radio communication

February 1975

Scout Jamboree on the Air, 1974

LEFT
Air Vice-Marshal Sir Bernard Chacksfield, KBE, CB, CEng, FRAeS, RAF (Rtd), Chief Commissioner for Scouts (standing, 2nd left) looking in on Jamboree on the Air at the Science Research Council's Appleton Laboratory Radio Club hut. Operator, Harry Willis. (*Photo: P. Hicks*).

BELOW
GB3HS operated by members of the Hereford ARS: G4CNY at the microphone, G3WRQ behind the clock. (*Photo by courtesy of the* Hereford Times).

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CONTENTS

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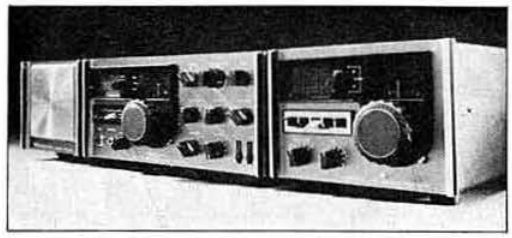
LOWE ELECTRONICS

TRIO FOR HF

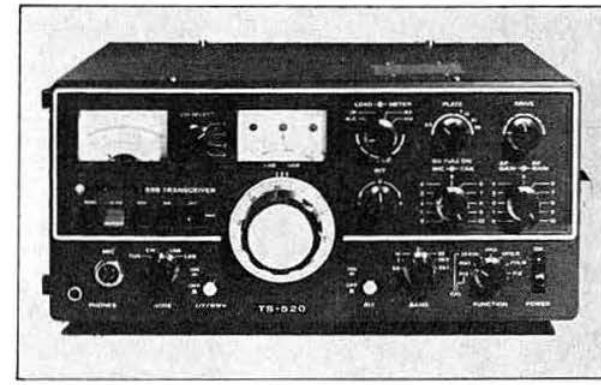


TS900

Top of the line. 300W p.e.p. 0·1μV sensitivity. All modes including RTTY. Vox, mox, PTT. The rig with **everything.**

£480 (VAT exc)

Optional remote VFO 900 available.

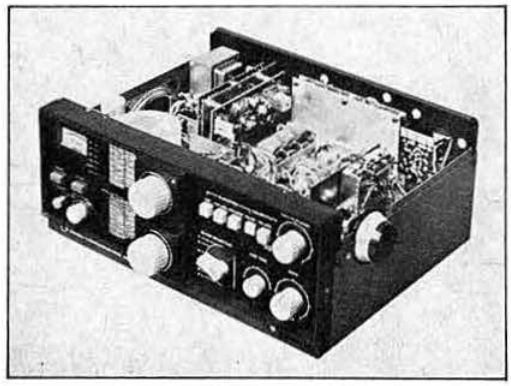


TS520

The go-anywhere rig. AC mains or 12v operation built-in. Speech compression built-in. Marker built-in. Vox built-in. Superb RX performance and unbeatable transmit voice quality.

£290 (VAT exc)

Optional remote VFO 520 and speaker SP 520 available.



QR666

New general coverage receiver. 3 way power supply, AC mains, 12v external supply or built-in batteries. 170kHz-30MHz coverage. Product detector. 2 position selectivity.

£130 (VAT exc)

Optional broadcast FM unit and marker unit available.

LOWE 2 METRE MONITOR RECEIVER REC-1420C

Here is a simple, low cost F.M. monitor receiver which monitors up to six channels and has an excellent performance/price ratio. Ideal for mobile use and when fitted with popular F.M. frequencies along with a repeater or two ensures that it is in the midst of any F.M. activity.

No necessity for a bulky and costly tunable I.F.—no fiddling around when driving—just scan the channels and if there is much F.M. activity you are sure of hearing it. Being F.M., ignition etc. suppression is not essential, and thus makes it the ideal mode for mobile. It's diminutive size (4ins.W × 2½ins.H × 8ins.D) and weight (2½lbs) make it a snip for portable. In fact it is the one receiver that is cheap enough for everyone to carry around anywhere.

R.F. STAGE • REQUIRES 12 to 15V D.C. •
6 CHANNEL CAPABILITY • 4 I.F. STAGES
DOUBLE CONVERSION •
EXCELLENT SQUELCH

CRYSTALS 145·000 Popular 145·725
145·500 calling 145·750 Repeaters
145·525 channels 145·775
145·550

PRICE (Less crystals) **£19.95** plus VAT **ALL IN PRICE,** fitted 6 channels **£31.26** (inc. VAT & postage)

LOWE ELECTRONICS

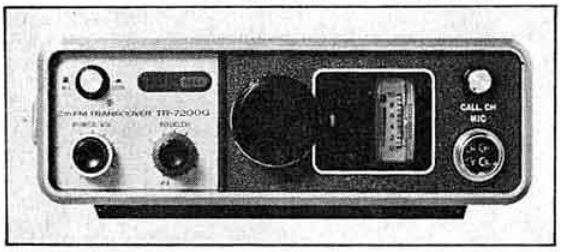
TRIO FOR VHF

TS700 Specification

FREQUENCY RANGE	*144–146MHz*
MODES	*usb, lsb, cw, am, fm*
VFO COVERAGE	*144–145 and 145–146 MHz*
CRYSTAL OUTPUT	*22 Channel capability*
POWER OUTPUT	*10W minimum*
ANTENNA IMPEDANCE	*50 ohms*
CARRIER SUPPRESSION	*50dB*
SIDEBAND SUPPRESSION	*Greater than 40dB*
SPURIOUS RADIATION	*Better than — 60dB down in all modes*
DEVIATION	*± 10KHz or ± 3KHz*
REPEATER TONE	*1750–Hz Tuning Fork Oscillator*
IF	*10·7MHz for ssb, am, cw, single Conversion* *10·7MHz and 455KHz for fm, double Conversion*
SENSITIVITY	*0·5V for 10dB S + N/N*
IMAGE REJECTION	*Greater than 60dB*
IF REJECTION	*Greater than 60dB*
IF SHAPE FACTOR	*Better than 2·1 all modes*
AF OUTPUT	*Greater than 2W into 8 ohms*
STABILITY	*Better than 200Hz in any 30 min. period after warm-up*
REPEATER SHIFT	*Standard 600KHz transmit downshift provided*
CALIBRATOR	*Built-in 1MHz Calibration points*
DIAL READOUT	*To better than 1KHz all modes*
R.I.T.	*4KHz shift of receiver with respect to transmit frequency*
NOISE BLANKER	*Advanced circuitry noise blanker for noise free mobile or fixed operation*
ALC INPUT	*Socket provided for ALC input from linear*
AUX RELAY	*Socket provided for switching external linear*

POWER REQUIREMENTS	*120/240V 50/60Hz ac; 12–16V dc negative earth*
CONSUMPTION	*Receive 45 watts ac; 800 ma dc* *Transmit 95 watts ac; 4A dc*
DIMENSIONS (mm)	*278 wide × 124 high × 320 deep*
WEIGHT	*11kg 24·2 lb*

Price £300 (VAT excl)



TR7200G 2m Mobile Transceiver

22 Switch selected transmitting and receiving frequencies in the 2m FM band between 144MHz and 146MHz, five of which are factory-equipped with TX and RX crystals. Illuminated channel indication.

Channels Fitted 145·50 Simplex 145·15/75 Duplex
145·525 Simplex 145·175/775 Duplex
145·55 Simplex

Price £125 (VAT excl)

TR2200G

The world's most popular 2 metre handy transceiver now comes complete with tuning fork controlled repeater access tone and facilities for 12 channels. With the advent of repeater operation in this country, it is now possible to work long distances with low power equipment and the sudden popularity of portable 2 metre equipment testifies to this fact. The TRIO TR2200G is a high performance transceiver with features not found in other rigs. Supplied with 3 channels fitted:

145·50 Simplex
145·55 Simplex
145·175/775 Duplex

Most other I.A.R.U. channels available.

Price £80 (VAT excl)

REMEMBER! IC210 STILL AVAILABLE AT £200 (VAT EXC.)
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Soho House, 362-4 Soho Road, Handsworth, Birmingham Tel. 021-554 0708
AGENTS Alan GW3YSA. 35 Pen-Y-Waun, Efail Isaf, Nr. Pontypridd. Tel. Newton Llantwit 3809
John G3JYG. 16 Harvard Road, Ringmer, Lewes, Sussex. Tel. Ringmer 812071
Sim GM3SAN. 19 Ellismuir Road, Baillieston, Nr. Glasgow. Tel. 041-771 0364

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

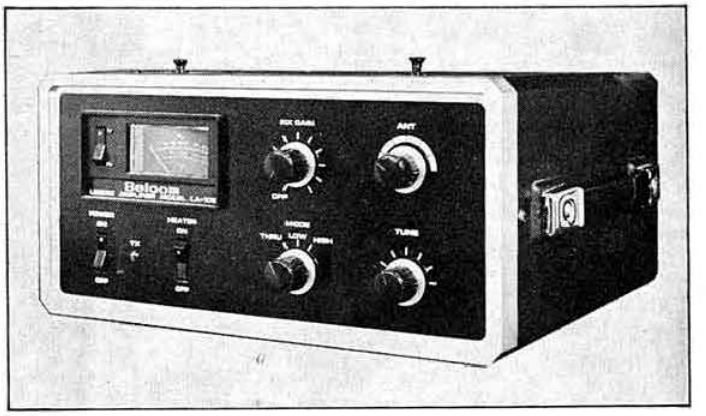
LOWE ELECTRONICS

BELCOM LA106 2m linear amplifier

A reasonably priced, compact, high performance linear for 2m SSB/FM CW operation. 10W of drive for more than 200W input gives your signal the extra kick to get it out of the noise. Built-in receive preamplifier with adjustable rf gain and using helical filters for extra selectivity and reduced intermod. from out of band signals. Built-in regulated 13v 2·5A power supply for Liner 2 or any similar drive unit.

Frequency range:	144-146MHz
Modes:	SSB, FM, CW
Input power:	200W p.e.p.
Drive power:	10W
Receiver preamplifier adjustable gain up to 10dB	
Accessory supply:	13v 2·5A regulated
Power supply:	240v 50Hz
Dimensions (mms)	315 × 148 × 280
Weight:	12kgs
Price:	**£165 plus v.a.t.**

MADE SPECIALLY BY NIHON DENGYO FOR THEIR LINER 2



Nihon Dengyo Co. Ltd.

SSB 144MHz MOBILE TRANSCEIVER

Liner 2

The brilliantly conceived and designed Liner 2 has revolutionized 2m sideband and is responsible for the enormous increase in activity. It combines the advantages of switched channels with direct frequency readout (e.g. Channel 20 is 145·20MHz) with the ability to tune between channels with the VXO. In addition the provision of R.I.T. which enables the rx to be tuned a kHz or two either side of the Tx frequency is a useful feature. The VXO gives, as one would expect, crystal stability which, coupled with an extremely effective noise blanker makes mobile operation a delight without detracting from its use (with an A.C. psu) as a base station.

Most important is the surprisingly low level of spurious emissions which sets a new standard. This low level is achieved by very careful design and alignment and owners are most strongly urged not to attempt alignment without a laboratory spectrum analyser.

For the first time, here is a completely solid state, fully tuneable 2m SSB rig with an electronically protected PA at a reasonable price which truly performs with the utmost reliability.

LOWE ELECTRONICS

PRICE LIST—FEBRUARY 1975

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2m 'J' BEAMS 50 ohms only		
5Y/2M. 5 element Yagi with 1" boom	£6.84	£4.64
8Y/2M. 8 element Yagi with 1" boom	£8.25	£6.05
10Y/2M. 10 element Yagi with 1½" boom	£14.08	£11.88
PBM14/2M. 14 element parabeam with 1½" boom	£20.46	£18.26
5XY/2M. 5 el. crossed Yagi with 1½" boom	£11.06	£8.86
8XY/2M. 8 el. crossed Yagi with 1½" boom	£13.22	£11.02
10XY/2M. 10 el. crossed Yagi with 1½" boom	£17.43	£15.23
D5/2M. 5 over 5 slot fed Yagi with 1" boom	£10.75	£8.55
D8/2M. 8 over 8 slot fed Yagi with 1" boom	£13.65	£11.35
PMH/2C*. 2 way phasing harness for circular polarisation*	£3.62*	£3.08
SVMK/2M*. Mounting kit for vertical polarisation for 2 slot fed Yagis*	£2.70*	£2.20
XD/2M. Crossed dipoles	£8.41	£6.21
UGP/2M. Unipole and ground plane	£6.68	£4.48
PMH2/2M*. 2 way phasing harness for 2 aerials*	£4.78	£4.27
PMH4/2M*. 4 way phasing harness for 4 aerials*	£10.52	£9.88
70cms 'J' BEAMS		
D8/70. 8 over 8 slot fed Yagi with ¾" boom	£11.92	£9.72
MBM46/70. 46 element multibeam	£15.27	£13.07
2M MOBILE WHIPS		
'J' BEAM ¾ vertical swivel mount	£8.64	£6.48
G-WHIPS		
Tri-bander 20, 15, and 10m	£15.44	£13.28
Multimobile 20, 15, and 10m	£17.60	£15.45
160, 80, or 40m coils for the above, each*	£4.75*	£4.43
Top whip section for the above*	£1.45*	£1.19
Base mount for all G-Whips*	£2.00*	£1.78
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MMC432/28	£19.91	£19.80
MMC432/144	£19.91	£19.80
MMC1296/28	£26.40	£26.25
MMC1296/144	£26.40	£26.25
MMV432	£19.25	£19.10
MMV1296	£27.50	£27.35
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TR 44 Heavier Duty Rotator	£55.20	£54.12
CD 44 Improved version of TR 44	£65.88	£64.80
Ham-2 Improved version of rugged Ham-M	£98.28	£97.20

	Carriage Paid	Callers Only
ANTENNA ACCESSORIES		
Please note that the carriage paid price assumes parcel post.		
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Rotator cable 4 core heavy duty per metre	.22	.20
Rotator cable 12 core heavy duty per metre	.49	.47
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SO239 matching sockets	.40	.38
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Hy-Gain Balun BN86	£10.80	£10.45
Diamond Balun BU-5	£4.80	£4.50
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9·0MHz Crystal filters complete with both carrier crystals.		
S.E.1. QC1246AX SSB filter	£20.40	£20.25
SE1WA YF90F SSB filter	£16.50	£16.30

VALVES

For the very common valves, it pays to shop at one of the large London importers who buy in such enormous quantities that they can sell retail at a lower price than we can buy wholesale. We do, however, maintain stocks of the more unusual valves which are used in the equipment we sell, and which you may find some difficulty in obtaining.

	Carriage Paid	Callers Only
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6GK6	£1.35	£1.30
6JS6C, 6KD6 matched pairs	£4.50	£4.30
6146B, S2001 each	£3.35	£3.25
6LQ6 matched pairs	£5.50	£5.25

CRYSTALS

Popular channels for Yaesu, Inoue, FDK, Trio and many other FM transceivers.
Simplex channels S20, 2S1, S22, S23 and S24
Repeater channels R3, R4, R5, R6, R7 plus other channels as they come into use.
A 'phone call will confirm current stock position.
Price **£2.50** per crystal, **£4.50** per pair.

THE ABOVE PRICES INCLUDE VAT

TERMS: CASH OR CHEQUE WITH ORDER (sorry we do not have facilities for credit accounts)
In the event that we are temporarily out of stock of any item, your money will be refunded in full immediately.

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High Power Base Station FT-401B★

560 Watt 80 thru 10 Metre Transceiver

YAESU'S years of experience in the amateur radio field is exemplified in the FT-401B.

This is a professionally engineered transceiver for the uncompromising radio amateur.

Features

- Built-in 100/110/117/200/220/234 VAC power supply
- 560 Watts PEP SSB, 430 Watts CW and 90 Watts AM (Slightly Lower on 10 metre).
- Automatic break-in CW operation with sidetone
- Selectable 25kHz and 100kHz calibrator
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- All mode operation—SSB, CW, & AM
- Built-in final amplifier cooling fan
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★ **LATEST MODEL!**

DON'T SETTLE FOR SECOND-BEST,

FULL DEMONSTRATION FACILITIES—

A COUPLE OF STAMPS (WE'LL PROVIDE THE ENVELOPE) WILL BRING YOU DETAILS OF ANY ITEM—PLEASE STATE SPECIFIC EQUIPMENT IN WHICH YOU ARE INTERESTED

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STOP mistreating your rig

Match your antenna system to the PA stage with a KW 107—observe your TX "Waveform" with a KW 108

KW 108 Monitorscope

- ★ Monitor your transmitted "Waveform" 10-160 metres
- ★ Can be left permanently in antenna feed
- ★ Two-tone generator incorporated to ensure optimum linearity for SSB
- ★ Displays SSB, AM and CW "Waveform"
- ★ A further safeguard for your PA tubes

KW 108 Monitorscope

KW 107 Antenna Tuning System

KW 107 ANTENNA TUNING SYSTEM

The KW range of aerial matching units will ensure optimum power transfer from the PA stage to the antenna system

- ★ Longer life for your PA tubes
- ★ KW 107 suitable for most transceivers and transmitters (250 watt rating)
- ★ The KW 109 is for use with linear amplifiers
- ★ Antenna selection
- ★ RF power and SWR measurement
- ★ Dummy load incorporated
- ★ Observation of SWR with and without antenna tuner
- ★ Attractive "G" line case

The antenna tuner in the above unit can be purchased separately if you already have the KW 101/103, dummy load and antenna switch

This unit is known as the KW E-Z match

Write or phone for catalogue to:

KW Communications

(Decca Communications Ltd)

1 Heath Street, Dartford, Kent. Tel: Dartford 25574/21919

Easy Terms on Equipment available over 12, 18 or 24 months.

Other KW Favourites KW 2000E Transceiver 10-160; KW 204 Transmitter; KW 1000 linear Amplifier; KW 202 Receiver; KW 160 ATU; KW 103 SWR/RF Power meter; KW Dummy Load; KW Traps (The original and best); KW Trap Dipoles; KW Low Pass Filter; KW Balun; KW Antenna Switch.

Stockists for Hy-Gain beams and verticals, CDR rotators. Shure microphones, etc.

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DON'T BUY ONE...

...UNLESS YOU WANT THE BEST IN MOSFET CONVERTERS!

144MHz Mosfet Converters

UPDATED SPECIFICATION

The overwhelming response to the introduction of our 144MHz SSB receive converter has indicated the requirement for a tightly specified converter for use with modern highly accurate 28-30MHz receivers. To this end we have now standardised the design of our 28-30MHz converter using a zener-stabilised 116MHz crystal oscillator, giving a typical read-out error of better than 1kHz. The converter is now available in the two versions, with and without the local oscillator output facility.

MMC144/28 Price **£16.42** inc VAT
MMC144/28 LO (with 116MHz output) Price **£17.60** inc VAT

SPECIFICATION

Noise figure: 2·8dB max. Gain: 27dB typ.
Image rejection: 65dB typ.
Crystal oscillator: 116MHz (zenered)
Frequency error at 144MHz: 3kHz max.
Power supply: 35mA at 12 volts.
116MHz o/p power: 5mW min (LO o/p version)

We have extended our popular range of single conversion converters to include the following I.F.s.:
9-11, 12-14, 14-16, 18-20, 24-26, 28-30MHz
Price **£16.42** inc. VAT

144MHz DOUBLE CONVERSION MOSFET CONVERTER
I.F.s available ex-stock: 2-4, 4-6MHz. Price inc VAT **£16.42**
This unit was developed to meet the heavy demand for a converter suitable for use with receivers having better performance at lower frequencies. It uses two dual-gate mosfet mixers, both fed from the output of a 70 or 71MHz crystal oscillator. Selectivity is obtained at the first IF in the 74MHz range, thereby overcoming the usual problems associated with low-I.F. single conversion converters.

136MHz SATELLITE BAND CONVERTER
I.F.'s available: 28-30MHz and others Price inc VAT **£16.42**

70MHz MOSFET CONVERTER
I.F.s available: 4-4·7, 14-14·7, 18-18·7, 28-28·7MHz.
Price **£16.42** inc VAT

432MHz MOSFET CONVERTER
I.F.s available ex-stock: 14-16, 18-20, 24-26, 28-30, 144-146MHz.
Price inc VAT **£19.55**

432MHz VARACTOR TRIPLER
Maximum input power at 144MHz: 20 watts. Typical output power (at maximum input): 14 watts. Price inc VAT **£18.90**

144MHz DUAL OUTPUT PREAMPLIFIER
Gain 18dB, N.F. 2·8dB. Ex-stock. Price inc. VAT **£9.72**

ALL EQUIPMENT EX-STOCK — ALL PRICES INCLUDE POSTAGE

Communications Ltd

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ANTENNAS, TOWERS, MASTS, ROTATORS, COAX

VERSATOWERS

Illustrated right. Tiltover Telescopic post mounted ex-stock. The tilting action allows ease of maintenance and changes of antennas. The relatively low weight allows ease of installation. From: **£172.25**

TELOMASTS

Galvanised steel Telescopic 10ft. section.
30ft.—**£15.00** 40ft.—**£20.00** 50ft.—**£25.00**
With rigging kits:
30ft.—**£29.00** 40ft.—**£39.00** 50ft.—**£49.00**

ALIMASTS

A/Alloy Telescopic 1·5, 2, 3 metre sections. 6–21 metres from **£11.50** for 6m to **£38.00** for 21m.

HAMTOWERS

Galvanised lattice 10ft. sections 30ft. height with climbing steps on one face. From: **£90.50**

THE COMPLETE RANGE OF JAYBEAM (AND MORE!) (Carriage extra)

OMNI-DIRECTIONAL				
HO/2M	Halo head only	—3dB	60 ohm	£1.85
HM/2M	Halo with mast	—3dB	60 ohm	£2.20
UGP/2M	Ground plane	0dB	60 ohm	£4.15
XD/2M	Crossed dipoles	—3dB	60 ohm	£5.15
CIRCULAR				
XD/2M	Crossed dipoles	0dB	60 ohm	£5.75
5XY/2M	5 element crossed	7·8dB	50 or 75 ohm	£8.20
8XY/2M	8 element crossed	10dB	50 or 75 ohm	£10.20
LLXY/2M	10 element crossed	13dB	50 or 75 ohm	£14.10
4 METRES				
4Y/4M	4 element	7dB	50 ohm	£6.80
BEARINGS				
RZ100	Alignment bearing			£7.60

YAGI'S				
5Y/2M	5 element Yagi	7·8dB	60 ohm	£4.30
8Y/2M	8 element Yagi	10dB	60 ohm	£5.60
10Y/2M	10 element long Yagi	13dB	50 or 75 ohm	£11.00
14Y/2M	14 element long Yagi	14·5dB	50 or 75 ohm	£14.00
SLOT-FED				
D5/2M	5 over 5	10·3dB	50 or 75 ohm	£7.92
D8/2M	8 over 8	12·6dB	50 or 75 ohm	£10.50
PARABEAM				
PBM14/2M	14 element parabeam	15·2dB	50 or 75 ohm	£16.90
70 CENTIMETRES				
D8/70	8 over 8	12·6dB	50 ohm	£9.00
PBM18/70	18 element parabeam	16·5dB	50 ohm	£10.90
MBM46/70	46 element Multibeam	17·3dB	60 ohm	£12.10

PHASING AND MATCHING HARNESSES AVAILABLE

ANTENNAS FROM HY GAIN (Carriage paid)

Hy Tower, 10–80m, Self supporting tower	£132.00	TH2 Mk. 3 10–20m. 3 element 600W ..	£62.00	103BA 10m. 3 element beam	£35.00
18V, 10–80m. Vertical self supporting	£15.50	Hy Quad 10–20m. 2 element 40m. ..	£90.00	LA 1 Lightning arrestor	£17.50
12AVQ, 10–20m. Vertical self supporting	£20.00	DB10–15A 10 and 15m. 3 element beam	£69.00	LA 2 Lightning arrestor	£3.00
14AVQ, 10–40m. Vertical self supporting	£29.50	DB24B, 3 element 20m. 2 element 40m.	£129.00	12RMQ Roof mounting kit	£11.00
LC80Q Loading coil for AVQ, 80m. ..	£9.30	402BA, 40m. 2 element	£110.00	14RMQ. Roof mounting kit	£13.00
18AVT/WB 10–80m. Vertical	£42.50	204BA 20m. 4 element beam	£96.00	400 Rotor	£139.00
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TH3 MK3 10–20m 3 element beam ..	£90.50	153BA 15m. 3 element beam	£44.00	TH3 Jnr 10–20m. 3 element 600W ..	£62.00

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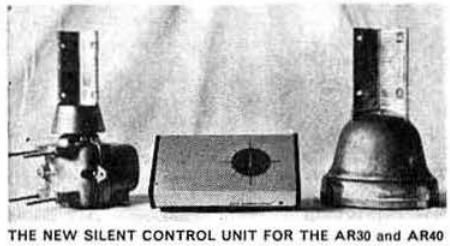

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100 ASSORTED BRANDED TRANSISTORS Mainly Small Signal Types NPN PNP for **£1.08.**
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VHF-UHF TUNING VARACTORS 80pf at 4 volt, 57pf at 8 volt with a Q of 100 at 100MHz. Tested **15p** each. Untested 6 for **25p.**
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GAREX (G3ZVI)

THE GAREX Mk II TWOMOBILE FM/AM Tx-Rx

Brief technical details:

Tx Rx and PSU for 12V DC input contained in one unit 12× 4½ × 8" deep. **Tx** Transistorised crystal oscillator (8MHz), multipliers and modulator, quick-heat tetrodes YL1080 driver and PA. No standby current. 6 switched crystal positions (**new** feature). Fist mic. with press-to-talk. Switched AM or FM. Tone-burst generator—2 tones + off switch (**new** feature).

