasions separate visual sightings had also been observed. G2FKZ is very interested in these auroras which have taken place when the Ap figures are low, and he asks any operators who participated in events on 2, 8, 10 October; 7, 8, 24 November; 1, 24, 27, 30 December 1977; and 23, 24 January and 29 April 1978, to send details of log entries.

Another aurora which is of great interest to the Propagation Studies Committee is the event which occurred on 18 December. This aurora was both a visual and radio event and was first noticed by GM3UU at 1650gmt. GM3UU worked G6GN in Bristol, and LA3WU, and heard SM4FXR, SM0DJW, SM4FXR and EI5BH; all signals peaked on a beam heading of 30°. Driving to his home 12 miles north of Aberdeen, GM3ZBE could see the aurora very brightly to the west of north. By 2000gmt signals on 144MHz had faded out, but GM8NCM and GM8FFX could still work each other, and both heard only DL0PR by beaming 330°. Careful checks by both stations confirmed that auroral signals could only be heard at this time by beaming west of north, and that no other beacons could be heard. Later, at 2200, a more normal aurora returned with signals back to beam headings of 30° to 40°.

GM8NCM was at home from university during the holidays and found several weak auroras taking place in the afternoons, often when only GB3LER could be heard, and then the only possible contact was GM8LHE in Elgin. He has now equipped himself with a 50MHz converter and finds many of the Channel 2 signals from the Norwegian and Swedish television stations are good indicators of impending 144MHz auroras. On 29 December signals in the 50MHz band were auroral from 0930gmt. OH3AXW telephoned warnings to GM8NCM on 26 and 28 December, giving Alistair about one hour's warning of the impending auroras.

The aurora on 29 December started at 1700gmt and waxed and waned during the evening. GM8BKE, GM8DMZ and GM3ZSS were all strong signals working stations in LA and SM and some DLs. No contacts are reported via the aurora on 432MHz, but 70MHz has been very active, with GM3JFG working pile-ups of stations including G3BHW, G4AEZ, G3OSS and EI6AS. This month's auroral report ends with a reminder that Charlie Newton, G2FKZ, will be talking about the latest auroral theories at the RSGB National VHF Convention on 10 March.

Late news

Two further convictions in the Manchester area following illegal transmissions on the 145MHz band—T. A. Eaton was fined £15, and D. C. Priestner was fined £75; an FT223 was also forfeited.

The Quadrantids meteor shower did not come up to many operators' expectations, as several schedules with stations in Russia were incomplete. G4DEZ managed to work 10 countries on ssb during the shower and had contacted three more during the auroras in the first week of January. Will G4DEZ be the first to qualify for the new RSGB QTH Squares Award? During the Quadrantids G3IMV worked OH3YW on cw, while G8HYQ and G8MJG stayed on ssb to contact DM2BYE and DL7HM.

Five auroral events occurred in the first seven days of January. The events on 2, 3 and 5 were confined to northern stations, but large-scale events occurred on 4 and 7 January. GM4BYT worked OH0JD on Aaland Island, and G8RCF in southerly locator YK15j was able to work Scottish stations. OY5NS was an outstanding signal on both cw and ssb during the event on 7 January, with the signals from the Faeroes peaking on a beam heading of 330° at Aberdeen. Many stations throughout the UK which took part in this event worked SM, LA, OZ, DL, PA0 and F, and GM3ZBE reports seeing a very bright visual display at 1900gmt when rays and ribbons of red, blue and green were predominant in the northern sky with a "humbar" ripple effect.

Three new repeaters are now operational, GB3HC (RB6) at Hereford, GB3SP (RB4) Pembroke, and GB3PR (R3) at Perth. □

microwaves

Charles Suckling, G3WDG *

1979 RSGB National VHF Convention

The Microwave Committee is organizing three lectures at the RSGB National VHF Convention. These will be "Getting the best out of your receiving system" by Charles Suckling, G3WDG; "Microstrip techniques" by Peter Tunbridge, G8DEK, and "Operating microwave equipment in the field" by Hugh Griffiths, G4CNV. In the first two lectures it is hoped to describe techniques which are useful not only at microwave frequencies, but also at vhf and uhf.

Winchester round table

A round table meeting was held at Winchester on 3 December, and was attended by about 50 people, including two visitors from France, F1DPC and F1DCZ.

In the morning session G3WDG outlined the microwave contests planned for 1979, including the 10GHz Cumulative Contest, and the Microwave Cumulative Contest. It was announced that the RSGB Council had agreed to allow non-RSGB members to enter the 10GHz event from abroad, and it is hoped that this will encourage more entries from outside the UK. G3JHM reported that he had forwarded a number of claims to the QTH-locator tables in *DUBUS*, to reflect the level of 10GHz activity in the UK.

In the discussion session which followed, G3KSU made a plea for more reception reports of the GB3IOW 1·3GHz beacon, which can be sent to him direct, or to the writer. G8ANZ reported that he has been experimenting with the G8APP Gunn oscillator (described in *Radio Communication* June 1978 p493). He has replaced the short circuit behind the Gunn diode by a 0·9 by 0·4in block of ferrite, which resulted in a much flatter power output versus frequency characteristic. Another point concerning Gunn oscillators, made at the previous meeting by G3IFF, is particularly worthy of note at this time of year. He has found that certain types of oscillator cease to function below 5°C, which suggests that perhaps steps should be taken to keep Gunn oscillators warm when operating in very cold weather.

In the afternoon session on measurement techniques, G3WDG outlined methods of optimizing receiver performance, and described how the G4COM "Alignment aid for vhf receivers" (*Radio Communication* January 1976) can be used for setting up microwave receivers. Some modifications to the design were described, including a simple noise source for 10GHz, and a more powerful noise source for 0-1GHz. Details of these modifications will be published in due course.

G4CNV then discussed the measurement of swr in waveguide, and showed how a slotted line can be used to do this, provided that it has a calibrated detector. He demonstrated the swr of various "matched" loads, short circuits and antennas.

Once again, many thanks to Anne and Don Hayter for organizing a most enjoyable meeting.

*Physical Chemistry Laboratory, South Parks Road, Oxford OX1 3QZ.

More enhanced propagation on 10GHz

Last month in *Microwaves* some results were reported of enhanced conditions over the Oxford-Hayling Island path. The meteorological conditions occurring during the 12 November lift have been analysed by G8AGN, and it appears that a cold front was passing over the path at the time that the test was being carried out. The fading on the signals was considerably more severe than usual, giving the cw and ssb signals an almost auroral quality, suggesting a very high level of turbulence in the "duct".

The apparent correlation between weather fronts and enhanced propagation has been mentioned before in *Microwaves* (November 1978), and this would appear to be another case of the same effect. In another lift, on 11 December, G3JVL again noticed that he could hear G3YGF/A's signals over a broader range of beam headings than usual, and this time the fading became worse as the antenna was turned off the direct path.

As these tests continue it is hoped that more data will be collected, so that eventually it may prove possible to predict good conditions based on a knowledge of the prevailing weather conditions.

The 1978 Fraser Shepherd Award

The 1978 Fraser Shepherd Award was presented to Simon Freeman, G3LQR, at the 1978 RSGB AGM. Simon is, of course, well known for his outstanding results on 1·3, 2·3 and 3·4GHz, and is the current holder of two European records, on 2·3 and 3·4GHz. He has operated regularly on the lower microwave bands for many years, and was among the first to use ssb on 1·3 and 2·3GHz. He has been ready to exploit almost every tropo opening which has occurred, resulting in a large number of excellent dx contacts. He is the leader of the 1·3GHz QTH locator squares table in *DUBUS*, with 51 squares worked. It is fitting that he should have been presented with this award in the same year in which he passed two significant milestones—50 squares on 1·3GHz, and the 400km mark on 3·4GHz; the latter also makes him eligible for the first microwave distance award on this band!

Polarization of GB3DD

BRS34348 has been making some observations of the incoming polarization of signals on 1·3GHz, and was surprised to discover that the Dunstable Downs beacon GB3DD was almost vertically polarized. The writer has observed a similar effect, and it seems likely that the slanted polarization is due to some effect of the mounting structure of the nominally horizontally-polarized HB9CV-type antenna. Work is in hand to rectify the problem.

EME activity on 1·3GHz

Since the closing down of the Crawford Hills VHF Club, W2NFA, in 1974, which provided much of the stimulus for 1·3GHz moonbounce operation, there has been very little eme activity on this band. However, information gleaned from the K2UYH 432MHz eme newsletter suggests that activity is on the increase again, with several stations on the verge of becoming operational.

In the last few months, in fact, PA0SSB and W6YFK have made at least one eme contact. No details of the signal strength

(Continued on p141)

Band planning—

145·8 to 146MHz

by TOM DOUGLAS, G3BA, VHF Committee chairman, and IAN WHITE, G3SEK, VHF manager

TO the average amateur who is more interested in day-to-day operation than in breaking new ground or in matters of principle and policy, the goings-on at conferences of the International Amateur Radio Union may seem of little practical concern. But the decision last April to recommend the allocation of 145·8–146MHz exclusively to the amateur satellite service affects *everyone* who uses those frequencies.

Note the word "recommend". Neither IARU, nor RSGB as a member society, presumes to order individual amateurs about. All amateurs are licensed to transmit anywhere within a given band; but how well they exercise that freedom is a test of their fitness to have amateur bands at all.

The satellite service is also free, in principle, to operate anywhere between 144 and 146MHz. In practice, however, it can only use those parts of the band which can be freed on a world-wide basis, and that at present means 145·8–146MHz. Until the satellite allocations which amateurs need in the microwave bands are obtained, all present and future satellites will have to use 145·8–146MHz as uplink or downlink.

Until recently the satellites seemed to get by with other users of those frequencies, so why not now? The answer lies with the two new Russian satellites, RS1 and RS2, which are designed to be usable by Russian amateurs who are restricted to 5W output. Consequently they will relay virtually any transmission in their uplink passbands, no matter how low-power, but anything stronger than a 5W signal will shut the transponder down completely. This happens almost every time the satellites pass over western Europe, so for the benefit of other amateurs the time to leave 145·8–146MHz free for satellite working is *now*.

In practice this throws up all manner of problems. One is that most countries are having to move their repeaters off R8 and R9; fortunately the RSGB saw the problem coming and UK amateurs are spared that trauma. Another stems from the early days of 144MHz band planning, when the higher frequency end of the band was almost the exclusive area of operation of Scottish and northern England stations, and although new plans have come and gone, there are still a very large number of operators who use 145·8MHz in particular as well as frequencies between 145·8 and 146MHz. Raynet has also used 145·8MHz for a very long time for its particular purposes.

With such a well established situation in being, it is obvious that a move to clear the frequencies concerned will, for many, be far from an easy or popular one. One can already visualize the reaction of the 145·8MHz adherents to the very thought of making a move, and the fiery cross will be abroad in the highlands and glens of GM to muster the faithful to the cause of burning the VHF Committee at the stake. Cries of "dictatorship" will be heard throughout the border counties and the north!

If amateurs consider themselves responsible people who can see beyond their own particular interests, they should be prepared to make the move. There is plenty of space, and a band plan to suggest where to resettle. Those who favour fm should move to one of the simplex channels above 145MHz for preference, or to the all-mode section of the band plan, published in the July 1978 issue of *Radio Communication*, where a.m. also finds a home. The gradual phasing-out of 145·8MHz as a Raynet inter-county channel has been agreed between the Raynet and VHF committees, with moves to the Raynet channels between 144·8 and 144·875MHz as the intent.

Probably the main source of irritation whenever there is a change in band plans is the need to buy new crystals, which is why such changes are not made lightly. But if it is recognized that the root of the problem lies in the inflexibility of the station bound to a single cherished "rock", maybe the answer lies in more versatile forms of frequency control.

Therefore, amateurs should take this opportunity to fill some of these empty simplex channels from S10 to S19 if they are fm addicts, or take their carriers and two sidebands to the all-mode zone where they can demonstrate the superiority of a.m. over fm for the weak signal traffic, and with less bandwidth too! Perhaps they might like to abandon a.m. and fm altogether and join the ssb and cw gang in the dx zones! Or can we suggest that they join in now on the ground floor of future communication via satellite, and make use of the sector 145·8 to 146MHz to get their feet wet? No matter what the feelings of the individual amateur are in the matter of band plans and their changes, it is only in a spirit of co-operation and understanding of the other amateur's needs as well as one's own that all amateurs will get anywhere in harmony. □

MICROWAVES

(Continued from p140)

are known, but in view of the equipment in use (PA0SSB is running 500W output from a ring of six 2C39s into a 20ft dish, and W6YFK is running 900W output from a klystron amplifier into an 18ft dish, and a 1·2dB nf GaAs fet preamp), they should have been quite substantial. These equipment parameters are adequate for 432MHz, where, using the same equipment, signals would be 9dB weaker!

As an example of the good signal strengths which can be obtained on 1·3GHz eme, WA2LTM, using the 28ft dish at K2UYH and a 1·0dB nf GaAs fet preamp, recently copied both PA0SSB and W6YFK at 539. A two-way contact was made on 19 November with W6YFK, using 450W output at WA2LTM.

Power generation appears to be the biggest problem with 1·3GHz eme. The current trend seems to be towards using six ceramic 2C39 type valves in parallel, in the UPX-4 amplifier design of W2IMU. Plans and mechanical parts for this amplifier are obtainable from OZ9CR. However, there is no reason why contacts should not be possible at the 100W level with the more well-equipped stations. This is readily obtainable from a pair of 2C39s in the WB6IOM design, which is much less of a problem to construct.

In a recent contact with the K3NSS group on 14MHz, the writer learned that they hope to be operational soon on 1·3GHz eme, a most exciting prospect in view of their 84ft dish. □

An initial look at the RS telemetry

by P. T. GREED, G3MQD*

SINCE early summer 1977 it had been known that the Soviet Union intended to place an OSCAR (Orbiting Satellite Carrying Amateur Radio) type satellite into orbit, but when the event took place at the end of October 1978 two Oscar satellites, not one, code-named RS1 and RS2 went into orbit.

The author had been prepared to hear a Russian Oscar operating a downlink and beacon in the 29MHz band and had speculated on the type and form of the telemetry system likely to be used. It seemed probable that some form of pulse duration modulation (pdm) would be used, and as the satellite was to be an Oscar type there was a good chance of this being in morse code.

From the study of previous Oscar telemetry, it was noticed that the telemetry parameters can be subdivided into various groups and types. For instance there is a certain group of parameters which is used more often than others; these can be considered to be the "good-housekeeping" parameters, and although some parameters' measurements vary little if at all, some vary from orbit to orbit, while others may vary during an orbital pass. Based on how these parameters vary, one may attempt to deduce the type of system being monitored.

Receiving the first set of telemetry data on 29·401MHz on the evening of 29 October, it was reassuring that the telemetry was indeed in morse code and being sent at about 14wpm. However, the signals did differ from previous Oscars as both letters and numerals were transmitted. Each channel consisting of four characters; a letter, two figures and a letter. After 15 such channels "RS" was sent; this feature being similar to the interframe identification signal of "HI" sent by Oscar 8. The first character, a letter, changed in a fixed sequence throughout the 15 channels and so appeared to be the channel identifier.

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Table 1. First pass telemetry

P01U C17U F34U Z33U L81U B45U H37U 015U W41U K01U U37U G01U R17U D01U S49U RS
P73K C73K F72K Z73K L01K B31K H50K 037K W50K K01K U42K G32K R46K D01K S40K RS

P01U C17U F34U Z32U L83U B45U H37U 007U W08U K07U U11U G01U R17U D01U S27U RS
P73K C73K F72K Z73K L01K B31K H38K 001K W04K K05K U38K G01K R07K D07K S23K RS

P01U C17U F33U Z32U L84U B45U H38U 012U W12U K11U U10U G01U R17U D01U S22U RS
P73K C73K F73K Z73K L01K B31K H52K 010K W10K K10K U15K G10K R10K D10K S17K RS

However, there seemed initially to be no obvious alphabetic sequence in the choice of these characters. The letters being:

P C F Z L B H O W K U G R D S

(Of course, there was a good reason. See Appendix A).

The fourth character, also a letter, was noticed to alternate between U and K, being U throughout one set of 15 channels and K throughout the next set, and so on. Inspecting the second and third characters, ie the two figures, it was apparent that there was possibly a 30-channel sequence, with U and K used to distinguish which 15-channel sub-frame was being sent. An extract of the telemetry of this pass is given in Table 1.

Very little can be deduced from one pass regarding the type of parameter being measured by any particular channel, but from this pass it was possible to make an initial sub-grouping of the channels as follows:

(1) Channels giving constant or near constant readings

P C F Z L B H . . . . G R D . U sub-frame
P C F Z L B . . . . . K sub-frame

(2) Channels giving the minimum reading 01

P . . . . . G . D . U sub-frame
. . . . L . . . . . . K sub-frame

(3) Channels significantly changing

. . . . . O W K U . . . S U sub-frame
. . . . . H O W K U G R D S K sub-frame

The telemetry received on 30 October between 1929 and 1953gmt showed a clear relationship between channels:

. . . . . U . . . . U sub-frame
. . . . . U . . . S K sub-frame

It appeared that these were measuring the same parameter for they came on, (rose from 01) in sequence and increased together in numerical sequence. There was a similar variation and relationship between channels:

. . . . . O . . . . . U sub-frame
. . . . . O . . . G . . . K sub-frame

and

. . . . . W . . . . . U sub-frame
. . . . . W . . . R . . K sub-frame

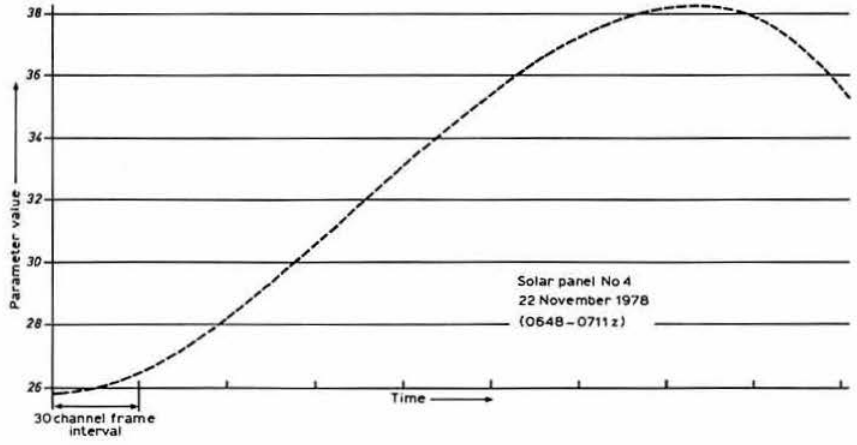


Fig 1. A sample of the variation given by solar panel No 4

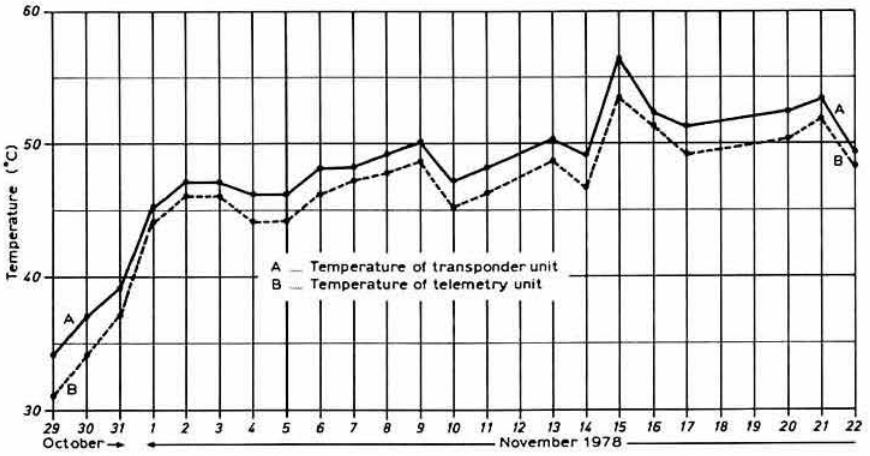


Fig 2. Variations of channels F and Z up to the end of November 1978

So a pattern had emerged regarding certain of the channels which had initially been sub-grouped as channels varying during a pass. Looking at this original sub-group another similarly spaced triplet seemed possible. That of channels

. . . . . K . . . . . U sub-frame
. . . . . K . . . D . K sub-frame

Inspecting the 30 October pass, all three channels were recording 01, but on referring to the previous day's pass there was indeed a similar relationship between the values for these channels. By good luck, the four solar-panel sampling channels had been identified from inspecting the telemetry signals from just two passes. Thus 12 of the 30 channels had been allocated a function.

An interesting feature of the telemetry sampling of these solar panels is the irregularity of the sampling throughout the 30-channel frame. If it is considered that the time required to send the 30 channels plus the two identification RSs is 32 units, then each solar panel is sampled at intervals of 4, 12, 16, 4, 12, 16, 4, 12, 16 units, and so on. Why this irregular sampling? If one wishes to monitor the variation of a parameter it is necessary for that parameter to be sampled at a rate of at least twice that of the variation expected. Were the Russians not sure of the expected tumbling rate of these satellites? Or is there another explanation? A sample of the variation given by what is now known to be solar panel No 4 is given in Fig 1.

It was noted from the 30 October telemetry, and verified by all other telemetry reports, that the numerical value of channels C and R of the U sub-frame were identical; thus it was concluded that the same parameter was being monitored. Also that channel S of the U sub-frame was identical to channel H of the K sub-frame.

It was on 1 November that a different format of telemetry frame, consisting of only seven channels, was recorded. The numerical values indicating not only that consecutive frames monitored the same parameters but that these seven channels were the first seven channels of the U sub-frame of the 30-channel format. This was confirmed when it broke into one complete 15-channel U frame. As these seven channels were being monitored in both telemetry formats it seemed that the good-housekeeping channels had now identified themselves. What parameters might one expect to be included in such a set of channels? By referring to previous Oscars it would seem that they would be those of temperature, voltage and, perhaps, power of the transmitter. By observing these seven channels over many passes it became apparent that the temperature channels were possibly F and Z. While probably channels L, B and H were voltage parameters. Channel P never moved off 01, so that left channel C as the possible power parameter, if one existed. Indeed, channels F and Z were, respectively, the transmitter temperature and transponder package temperature. Fig 2 shows the variation of these channels up to the end of November.

An interesting feature of this short frame format is the behaviour of the fourth character. It is not necessarily constant throughout a frame nor constant for the same channel in consecutive frames, changing between U and an S (see Appendix B). The variation of this fourth character for the pass at 1938 to 2002gmt on 1 November is shown in Fig 3. A high level representing S, a low level U.

While the author was inspecting the telemetry, his students were taking measurements of the doppler shift. Being in a higher orbit than previous Oscars, the doppler shift was less, but using the method referred to in "Observing radio satellites," *Radio Communication* June 1978, good doppler shift curves were obtained (see Fig 4), and the time of closest

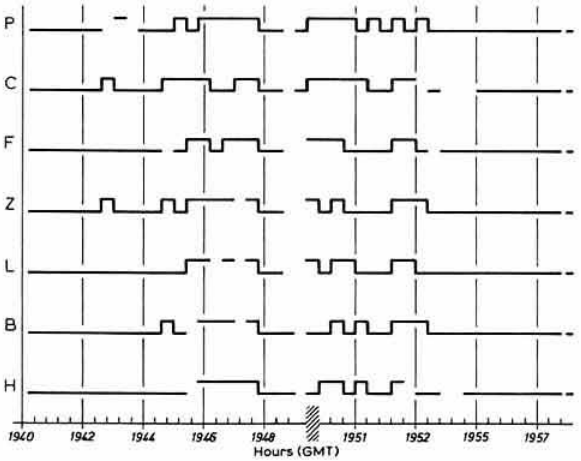


Fig 3. Variation of the fourth character for a pass on 1 November 1978

approach (tca) determined, together with an initial estimate of the slant distance to the satellite.