Rx Fully transistorised. Continuous tuning from 144 to 146MHz directly calibrated dial. VFO supplied from i.c. voltage regulator for improved stability under mobile conditions. 2 RF amplifiers, FET 1st mixer, 1st IF 10·7MHz, crystal controlled 2nd FET mixer, 2nd IF 455kHz, squelch, audio output to drive external 3Ω speaker. FM/AM reception selected by switch independent of Tx mode, utilising i.c. quadrature detector on FM.

35 transistors, 3 i.c's, 15 diodes. Floating supply for pos. or neg. earth.

Delivered price complete with one Tx crystal and detailed handbook **£129.60** inc. VAT.

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Matching style to Twomobile, dual-purpose table-top or mobile mounting; 5 × 3" 3/5Ω drive unit. Ideal for popular R/T equipment **£4.32**

Printed circuit boards from Pye R/T equipment, with circuits. All transistor, all in good used condition, unless otherwise stated.

FM AF board provides audio for FMTx also Rx audio preamp, suitable valve or transistor Tx — New **£1.95** Good used **£1.00**

10·7MHz I.F. board — **£1.85**

2nd mixer 10·7MHz to 455kHz, with 11·155MHz xtal — **£1.85**

455kHz block filters 25kHz chann. spacing, low impedance — **£1.75**
25kHz chann. spacing, high impedance — **70p**
12½kHz chann. spacing—details & prices on application

455kHz AM I.F. board (ex AM25B) — **£1.00**

Squelch boards (ex Cambridge) FM **85p** AM **35p**
(ex AM25T) **45p**
(ex AM25B) Type A or B, **15p** 2 for **25p**

Mic. amplifier board ex AM25B — **85p**
ex AM25T — **85p**

Mod. output board ex AM25B or T — **45p**

Rx Audio board ex AM25B — **45p**
ex AM25B, soiled — **25p**
ex AM25T — **45p**

Mic. preamp board, 2 transistor, emitter follower output — **60p**

NOTE—Apart from providing spares for the specific equipment, all the above boards are an ideal basis for home-brew equipment.

Modulation transformers with connection data
p.p. NKT404/OC28/OC35 to QQVO3-20a **£1.30** Driver to suit **50p**
p.p. NKT404/OC28/OC35 to QQVO3-10 **£1.20** Driver to suit **40p**
Single EL84 to QQVO3-10 **£1.05**
p.p. EL91 to QQVO3-10, + 3Ω LS & 15Ω pub. address — **£1.05**
p.p. EL84 to QQVO3-20a **£2.16**

Audio transformers p.p. NKT404 to 3Ω, small or large — **40p**
Drivers to suit, small or large — **40p**
6AQ5 to 3Ω and 10Ω — **40p**

Camera video board (Lynx) new — **£3.85**

Rectifier plug in valve replacement stack of silicon diodes, full wave 2·6kV p.i.v. at 400ma. Int. oct. base, wired as 5U4, easily moded. — **75p**

Circuit breakers, panel mounted, 0·3, 0·5, 1 and 2 amp (new) — **45p**

Reed switch S.P.C.O. 33mm × 5mm dia. (75mm over leads) 10VA rating **35p**
Reed relay coils to match above, 24V (2·5k res.) **20p** each **3 for 50p**
Low loss SP reed and 24V coil glass encap. OK for switching tuned circuits — **£1.00**

Painton (min. Jones) connectors, chassis mtg. 18 way male or female **30p**
ditto, 6 way (2 pins at rt. angles) — **15p**

Toggle switches SP biased off — **15p**
DPDT — **15p**

Crystals HC6U: 12·700MHz B7G: 2·400MHz — **30p**

Valves (New or tested ex. equip.) EB91, EC91, ECC91, ECF80, ECH83, ECH34, 6AT6, 6BH6, 6BJ6, 6CB6, EZ81 — **15p** each, any 4 for **50p**

Transistors (tested, with mtg. kits) NKT404 — **15p** each, 4 for **50p**

Integrated circuits (new, full spec.)
723 voltage reg. TO5 metal case, 2/37V out at 150ma for 5/40V in — **80p**
SN76660 FM quadrature detector — **£1.25**
CD4001 AE quad. 2-input NOR gate for tone-burst gen. — **70p**
NE555 Timer for tone-burst gen. or time-out indicator — **85p**

Relays Cambridge 12V 2 pole c.o. — **20p**
Miniature 12V plastic cover 2PCO **30p**; 4PCO **35p**
25 AMP 6V single make; 6V double make; 12V double make — **35p**
Type 2400 ex AM25, please specify coil/contacts required — **25p**
Coaxial aerial relay type 951, 50Ω, OK at 70cm. 24V — **£2.16**

Mains transformers multitap prim. unless stated otherwise
HT Transf. 5 windings: 35v 0·2A, 75/115v 0·15A, 50v 0·5A, 150v 0·3A, 170/220v 0·3A (13lbs) — **£5.70**
(For quick heat QQZO6-40 Tx) 7 windings 232V, 276V (300ma); 60V, 50V (50ma) 2·1V 8A; 17·5V 1A; 12·6V 4A (11·5lb) — **£4.55**
170–0–170V 90ma, 50V 50ma, 6·3V 3·3a, 5V 2A (5·5lb) — **£1.55**
0–145–232V 160ma, 26·5V 1A, 13·9V 5A, 50V 50ma (10·5lb) — **£3.20**
6·3V 4A (2·2lb) — **95p**
Small 110V Pri. 30V 100ma sec. **40p** each, 2 for **75p** (series pri. for 240V)
230/240V Pri. 72V 40ma, 6·8V 10A, 6·3V 4·6A C core (7lb) — **£4.35**
200/250V Pri. 31·5–0–31·5V ½A tapped 22, 24, 25·5, 28·5V — **£2.65**
Auto 20-10-0-100-190-230V 200VA — **£2.75**
345–0–345V 150mA, 5V 2A (P.O.F.) — **£4.35**
6·5–0–6·5V 2·3A, 6·5–0–6·5V 2·9A, 6·5–0–6·5V 4·25A, 6·5V 2·7A, 37V 30mA (P.O.F.) — **£4.35**
Charger transf. 240V in, 17·5V 1A out — **80p**

HT chokes 5H 80ma, 4H 240ma, 1H 240ma, 1·25H 350ma, 1·8H 125ma — **80p**
Top grade types: 9H 250ma 107Ω **£1.95**, 10H 20ma 100Ω **£1.15**
8H 240mA (P.O.F.) **£1.95**; 35H 25mA (P.O.F.) **£1.15**
N.B. P.O.F. = Potted, oil-filled.

Toroidal inverter transformers 12V DC input (with circuits)
265V at 150mA (Cambridge) 2·25" × 2" × 1·6" — **£1.70**
(6/12V & 12/24V versions also available same price)
Pye Continental type — **£2.80**
170/375V at 180mA (Vanguard) 2·75" × 2·5" × 2·5" — **£1.90**
(24V version, same price)

V double 390V at 200mA 2·9" × 2·5" × 2·5" — **£1.90**

V double 400V at 200mA and 250V at 150mA 3·5" × 2·75" × 2·25" — **£2.60**
(NB: both on same winding—so cannot be added to give 650V)

HT choke suitable for 2-3kHz inverters — **50p**

LT choke, 3 Amp, 0·1Ω, ideal for LT psu or hash filtering, — **30p**

Rectilinear pots multiturn, preset, p.c. mtg. (new)
10, 20, 25, 100, 250, 500, 1·5k, 2k, 2·5k. **25p** each, any 5 for **£1.**

Neons, min. wire ended, **5p** ea., 12 for **50p.**

Diodes CS34-A — **35p**

Air spaced Trimmers (ex) small: 2–20pf, 2·4–30pf, large: 10pf, 25pf — **15p**
small 2–20pf with spindle ¼" × ½" — **25p**

Butterfly trimmers large 2 × 17·5pf, 2 × 10pf — **70p**

Beehive trimmers 2–8pf **5p** 3–30pf (new) **8p**

Tetfer trimmers 2-10pf, multiturn, O.K. for U.H.F. — **60p**

Tx Multiplier Transformer for AM10, AM25B or T, High or Low Band — **30p**

Other Pye coils and transformers also available

10·7 IFT (valve type) 2½" × ½" square double tuned **20p** 2 for **35p**

Coil formers, ceramic, single hole fix 1½" × ½", (with slug) 10 for **50p**

Modulator kit for QQVO3-20a. Includes **all** necessary components; ready assembled p.c. boards, driver and output transformers, power transistors (with mtg. kits) circuit and connection details; also suitable for QQVO3-10, for 12V working, bargain price — **£2.40**
Type 2, similar to above, but output transformer has additional 15Ω output winding for pub. address. — **£2.60**

Rx audio kit similar to above, but 3Ω output — **£1.20**

Mobile PSU 12V DC input (floating for + or — E) transistor inverter 170, 220 or 380V DC at 180mA output, fully smoothed, chassis section, self-contained, fully wired and tested, with circuit — **£4.85**
As above, but partly assembled (as cut out), complete with all components, circuit, finish-it-yourself — **£2.95**

S.T.C. AM661 mobiles, hiband, 6 channel, all solid state, 20W RF output, 12½kHz spec. P.O.A.

Ventilated steel cabinets 12 × 12 × 18" high, with wall-fixing lugs, internal chassis frame 11½" × 11" × 13". New condition **£2.** Buyer inspect and collect by appointment.

TW Phase II 2 metre Transverters 10 metre input, built-in Rx conv. for 10 metre output. QQV06-40a P.A. External condx. brand new, internally marked; with handbook; delivered price. — **£69.40**

Pye Ranger spares I.F.T's 10·7MHz, 2MHz, Noise lim. assy., Rx osc. mult. transformer: — all at **30p**
Vibrator transformer 6/12V or 24V — **£1.50**
Inverter transformer (160/260V out for 12V in) — **£1.65**

BNC 50ohm free sockets (new) special offer — **12 for £1.30**

Paper block capacitors (Mfd/voltage) 0·5/400; 1/500; 1·5/500; 2/350 at **54p**
8/600; 8/800; 8/1000 — at **£1.08**

Walkie-talkie canvas satchel, main compartment approx. 8½ × 7 × 2", plus mic/batt compartment approx. 7 × 5 × 1½" for Murphy Rover, (Bantam will fit) — **£1.80**

Unless stated otherwise, components are ex-equipment, in good condition, your satisfaction guaranteed. Wherever possible, full supporting data is given.

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Like most Heathkit amateur radio equipment, our HW-101 SSB transceiver comes in kit form.

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Especially as it's about the best transceiver in its class. And represents exceptionally good value for money.

Take a look at the technical specifications now and then send for your free Heathkit catalogue.

In it you'll find the whole of our amateur radio range together with full details about the easy payments available with the Heathkit Monthly Budget Plan.

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HW-101 transceiver specifications

Receiver section:

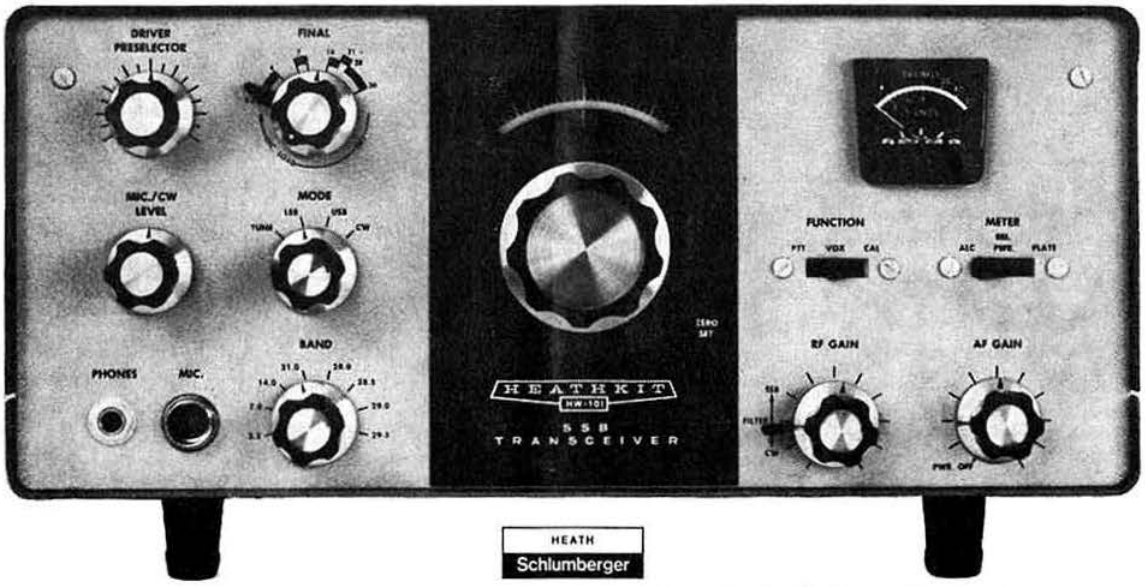
Sensitivity: Less than 0.35 microvolt for 10 db signal-plus-noise ratio for SSB operation.
SSB selectivity: 2.1 kHz min. at 6 dB down; 7 kHz max. at 60 dB down (3.395 MHz filter).
CW selectivity: (with optional CW filter installed) 400 Hz min. at 6 dB down; 2.0 kHz max. at 60 dB down.
Input: Low impedance for unbalanced coaxial input.
Output impedance: 8 ohm speaker and high impedance headphone.
Power output: 2 watts with less than 10% distortion.
Spurious response: Image and IF rejection better than 50 dB.

Transmitter section:

DC power input: SSB—180 watts PEP; CW—170 watts.
RF power output: 100 watts on 80-15 M; 80 watts on 10 M.
Output impedance: 50 ohm to 75 ohm with less than 2:1 SWR.
Oscillator feed-through or mixer products: 55 dB below rated output.
Harmonic radiation: 45 dB below rated output.
Transmit/receive operation: SSB, PTT or VOX. CW provided by operating VOX from keyed tone using grid-block keying.
CW sidetone: Internally switched to speaker or headphone in CW mode. Approx. 1000 Hz tone.
Microphone input: High impedance with a rating of −45 to −55 dB.
Carrier suppression: 45 dB down from single-tone output.
Unwanted sideband suppression: 45 dB down from single-tone output at 1000 Hz reference.
Third order distortion: 30 dB down from two-tone output.
RF compression: 10 dB or greater at .1 mA final grid current.

General:

Frequency coverage: 3.5 to 4.0; 7.0 to 7.3; 14.0 to 14.5; 21.0 to 21.5; 28.0 to 28.5; 28.5 to 29.0; 29.5 to 30.0 MHz.
Frequency stability: Less than 100 Hz per hour after 45 minutes warm-up. Less than 100 Hz for ±10% line voltage variations.
Modes of operation: Selectable upper or lower sideband and CW.
Dial calibration: 5 kHz.
Calibration: 100 kHz crystal.
Audio frequency response: 350 to 2450 Hz.
Power requirements: 700 to 850 V at 250 mA with 1% max. ripple; 300 V at 150 mA with .05% max. ripple; −115 V at 10 mA with .5% max. ripple; 12 VAC/DC at 4.76 amps.
Cabinet dimensions: 6 5/16" H., 14 13/16" W., 13 3/8" D.



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RADIO SOCIETY OF GREAT BRITAIN

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INCORPORATED 1926

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INTERNATIONAL AMATEUR RADIO UNION

PATRON: HRH THE PRINCE PHILIP, DUKE OF EDINBURGH, KG

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Membership rates: UK—£5.50, VAT included (Unlicensed members under 18 years of age—£2). Overseas—£5 (USA $12). Members are asked to notify changes of address without delay.

CURRENT COMMENT

Warsaw ahead

THE tenth conference of the IARU Region 1 Division will open on 14 April 1975 in the Palace of Culture and Science at Warsaw. It was on the same date 50 years ago that the IARU was founded at a meeting in Paris. Twenty-five years later on 18 May 1950 the Region 1 Division was formed, also at a meeting held in Paris. At its formation Region 1 comprised 15 societies, today there are 41 national member-societies. The formation of the Region 1 organization was followed by that of similar regional bodies in ITU Regions 2 and 3. Now there is not only close contact between member-societies in each region but also between the regions and IARU headquarters.

An international body, united in aim and purpose, is essential if amateur radio is to continue. No longer is the future controlled by the votes of those nations who have always held a traditionally friendly attitude towards the amateur service. Today, and in the future, conference decisions will depend on the votes of nations who are, at the best, unco-operative with the amateur movement. A Region 3 conference is being held in Hong Kong in March 1975, and at this meeting the theme will be the World Administrative Conference, 1979. This subject will also be the main topic of discussion at the Warsaw meeting at which representatives from Regions 2 and 3 and IARU headquarters will be present.

The amateur service does not intend to be on the defensive. A logical plan for the expansion of the frequencies allocated to the amateur service in accordance with the conditions of the time exists and has already been considered in regional committee meetings. To be successful in our aim such a plan must be basically acceptable to many national administrations who will be prepared to support it at the ITU with positive votes. Only the IARU is in a position to prepare a plan and then to propagate it world-wide.

The RSGB has always been a strong supporter of the IARU concept. At each of the regional conferences many valuable papers have been presented on behalf of the Society leading to unified action throughout Region 1. The IARU Monitoring System is in the hands of the RSGB Intruder Watch organizer, G3PSM, and the chairman of the International Beacon Project is G3DME. VHF manager G3FZL was appointed to co-ordinate vhf beacon frequencies in Region 1. In these and many other ways the Society has always made a positive contribution. Preparation for Warsaw shows no less activity, and the RSGB has submitted a number of papers for consideration by the conference. The Society team will be led by Tim Hughes, G3GVV, who will have the support of G3FZL, G3USB and G3MXJ.

From the time that the Region 1 organization was formed in 1950 the RSGB has played a prominent part in both the administration work of the division and at each succeeding conference. The contribution that will be made at Warsaw will be no less significant.

G2BVN

The Palace of Culture and Science, Warsaw

QTC AMATEUR RADIO NEWS

Lord Wallace

At about the time that this issue will reach members, Lord Wallace of Coslany will be taking his place in the House of Lords. Lord Wallace will be known to many members for his support of the RSGB when a member of the House of Commons. It was largely due to his efforts that reciprocal licensing became a reality and he assisted the Society in many ways since that time. A message of congratulation was sent by the then President, Mr G. R. Jessop, on behalf of all members of the Society.

Mobile logging

The Home Office has agreed a proposal from the Society that the requirements for keeping a log while operating mobile should be simplified. This change will require a modification of the licence conditions and the full details will be published as soon as the official statement is received from the administration.

Reply coupons

International reply coupons are obtainable in a new design wef 1 January 1975. The cost (13p) of the coupons has not altered and all existing coupons will remain valid indefinitely until they are exchanged for stamps. IRCs are exchangeable in virtually any country for stamps to the value of the postage for a 1oz or 20g surface mail letter to any place abroad. Annual sales of IRCs in the UK amount to about 45,000.

QSL Bureau notice

Having recently taken over the duties of QSL sub-managership for the G4C— series, Mr A. T. Cheesley, G4CHP, finds that many thousands of cards are held for which no envelopes have been sent. In order to reduce further wasted effort and to increase available storage space, all cards held without envelopes will be destroyed following publication of this notice.

RSGB News Bulletin Service

From 16 February 1975 the vhf frequency of GB2RS broadcasts will be 144·5MHz. An amended schedule is shown below:

Time	Frequency (MHz)	Location and coverage (hf) or beam heading (vhf) of station
0930	3·6	Bromley, Kent (SE England)
1000	3·6	Cheltenham (SW England)
	144·5	Aberdeen (NNW)
	144·5	Croydon, Surrey (NE)
1015	3·6	Belfast (N. Ireland)
	144·5	Bangor, Co Down (N)
1030	3·6	Derby (N. Midlands)
	144·5	Weston-super-Mare (NW)
	144·5	Aberdeen (SW)
	144·5	Brierley Hill (NW)
1045	144·5	Middlesbrough (NW)
	144·5	Croydon, Surrey (SW)
1100	3·6	Bridlington (NE England)
	144·5	Brierley Hill (SW)
1130	3·6	Motherwell (S Central Scotland)
1200	3·6	Aberdeen (NE Scotland)

Returned to sender

The Post Office estimates that each year it spends about £4m returning undeliverable letters and parcels. In a bid to cut this bill, second-class items which contain newspapers, magazines and commercial advertising which the Post Office is unable to deliver will be returned to sender only if an external address is shown. Current copies of *Radio Communication* meet this requirement but, at the best, redirection is an uncertain business so please ensure that your correct address is advised to headquarters.

Radio Amateur Old Timers Association

The RAOTA net is now well established and over 60 members have joined in at various times. Many old friendships have been renewed through the net and, of course, many new friendships have been started.

The president, G2DX, is very interested in finding out the locations of groups of old-timers with a view to making some future arrangements for a get-together outside the London area in the hopes that those who could not easily reach London can be catered for in the years to come.

All amateurs who have been licensed for 25 years and over are very welcome to join in on 3,740kHz approximately at 1100 on the first Thursday of the month, with informal gatherings on the other Thursdays.

The next annual reunion will take place on Friday 16 May at the Bonnington Hotel, London.

Details of RAOTA can be obtained from Miss M. Gadsden, 79 New River Crescent, London N13 5RQ. Tel 01-882 1272.

The Marcuse Trophy

In memory of Gerry Marcuse, G2NM, a magnificent pewter tankard has been presented to the Chichester & District ARS by his widow, Irene, and son, David. It is to be awarded annually to the member who has made the greatest contribution within the Chichester & DARS to amateur radio or to the success of the meetings throughout the year.

The first recipient is Mark Trufitt, a 17-year-old student, for his receiver built mainly from scrap which showed a high degree of engineering skill and which performed extremely well.

GENERAL MANAGER STEPS DOWN

Mr D. A. Findlay, general manager of the RSGB for the past four years, has been forced for health reasons to resign from this position. The following letters exchanged between Mr Findlay and the President make the position clear.

G. R. Jessop Esq,
President,
Radio Society of Great Britain

24 December 1974

Dear Mr President

Early in October I informed the Honorary Treasurer that the problems surrounding the position of general manager were seriously affecting my health. I therefore indicated that I wished to resign from the position.

This matter was subsequently discussed with you and brought to the notice of the Finance and Staff Committee.

Will you therefore accept this letter as notice of my wish to terminate my appointment as general manager from 31 December 1974.

May I take this opportunity of thanking you for the great amount of personal assistance that I have received from you during the last two years.

Yours sincerely
D. A. Findlay

D. A. Findlay Esq.

30 December 1974

Dear Mr Findlay,

Thank you for your letter of 24th December tendering your resignation as General Manager.

I am very sorry that your health has become affected and you have been forced into this action by the load imposed upon you by the Society's work.

The Society owes you a considerable debt for getting its accountancy on to a sound basis, which has undoubtedly contributed in a large measure to the surplus of the last three successive years.

It is my sincere hope that your valued services will continue to be available to the management of the Society for many years to come.

Thank you for all your help and kindness during my Presidential year and my very best wishes for your future activities.

Yours sincerely
G. R. Jessop

Members will be pleased to know, however, that the Society is not to lose Doug Findlay's considerable knowledge and experience of Society matters, as he has been appointed subscriptions manager in order to take charge of the vital membership records section.