The students were also endeavouring to track back to a Russian launch site using initial orbital parameters and so determine the actual orbit number, which was in some doubt at that time. On tracking back it was ascertained that the satellites were launched from Plesetsk, and the time estimated for the virtual ascending node for orbit 0 was 0637gmt 26 October; confirming that the orbit number for the pass referred to on 29 October was 43.

On 8 November a part frame with the fourth character being W was received before the morse code telemetry discontinued, and was apparently replaced with a high speed pulse transmission. On 15 November complete short frames ending in two RSs, and having as the fourth character the letter W, were recorded. The associated numerical values being consistent with the good-housekeeping channels, but with a significant increase in channel C which was thought possibly to be the power parameter. It was another couple of weeks before a complete 30-channel format containing the double RS identifier was recorded, and this indeed did confirm the significant high value for the C channel of the W sub-frame, and that when the double identifier was being used the other sub-frame had as its fourth character the letter O.

It has since been confirmed that when the double RS identifier is used the transponder is switched on, and this accounts for the increased reading in channel C of the W sub-frame. The sub-frame fourth characters being changed from U and K to W and O when the transponder is on. A change of the fourth character between W and R has been reported when the short frame format is being used.

Unlike Oscars 7 and 8, which could easily be distinguished from each other by their "HI-HI" and "HI" identifiers, both

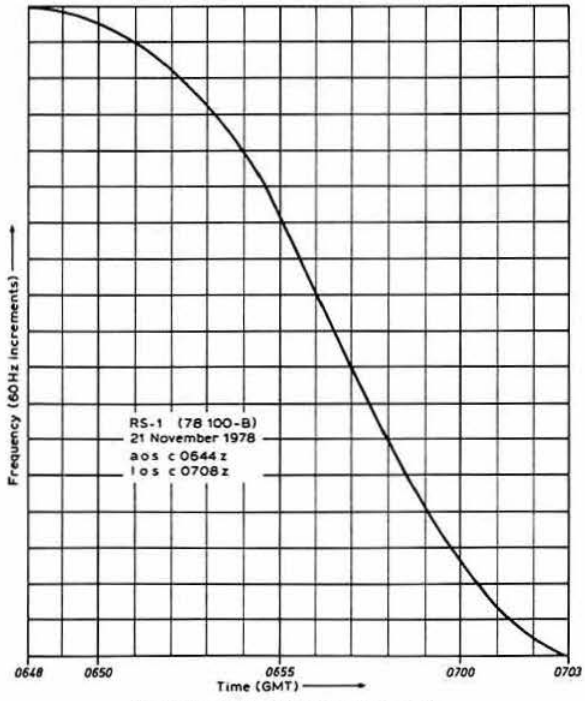


Fig 4. Doppler shift measurements

Table 2. Full cycle data

Channel	Letter	Parameter	Measurement limits	Decoding formula
01	P	Calibration signal	01	—
02	C	Repeater rf output	60 .. 990	10N
03	F	Transmitter temperature	−30 .. +80	N
04	Z	Telemetry equipment temperature	−30 .. +80	N
05	L	Power supply voltage	+11 .. 18	0·2N
06	B	9V regulated voltage	+8·5 .. 9·5	0·2N
07	H	7·6V regulated voltage	+7·0 .. 8·0	0·2N
08	O	No 1 solar panel voltage	01 .. 95	—
09	W	No 2 solar panel voltage	01 .. 95	—
10	K	No 3 solar panel voltage	01 .. 95	—
11	U	No 4 solar panel voltage	01 .. 95	—
12	G	Calibration signal	01	—
13	R	Repeater rf output	60 .. 990	10N
14	D	Ground voltage	01 ..	—
15	S	Battery charge current	0 .. 500	10 (50-N)
16	P	Battery No 1 voltage	+11 .. 18	0·2 (N + 12)
17	C	Battery No 2 voltage	+11 .. 18	0·2 (N + 12)
18	F	Battery No 3 voltage	+11 .. 18	0·2 (N + 12)
19	Z	Battery No 4 voltage	+11 .. 18	0·2 (N + 12)
20	L	Calibration signal	01 ..	—
21	B	Battery switch unit temperature	−30 .. +80	N
22	H	Battery charge current	0 .. 500	10 (50-N)
23	O	No 1 solar panel voltage	01 .. 95	—
24	W	No 2 solar panel voltage	01 .. 95	—
25	K	No 3 solar panel voltage	01 .. 95	—
26	U	No 4 solar panel voltage	01 .. 95	—
27	G	No 1 solar panel voltage	01 .. 95	—
28	R	No 2 solar panel voltage	01 .. 95	—
29	D	No 3 solar panel voltage	01 .. 95	—
30	S	No 4 solar panel voltage	01 .. 95	—

RS Oscars have identical telemetry formats. They do, however, have slightly different orbital parameters and this, initially, will distinguish between them, as they are moving apart time-wise. However, the temperatures of the two satellites are significantly different at present, and channel H of the U (and possibly W) sub-frame for the lagging satellite seems to be stuck on 01.

RS telemetry

The telemetry for the RS1 beacon operating on 29·401MHz (±doppler effect) uses morse code sent at about 70 characters per minute with a power of 100mW. A full cycle of telemetry data consists of 30 time-divided channels. Information in each channel consists of four characters. Address (one letter) a two-part decimal number "N" (a quantified indication of a telemetric parameter), and a repeater operation indicator. A full cycle consists of two half-cycles of 15 channels each, separated by callsign RS, transmitted twice when the repeater is on and once if it is off. The first cycle is indicated by the letters W [repeater on] and U [repeater off], and the second half-cycle by the letters O and K respectively. On command from the control centre, a shortened cycle consisting of the first seven channels is transmitted.

In Table 2, output power is in milliwatts (to a maximum of 990mW), temperatures in degrees centigrade, and current in milliamperes.

Acknowledgement

The author would like to thank G2UK, G4JJ, G8SC, G3ASM and G3WDI for the many telemetry reports they have sent to him. He had available telemetry reports on over 80 of the first 350 orbits, many thanks.

Appendix A

Extract from *Observers' Forum No 41* by Geoffrey Perry.

4. The first characters of each group are always in the following sequence:

P C F Z L B H O W K U G R D S

The first seven of these morse characters consist of four bits (dots and dashes). The remaining eight characters consist of three bits. It is suggested that two sub-frames, of seven and eight groups respectively, exist. Replacing the dots by binary 0 and the dashes by binary 1 and, as with the morse code telemetry from the second generation reconnaissance Cosmos satellites, interpreting the results as binary numbers transmitted in the opposite sense to that used conventionally, one obtains the following sequence of numbers:

6 5 4 3 2 1 0 7 6 5 4 3 2 1 0

The position of a group within a frame is thus fixed unambiguously.

Appendix B

Extract from *Observers' Forum No 42* by Peter Greed.

5. When the complete frame of 15 channels is being sent the final character is constant throughout the frame. If for one frame this character is K, for the next frame it is U, the next K, and so on, alternating between K and U on successive frames. The numerical values, the second and third characters, being significantly different for some channels between the K and U frames, suggest the possibility of a 30-channel sequence.

When a short frame, containing P C F Z L B H channels (ie all the four-bit characters) is being transmitted, the final character may differ between successive channels in the same frame or between the same channel in successive frames. The numerical values of the short frame indicate that the systems being monitored are those of the first seven channels of the 15-channel U frame. Thus the fourth character of the short frame would seem to have special significance.

These appendices are extracts from *Satellite Observation Notes* published by the Science Research Council, dated 13 November 1978. □

NEW PRODUCTS

Miniature fan

A miniature high-performance axial fan, designed to provide cooling and ventilation for small cabinets and electronic circuitry, has been introduced by Airflow Developments Limited. Designated the type MF55, the low voltage fan is capable of moving up to 30cfm (52m³/h) of air. Measuring only 62 by 62 by 45mm (2·4 by 2·4 by 1·8in) overall, including the motor, the fan is suitable for mounting within racks, cases and cabinets having high component packing densities. This compact design and an overall weight of approximately 150g make it particularly suitable for use in portable equipment.

The long-life brushless motor is used in association with a small solid-state power module about the size of a matchbox. Fan performance can be controlled by adjusting the input voltage to the module. Although power requirement is nominally 2·6W at 12V dc, supply voltage may vary between 8 and 16V with corresponding variations in performance. Nominal fan speed is from 3,500 to 6,500 rpm. Because the motor has special sintered bearings and a brushless design, very little mechanical or electrical noise, or magnetic interference, is produced during operation.

Mounting is extremely simple. The flat face of the frame contains four mounting holes on a 50mm square, and the fan will operate in any position to suit the application. Further information from: Airflow Developments Ltd, Lancaster Road, High Wycombe, Bucks HP12 3QP. Tel: 0494 25252.

Power multimeter

ALCON Instruments announce what is probably the first electronically protected multimeter designed specifically for the electrical and power engineer. Called the Superelectro, the new meter is a member of the Miselco Tester family. Current measuring facilities on both ac and dc extend up to 30A, with voltage facilities up to 1kV on both. On ac the voltage ranges extend down to 10V, while the dc ranges are carried on down to 100mV. On dc current the ranges extend down to 100μA, although the ac limit is 3mA. There are three resistance ranges covering from 0 to 10kΩ, 100kΩ, and 1MΩ. In addition, the

instrument is calibrated for power measurements from −10 to +61dB.

The most important advance which this instrument represents is the inclusion of an electronic cut-out module, itself replaceable in line with the Tester practice, capable of providing movement protection both simply and reliably. As the name implies, the cut-out is resettable simply by returning a small red button to the reset position. Operation of the cut-out occurs when the applied energy exceeds that which the meter range identifies by a factor sufficient to prevent movement damage. The same action releases the reset button to indicate activation. The cut-out can be tested in-situ simply by pressing a second button marked "test" which promptly causes the cut-out to actuate, provided the 15V battery powering the cut-out is in good order.

Currently, the price of the instrument, including a carrying case, leads and instructions, is expected to be in the region of £55. Further information from: Alberto Coniglio, 19 Mulberry Walk, London SW3. Tel: 01-352 1897.

swl news

Bob Treacher, BRS32525 *

BY the time this is read the Christmas and New Year festivities will be but a memory, and it is hoped that all readers enjoyed the holiday season. On the amateur radio front, the Christmas period saw fluctuating conditions. Higher frequency propagation until late December seemed poor, with little or none of the rarer dx audible. A magnetic storm disturbed conditions around 30 December, and as a result 14MHz remained open until at least 0200 on 31 December with an Arctic flutter on all signals. Many W6, W7 and KL7 stations were audible at your scribe's QTH during this period. Conditions on 3·5MHz were poor, with little dx activity noted during afternoon "grey-line" times. 5B4HF and VE3BWK/4U in the Golan Heights (YK for DXCC) being the only dx logged around 1500. On 7MHz it was slightly better, with dx audible until 1030 on ssb from the USA and XE. Several W7s were heard, and stations in Wales are understood to have worked KH6 and JA after 0930. Around midnight, stations in South America were quite strong, with occasional African dx in the shape of TU2FH and CN8CW.

Expeditions

At the time of writing, the Bouvet Is expedition was reported as being active, although few stations seemed to have actually worked it. LA5DQ and LA1VC were scheduled to be active for a considerable time, but reports suggest that the beam had to be left in South Africa and that they were using a vertical, which would account for the lack of signal in G-land. It also seems that they were not prepared to work from a list, but would only operate around 14,300kHz and tune around and work stations which they heard calling them. In this way they hoped to reduce the pile-up of stations who obviously need the rarest expedition for many a year.

VE3FXT was active from Transkei (S8) and heard on 14 and 21MHz.

There are rumours of several expeditions possibly being active in the near future. A number of VE1s are to activate Sable Is; there may be some activity from Andaman Is (VU7), and OE6EEG is rumoured to be activating Kamaran Is (VS9K) for two weeks. A close ear to the bands will either prove or disprove such rumours.

There is currently no activity from Niue Is (ZK2), T2O has now left Tuvalu; it is unlikely that there will be any further activity from this island for at least a year. On the brighter side, it is suggested that there may soon be further activity from VR6. Tom Christian, VR6TC, has been active on 14 and 21MHz, but Pitcairn Island still remains one of the rarer inhabited Pacific islands.

While on a dx theme, your scribe would like *your* help. He has two countries unconfirmed which are now deleted countries. Anyone with QSL information for HR1RF/KS4 (Swan Island—December 1971) and CR8A1 (Portuguese Timor—April 1972) would be doing him a great favour.

D68AD has provided details of his cw schedules as follows: 1,808kHz—0220-0240; 3,503kHz—0240-0300, and 7,003kHz—0300-0315. He can always make other schedules for the same day on 21,200kHz between 1530 and 1730.

*79 Granby Road, Eltham, London SE9 1EH.

1978 HF countries table

(top 16 entries only)

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS25429	180	192	225	99	112	19	827	ssb
BRS17567	201	222	242	51	81	6	803	ssb/cw
ARS8841	145	175	234	86	90	0	730	ssb/cw
BRS39965	160	173	189	63	62	19	666	ssb/cw
A9140	123	149	145	93	78	22	610	ssb/cw
BRS35943	127	128	165	74	111	4	609	ssb
BRS29641	127	138	171	74	72	4	586	ssb
A9191	127	140	162	46	58	10	543	ssb
BRS34740	104	129	151	77	52	11	524	ssb
BRS35454	106	109	147	46	66	6	481	ssb/cw
BRS38518	113	112	129	50	46	3	453	ssb
BRS32286	121	100	116	35	56	0	428	ssb
BRS40154	64	110	175	22	12	1	384	ssb
BRS34658	40	85	129	42	61	4	361	ssb
BRS37782	81	98	114	26	34	8	361	ssb
BRS20185	84	83	117	21	42	2	349	ssb

Note: All other entries remain unchanged.

VK1 . . . rare?

It was surprising how much mail commented on Ken Sketheway's and Dennis Byers' failure to hear stations from the VK1 area of Australia (*SWL news*, November). G3AAE says he has worked 17 recently and suggests a QSX around 28,500kHz about 0800 should produce the desired results. He points out, however, that, while working them is easy, obtaining the QSL card is the problem—and that is not an invitation for letters suggesting how to obtain QSL cards from VK1s! Neville Spry, BRS17567, points out that there is nearly always a VK1 on the P29JS net on 14,220kHz at 0700 daily.

The mail

The holiday period certainly saw a decrease in contributions this time. Two regulars found time to write—Ian Marquis, A9140, and Robert Small, who is now ARS8841, the RSGB allowing him to keep his "8841" suffix. Ian has at last added ZL to his 28MHz total—surprising how difficult ZL on 28MHz really is—KL7 on 7MHz, TR8 on 3·5MHz and ZF2AG on 21MHz. Robert managed to hear the Navassa Is expedition on 28MHz. However, the lower frequency bands have given him the majority of his best dx this time: 7MHz produced CM2HB, 9V1RS, VU2BK, YN1Z and KZ5EK; while on 3·5MHz the best of his catch were K0AX/DU2, 9K2EX, 7X2BD and a number of JAs. Robert also points out that 7Z2AP is located in Algeria and not, as the callsign suggests, in Saudi Arabia.

Ken Sketheway, BRS20185, had not been able to locate many new countries, and as he was in DL over the Christmas and New Year period his chances of listening were curtailed during that time.

Ken Steele, BRS36883, was anxiously awaiting the 1979 issue of the *DX Listings Callbook*, which contains the addresses of amateurs worldwide and is a very useful aid if QSLs are sent direct. Both that book and the *USA Listings Callbook* are rather expensive, but to ensure that cards are sent to the right address it is a "must". Copies may be purchased from RSGB Publications (Sales).

David Greenhalgh, ARS39965, mentions that selectivity can be greatly improved with a Q-multiplier, which can be used to tune out adjacent channel interference. He will be glad to supply a circuit diagram on receipt of 15p to cover the cost of

(Continued on p147)

"Operation Broadshoulders"

by A. F. DENNIS, G3CNV, county controller, West Midlands Raynet

FOLLOWING the cancellation of the ambulance service administered by the West Midlands Metropolitan Council in mid-November 1978, the author and certain local controllers came to the conclusion that a state of emergency existed. The RSGB emergency communications manager, G3BPT, was also asked for his opinion of the situation. The result was the launching of "Operation Broadshoulders" early on the evening of 18 November, when the West Midlands Raynet was alerted and the author went to the St John Ambulance Brigade area headquarters to assess the situation.

It was clear that any assistance would be more than welcome, and accordingly the Central and Sutton Coldfield groups were called in to create a fully operational station at the headquarters from where the control of St John ambulances would be co-ordinated. In approximately one-and-a-half hours, no less than 17 mobiles had converged on the headquarters, erected the necessary antennas and installed a 144MHz transmitter. Operations commenced immediately.

Although past experience had indicated that the use of a repeater was not desirable, in this particular instance (and for geographical reasons) it was decided to use GB3BM. This was done with little dissent from the vast majority of local repeater users, who readily appreciated that this was not just another Raynet exercise. The thanks of all concerned, particularly of the patients involved, were extended to those who so generously permitted Raynet to monopolize their repeater.

Before the evening was out calls had been received from all the adjacent county controllers advising that all their members were on "alert" and ready to assist where possible. This offer was to be taken up quite swiftly when the full implications were assessed, and the large number of members, who frequently travelled quite long distances to assist, enabled Raynet to remain a very potent force. By midnight traffic was flowing quite freely and without noticeable delay, according to the ambulance control, despite fewer vehicles being available. Inside the control room, life was beginning to take an organized shape and a routine pattern was established.

From the start of the operation all ambulances were accompanied by a "radiotail", thus enabling the St John duty officer to deploy to the best advantage all vehicles and staff at his disposal. On receipt of a "999" call an ambulance and "radiotail" were usually speeding on the way well within two minutes.

The initial traffic varied considerably depending on the time of day, except for "matties" (maternity cases to the uninitiated!). In emergency cases, sometimes one was in time, sometimes the call to control laconically ended with the dreaded initials DOA—dead on arrival. None of this has anything to do with amateur radio, but it did have an effect on those concerned, and one speedily gained another impression of big city life. With a rapid change of weather came the not unexpected spate of RTAs (road traffic accidents), and once again we all came face to face with the less welcome fact of life. At the end of the second day, Raynet emerged battered and a little bent, but most definitely *not* broken.

During the 18 days of continuous operation, the prime aim of this marathon task was to carry on regardless and keep the ambulances on the move and ready for all contingencies. The headquarters station log had 217 pages, each with some 34 entries, and approximately 170 callsigns became involved one way or another. Over 1,000 incidents were dealt with, and if each one resulted in the protection of just one life then we are satisfied, and adequately recompensed, for all the effort involved. The reactions of various listeners amazed those watching and waiting. Tokens of appreciation included two bottles of Scotch whisky (an excellent lubricant for overworked voice boxes) and a letter from a listener addressed to Raynet Control, SJAB Headquarters, Birmingham, containing a most appreciated note of thanks and a cheque for £10; and on most mornings we had the occasional call on GB3BM to wish us well and say thank you. All very encouraging at a time when it was needed, because we did not know that we could keep going for so long. For a time we endured the efforts of those who are "anti this or that" in their attempts to disrupt vital messages, but this was overcome by a complete technical breakthrough and the stations were officially silenced.

This report would be incomplete without reference to all ranks of the St John Ambulance Brigade whom we served during "Operation Broadshoulders". It was indeed a privilege; we of Raynet now feel part of a well integrated team and, in a way, it will be a pity to split it up. But this may not happen, as we understand that members of Raynet are to be made auxiliary members of SJAB. This can only forge stronger links between two organizations devoted to serving the community in which we live. □

SWL news

(Continued from p146)

photocopying and postage. His address is 24 Park Avenue, Poynton, Cheshire SK12 1QY.

Ray Williams, BRS6072, has unfortunately been in poor health since December 1977 and is grateful to all who contribute to *Radio Communication* to make it such a worthwhile publication. He has been trying to obtain a 144MHz receiver but has had little success in answering advertisements. If anyone has any surplus 144MHz receiving equipment, Ray would be interested; his address is 204 Dysart Road, Grantham, Lincs.

David Hawes, A9191, submitted a table entry which he hoped would keep him well placed, but when he wrote, homework had been interfering with his listening habits. He asked about the sort of score needed to win the table; in the past, a score of around 820 has clinched it, and 1978 will probably be no exception.

Two first-timers now; Rod Hunt, BRS41333, and Craig Cameron. Rod joined the RSGB in December but began listening last September with a homebrew receiver. Craig is 13 years old and new to the hobby, and is anxious to purchase a second-hand amateur bands receiver. If anyone would like to help out a newcomer perhaps they could write to him direct at Highcroft, Brampton Road, Greytree, Ross-on-Wye, Herefordshire.

Finally

All contributions for the April *SWL news* should reach your scribe by 26 February. □

the month on the air

John Allaway, G3FKM *

THE IARU Region 1 Band Plan included in last month's *MOTA* was discussed and endorsed by representatives of 36 national societies (including the RSGB) at the Region 1 Conference in Hungary last April, and represents a scheme whereby reasonably efficient usage of our crowded hf bands may be made. It is not *mandatory* (as are band plans in the USA for example) but it is strongly recommended to, and followed by, thoughtful amateurs. However, G4DBR finds that a group of UK phone stations has been operating on or near 3,585kHz regardless of polite requests to move. No doubt its members are within their "rights" but it seems a great pity that they have to emphasize their independence by being such a nuisance.

DX news

QSLs from HF0POL have been delayed by the illness of QSL manager SP2BBD. The crew at the base was due to be changed at the end of January and the operator will be dealing with QSL requests when he returns home. There is believed to be no amateur operator with the 1979 crew.

The callsign VP2VDS belongs to W1WPW. He has not been on the air from St Vincent since 5 June 1978 and says that his equipment will not tune below 28,400kHz in spite of the fact that there has been a station using his callsign on 28MHz cw.

JW1IJ replaced JW7FD in mid-December and is located on Bear Is. JW5ZJ is also active, and QSLs for both stations should be sent via LA5NM. LA5NM also deals with QSL requests for contacts with JW4FG, JW5IJ, JW5NM, JW7FD, JW8KT, JW8LU, JW9UV, JW9WT, LA1H, JX3P, JX9WT, and the recent 3Y1VC activity.

Amateur operation from the Seychelles Is seems to be on the decline. There are reports that no new licences are to be issued, but it is believed that present licensees will be allowed to continue. S79MC and S79WHW are still active at the time of writing, the latter mostly on 14MHz ssb.

West Coast DX Bulletin lists the present whereabouts of former XW8 stations: XW8AL is now F0DAJ; XW8FN is Lloyd Gruhn, 1640 South Parfet Ct, Lakewood, Colo, USA; XW8LA is in Islamabad and can be reached via the USA State Department. W3HNK is believed to have XW8FN logs.

Tim, BV2A/BV2B, has been worked on 28MHz, mostly on Thursdays and Fridays from 1200.

FY7BC, who was very active during the CQ WW DX CW Contest made nearly 7,000 contacts. The station was operated by FY7BC, FY7BG, F2QQ and F5QQ, and is believed to have been located on the former penal colony of Devil's Island. DXCC status is being applied for as the island is administered differently from the rest of the FY7 area.

*10 Knightlow Road, Birmingham B17 8QB.

Sam Turner, G3JUB, of Liverpool, has a particular interest in Sweden and has visited that country many times. He has also learned to speak Swedish and spends a great deal of his time talking to SM stations. He was awarded the SSA badge of honour—the first to be issued—in July 1978.

Stations in White Russia (UC) have been using the EU2 prefix. The USSR is using many of its prefix allocations for special amateur activities and readers should note that EK, EM, EN, EO, ER, ES, EU, EV, EW, EX, EY, and EZ are all available for this purpose. Other unusual prefixes noted recently include HW7G who was FG7AS using a special call to mark the 18th ICAA Congress. AH0, KH0, NH0 and WH0 have been used by stations in the Mariana Is—formerly KG6R, KG6S and KG6T—since 1 January 1979. J20BL was genuine and QSLs have been received.

OZ8AE operated from Macquarie Is during November 1978 as VK0JC before moving on to Davis Base, Antarctica. QSLs should be sent to his home address. VK0PK may also be on the air from the island for a few months.

9N1AB has been heard after 1200 in the area between 21,310 and 21,380kHz. 9N1MM is also back in Nepal.

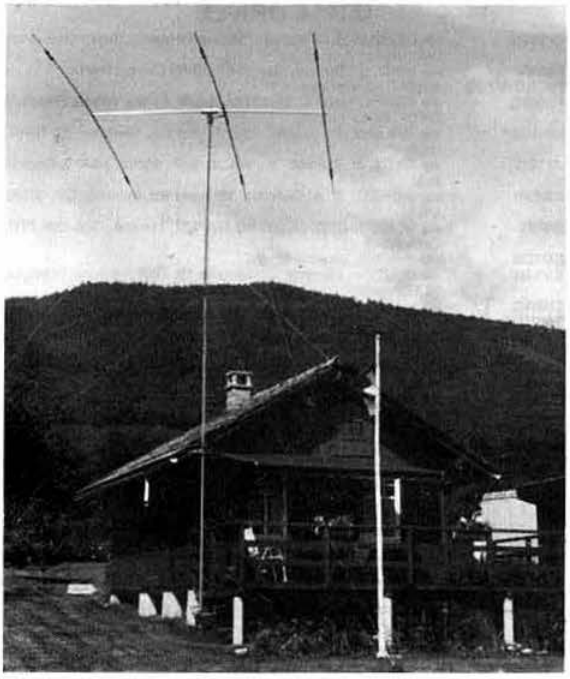
Ken Bishop, G3LQB/EI0CX, has started a two-year contract as resident engineer in the eastern province of Saudi Arabia near Al Khobar. He would be very interested to hear from other UK and Irish amateurs who are at present in that country. He may be reached via the Al Hada compound, or c/o Nafcat, PO Box 1017, Damman, Saudi Arabia.

LA7JO keeps a schedule with two stations on Jan Mayen Is—JX4GN and JX9WT—on Wednesdays and Thursdays at 1700 on 14,240 or 14,270kHz. On Saturdays at 0900 he meets them on 14,270kHz and at 1100 on 28,570kHz. The Sunday schedule is at 1400 on 28,570kHz.

SU1DP is a Canadian—VE7QI—who is a civilian attached to the UN forces; he expects to be in Ismalia for 18 months.

Top band news

G3JMJ reports an excellent opening into Japan on 15 December when he made contact with both JA5DQH and JA6FB, with signal reports of RST 569/449 respectively. Other JA stations known to be active include JA3ONB, JA6WGE, JR1CFG and JA3BIB. G3JMJ also gave EP2IA his first British contact the next day when the Iranian station had an S8 signal for over 30min—equipment used being a $\lambda/2$ dipole and



The chalet of HB9AJU at the foot of the Jura and facing Lac Leman. The antenna is a Western Electronics tri-bander

Tentec transceiver with a transverter. Problems with 3·5MHz breakthrough cause difficulties with reception of European signals but attempts are being made to obviate the trouble. GM3IAA was delighted to make a contact with VK6HD at 2100 on 28 December, and heard him again the following evening but no contact resulted due to severe phone QRM.

News from overseas

John Stratfull closed down his activities from 3B8CV in Mauritius in June 1978. He is now in Dominica and will be there until late 1980. He recently received his 3B8CV logs and hoped to send out some 500 QSL cards during January to those who applied after his baggage had been shipped from Mauritius. John is now VP2DB, and his wife Sheila holds the callsign VP2DS. QSLs should be sent to the address in QTH Corner.

South Sandwich Islands

Several readers have written to your scribe concerning the recent operation by an Argentinian amateur using the callsign LU3ZY from Thule Is in the Sandwich Is. Feeling is also strong in the Falkland Is. A letter received by G3FKM from the Foreign and Commonwealth Office in reply to enquiries contains the following paragraph: "I can confirm that Thule Is is a Dependency of the Falkland Is, which, as you probably know, is a Crown Colony. The unlicensed Argentine amateur radio station on Thule, which we understand uses the callsign LU3ZY, is therefore illegal. We have protested to the Argentine Government about its operation. You are right to suppose that any such activity should be authorized by the Falkland Islands Government using the callsign prefix VP8"

Welcome

Since the middle of November the following overseas amateurs have joined the Society: AE5T, AF4K, DB4LN, DB4LT, DK2ZF, EA1UU, EI1CS, EI7BM, F1AXP, F6BNI, LA0CA, LA0CD, LA0AQ, LU9HJQ, LX1BD, LX1HW, LX2FT, OH2AVA, OK4EW, ON7PZ, ON1EV, OZ5YS, PA2ETW, VE3HZA, VK4ALB, VU2RX, W2EJV, WB4EFQ, WB5UKI, W6POK, W6TOY and 9Y4EH.

Dxpeditions

There is news of a group of Australian and New Zealand amateurs who hope to visit Spratly Is this year—probably before mid-summer. VK2BJL is believed to be involved and is one of those who took part in the recent highly successful VK9ZR expedition. It is planned to have five operators, and the trip should last for up to 10 days, with two stations on the air.

Japanese amateurs are reported to be investigating the DX-CC possibilities of an island some 200 miles from Okino Torishima.

Willy de Roos, ON8RP, left Belgium for Chile on 22 November and his boat *Williwaw* was due to leave Valdivia on 15 December and to arrive at Peter I Island about 1 February. A Chilean icebreaker will precede Willy's boat to clear a passage for him and will stay for a few days after the landing while the camp is set up. If all goes well it will leave and return a few weeks later to check conditions; should all be well Willy and Jean Bourgeois will remain for a 10-month stay. A safe anchorage close to the island will be a major factor affecting the decision to stay. The British Columbia DX Club has been instrumental in getting the operation on its way and has arranged for most of the equipment, including a vfo for the TS520, a TS33 beam and 30ft mast, a five-band vertical, and associated accessories. It has also arranged for an Atlas 210X with crystals for 3,770, 7,085, 14,195, 21,245 and 28,495kHz. Dentron is supplying an MLA-2500B and MT-3000A tuner. VE3MR is supplying a 1·5kW generator.

Iris and Lloyd Colvin continue their expedition in the Caribbean, and, after Jamaica, continued to the Cayman Is where

The LA-DX Group, with the two amateur operators who are going to Bouvet Is. L to r: 3Y5DQ, LA5HE, 3Y1VC and LA1KI

they operated as ZF2CI. In a letter dated 9 December they said that they made 10,000 contacts from W6QL/6Y5 and worked 123 different countries. For the first time a YASME expedition operated on 1·8MHz, where they contacted 10 countries and 35 USA states. The highlight of their Jamaica visit was meeting all 10 of the Navassa Is expedition operators, with whom they shared a hotel for a brief period.

West Coast DX Bulletin reported that members of the Bangalore RC would visit the Laccadive Is during January using the callsign VU4ARC or VU5ARC. There was no certainty about the actual timing, and it may be that the activity may extend into February as another group is believed to have permission to go there during either month.

An expedition to Aves Is, YV0, is being organized and is most likely to take place during March or April. YV5DFI, YV5ANF, YS1RRD and others will take part and will put YV0AA on the air for 10 days, around-the-clock operation, with three fully equipped stations.

Contests

The Helvetia 26 Contest

1500 28 April to 1700 29 April

All bands 1·8 to 28MHz, cw or phone. Exchange RS/T plus serial QSO number (from 001). Swiss stations will give their canton abbreviation as well. Each contact counts three points. Each station may be worked once per band—either on phone or cw. The multiplier is the sum of cantons worked on each band—making a possible maximum of 156. Certificates will be awarded to the leading station in each country or USA/VE call area. Logs should be posted no later than 30 days after the contest to: TM USKA, K. Bindschedler, HB9MX, Strahleggweg 28, 8400 Winterthur, Switzerland.

Apologies to **GD4BEG** whose score of 102,753 points in the 1978 **CQ 160 Meter DX Contest** was omitted from the results listed in December *MOTA*. This was, of course, a magnificent score and was world third and leading European total—in fact the highest European score ever in the contest.

UK scores in the **1978 Helvetia 22 Contest** were given in last month's *MOTA*. More complete details received from USKA also include mention of GW3HCL who obtained 1,944 points.

Results of the **1978 CQ WW WPX Contest** appeared in December *CQ* and are as follows:

G3FXB	(All band)	2,101,440	points
G4CNY	..	1,243,143	..
G3YBH	..	644,910	..
G4CVZ	..	315,462	..
GM4GPN	..	223,027	..
G5CEY	..	201,432	..
G2AJB	..	59,568	..
G4DMN	(28MHz)	566,754	..
G4DKT	..	164,688	..
G3TOE	..	136,017	..
GU3YIZ	..	114,056	..
G4BBA	..	57,096	..
GW5BI	..	46,763	..
G4AHO	(21MHz)	78,446	..
G3TKR	..	24,510	..
GM4ELV	..	37,170	..
G3NT	..	31,080	..
G8DI	..	22,572	..
G3XFW	..	21,758	..
GW3SLA	(14MHz)	58,529	..
GU4EDN	(3·5MHz)	102,200	..

QTH CORNER

EP2WR	via G3JXE, R. S. Wilkinson, 55 Summergangs Drive, Thorngumbald, Hull.
FB8XV	via F5VU, J. Brunner, Savigne F-86400 Civray, France.
FG7AS/VP2D	BP 444, Guadeloupe.
FW8AC	via F6BWX, Marie C. Lecul-Freville, 38 Av des Villa de France, F 88000, Epinal France.
HK0COP	via W9UCW, B. Boothe, RFD 1, Bell Rd, Minooka, Ill, 60447, USA.
JT1BG	via I8YGZ, P. Zamboli, Via Istituta 6, P. Monti, I-84018 Scafati, Italy.
KA1MI	via WB1GXU, R. A. Kobylarz, 36 Manor Rd, Oakland, Cal, 06370, USA.
S8FXT	via VE3DPB, B. C. Dekat, PO Box 137, Lyndon, Ont, L0R 1TO, Canada.
SU1DR	PO Box 138, Ismalia, Egypt.
SV1JH	via DJ9ZB, F. Langner, C Kistnerstr 19, 7800 Freiburg, Breisgau, W Germany.
TR8AC **TR8GDC**	via W5RU, Delta DX Ass'n, Box 73, Metaire, La, 70004, USA.
VP2DB	John Stratfull, Accountant General's Office, Dominica, West Indies.
VP2DS	Sheila Stratfull, Accountant General's Office, Dominica, West Indies.
ZD9GH	via ZS1Z, Stes-boro Garage, Kleine Drakenstein, 9628 Paarl, Rep of S Africa.
ZF2CI	YASME, Box 2025, Castro Valley, Cal, 94546, USA.
ex-3B8CV	(see VP2DB).
5N2JHK	via DC2JH, G. Krieger, Bilker Allee 16, 4000 Dusseldorf, W Germany.

RSGB QSL Bureau, G3DRN,
30 Bodnant Gardens, London SW20 0UD.

In the multi-operator section (single-transmitter) **GD5CGV** came world tenth with 2,079,879 points. Other scores were **G8JC** (2,050,290), **GB3CCL** (66,930), and **GU3HFN** (58,190). Certificates have been awarded to those listed in bold type.

Awards

Worked All West Australian Shires Award
Worked All West Australian Post Codes Award

For confirmed contact with at least 40 shires or 50 different post codes respectively. The awards are issued by the WIA (W Australia Division) and applicants should send proof of their contacts plus 10 ircs or equivalent to Contest Committee C-PO Box 6250 Hay Street, Perth 6000, W Australia. Further stickers are issued free. A map of W Australia showing all shires is available from the above address price $2 Australian.

University of Cape Town Award

Available to all licensed amateurs and listeners. Applicants must log ZS1UCT as well as two other ZS1 stations between 15 February and 15 March 1979. Any modes or bands may be used. The award is issued by the Cape Town branch of the SARL, and copies of logs (certified by two licensed amateurs) plus 10 ircs, $1, or R1, should be sent (before July) to the Award Manager, ZS1MO, PO Box 5100, Cape Town 8000, Republic of S Africa. (For details of ZS1UCT see "DX news").

The Gibraltar Amateur Radio Society ZB2BU Award

Available to licensed amateurs and listeners who have worked/heard ZB2BU on three different bands since 12 January 1978. Any modes or bands are valid. Send log details (not confirmations) plus USA $3 or equivalent to GARS, PO Box 292, Gibraltar.

The ZB2 Award

This will be available soon and is similar to the ZB2BU Award except that five different ZB2 stations must have been worked or heard (on any bands or modes) since 12 January 1978. Application details are as for the ZB2BU certificate.

Allan Davidson VP9AD (left) recently presented RSGB President John Bazley, G3HCT, with the Bermuda 100 Club Award plaque. This is the first Bermuda 100 Club Award to be achieved by an amateur outside the American continent

Worked All Zones (Five band)
Commencing 1 January 1979 an engraved plaque will be available from *CQ* for those who have worked all zones on the five bands 3·5 to 28MHz. There will be no mode endorsements and all contacts must have been made since 1 January 1979. An award will be available for 100 confirmed zones (on any combination of bands) and endorsement stickers will be issued for each additional 10 zones. An honour roll will be kept of those with more than 150 zones confirmed.

The Helvetia 26 Award
This is a new award issued by USKA and is for those who can produce QSL cards confirming contacts with all 26 Swiss cantons and half-cantons since 1 January 1979. Cross-mode and cross-band contacts are not valid. It is issued in three classes: (1) Telephony, telegraphy or mixed, (2) rtty, and (3) sstv. QSLs must show clear evidence of the canton where the station was located, and they should be sent, together with a signed list showing callsign, location, date, time, frequency band, and class of emission used for each contact, to: Walter Blattner, HB9ALF, PO Box 450, 6601 Locarno, Switzerland. The award is free but ircs to cover return postage would be appreciated.

The Helvetia 22 Award
This is now being phased out and replaced by the new certificate listed above. Contacts made between 15 April 1948 and 31 December 1979 only are valid now and applications must reach HB9ALF before 31 December 1980.

The USKA Jubilee Award
To celebrate the 50th anniversary of the Union of Swiss Short Wave Amateurs. Contacts made during the whole of 1979 with stations using the special HB7 prefix count for the award, and each of the 23 cantons must be worked but not via terrestial repeaters. Different classes are as follows: (1) Telegraphy, telephony, or mixed, (2) rtty, and (3) sstv. The same three categories are available on frequencies above 144MHz. Application details are as for the Helvetia 26 Award except that *listeners may also apply*, and they should be sent to: USKA, PO Box 11, CH-8607 Seegraeben, Switzerland, before 31 December 1981. The abbreviations used by the 23 cantons are as follows: Zurich (ZH), Berne (BE), Lucerne (LU), Uri (UR), Schwyz (SZ), Obwalden/Nidwalden (NW), Glaris (GL), Zug (ZG), Fribourg (FR), Soleure (SO), Basle (City + Country, BS), Schaffhausen (SH), Appenzell (AR), St Gall (SG), Grisons (GR), Aargau (AG), Thurgau (TG), Tessin (TI), Vaud (VD), Valais (VS), Neuchatel (NE), Geneva (GE), and Jura (JU).

Guildford & District RS Diamond Jubilee Award
Claimants must contact at least four members of the club between 1 March and 31 August 1979. At least two different bands must have been used, and no one located less than 50km from Guildford may apply. NFD and other contest QSOs count. Send log details plus 20p or two ircs to Mike Birch, G3KMO, "Sorrento" White Lane, Ash, Aldershot, Hants GU12 6HN. Special endorsements are available for mode, mobile, portable, /MM etc. Special activity will be found daily at 2000 near 1,835, 1,935, 3,535, 3,735, 7,035, 7,055, 14,035, 14,235, 21,035, 21,235, 28,035 and 28,535kHz (the last being the club net on Mondays). Club members include G2s BBX and DBH; G3s ARM, GJX, HTP, IAF, KMO, OLM, PGT, PJX, SYM, WAF, WHM, WJT, XON, XRP and ZDD; G4s AWY, BCY, BCZ, BHQ, CMG, CWP, CXY, DWE, ECF and EEC; G5s OD and WP; G6s GS and NK; and G8s GS, MY, ACJ, DTH, EGG, FSZ, FUL, IBO, IQL and JMP.

Islands-on-the-Air Awards (IOTA)
Issued by Geoff Watts (of *DX News Sheet)* for confirmation of contacts with amateur stations located on islands throughout the world. An 18-page directory of islands (which also contains full details of the various awards available and of the IOTA silver cup) is available, price 40p, $1, or five ircs from G. Watts, 62 Belmore Rd, Norwich NR7 0PU. An indication of the possibilities open to IOTA hunters is the fact that IT9JT (the only person so far to be awarded the IOTA cup for gaining all 12 IOTA awards) is the first to have 300 IOTA islands/groups confirmed.

Band reports

Conditions on the hf bands have been very patchy during the past month. However, even 28MHz has had some good openings, and David Whitaker, BRS25429, notes that 219 countries have been reported on the band in UK dx columns during 1978. G3KSH would be interested to know whether ZL2MHF has been heard on 28,230kHz.

The latest summary from G8KG says that during 1978 the mean solar flux rose by about 70 units, compared with 25 in 1977. An interesting feature and one which has made for a generally good year was the fact that no less than 60 per cent of the annual increase was achieved in a single upward leap in the first 60 days of the year. The rest of the year was relatively flat and the annual mean of the 144 sfu was only exceeded by a significant amount in September, October and December. December itself was generally a good month, the best conditions being in the first two weeks, the solar flux value of 237 on 12 December being the highest so far recorded this cycle. At the end of the month the flux was again rising and passed the 200 level on 31 December.

The re-appearance of WWV on the 20MHz channel provides much improved opportunities for copying the daily solar and geomagnetic reports as well as itself being a useful guide to conditions, while the Californian QRP beacon on 28,888kHz (W6IRT) has been audible for up to three hours on better days.

Stations listed below in italics were using cw.

1·8MHz. 0000 *EP2TA, IS0LYN.* **0300** *YV1OB.* **0700** *W9CG.* **0800** *WB9QMC.* **2100** *VK6HD.* **2200** *JA5DQH, JA6FB, 9H1AV.*

3·5MHz. 0000 AP2KS, FM7AV, JX9WT, *ZB2,* 9M2DW (QSL to DJ3HJ). **0100** *CN,* EA8OH. **0200** EP2SL, FP8HG, UI8FAI, VP9IR. **0300** PY2FOS, UM8NAF, W6, 9Y4NP. **0400** TI, YV1TO. **0600** W5XZ. **0900** *JA.* **1800** ZL4KE. **2000** JR1CFG, 7X2KBS. **2100** JA6s BZI, CLG, *UD6, UH8,* W1FC, W8ZF. **2200** AP2KS. **2300** VE8MS, 4X4VL, 9K2EP.

7MHz. 0000 *7X4AN.* **0100** *OY5NS, 8P6.* **0800** *CT2, JA, N5VV* (N Mex), *YV, ZF2CI.* **0900** *VP2LDH/MM* (off St Vincent), *W1-W0.* **1100** *W2LT.* **1500** *HS1ABD, N6s RA,SS.* **1600** *AA7C, EA8CR, JAs 3BZC, 7APU, UA9HCF, UM8NAP, VU2GW, W7FU, 4X4BT.* **2000** *VU2GO.* **2100** *F0AHY/FG.*

14MHz. 0000 JA, KL7NA, W6-W7, 3Y5DQ. **0800** *C5AAO,* H44LW, JA, KL7, *TR8BJ,* VK, ZL, 3D2UP. **0900** BV2B, DU9RG, KH6, P29JS. **1100** VS6CZ. **1200** AL7AC, VS6AK. **1300** KG6AJQ. **1400** *VU.* **1500** *KL7,* YI1BGD. **1600** FB8XV, FR7AI/T, FR7BT, FW8AC. **1700** 3Y5DQ. **1800** A6XJA, ZL1KK. **1900** *FS7AS/VP2D,* ZL. **2000** J3AAG, VP8s PM, PR, 9Q5MA (ex-9Q5JH). **2100** D4CBS, KA1NC, P29BH. **2200** J28AI, K0AX/DU2, XT2AT, ZD9GH. **2300** BV2B, *CE9AI,* HL9TJ, JA, VK9XW.

21MHz. 0000 CR9AJ, *JA, LU,* VK, ZL. **1000** JA, VK, VS6, ZL, 9X5PP. **1200** ZL4JO. **1500** *ZF2CI.* **1600** W6-W7. **1700** OX3CO. **1800** VP2s AC, DAW, ZD7BW, ZF2AG, 3D6AC. **1900** FK8CR, FR7ZN, *FY,* HD5EA, *J3, VP2M,* W7, 5H3JR, W6QL/6Y5. **2000** WA3WHU/TJ.

28MHz. 0800 JA, VK6, ZL. **0900** JA, VK, ZL. **1000** D68AD, K0AX/DU2, S8FXT, VK, VK9XK, VS6, ZL, 9L1KB. **1100** A4XFE, A9XBD, EP, HP, ST0RK, VK, VS6, 9M2MQ. **1200** HH2PW, KA1NC, VK, ZF2AG (QSL to N8AG), 8P6, 9L1CA. **1300** FR7ZL, ZF2CI. **1400** XE1EFT. **1500** FY0EOL, PJ8NUT, all W districts, XE, YS0GMV, W6QL/6Y5. **1600** FP8HL, HH2LD, VP2DAY, W7, VE6. **1700** EL, OA, VE6-VE7, W6-W0. **1800** VE6-VE7, W1-W5, W8-W0. **1900** ZS3JJ, 5Z4NH.

Many thanks to the following for providing logs from which the above was extracted: G2CDT, G2HKU, G3GVV, GM3IAA, G3JMJ, G3KSH, G3LOL, GM3LYY, G3LPS, G4BYB, GM4CHX, G4EHQ, GM4ELV, G5HJ, BRS17567 and BRS31301. Thanks also to the writers of the following news sources for information extracted: The *Ex-G Radio Club Magazine* **(W3HQO),** *DX News Sheet* **(Geoff Watts),** *Long Skip* **(VE1AL/3),** the *West Coast DX Bulletin* **(WA6AUD),** *DX'press* **(PA0TO),** and *CQ Magazine* **(W1WY).**

Please send all items for **April** issue **to reach G3FKM** no later than **10 March,** and for **May** by **3 April.**

HF propagation study

Predicted hpfs (MHz × 10) for February 1979

GMT =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	199	185	172	354	534	524	498	516	475	360	274	223	199
Ascension	274	249	213	187	422	578	524	514	498	450	364	319	274
Bahrain	173	173	150	350	522	500	487	497	465	326	225	197	173
Bangkok	136	129	125	329	473	534	521	470	371	243	174	148	136
Barbados	249	234	200	174	199	305	521	521	497	455	371	295	249
Bermuda	224	199	174	162	162	248	472	509	484	448	373	267	224
Bogota	237	224	194	174	181	219	462	521	491	448	373	286	237
Buenos Aires	263	242	223	183	275	399	451	477	478	449	365	308	263
Cape Town	262	218	182	194	408	445	465	473	444	437	348	299	262
Colombo	164	161	139	360	497	528	486	489	401	299	211	178	164
Cyprus	162	158	140	277	474	510	475	487	441	323	229	186	162
Dakar	274	249	213	187	422	578	524	521	498	450	364	319	274
Denver	199	162	144	138	149	162	174	336	448	385	299	224	199
Fairbanks	187	168	162	180	199	211	224	230	225	249	200	200	187
Falklands	263	242	221	183	271	373	425	450	475	449	362	308	263
Gibraltar	143	128	117	105	241	356	348	348	324	284	204	164	143
Hong Kong	126	101	125	299	428	497	421	322	249	195	150	126	126
Honolulu	187	162	150	173	199	169	157	126	114	249	200	200	187
Iceland	126	101	94	100	155	274	332	328	310	242	158	124	126
Jamaica	224	199	174	166	164	219	398	509	484	448	360	270	224
Lagos	272	249	200	196	510	585	511	520	498	449	360	319	272
Las Palmas	224	205	181	161	301	489	489	479	455	402	315	256	224
Lima	255	232	213	181	202	220	487	522	498	449	373	298	255
Los Angeles	199	162	144	138	149	157	157	237	423	373	274	211	199
Malta	140	133	121	152	366	427	403	403	376	294	208	174	140
Mauritius	213	188	176	336	464	478	478	478	440	373	299	237	213
Mexico	211	174	155	149	149	176	225	449	472	422	323	248	211
Moscow	108	102	103	177	354	422	422	415	362	229	166	125	108
Nairobi	229	200	182	323	525	477	489	514	498	398	307	249	229
New Delhi	150	139	125	347	479	498	473	422	323	221	187	157	150
New York	211	176	158	152	149	181	364	472	472	422	323	248	211
Osaka	172	171	172	223	385	395	263	205	176	164	152	150	172
Perth	163	158	138	360	402	389	364	326	321	275	208	177	163
Rio de Janeiro	265	243	223	183	291	463	500	475	475	449	365	310	265
Salisbury	248	225	187	285	450	477	498	519	491	423	322	274	248
Seychelles	228	187	174	360	459	460	482	463	432	370	284	228	228
Singapore	150	139	125	347	479	534	501	474	409	251	187	157	150
Suva (s)	187	192	192	197	248	373	434	384	298	219	194	187	187
Suva (l)	274	256	206	187	277	312	293	256	237	281	289	290	274
Sydney (s)	126	101	125	299	407	365	338	342	290	219	150	126	126
Sydney (l)	255	230	215	177	220	279	224	200	173	195	274	298	255
Teheran	164	161	139	360	497	524	473	503	422	277	208	178	164
Vancouver	187	162	144	162	180	174	199	187	286	312	213	200	187
Wellington (s)	187	180	180	211	373	355	373	305	274	206	168	163	187
Wellington (l)	267	243	219	181	270	243	187	150	176	244	288	295	267

Bands recommended are those between hpf and half hpf.