Until a new permanent general manager is appointed, Mr G. R. Jessop has been appointed to this position on a temporary basis. Mr Jessop was last year's President of the Society, and in order to undertake the general manager's duties he has resigned the office of Immediate Past President.

VHF meteor scatter propagation

by J. D. V. LUDLOW, GW3ZTH, MSERT*

IN recent years the amount of meteor scatter activity has been increasing and although results have been good many people have failed, primarily due to lack of information on the subject; likewise, a great number of interested individuals do not know how to begin. It was with this in mind that the idea for this article was conceived. No claim of originality is made for any of what follows, and all credit must go to those pioneers who for many years have done most of the spade work. There is still, however, enough scope for the experimenter to contribute to the knowledge of this interesting area of radio propagation.

Every day of the year millions of meteors enter the earth's atmosphere and in burning up form long columns of ionized particles. These columns diffuse rapidly and usually disappear within a few seconds. However, during their existence they will reflect radio signals and so give rise to what we now call meteor scatter propagation. This phenomenon is used by the vhf enthusiast to scatter signals over long distances, and it is the author's intention to concentrate on this aspect of meteor scatter work.

Meteor scatter communication systems are usually weak-signal systems with amateur equipment because the losses associated with the meteor trail reflection are relatively high. However, the losses are somewhat less than those of the forward tropospheric scatter path. Signals over long paths do sometimes produce returns in excess of S6 to 7 but it is more usual for signals to be in the range of S2-3. Two stations known to have had approximately 200h testing received less than a total of five minutes of S9+ signals but several thousand weaker bursts. The term "meteor" applies to those particles that enter the earth's atmosphere and are completely burnt up by frictional heating. This excludes the very small particles, the "micrometeorites" that slowly settle through the atmosphere without being destroyed. It also excludes the large meteors which manifest themselves as fireballs or even larger ones which reach the earth's surface as meteorites.

The micrometeorites are of no concern to the meteor scatter operator since they produce little or no ionization. The large meteorites, although they produce substantial ionization, are of little concern because their rate of occurrence is extremely low. The particles that produce most of the returns are those with masses in the range 10^{3}–10^{-7}g and have dimensions in the range 8cm–40μm. Before being trapped by the gravitational field of the earth, these particles move in orbits around the sun. Their composition is uncertain although they appear to be almost entirely of cometary origin. A substantial number of them are not single solid particles but loosely-bound dust balls.

Meteors are divided into two classes: the "shower" meteors and the "sporadic" meteors. The shower meteors are collections of particles moving with a common velocity around the sun. Their orbits intersect the orbit of the earth at a specific time each year, and at these times these well-known showers can be observed. In cases where the particles are uniformly distributed around the orbit the size of the shower varies little from year to year. If on the other hand there is a concentration of particles within the orbit, the extent of the shower can vary substantially in successive years.

The shower meteors only account for a small fraction of all meteors. Sporadic meteors are those which do not have well-defined streams but instead move in random orbits. Thus whereas shower meteors appear to be coming from a specific point in the sky—the "radiant" point for the shower —sporadic meteors have radiants that appear to be randomly distributed over the sky.

On the morning side of the earth, meteors are swept up by the forward motion of the earth in its motion around the sun, the maximum rate occurring between midnight and 0600 local time. The velocities of the meteors approaching the earth are in the range 12 to 72km/s. The lower limit is the escape velocity of a particle leaving the earth, while the upper limit is the sum of two components: a 30km/s component associated with the earth's velocity around the sun and a 42km/s component associated with the meteor itself. This latter component corresponds to the escape velocity for a particle leaving the solar system.

Meteor trails

As a meteor enters the earth's atmosphere it collides with air molecules which then become trapped in its surface. The impact energy produces heat, which evaporates atoms from the meteor. These move off with a velocity which is substantially equal to that of the meteor. Collisions between these high-velocity atoms and the surrounding air results in the production of heat, light and ionization, in the form of a long, thin trail with the particle at the head of it. As a meteoric particle approaches the earth no appreciable ionization is formed until the particle enters the relatively dense air at heights below about 120km. As the particle transverses the region below 120km, it vaporizes rapidly and is completely evaporated before reaching 80km. The height distribution of trails varies somewhat with the meteor characteristics. The higher-velocity particles produce trails at higher altitudes with the higher-mass ones producing maximum trail ionization at lower altitudes. There is also a height variation with the zenith angle of the trail orientation, with the larger angles corresponding to greater altitudes.

The lengths of the meteor trails are dependent on particle mass and zenith angle, being typically in the range 15 to 50km. While the practical lifetime of a trail is of course dependent on the means of detecting it, most of them last only a fraction of a second, while trails with the duration of a minute or more can be observed a few times a day during the non-shower periods. The energy reflected by a meteor trail is a function of many variables, such as ionization density distribution across and along the trail, the orientation of the trail, radio wavelength, the polarization of the incident wave with respect to the trail direction, motion of the trail due to ionospheric winds and the straightness of the trail.

The above is a brief description of how the medium is generated; far more detail can be found elsewhere [1-5]. It is

* 1 Maes Glas, Cefn Cribwr, Bridgend, Glamorgan, CF32 0AL.

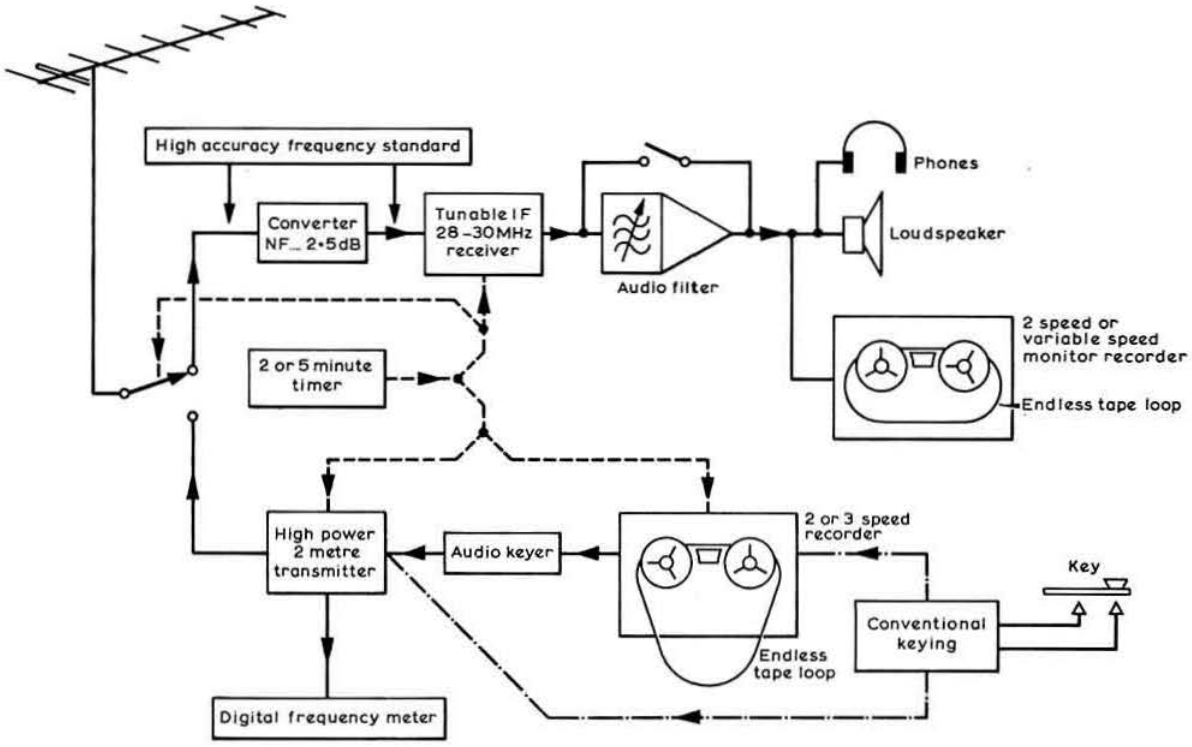


Fig 1. Block diagram of basic meteor scatter station layout

the author's intention to concentrate on how best the medium can be exploited and leave detailed investigation of the phenomena to the reader. Communication by meteor scatter is not a new art; it has been with us for some time, its history being somewhat obscure. Certainly it was known in the late 'thirties, and radar results during the 'forties paved the way for amateur use after the war. In the USA much of the early work was done by W4HHK of Collierville, Tenn, and W2UK of New Brunswick, NJ, from 1953 onwards, while here in the UK G3CCH and G3LTF between them have done much to show what can be achieved over long paths. Today, with modern techniques and reasonable knowledge, communication over paths of 1,500 miles is possible [6-8].

Basic requirements

The hardware requirements for meteor scatter work are fortunately well defined; a block diagram of a typical station is shown in Fig 1, and the following information should be used as a guide.

Transmitter

The transmitter should be capable of 100 to 150W dc input; although scattering is possible at lower inputs, returns are poorer, so the maximum available power should be used. Transmitter drift should be kept to a minimum. Aim for a figure of $\pm$100Hz/h; as an aid towards this leave the transmitter vfo/vxo running during receive periods, as even crystal oscillators drift during the first few minutes after being switched on.

Keying

The transmitter should be capable of reproducing good keying waveforms at all speeds that the meteor scatter operator intends to use. Key clicks should be effectively suppressed as these can be a menace to other local stations, and grid block keying is to be preferred unless a high-quality keying relay is used.

Keyers

There are many ways of sending high-speed cw, and it is up to the individual to decide what method suits him best. A brief description of each method follows:

(a) Hand-sent cw is practical and has the advantage of requiring no additional equipment, but has the disadvantage of having to be sent at high speeds for long periods without making a mistake. This is very demanding and can be extremely tiring for most operators.

(b) The electromechanical tape sender—this produces excellent cw at speeds up to 1,000 letters/min. It uses punched paper tape similar to that used by computers. Continuous loops of tape have to be prepared beforehand and are loaded individually onto the reader when required. Further disadvantages of this system are that special width paper tape is required and a perforator (punch) is needed to produce the tapes. These tend to be noisy and this is important if one has to consider the effects on the family or neighbours at 2am.

(c) Optical methods using paper tapes or discs employing a lamp and photocell are practical. However, it requires

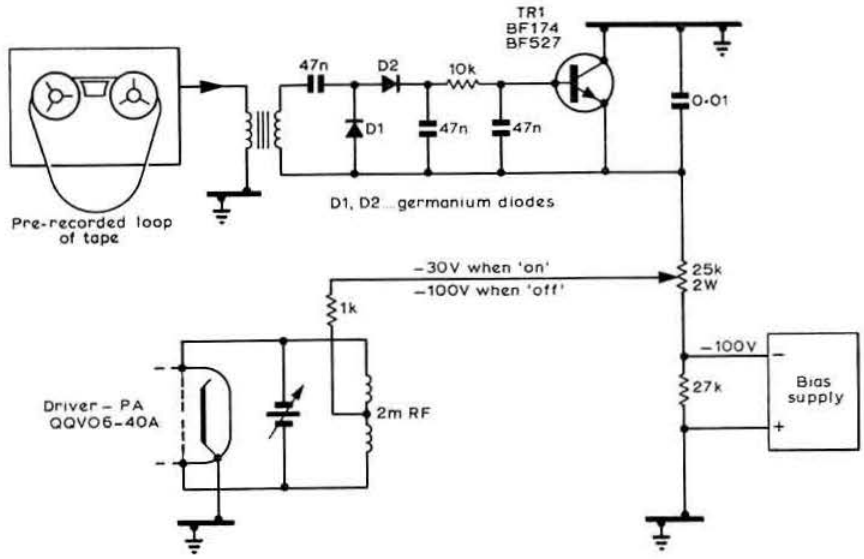


Fig 2. The I4BER keying arrangement

some mechanical expertise to make one and they also suffer from the pre-production requirement.

(d) Audio keying using a tape recorder is also possible and is capable of giving excellent results, but has the disadvantages of requiring a tape recorder and audio keying unit, both of which have to be rfi proof. This method also requires the pre-production of magnetic tape loops. Two keying units suitable for this arrangement are shown in Figs 2 and 3, the former used by I4BER and the latter developed by the author with the help of G3CCH and G3WSN.

(e) Digital techniques have come into their own in recent years and it is interesting to note that some of the RSGB beacons use digital keyers. The manual programming method uses a matrix of diodes which can be selected by means of a patch board to produce the required callsigns and reports. This method has been used with success by G3CCH and G3WZT. The only limitation of this method appears to be the size of patch board necessary and the number of diodes needed to generate each letter.

Alternatively the cw message can be stored in a code store similar to that used in modern computers; such an arrangement uses the digital method outlined above, storing the morse characters as a series of logic 1 or 0 states. These can be recalled at will at any speed the operator requires; speeds of the order of 300 letters/min are possible but it is doubtful whether such speeds are needed by amateurs. This arrangement is gaining favour among ms operators, the main disadvantage being the cost of the code stores. There are two devices available which can be employed in this configuration. These are the mos shift register and the random access memory (r.a.m.). The former is cheaper but is not as flexible as the latter. Some circuits are available and the reader is referred to references [9-11].

Aerials

Most meteor scatter operators have their own pet requirements with regard to what they consider to be the optimum aerial system. In fact there are no hard and fast rules here as to what aerial is best; indeed there is scope for more experimentation in this respect than any other. However, some basic requirements need to be met when attempting the higher distances. Distances of 1,500 miles need the best aerial systems and the basic points appear to be:

1. The highest possible aerial height.
2. The highest possible aerial gain.
3. The narrowest vertical and horizontal beamwidths.

Of course the ability to elevate the aerial is useful if one wishes to attempt the shorter range contacts, but this again is dependent upon the type of aerial employed. For example, enough gain comes from a small Yagi in both horizontal and vertical directions to make precise beam setting and tilting

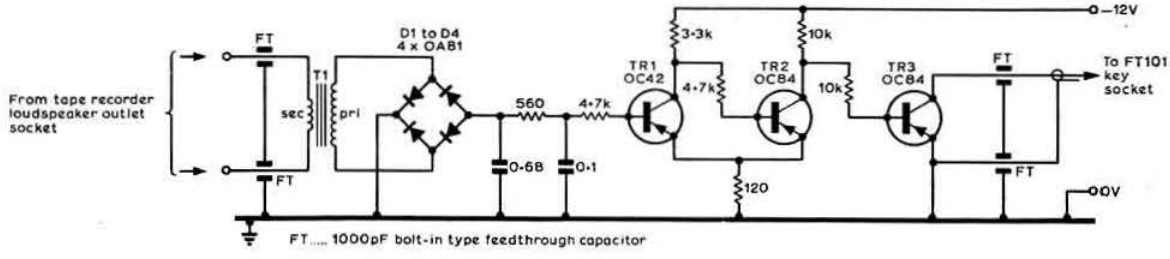


Fig 3. The GW3ZTH keying unit

unnecessary. With many people the choice will be made on domestic, social and financial considerations but they should not be put off by the chap down the road using an 80-element stack! A favourite among many operators appears to be the Jaybeam 10-element Skybeam. The author has, however, used an 8-element aerial with some success.

A rough guide as to what height and what elevation one should use is given in Fig 4. Aerial elevation and height above ground is given against the distance between the two stations, assuming no immediate obstacles. There are other aerial possibilities such as circular polarization and diversity reception, both having merits and as yet unexploited—indeed the experienced meteor scatter operator may have more than one aerial system in use at his station at any one time.

For the best results the aerial should be aimed at the other station using the great circle bearings, although side scattering is possible. Further, it has been found that beaming north by $6\frac{1}{2}°$ of the great circle heading during the morning hours and $6\frac{1}{2}°$ south of the great circle path during the evening produces better results, but unless a narrow-beamwidth Yagi is used it is doubtful if any advantage will be obtained from re-orientating the aerial from the great circle heading.

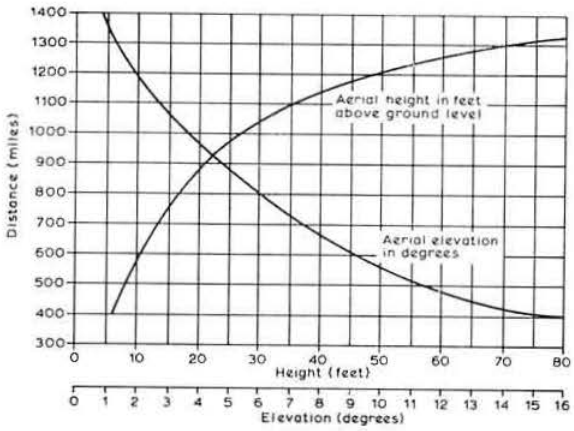


Fig 4. Distance/aerial height and elevation graph (details from G3CCH)

The receiver

The receiver set-up is more easily met. There are, however, a few requirements which are:

1. A low noise figure: 2·5–3·0dB is normal.
2. Variable bandwidth in the range 1–10kHz; the optimum figure for meteor scatter is about 1kHz.
3. Good stability, with the drift being less than 100Hz/h over the whole system (converter and tunable i.f.).
4. Good dynamic performance if other stations operate in the locality.

To go into the reasons for each of these in detail would take up too much space, but not enough stress can be placed upon the fact that they are absolutely necessary if one is to be guaranteed success.

Frequency measurement

Frequency measurement is probably the most important aspect of meteor scatter work because on average in any five-minute period the signal is only present for four or five seconds. Quite naturally, precise frequency setting is a necessity and not a luxury. There are fortunately a number of alternative ways of measuring frequency at 144MHz. Some of these have appeared in past issues of *Radio Communication* and other publications [12-16].

The would-be ms operator is reminded that both tunable i.f. and converter need to be calibrated—too many people forget

Table 1. Meteor scatter shower list for 1975. Latitude 50° N at DJ5DT*

Date of shower maximum	Best possible dates	Echoes/h	Shower period (days)	Path/Optimum time (gmt) SW–NE	E–W	SE–NW	N–S	Velocity (km/s)
4 January Quadrantids	3/4 January	100	*9h*	0930–1500	2300–0330 1130–1630	2300–0500	0000–0530 0930–1430	41
22 April Lyrids		15	2	2300–0130 0600–0900	0200–0400	0330–0730 2030–2300	0500–0930 2030–0130	48
5 May η Aquarids		20	5	0230–0630	0400–0900	0630–1000	0200–0500 0800–1100	64
7 June Arietids	6-10 June	60	8	0500–0830 1230–1400	0730–1030	0900–1330	0330–0700 1100–1430	39
9 June ξ Daytime Perseids	8, 9 June	40	8	0530–0930 1330–1500	0830–1130	0430–0530 1000–1430	0430–0800 1200–1530	29
16 June June Lyrids		10	2	2300–1030 0600–0900	0200–0400	0330–0730 2030–2300	0500–0930 2030–0130	
27, 28 July δ Aquarids		15	2	2100–0130	2230–0330	0100–0430	0300–0530 2100–2330	41
13 August Perseids	11-14 August	60	4	0600–1300	0900–1400 1900–0000	1800–0200	0700–1130 2130–0200	60
9 October Draconids		10	*1h*	1700–2300	0730–0930	0500–1230	0800–1300 1730–2200	
21 October Orionids	21, 22 October	20	2	2300–0300	0100–0530	0300–0800	0500–0830 2230–0130	66
8 November Taurids		10	20	1900–2300	2100–0200	2300–0400	0130–0430 1830–2130	30
18 November Leonids		10	*3h*	0100–0430	0400–0700	0530–1000	2330–0330 0700–1100	72
14 December Geminids	12-14 December	60	3	0400–0700	2330–0230	0200–0500 1830–2130	0300–0700 1830–2300	35
22 December Ursids	21, 22 December	15	*12h*	0700–1900		1800–0600	Nil	34

* Compiled from information in *VHF Communications* and the *BAA Handbook*. Allowance should be made for slight variations at UK QTHs.

about this point. Crystals have a habit of being on any frequency other than the one stamped on the holder.

The operator

"Patience is a virtue." Never was a truer statement uttered when it comes to a meteor scatter operator. The ability to leave the receiver and transmitter alone is a mighty task to some, and the author has found an endless supply of coffee and biscuits helps in this respect.

The showers

The earth passes through many showers each year. Some of these, however, do not bring good returns for meteor scatter, so only the more useful ones have been listed for the newcomer (see Table 1). These are likely to give the best results, but the experimenter would be well advised not to ignore the others, as in fact it is often surprising what can be done during the minor ones.

Calculating the optimum time

There is an optimum time to conduct each test though the calculation of this is somewhat involved [4]. First, the optimum path between any two stations occurs when the shower crosses midway between them and at right angles to their path with an elevation of 45° (see Fig 5). This may be calculated from the radiant path of the shower at the midpoint.

The radiant path of the shower is also known as the "eye" of the shower, ie the apparent part of the sky where the shower appears to originate. As an analogy, one could consider the case of a man standing on a bridge across a straight motorway. Looking up the motorway he would see the point where the carriageways converge—this could be termed the "radiant point". The cars travelling in the three lanes towards him would be travelling in straight lines, and these could be

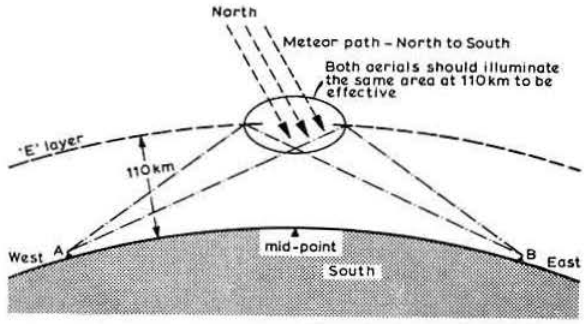
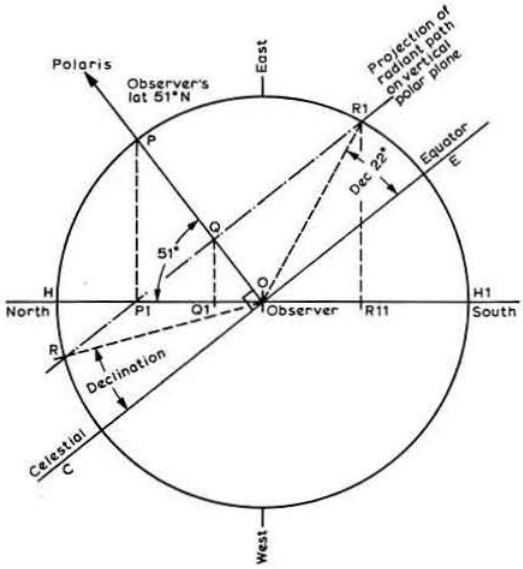


Fig 5. Meteors burn up and ionize at approx 110km optimum when this occurs midway between both stations and crosses the path at right angles to them with a shower radiant elevation of 45°

termed the "radiant path". Since the earth rotates on its axis the radiant path would appear to move across the sky and in twelve hours time the man on the bridge would have to look in the opposite direction to observe the path of the cars, the same being true for the meteor showers.

Showers such as the Geminids are named after the constellation in which they have their radiant point, in this case Gemini (The Twins). Fortunately the radiant path of the showers can be calculated by using simple trigonometry. The following description deals with the calculation for the optimum sked time between G3WZT in Sussex and UT5DL in the West Ukraine during the Leonids meteor shower on 16 November 1973.

Starting with Fig 6, two circles of 2·5in radius are constructed, although other scales are possible. The left-hand diagram is used to calculate the axis of the ellipse of the radiant path of the shower. The observer is always in the centre of the circle, ie G3WZT is the observer in this case. The ordinates



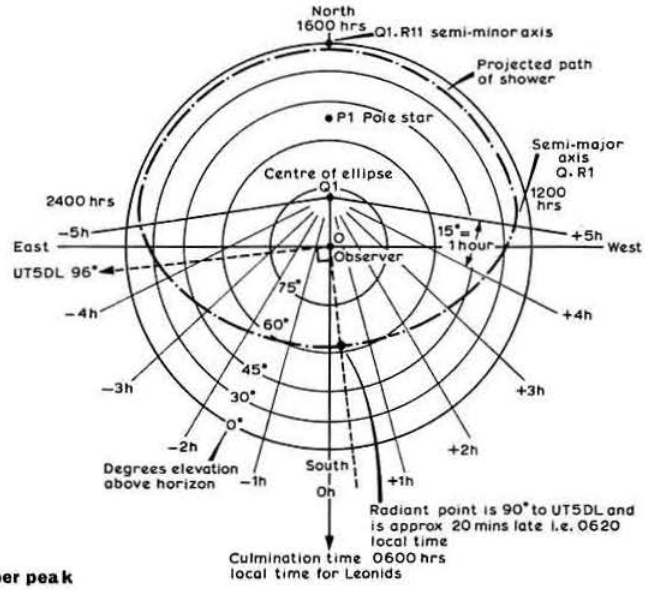


Fig 6. Leonids. Left; 15 to 20 November: right; 18 November peak

H, H¹ are the observer's horizon and H is always at north; when plotting the diagram it is though one is laid on one's back looking up at the sky with one's feet to the south. West will be on the right-hand side.