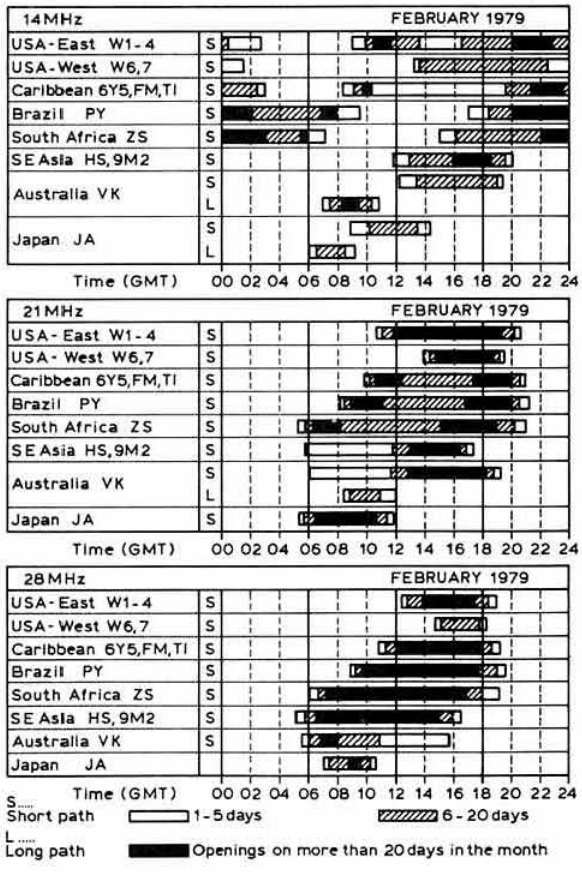
Propagation predictions

Winter conditions in the ionosphere come slowly to an end during February. Days lengthen and towards the end of the month **14** to **28MHz** will remain open longer than in previous months. Traffic with western North America will not be certain on **28MHz** but all continents will be heard, even if at times for very brief periods. On **21MHz** traffic with all continents will be possible.

The improving spring-time conditions will be most noticeable on **14MHz**; during the latter half of the night conditioins will be markedly better than in previous months. However, only in April will this band revert to being the main night-time dx band. If, during the coming ARRL DX Contest the F2 mufs are above the monthly average, there will be chances of USA dx during the first two to four hours of the latter half of the night.

Conditions on **7** and **3·5MHz** will change little from those of January. Traffic with the USA will probably be possible from a few hours before midnight, and on **3·5MHz** from about three to four hours before sunrise until dawn.

The provisional sunspot number for November 1978 from the Swiss Federal Observatory was 96·6. Periods of intense solar activity occurred during the first and last weeks of the month when the highest daily number recorded was 129. The predicted smoothed numbers for March, April and May are 136, 139 and 141 respectively.



council proceedings

A brief report of the Council meeting held on 16 November 1978

Present: Dr D. S. Evans (President, in the chair), Dr E. J. Allaway, Messrs J. Anthony, P. Balestrini, J. Bazley, P. F. D. Cornish, T. P. Douglas, F. D. Hall, W. F. McGonigle, B. O'Brien, W. A. Scarr, R. F. Stevens, G. M. C. Stone, C. J. Thomas (members of Council), Mr A. W. Hutchinson (editor) and Mrs H. M. Allin (minutes secretary).

Apologies for absence were received from Lord Wallace and Messrs D. H. Adams, D. J. Andrews, C. H. Parsons and D. A. Evans.

Financial report

Mr Cornish made some final comments on the annual accounts which had been published with the November issue of *Radio Communication*.

He added that the auditors' management letter had now been received and included only minor points, which would be discussed with the general manager and accountant.

General manager's report

This had been circulated to Council, and it was noted with pleasure that the Society's nett membership was now 22,008, an increase of 1,000 in six months. It was therefore probable that the increase for the current financial year would exceed that of 1,362 in the previous year. One sign of health was that the rate at which members were leaving the Society has dropped slightly.

The general manager also reported on experience to date with the identity card system. Minor problems were being dealt with.

The expected move of the packing department into the basement will take place early in the new year, after the Christmas book rush.

A report on the effects of the spread of delivery of *Radio Communication* was referred to the Finance & Staff Committee for consideration.

Awards

It was agreed unanimously that Lord Wallace of Coslany be made an Honorary Member of the Society.

It was also agreed unanimously that Mr G. R. Jessop, G6JP, be awarded the Founders Trophy for services to the Society.

Review of committee business

Education

Mr Anthony reported on arrangements being made for this year's Science Museum lecture.

He also spoke of a meeting of some of the committee members at Leicester, where the new RAE syllabus was discussed. He asked Council's views on the possibility of holding a similar meeting, or weekend seminar, to be held next year. The President asked Mr Anthony to put this proposal in writing, setting out details of expenses etc.

Finance & Staff

It was confirmed that most of the outstanding honoraria for 1977 had now been dealt with and that the remaining payments were in hand. The committee would recommend the rates for 1978.

Dr Allaway reported that the 1979 Presidential Installation would be in Edgbaston, Birmingham, and that tickets would be £2 (single) and £3 (double).

HF Contests

No comment.

IARU Working Group

Mr Stevens gave a detailed account of the Special Preparatory Meeting for WARC, held in Geneva and attended by 740 delegates from 92 countries. The IARU had held a reception at which 150 delegates, including (for the first time) those from the People's Republic of China, had been present.

The President reported on the very successful GI/EI convention held in October, and extended his thanks to Mr and Mrs McGonigle for their hospitality. He also reported on his recent trip to the USA, which had incorporated visits to ARRL HQ, Microwave Associates, and a convention.

Mr Douglas asked if it was yet known which country would act as host for the next IARU Region 1 Conference. Mr Stevens replied that he was still waiting to receive details of the likely cost of holding the conference in Monaco.

Interference

It was noted that BREMA had confirmed to the general manager that the Society's representative was invited only to meetings when his presence was felt to be necessary. It was decided that the general manager should write again to BREMA, asking that a full-time representative of the RSGB be appointed.

Mobile & Exhibition

Mr Balestrini said he hoped to have a full report on the Leicester exhibition available for the next meeting.

Membership & Representation

Mr O'Brien reported that he was preparing a paragraph for *Radio Communication* on reduced and waived subscriptions. He agreed to report back on a suggestion for badges to indicate years of membership.

Council approved the suggestion of providing special badges for the 26 QSL Bureau sub-managers.

The question of a 1979 RRs' conference was raised. It was agreed to await final figures involved with the 1978 conference before making a decision.

Microwave

Concern was expressed at an item in recent VHF Committee minutes regarding 1,296MHz repeaters. Dr Evans asked for an assurance that such matters would be referred to the Microwave Committee.

Dr Evans confirmed that the committee had accepted responsibility for next year's IEE lecture.

Telecommunications Liaison

A discussion in connection with the President's reception being held on 30 November took place.

VHF

Council co-opted Mr M. Appleby, G3ZNU, on to the committee.

Mr Douglas reported on the licensing of Phase 3 uhf and Phase 2 vhf repeaters; arrangements for the IERE Conference; and new awards based on the QTH locator system.

Mr Stevens reported on a letter he had received from AMSAT UK regarding the use of fm and a.m. on 145·8-146MHz, which was causing some concern. The use of this frequency segment for satellites had been negotiated by Mr P. Gowen, G3IOR, at the 1978 Region 1 Conference.

Mr Balestrini said he had also had a letter from AMSAT. Raynet had use of 145·8MHz on a shared basis, but it was not widely used by them.

It was agreed that Raynet use of this frequency would be gradually reduced.

VHF Contests

The committee requested Council's approval to permit foreign members or non-members to enter the 10GHz cumulative event, and for the meteor scatter event to be open to all Region 1 stations. It was recommended that the relevant rules normally applied to these two contests be waived.

Mr Stevens said that the rules should be suitably framed to exclude non-RSGB members in the UK.

The recommendations were agreed unanimously.

Membership and representation

It was resolved:

(i) to accept reduced subscription from 18 members;

(ii) to waive the subscription of one member;

(iii) to grant affiliation to: Blackwood & District ARS, Newport, Gwent; Ciba Sports & Social Club, Radio Section, Horsham, W Sussex; Exmouth ARC; Humberside Repeater Group; Racal Communications (RS), Warrington, Cheshire; Swipe VHF DX Association, Aberdeen.

Some discussion took place on the Swipe VHF DX Association, and the M & R Committee would investigate this;

(iv) to grant life membership to two members;

(v) to appoint Mr P. H. Hudson, GW3IEQ, as regional representative for Region 11;

(vi) to appoint the following area representatives: G. L. Adams, G3LEQ; P. J. Brooker, G3WXC; A. B. Langfield, G3IOA; E. A. Perkins, G3MA; G. W. Perkins, G3VIJ, and J. R. Simpson, G3CAA.

Correspondence

The President said he had received a letter from Mr D. Adams, GW3VBP, who had been co-opted on to Council for Zone E for 1978, expressing his regrets that he was unable to stand for Council in 1979 due to the difficulty of attending week-day meetings.

Headquarters station

Mr Thomas spoke of the TS820 and the FT225RD recently presented to the Society's headquarters station by Lowe Electronics and South Midlands Communications respectively. The President said he would write to these companies and express Council's appreciation of their generosity.

NEW RSGB PRESIDENT INSTALLED

THE installation of the Society's 45th President, Mr John Bazley, G3HCT, took place on 13 January 1979. The venue, at the Warwickshire County Cricket ground in Birmingham, again proved popular, with about 100 people attending. The weather had made travelling conditions poor, with snow, ice and freezing fog being reported en route. Petrol shortages had also kept a number of guests away.

Members and visitors were greeted by the regional representative, Henry Pinchin, G3VPE. Special guests included the High Bailiff of the Manor of Henley in Arden, and his wife; Prof and Mrs R. M. Browne; Mrs Martin; Mr Swetnam; Mr P. Rowley of Eddystone Radio Ltd, and Mrs Rowley; and Mr R. Williams of the Midlands Telecommunications Region HQ.

The bad weather played a significant role in the short formal section of the evening. Dr D. S. Evans, G3RPE, last year's RSGB President, had fallen on the ice during the previous day and had broken his ankle. He was therefore unable to be present to instal the new President, by presenting him with the presidential chain of office, but Past-President Cyril Parsons, GW8NP, stepped in at short notice to perform the ceremony.

In introducing Cyril Parsons, the Council member for Zone B, Jack Anthony, G3KQF, welcomed members and guests, and explained that Dain Evans was unable to attend because of his accident.

Before formally installing the new President, Mr Parsons said:

"Mr High Bailiff, ladies and gentlemen. It was my great privilege to carry this emblem (referring to the presidential chain of office), on which are some of the most famous names in radio, around my neck in 1975. I think tonight's installation creates a precedent, inasmuch as I am making, if you will forgive the play on words, a president for the second time, and I am sure there is no more worthy person to hold this office.

"I have known John for a number of years: I know his enthusiasm; I know his energy, and I am sure that he will carry this (chain of office) around with him. Probably, like myself, he will consider it a bit of a nuisance when the year gets well advanced, but he will carry it with distinction, and I wish him well."

Cyril Parsons speaking before installing the new President

The newly-installed President addressing the gathering

After thanking GW8NP for performing the ceremony, the new President said:

"Mr High Bailiff, ladies and gentlemen. It is indeed a pleasure to see so many people here tonight, particularly in view of the troubles we have had; not only with the weather but also with the petrol shortage, particularly in this area.

"First of all, I would like to convey, by David Evans, our general manager, our good wishes to Dain Evans, and sincerely hope it won't be too long before he's fully active again. It is a very great pity that he isn't here with us tonight, particularly in view of the terrific amount of work that Dain has given to the Society in the past 12 months, and I think it will be many years before we have a President who can devote so much time to the benefit of us all.

"Over 30 years ago, on joining our Society, I never imagined that I would be asked to accept the honour of being your President for 1979. This presidential chain records the names of many great men who have made enormous contributions to our Society and to the technical development of radio. I intend during the next 12 months, to do everything within my capabilities to uphold the traditions and the examples set by the previous presidents of our Society.

"Tonight, ladies and gentlemen, I would like to issue a challenge. During the past 50 years we have seen giant strides taken in the field of communications—the introduction of solid-state devices, miniaturization, satellite communication, to name but a few—but to me there is an underlying trend towards commercialization that I personally regret. Amateur radio is, and must remain, a challenge, and to the newcomer the quickest way of quenching the first spark of interest is to quote the price of a modern transceiver. We must produce for these newcomers, either through the pages of *Radio Communication* or by other RSGB publications, details of easily

constructed and simple equipment. This challenge is directed to all our members.

"Requests for such articles have appeared from time to time in *Radio Communication* but, I regret to say, with very little useful response. I understand from Roy Stevens, chairman of the Technical & Publications Committee, that if a brief outline, with circuit diagrams and photographs, of equipment designed and built by members is submitted to that committee, they have the resources to get suitable articles written up for publication. The challenge has been issued and I would like to see a positive response within the next 12 months. We have within our Society the technical expertise which, for some unknown reason, we just seem unable to tap.

"This year, in the latter part of September, we shall see the opening of the World Administrative Radio Conference in Geneva—WARC 79—where, to quote Mr Butler, the Deputy Secretary General of the ITU, 'WARC 79 will come forward with a new treaty which will govern the planning and operation of radio communication services well beyond the year 2000'. Negotiations have been taking place for several years between our Society and the Home Office in preparation for this conference, and I would like to record our appreciation of the sympathetic attitude taken by officials of the Home Office during these discussions. Each one of us can still contribute towards WARC 79 in a number of ways:

by setting an example at all times by operating intelligently and politely;

at every suitable opportunity point out the service that amateur radio gives to society; and

encourage new members to join our Society, so that, during discussions, we can truly say that we represent the majority of radio amateurs in this country today.

"Now to turn to more personal matters. I have a very pleasant duty to do tonight, for we have with us our three new Council members, and if they would be good enough to come forward I would like to present them with their badges of office—alphabetically, Robin Bellerby, Les Hawkyard and Graham Knight.

"When I first drafted my notes for what I was going to say and do tonight, I had no idea of the significance which the next item would really have. I thought it would be rather a nice idea to present a pennant to the person who has travelled the farthest to be here tonight, excluding Council members and members of the staff. According to the adjudicators who have been checking everybody in, that person is G3KSH. Now, I don't doubt their accuracy, but whenever we do this sort of thing there is always somebody who says 'Ah, but I travelled farther'! Well, in this case ladies and gentlemen, my decision is final!

"I would like to thank you all for coming tonight, and some of you, I know, have travelled quite long distances in very difficult conditions. I would like to thank all of the members and staff who have contributed to the arrangements tonight, and made what, to me, is a very successful evening.

"And finally, may I wish you all, at the conclusion of this evening, a safe journey home.

"Thank you."

G3KSH receiving his pennant for having travelled farthest to the installation

The President then read greetings telegrams, among which was one from "Jumbo" Godfrey, ZL1HV, the president of the New Zealand society NZART.

The brief formal installation ceremony was followed by an excellent buffet reception at which those present were able to meet and enjoy the company of old and new friends. □

obituaries

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

Mr H. K. Basterfield, G4MJ
Ken Basterfield, who died on 28 November 1978, had been an enthusiastic radio amateur since before the second world war and was very active on the hf dx bands until he was taken ill two years ago. His callsign appeared in the DXCC Honour Roll for many years, and he was very proud of his honorary membership of the Ex-G Radio Club, in whose activities he always took great interest.

Mr G. Buckland, G3CHM
Graham Buckland died on 11 November 1978, aged 57. He was well known in the S Manchester area on the hf bands and 144MHz, and was a member of the RNARS.

Mr N. T. Gwynn, GU4BSI
Bob Gwynn, who died on 21 September 1978, was a member of Guernsey RAS and, although he was licensed rather late in life, was an enthusiastic amateur.

Mr C. Kretschmar, WA2JZU
Charles Kretschmar, who died on 3 September 1978, was a keen dx operator, and had regular skeds with many British and Continental stations.

Mr E. R. Robson, 5Z4ERR
Robbie Robson, who died recently, had been an active amateur in Kenya for many years, with many friends in Britain and throughout the world. He was patron of the Radio Society of Kenya.

Mr A. Staples, G3XZ
Albert Staples died on 25 November 1978, aged 74. He had been an amateur since before the second world war and was active until shortly before his death.

We have also been advised of the deaths of:
Mr J. M. Ackland, RS36446;
Mr C. A. Harley, G2ACC, on 5 November 1978.

your opinion

WHAT IS A DEMONSTRATION?

The Editor
Radio Communication

Sir—I must, on behalf of myself and the Sutton Coldfield RS, accept the challenge of "Current Comment" in your September 1978 issue, and defend, I quote: ". . . the Tony Hancock image of bungling incompetence . . ."

Someone, I cannot remember who it was, once said, "There is no such thing as bad publicity", and in our experience, from speaking to a great number of visitors to our twenty-first anniversary exhibition, the point was proved. Tony Hancock turned out to be a common talking point and started conversations which ended with a conducted tour with non-technical, no-jargon type of explanations of the displays. All the visitors I spoke to appreciated that Tony Hancock was "larger than life", but this started a conversation about amateur radio, and then it was up to us to show the difference between the imagery and the real thing.

We must not be insulted by references to "bread puddings", "darling pa valves", or "a bob for the meter". We must capitalise on it. We must show ourselves, as per the dictionary definition of "amateur", to be "those whose interest is in the love of a subject", as opposed to the concept of amateurish. We should explain our interests in plain English. You know what "pse QSL mani tks fer QSO 73 OM GL GN . . . AR" means, so explain it in the Queen's English, and, more important, the reason for the abbreviations.

With reference to G8AKX's last sentence, I can make some observations and suggestions for clubs:

Make sure that you have at least 90 per cent of your members' support.

Form a sub-committee of enthusiastic, hard-working and reliable members—three or four are enough—and liaise with the club's management committee with reference to general policy and spending money.

Spend eight months on arranging the show—not forgetting details like the table coverings, the posters (which should contain a minimum of words—people haven't the patience to read long screeds), the public liability and all risks insurance, the station equipment—with alternative plans in case of failure, and the screened-off area for exhausted operators to sit down and refresh themselves out of the public eye.

Approach the exhibition concept with the eyes of a professional—nothing must be just "good enough"; it must all be *very* good. In station operating, demonstrate R5 S9 signals only. Yes, I know we can understand (?) an RB . . . on 10 metres using a questionable A3j at R4S1, but we are trained operators—if you do not believe me, read your licence! The general public's ears are not tuned to "fine business dear friend, pleece QSL Box . . ."

Have some electronic games and gimmicks, constructed by your junior members, for little (and sometimes big) fingers to touch. It saves the TS820 from damage.

Think out what you would like to see at an exhibition/demonstration.

Accept the challenge! The experience can be overwhelming, but when you close the doors at the end of the final day, you can look back with satisfaction in the knowledge that the effort was worthwhile, and that a visitor who knew practically nothing of amateur radio has seen it in action and has been convinced that Tony Hancock was a joke in exactly the same way as his "losing an armful of blood".

V. Sutton, G3GLQ
Chairman, Exhibition Sub-committee, Sutton Coldfield RS

Sir—Referring to the "Current Comment" item "What is a demonstration", we of the Horndean & D ARC have tried to make our demonstrations mean something to the general public on two occasions with the following idea.

We have a large map of the UK (it could be of Europe or the world, depending on the expected range of contacts) and through a hole in the map at our QTH we bring a pair of thin wires with a small lamp attached and equipped with a pin, so that the lamp can be pinned to the map at the QTH of the station with which we are in contact. We arrange for the wire to be kept taught, so that it marks a straight line between us and the other station, and the lamp flashes to attract attention.

On completion of a QSO, we stretch a piece of coloured cord over the path now vacated by the wire and fix a small flag at the remote end of the cord showing a serial number. At the side of the map we have a list of completed contacts, each with its appropriate serial number and brief description of location.

Above the map we have a brief explanation of what it all means.

So, we progress through the demonstration with an increasing number of cords and listed contacts on the map, and the flashing lamp showing the location of the contact in actual progress.

J. Harwood, G3WLY

APPALLING "GOINGS ON"

The Editor
Radio Communication

Sir—Having been a radio amateur for just a shade over 40 years, and writing as one who has had an incurable leaning towards dx for all of that time, I feel compelled to express my unhappiness about some of the appalling "goings on" on the bands of late.

We have had the obscene jammer of "G" origin on the top end of 80 who has got away with it for far too long. How does he do it without everyone in the neighbourhood knowing?

Bob Treacher in *SWL news* referred to the HZ1BS/8Z4 shambles. This was a well-meant dxpedition organized by real amateurs who just did not know to what depths behaviour on the bands has sunk. I felt the deepest sympathy for Saleem, OE6EEG, who must have suffered agonies of frustration and disappointment at everything that happened.

John Allaway also referred to the G3RCA situation, and one could quote dozens of others, not least the GW4ELI "obituary".

What has come over this hobby of ours? I feel we are being swamped by sheer numbers, too much power and an absolute obsession to "work it no matter what; and if I can not, nobody will".

I like dx, but I do not blow a gasket if I do not work a new country today—there is always tomorrow. At least let us here in the UK set a standard of which we can be proud.

R. Small, G3ALI

"What sort of aerial did you have in mind?"

contest news

November 1978 144MHz CW Contest results

This contest was not so well supported as in 1977, although conditions were better, with 24 entries against 29. The difference between the RSGB contest 2000 to 0100 and the Marconi Memorial IARU 24h event again caused much comment. The overall winner, G3POI, only worked one G and one GJ station compared with 28 DLs and 19 PAOs.