Once H, H¹ is drawn in, the observer's latitude can be drawn, and for this case is approximately 51°N. At the intersect with the circle the point P is marked at 51° from H, H¹. The celestial equator CE is drawn at 90° to OP through point O. The declination of the shower should be added to the diagram as shown. The declination angle of most showers can be obtained from the various astronomical journals, and these are available from most libraries [3, 8, 17].

However, in this example it is 22°, so from O in the diagram the lines OR and OR¹ are drawn in. Next points R, R¹ are joined together; RR¹ represents the projection of the radiant path on a vertical polar plane relative to the observer at O. Points P and R¹ are projected down from the circumference to the observer's horizon HH¹. This completes the projection of the radiant path of the shower onto a plane surface. Point Q¹ is obtained by projecting from the intersect of OP and RR¹ to the observer's horizon HH¹. These points can then be projected onto the right-hand circle of Fig 6, which is a plot of the midpoint radiant path of the shower between the two stations. The centre point is still the observer and the radiant points are measured in degrees from the centre. However, the time scales are a different matter. These are laid from Q¹, which is the centre of the projected radiant path of the shower at the midpoint between the two stations. Point Q¹ is obtained from the left-hand diagram as OQ¹. Point P¹ has no special significance except that it is the pole star; it has only been included for information. The semi-major axis of the ellipse is obtained from QR¹ and is laid out in an east-west direction. The semi-minor axis is obtained from points Q¹R¹¹ and is laid out in the north-south plane. An ellipse is constructed from these points. This represents the radiant path of the shower.

Time is always laid out from Q¹ but of course paths are calculated from the observer. The culmination time for the shower can be obtained from astronomical books. It is always quoted as the local time when the radiant is due south. For the Leonids it is 0600. Moving 15° further east, the culmination occurs one hour earlier; 90° further east, six hours earlier, and so on.

Referring to the sked proposed earlier, UT5DL is at a magnetic bearing of 96° from the observer; a line is drawn from the observer to 96° east on the left-hand side of the circle as shown, and another at 90° to this from O to the point shown on the ellipse. As the optimum time for these two stations to make contact is that when the radiant path is at 90° to them and midway between them, culmination at 0620 local time from Fig 6 is not correct as UT5DL is some 15° east of G3WZT, and an allowance will have to be made for the difference. Since UT5DL is 15° east of G3WZT (one hour early) the midpoint will occur at 0620 − (1 hour ÷ 2), that is, 0550 local time. Thus the optimum time for a test would be plus or minus one hour either side of this time. In practice, from 0500 until 0700 local time would be satisfactory.

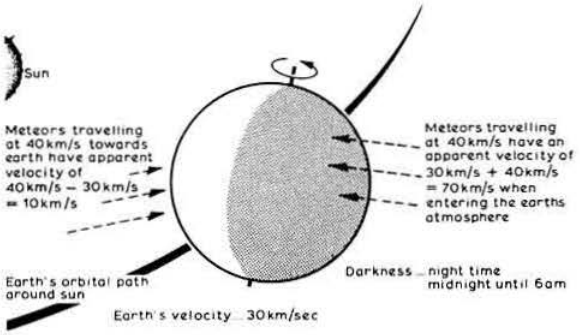


Fig 7. Path of space debris being intercepted by the earth with their apparent collision velocities

The shower elevation is calculated as follows, assuming a radius of 2·5in for the projections. First, the radii of inner elevation circles are tabulated as below.

Elevation	Cosine	Radius(in)
0°	1	2·5
15°	0·9659	2·415
30°	0·8660	2·165
45°	0·7071	1·767
60°	0·5000	1·25
70°	0·2588	0·647

The inner circles are drawn using these and thus the angle of elevation at any given time can be computed by simply noting the point where the projected radiant path crosses the inner elevation circles—in this case it would be a nominal 60°. Should G3WZT wish to find out if the path to the south is suitable, a new set of drawings will have to be produced. Assuming that the new station is on latitude 41° north, the calculations would have to be made as though the observer were midway between both stations at latitude 46°. This would alter the position of the observer's latitude line OP in Fig 6, with the resultant shift of the centre of the ellipse and dimension of the semi-minor axis of the ellipse. Should the station be on the same line of longitude as G3WZT there is no time change between them. The above method was developed by G3LTF and full credit must go to him for producing a reliable and effective system. The author would also like to thank G3WZT for his assistance in explaining the above method.

So far, we have dealt exclusively with shower meteors. For sporadic meteors the timing is by no means as complex. There are always meteors entering the earth's atmosphere, regardless of the time of day, and although they can be used for communication the chance of success is far more remote as the numbers are few compared with the regular showers. The best time for using sporadic meteors is between midnight and 0600 local time, for at this time that part of the earth is facing the direction of motion of its orbit around the sun, and thus is meeting meteors head-on rather than being overtaken by them. As stated earlier this results in more meteors being swept up [6] and is shown diagrammatically in Fig 7.

Meteor scatter QSO procedure

This information relates to the published procedure laid down by the ARRL and is now almost universally adopted in Europe [18]. See Table 2.

The annual amount of meteor scatter work is increasing steadily in IARU Region 1, and although this form of contact is well known there is still some confusion over the procedure involved; unhappily this has resulted in failures due to international misunderstandings. Therefore it would help all interested parties if more definite rules were laid down. The following should serve as a guide to those thinking about taking up meteor scattering.

Timing
All meteor scatter enthusiasts in the same area are advised to agree to transmit and receive during the same periods to avoid the possibility of interfering with each other. In Europe the recognized standard for receiving and transmitting periods is five minutes. However, other time sequences are possible.

Choice of frequency
It has been agreed by the IARU that 144·10MHz be allotted to meteor scatter stations, but with so much cw activity, especially during aurora and tropospheric openings, stations would be well advised to find a clear spot in the band before undertaking the test. Further, since there is the distinct possibility that someone else sited locally will also be operational during the same period, the details should be communicated to all interested.

Procedures
The test begins with one station calling the other, for example HG5AIR GW3ZTH HG5AIR GW3ZTH HG5AIR . . . Note that the word "de" between the calls has been omitted because it has no function. Alternatively, random calling can commence by the calling station sending CQ MS CQ MS CQ MS GW3ZTH GW3ZTH and so on for his normal transmitting period.

CW speeds
The usual transmitting speeds are between 140 and 200 letter/min, (28–40wpm in the UK). The transmitting speed should always be agreed before the test as many operators are unable to reach the upper limit. Furthermore, the Home Office requires calls to be sent once not faster than 20wpm at the beginning and end of each transmitting period. The callsigns must also have the word "de" inserted between them.

Reporting system
This consists of a two-number system:

First number (burst duration)	Second number (signal strength)
1. Only pings, no information	6. S2 to S3
2. Bursts up to 5s	7. S4 to S5
3. Bursts 5 to 20s	8. S6 to S7
4. Bursts 20 to 120s	9. S8 to S9
5. Bursts over 2min	

A report containing the number 1 should not be sent as it is no longer internationally recognized. A report can thus be given as soon as anything more than a ping is heard. This can be a number or letter or part of a word. Callsigns and reports can be received letter by letter, the main point being that both callsigns and report should be received before sending a "Roger" report. For example, OK3CDI GW3ZTH 26 26 26 OK3 . . . could be received in any order such as GW, CDI, 3Z, OK3, 2, 6OK3, TH, TH2, If unsure about the report to be given, choose one that does not contain the numbers in callsigns; eg in the above example do not use the number 3.

Reporting
The report may be given as OK3CDI GW3ZTH 47 47 47 47 OK3CDI GW3ZTH 47 47 47 47 OK3CDI . . ., a time ratio of 1:1 being kept between the calls and reports. Further, the report must not change during the test.

As soon as either operator copies both calls and report, a "Roger" report can be given, for example UT5DL GW3ZTH R27 R27 R27 R27. Alternatively, should one of the participants have an "R" in the call, the report should be sent as I4BER GW3ZTH RR27 RR27 RR27 RR27.

Table 2. 14BER/A—GW3ZTH ms tests. 14BER locator FE54e, GW3ZTH locator YL32d

Dates and times	20 October 1973 0430 to 0630gmt 21 October 1973 0430 to 0630gmt
Frequency	144·100 ± 1kHz max, drift less than 100Hz/h
Keying speeds	120 to 150 letters/min (24 to 30wpm).
RS reporting system	R2 = burst shorter than 40s R5 = burst longer than 40s S6 = 2 to 3 S-units, S7 = 4 to 5 S-units, S8 = 6 to 7 S-units, S9 = 8 to 9 S-units. numbers 3 & 4 *not* to be used in reports.
TX times (gmt)	5min each way I4BER 0430; 0440; 0450; etc GW3ZTH 0435; 0445; 0455; etc
Report format	I4BER GW3ZTH 27 27 27 27 I4BER GW3ZTH 27 27 ... GW3ZTH I4BER RR27 RR27 RR27 RR27 GW3ZTH I4BER... If neither station has "R" in callsign, report can be sent R27 R27 R27 etc
Notes	1. The report *must not* change during the test. 2. I will send signing RRRRRRs for 3 periods after receiving your report to me.

Signing
When one of the participants receives a "Roger" report and has all other details complete, he may sign with a string of RRRs, adding callsigns only at beginning and end of each five-minute period. When the signing RRRs have been received the other participant may return with GW3ZTH DE UT4DL RRRR . . . RRRR GW3ZTH DE UT5DL. This should be sent for only three per'ods.

Sked periods
Every sked period must be considered as a separate trial. This means that one cannot break off and recontinue from the point where one left off on the previous day; each contact must be completed within six hours.

Meteor scatter using ssb is also possible and these tests should be conducted in a similar way to the cw ones. *Letters and numbers are pronounced as they are.* An exception is the signing which is pronounced "Roger".

Logging

Logging is an important aspect of meteor scatter work. It provides the operator with a record of information received that can be used to establish whether sufficient has been received to send a signing report. It could also be used for confirmation at a later date and provides useful analysis on one's performance during any specific shower.

Logging can be accomplished by a paper log or preferably by a continuous tape recording. Both methods are straightforward and an example of a paper tape log is shown in Fig 8. Tape recorder logging can be accomplished by either monitoring using reel-to-reel or by using a continuous loop of tape. This latter method does enable the operator to retrieve information faster than the reel-to-reel method, and a 15–20s loop of tape is usually long enough for most cw speeds.

The tendency towards high-speed cw continues and since few operators are able to copy the upper limit some means of slowing it down again is necessary. However, the author would like to point out that in some circles it is considered "non-U" if one does not copy the cw first-hand. There also appears to be some difference of opinion on whether or not

Time (gmt)	Information sent	Information received	Pings
0700	GW3ZTH SM7AED		
0705		Nil	—
0710	GW3ZTH SM7AED		
0715		ZT	I
0720	GW3ZTH SM7AED 26 26 26 26		
0725			IIII
0730	GW3ZTH SM7AED 26 26 26 26		
0735		SM7AED GW3ZTH, 7, 28	IIIII I
0740	GW3ZTH SM7AED R26 R26 R26 R26		
0745		28, SM7, 8, A	IIIII
0750	GW3ZTH SM7AED R26 R26 R26 R26		
0755		RR	IIII
0800	GW3ZTH SM7AED R26 R26 R26 R26		
0805		GW3ZTH RRRRRRR	I

Fig 8. GW3ZTH-SM7AED ms sked, 23 December 1973. Typical paper log

high speeds are necessary, but generally 150 to 200 letters/min seems to be accepted as adequate.

Other possibilities

SSB

MS work using ssb is possible but requires far more expertise and patience. Precise frequency setting is of paramount importance and the full legal power is possibly necessary; at lower levels the returns will not be as good, thereby reducing the chance of success. However, this fact should not put anyone off attempting meteor scatter.

In recent years a number of people have reported success using this mode and interest here in the UK is growing.

Recording of signals is to be recommended because off-net signals can be replayed through one's own ssb exciter; this allows one to resolve information that would otherwise be lost.

RTTY

Some ms rtty has been carried out, but like ssb great emphasis must be placed on its more exacting requirements. Unfortunately here in Europe there are few amateur stations using the mode, but in the USA contacts using rtty in the same way as ssb via ms are commonplace. There are several commercial links using rtty giving excellent results, so the mode offers great possibility and challenge [19, 21].

Other bands

Meteor scatter is possible on other vhf bands with returns on 10 and 4m giving better results. It is a pity that meteor scatter work on 4m is not as high as 2m but this is probably due to lower occupancy on the band. Also several successful contacts have been made on 70cm; however, the returns are not as good as 144MHz. The former does, however, offer greater potential as high-gain aerial systems are of a more practical size. Meteor returns have been noted above 1,000MHz but to the author's knowledge no successful European contact has been made using this mode.

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An 80m d-c receiver for the novice

by J. YOUNG, BRS33339*

A direct-conversion receiver, even in its simplest form, has many advantages over the superheterodyne, when looked at in terms of performance versus complexity and cost. That to be described may be constructed using only hand tools and a small bench vice, at a cost of less than £10. The performance is good: using a simple end-fed aerial, stations from all over the UK and Europe can be heard. The current consumption is about 15mA excluding the power amplifier, providing many hours of operation from a set of batteries. Although intended for the reception of ssb and cw stations, a.m. can be resolved by tuning to zero beat.

The 80m band was chosen because, in the author's opinion, it is the most interesting for the beginner. There is always something on the band, and much can be learned by listening to the technical discussions and operating procedures of the licensed radio amateurs.

The receiver should also prove an interesting project for the experienced constructor. The addition of a transistor buffer/pa driven from the oscillator would make it a very compact QRP transceiver for the licensed amateur.

Circuit description—Fig 1

A field effect transistor is used as an rf amplifier. As well as providing pre-mixer gain, this isolates the front end tuned circuit from the aerial, thus preventing rf induced into L1 from the oscillator being radiated by the aerial.

The mixer is a balanced type. It uses two silicon diodes, feeding an m-derived, single section, low-pass filter, with a cut-off frequency of 3kHz. The balance potentiometer is pre-set, and once set should not require adjustment unless the mixer diodes or L1 are changed for any reason.

The oscillator is a Colpitts employing a fet, followed by a buffer stage to prevent pulling of the oscillator when tuning the front end. Both the oscillator and buffer stages are stabilized by a 5·6V zener diode. An electrolytic capacitor C11 is connected across the zener diode. If this capacitor is omitted the noise generated by the diode will be introduced into the mixer and low-level input signals will be lost.

A three-stage af amplifier provides enough gain to drive medium- to high-impedance headphones. The power amplifier is required only if low impedance headphones or loudspeaker are to be used: it will drive loads down to 8Ω. The extra current drawn by the power amplifier will depend upon the load it is driving and the output level used; about 7mA at zero output. A 35Ω loudspeaker is a good compromise between power output and current consumption.

The diodes D1 and D2 were added to the original design to protect TR1 and will also protect the receiver if it is to be used with a transmitter.

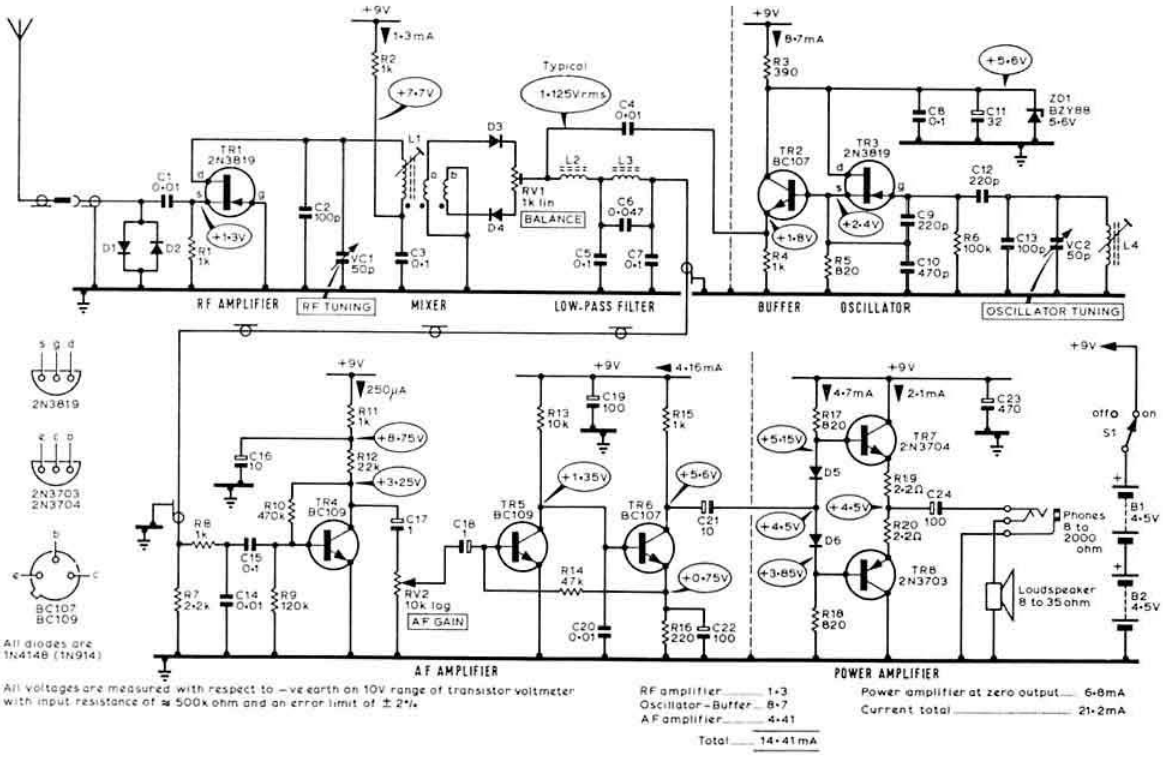


Fig 1. Circuit diagram

97 Richmond Avenue, Hillingdon, Uxbridge, Middlesex.

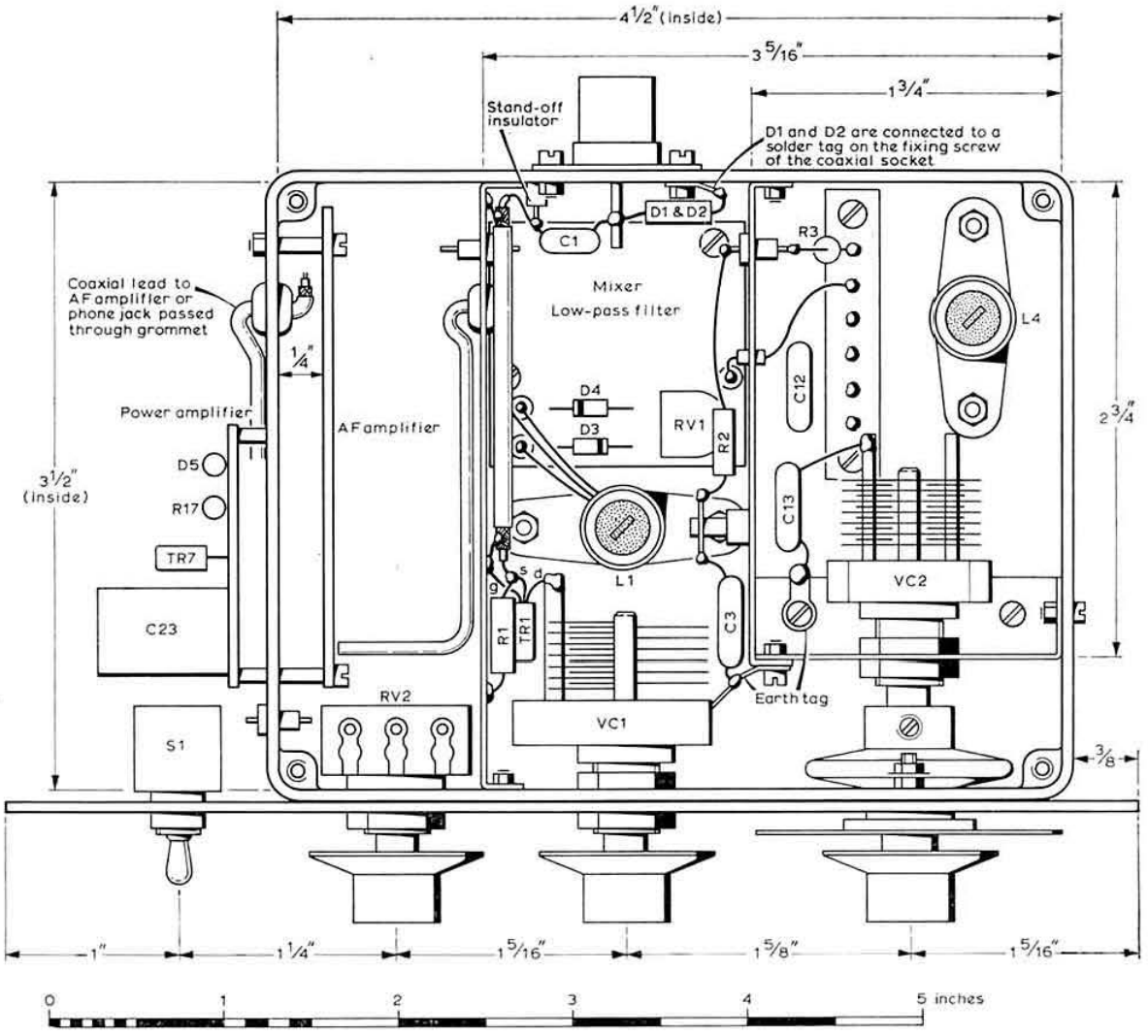
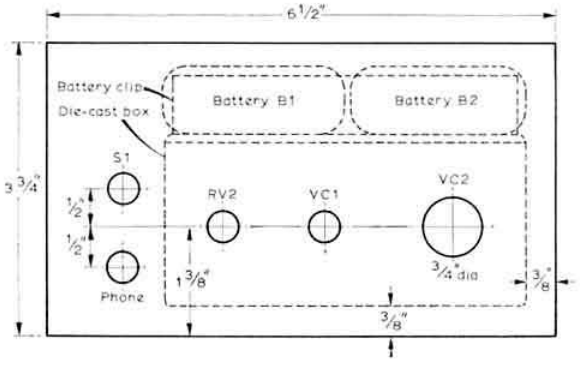


Fig 2. Top view, above; front view, below



Construction

The receiver is constructed in a 4½in by 3⅛in by 2in Eddystone die-cast box type 6908P. The layout and mechanical details are shown in Fig 2. To simplify construction the compartments should be assembled in the following order: oscillator, rf and mixer, af amplifier.

The oscillator tuning capacitor VC2 is mounted on a 16swg aluminium bracket, secured to the side and bottom of the case with four 6BA screws. Two screens made from 22swg tinplate or aluminium, also secured to the side and bottom of the case, but with 8BA screws, divide the case into three compartments. Extra holes are drilled in the screens for feed-through insulators. VC1 and RV2 are fixed to the front of the case. A Jackson six-to-one reduction drive is screwed to the spindle of VC2 and secured with a 6BA counter-sunk screw to the front of the case. The front of the drive should protrude ⅛in from the case to allow for fixing the tuning dial.

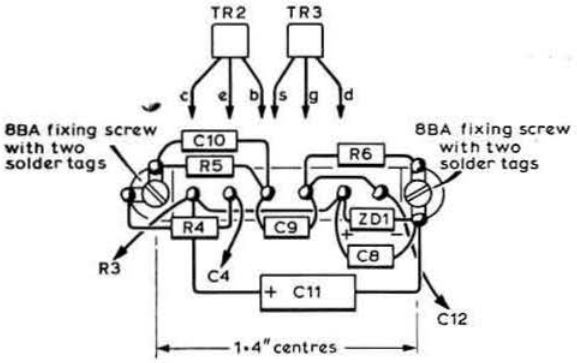


Fig 3. Oscillator component layout

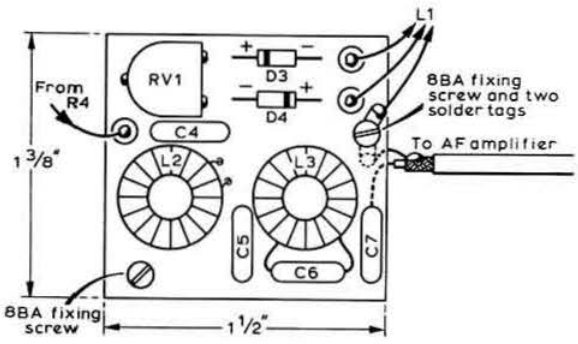


Fig 4. Mixer and low-pass filter

One word of warning, **do not** drill die-cast boxes unless they are firmly secured to the work bench.