G3BDQ commented, "Try to coincide next year's event with the other contest but do not lengthen the RSGB one; five or six hours is enough at a stretch for a single operator." This is the nub of the problem, and for this year the committee is considering holding the RSGB event on Sunday only, but this will not solve the incompatibility. Contest enthusiasts are therefore invited to write to G3FZL with views on whether the RSGB event should coincide entirely with the IARU event. If so, should there be an off period, say during the night? Or is there any other way to deal with the problem? As a reminder, the IARU Region 1 Marconi Memorial contest organized by the Italian society ARI runs 24h 1600 to 1600gmt on the first weekend of November. In the UK this often coincides with bonfire night celebrations (Saturday evening) and sometimes the Leicester show. Thus a Sunday-only contest may be preferred, although this will still of course not match the Region 1 event. So, please, what should we do in 1979?

With the exception of the above problem, all participants enjoyed the contest, especially as conditions were very good into central Europe. The winner will be awarded a certificate. Entries for the Marconi Memorial contest made through RSGB were received from G3NAQ (Harwell ARC) 53,449 points (154 QSOs), G3YYF/P 19,928 points (79 QSOs) and G3FPK 6,644 (16 QSOs). The scoring system is one point/km with QTH locator only being exchanged. These entries were used as check logs in the RSGB event. *G3FZL*

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G3POI	1,271	70	AL51g	DM2CSB/P	813
2	GW3WOH/P	1,172	63	YM44d	F6BUL/P	997
3	G4DGA	1,061	91	ZL58b	F6BUL/P	735
4	G3NNG	1,043	87	ZL23f	DK0VL	850
5	G3BDQ	954	66	AK04f	DL1JF	730
6	G3LCH/P	863	78	ZN71h	F6BUL/P	965
7	G3YYF/P	788	70	AK03d	F6BUL/P	670
8	G4DLB	695	59	ZM73j	DL0GT/P	1,017
9	G4APL	552	52	ZL60j	DL0EP/P	725
10	G4DZW	544	52	YL66d	DL0EP/P	1,010
11	G4GRG	476	20	ZM31b	DJ7HC/P	880
12	G2BLA	407	41	ZL20h	DJ9MH/P	727
13	G3SCZ	382	50	ZL45c	DL7WX	777
14	G4FRE	276	27	ZM33d	DL0SO/P	589
15	G5UM	238	35	ZM35b	F6AJI	531
16	G3UYM	210	16	ZL09c	DK0VL	725
17	G4GGV	203	29	ZL37g	HB9AMO	725
18	G4AYM/P	193	23	ZL01j	DK0BN/P	663
19	GU3HFN	177	19	YJ48g	GM3WOJ/P	600
20	G4EGG	157	19	YN38e	G3ZPJ	421
21	G2DUP	150	14	XK35d	ON4YZ	650
22	G2WS	130	20	YL56h	DL0SO/P	720
23	G4GHS	88	16	YN46e	ON4YZ	612
24	G3XBM	81	11	AM52j	DL9SGA	485

June 1978 Microwave Contest results

It is a great pity indeed that this once popular contest has slumped to such low depths. It cannot be said that the very low entry last year was due to any special reason, as it has now happened several times.

Following much discussion, it has been decided that as this contest no longer matches the requirements of modern microwave operating, it will be discontinued. It will be replaced by a new event, to be run concurrently with the 10GHz Cumulative Contest, and it is hoped that this will stimulate greater activity on the intermediate bands.

Congratulations to the winners, the Vectis Wireless Group, G3KSU/P, and to the band leader on 2·3 and 3·4GHz, G8ADC/P, both of whom will receive certificates. *G3WDG*

2·3GHz

Posn	Callsign	Points	QSOs	Best dx	Km
1	G8ADC/P	140	3	G3EEZ/P	152*

3·4GHz

Posn	Callsign	Points	QSOs	Best dx	Km
1	G8ADC/P	76	1	G3EEZ/P	152*
2	G8AGN/P	17	1	G8HAJ/P	17

10GHz

Posn	Callsign	Points	QSOs	Best dx	Km
1	G3KSU/P	579	10	G3VPF/P	89
2	G8AGN/P	28	2	G8HAJ/P	17
3	G8ADC/P	12	2	G8EUQ/M	6
4	G3AHD/P	9	2	G8AXE/P	7

*indicates one-way QSO.

Check logs from G3JVL and G3NRT are gratefully acknowledged.

1978 10GHz Cumulative Contest results

Activity during this contest was slightly higher than last year, with quite a number of new callsigns appearing in the logs. The character of the contest was entirely different, however, with less than 300 points separating the top six stations.

The regular activity which this contest provides was welcomed by a number of stations, who remarked that it gives the opportunity for improving both operating techniques and equipment performance. There seems to be a tendency for the newer stations to operate alongside the old hands; while this decreases the number of different paths attempted, it does provide an excellent opportunity for gaining experience.

It is encouraging to see an increase in fixed station operation. The results show that the disadvantage of a fixed site can be offset to a large extent by the use of high-power equipment.

Also most welcome is the growing activity in France, which led this year to several cross-Channel contacts being made. This contest will be open next year to non-RSGB members operating outside the UK, and the rules will be circulated to the foreign journals, in the hope that the contest will attract a wide entry.

Congratulations to the winner, G3JHM/P, the runner-up, G4DDK/P, the leading fixed station, G3JVL, and to the highest placed station who has not won a certificate before in this event, G8BDJ/P, all of whom will receive certificates. *G3WDG*

Posn	Callsign	Points	QSOs	Best dx	Km
1	G3JHM/P	1,174	22	F6DLA/P	116
2	G4DDK/P	1,161	17	G3NKL/P	134
3	G8BDJ/P	1,031	16	F6DLA/P	138
4	G8GKV/P	940	16	F3LP	138
5	G3JVL	926	27	F0AKD/P	131
6	G8ANZ/P	901	14	G8BTY/P	98
7	F6DLA/P	771	7	G3VPF/P	230
8	G3FYX/P	651	10	G8BTY/P	108
9	G8DIC	590	20	F0AKD/P	131
10	G3IFF/P	381	13	G8BDJ/P	50
*	G3WDG/P	360	6	G3KSU/P	86
11	G3ZME/P	344	6	G8AXE/P	106
12	G3AYJ/P	280	6	G8ANZ/P	70
13	G4ETU/P	211	8	G3KSU/P	67
14	G2DSP/P	197	7	G3KSU/P	67
15	G3YGF/A	110	1	G3JVL	110

1978 SSB Field Day results

Although G4DAA/P again won this contest, the margin between first and second place was narrowed considerably. Will G4AAX, GU3HFN, G3WAS or G3RAC hit the top spot in 1979?

During the event the weather varied enormously across the country, some groups reporting a warm, pleasant weekend, others complaining of continual rain throughout the operating period. All the comments received will be put to the HF Contests Committee, but two points appear in several of your letters; the clash with vhf contests, and a request from the smaller groups for a restricted section.

Many thanks for your support and suggestions, and may the weather be more evenly distributed across the country this year.

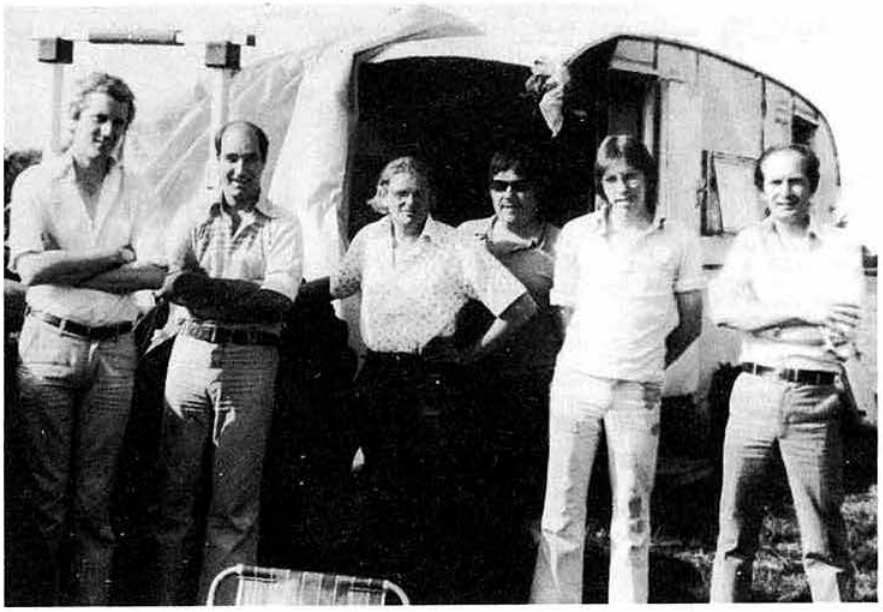
Equipment

G4DAA. TX: FLDX500, SB401, FLDX2000, KW1000.
RX: FRDX400, SB301.
Antennas: 2-el quad at 60ft for 14, 21, 28MHz; dipole for 3·5 and 7MHz.

GU3HFN. TX: FT101B, FL2100.
RX: FT101B.
Antennas: 4-el triband Yagi, W3DZZ.

G3WAS. TX: T4XC, TS520, SB220.
RX: R4C, SB303, 75S3.
Antennas: TH3 at 60ft, delta loop, 3·5 and 7MHz.

G3RAC. TX: FT101B, FL2100B.
RX: FT101B, FT100.
Antennas: quad 14, 21, 28MHz; dipoles 3·5 and 7MHz.



The winning group who operated G4DAA in the SSB Field Day; l to r G3MXJ, G4BUE, G3FXB, G3ZQW, G4EHF and G3XBN

Posn	Group	Callsign	Points
1	Channel Group	G4DAA/P	1,524,970
2	Guernsey ARC	GU3HFN/P	1,485,160
3	Lichfield	G3WAS/P	1,382,355
4	Racal	G3RAC/P	1,124,450
5	Kent	G3RCV/P	714,420
6	Southgate	G3SFG/P	686,700
7	Nottingham	G6CW/P	616,980
8	Crawley	G3WSC/P	577,095
9	Northumbria	G4AAX/P	570,950
10	Shefford	G3FJE/P	432,250
11	Torbay	G3NJA/P	358,020
12	Ipswich	G4CFI/P	331,200
13	Worthing	G3WOR/P	311,200
14	Reading	G5KV/P	309,400
15	Port Talbot	GW3EOP/P	309,050
16	White Rose	G3XEP/P	275,870
17	South Birmingham	G3OHM/P	236,985
18	Oxford University	GW4BUO/P	187,720
19	Derby	G2DJ/P	181,525
20	Bromsgrove	G3VGG/P	157,500
21	Clifton	G3GHN/P	142,220
22	Edgware	G3ASR/P	139,995
23	Ainsdale	G4EID/P	124,440
24	Stourbridge	G6OI/P	97,875
25	Greenock	GM3ZRC/P	91,850
26	Berwick	G3YOG/P	88,020
27	Lincoln	G3IXH/P	80,460
28	Crawley Court	G3LMH/P	73,415
29		GM4FDT/P	55,440
30	Denby Dale	G4HKY/P	54,775
31	Helensburgh	GM4HEL/P	44,715
32	Ilford	G3XRT/P	36,850
33	Lagan Valley	GI4GDV/P	29,145
34	Bury	G3BRS/P	14,360

Overseas and check logs acknowledged from 9HAG, G3NKS, BRS39782, SM5GYQ and ON6JG. Late entries: GM4AGG/P and G3VRE/P.

Low Power Contest 1979 rules

Licensed radio amateurs are invited to take part in the RSGB Low Power Contest. Entrants should note that there is a minor change to the power rule, and the 7MHz multiplier has been deleted for this year's contest. In other respects the rules remain the same as those for the 1978 event.

1. The general rules for RSGB hf contests, published in the January 1979 issue of *Radio Communication*, will apply. This is a single-operator contest.

2. Eligible entrants. British Isles—RSGB members only.
Overseas—All licensed amateurs.

3. When. Sunday 8 April 1979. Entrants are permitted to operate for a total of eight hours between 0700 and 1700gmt in two periods of their own choice, with a break of at least one hour between periods. The start and finish of each period is to be shown in the entrant's logs.

4. Bands. CW only in the 7 and 3·5MHz bands.

5. Exchange. RST plus serial number starting at 001 and entrants power group, eg 579001/3W.

6. (a) Scoring. All entrants will claim points for each completed contact in relation to the power group used to make the contact, viz:

1W or less	3W maximum	5W maximum
100 points	50 points	25 points

(Entrants may use different powers during the contest, but the power used for each completed contact must be shown in the logs—see below).

(b) Bonus. All entrants may claim extra points for contacts with other low power stations, by adding the points for the power group as received during the contest exchange. Thus an entrant running 1W contacting a station running 3W may claim 100+50 points for the contact. No bonus may be claimed for contacts with non-QRP stations.

(c) Overseas entrants may only claim points (and bonus) for contacts with UK stations.

7. Logs. Log sheets to be headed: date/gmt, callsign of station worked, RST and number sent, RST and number received, power group received, power group sent and claimed score for contact. Separate logs are required for each band.

8. Declaration. Each log must be accompanied by the following declaration: "I declare that my station was operated in accordance with the rules of the contest, and in accordance with the terms of my licence." The declaration must be dated and signed.

9. Address for entries. RSGB HF Contests Committee, c/o R. L. Glaisher, G6LX, 279 Addiscombe Road, Croydon, Surrey CR0 7HY, England.

10. Closing date for receipt of logs. 30 April 1979.

11. Awards. The 1930 Committee Cup will be awarded to the winner of the UK Section. The winner of the Overseas Section and the entrants placed second and third in each section will receive certificates.

12. Disputes. In the case of any dispute, the ruling of the Council of the RSGB shall be final.

144MHz CW Contest rules

0900–1700gmt 22 April 1979

All entries and checklogs to: VHF Contests Committee, c/o Mr G. M. C. Stone, G3FZL, 11 Liphook Crescent, Forest Hill, London SE23 3BN.

The following general rules, published in the January 1979 issue of *Radio Communication,* will apply: 1, 2, 3, 4a, 5a, 6b, 7a, 8, 9a, 10a, 11a, 12–22.

National Field Day 1979

The HF Contests Committee wishes to thank those groups who sent comments and suggestions regarding the rules for this contest. As a result, the scoring has been simplified, while still retaining an emphasis on contacts with portable stations, and additional awards have been introduced.

Most groups were satisfied with the timing, hence no change.

RULES

1. The general rules for RSGB hf contests, published in the January 1979 issue of *Radio Communication,* will apply.

2. Applications. Each group intending to compete must submit an application on form HFC 10/79 to Mr D. S. Booty, 139 Petersfield Avenue, Staines, Middlesex TW18 1DH, not later than 28 April 1979. Supplies of forms can be obtained from RSGB HQ, or direct from Mr Booty on receipt of an sae.

3. When. From 1700gmt Saturday 9 June to 1700gmt Sunday 10 June 1979.

4. Eligible entrants. Any group of RSGB members within the prefix zones, G, GD, GI, GJ, GM, GU and GW. NFD is a multi-operator contest.

5. Operation must be from a portable station not located in a permanent building and not using a mains supply. No equipment or antennas may be installed on the site prior to 24 hours before the start of the contest. This does not apply to the storage of equipment.

6. Mode. CW(A1) only, in the 1·8, 3·5, 7, 14, 21 and 28MHz bands.

7. Sections.

(a) Open section. The station shall consist of a transceiver (or transmitter and receiver) with an additional receiver if desired, which may only be used for monitoring purposes. There is no restriction on the number or type of antennas, but the maximum height above ground must not exceed 60ft (18·5m).

(b) Restricted section. The station shall consist of a transceiver (or transmitter and receiver) with one antenna which must be a single element such as a dipole, vertical, long wire, inverted-V, etc, having not more than two elevated support points, and not exceeding 35ft (11·5m) above ground at its highest point.

Both sections. Standby equipment may be at hand but not powered or connected in any way simultaneously with the main equipment. The presence on the site of additional amplifiers or modified commercial equipment capable of excess power, may result in the entry being disallowed.

8. Scoring. Points will be scored as follows:

(a) Fixed stations in Europe (including the British Isles).... 2 points
(b) Fixed stations outside Europe..... 3 points
(c) Portable and mobile stations in Europe (including the British Isles)..... 4 points
(d) Portable and mobile stations outside Europe..... 6 points

The contacts on 1·8MHz and 28MHz should be scored as above and the totals multiplied by two to obtain the claimed score.

9. Group contacts. Points must not be claimed for contacts made by a competing station with members of its own group.

10. Entries. These are to be in accordance with General Rule 6, with the following exceptions:

(a) The normal cover sheet will not be used. Special cover and summary sheets will be sent to the person responsible for the entry.
(b) Points must be totalled separately for each band.
(c) Logs must be sent to the RSGB HF Contests Committee, c/o Mr M. Harrington, 123 Clensham Lane, Sutton, Surrey SM1 2ND, postmarked not later than 25 June 1979.

Entries sent direct to RSGB headquarters will not be accepted.

11. Trophies.

(a) The National Field Day Trophy to the group in the Open section having the highest checked score.
(b) The Bristol Trophy to the group in the Restricted section having the highest checked score.
(c) The Gravesend Trophy to the group having the second highest checked score, in the section with the largest number of entries.
(d) The Scottish NFD Trophy to the Scottish group having the highest checked score.
(e) The Frank Hoosen Trophy to the group having the highest checked score on the 14MHz band.
(f) Certificates of merit to the groups in the Open section with the highest checked scores on the 1·8, 3·5, 7, 14, 21 and 28MHz bands.
(g) Certificates of merit to the groups in the Restricted section with the highest checked scores on the 1·8, 3·5, 7, 14, 21 and 28MHz bands.

12. Check logs. While overseas stations are not eligible to enter NFD, check logs are very welcome. A certificate will be awarded to the overseas station in each continent whose check log shows the most points contributed to competitors.

13. Inspections. All stations are subject to inspection by nominated representatives of the HF Contests Committee. The inspector's brief will be to ensure that the rules and spirit of the contest are being observed. Should the inspector be unable to locate the site due to inadequate or incorrect information given on the application form, the entry will be disallowed. In the event of a last-minute change of site, it is the responsibility of the members of the group to make suitable arrangements for the inspector to find the new site.

70MHz Contest rules

0900–1500gmt 29 April 1979

All entries and check logs to: VHF Contests Committee, c/o Mr R. Taylor, G4BEL, 12 The Rampart, Haddenham, Cambs CB6 3ST.

The following general rules, published in the January 1979 issue of *Radio Communication,* will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8, 9a, 10a, 11a, 12–22.

1,296MHz Contest rules

1600–2400gmt 7 April 1979

All entries and check logs to: VHF Contests Committee, c/o Mr R. Sharpe, G2HIF, 20 Harcourt Road, Wantage, Oxon OX12 7DQ.

The VHF Contests Committee Cup will be awarded to the leading station.

The following general rules, published in the January 1979 issue of *Radio Communication,* will apply: 1, 2, 3, 4a, 5a, 6a, 7b, 8, 9b, 10a, 11a, 12–22.

432MHz and SWL Contest rules

0900–1700gmt 8 April 1979

All entries and check logs to: VHF Contests Committee, c/o Mr C. Sharpe, G2HIF, 20 Harcourt Road, Wantage, Oxon OX12 7DQ.

The 1951 Council Cup will be awarded to the leading station.

The following general rules, published in the January 1979 issue of *Radio Communication,* will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8, 9a, 10a, 11a, 12–22.

Contests calendar

10–11 February	1st 1·8MHz *(Rules in January issue)*
24–25 February	1979 French (Phone) *(Rules in January issue)*
3–4 March	144/432MHz and SWL *(Rules in January issue)*
3–4 March	1979 ARRL International DX (Phone) *(Rules in January issue)*
10–11 March	Commonwealth *(Rules in December issue)*
17–18 March	1979 ARRL International DX (CW) *(Rules in January issue)*
24–26 March	BARTG Spring RTTY *(Rules in January issue)*
7 April	1,296MHz Open *(Rules in February issue)*
8 April	Low Power *(Rules in February issue)*
8 April	432MHz Open and SWL *(Rules in February issue)*
22 April	144MHz CW *(Rules in February issue)*
28–29 April	Helvetia 26
29 April	70MHz Open *(Rules in February issue)*
5–6 May	432/1,296/2,304MHz
6 May	Region Round-up CW
20 May	Region Round-up SSB
26–27 May	144MHz Portable
9–10 June	NFD *(Rules in February issue)*
16–17 June	Microwave
23–24 June	Summer 1·8MHz
7–8 July	VHF NFD
15 July	3·5MHz Field Day
29 July	144MHz QRP
11–12 August	European Meteor Scatter
18–19 August	70MHz Open
1–2 September	144MHz Open and SWL
1–2 September	SSB Field Day
October–November	432/1,296MHz Cumulative
6–7 October	432/1,296/2,304MHz
13–14 October	21/28MHz
20–21 October	7MHz Phone
21 October	70MHz Fixed
3–4 November	144MHz CW
3–4 November	7MHz CW
10–11 November	2nd 1·8MHz
2 December	144MHz Fixed

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of the 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* mailing label addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 75p (stamps not accepted) for every 40 words or part thereof. They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

Closing dates in 1979; **2 Mar, 27 Mar, 27 Apr, 28 May, 21 June, 2 Aug, 30 Aug, 27 Sept, 25 Oct, 22 Nov, 27 Dec.** No guarantee of inclusion in a specific issue can be given, other than the first possible issue after receipt.

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.

Advertisements for 27MHz equipment will not be accepted.

Post to: MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS.

Do not post to RSGB HQ or Advertising Representative

FOR SALE

Drake R4B rx, T4XB tx, AC4 psu, MS4 spkr, brand-new Shure 444 mic, all in good cond, £450 ono. Owner going abroad. G4DHA, QTHR. Tel Saltash (075 55) 3219.

Liner 2, vgc, mic, fitted preamp, mobile mount, handbook, £110 ono. SML vswr twin meter, six months old, boxed, £10 ono. Few Mullard QQVO6-40A, (heaters ok), £5 ea. Stabilized psu, dual 250V 100mA, meter, £20 ono. G8OGH, QTHR. Tel Byfleet 42581.

Trio 2200G, modified for and comp with VFO30G, seven xtal channels, homebrew mobile mount, mains psu and afterburner, usual accessories, £180. G8JNI, QTHR. Tel Godalming (04868) 22834.

IC202, 144·0–144·6, 144·8–145·0, 145·8–146MHz, £140. IC215, R3–8, S20, S22, helical whip, £130. 24W linear amp for 202/215, £25. Pair PF1 Pocketfones, on SU22, incl nicads, £30. G8GMF, G8OBL QTHR. Tel 01-868 2159.

Atlas 210X, latest D series model, very sensitive, 6,545kHz i.f., comes with noise blanker, ac supply, mic, in new no-scratch cond, covers 80–10m, 200W p.e.p., £400. Selman, 9 Park Parade, Cambridge CB5 8AL.

KW202, 204, brand-new, unused, buyer collects, £400 no offers; not to be split. Owner buying motor cycle. Plant, "The Double R'R", Moor Lane, Brighstone, Isle of Wight. Tel Brighstone 740002.

Cossor oscilloscope tubes 89D, 89J, 89Z, boxed, offers. Avo 40, £16. Phillips microvoltmeter, type GM6020, £22. Furzehill valve voltmeter, V200A, £18. Roband RO50A Mk2 oscilloscope, 25MHz dual beam, £100. Cooper, 11 Radical Ride, Wokingham, Berks. Tel 0734 734312.

"Practical Wireless": volumes Jan '62 to Dec '77, £20; 102 earlier copies, free to buyer Creed teleprinter 75RPRK, £10. Old bluespot spkr NMP 1134, send rec B70 R1082, phone, amp, Fonadek Varley square peak coil, new. G3XLC, QTHR. Tel 0782 311811.

Yaesu FRG7 gen cov rx, fine tune, manual, mint cond, £130. Ranger 2m rx, not wkg, £12. Buyer collects. Tel Gary, 01-642 1465, after 5pm.

Trio 2200G, VB2200, 11ch xtalled, mobile mount, £125. G4DBX, QTHR. Tel 0270 581657.

Hudson FM208 with 145·00 xtals and Toyo xtal filter, tx tuned to 2m, transistor rx not tuned, bargain, £30 ono. G8MEK, QTHR. Tel 01-286 1833.

TTC test meter, model C1085, 100,000Ω/V dc, 50,000Ω/V ac, 51 ranges, mint cond, £25. Buyer collects. E. R. Crane, 1 Lea House, Salisbury Street, London NW8. Tel 01-262 1461.

IC21XT, exc cond, £95. KW2000, handbook, ac/dc psus, £110. KW Vespa, as new, offers. G3UKE, QTHR. Tel 0279 814889, evenings.

QR666 gen cov rx, 170kHz–30MHz, plus 87–108MHz adaptor, 500kHz calibrator, £130. Technical Associates xtal calibrator, £8. G4FQF, QTHR. Tel Romford 47998.

Icom IC202, extra cov 144·4 to 144·6 and 144·8 to 145MHz, in exc cond, comp with all accessories as supplied, £140. G3KLF, QTHR. Tel Ipswich (0473) 310442, weekends or evenings.

QM70 2m transverter, 2W o/p, comp with leads for Yaesu equipment, £30 ono. RF ammeter, 2·5A fsd, £5. Numerous valves and other components available, sae your requirements. GI4FUE, 103 Hawthorn Avenue, Carrickfergus, Co Antrim. Tel 09603 67978.

2200G, S0, S16, S20–24, R5–7, nicads, charger, boxed, £110. *Wanted:* hf triband beam. G4EJW. Tel Weston-Zoyland (Somerset) 494.

KW2000B, ac psu, Shure 201 mic, extra xtals 28·2–4 and 29·4–6MHz, new 6146s and other valves fitted, £210 ono. G4GZK, 24 Church Lane, Coven, Nr Wolverhampton. Tel Standeford (0902) 790750.

Microwave Associates 3cm Gunnplexer tx/rx, as reviewed November, new, unused, with maker's test report, £69. G8APX, QTHR.

Trio lp filter, as new, £10. Joystick vfa and tuner system J, perfect cond, £30. G3HRU, 40 Winding Way, Alwoodley, Leeds 17. Tel Leeds 677178.

Offers wanted for the following: *Wireless World* '55–'72, in library binding; '73 to date, unbound; GR78 gen cov rx, to 30MHz, nicad battery. G8CGK, QTHR.

Samson ETM 3C keyer, used very little, A1 cond, £40. Microwave Modules 2m converter, 28–30 i.f., 116MHz o/p available, unused, £15. G3IRW, QTHR. Tel Bacton (Suffolk) 403.

MM 2m converter, 28MHz i.f., £12. STE MILAN AR10 board, af amp, fm disc, vgc, £27.50. G8HUU, 3 Red House Lane, Leiston, Suffolk. Tel Leiston 830853.

Unwanted gift: YC601, digital display, brand-new, unpacked only for examination and trial, orig packing and guarantee, someone is lucky at £85. G3SEU, QTHR. Tel 0734 332414.

HW12A, HP23 psu, Yaesu mic, as new, £80. DX60B tx, matching vfo as new, T9 note very stable, £50. Could deliver Rugby area. G3WAU, QTHR (Glos). Tel 0452 82 3315.

IC202, orig packing, fitted 144·0, 144·6MHz, good cond, £138. Two 20ft dural poles, new, 2in dia ¼in wall, £10 ea. Buyer collects. Mullard 5–10 stereo amp, spkrs, £20 ono. Tel Mike, Tetbury (0666) 53425.

RTTY rx adaptor outfit FAE2, matching crt tuning indicator in 19in rack, instruction manual, all as described in *Teleprinter Handbook*, £35 ono. Creed 86R reperforator, mains motor, £8. R. Looker, 91 Station Road, Amersham, Bucks. Tel 02403 7671.

Drake TR4, AC4 power pack, bargain, good cond, £290 or offers. G3GHS, QTHR. Tel 01-399 6293.

Eddystone 898 dial, new, £9. Xtal calibrator, wkg, £1.50. Marine mf xtals: 2,009, 2,016, 2,104, 2,111, 2,182, 2,241, 2,262, 2,304, 2,306, 2,381, 2,395, 2,652, 2,776kHz. G4ERA, QTHR.

Trio 2200GX, fitted R5, R7, S0, S20, S22, plus full accessories, mobile mount. *Wanted:* old hf tx/rx, HW100, etc, cond not important if repairable. GI3YMT. Tel Belfast 644688.

Pye Cambridge AM10D, 2m a.m./fm tx and rx, 6ch, S20–22, S0, 144·48, R6, fitted preamp, vgc, £50. GW4HDR, QTHR. Tel Rhyl (0745) 31980.

Kokusai mechanical filter type MF455-15K, £8. Eddystone 898 dial, unused, £9. G3OWY, QTHR. Tel Chester 41600, evenings.

No reasonable offer refused: Ex-WD sig gen model CT218, 85–183kHz in six stages to 18·3–30MHz, 2MHz and 200kHz xtal checks cw, carrier level indicator and deviation depth etc, mode select fm, cw, a.m., mode frequency 400-1,000-1,600-3,000- ext + voltage 110–240 ac, spare film calib strip and tool. Buyer to pay freight costs. Weight of unit approx 40lb. A mass of goodies for the interested . . . or wkg unit. Why? *Wanted:* Yaesu FT227R, must be mint cond. Hatton, 8 Alnwick Street, Newburn, Newcastle Upon Tyne NE15 8PT, Tyne & Wear. Tel 0632 678828. Call or phone anytime.

TV camera, Marconi Mk3 image Orthicon camera, with viewfinder, ccu, psu, picture and waveform monitor, connecting cable, circuits, plus 17in monitor and four lenses, £80 ono. Some other cameras and pieces of tv gear. G8GQS, QTHR. Tel Gainsborough 3940, evenings.

G2ACC's widow, Mrs B. M. Harley, offers the following equipment, unused on the air, due to health reasons: Yaesu Musen FL50B tx with vox; Yaesu Musen FR50B rx; KW107 antenna 52Ω tuning system; KW balun, 1 to 1 ratio dual impedance 52/75Ω; YD844 table mic; metal cabinet 39 by 15 by 10·5in, with 15 drawers containing new components, etc. For appointment to view, tel Clive (Nr Shrewsbury) 494.

Morse keyboard, as described in my article *WW* Jan '77, alphanumeric keyboard + VA, AR, etc, 64 character fifo memory, led indicators, psu, reed-relay output, comp, in case, £95. G3RVM, 5 St Giles Road, Bredon, Tewkesbury, Glos.

Xtals for ladder filters (ref *Radio Communication* Sept '76 to Feb '77, and June, September '77; *Wireless World* July '77) HC6U types, approx 9·5MHz, 10, single freq, £1 incl p&p. G3YKB, QTHR.

TR2200GX, fitted R3-7, S20-24, mint cond, all accessories, in orig packing, £130. MMV 432, £7. Jaybeam 5Y/2M, £5. *Wanted:* RAF box kite, plus antenna wire. GW8NBK, QTHR. Tel 0222 60694, after 4pm.

Press-button dialling telephone, £2.50. Storno Viscount controls, spkr, 8ch, £4. Microwave burglar alarm, unused, £25. Radiovisor alarm (rays), 70ft range, £18. Oscilloscope crt, unused, £15. Valve voltmeter, £12. Teledial signaller, £7.50. W. Joyce, 41 Rochdale Road, London E17 8JF. Tel 01-539 5421.

FT221R, in mint cond, Yaesu mic, £295. Microwave Modules 144/28MHz converter, £14. 25 Meadway, Waterlooville, Portsmouth, Hants. Tel Waterlooville 54828, after 6pm.

Liner 2, no mods, £100. Prefer swop fm box or FRG7. Cooke, G8ETR. Tel 0245 83262.

KW E-Zee match, perf cond, £20. G5YH, QTHR.

Pye AM25T, 2m, 6ch, toneburst, R7, R5, S20-23, a.m./fm, switchable helical whip, controls on main unit, offers. G8EZT, QTHR. Tel Ray, 01-749 2584.

Property late G3CHM: Uniden TR2020, £350; FL2100 linear, £275; Icom IC240, brand-new, used twice only, £160; all immac, all ono. 18AVT vertical, second-hand, boxed, £30 ono. G3ZBZ, QTHR (Manchester). Tel 061-437 9584.

FT101, new pa tubes and blower, £270. HD1250 solid-state dip meter, as new, £30. HD1426 field strength meter, as new, £7. G4GAP, QTHR.

Generator, portable, 12V 3A, petrol, ex-WD, £20. Manual for Marconi Atalanta, £2.50. Heathkit AR14 stereo rx, 10W/ch auxiliary inputs, four spkrs, never switched on, cost nearly £70 five years ago, now only £30. G4EUW. Tel Brightlingsea (0206 30) 3071.

Storno Viscount, boot mount, fitted S20, S22, 145·8, R5, incl auto xtal toneburst, receive preamp, handbook, R7 xtals, £45 ono. Solid States Modules 144-28MHz converter, £10. Toneburst xtal with circuit, £1.25. G4FFJ, QTHR. Tel 0632 815966.

Trio TS700S, SD306 preamp, £450. FRSDX400, all options fitted, £160. Burns TC101 wavemeter, 800kHz-500MHZ, £35. DIAWA SW410A swr power, 144/432, £40. Hartley 13A 'scope, offers. 4-el 2m quad, + 19m, RG8, £20. G8RCG. Tel Mike, 061-494 0434.

Transformer, 3,630V 500mA, ceramic terminals, £5. Choke, £2. RS isolating transformers: 200/250V, as new, 75W, £3; two 200W, £5 ea. Electrolytics 40 MFD, 275V ac, alternatively 375V dc, 10p ea. Paper, dielectric, oil-filled, various, new, quantity. Carr extra. G3JHL, QTHR. Tel Romsey 513215.

Versatower P25, comp with winch, head unit, brand-new, never erected, £160. Heathkit HW100, Heathkit digital display, h/b psu, £175. MK sstv monitor, £30. *Wanted:* FT301S. G3XOF, QTHR. Tel 0283 813782.

Trio 2200G, S20 S22, R3, R5-7, rev R5, 145·8, nicads, helical, £100 ono. PA/preamp, 14W, rf, switched, £30 ono. Liner 2, fitted preamp, cw facility, £110 ono. 5/8λ magnetic Revco whip, £12. Gone hf bands. G4FFJ, QTHR. Tel 0632 815966.

UHF Starphone, fm, mobile, wkg on RB0, RB4, RB6, SU8, RB14, comp with mic, mobile mount, workshop manual, spare i.f. coils, £70 ono. G8GTZ, QTHR. Tel 0953 452163.

Europa B, mint, hardly used, £70 ono. MM 2m to 28/30 converter, xtal o/p for transverter, £14. *Wanted:* rotator 100+ft vy low loss, uhf 50Ω coaxial. G3CDK, QTHR. Tel 01-647 1866.

Echo 8G three-band vertical antenna, hf, vgc, £25. KW dummy load, 50Ω, up to 30MHz, £20. Buyer collects both items. G4DQH, QTHR. Tel Dronfield 413500.

KW1000 linear, hardly used, for sale or exch, why? G3LWM, QTHR. Tel 0279 814929, day; or 0279 56347, after 7pm.

YO100 monitorscope, 3,180kHz i.f. for 101/401 range, conversion kit 9MHz i.f. for 201/501 range, £100; Spacemark electronic keyer module, £7.50; Ten-Tec electronic keyer module, £5; all with instruction books or data. G3DOG, QTHR. Tel 09322 26076, after 7pm.

Marconi Marine style rx, 15kHz to 30·5MHz, £35. Marconi rf power meter, type TF1020, 50W and 100W ranges, £30. Property of late G8ALU. Tel Hitchin 730546, after 5pm.

Trio JR599 custom special rx, 2m converter, all filters, a.m./fm/cw/ssb, manual, exc cond, £160. G3YRW, QTHR.

FRG7, mint cond, little used, £150. G4BXO, NOT QTHR. Tel Roade (0604) 862977.

TS820, immac, hardly used, £600. Eddystone 940 gen cov rx, exc cond, £80 ono. *Wanted:* Trio TR7010 or similar. Wood, G3RDC, QTHR. Tel Rugby (0788) 823250.

7in by 4in 3Ω spkr, £1. Phones, Foster RDF-207, £4.50. MM 500MHz prescaler, £17.50. Advance SG21 square-wave generator, 3kHz-100MHz, manual, £37.50. Eagle 20,000Ω/V multitester, £4.50. Belco BR8 LCR bridge, £20. Johnson 100 MFD tx variable, £2.50. Sinclair scientific calculator, £7.50. G3YMS, QTHR.

Trio 7010 2m tx/rx, 18 months old, £130 ono. G8AQP, QTHR. Tel Huntingdon (0480) 56981.

Tansad office chair, blue vinyl, with arms, swivel, £15. Tel Hemel Hempstead 56196.

Pocketfone PF1, £30; Pye Compact, £40; Burndept BE357, xtalled on RB10, £35; all above incl batteries. 14-el Parabeam, hardly used, £17.50. G8BCL, QTHR. Tel 0274 883448.

Pye Bantam hi-band, fm, 12·5kHz, batts, exc cond, £58. G4DHK. Tel Bristol 553767.

G3LVZ QRT shack clearance, new QTH, sae for lists. Jackson, 73 St Christopher Caravan Park, Ellistown, Coalville, Leics LE6 1FG.

National rx, NC-120, similar to HRO, xtal filter, built-in psu, £7.50. BC342 rx, vgc, £18. VLF rx, vgc, £5. G8RDE. Tel 01-310 7355, after 6.30pm.

FT101, fitted 160m, fan, vgc, £280. G3AJX, QTHR. Tel Winchester 61605.

Property late G3TBR: KW2000A, £130; HRO rx, five gc coils, HRO, power-pack, £21; 1191 wavemeter, charts, £9; all above collect or arrange carr; SSM 2m converter, 28MHz o/p, SSM preamp, 116MHz take-off, £14, post paid. Sutton, 3 Crossfield Road, Wardle, Rochdale.

TR2200GX, boxed, as new, fitted S21-23, R1, 4-6, 8, nicads, charger, mobile mount, £110. HW-8 QRP cw rig, comp with mains psu, handbook, £75. 2m converter, MMC 144/28 LO, £12. SSTV monitor, MK Products design, comp with int psu, test tapes, £65. ETM 2B electronic keyer, tune button, £15. Shure 444, virtually unused, £15. G-whip, hardly used, coils for 40, 80 and 160m, incl base mount, £30. *Radio Communication* '74-'78, mint cond, £5. Postage extra on all items. Broadley, G3WBP, 19 Atcherley Road, Compton Bassett, Calne, Wilts.

Drake 2BQ Q-multiplier, £20. Heathkit reflected power meter HM11U, £15. Z-match components, high power, offers. *Wanted:* Drake MS4 spkr, Datong speech processor. G2UZ, QTHR. Tel Leeds 784074.

KW204 tx, good used cond, £120. IC202 plus modular preamp and linear, £140. BC342, rough, no power pack, £5. TF144G sig gen, £5. G3CPA, QTHR. Tel 01-979 1417.

Eddystone EA12 amateur bands rx, plinth spkr. Mosley TA31JR antenna, 20m coaxial cable, all exc cond, £135 ono. Dawes, 94 Snape Hill Lane, Dronfield, Sheffield. Tel 0246 419411.

TS820, mint cond, cw filter, 12V mobile supply, all manuals, £595. G5CQO, not QTHR. Tel Bexhill (0424) 217277.

Microwave Modules 144 to 432MHz transverter (not R version), £88. Microwave Modules 144/LO converter, 28MHz i.f., £10. Magmount pws 144MHz λ/4 whip, £5. Mini-products miniature vertical dipole, Model C4 14-28MHz. Woodhouse, G8DEE, 24 Hurst Park Avenue, Cambridge. Tel 64251.

New, unopened, Hy-Gain TH3-Mk3 triband beam, comp kit, £150. Mint Jaybeam 14el 2m Parabeam, comp, £26. Pye Vanguard AM25TS, mint, 2m a.m. tx/rx, with control unit, £36. Marconi fm deviation meter No 2, needs transformer. Offers? GM3WTA, QTHR.

QY2-100 (Mullard) boxed, £4.50. 813, unboxed, £3. 2N5070 s/hand continuity tested, matched, five for £1. CR100 meter, h/book, £25. Creed reg psu 40V 4A, £6.50. Leak throughline fm stereo, £17. Moss. Tel 01-789 5846.

HF linear Heathkit SB230 (conductively cooled), hardly used, £295. KDK Digital Two with scanning, £190. Alan Fish, G4GPL, 32 Deacons Hill Road, Elstree, Herts. Tel 01-953 6921.

Gone Collins: offers for Trio TS820 c/w digital readout, cw filter; 520 remote vfo; SP820 spkr; two new spare pa valves; all in mint cond. *Wanted:* Collins 30L1 linear amplifier. GM4DNM, QTHR.

AR88LF, comp with set of new valves, vgc; plus KW Vanguard; £55 the pair. Buyer collects. G4DIA, QTHR. Tel 021-544 6655, evenings.

4CX250B coaxial base, chimney, SK620A type, new, £10, incl p&p. TV high pass filter HP3A, new, £2, incl p&p. Telescopic mast, 20ft, as new, £3. G3SEF, QTHR. Tel Cheslyn Hay (0922) 415369.

Swan 175 tx/rx 80m, ssb, mains and 12V psus, similar to HW12, £80. KW Valiant, 160-10, a.m./cw, mains psu, £25. Lafayette HA700 rx, 0·15-30MHz, bandspread, £35. Prefer buyers collect, inspect. G3WWJ, QTHR. Tel Cambridge (0223) 880101.

KW2000E tx/rx, ac psu, exc rig, as new cond, £250 ono. KW E-Zee match, almost new, £25 ono. KW trap dipole incl twin feeder, 16-gauge copper wire, made up but never erected, 10-160m, £7 ono. G3YYG. Tel Hemel Hempstead 64025, evenings.

FT620B, 2m, 70cm, £250. 2200GX plus accessories, £125. PF1s, tx/rx, 70cm, £35. Xtals 8·1, 8·0333, 10·245, 144·95, 145·40, 48·6, 71·0, 12·0319, 12·0333MHz, £1.50 ea; psus, 12-24V, 3·5A, £12; mains transformer, 15A, 24V, £25; 4X150+ base, £8. G8AFJ, QTHR. Tel 0524 51734.

Pye Bantam, fm, wkg, nicads, charger, S0, S22, R3, £50. Pye Cambridge xtals, 8MHz tx, 44MHz rx, S0, S22, R3, R6, R7, £3 per pair. CR100 gen cov rx, vgc, £30. G4FAW, QTHR. Tel Ipswich 58815.

Hallicrafters SX16, Sky Challenger, 550kHz-38MHz, spkr, spare valves, circuit diagram, £18. 39 Sandy Lane, Stretford, Manchester M32 9DB. Tel 061-865 2535.

TS900, £450; FT101E, £375; FRG7, £125; all as new. G3LBG, QTHR. Tel (0702) 521561.

Yaesu FT2F, 12ch, 10W, vhf many channels, two repeater, narrow band filter, improved modulator, £100. Tel Crayford 528915.

Shure 444 mic, £20; Technical Associates audio compressor, £20; both mint and hardly used; £37.50 the pair. G3SYL, 10 Sunflower Close, Kempshott, Basingstoke, Hants. Tel Basingstoke (0256) 51141.

Liner 2, £105. Vibratrol RFL801 amp, £85. KP12 speech processor, £35. FP2 psu, int spkr, 13·6V at 2A, £35. YC601 counter for FT101, £105. FT101 spkr, £12. Codar preselector, £8.50. Racal TRA109 hf ssb tx/rx, no psu 1·8–15MHz, £30. G4CVI. Tel Leatherhead 76530.

Trio TS820 digital, for sale or exch for FT101E for mobile use, cash adjustment. *Wanted:* Power winch for 60ft Westower, 240V. G4DXC, QTHR. Tel Bingley 3289.

Modular Electronics ME202-25 linear, 25W, exc cond, £35. Jaybeam quad, 6-el, only used six months, £15. Avery, G8MGA, 33 Vicarage Close, Worle, Weston-super-Mare, Avon. Tel Weston-super-Mare 512698.

AR88D, Marconi TF801C, hp vswr meter, 10GHz gear, Heath sig gen, audio gen, audio millivoltmeter, Eico 'scope, meganode noise gen, xtals, filters; all listed. G2CPM, QTHR. Tel 0635 40464.

KEN KP202 tx/rx, channels S0, S20–22, R5–6, nicads, hod charger, whip, uhf adaptor, good order, £100. G4CIZ, NOT QTHR. Tel Cottenham (Cambs) 50773.

Yaesu FT101E, used few hours only, virtually brand-new, boxed, all accessories as supplied, 18 months guarantee, £505. G3UEP. Tel 0705 595978.

HW32A, HP13A dc psu, G-whip triband ant (brand-new), £90 the lot. G3KPP, QTHR. Tel Shrewsbury 3545.

Sig gens: Grayshaw SG50, 220kHz–80MHz, £14; Atkins CT53, 10–300MHz, £15. Mullard pulse gen, L141, £15. GBL516 projector, etc, no lamp, £40. Pye Pocketfones, batteries, £30. Offers considered. Buyers collect. G3XSF, QTHR. Tel Halifax 60438.

R209 Mk2, Exc cond, and apparatus. Selective carrier No2 tx/rx, (Army radio line equipment). Tel 01-949 2317.

Europa 2m transverter, repeater shift, rf switching, G3LLL FT101 fm discriminator, 1,750Hz toneburst, £100 ono. G3LLL rf clipper for FT101 series, £25 ono. *Wanted:* Heathkit HA55 aircraft rx. G3KNA, QTHR. Tel 0274 873122.

Telequipment dual-beam 'scope, case, D54R, 10MHz b/w, £350. Yaesu counter, YC355D, £110. Trio 7200G, fitted R5–7, S20–24, S0, auto t/b, £150. Jaybeam, 70cm 12XY, as new, £20. Homebrew 500MHz counter, *VHF Communications* design, £60. Multi U11, fitted SU8, 16, 18, 20, and RB2, 6, 14, £200. All ono. Tel Cosham 86184.

Multi 800D, remote display, mint, £260. Multi U11, mint, £220. Racal RA17, cased, vgc, £230. G2AXO, QTHR. Tel 0604 863311.

Datong active antenna, model AD170, psu type mpu, hardly used, cost £36, sell £25; or exch for Joystick with atu. Avo 40, wkg, £7 ono. G4AOE, QTHR.

Marker rx BC357-P, £4. Morse key, type D 10F/7373, £20. WW2 Japanese morse key, £12. Rebecca type 78 coaxial relays, 12/24V dc, £3. Morse keys, type J 10A/7741, £3.50. Radio compass indicators, I82A, 110Q13, £2.50 ea. Plus carr. G3AFN, QTHR. Tel Wormley 2364.

Belcom FS1007P 10W scanning fm tx/rx, 16ch (seven fitted), 200V ac/12V dc, 0·3μV sensitivity, little used, £130. Trio TR7010 ssb 12V tx/rx, £130. Pleasing results with both; now going hf. G8MEO, QTHR. Tel 0532 665568, after 6pm or at weekends.

23cm gear: MM converter, £20; preamp, £10; quad loop Yagi, £10; 2C39A 144/1152 mixer, £10; SWL rxs: Mohican, £25; SW717, £25. G3RZD/G8BDJ, QTHR.

RTTY non-mechanical stn HBR TD224 display: Modular TD1, AK1 terminal unit; Baudot keyboard, all cased with connections for FT101; needs tv and ssb tx/rx to complete; £240. G2AXO, QTHR. Tel 0604 863311.

FT101 cw filter, 600Hz, £15. ST6 terminal unit, almost built, £30. Spare 7B printers (three), at £5. 28/144 transverter, £20. Eddystone 880/2 rx, £150. G3LQI. Tel Lancing (09063) 4017.

FRG7 gen/cov rx, mint cond, comp with instruction manual, £155 ono. G3KNF, QTHR. Tel 02013 71348.