The oscillator components are mounted on a six-way tag strip, and should be assembled before being put into the box (Fig 3). Resistor R3 is connected between the tag strip and a feed-through insulator on the screen dividing the oscillator and rf compartments. C13 is wired across VC2. A short wire from the emitter of TR2 is passed through a nylon insert in the screen and connects to the mixer board.

Both the mixer and low-pass filter are constructed on a paxolin board, fixed by 8BA screws to the bottom of the case; this is also assembled before being put into the case. The layout is shown in Fig 4. The mixer/filter board occupies the rear half of the centre compartment. R2 and C3 are wired to an insulated stand-off on the screen dividing the oscillator and rf compartments. TR1 and R1 are mounted on the other screen close to VC2. A short length of screened lead connects R1 to another insulated stand-off on the rear of the case, C1 is wired between the stand-off and the coaxial aerial socket. D1 and D2 are wired across the aerial socket.

A ¼in hole is drilled in the screen to take a grommet through which a screened lead is passed, connecting the low-pass filter to the af amplifier.

The af amplifier is constructed on a $1\frac{7}{8}$ by $2\frac{7}{8}$in paxolin board (Fig 5) and mounted on the side of the case. Small holes are drilled in the board to take the component leads. These are connected together with 24swg tinned-copper wire or $\frac{1}{10}$in wide Cir-kit strip on the underside of the board. A 16swg bus wire is used as the earth line, and is soldered to 6BA tags through which are passed the screws securing the board to the case. A screened lead from the output of the af amplifier is passed through a grommet, and connects to the headphone socket or the power amplifier.

Wiring pins are used for all leads connecting the two circuit boards to other parts of the receiver. The power amplifier is mounted on the outside of the case behind the headphone socket and on/off switch.

When all the parts have been assembled and wired, the case is fixed to the front panel, secured by the lock-nuts of RV2, VC1 and two 6BA counter-sunk screws.

The batteries are held in place by two L-shaped brackets mounted on the lid of the box. The rear bracket supports a $4\frac{1}{2}$in length of $\frac{1}{8}$in paxolin strip into which round-headed screws or rivets are fixed to form the battery contacts. These contacts should be spaced in such a way as to make it impossible to connect the batteries the wrong way round. A

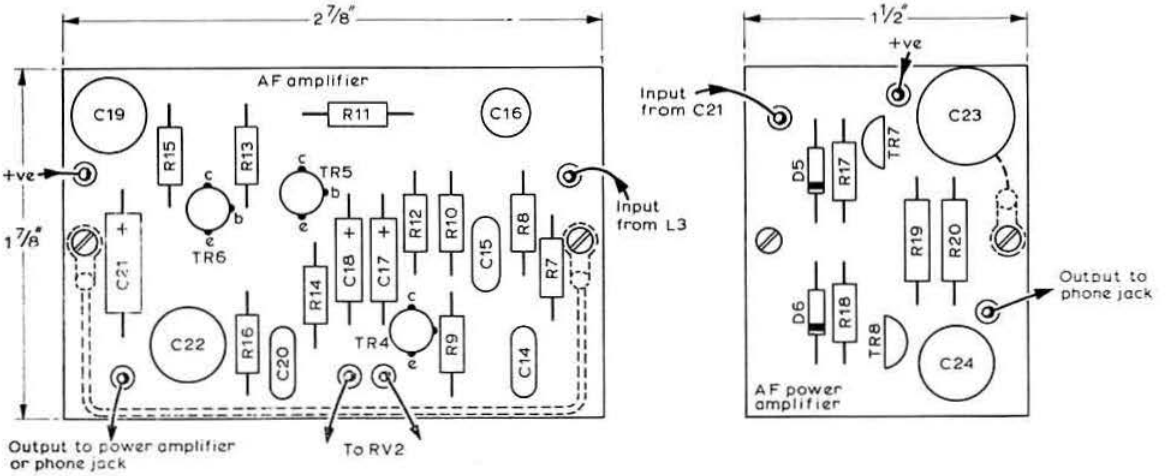


Fig 5. Amplifier component layout

strip of foam rubber glued to the other bracket holds the batteries against the contacts.

If the power amplifier is not required, a PP7 battery may be used instead of the two V1289 batteries. This is fitted behind the front panel in place of the amplifier. The length of the front panel must be increased by $\frac{3}{8}$in and the height reduced by $\frac{3}{4}$in.

The completed receiver is put into a wooden case with the loudspeaker.

Coil details

L1 and L4 are wound on $\frac{3}{8}$in diameter formers with tuning slugs. L2 and L3 are wound on Mullard ferrite rings type FX1593.

Before winding L1 study Fig 6. L1 is wound with 40 turns of 30swg enamelled wire and given a thin coat of varnish. When dry, two lengths of 34swg enamelled wire are wound six times over the cold end of L1. A length of sewing thread is used to secure the link windings to the coil former. All windings are close-wound in the same direction.

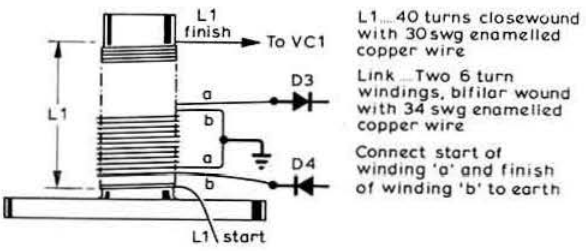


Fig 6. L1 winding details

L4 is wound with 30 turns 30swg enamelled wire, given a coat of varnish and left to dry.

The winding of L1 and L4 can be made easier by securing the coil formers to the bench and placing drawing pins on either side to hold the ends of the windings until the varnish has dried.

L2 is wound with 40 turns of 30swg enamelled wire. A 1mH rf choke may be used in place of L2.

L3 is wound with 300 turns of 38swg enamelled wire. To do this make a shuttle from a $3\frac{1}{2}$in length of $\frac{1}{8}$in diameter knitting needle, with a $\frac{1}{4}$in slot cut in each end. Wind on 30 turns of wire, and pass it through the centre of the ring. Before winding the rings, rub them gently with fine emery cloth to remove any sharp edges. Varnish the completed coil and leave to dry. The rings are secured with sewing thread passed through small holes drilled in the board.

Setting up

First make a double check of all wiring. Connect the batteries in series, negative to earth. Set the balance potentiometer RV1 to mid-way, and the oscillator tuning capacitor VC2 to full mesh. With the aid of a communications receiver (bfo on) adjust the tuning slug in L4 for zero beat at 3·5MHz. Turn VC2 to minimum capacitance. The oscillator frequency should now be between 3·8MHz and 3·9MHz. If it is below 3·8MHz, reduce C13 to 82pF and repeat the tuning procedure. The tuning can be made to cover the range 3·5MHz to 4MHz by further reducing C13. When the oscillator has been tuned, connect the aerial and a pair of headphones. Set VC1 to 90 per cent of full mesh, the oscillator to 3·5MHz, and adjust the tuning slug in L1 for maximum output in the headphones. Finally, tune the receiver to a quiet spot on the band and rotate the rf tuning capacitor VC1. Any stations heard that are independent of the oscillator frequency should be balanced out by careful adjustment of RV1.

Components list

R1, 2, 4, 8, 11, 15	1kΩ	**C1, 4, 14, 20**	0·01μF ceramic
R3	390Ω	**C2, 13**	100pF s/mica
R5, R17, R18	820Ω	**C3, 5, 7, 8, 15**	0·1μF ceramic
R6	100kΩ	**C6**	0·047μF ceramic
R7	2·2kΩ	**C9, 12**	220pF s/mica
R9	120kΩ	**C10**	470pF s/mica
R10	470kΩ	**C11**	32μF/10V
R12	22kΩ	**C16, 21**	10μF/16V
R13	10kΩ	**C17, 18**	1μF/16V
R14	47kΩ	**C19, 22, 24**	100μF/16V
R16	220Ω	**C23**	470μF/16V
(All above, 10 per cent ¼W)			
R19, 20	2·2Ω ¼W	**VC1, 2**	50pF Jackson C804
RV1	1kΩ lin min pre-set	**TR1, 3**	2N3819 fet
RV2	10kΩ log midget control	**TR2, 6**	BC107
		TR4, 5	BC109
		TR7	2N3704
(RV1, 2 obtainable from RS Components Ltd)		**TR8**	2N3703
		ZD1	BZY88 5·6V
		D1-6	1N4148(1N914)

Die-cast box	Eddystone type 6908P
Control knobs	Eagle F19
Loudspeaker	8 to 35Ω by 70mm, Eagle TP80G
Ferrite rings	Mullard FX1593, 2 off
Ball drive	6:1 Jackson type F
Jack plug	Bulgin P519
Jack socket	Bulgin J30
Sub-min toggle switch	Eagle MTS2

Conclusion

At first sight this receiver may seem a little expensive, but a superheterodyne with the same perfomance would cost more. The case, loudspeaker and FETs account for a quarter of the total cost. Most of the other components will be found in the odds and ends box. Miniature electrolytic capacitors are used in the audio amplifier, and these should be purchased new. Old or salvaged electrolytic capacitors are often faulty.

When used out of doors, the receiver works well with a $\frac{1}{4}\lambda$ (66ft) wire aerial tied to a branch of a nearby tree. A copper earth rod will improve reception, but is unnecessary unless reception of dx stations is desired. At home even a short indoor aerial will bring in a surprising number of stations.

Should the constructor wish to make this receiver for an amateur band other than 80m, only the tuned circuits need be altered. The formulae are covered in detail in the article by the late W. H. Allen, MBE, G2UJ [1] and in the fourth edition of *Radio Communication Handbook*.

The mixer used in this design is an improvement on the type used in "The Cadet" [2] and those who have constructed it will find this a worthwhile modification.

All the components for this receiver may be purchased from Stan Reed Ltd, 109 Hillingdon Hill, Uxbridge, Middx.

References

[1] W. H. Allan, MBE, G2UJ. "Coils, capacitors and bandspread", *Radio Communication* November 1972.

[2] J. Young, BRS33339. "The Cadet", *Radio Communication* October 1973. □

Control of aerial polarization

by B. SYKES, G2HCG*

DURING recent years, vertical polarization has become popular for mobile operation in the UK, due to the basic fact that it is far easier to obtain omni-directional radiation with a vertical aerial than it is with a horizontal aerial. This is particularly important on a vehicle, where the mechanical simplicity of a short vertical rod considerably outweighs the complexity of a halo or crossed dipole, particularly when it is realized that the horizontal aerial must be at least a half wave above the vehicle surface to ensure low-angle radiation.

The advent of repeaters using vertical polarization for much the same reason of simplicity of aerial design means that operation of a fixed station, either direct to mobiles or via repeaters, can only be satisfactorily accomplished if a means of changing polarization is available. It is of course quite possible to use two aerials, and ideally two rotating systems, but the cost becomes rather formidable.

Space communication where control of polarization is difficult or impossible has forced the use of circular polarization and it is surprising that it is not used more between fixed stations for long-distance terrestrial work. The fundamental advantage of circular polarization is that all reflections change the direction of polarization, precluding the usual addition or subtraction of main and reflected signal; therefore there is far less fading and aircraft flutter when circular polarization is used at each end of the link. This has been proved many times with the long-standing schedule on 2m between the author in Northampton and G3FAN in the Isle of Wight. The use of circular polarization at one end only, with normal horizontal or vertical at the other end of the link, naturally results in a 3dB loss, and therefore to achieve the advantages of circular polarization it is necessary for all stations to use it. Changing all 2m operations to circular polarization is obviously not practical, but if a system of switching polarizations were in use at all stations it would soon become evident that circular was the best, and there would of course be the added bonus that vertical would be available for operation with mobiles. Having used a system of polarization switching, the author has been somewhat surprised to find big variations in polarization from stations, in particular mobiles. Quite often a mobile using a vertical aerial has been found to be of equal strength on all polarizations and in some cases a definite advantage for circular has been shown. One of the UK repeaters has varying polarization, depending upon the direction from which it is received, and the use of 45° extends the service area considerably in some directions. It appears that whereas horizontal polarization does not twist even at long range, vertical will often shift as much as 45° and even go circular or elliptical.

The author with the extensive range of equipment comprising his station

Circular polarization normally brings to mind the helical aerial, which can only produce one mode of circular, depending upon whether the thread of the aerial element is wound clockwise or anti-clockwise. Horizontal or vertical polarization is possible from helical aerials, but only by the use of two helices and suitable phasing, with no real means of control. The simple means of changing polarization is to mount a horizontal Yagi and a vertical Yagi on the same boom, giving the well-known crossed Yagi. Separate feed to each section of the Yagi brought down to the operating position will enable the user to switch to either horizontal or vertical, but it is perhaps not generally realized that it is a relatively simple matter to alter the phasing of the two Yagis in the shack and obtain four more polarization options, namely two slant positions −45° and 135°, together with two circular positions—clockwise and anti-clockwise, which with horizontal and vertical gives six positions altogether.

Although vertical polarization is mechanically and electrically advantageous when using a simple dipole type of aerial, the presence of the mast in the same plane as the vertical elements on a Yagi considerably detracts from performance. This can be very simply overcome with a crossed Yagi with polarization switching, mounting the aerial with elements at 45°. The mast then has little effect on the vertical performance and vertical and horizontal only can still be produced by feeding both aerials in the correct phase relationship.

Assuming therefore that a crossed Yagi is mounted at 45° with individual feeders to the operating position, the polarization available and the phasing required is as follows:

Slant position 45° and 135°	Aerials fed individually
Circular positions clockwise and anti-clockwise	Both aerials fed with 90° + or 90° − phase relationship
Horizontal and vertical	Both aerials fed with 0° or 180° phase relationship

This all sounds very complicated, but in actual fact the desired result may be accomplished relatively simply with a

* Jaybeam Limited, Moulton Park Industrial Estate, Northampton NN3 1QQ.

3-gang 6-position Yaxley-type wafer switch. A coaxial switch is the "pure" way to do the job, but considering the cost of a 3-gang 6-way coaxial switch together with the necessary plugs and sockets, the difference in performance is just not worthwhile on 2m.

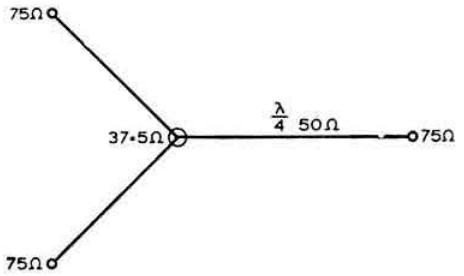


Fig 1. Matching two 75Ω aerials by paralleling o 37·5Ω and increasing impedance to 75Ω again

The first problem to overcome is simply that of providing the correct matching for feeding two aerials in parallel. Briefly, with 75Ω aerials the two feeders are simply paralleled, giving 37·5Ω and a ¼-wave of 50Ω feeder used to transform back to 75Ω, as illustrated in Fig 1. 50Ω aerials are treated in a slightly different way in that a ¼-wave of 75Ω feeder is used in each feeder to transform up to 100Ω and the two are placed in parallel to produce 50Ω again, as shown in Fig 2.

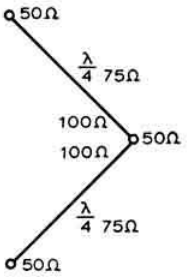


Fig 2. Matching two 50Ω aerials by increasing impedance to 100Ω and paralleling to 50Ω again

Phasing is simply a question of altering the length of the feeders to each half of the crossed Yagi as the polarization is changed. Where a 90° phase shift is required, a ¼-wave of feeder is inserted and where a 180° phase shift is required, a ½-wave feeder is inserted. The polarization switch must therefore arrange for correct matching by switching in the appropriate ¼-wave impedance transformer and correct phasing by switching in the appropriate length of feeder.

There is an added complication in that by no means all aerial systems are 50Ω, and a considerable number of 75Ω users still remain on vhf. 50Ω has become an international standard and is of course completely standard on low frequency; it can therefore only be a matter of time before all vhf installations are 50Ω.

Figs 3 and 4 show the necessary switching arrangements for 75Ω and 50Ω aerials respectively. The normal drawing

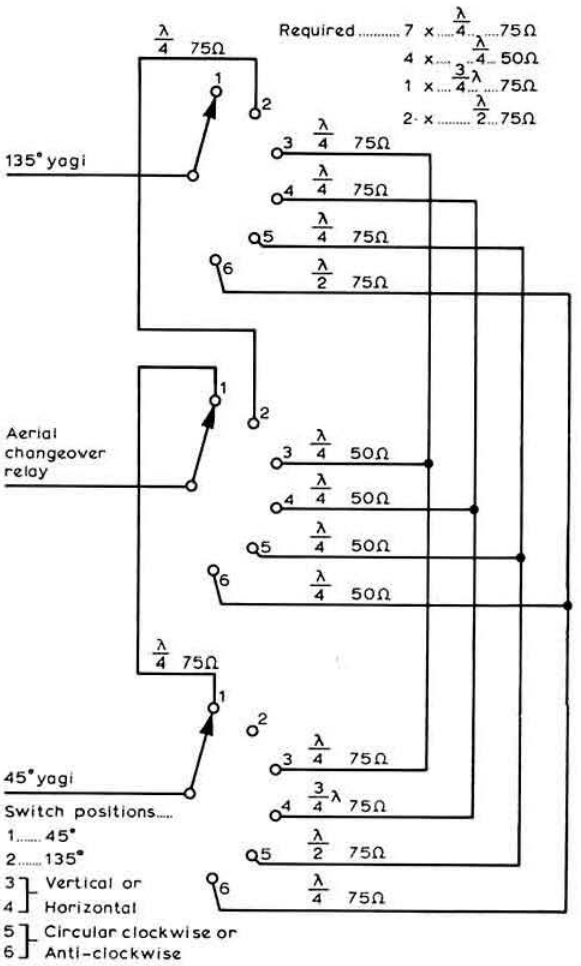


Fig 3. 75Ω phasing and matching switch

of a switch makes the illustration of the 50Ω system extremely complicated, and Fig 4 is drawn as a side view of the Yaxley switch with the six contacts visible in a vertical line, the moving contact not being shown. It will be noticed that the 50Ω version is much simpler as there is no need to manufacture T-junctions in the cables.

It is very necessary for the phasing lengths of feeder to be accurately cut and this may be simply accomplished with a gdo. First, use the smallest possible diameter cable to minimize the mechanical problems of connection to the contacts of the switch. Types UR43 for 50Ω and UR70 for 75Ω are to be preferred and certainly a solid dielectric type should be used in the interests of uniformity. To obtain a ¼-wave of cable, cut off slightly more than the calculated length, which in the case of 2m will be 15in of solid dielectric cable, leave one end open circuit, and short the other end with the shortest possible loop that will produce a dip on the gdo. It is surprising just how small that loop can be and, given a reasonably sensitive gdo, a virtual short circuit will still couple. Check the dip frequency, which will probably be around

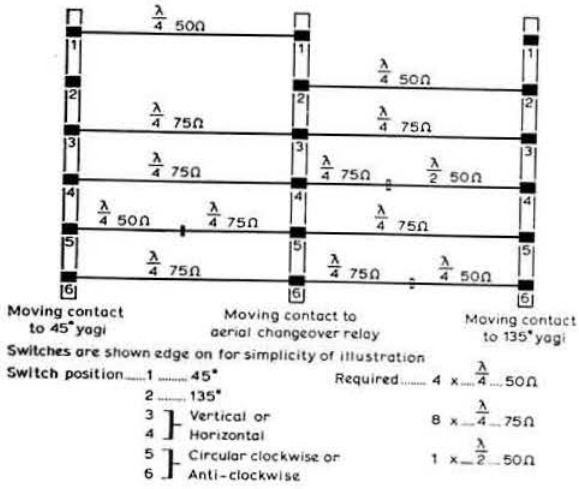


Fig 4. 50Ω phasing and matching switch

120MHz, and carefully clip pieces off the open end of the cable until the dip occurs at 145MHz. Assuming that a solid dielectric cable of similar size is used throughout the switch, there is no necessity to dip each length. The uniformity of the cable is sufficient simply to copy mechanically this $\frac{1}{4}$-wavelength and to double or treble it where a $\frac{1}{2}$- or $\frac{3}{4}$-wavelength is required. The slight shortening of the cables when they are prepared for connection is compensated by the length in the switch contacts.

Remember when wiring the switch that every effort should be made to maintain impedance and all cable ends should be made up as short as possible to the configuration shown in Fig 5. All outer braids on each wafer of the switch must be joined together by the shortest possible route and not connected to the frame of the switch. The use of the Radiospares Maka-switch miniature switches with small diameter cable makes for a beautifully neat assembly, but very great care indeed is needed to deal with the many coaxial connections in a switch of this small size. The joining of a length of 50Ω and 75Ω is important, and here every effort should be made to maintain the coaxiality of the cable by pushing the braid back away from the inner, making the inner connections carefully, taping up with polythene tape to avoid any possible short circuit, and then bringing the braids back again over the tape and binding securely with fine wire. Any attempt at soldering will probably be disastrous, as the polythene will undoubtedly melt with the risk of short circuit. Further protection may be given by a layer of tape over the entire joint. Similarly, the T-junctions required on the 75Ω switch

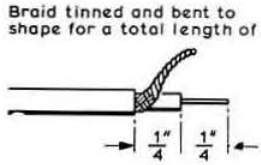


Fig 5. Method of "tailing" coaxial cable

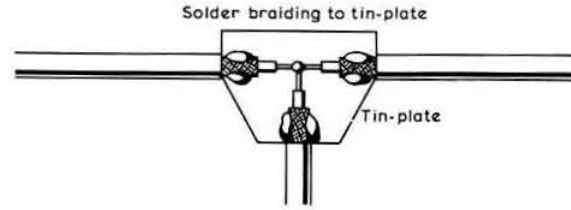


Fig 6. Method of joining 3 cables

may be made up by cutting small triangular sections of tin-plate and quickly soldering the outers of each cable to the tin; in this case short circuits may be seen and avoided. Fig 6 illustrates the method.

Assuming that the switch has been satisfactorily built, there is now the problem of whether the feeders to the halves of the crossed Yagi are of the correct individual length. Ideally, these feeders should be cut mechanically and electrically to equal length before installation, and the two halves of the crossed Yagi should be in exactly the same place on the boom. While the feeders may be cut accurately, it is mechanically difficult and almost impossible to mount the two halves of the Yagi in the same place. They inevitably have to be spaced by a few inches. It is therefore necessary to correct this mechanical displacement of phase by an equal displacement of length of the feeders, and in practice it is far easier to simply connect everything up with unknown lengths of feeders and adjust the length of one or both feeders until the switch operates correctly.

A convenient method of adjustment is to receive a horizontally-polarized signal of constant amplitude from a local, ensuring that the transmitting and receiving aerials are beamed directly at each other. This point is vitally important —a beam aerial only radiates its intended polarization from the main lobe—a fact which will become very evident in subsequent use of the switch. The feeder lengths should now be adjusted so that all slant and circular positions are equal, together with maximum rejection in the vertical position of the switch. The choice of which shall be the horizontal and vertical positions can now be taken. Accurate S-meter readings logged for each position of the switch after every feeder adjustment are essential. Typically, the slant or circular positions will be about one S-point down on the horizontal, while the vertical position will be some six S-points or 20-30dB down. To avoid the problem of the man trying to level the legs of a four-legged table and finishing up with a 3in-high table, when cutting feeder lengths cut only 1in at a time from one feeder. When the recorded readings indicate that the last cut was one too many, cut that last piece from the other feeder and the optimum situation will be restored.

With the Yagis mounted at 45°, it may appear surprising that a horizontal signal can produce differing signal strengths on each aerial, but this will happen until the respective feeders are of equal length. The reason is the inevitable mis-match (sometimes deliberate to improve noise factor) which occurs at the input to the converter or receiver. Remember the object is *equal* signals, not maximum signals—converter mis-match can be compensated for and *maximum* signal strength achieved by altering the length of the main feeder after the switch, which will not affect the phase relationships between the aerials.