Trio JR599 custom special, 160–2m, perfect cond, a.m., fm, cw, ssb rx, £150; HW7 QRP rig, 20, 40, 15m, £30; handbook for both items. G4EIA, QTHR. Tel Keynsham 61326.

Mechanical filters, Kokusai MF-455-30W, 6kHz at 6dB, £5. IFTs, 85kHz ex-BC453, set of four, £3. Tape recorder, Collaro Studio half-track deck, Mullard type C amp, £9. G8IXP, QTHR. Tel 0622 65635.

Trio QR-666, 170kHz–30MHz, vhf tuner 87·5MHz–108MHz, vgc, £100. 6 Wheeler Avenue, Hilltop, Eastwood, Notts. Tel Langley Mill 67846.

Superb Trio twins TX/JR599, separate filters for ssb, cw, a.m., fm, built-in 2m converter, £320. Trio 3·395MHz ssb filter, with carrier xtals, £18. G3ZVC tx/rx board, QC1246AX filter, £40. Griffiths, "Upcote Cottage", Chilbolton, Stockbridge. Hants. Tel Chilbolton (026 474) 244.

Spy set tx/rx Mk123, 2·5-20MHz, size 11½ by 3½ by 5½in, tx xtal controlled, 25W cw output, plus spares, in case, ac mains or 12V dc, ex-min, fine cond, £30. G3SEF, QTHR. Tel Cheslyn Hay (0922) 415369.

Microwave Modules 0–500MHz counter, as new, £60. G4EKG, QTHR. Tel Evesham (0386) 41105.

Trio TR8300 70cm tx/rx, 17ch, PA-U2 stripline preamp, £230 ono. Microwave Modules 0–500MHz digital frequency meter; 18-el 70cm beam; offers. G3UKM, QTHR. Tel 061-439 5756.

FT101, late model, £285. FT221RD, fitted preamp, YC221, £375. Varitronics (USA) 2m 50W amp, mobile mount, £45. Ascot ⅝ mobile whip, £5. Mustang Mk2, unused, £85. Carr extra. J. L. Barry, 10a Henbury Close, Torquay, Devon. Tel 0803 312879.

Linear pa, Modular Electronics, 2m, 10–13W, £20. SSB 9MHz filter KVG XF-9B, with pair oscillator xtal, £15. Anzac ring diode mixer MD108, £4. G8FCH, QTHR. Tel Evesham 830525.

FT101B, £340; FL2000B, £160; vgc. Datong Model ASP speech processor, as new, £60. TA33Jr, AR22 rotator, £65. Property of late G4BFO. Prefer buyer inspects and collects. G3TBT, QTHR. Tel Lyndhurst (042128) 2127, after working hours please.

AR88D, good wkg order, xtal bfo, mech filter, product detector, good metalwork and mechanics, very reliable, circuit diags etc, £55 ovno. Could deliver along NW London to Bath route. Dale, 144 Northwood Way, Northwood Hills, Middx.

AR88LF, handbook, £25. CR150, handbook, £15. Valve teleprinter terminal unit, £5. ITT Star, uhf, mobile, wkg on RB10, £70. Prefer buyers collect. G8GYO, QTHR. Tel 051-342 7155.

WANTED

WS No19. Also interested in other surplus sets, and BC221, BC654, BC611, valve 5A163K. Good price paid. Baynes. Tel 01-949 2317.

HRO. Sims, 679 Chorley New Road, Lostock, Bolton, Lancs BL6 4AG. Tel Bolton (0204) 491781.

Can you help? Method to sync two Lynx cameras to give split picture. GM3FUU, 44 Ashley Terrace, Edinburgh.

R389/URR vlf rx. Like to hear from anyone using one. CV-157/URR. Valves: 12AT7NA, 6BA7, 6DC6, 5751, 6080WA, 6082WA, 26Z5, 3TF7, 6BH6, 6BJ6, 6AQ5W, 6AU6WA, 6BE6W, 6AK5W, 6CW4W, 6BA6W, 5718, 5840, 2AS15A, 7077, 6CB6, 6AF4A, 115N060, 5814A. Fletcher. Tel Sandiacre (0602) 397446.

Ham 2 rotator, in good cond. Exch for British Inst Radio Engineers journals, comp volumes '45–'70, bound/unbound; also two waterproof gadget bags, 12in cube, ideal field days. Cash adjustment or reasonable offers. G3ZDO, QTHR.

For wireless set (Canadian) No19 Mk3: manual, vibrator psu to tx lead with plugs (12-pin). G4HOC (formerly G8NIM), QTHR. Tel 021-779 3118.

9·5 cine projector, with or without viewer. G8IX, QTHR. Tel 0782 24941.

Postally used pre-1939 QSL cards from dx or any foreign countries, by collector, fair settlement for clean unbent cards, let me know what you have. G3BDQ, "Whitefriars", Friars Hill, Guestling, Hastings, E Sussex.

AR88D rx. Any info on mods etc. All letters answered and postage refunded. ZC4AJ, via Fred Trainer, 53 Home Farm Road, Knowsley, Merseyside L34 0EA.

FRG7 rx, must be mint, no mods, state cond and price. Also circuit and alignment data for Eddystone 770U rx, copy and return next day, or buy, postage refunded. G3GOG, QTHR. Tel 01-856 7442.

Manual, circuit/dia Collins 51X-2B, spares; also for Pye Ranger. PVI-35, FW4-500, ACU, No12 tx. Any ex-WD marine or ham tx/rx. Dorsett, 15 Chalcrafts, Alton, Hants. Tel Alton 88715.

For Lafayette HE30 comm rx, manual/circuit drawing any info, buy, borrow, beg, why? BRS40827, 11 Macbeth Road, Fleetwood, Lancs FY7 7HR.

Low-band, a.m., all-transistor, mobile equip, manual. Socket type Erie 9806009, RCA J15280, RCA J15284, Jettron CD89083, for the 4HC/170J or 7650 valves. Heater transformer 6V at 7A. Will collect reasonable distance, all letters answered. G8JTJ, QTHR.

Oscilloscope, preferably Heathkit, up to £35; KW E-Zee match, matching spkr and cw filter for Heathkit HW101. Mailing address in Surrey. P. de Man, Box 170, 2250 AD Voorschoten, Holland. Tel 01031-1717 6033, after 7.30pm. Reverse charges accepted.

WS19 set Mk3, or sim tx/rx, must be in good wkg order, all access incl, headphones, mic, psu, etc, for newly-licensed school boy. Any sim type tx/rx considered, must cover some amateur band/s. G8PRX. Tel Leeds (0532) 822968.

FRG7 rx, must be vgc, no mods, please state price req'd, pref within easy travelling of London. All letters answered. *For sale:* FT200B/FP200 tx/rx, mint cond, orig packing, £295. G4GED, QTHR. Tel 01-575 1454, after 6pm.

Base 4CX1000A with chimney, £17.50 ono; will pay postage. G3MHM, QTHR.

Young enthusiast would like to buy, or borrow to photocopy, a service manual for British surplus R209 rx, all costs willingly refunded. Please contact R. H. Wynne, "Cronk Nash", Park Avenue, Douglas, Isle of Man.

Handbook, circuits, any info for B46 rx, buy or photocopy. Probert, 276 Hook Road, Chessington, Surrey. Tel Steve, 01-397 0063.
Yaesu FV50 vfo, FP75B psu for FT75B. Also hf mobile whip. G4ERW, QTHR. Tel Dave, Sevenoaks (0732) 61677.
SB101, cw filter, HP23, SB600, plus spare valves and relay, offered in exch for KW204 tx. Also wanted, Eddystone Edometer. Taylor, 8 Heythrop Drive, Middlesbrough.
14-year-old newly-licensed G4HSQ, requires amateur bands rx, Trio JR310 or similar (with cw filters?). Funds limited, but good price paid for good rx. 11 Cottenham Drive, SW20 0TD. Tel 01-947 1923.
FR50 or FR50B rx. Buyer will collect SE England. G8ISX, QTHR.
Electoniques i.f. strip Mk3, 1·6 or 455 xtal. G3KRH, QTHR. Tel 01-455 5039.
KW antenna tuning system, 105, 107, 109. D. E. Barnes, 3 The Chennells, High Halden, Ashford, Kent TN26 3NB. Tel High Halden 293.
18AVT/WB, must be cheap. GM3UWO, QTHR.
TX/RXs for hf and vhf. Rx for hf, eg Trio, KW, Yaesu, anything considered. Can collect. Tel Bolton 592929.
Handbook or circuit diagram for Telford TC7 rx. Also battery tray and mic for Pye Bantam. G8ONX. Tel Wolston 2086.
B2 psu, manual, case and any accessories. Tel 01-949 2317.

Looking ahead

27-28 February—Conference on "Advances in hf communications", IEE, Savoy Place, London.
10 March—RSGB National VHF Convention, The Winning Post, Twickenham, Middx.
22 April—NRSA Radio & Electronics Exhibition. Belle Vue, Manchester.
11-12 May—RSGB Amateur Radio Exhibition, Alexandra Palace, London.
15 September—RSGB HF Convention, Birmingham.
22 September—Scottish VHF Convention, Dundee Technical College, Dundee.

Mobile rallies calendar

8 April—White Rose Mobile Rally, Lawnswood School, Leeds 16. Details from G4DZI, QTHR.
29 April—Southend & D RS Mobile Rally, Fitzwymarc School, Hockley Road, Rayleigh, Essex. Details from M. Daniels, G8KLD, 25 Sweyne Avenue, Southend, Essex SS2 6JQ.
20 May—Northern Mobile Rally, Victoria Park Hall, Keighley. Trade stands, children's films, refreshments, bar, etc. Details from G8DFZ, QTHR.
3 June—East Suffolk Wireless Revival, near Ipswich, Suffolk. Details from G4CVB, QTHR.
10 June—Elvaston Castle Mobile Radio Rally, Elvaston Castle Country Park (5 miles SE of Derby, on B5010). 11am start. Talk-in by G3EEO and G3ZBI on 144 and 432MHz. Usual attractions including grand bring and buy sale, plus full on-site catering facilities. Rally free, but local authority car parking charge of 25p. Further details from G4CTZ, QTHR, tel Derby 71875.
17 June—Plymouth Mobile Rally, Plymouth, Devon. Details from G4GWJ, via RSGB HQ.
17 June—*HMS Mercury* Mobile Rally, *HMS Mercury*, near Petersfield, Hants.
24 June—Longleat Mobile Rally, Longleat Park, Warminster. Details later.
1 July—Upton Mobile Rally, Upton-on-Severn, Worcs.
5 August—RSGB National Mobile Rally, Woburn Park, Beds. Details from G3MVV, QTHR.

Special event station

GB3STD, 23-25 February
St Dunstan's ARS will be operating a station at a get-together for the launching of a base station at Ian Fraser House, Ovingdean, Nr Brighton, E Sussex.

MEMBERS' AD ORDER FORM

FOR SALE ☐ WANTED ☐ (Tick as appropriate)

- **See Members' Ads page for conditions of acceptance.**
- **Not more than 40 words, including name, address, etc**
- **Do not forget 75p remittance plus wrapper.**
- **Please write in block capitals, or type.**
- **Use correct address**

Licensed members are asked to use their callsign and QTHR, meaning that their address in the current *RSGB Amateur Radio Call Book* is correct. BRS and A members will, of course, have to provide their name and address.

I enclose cheque/PO for **75p** to cover the cost of this advertisement.

Signed .....

Date .....

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"LEAVE IT SWITCHED IN, I CAN'T COPY YOU WITHOUT IT"

This is a statement well known to users of our R.F. speech processors. Using the advanced technique of **R.F. clipping** these units greatly increase your talk power and help your voice punch through the QRM.
They work on any rig, with any speech mode, at any power level, and on any band. Simply connect in series with your microphone to get a really punchy speech signal. The use of the R.F. clipping technique raises your average power level and also enhances the intelligibility of your speech signal.
MODEL ASP, our latest model offers for the first time the ultimate convenience of instant push-button selection of the desired amount of clipping. No manual knob setting or meter watching is required. Advanced circuitry does the work quicker and more accurately. Other features include: "TONE" button (for setting the transmitter microphone gain), switchable microphone impedance, full monitoring by three light emitting diodes.
The world famous **MODEL RFC** is still available and so is **MODEL RFC/M** which is a fully tested printed circuit board module as used in **MODEL RFC.**

PRICES: ASP **£65.00** plus VAT (**£73.13** total); RFC **£40.00** plus VAT (**£45.00** total) RFC/M **£21.50** plus VAT (**£24.19** total).

"GOOD GENERAL COVERAGE RECEIVERS COST A FORTUNE!"

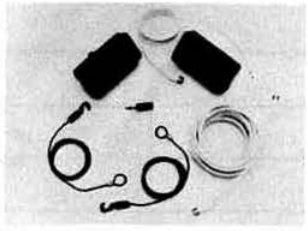
True . . . but if you already own a good quality **ten-metre** or **two-metre** receiver or transceiver you are only £118 away from a really high performance general coverage receiver. Just add the magic ingredient, **MODEL UC/1** from DATONG!
For just £118.13 **including VAT** you get full coverage in thirty synthesised 1MHz segments from 60kHz (Rugby MSF) to 30MHz, at high sensitivity and with all the facilities and high performance of your existing rig!
For good measure UC/1 also adds two-metre coverage to ten-metre receivers.
If you want **high performance** general coverage reception, MODEL UC/1 combined with your existing amateur-bands-only rig is the answer. The fact that it costs less than even a cheap general coverage receiver is just one of life's pleasant surprises!

PRICE: £105.00 plus VAT (**£118.13** total).

VIVE LA DIFFERENCE!

MODEL FL1 is a most unusual audio filter. It is a highly versatile add-on unit for communications receivers which gives great flexibility in helping to extract the signals you want (SSB, CW, RTTY etc) from background interference. It simply connects in series with the loudspeaker or headphones. Fully variable bandwidth and centre frequency plus "flat-topped" pass-band response give similar effects to "I.F. pass-band tuning" for SSB/or RTTY reception, and bandwidth down to 20Hz (with limited a.f.c.) gives an amazing capability for pulling weak CW stations out of the QRM.
MODEL FL1 is also completely unique in being able to tune itself when notching out unwanted whistles. That's why we call it the "Frequency-Agile Audio Filter". If a whistle appears on your channel, **MODEL FL1** will normally remove it from audibility within a couple of seconds . . . completely automatically! This ability makes conventional notch filters look positively stone-age and allows the notch width to be so narrow (5Hz) that you lose virtually nothing of the signal you want.

PRICE: £53.00 plus VAT (**£59.63** total).



A GOOD RECEIVER DESERVES A GOOD AERIAL

For sensitive reception right through from MSF at 60kHz to Band 1 TV DX around 50MHz, without the need for an antenna farm, **MODEL AD170** is ideal. Designed for loft mounting, **MODEL AD170** has no adjustments and needs no external tuning units. The actual antenna comprises a wire dipole (overall length only 3 metres) together with a rather special FET/bipolar amplifier unit. The broad-band signal from the remotely located antenna is piped via TV-type coax to the interface unit (**which now contains a switchable 12dbs amplifier**) located near the receiver.
Although only 3 metres long, **MODEL AD170** has the same directional properties as a full-size dipole, even at 60kHz. Despite its small size, signal-to-noise ratios produced by **MODEL AD170** at any given frequency are similar to those from a conventional dipole cut to resonance for that frequency, and the unit makes an ideal accessory for a good general coverage receiver where space for antennas is limited.

PRICE: £29.50 plus VAT (**£33.19** total); Special price complete with mains power unit: **£33.00** plus VAT (**£37.13** total).

NEW PRODUCT PREVIEW
INSTANT MORSE PRACTICE
AVAILABLE SHORTLY

Imagine the convenience of having your own source of accurate Morse for instant receiving practice anywhere at any time!
The Datong **MORSE TUTOR** produces digitally a random stream of five character groups at variable speed and with variable extra spacing between letters. You can select letters or numbers or a mixture and unlike records or tapes, the sequence never repeats.
A Morse practice oscillator is also built in. Just plug in a standard key to practice sending.

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Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE Tel: Pudsey (0532) 552461.

FRG-7 DIGITAL £227.00

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FRG-7—DIGITAL DISPLAY

Yes. The world famous FRG-7 is now available with digital read-out fitted by Lee Electronics in place of kHz dial..... **Special price £227.00 + VAT**

For customers who already own FRG-7's we can supply the digital read-out complete with installation instructions..... **£39.50 + VAT**

MICROWAVE MODULES DESPATCHED TO ANY PART OF THE WORLD POST FREE

TRANSVERTORS

MMT 144/28 Transvertor	£79.00
MMT 432/28S Transvertor with Oscar shift	£119.00
MMT 432/144R Transvertor	£151.00

VARACTORS

MMV 1296 23cm Tripler	£30.00

FREQUENCY COUNTERS

MMD 050/500Mhz Counter	£63.89
M500P 10 Prescaler	£25.00

LINEAR AMPS

MML432 100W	£220.00
MML144 80W	£120.00

CONVERTORS

MMC 432/28S for Oscar	£26.58
MMC 432/144S for Oscar	£26.58
MMC 70 4m convertor	£18.00
MMC 70 LO 4m convertor	£20.00
MMC 144 2m convertor	£18.00
MMC 144 LO 2m convertor	£20.00
ATV435/51 convertor	£26.58
MMC1296/144/28	£30.00
MMC156/28 Marine	£20.00
MMC28/144 up convertor	£18.00

All 2m converters can be supplied with IF outputs of 2-4-12-14-18-28MHz 70cm models with IF outputs of 28-14-18- or 144MHz.

ALL MICROWAVE MODELS SUBJECT TO VAT IN UK 8% ON FREQUENCY COUNTERS, ALL OTHER MODELS 12½%

A.S.P. MOBILE AND BASE STATION ANTENNAS

Asp201 ¼W 2m mobile	£3.50	Asp393 ¼W 3dB 2m mobile	£17	Asp E462 70cm 3dB mobile	£7.23
Asp2009 ½ 3dB 2m mobile	£7.50	Asp no hole boot mount	£3.70	Asp E667 70cm 5dB mobile	£16.90
Asp629 ¼W 3dB 2m mobile	£7.60	Asp magnetic mount	£8.95	Asp A659 UK 70cm 5dB, base antenna	£19.00
Asp677 ½ 3dB 2m mobile	£13.50	Asp cutter with cable	£6.75		

Post & Package, £1.00

Special offer A.S.P. A680 U.K. 6dB 144/148MHz Co-linear Power handling 350W. Length approx. 12ft. List £51 special offer **£41.50** PLUS VAT 8%

YAESU MUSEN (FULL RANGE AVAILABLE) FREE DELIVERY IN UK

FT901DM	£853.00	FT101E	£515.00	CPU2500RK	£308.00	FRG7000	£327.00
FT901D/DE	£737.50	FR101D	£525.00	FT225R	£487.50	YO100	£145.00
FT301	£515.00	FR101DD	£615.00	FT225RD	£535.00	QTR24	£16.00
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FP301	£98.00	FT7	£318.00	FT227RX	£253.00	YC500J	£168.50
FP301D	£162.50	FL110	£130.00	FT202	£106.50	YP150	£58.50
FV301	£86.00	FP4	£35.00	FRG7	£187.00	YD844	£19.50
FC301	£108.00	FL2100D	£311.00	FRG7DIG	£227.00	YD846	£7.50

All prices subject to VAT

ICOM RANGE

IC701 transceiver and power supply	£888.00
IC215 2M portable	£151.11
IC202S 2M SSB	£192.00
IC402 70cm SSB	£256.00
IC240 2M Transceiver	£176.00
IC245 2M FM/SSB	£368.00
IC211E 2M FM/SSB	£496.00
Xtals for 215/22 p/pair	£4.50
Cases 202/215/402	£6.75
Mobile mounting bracket 202/215	£10.75

SST ANTENNA TUNERS

SST1 Random	£22.00
SST2 Coax	£26.75
SST3 Match unit	£13.50

ROTATORS

AR22	£43.00
CD44	£95.00
AR40	£47.50
HAM 11	£129.00
KR400	£85.00

KYOCUTO DIGITAL 2015
10W mobile 400ch Tx/rx — £245

J-BEAM ANTENNAS
ALL MODELS IN STOCK

All above prices + VAT, carr. free

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2m with BNC	£3.85 each
2m with PL259	£3.85 each
2m for IC215, Trio 2200 Gx, standard C146A	£3.50

All + post 25p + 12½% VAT

STANDARD C432 70cm TRANSCEIVER

THIS 6 CHANNEL 2·2 WATT TRANSCEIVER COMES COMPLETE WITH LEATHER CARRY CASE AND FITTED WITH 433·2 AND 433·5 MHz.

£169.95 + VAT

THIS SOPHISTICATED UNIT HAS EXCELLENT SENSITIVITY, OUT PERFORMING MOST OTHER RIGS, JUST THE UNIT NOW 70cm REPEATERS ARE OPENING UP ALL OVER THE COUNTRY. A FULL RANGE OF ACCESSORIES ARE AVAILABLE FOR THIS MODEL.

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CMPO8 External Microphone	£15.00 + 12½% VAT
SMP30 External Spk/Mic	£16.50 + 12½% VAT
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BCA Base Charger	£22.50 + 12½% VAT
N-10 Set Ni-cad	£8.50 + 12½% VAT
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SWR25 This ever popular twin SWR and power meter covers 3·5-150MHz at **£10.50** plus 8% VAT and 25p P & P.
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UH74 SWR and power meter switchable HF, 2M & 432MHz with remote head at **£13.50** plus 8% VAT and 25p P & P.

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1N914	100v	10mA	.05
1N4005	600v	1A	.08
1N4007	1000v	1A	.15
1N4148	75v	10mA	.05
1N4733	5.1v	1 W Zener	.25
1N753A	6.2v	500 mW Zener	.25
1N758A	10v	"	.25
1N759A	12v	"	.25
1N5243	13v	"	.25
1N5244B	14v	"	.25
1N5245B	15v	"	.25

SOCKETS/BRIDGES

8-pin	pcb	.20	ww	.35
14-pin	pcb	.20	ww	.40
16-pin	pcb	.20	ww	.40
18-pin	pcb	.25	ww	.75
22-pin	pcb	.35	ww	.95
24-pin	pcb	.35	ww	.95
28-pin	pcb	.45	ww	1.25
40-pin	pcb	.50	ww	1.25
Molex pins .01		To-3 Sockets		.25
2 Amp Bridge		100-prv		.95
25 Amp Bridge		200-prv		1.95

TRANSISTORS, LEDS, etc.