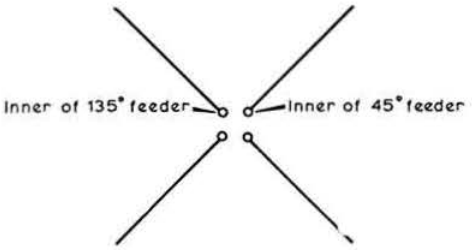


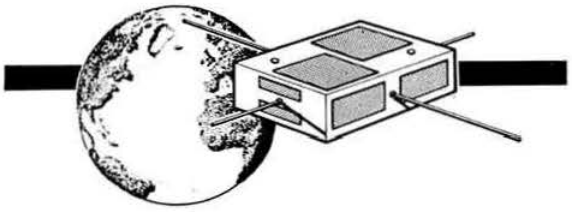
Fig 7. Aerial connections looking in the direction of radiation from rear of the boom

The question now arises as to which of the circular polarization positions are clockwise or anti-clockwise. This subject merits an entire article; it will be remembered that even the world's top telecommunication engineers got this one wrong on the first transatlantic tv broadcast via Telstar.

Should the operator wish to define the circular positions, then with accurately cut equal feeders and an accurately made switch, position 5 will be clockwise and 6 anti-clockwise, providing the aerial connections are as shown in Fig 7. If the aerial connections are not known, then the only way to calibrate the switch is to receive a known circularly-polarized signal, when the respective positions will be immediately evident.

A correctly wired and phased switch should perform as follows:

Switch position	Polarization of signal (dB down)					
	Horiz.	Vert.	45°	135°	Clockwise	Anti-clockwise
Horizontal	Max	20/30	3	3	3	3
Vertical	20/30	Max	3	3	3	3
45°	3	3	Max	20/30	3	3
135°	3	3	20/30	Max	3	3
Clockwise	3	3	3	3	Max	20/30
Anti-clockwise	3	3	3	3	20/30	Max



Oscar 6

The spacecraft continues in orbit with some excellent dx signals worked through the 144–29MHz repeater. The switching malfunction continues and due to the absence of the command station operated by CN8BO a greater proportion of off passes is currently being experienced. It is hoped that alternative command arrangements may soon be effective. The operating schedule continues unaltered and should be strictly observed with the use of the minimum power necessary to effect communication. Many European stations are still noted using the satellite on off days obviously with greatly excessive erp. Reference orbits are:
10611 February 10 0116·9ut 067·7°W
10648 February 13 0011·7ut 051·4°W
10661 February 14 0106·6ut 065·1°W

Oscar 7

Both the 432–144MHz and the 144–29MHz repeaters are providing excellent contacts. The operating schedule is that the 432–144MHz repeater is operative on even days of the year while the 144–29MHz repeater is available on odd days. This includes Wednesdays, but the repeater is available on these days for special tests only and should not be used for two-way communication. Note that the schedule refers to odd and even days *of the year*, days having odd numbers in February will, however, be even days in so far as the yearly sequence is concerned. The 145 and 29MHz beacons are operating with strong cw and rtty telemetry but the 435MHz beacon is now heard at much reduced strength.

The 432–144MHz repeater input is more sensitive than originally expected and no more than 80W erp is necessary for communication. AMSAT confirms that the 14dB pad in the input to the 144MHz receiver is not in circuit and that the age characteristics may be responsible for some communication difficulties being experienced. On the other hand dx communication with Oscar 7 on a quiet pass has often proved remarkably easy and it has been noted that a simple turnstile when used for the uplink has proved more successful on dx passes than when used with Oscar 6.

For about the next month or six weeks the two spacecraft will be in orbital proximity. Consequently one repeater may relay signals received from the repeater in the second spacecraft. This may become objectionable and therefore one repeater may be commanded off.

Up-to-date information on the Oscars may be obtained from the GB2RS news bulletins, also the Oscar nets on Sundays on 3,780kHz at 1015 and on 144·480MHz at 1930. The latter net is conducted by G8CSI (New Malden, Surrey) who beams in several directions in turn to pick up calling stations. *Oscar News* is obtainable from G3WPO, QTHR, (sae with enquiries please) while subscriptions to AMSAT can be sent via G2BVN.

Reference orbits are:
Friday 14 February orbit 1142 2007·39 351·9W mode A;
Saturday 15 February orbit 1154 1906·59 336·7W mode B;
Sunday 16 February orbit 1167 2001·16 350·3W mode A.

Orbital increments are 114·944min and 28·73° per revolution. □

INTERFERENCE PROBLEMS

Members accused of causing interference or who suffer interference from external sources are invited to seek the assistance of the Interference Committee in solving their problems.

Enquiries should be addressed to: The Chairman, Interference Committee, RSGB, 35 Doughty Street, London WC1N 2AE.

Some thoughts on cw communications

by R. SKELTON, 6Y5SR, G3IHP*

AS a cw enthusiast, the author has always been fascinated by the basic nature of communications by morse code. It is surprising that references to means of improving cw to its ultimate limits do not appear in amateur literature. Perhaps as the original inventors we have convinced ourselves that there is really not very much more to know about humble cw.

Our professional colleagues on the other hand are very actively trying to perfect various means of data communication. They are extremely interested in increasing the amount of data being passed through a given channel. Whether for example this be a minimum bandwidth channel for satellite telemetry or a 4kHz-wide telephone line, the problem is essentially the same—how to communicate the required amount of information with acceptable quality in the available spectrum. By data communications we mean communications by coded pulses; cw is of course data communication in its most elementary form.

Theoretical limits

To study the limitations to the cw mode, we must refer to some basic laws of communications theory. Shannon's Law is regarded as a fundamental law of nature and relates the maximum possible information rate to channel bandwidth and signal-to-noise ratio. It can be expressed as follows:

$$C = W \log_2 [1 + (S/N)]$$

where C = Channel capacity in bit/s
W = Channel bandwidth in hertz
S = Signal power
N = Noise power

A standard word used for calibrating keying speeds contains 50 bits of information so that at 25wpm we are transmitting at $(25 \times 50)/60$ or approximately 20bit/s. Taking an arbitrary signal-to-noise ratio of 15, the minimum bandwidth required adequately to contain this information calculated from Shannon's formula is 5Hz. Unfortunately Mr Shannon did not invent the necessary code structure which is required to reach this theoretical limit and it is to this day unattainable in practice.

Practical limits

The minimum practical bandwidth required for different data modes, a.m., fsk, psk etc, have been studied and in practice for cw we would need three or four times the bandwidth calculated from Shannon's Law, ie (say) $4 \times 5\text{Hz} = 20\text{Hz}$ for 25wpm. This is much less than the bandwidths in common use by cw operators today.

Asking around, one will find a wide divergence in opinion as to the minimum practical bandwidth for cw. Opinions seem to range from "none at all, I rely on my brain for selectivity" to advocates of sharp audio filters of say 80Hz bandwidth. We must certainly not disregard the contribution of our own hearing systems, but that is another story. If however we can reduce our channel bandwidth from 80Hz to 20Hz, not only would we improve adjacent channel QRM but we could improve the s/n ratio by as much as 6dB by reducing the noise bandwidth.

Problems

There appeared to be several practical problems not so long ago. The frequency stability of equipment was inadequate and construction of filters with this performance was cumbersome. With present-day equipment and simple active filters neither of these problems are limiting factors today. A mysterious phenomenon known as ringing remains a problem, however.

The effect known as ringing can occur when sharp-sided pulses are passed through narrow-bandwidth channels. The pulses become distorted and lengthened in duration so that bits of information overlap and interfere with each other. For this reason, sharp noise spikes must always be removed before attempting to pass them through a narrow-bandwidth filter. It is not possible to eliminate ringing entirely; however, by suitable design of filter bandpass characteristics ringing effects can be minimized.

Optimum response

To find out about the optimum channel response it is necessary to refer to some more fundamental theory. A scientist, H. Nyquist, examined the practical matter of data transmission theory in the early 'twenties when the main concern was to optimize telegraph transmission. Nyquist proved that an ideal channel having linear phase and amplitude response and abrupt cut-off could transmit a series of pulses without mutual interference at a maximum rate given by $C = 2W$. In our example, $C = 20\text{bit/s}$, therefore $W = 10\text{Hz}$.

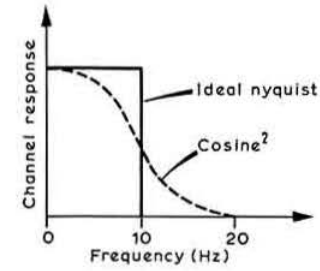


Fig 1. Difference between Nyquist ideal and cosine² response for 25wpm

It was also proved that non-ideal channels with bandwidths somewhat in excess of this minimum could give the same results. A channel having a frequency characteristic shaped according to a cosine² law would combine minimum bandwidth with minimum pulse distortion.

Fig 1 indicates the difference between Nyquist ideal response and cosine² for our 25wpm. The associated pulse distortion which results from transmitting through these two

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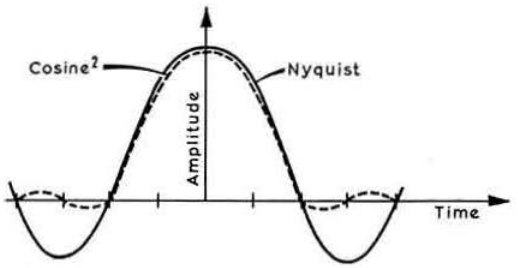

Fig 2. Associated pulse distortion resulting from transmitting Nyquist ideal and cosine² channels at 25wpm

channels is shown in Fig 2. Clearly the cosine² shape results in less ringing distortion than the ideal minimum-bandwidth filter or channel characteristic.

Application

Now we can discuss our practical communications channel, which commences with the morse key and terminates as pulses of af tone into our ears. Throughout this entire link, the available bandwidth is much in excess of that required for the information to be transmitted and can usually be considered flat. Nyquist has proved that in this case there would be advantage in modifying the channel characteristic partly at the transmitting end, by shaping with a cosine law, and partly at the receiving end, again with a cosine filter, thus retaining the overall effect of a cosine² channel shape. In practical terms, this would mean that key filter components and receiver filter components should cut off in this manner.

To implement filtering at the receiver, a simple approach would be that of an active af filter with the possible refinements of variable bandwidth and centre frequency. This arrangement is not necessarily the optimum and we should give careful consideration to the techniques used in space communications which employ phase-locked loops as detector/filters. Information bandwidths of less than 1Hz are achieved in this manner when required.

Conclusion

To conclude, dare the author suggest that the amateur world has neglected the whole subject of signal processing for the cw mode and that a thorough review of the subject (including the contribution of our hearing faculty) would be in order? As a cw man, he is convinced that one day even amateur voice communications will be converted to cw transmission.

Speech clipper for the Microwave Modules A3 transmitter

by B. PRIESTLEY, G3JGO*

AS is well known the peaky nature of speech forces a compromise between not over-modulating on peaks and yet maintaining an average level which is adequate to be heard at the other end. This is particularly noticeable on the vhf bands when signal/noise levels are low.

The Microwave Modules transmitter has sufficient drive to permit up to 100 per cent modulation, which helps in this direction. Even so it is not always possible to satisfy the distant station's demands for more audio without over-modulating and consequential splatter, which does not improve popularity with local stations. After a little thought it was realized that there was a very simple modification which permitted the modulator to act as a high-level clipper. This consists simply of a low-pass filter between the modulator and pa transistors. Several users of the transmitter have expressed interest, and this note is for them, and any other users of the same type of series modulator.

Referring to Fig 1, with no modulation the emitter of the 2N3055 and the collector of the BLY84 sit at +6V. When modulation is applied the 2N3055 follows the audio applied

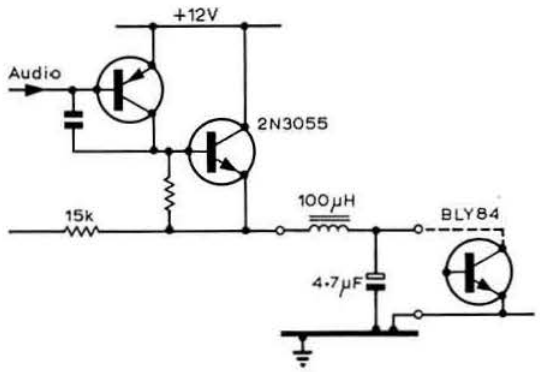

Fig 1. Circuit of the clipper

to its base within the limits of 0 and +12V, corresponding to 100 per cent modulation. Beyond these limits the voltage cannot be swung, and so the audio peaks are clipped off. The filter between the 2N3055 and BLY84 removes the splatter producing sharp edges.

The values for the audio filter may look a little odd, but 100μH is correct because the impedance is only about 6Ω. On the other hand the coil must be capable of carrying 2A without saturating, so a gapped ferrite or iron cored component is needed. The heater smoothing choke from the Command series receivers is one suitable component.

As to results, the transmitter still gets unsolicited compliments on the audio quality, the locals say it does not spread even when "shouting for the dx", and the increased audio level possible when hitting the clipper has on one occasion resulted in a report of readability six from a semi-distant station. □

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Building blocks for the novice

by SVEN WEBER, G8ACC*

Diodes, diodes and diodes — and some experiments with them

(Part 11)

Diodes and demodulation (2)

FM. With frequency modulation, the amplitude of the carrier wave stays constant at all times but the frequency is varied with the instantaneous voltage of the modulating frequency. Similarly with phase modulation, the phase is varied as the absolute value of the modulation at any time. Frequency and phase modulation are very similar but the difference between them can best be described in a diagram of a carrier wave subjected to some modulation (Fig 77).

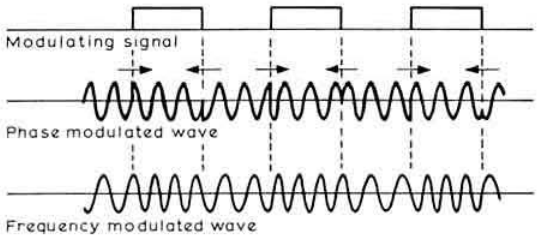

Fig 77. Phase and frequency modulation with a square wave modulating voltage

FM can be generated very simply by altering the C, L or R constants of the tuned circuit which determine the frequency of an oscillator with the modulating voltage. Normally this comes down to putting a voltage variable reactance (which could be a variable capacitance diode) in parallel with a tuned circuit. However, this is somewhat outside the scope of this part but will be dealt with later in the series. FM can be detected by having a circuit whose response varies with frequency and rectifying the result. In other words it could be a tuned circuit and a diode (Fig 78). But a circuit of this kind is rather non-linear as regards frequency and therefore the output distortion would be considerable. Further, this circuit is also responsive to a.m. and a.m. noise and it would thus lose out on one of the accepted advantages of fm, that most noise is a sudden amplitude change not a frequency change. Amplitude changes can for the most part be eliminated by having a stage which cuts all its output down

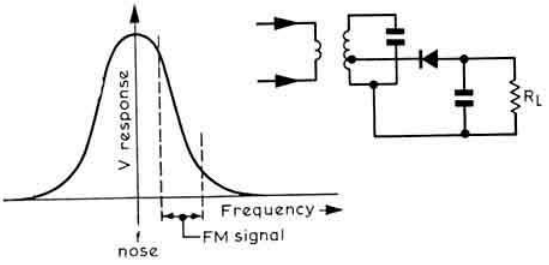

Fig 78. Slope fm detection

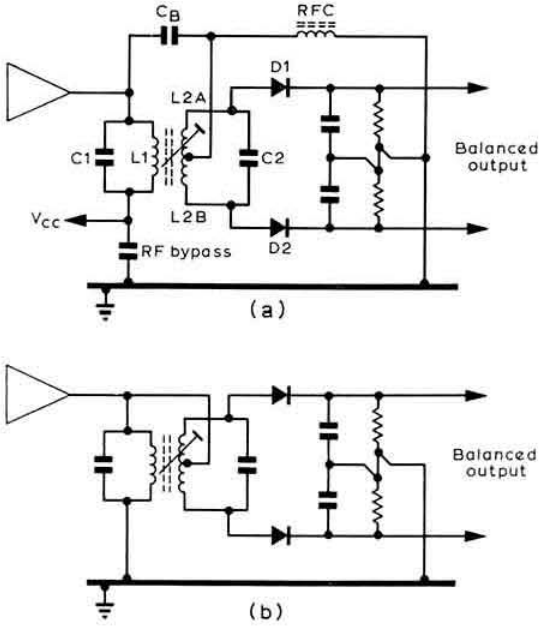

Fig 79. (a) standard Foster-Seeley phase discriminator and (b) FS discriminator with no dc level change

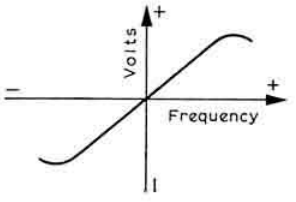

Fig 80. Output of FS discriminator

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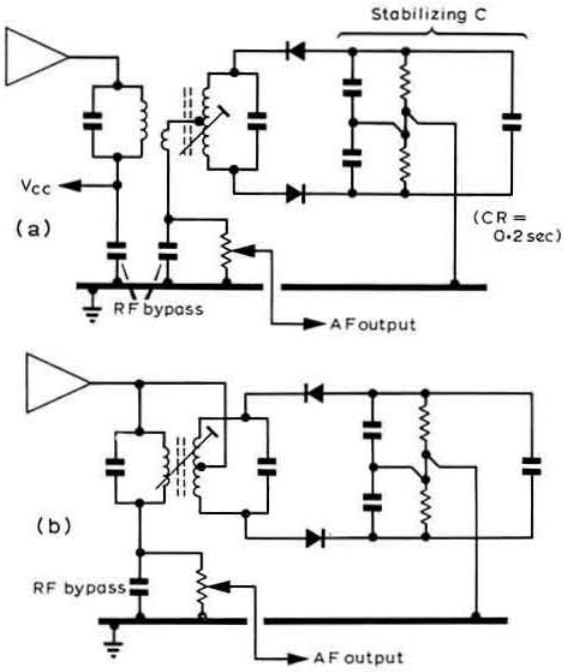

Fig 81. (a) ratio detector and (b) the same if there is no dc level change from primary to secondary

(positive and negative half-cycles) to a square wave of fixed amplitude, ie a limiter, before the detector. With low frequencies this could be done with back-to-back zener diodes (see Part 6) but with a frequency in the range of tens of megahertz this would not be possible. Here, limiting amplifiers or Schmitt triggers would be best.

Assuming that the input has been limited, the simple detector in Fig 78 could be used. But there is still the distortion problem with non-linear frequency characteristics. One of the best-known detectors is the Foster-Seeley phase discriminator which, when it is properly adjusted, gives very little distortion. The circuit (Fig 79) depends for its operation on the fact that at resonance the voltages on the primary and secondary tuned circuits are 90° out of phase. The voltage on C1L1 is applied through a blocking capacitor to the detector diodes D1 and D2 which are back to back (their dc paths are completed by the rfc, although this and C_B are not necessary if there is no change of dc level between primary and secondary) and L2a and L2b are arranged to present half that voltage, +90° and −90° out of phase, to

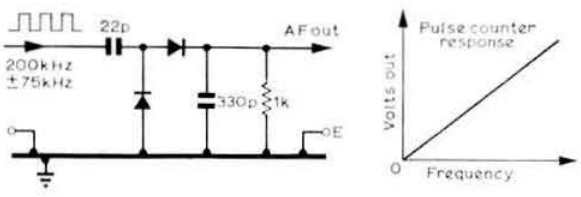

Fig 82. Pulse counter fm detector

the diodes. At resonance there would be no output, but if the frequency changes, the impedance of the tuned circuit changes from resistive to either capacitative or inductive and the phase swings accordingly. The output no longer balances and an output is detected (Fig 80). There are all sorts and varieties of this discriminator differing in one way or another: C2 may be split instead of L2; each diode can be replaced with a half-wave voltage doubling pair; the output may be unbalanced and so on. But there is one simple-looking alteration which affects the whole way the circuit operates, and this is to reverse one of the diodes. This new circuit is called a "ratio" detector (Fig 81). The signal voltage is applied to the diodes in series and it is held constant by the capacitor at the right hand of the circuit. L2 is used in place of L1 for the primary voltage to avoid the necessity for coupling capacitors and chokes. This circuit has an inherent limiting effect whereas the Foster-Seeley has not, but often causes more distortion than the latter. It is also more difficult to set up and align for best results.

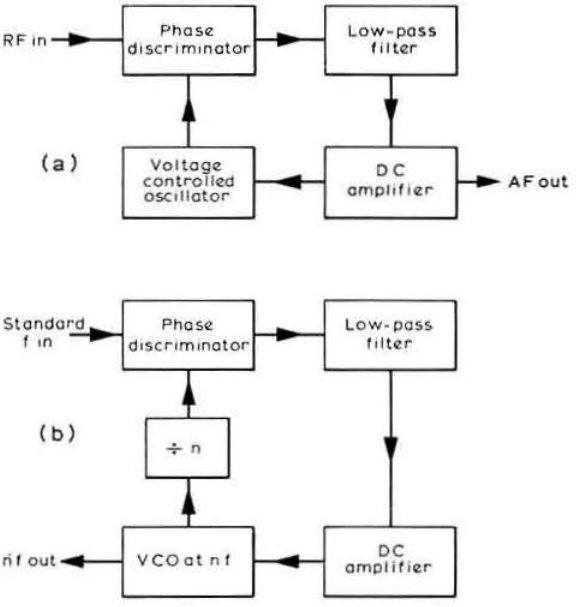

Fig 83. (a) fm detection with phase locked loop and (b) frequency multiplication with pll

Another interesting variety of fm detector is called a pulse counter (or bucket detector). If the fm transmission is translated in the receiver to a very low intermediate frequency (say, around 200kHz with 75kHz deviation), a circuit such as Fig 82 with a square wave input from a limiter would have a response directly proportional to frequency as the CR time constants are much shorter than the highest signal frequency (ie it is a differentiator). This is a simple detector with a good frequency characteristic and very little distortion, and it can be fed from a simple af amplifier substituting for a high frequency i.f., after the mixer in a receiver.

If the incoming signal is compared as to its phase with an internal oscillator in a phase discriminator, the output will reflect the phase difference. This output voltage can be amplified and taken back to the internal oscillator to keep

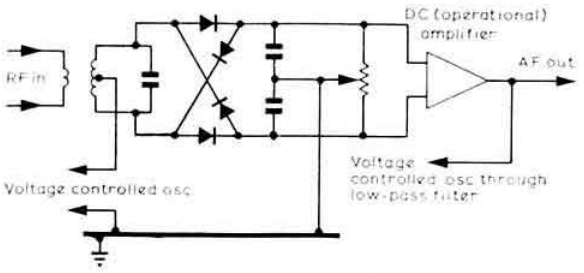

Fig 84. Typical diode phase discriminator for pll circuits

it in step with the incoming frequency (using a voltage variable reactance) and therefore this voltage would be the modulation voltage. This technique is called phase locked loop (pll) and it works very well, not only as a detector for fm but for frequency multiplication (Figs 83(a) and (b)) and a typical circuit for the discriminator is shown in Fig 84. This is a double balanced ring modulator followed by a dc (operational) amplifier. Incidentally, the ring modulator could well be used in the Foster-Seeley circuit where it would give twice as much output: the pll phase discriminator and the Foster-Seeley circuits are exactly alike in the way they work.

Part 12 will consider voltage variable capacitance diodes. □

Electronic ignition —a recapitulation

by B. PRIESTLEY, G3JGO*

DIGESTING the further letters I have received on the above subject (including one from W7ZI) the following points emerge.

The normally claimed advantage for electronic ignition of easier cold starting is useful, but not a major improvement, perhaps because in general radio amateurs give the battery more care and attention than the average motorist.

Plug and point wear is appreciably reduced. If I understand one correspondent correctly he is still using the same plugs after six years use, with very satisfactory results with a 50thou gap.

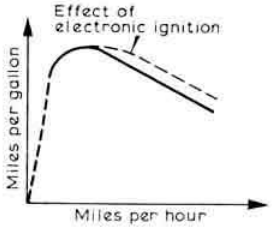

Fig 1. The effect of electronic ignition on petrol consumption

On petrol consumption the results are interesting. The normal characteristic of any car is of the form shown in Fig 1, and it is generally assumed that the fall-off in mpg at higher speeds is an inherent limitation of the engine, and can only be countered by running at the optimum speed, typically 35-40mph which is tedious on a motorway. However, the spark energy with a conventional ignition falls off at high rpm, and this seems in part to be the cause of the fall-off in efficiency. Thus the effect of electronic ignition is as shown in Fig 1. In other words there will be little or no effect on petrol consumption for urban motoring, but at a steady higher speed the improvement is about 10 per cent.

Incidentally, electronic ignition is not the end of the road. W7ZI, after improving the consumption by 7·7 per cent average with electronic ignition, went on to get a further 6 per cent with water vapour injection, ie a total of 14 per cent.

One correspondent had a most unfortunate history of trouble with electronic ignition, probably due to a situation "where ventilation was inadequate". It is perhaps worth pointing out that component life is approximately halved every time the temperature rises 10°C so that it is most important that ventilation is good and components are adequately rated. □

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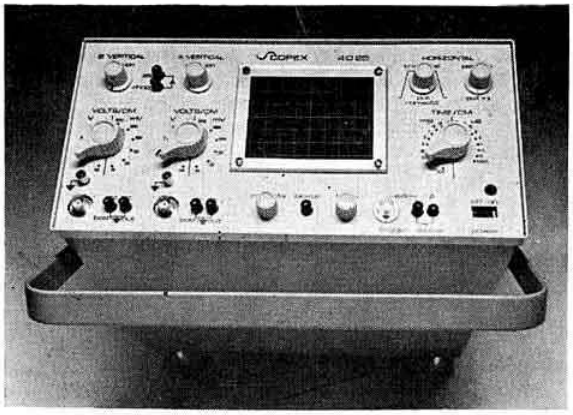
NEW EQUIPMENT

Scopex oscilloscopes

The Scopex 4D10 equipment, which was reviewed in the July 1974 *Radio Communication*, is now available on 12-14 weeks delivery and not as mentioned in the review. The Scopex 4D25 instrument is now available in the reduced delivery time of 18-20 weeks. The latter is a dual-trace solid state oscilloscope with a bandwidth of dc to 25MHz and it is hoped to publish a review of the 4D25 later this year. Both equipments are available to the amateur radio market through Burns Electronics. □



The Scopex 4D25 oscilloscope

A strange case of mains interference

by M. J. L. FADIL, G4CCA*

THE Yaesu FTDX400 is an ssb transceiver with an internal power supply. The mains transformer, as can be imagined in a piece of equipment capable of running 400W and using mainly valves, is fairly substantial but very compact.

On acquiring a second-hand FTDX400 last year very severe vibrations of 10s duration were experienced each morning, apparently coming from the mains transformer. The entire case of the set shuddered and shook in a really frightening manner; immediate switch-off seemed vital. On those occasions when transmitting was actually taking place the fuse in the primary mains circuit blew. It was thought that the mains transformer must be faulty—surely an expensive repair job.

This mysterious behaviour led to the return of the transceiver to the company from which it was purchased. Their chief technician, while listening sympathetically to the story, could nevertheless not reproduce the fault despite a prolonged soak test. So the set was brought back home but the "buzz", for want of a better way of describing the problem, continued spasmodically to spoil the use of the transceiver.

In desperation the set was again taken back to the supplier together with a tape-recording of the buzz so as to reinforce the case for complaint. At the very least it was considered that a replacement transformer should be fitted. Again, a courteous and patient hearing was given but no buzz could be induced from the set when tested in their very well-equipped laboratory.

Then one evening on 2m the fault was outlined to a good and knowledgeable friend who suggested that an accurate log of the occurrences should be kept. So for the past year the date, time and duration of these buzzes have been noted in the station log-book.

It soon became evident that the times of buzzes were related to the time of day. In the morning they lasted for 10s; in the evening for only about 1s. It was not long before a clear pattern began to emerge: the occurrences of the buzzes seemed to be influenced by dawn and dusk.

Logic now indicated that the problem was mains-born, but neither the Eastern Electricity Board nor the Central Electricity Generating Board would admit to any special characteristic, time-dependent, on their product. On pressing the point with the CEGB and explaining that he was a licensed amateur, and therefore somewhat more knowledgeable than the average consumer, the author was at last referred to a retired member of their staff who was a G8 plus two.

This amateur, true to the spirit of the hobby, wrote in reply to the enquiry explaining in detail how a dc impulse could be superimposed on the mains, either to switch auto-transformer tappings at unmanned substations or to switch street lights on and off from a central location.

Now the mystery was practically solved. Each morning about sunrise a 10s switching impulse would occur, shaking up the old FT400, but doing no damage unless it was actually being used for transmitting. Again at sunset a 1s pulse came along the mains. It seems that the mains supply at the QTH is of good quality but the extra pulse, being dc, drives the mains transformer, which is already well loaded, into a saturated condition. It complains at this treatment by buzzing and if the set is transmitting the current rating of the fuse is exceeded. These pulses are not present on all mains supplies, but are very definitely so in this case.

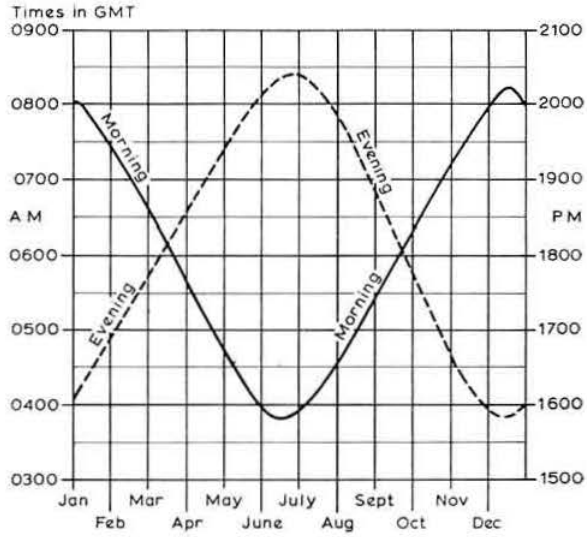


Fig 1. Relation of the time of occurrence of the pulses to the time of year.

The answer has proved to be to restrict transmission until the pulse has passed, this being quite easy to arrange as the pulse timing is consistent at any given time of the year (see Fig 1). It has also been suggested that a heavy-duty 3Ω resistor in series with the mains primary would limit the surge.

Although the street lights have been surveyed at the critical times no evidence has been accumulated to suggest that the buzzes coincide with their switching on and off. There is an electricity substation very near the author's house which perhaps contains a switched auto-transformer. No confirmation of this is held, so to this day the purpose the impulses serve is unknown.

When the set jumps about on the bench at about sunrise, however, violently complaining about its diet, the author can only hold his breath and hope that the wire in the mains transformer is substantial enough to withstand this treatment. □

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TECHNICAL TOPICS

by PAT HAWKER, G3VA

THOSE who remember or know of the radio broadcasting set-up in the UK during the 1939-45 war will need no introduction to the idea that synchronized transmitters can minimize their use for direction-finding purposes. But how many know that this technique was pioneered as early as 1923 by an amateur? The story is told in G. G. Blake's *History of Radio Telegraphy and Telephony*, published in 1928. It surely deserves to be retold in *TT* if only to illustrate genuine, even if misplaced, pioneering by amateurs.

According to Blake, during 1923 and 1924 Reginald Gourand, an American amateur (8DZ) living in France in the days before reciprocal licensing, carried out a series of transmissions on about 1,500m in the heart of Paris. For two months French official df stations at Issy-les-Moulineaux and Porte d'Orléans, on either side of Paris vainly attempted to locate his station, but consistently traced it to the Rond Point in the middle of the Champs Elysées.

8DZ finally disclosed his position voluntarily and revealed that he was using two transmitters some distance apart, neither needless to say in the Champs Elysées.

In fact if one digs into the history of radio communication it is remarkable just how often the early radio amateurs and experimenters were able to make their marks to an extent often now completely forgotten. For example, how many of the present-day nbfm enthusiasts know that the very first station ever to transmit regularly using the frequency modulation system developed by Armstrong (who himself began as a keen amateur) was that of his friend Randy Runyon, W2AG. In the summer of 1935 Armstrong and Runyon rebuilt W2AG to operate on fm on the old 112MHz band in order to demonstrate the potential of fm to the IRE in November 1935—and for many months "This is amateur station W2AG at Yonkers, New York, operating on frequency modulation at two and a half metres" was the only station anywhere in the world using fm!

Do-it-yourself power

One of those mental exercises that can, if one is not careful, become something of an obsession is to imagine that one has suddenly lost all normal sources of electric power but has to keep a station on the air. And suddenly, in this day and age, it is possible to think of such a situation actually occurring.

No mains supply to use either directly or to recharge batteries; no petrol generator or car alternators. Dry batteries yes, but suitable only for QRP and specially-designed equipment. So, what is left? Hand- or pedal-driven generators—one remembers those photographs of Arthur Simmons, G5BD, who in the 'twenties, used to key his transmitter while operating a pedal generator. Then there are solar power generators, wind generators, generators driven by small waterfalls, steam generators . . .

Someone who seems to be taking this exercise seriously is Ed Noll, W3FQJ, who in *Ham Radio* has already tackled the possibilities of solar power to provide trickle charging (November 1974) with acknowledgement to the all-solar-power contacts made by G3HMO back in 1954 on 1·8MHz cw. W3FQJ has gone one better with an ssb contact with WB4ZXJ on 21MHz using a Ten-Tec Argonaut transceiver with a $150 bank of solar cells that can provide up to 12V, 0·3A charging current for a motorcycle battery, at least on a sunny day. Interesting, but the cost of solar cells is rather off-putting; and W3FQJ has set himself a 1kW capability.

So in the January 1975 issue he tackles the field of wind generators and finds that in the USA there is still available quite a range of commercial units of this type that can provide sufficient power to keep a high-power rig on the air for some hours daily. These require that the site shall have wind velocity exceeding about 10m/h over long periods.

This reminded me of some notes that I wrote on this subject about 10 years ago based on an analysis by P. Sachs of The Marconi Company that noted the attractions of such sources of power for unattended and isolated telecommunications installations, and where he concluded that two 1kW wind generators mounted on 50ft towers would cost less than the smallest continuous-running diesel installations and would result in fewer maintenance problems. It was then stated that such wind generators, connected to lead-acid batteries, would start to revolve in a 4m/h wind, start charging at 8m/h and reach maximum capacity at 15-20m/h. Of course in places like the Antarctic where strong winds are normal considerable use has been made of wind generators, but the analysis by Sachs suggested that there were many places where useful power could be obtained in this way. There might still be room for improving the efficiency of the propellors or vanes. How about looking around for a windmill as an emergency ham shack?

Intermediate technology

While for normal fixed station operation in the UK it must be still too pessimistic to suppose that the energy crisis will reach the stage where mains power may not be continuously available for amateur radio operation, we should perhaps all think more of those parts of the world where reliable mains supplies are still a luxury. A good deal has been written about the vitally important need to convince African and other emerging nations (all of whom have equal votes with the USA and the UK in ITU conferences) that amateur radio is an excellent way or providing self-training in radio communication and fully justifies its frequency allocations. Yet increasingly one feels that we think far too much in terms of amateur radio depending on the use of sophisticated equipment which for economic reasons would be out of the question for other than a tiny minority of the indigenous population, and particularly youngsters, in such countries. Let us not fall into the trap of dismissing all but the latest technology as having no place in amateur radio.

I must admit to having been much impressed by some of

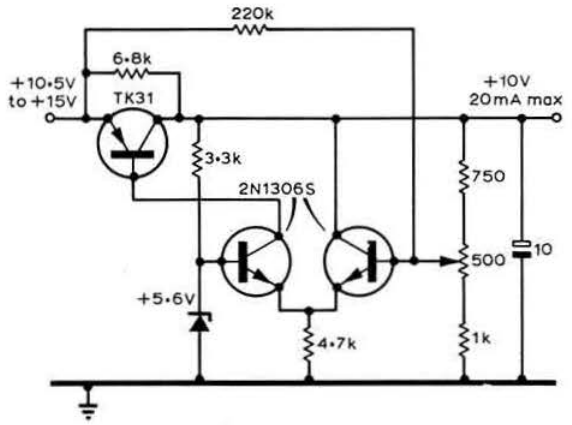

Fig 1. Baxandall voltage stabilizer with fold-back limiting and capable of working with an input only 0·2V above the stabilized level

the ideas that have come to be termed "intermediate technology" that have been advocated for some years by E. F. Schumacher (for example in his book *Small is beautiful*, Abacus paperback edition, 75p). He has shown very convincingly that the way really to help underdeveloped countries is not by the exporting of industrial techniques and technology more suitable to highly developed countries but by showing that it is still possible to use simpler industrial processes and techniques not unlike those from which our own modern industries have come. These may often require much more manpower but far less capital investment. He suggests that a multitude of small industries producing goods for the local market is often far more beneficial to these countries than large centralized, export-orientated, automated plants. On the other hand, he does not advocate a "back to nature" or a deliberate turning of the clock backwards approach, but takes into account the most modern technology provided that this is suitable for local, relatively small-scale operations by the indigenous population.

At first sight this may not seem to have much relevance to amateur radio but I am not so sure. In *TT* (October 1974) we recently noted the complaints from Bangladesh that the more advanced broadcasting and domestic equipment poses many maintenance problems and is less suitable than some of the older designs. Are we sure that there is still not a real place in amateur radio for relatively simple transmitters and receivers that can easily be put together, easily maintained, and able to put someone on the air for a total expenditure of a few pounds? And perhaps not only in the underdeveloped countries.

A recent correspondent wrote: "Of the 20 or so local amateurs I know, with only two can anything technical be discussed. Today seems to be the day of the 'black box operator' who neither knows nor, worse still, wants to know what goes on behind the knobs. I cannot think we are granted a licence just to operate commercial gear as a radiotelephone . . ."

Certainly we seem unlikely to win much support from those new countries if this is really the image of amateur radio that is the true one. Personally I think, or like to think, that the real situation is a good deal better than this—and that amateur radio still has a useful role in both advanced and underdeveloped countries.

Baxandall voltage stabilizer

One of the problems when using voltage stabilization for battery equipment is the considerable loss of power involved in conventional series regulators, including some of the now popular ic regulators which need a considerable voltage drop to work properly, particularly with fold-back limiting. Barry Priestley, G3JGO, notes that a technique described some 10 years ago by P. J. Baxandall (of tone-control fame) in *Radio & Electronic Engineer* (April 1965, p244) continues to work with an input voltage only 0·2V above the stabilized output. It thus seems ideal for a portable vfo requiring, say, 10V as the batteries come down from 13·5 to around 11V! It is also fold-back limiting and hardly expensive in components: Fig 1. The maximum base current in the TK31 is the tail current of the 2N1306s which is equal to (5·6 −0·2)/4·7kΩ and so maximum output current is β times this. If more current is drawn the zener current falls, so zener voltage and hence TK31 base current falls, giving a fold-back. The 6·8kΩ resistor is to ensure start up; the 220kΩ resistor reduces the sensitivity of output volts to input volts (probably due to the 6·8kΩ, G3JGO suggests).

Tone-burst generator

Although several tone-burst generators have already been featured in *TT* it seems well worth giving another possibility (Fig 2) stemming from Paul Williams, G3YZQ. This one is very simple and can often be put together from the proverbial junk box. G3YZQ describes its operation as follows:

"The basic circuit is a simple 'twin-T' audio oscillator whose output is shunted by a transistor. The values shown for the oscillator will, in conjunction with the 300Ω pre-set resistor provide a tunable range from just under 1,700Hz to about 1,800Hz, ideal for access to repeaters using 1,700 or 1,750Hz.

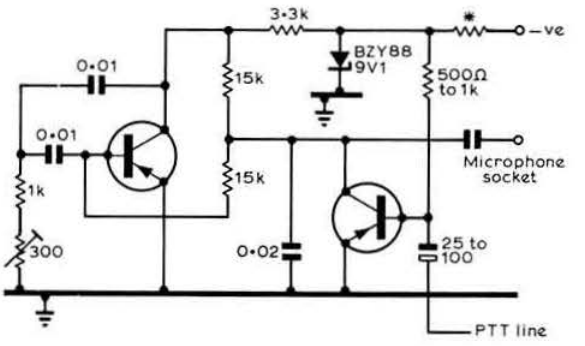

Fig 2. Simple tone-burst generator used successfully for two years by G3YZQ

"Under normal conditions the switching transistor is biased fully on, shunting the output of the oscillator. However, when the positive side of the electrolytic capacitor is earthed via the push-to-talk or transmit switch, the pulse momentarily switches the transistor 'off' and the tone is then fed briefly into the microphone socket.

"For stability the supply is regulated by a zener at about

9V, and a supply variation of from 12 to 20V then changes the output frequency by only about 2 to 3Hz.

"Almost any audio type of transistor can be used, the original has two GET872s. The generator has been used now for some two years in a Pye Cambridge and is built on a piece of Veroboard about 1½in square and mounted in the boot-mount control box, although quite possibly it could be built directly into the microphone case.

"The resistor and capacitor values of the time-constant in the base circuit of the switching transistor will depend on the duration of the tone-burst required, but the resistor should be kept less than 1kΩ to ensure that the transistor is fully 'on'. The value of the series resistance in the supply line depends on the supply voltage."

The VK2ABQ pseudo-quad

Fred Caton, VK2ABQ/G3ONC, has already chalked up several useful contributions to *TT* aerial lore—but he has now come up with another novel idea for a mini-beam that has no traps or loading coils and looks like a quad but is not. Following evaluation of the design at vhf he has built and tried a 14MHz model and also proffers the (untried) suggestion that a 7MHz model would come out smaller than a conventional 14MHz quad. Like all miniaturized and loaded aerials one inevitably loses some gain and increases the need for careful adjustment, but VK2ABQ reports achieving about 18dB front-to-back ratio which in the real world of interference is often as useful operationally as striving after more forward gain.

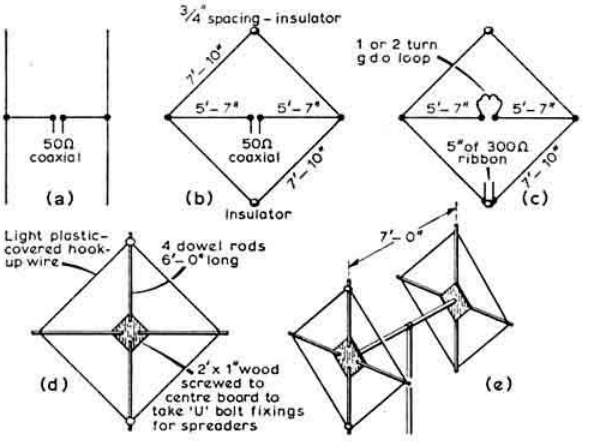

Fig 3. The VK2ABQ pseudo-quad (actually a form of Yagi using end-loaded horizontal elements): (a) basic configuration of the element; (b) formed into a diamond to provide more manageable structure; (c) reflector with tuning stub; (d) and (e) basic construction of the framework

The aerial is based on the relative high efficiency of a heavily end-loaded element. In practice the basic horizontal diagonal of a 14MHz element is about 11ft 4in and the boom about 7ft. As VK2ABQ puts it, with a touch of nostalgia, "this beam would fit into small but beautiful English gardens very nicely".

In effect an end-loaded dipole in the form of an H-element is bent into a more manageable diamond shape to make the driven element: Fig 3. In doing this the radiation pattern of the H element with its deep nulls off the ends is but little affected. The dimensions given in Fig 3 were those found by VK2ABQ to resonate at 14·2MHz with the bottom apex about 9ft off ground.

In practice simple and extremely light frames were made using ⅝in dowel rod with a wood plate 9in by 9in at the centre and with a piece of 2in by 1in wood for the U-bolt which attaches the element to the boom, for which he uses a 7ft length of light tubing of about 1¼in diameter. Both the frames for the driven element and the reflector are identical but the reflector includes about 5in of 300Ω ribbon feeder which is trimmed to resonate the reflector to 13·3MHz using a one- or two-turn gdo loop as shown, and which is then left *in situ* (or the two halves joined).

It would be possible to rotate the loops by 90° if vertical polarization were required, and a tri-band beam could be formed by interlacing the 21 and 28MHz elements in the usual way, and all fed at the same point; short horizontal wire sections are spaced equal distances along the dowel rod and taped in place. The reflector stubs are tacked on to the dowel rod and each reflector loop resonated at a frequency 5 per cent lower than the driven element.

TVI cure by serendipity

Serendipity is the faculty of making happy and unexpected discoveries by accident; in this case the beneficiary was Ted Burgis, G6FB, but he feels that his findings may bring relief to some sufferers from tvi, as they certainly solved his own problems.

He reports: "The configuration of a new QTH demanded a new method of running the feeder cable to the dipole aerials, since coaxial cable trailing over the grass was no longer considered socially acceptable. As a result the buried-cable layout shown in Fig 4 was adopted. The baluns are contained in screened and earthed metal boxes and the co-axial cable buried to a depth of about 2in. An unexpected result was that tvi on Channel 3 (vision 56MHz) completely disappeared, presumably because unwanted radiation from the feeder is effectively buried.

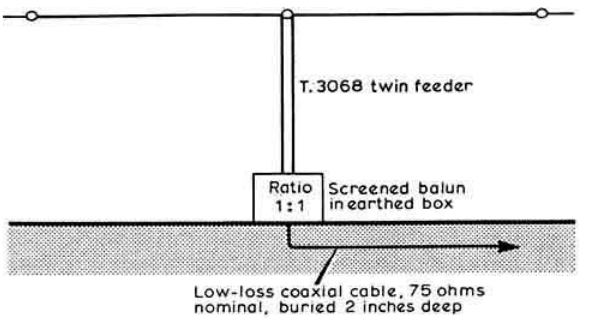

Fig 4. Dipole with buried coaxial cable feeder found by G6FB to give effective freedom from tvi

"The dipoles are carefully trimmed and resonated using a gdo, and it is now possible to enjoy full legal power working on all bands from 3·5 to 28MHz. The system has been in use for two years and no problems have arisen. It is understood that burying coaxial cable is quite a common commercial practice.

"The use of BICC twin-feeder type T3068 between the baluns and dipoles is strongly recommended. It is of UK manufacture, and cheaper and as effective as the more expensive near equivalent Belden cable made in the USA. But do not confuse T3068 twin feeder with cheap low-duty tv feeder cable. The characteristics are:

Manufacturers: BICC Ltd obtainable from KW Electronics Ltd.
Size: 5·08 by 4·06mm flat section.
Conductors: 18swg.
Power rating: 10MHz 830W; 100MHz 260W.
Impedance: 80Ω nominal.
Velocity ratio: 0·693 nominal.
Attenuation: 1MHz 0·0092dB/m; 10MHz 0·029dB/m; 100MHz 0·092dB/m.

G6FB adds that it is hardly necessary to comment on the advantages of feeding the dipoles with balanced twin cable and leading it to the centre of the aerial at right angles. He suggests adjusting aerial height and length to provide optimum match with feeder cable and the operating frequency (personally I would always plump for maximum possible aerial height even at the risk of slight mismatch). In his location the balanced coaxial feeder, with 75Ω nominal impedance, is about 50ft long.

On the general subject of tvi, Barry Priestley, G3JGO less happily draws attention to the need for amateurs to take care when dealing with commercially-built equipment not to ignore good practices when incorporating modifications or carrying out maintenance. He recently sorted out one case where the power amplifier screening box of a KW2000 was topped with a piece of the flimsiest gauge of perforated aluminium secured with four pk screws in the centres of the sides, so that the cover was peeling away from the screening box at each of the corners. Yet the owner of the equipment had not suspected that there was any connection between this bodge-up and the detection of 42MHz radiation by local Post Office interference officers.

Saucepan-lid reflectors for uhf?

On several occasions reference has been made in *TT* and *ART* to the development by H. W. Ehrenspeck at the USAF Research Laboratories of various forms of vhf/uhf "backfire" aerials and his use for this purpose of large planar reflectors having a saucepan-like lip or rim (Fig 5). He has now suggested that this type of reflector has a special value when the dimensions of the lip are carefully adjusted and can then give significantly greater gain than would be possible when using an equivalent area of plane reflector (*IEEE Trans Ant & Prop*, March 1974, pp329-332).

In one of a series of examples, Ehrenspeck uses a reflector with a diameter of less than 2·35λ having an adjustable depth of rim. His results indicate that gain is optimized when the rim in the forward direction is 0·6λ, at which point the directive gain of the aerial is 14·2dB or 5·2dB better than would be achieved with a rimless reflector: Fig 6. On the other hand increasing the rim beyond this depth causes the gain to fall off again until at 1·5λ it is actually below that of a rimless reflector.