2N2222	NPN (2N2222 Plastic .10)	.15
2N2907	PNP	.15
2N3906	PNP (Plastic - Unmarked)	.10
2N3904	NPN (Plastic - Unmarked)	.10
2N3054	NPN	.35
2N3055	NPN 15A 60v	.50
T1P125	PNP Darlington	.35
LED Green, Red, Clear, Yellow		.15
D.L.747	7 seg 5/8" High com-anode	1.95
MAN72	7 seg com-anode (Red)	1.25
MAN3610	7 seg com-anode (Orange)	1.25
MAN82A	7 seg com-anode (Yellow)	1.25
MAN74A	7 seg com-cathode (Red)	1.50
FND359	7 seg com-cathode (Red)	1.25

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4000	.15
4001	.15
4002	.20
4004	3.95
4006	.95
4007	.20
4008	.75
4009	.35
4010	.35
4011	.20
4012	.20
4013	.40
4014	.75
4015	.75
4016	.35
4017	.75
4018	.75
4019	.35
4020	.85
4021	.75
4022	.75
4023	.20
4024	.75
4025	.20
4026	1.95
4027	.35
4028	.75
4030	.35
4033	1.50
4034	2.45
4035	.75
4040	.75
4041	.69
4042	.65
4043	.50
4044	.65
4046	1.25
4049	.45
4050	.45
4066	.55
4069/74C04	.25
4071	.25
4081	.30
4082	.30
MC 14409	14.50
MC 14419	4.85
4511	.95
74C151	1.90

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7400	.10	7473	.25	74176	.85	74H72	.35
7401	.15	7474	.30	74180	.55	74H101	.75
7402	.15	7475	.35	74181	2.25	74H103	.55
7403	.15	7476	.40	74182	.75	74H106	.95
7404	.10	7480	.55	74190	1.25		
7405	.25	7481	.75	74191	.95	74L00	.25
7406	.25	7483	.75	74192	.75	74L02	.20
7407	.55	7485	.55	74193	.85	74L03	.25
7408	.15	7486	.25	74194	.95	74L04	.30
7409	.15	7489	1.05	74195	.95	74L10	.20
7410	.15	7490	.45	74196	.95	74L20	.35
7411	.25	7491	.70	74197	.95	74L30	.45
7412	.25	7492	.45	74198	1.45	74L47	1.95
7413	.25	7493	.35	74221	1.00	74L51	.45
7414	.75	7494	.75	74367	.75	74L55	.65
7416	.25	7495	.60			74L72	.45
7417	.40	7496	.80	75108A	.35	74L73	.40
7420	.15	74100	1.15	75491	.50	74L74	.45
7426	.25	74107	.25	75492	.50	74L75	.55
7427	.25	74121	.35			74L93	.55
7430	.15	74122	.55			74L123	.85
7432	.20	74123	.35	74H00	.15		
7437	.20	74125	.45	74H01	.20	74S00	.35
7438	.20	74126	.35	74H04	.20	74S02	.35
7440	.20	74132	.75	74H05	.20	74S03	.25
7441	1.15	74141	.90	74H08	.35	74S04	.25
7442	.45	74150	.85	74H10	.35	74S05	.35
7443	.45	74151	.65	74H11	.25	74S08	.35
7444	.45	74153	.75	74H15	.45	74S10	.35
7445	.65	74154	.95	74H20	.25	74S11	.35
7446	.70	74156	.70	74H21	.25	74S20	.25
7447	.70	74157	.65	74H22	.40	74S40	.20
7448	.50	74161	.55	74H30	.20	74S50	.20
7450	.25	74163	.85	74H40	.25	74S51	.25
7451	.25	74164	.60	74H50	.25	74S64	.15
7453	.20	74165	1.10	74H51	.25	74S74	.35
7454	.25	74166	1.25	74H52	.15	74S112	.60
7460	.40	74175	.80	74H53J	.25	74S114	.65
7470	.45			74H55	.20		
7472	.40						

74S133	.40
74S140	.55
74S151	.30
74S153	.35
74S157	.75
74S158	.30
74S194	1.05
74S257 (8123)	1.05
74LS00	.20
74LS01	.20
74LS02	.20
74LS04	.20
74LS05	.25
74LS08	.25
74LS09	.25
74LS10	.25
74LS11	.25
74LS20	.20
74LS21	.25
74LS22	.25
74LS32	.25
74LS37	.25
74LS38	.35
74LS40	.30
74LS42	.65
74LS51	.35
74LS74	.35
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74LS93	.55
74LS107	.40
74LS123	1.00
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74LS164	1.00
74LS193	.95
74LS367	.75
74LS368	.65

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LM309H	.65
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LM310	.85
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LM320K12	1.65
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LM739	1.50
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LM747	1.10
LM1307	1.25
LM1458	.65
LM3900	.50
LM75451	.65
NE555	.35
NE556	.85
NE565	.95
NE566	1.25
NE567	.95

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MM5316	3.50	8251	8.50
2102-1	1.45	8255	10.50
2102L-1	1.75	8T13	1.50
2114	9.50	8T23	1.50
TR1602B	3.95	8T24	2.00
TMS 4044-4	9.95	8T97	1.00
		2107B-4	4.95
8080	8.95	2708	9.50
8212	2.95	Z80 PIO	8.50

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144.030	e	e	e	e	e	e	e	e	e	e	e	e	e	e
144.4 (433.2)	a	e	a	e	e	b	e	e	e	e	e	e	e	e
144.480	e	e	e	e	e	e	e	e	e	e	e	e	e	e
144.800	d	e	e	e	e	d	e	e	e	d	d	e	e	e
144.850	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.000/R0T	a	b	a	c	c	a	a	a	b	a	a	b	c	e
145.025/R1T	a	b	a	e	e	a	e	a	e	e	e	e	e	e
145.050/R2T	a	b	a	e	e	a	e	a	e	e	e	e	e	e
145.075/R3T	a	b	a	e	e	a	e	a	e	e	e	e	e	e
145.100/R4T	a	b	a	e	e	a	e	a	e	e	e	e	e	e
145.125/R5T	a	b	a	e	e	a	e	a	e	e	e	e	e	e
145.150/R6T	a	b	a	e	e	a	e	a	e	e	e	e	e	e
145.175/R7T	a	b	a	e	e	a	e	a	e	e	e	e	e	e
145.200/R8T	a	b	a	e	e	a	a	a	e	a	a	e	c	e
145.300/S12	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.350/S14	e	e	c	e	e	c	c	c	e	c	c	e	e	e
145.400/S16	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.425/S17	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.450/S18	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.475/S19	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.500/S20	a	b	a	c	c	a	a	a	b	a	a	b	c	e
145.525/S21	a	b	a	c	c	a	a	a	e	a	a	e	c	e
145.550/S22	a	b	a	c	c	a	a	a	e	a	a	e	c	e
145.575/S23	a	b	a	c	c	a	a	a	e	a	a	e	c	e
145.600/R0R	a	b	a	c	c	a	a	a	e	a	a	e	c	e
145.625/R1R	e	e	e	e	e	e	a	e	e	a	a	e	c	e
145.650/R2R	e	e	e	e	e	e	a	e	e	a	a	e	c	e
145.675/R3R	e	e	e	c	c	e	a	e	e	a	a	e	c	e
145.700/R4R	e	e	e	c	c	e	a	e	e	a	a	e	c	e
145.725/R5R	e	e	e	c	c	e	a	e	e	a	a	e	c	e
145.750/R6R	e	e	e	c	c	e	a	e	e	a	a	e	c	e
145.775/R7R	e	e	e	c	c	e	a	e	e	a	a	e	c	e
145/800/R8R	a	b	a	c	c	a	a	a	e	a	a	e	c	e
145.950/S38	a	e	e	a	e	e	e	e	e	a	e	e	e	e

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AVAILABILITY: (a), (b), (c) and (d) stock items normally available by return (we have over 5000 items in stock). (e) Four weeks normally but it is quite possible we could supply from stock. **N.B.** Frequencies as listed above but in alternative holders and/or no stock loadings are available as per code (e).
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All at **£3.00** (£3.37), 38·6666MHz (144/28), 42MHz (70/28), 58MHz (144/28), 70MHz (144/4), 71MHz (144/2), 95MHz (342/52), 96MHz (1,296/432/144), 101MHz (432/28), 101·50MHz (434/28), 105·6666MHz (1,296/28) and 116MHz (144/28).

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Prices shown are for one off to our amateur specs; closer tolerances are available. Please send us details of your requirements.

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B Mid frequencies:

	Adj. tol.±30ppm	Temp. tol.±30ppm 0 to 60°C
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1·0 to 1·4999MHz Fundamental	**£9.40**	(£10.57)
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*21 to 63 MHz 3rd Overtone	**£3.36**	(£3.78)
*60 to 62·999 MHz 5th Overtone	**£3.95**	(£4.44)
*63 to 105 MHz 5th Overtone	**£3.36**	(£3.78)

C High frequencies:

Adj. tol.±20ppm	Temp. tol.±30ppm—10 to 60°C.
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Delivery* normally 4/6 weeks—all other frequencies 6/8 weeks.
Holders all low frequencies are in HE13/U or similar—otherwise supplies in HC6/U, HC18/U and HC25/U are available at frequencies above 4MHz. HC17/U (same pins as FT243) available at **25p** (28p) extra on above prices.
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100kHz in HC13/U and 455kHz in HC6/U, **£2.95** (£3.19).
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BC108	**12p**	BLY93A	**£14.74**	2N4427	**96p**	1N4004	**9½p**
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F.D.K.

TM56B VHF Monitor Receiver	£105.00

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MK2 Covers 550Khz to 30MHz **£25.00**

Designed and manufactured by us. Fifty switchable tunable positions, will match any antenna to your receiver. Now in use in over 40 countries. Ideal for use with QRP transmitters. Price includes VAT and postage on this unit.

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Due to the fact that our secondhand equipment stock changes daily and our adverts are in press weeks before publication we are not publishing a list. A.S.A.E. will bring you an up-to-date list or please phone. Good clean equipment wanted and spot cash will be paid. All secondhand equipment carries a three month guarantee.

Shop Hours Mon to Fri 9.30am to 5.30pm
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We are located on the A574. Turn at the Greyhound Motel on the A580 (East Lancs Road) and we are about ½-mile on right. No parking problems at any time.

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FRG7000

COMMUNICATIONS RECEIVER

THE FRG7000 IS A HIGH PERFORMANCE ALL SOLID STATE COMMUNICATIONS RECEIVER DESIGNED TO COVER THE ENTIRE HIGH FREQUENCY SPECTRUM OF 0·25 TO 30MHz. WITH BRIGHT ½" SEVEN SEGMENT LED's PROVIDING DIGITAL READOUT TO 1 kHz. ALSO INCLUDED IS A 24-HOUR DIGITAL CLOCK FOR BOTH LOCAL AND GMT TIME, WITH A TIMING FEATURE FOR AUTOMATIC RECEIVER (AND/OR TAPE RECORDER THROUGH REAR PANEL RELAY CONTACTS) ON/OFF SWITCHING.

The Barlow Wadley loop (Triple conversion Superhetrodyne) system used, proffers extremely stable (better than 500Hz/hr. A.W.U.) performance. Ceramic IF filters with a 6dB bandwidth of 3kHz for SSB & CW (8kHz at 50dB) and 6kHz bandwidth for AM (14kHz at 50dB) provide optimum intelligibility coupled with good rejection of interference.

The Mosfet RF amplifier offers an outstanding sensitivity of 0.7μV for 10dB S/N on SSB and 2μV for 10dB S/N on AM, without sacrificing strong signal performance. Wide provisions are made for antenna connections; for MW broadcast (0·25-1·6 MHz) a high impedance binding post, for 1·6-30MHz a SO239 socket (to take a 50-75 ohm unbalanced coaxial feed) plus binding post (for random low impedance length SW antenna). Also the antenna terminal strip is the earth and a mute (earth for standby) connector.

Audio output of up to 2 Watts drives the internal speaker, but plugging in an external 4 ohm unit or headphones (¼" Jack) disables this. A socket for tape recording produces about 50mV independent of the volume control setting. A built-in mains power supply allows operations from 100/110/117/220/230V AC (50 or 60Hz).

To reduce the power consumption (of 25W) the front panel lamps and displays may be extinguished.

For high reliability FET's and IC's are used extensively throughout the receiver providing maximum performance within a compact cabinet (36(w), 12·5(h), 20·5(d) and 7Kg.). For ease of service plug in boards are employed widely.

A switchable RF attenuator, AM noise limiter and amplified AGC, assist in reception under adverse conditions of strong adjacent signals, impulse noise and deep signal fading. The continuously variable audio filter minimises the high or low audio responses as required, and a fine Tune (±2·5kHz) allows easy zeroing of a desired station.

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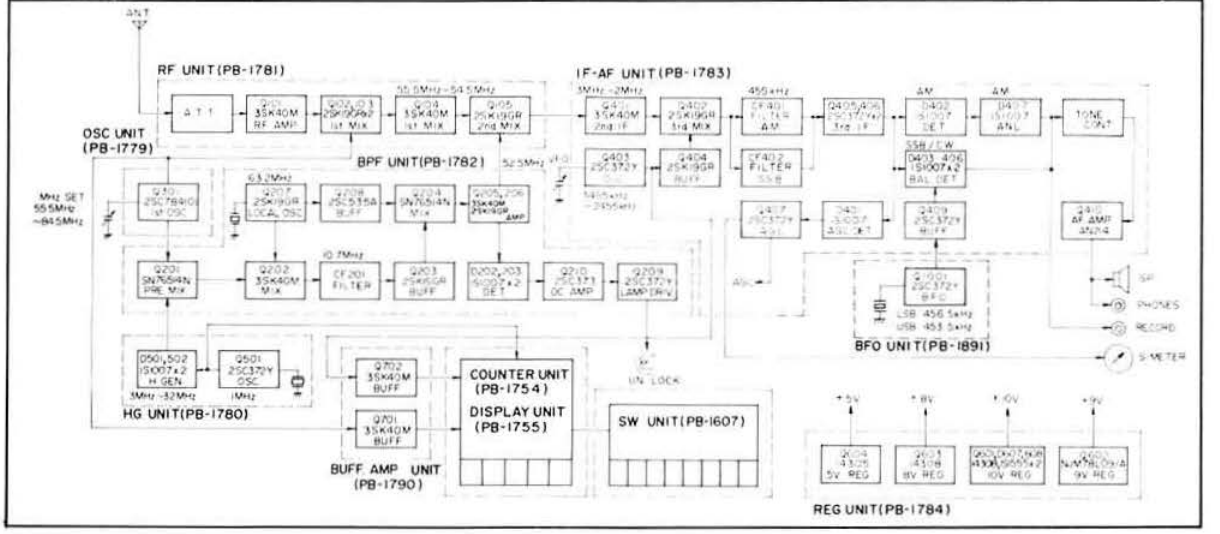
Accessories included are the handbook, plugs (for every socket in the receiver) and 3 and 10m wire antennas.

FOR FURTHER DETAILS WRITE TO OUR AGENTS FOR FULL SPECIFICATIONS SHEET



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10·7MHz NARROW BAND F.M. I.F. AMPLIFIER

PERFORMANCE

Sensitivity – 4μV (EMF from a 50ohm source) for 20dB quieting
Selectivity – ±7½kHz @ 3db, ±25kHz @ 60db.
A.F. Output – 200mV p-p when input is above limiting threshold and modulated ±5kHz @1kHz.
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– Output 3dB down @ 4kHz, 20dB down @ 8kHz (de-emphasis removed)
– Noise output to suit squelch circuit on A.F. board
Supply D.C. – 9 to 15V @ 30mA (negative earth)

FEATURES

High sensitivity and selectivity
On board crystal filter buffering for ease of interface
Single Conversion
Audio low pass filter to remove unwanted high frequency noise
"S" meter and delayed AGC outputs
Small size only – 97 × 42mm **PRICE £26.50.** inc. VAT

144MHz CONVERTOR

2 Dual gate MOSFETS 3N204 or MEM680.
Gain 25db min. Noise 2·2db typical.
Bandwidth 2·5MHz. I.F. output 10·7MHz.
Power requirement 9–15v DC. Oscillator Freq. input 135MHz.
Size only 38 × 60mm. **PRICE £12.00.**

2 WATT AUDIO AMPLIFIER WITH SQUELCH

PERFORMANCE

Power Output – 2W minimum into 4Ω<10% distortion
Sensitivity – 75mV̄ p-p @1kHz for full output
Bandwidth – 200Hz to 15kHz
Squelch – noise operated, threshold adjustable over the range 0 to 20dB s/n
Supply – 9 to 15 volts D.C. @ 7mA quiescent (neg. earth).

FEATURES

True noise operated squelch with adjustable threshold, no hysteresis.
Will drive a wide range of speaker impedances, 4 to 16Ω. Thermal overload and short circuit output protection.
Rectified and filtered squelch output available for channel scanner etc.
Small size only 52mm × 52mm
PRICE £9.50 inc. VAT

6 CHANNEL OSCILLATOR

Matching unit for our 144MHz convertor output frequency 135MHz.
Crystal frequency 44MHz types HC25/U. Output voltage 0·5v @ 50 ohm, 1v @ 2k ohm.
Spurious output greater than 50db down.
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The above four **"KENT MODULES"** make a first class switched channel VHF N.B.F.M. monitor receiver with a sensitivity of typically 0.2μV.

SPECIAL OFFER the above four **"KENT MODULES"** for only **£55.00.**

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SN7413	25p	SN74196	£1.05

MINIATURE NIXIE TUBE ITT 5853S 5 for **£2.50**, 10 for **£4.50.**

DECADE COUNTER P.C.B. drilled and etched takes min. nixie, 7490, 7475 and 74141 ICs **75p** each. Size only 63 × 46mm.

P.C.B. EDGE CONNECTOR for above board (if required) **50p.**
10,000 MFD 16vw **40p**
10 MFD 350vw **15p**

BRIDGE RECTIFIER two required **50p** each.
1N4005 rectifier diode **10p.**
5v 1 amp regulator MC7085 TO3 case **£1.60.**
6·2v zener **12p.**

1000 pf 500v feedthrough caps, **3p** each 10 for **20p.**

2N706 transistor **20p** each.

MINIATURE D.P.D.T. TOGGLE switch **£1.00.**

STEREO CAR CASSETTE PLAYERS famous manufacturers warranty returns fully overhauled and in working order 5 watts per channel output, controls = volume, balance, tone, fast forward and rewind, auto stop. Supplied less speakers and power lead but we do supply power plug and circuit. LIST PRICE over **£50.00** OUR PRICE ONLY **£20.00.**

BARGAIN BOXES of mixed components IFTs, coils, res. caps. PCBs with components on for break down, etc. etc. our selection **£4.00** + £1.00 pp.

AUDIO INTEGRATED CIRCUIT type TA7205P 5.8 watts output @ 13·2v. ex-new equipment and tested before despatch comp. with data sheet **90p.**

LM380 Audio Amp. 2 watt @ 12 volt, 4Ω **85p.**

10·7MHz RADIOTELEPHONE MARKER OSCILLATOR UNIT built into small die cast box with internal battery brand new supply ex-stock **£14.04** post paid (other frequencies made to order).

PYE WESTMINSTER SINGLE CHANNEL OSCILLATOR BOARDS for W15AM 79-101MHz Tx. coil can be rewound to suit any frequency required for Tx or Rx. New @ only **80p** each. 5 for **£3.00**, 10 for **£5.00.**

PCBs marked COMPRESSION UNIT complete circuit with 7 transistors, if used with pre-amp this could possibly make nice mic. compressor, sorry we have no info, but connections are marked on board. **£1.00** each.

CO-AX PLUGS/SOCKETS: 50 ohm "N" plug for UR67 **70p.** "N" plug for UR76 etc. **65p, free** "N" socket right angle cable mounting for UR67 **75p.** 75 ohm "N" plug for RG164 **75p.** 50 ohm BNC right angle adaptors **50p,** SPECIAL OFFER 75 ohm BNC plugs & single hole fixing sockets ONLY **35p** each. SO239 UHF sockets 4 hole fixing **50p.** Screening shields for SO239 sockets **20p.** 50 ohm BNC plugs for min. co-ax **60p.** PL259 plug for UR67 **55p.** PL259 plug for UR43 **65p.** 3mm JACK SOCKETS with chassis insulating bush **15p** each.

PUSH BUTTON SWITCH 2PCO P.C. mounting or can be used chassis mount **25p.** 10 for **£2.00.**

UR57 CO-AX CABLE sorry now all sold out.

DOUBLE GANG 5k ohm 1 watt wire wound pots **20p.**

MIXED FERRITE CORES bag of approx 100 **50p.**

SOLDER IN F/T CAPACITORS 1000pf 500 vw. ¼" dia. 10 for **20p**

F/T SOLDER IN GLASS INSULATORS 100 for **50p.**

DISC CERAMICS 0·01 mf 2·5 kv working **5p** each. 1000pf 500vw. 2.200pf 500vw. both types 10 for **15p.**

SIX-BANK PUSH BUTTON SWITCHES each bank 6 pco. Self cancelling **£1.00.**

HEWLETT PACKARD PIN DIODES type HP5082-3080 **50p** each or 4 for **£1.50.**

PYE COILS 5mm dia 10mm sq base OK for rewinding as used in all PYE R/Ts. **6p** each 10 for **50p.**

CATHODEON 1·4MHz CRYSTAL FILTER I.O. base for lower side band SSB, with base connections new unused **£4.00** each, two for **£7.00.**

TRIMMER CAPACITORS 10mm dia. ceramic, 2–8pf 3–10pf, 4–20pf, 10–40pf, all **10p** each.
7mm dia. ceramic, 3–9pf, all **10p** each.
Tubular ceramic, 1–6pf solder in type, **8p** each; **60p** for 10.
Mullard tubular ceramic 0·8–6·8pf bolt in type, **15p** each. Ceramic miniature compression P.C. mount 10–40pf, **8p** each.
Plastic semi-airspaced 2–25pf 10mm dia. **6p** each; 10 for **50p.**
Oxley airspaced 9mm sq base 1 – 15pf, **18p** each; 2 – 30pf **20p** each.

10pf JACKSON TETFER TRIMMER Cat. No 5640 9mm sq base, **25p** each; also 8mm P.C. mount, **25p** each.

PLASTIC SEMI-AIRSPACED TRIMMER as used in Pye Westminsters P.A. stages 10–60pf, **15p** each.

STEREO CAR CASSETTE player amplifier boards with two amp. ICs NEC-uPC 1001 H2, requires 12V D.C. 3½W per channel, removed from new equipment by manufacturer, size 120mm × 45mm, supplied with circuit, **£2.25** each.

FM RADIO FRONT END TUNER Units 88–108MHz (remove three Cs and it tunes Air Band) and 2m very high quality and stable unit with exceptional sensitivity FET RF amp. NPN mixer and separate osc. AFC and AGC inputs, works from 9–15V D.C., with circuit; new and unused BARGAIN @ **£4.00** each.

REVCO 144 146MHz ¼ mobile aerial **£8.50** also commercial R/T band 156–172MHz (approx 3dB gain both types) **£8.50.**

CRYSTALS OK for 2 Mtrs ie: x4 + 10·7MHz, 33·5 33·550, 33·600, 33·675, 33·700, 33·725, 33·750, 33·775, 33·800, all **£1.25** each. HC6U types.

SECOND CONVERSION CRYSTALS 11·170 HC6/U, 11·155 HC6/U, 11·155 HC6/U, 10·230 HC6/U & HC18/U, all **£1.75** each. 4,000MHz HC6/U **£2.00.** 7·00MHz HC6/U **£2.00.**

RF POWER TRANSISTORS

2N5070 (RCA) 30MHz SSB linear 25 watt p.e.p. output 28v stud mounting 13dB gain requires only 1·25 watt pep drive, manufacturers price about **£20.00** our price ONLY **£5.00.** New and unused with data sheet.

40081 (RCA) driver for 27MHz CB use 75m/w in 400 m/w out (12v). TO5 case, **75p** each.

2N2631 VHF driver (1 watt in @ 50MHz will give 7·5 watts out) (1 watt in @150MHz will give 3 watts out) 28v. supply. TO5 case for AM, FM, & CW use up to 150MHz. ONLY **£1.00** each.

BLY87A VHF driver/PA 8 watts output for 1 watt input @ 175MHz 9dB gain 12·5v supply. FT 700 MHz, for CW & FM use, supplied with copy of data sheet ONLY **£4.00** each.

2N5947 marked SRF1117 CATV device with an FT of 1500MHz special low price ONLY **65p** each.

BLY53A (marked FV05284) **£4.00** each.

FETs & MOS FETs

2N3819 "N" chan. **20p**; 2N4381 "P" chan. **20p**; TIS88A "N" chan. **35p.** 3N204 mosfet **£1.10** 2·5dB noise @ 200MHz 24dB gain. (RCA).

BF224B **20p**, 3 for **50p**; BF115 **15p**, 3 for **40p**; BF152 **12p**, 3 for **30p**; BF166 **18p**, 3 for **50p**; BF180 **22p**, 3 for **55p**; BF194a **12p**; BF195 **12p**; BFY50 **15p.**

STOCK LIST NOW AVAILABLE large stamped envelope please.

THE GABLES, 20 BARBY LANE, HILLMORTON, RUGBY, WARWICKSHIRE CU22 5QJ

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