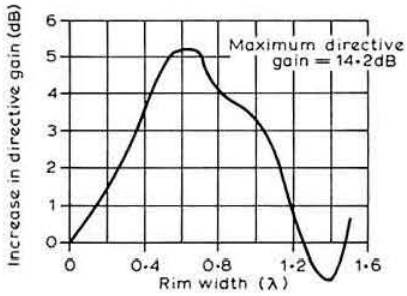

Fig 6. How rim width was found to effect the directive gain of the saucepan lid aerial

The short paper gives a detailed account of his series of experiments on various sizes of reflector (if beyond a specified diameter these need to be illuminated by a Yagi type of array as in his backward-firing aerials).

This approach could clearly be of interest at uhf as an alternative to conical or paraboloidal reflectors, or even G3RPE's microwave dustbin lids, though it must be admitted that relatively few amateurs appear to have followed up his earlier work on various backfire techniques.

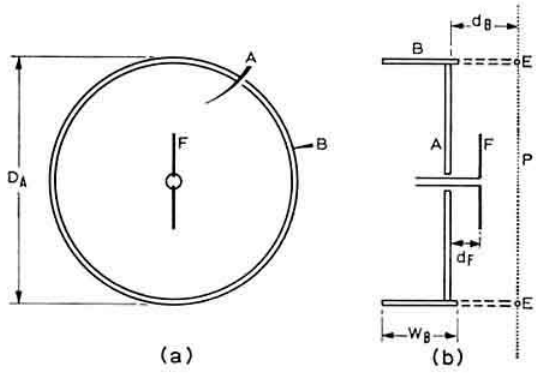

Fig 5. Sketch of the experimental aerial system used by Ehrenspeck to investigate effect of varying the rim depth on gain

Using microphones

Roy Rowntree, G3ZQA, adds a comment to the November *TT* notes on microphones and room acoustics. He finds that many amateurs speak well away from the microphone with the result that room resonances make the speech sound thick, woolly and indistinct and often apparently lacking in top. He suggests that few amateurs are able to make major alterations to room resonances but that we could all reduce their effect drastically by bringing the microphone nearer to the original sound source, the mouth; speaking across the microphone and being careful not to blow at it either with nose or mouth. In this way the excess of middle registers seems reduced and speech becomes cleaner and clearer. Additionally, for the listener, this seems to bring the voice from deep behind the loudspeaker grill and behind the noise when the speaker is well away from the microphone to nearer the surface of the loudspeaker and in front of the noise. G3ZQA believes that careful use of close-speaking techniques could clean up many of the signals he hears.

For professional applications, close-speaking, noise-reducing microphones are fitted with a special case equipped

with nose and mouth breath shields made from stainless-steel woven mesh, with the talking distance with respect to the nose and mouth accurately controlled by means of a positioning bar which contacts the speaker's upper lip so that there is always a distance of about 2in between lips and the ribbon of the microphone.

Series-connected multivibrator

Many years ago (*TT* February 1963) attention was drawn to a simple series-connected multivibrator RC generator by DJ3NW which used a double-triode valve. But now in *Practical Electronics* (January 1975) there is a transistorized version of this little-known circuit configuration. It is pointed out by M. Harding that this type of multivibrator has the advantage of providing virtually a square-wave output with equally fast rise and fall times instead of the usual slow outer edge of the conventional transistor multivibrator and that it is always self-starting. In the circuit shown in Fig 7, if the time constants R1-C1 and R2-C2 are sufficiently large, the frequency of oscillation is determined mainly by C3-R3 and C3-R4 so that a variation of C3 is sufficient to provide a useful frequency range, as indicated. Current consumption is given as only 0·7mA from a 9V battery as the circuit consumes current during only one half period of the cycle. Output is about 5·5V peak-to-peak.

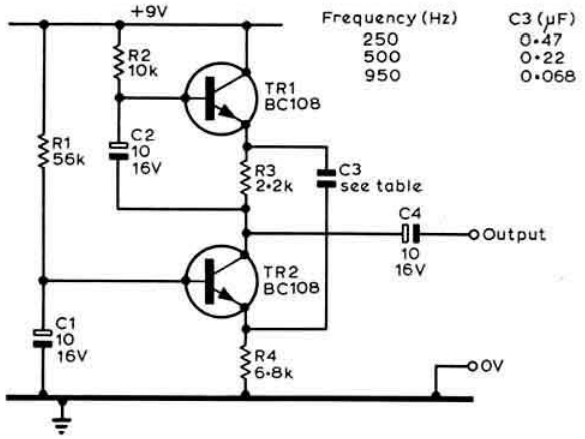

Fig 7. Series multivibrator circuit described in *Practical Electronics*

More on dental burrs

Harold Chorley, G5YH, endorses the value of WA2RKU's suggestion of using a dental No 2 burr for drilling printed circuit boards, etc (*TT* October 1974). But he adds a word of warning in pointing out that there are two kinds of these burrs—and the ones with cylindrical cutting heads are not suitable for this purpose. The type that really is useful comes in at least two sizes. G5YH recommends particularly those with a long shank (total length 1¼in) but the shorter ones, ⅞in overall, also seem handy. He comments that whereas it is all too easy to bend or break a conventional fine twist drill, these dental burrs are almost indestructible.

G5YH also adds two more "musts" for the amateur workshop:

(1) A number of dental probes (wry-necked with micro-spoons) as an aid for getting microsplashes of solder off printed circuit boards and the like; and

(2) A pair of 5in curved Spencer-Wells forceps.

I would also mention that over the years I have found a small dental mirror quite useful to have around. Many years ago I suggested that in the era of microelectronics we all needed to acquire a watchmaker's skills. Perhaps I was wrong—we need rather to imitate the dentist's!

Flexible morse practice oscillator

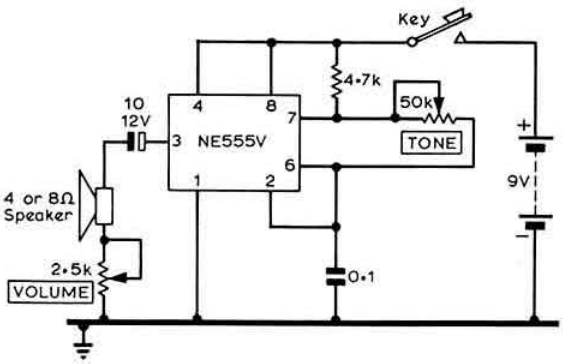

Fig 8. Morse code practice oscillator capable of providing sufficient output for class use and with adjustable tone

A code practice oscillator (Fig 8) capable of providing sufficient output for classroom instruction (but including a volume control for lower levels) and with a frequency range from a few hundred to several thousand hertz is described by Jim Burney, WA5YFL, in the "Hints & Kinks" column of *QST* (July 1974). This (like the mini-tone-burst oscillator described by G4ABB in the October *TT*) is based on the Signetics NE-555V timer ic, readily available in the UK at under £1. WA5YFL made his unit on perforated board enclosed in a bakelite box which includes the key apart from the paddle. No switch is needed since no current is drawn from the 9V transistor radio battery except when the key is depressed.

Lamps as dummy loads

In the early editions of the *Amateur Radio Handbook* there used to be a graph showing the characteristics of electric light bulbs when used as resistors, and for many years it has been common practice to use bulbs as dummy loads for transmitters. This can still provide a useful indication of power output and forms a suitable load when applied to transmitters having continuous output power, but it introduces problems when this is attempted with ssb equipment. For as that series of "curves" in the handbook indicated, the electric lamp bulb cannot be considered as a fixed resistor as it is very temperature dependent.

Ted Burgis, G6FB, points out that the use of incandescent lamps as dummy loads not only results in misleading measurements but also has inherent dangers when applied to modern ssb transmitters, linears or transceivers, particularly those using television "sweep tubes" (television line-output valves) in circuits designed to match into 50-70Ω loads, and

where any serious mismatch between power amplifier and load can damage the tubes.

This is because such bulbs are to some extent inductive, and also because of the very wide variation between their hot and cold resistance. The cold value may be only about 10 per cent of the value when the full working voltage is applied. For example, a typical 240V 150W lamp with a tungsten filament can vary from 40Ω cold to 400Ω hot. And an application of Ohm's Law will indicate values for other wattages. Carbon filament lamps, if available, are little better since they have a pronounced negative resistance temperature coefficient.

G6FB thus suggests that anyone having a rig using 6KD6s or similar tv tubes in the output stage uses lamps as dummy loads at his peril. Even a non-inductive carbon resistor load may have limitations due to its negative resistance temperature coefficient, and adequate cooling to provide reasonable temperature stability should be provided. □

Modifications to a Stolle memomatic rotator

by P. DOWDING, G3XQA*

A STOLLE memomatic beam rotator had been used by the author for some time, but was noisy and rather unreliable, which may have been due to the effort required to turn a 14-element 2m Parabeam. However, after the following modifications were made, operation became more reliable and much quieter.

Initial investigations revealed that, of the five connections between the control box and the motor, one was a common connection (1) and of the pair (2 or 3) one was used depending upon the direction of rotation. A pulser switch in the drive unit was connected via wires (1 and 4). Had it been realized at the time of installation that a single wire (1) was common to the motor and to the pulser switch, two parallel wires in a five-wire cable, instead of one of a four-wire cable would have been used. This would then have reduced the voltage lost in the cable to the pulsing electromagnet.

Some improvements were, however, easily made to the control box. The whole assembly was examined before being stripped down. It was found that the armature of the electromagnet was distorted and was rubbing on the base plate. The teeth which engage a ratchet wheel had been bent, probably to try to improve the operation; these teeth were straightened and any burrs removed with a fine file. The whole was adjusted so that it would swing without touching anything.

The spring return wire was discarded and replaced by a spiral spring obtained from a vacuum cleaner carbon brush assembly. One end of the spring was attached to the armature through an existing hole and the other to a small bracket held under one of the base-plate retaining screws. The tension was adjusted so that the forward magnetic pull and the reverse spring tension were about equal.

The electromagnet was fed from a rectified signal, the leads to the coil having been cut and a 2A, 100V silicon bridge rectifier inserted. The rectifier is bolted on to the box plate with a 6BA screw, nut and shakeproof washer. The position of the electromagnet was adjustable and the best position found.

The indicating disc was dangerously near to the casing and slight pressure would cause a lost movement with a subsequent positional error. It was found that the metal indicating disc, held in place with a contact adhesive, was

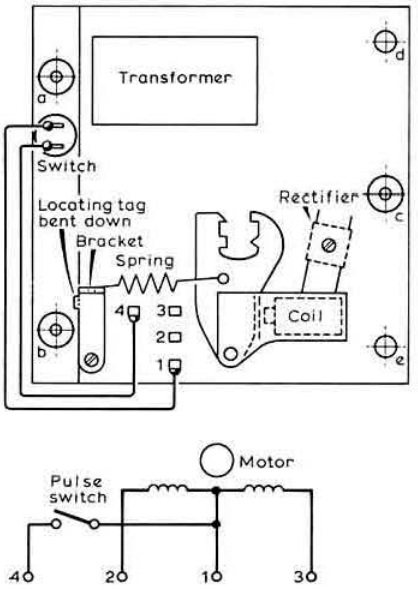

Fig 1. Layout and circuit diagram

far from flat and it would lift in places. Attempts to straighten the disc were unsuccessful and so thick washers were used to lift the upper part of the case clear. Three were used at the fixing screws (a,b,c) and another two at the locating points (d,e) Four small slips of srbp sheet of the same thickness as the washers were used to lift the operating buttons. All were held in place with polystyrene cement.

An alternative method would have been to have discarded the metal disc and remove any adhesive and then to have sprayed the plastic matt black. A red arrowhead would then have been added.

In order to correct an error more easily, a miniature Arcolectric push-button switch was wired to terminals (1) and (4). This allows extra pulses to be added but only when one of the operating buttons is pressed.

The whole unit now seems to be much more reliable and operates with a quiet but distinct clicking. □

* 146 Oakfield Road, Benfleet, Essex.

FOUR-TWO-SEVENTY

by MARTIN DANN, G3NHE*

ONE'S view of the vhf/uhf bands recently depends very much on one's individual interests. At the time of writing, as the calendar changes from 1974 to 1975, it seems a long while since those interested in tropo dx had much to get excited about. On the other hand, fm repeaters seem to be proliferating at a remarkable rate, and these must be fascinating months for those with a penchant for this type of operation. Also, despite the odd kink, Oscar 7 provides ample scope for the satellite buffs. Perhaps there is something to be said for retaining a wide enough sphere of interest to get the best of all worlds.

Keep in lane

We make no apology for bringing up the subject of band plans again, hoping that the continual drip, drip of comment will gradually wear away the stoniest resistance to change; and listening around 2m lately leads one to believe that a good deal of change is still necessary. The 4m and 70cm bands are normally so sparsely populated that problems associated with non-observance of band plans rarely arise, so the following remarks apply mainly to 2m, although it would do no harm, on 70cm, to plan one's future operation to conform with the IARU recommendations for this band. Of course, new crystals are not cheap items these days, and no one expects mass overnight movement of those who are rock bound, but it has now been more than a year since the new plans were published (p846 of the December 1973 issue of *Radio Communication*) and one would have hoped that most would by now have taken the necessary steps to comply.

Listening on the down-link of the 70cm/2m Oscar 7 repeater, one too often hears a.m./fm stations conducting local QSOs in the 145·845–146·0MHz space allocation of 2m while a pass of the satellite is taking place. There would be no cause for complaint if such QSOs were suspended while any active amateur satellite was within range, but this is not generally the case. One appreciates that there are many to whom the whole satellite business is a total bore—each to his own—but there is a good deal of room on 2m for all to "do their own thing" without mutual interference.

There is, perhaps, some excuse for the fm boys, where the demand for a group of specific frequencies causes a shortage of the relative crystals. One would hope, however, that most fm users are in the process of changing to the approved simplex channels, if they are not already using them.

Little criticism could justifiably be levelled against the sidebanders, whose move was completed swiftly and with little fuss. Top marks to those commercial establishments whose crash programme of modification to those "black boxes" went so smoothly.

While the fm groups, in their newsletters, continually exhort their members to adopt the appropriate IARU channels as soon as possible, there may be some justification for their criticism that there is no equivalent pressure on a.m. users to "get into lane". Tuning round 2m leaves one with the impression that there are a good many a.m. stations who are ignoring the new band plan, whether through ignorance or by design.

We can only repeat what has been said before; that the band plan is designed for the benefit of all vhf users in Europe, and whether we agree with it or not, it exists, has been democratically arrived at, and if democracy is to prevail should, surely, be adhered to. No one is suggesting that the band plans are mandatory: they are an attempt to maintain order and avoid chaos by voluntary means. No one will be shot at dawn for a brief excursion into forbidden territory for, say, a cross-mode contact; it is the habitual users of the wrong part of the band for their particular mode that is liable to cause needless QRM and the resulting bad feeling and prejudices against one mode or another.

Beacon news

Following objections from Scotland to some of the proposed new beacon frequencies, alternative suggestions have been discussed by the VHF Committee. A specific objection was that GB3GI (144·1325MHz) would be very strong in some parts of Scotland, making the reception of GB3ANG (144·135MHz) difficult. In view of the fact that there is evidence of support from European countries for the practice of using 144·9–145·0MHz for beacons, it is suggested that it would be logical to do the same in this country for local coverage, dx beacons remaining in the 144·13–144·15MHz band.

The proposed beacon frequencies are:

144·13	GB3CTC	144·925	GB3GW
144·14	GB3DM	144·95	GB3ANG
144·15	GB3VHF	144·975	GB3GI

(GB3GM is closing down, and has therefore not been considered.)

On 432MHz the following beacon frequencies have been suggested:

432·025	GB3SC	432·0625	GB3UJ
432·0375	Emley Moor	432·075	GB3CS
432·05	GB3DM	432·1	GB3GEC

Members' comments on these proposals are invited, with particular reference to the use of the middle of the 2m band for local beacons. Such comment should reach the VHF Committee (or G3NHE for forwarding) in time for discussion before the UK delegates attend the IARU Region I meeting in April.

Super-dx men may be interested in a proposal to establish two Italian beacons, one in the north on 144·135MHz, and one in Sicily on 144·145MHz. The power would be between 25W and 50W to aerials with at least 6dB gain, covering western, northern and eastern Europe. Keying would be fsk with the callsign at 15w/min every 15s.

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We wonder how many noticed that GB3SU was missing from 70·695MHz between 10 and 13 December? But for a good reason, as those who have noticed its increased signal strength will confirm. Beacon keeper G3RKL moved it from its temporary site at Sheffield University to the new location near Harpurs Hill, 3km south of Buxton (QRA ZN61a). The move was not without incident; on the Thursday, Tony Whittaker drove to the new site through horizontal rain, then snow, in a wind registering over 60mph. After installation, the beacon was switched on—and promptly expired amidst ominous crackling noises. Back it went to Sheffield, where the ht transformer was replaced, and when Tony returned to Buxton the following day (the wind having moderated to a mere 30–40mph) all went smoothly.

The new location is around 1,400ft asl and, although there are higher hills in the area, the take-off immediately surrounding the beacon is excellent. The turnstile aerial should spread rf from the 35W input transmitter nicely round the country, if the results of G3RKL's portable operations using the same aerial and location are anything to go by. Reception reports of GB3SU from its new location would be welcome, and should be sent to G3NHE, please.

FM channel

GB3SN, the UK FM Group (Southern) 2m fm repeater at Four Marks, Hampshire, is now undergoing trials as a beacon on 145·725MHz prior to being placed in the repeater mode. The device is presently controlled by a time switch and is normally switched off for a couple of hours in the early morning, and again from 1800 to 2015gmt. GB3SN periodically emits its callsign on mcw and early reports indicate wide coverage and reliable operation.

News from the newly-formed Kent Repeater Group of their proposal to site a repeater (GB3KR) near Dover Castle. The channel will probably be R4, and they expect to cover about 80 per cent of Kent, as well as some of southern Essex and the coasts of France and Belgium. Funds are required and anyone wishing to contribute should contact the group's treasurer, G3VJF, QTHR.

The Malvern Hills repeater, GB3MH, is now reported to be in operation, while the Central Scotland (Black Hill) repeater, GB3SC, is not expected to go into service before this month.

Awards

From the vhf awards manager comes the following list of FMD awards:

70MHz Senior Transmitting: Certificate No 21 to Ken Eastty, G3LVP, of Benfleet, Essex; No 22 to Graham Badger, G3OHC, of Sutton Coldfield; No 23 to Dale Harvey, G3XBY of Hatton, Warwickshire; and by collecting award No 24, G3NHE was able to add this to Seniors for 2m and 70cm and receive FMD Supreme No 9.

144MHz Senior Transmitting: as well as the 70MHz Senior award mentioned above, G3OHC also gains certificate No 69 for 2m.

144MHz Transmitting: certificate No 412 to G3NVL; No 413 to G8HAK; Nos 414 and 415 to GW8BXQ and GW8BXQ/A respectively, on behalf of the Pembroke Dock RC and RSGB Group; No 416 to GM4CXP; No 417 to G2ATM/M, and No 418 to G8HHI.

Iain Petrie, GM8BRM, of Alford, informs us that he has achieved the PACC award for 2m, all done with an input power of only 10W.

One of the most frequent comments accompanying claims for FMD awards is a recognition of the sterling work done by the /P boys, either as highly-organized groups or as enthusiastic individuals. The band that excites most of this praise for the expeditioner is 4m, and this is hardly surprising for it is most unlikely that the 70MHz Senior could be won without the assistance of visitors to those many counties where 4m activity seems not to exist.

It is difficult to refer to individual expeditioners without risking offending those we miss, but it is impossible, in a 4m context, not to mention Peter Lennard, G3VPS, who seems to get through a prodigious amount of first-class portable activity. The efforts of these groups and individuals is particularly appreciated by all county chasers and award hunters, as well as those who just like to put their signals into unusual parts of the country. Good luck to them, and may their petrol tanks never be empty!

In the opinion of the vhf awards manager the 70MHz Senior certificate is the most difficult of any of the Seniors to obtain. Accordingly, he rates 1974 as a vintage year in respect of that particular award; no fewer than nine were issued. For the Supreme Award, too, last year was a record; four being awarded. A list of all the holders of this certificate follows.

1. G3MCS 1970 for two Seniors + 23cm
2. G5NU 1972 for three Seniors
3. G3ZYC 1973 for three Seniors
4. G3COJ 1973 for three Seniors
5. G4BEL 1973 for two Seniors + 23cm
6. G5DF 1974 for three Seniors
7. G3DAH 1974 for two Seniors + 23cm (third Senior awarded later)
8. G3ZMD 1974 for three Seniors
9. G3NHE 1974 for three Seniors

Six of the holders achieved this status via the route of the 70MHz Senior. To obtain the latter, six countries and 60 counties must be worked; not easy when it is remembered that the band is denied to Class B licencees and to the nations of the Continent of Europe. In consequence its occupancy is low in comparison with 144MHz.

Contest happenings

What a pity that the last of the 4m cumulatives clashed with the 144MHz fixed station contest, forcing those with an interest in both bands to choose between one or the other. Conditions on 8 December were a little up, if not sensationally so, and those who opted for 70MHz found things better than they had during the previous few weeks' sessions. The 2m event produced a remarkable amount of activity, mainly on sideband, and mainly from G, although a few Continentals were active. This contest seems to have become basically an ssb affair, there being little significant a.m., fm or cw activity. This being the case, it makes one wonder whether any purpose is served by having a separate ssb event on this band, or, indeed, on any band where the mode is well established.

It would be interesting to know whether the contest enthusiasts favour single-mode contests, or would prefer all-mode events. The latter would tend to encourage cross-mode working, although in practice it might be found that eventually all contests would be sideband only. John Ridd, G8BQX, is very much in favour of encouraging cross-mode contacts, and chides us for suggesting that allowing such QSOs during the 432MHz ssb contest is a concession; John feels that it is an improvement.

Single-mode contests do allow neglected modes such as cw to be encouraged, although there appears to be little pressure for a.m. or fm only events. While a.m. is probably a dying mode (and if that remark produces no comment, then it *is* a dying mode!) fm is thriving, and being a non-dx mode it is surprising that fm addicts do not press for their own contests.

A contest alternative?

There has, so far, been little response to the idea of an achievement table to promote activity on the less active bands and enable the VHF Contests Committee to reduce the number of vhf/uhf contests. What comment there has been mainly supports the continuation of cumulative contests and rejects the idea of a monthly table; although two correspondents were prepared to support the scheme, one had severe reservations and the other thought that it should be additional to, rather than instead of, existing contests.

If there *is* any support for a monthly achievement table to be carried by *Four-Two-Seventy* if would be a shame to let the idea die by default, so we shall keep our options open for a while and ask that if the contest-minded reader has any views, one way or the other, he might let us know. Our thanks to those who have already commented.

The big blow

The gales of 28 December caused many of us, especially in the north, to glance nervously aloft at our long-suffering aerials. Your scribe took such fright at the sight of his 2in heavy-gauge mast lashing about, like a whip aerial, despite the guys, that he dropped everything to the lowest possible height consistent with staying on the air. A post-gale check showed that all of the eight large bolts holding the installation to the house wall had worked loose; moral—check everything thoroughly after high winds.

Dennis Boniface of Ripon, ex-G8IBB and now G4DSC, had only just erected a brand-new crossed-10-el array when the wind brought it down. Even worse, the roof of his garden shack departed into the middle distance, but, undaunted, G4DSC was back on the air with indoor aerials the same evening. Normal service, promises Dennis, will be resumed as soon as possible.

CW calling channels

G3BTO is very much against the concept of a 144·12MHz calling channel for cw or, for that matter, any other calling channels. Derek Wrighton feels that as we are not, like the commercial station, exchanging batches of messages, listening for our own callsigns in a long traffic list, or maintaining a watch for distress signals, there is no valid reason for calling or working channels. Derek, as a dedicated cw operator, will continue to support and encourage the use of the mode on 2m, but will not subscribe to the use of any part of the narrow cw allocation, already eroded by the beacon segment, as a calling frequency.

Help required

G8HUU is not having much luck with fm discriminators, having tried several which did not appear to work. If anyone has a reliable circuit to offer, Paul Newman, QTHR, would be pleased to hear from him.

Another request for technical help comes from Julian Moss, G8ILO. He has experienced a couple of problems with his TC7 tunable i.f.; problems which, he understands, have been experienced by other users of this equipment. The first concerns a warble in the varicap tuned local oscillator, which makes the reception of sideband difficult. The second problem is the extreme susceptibility of the front end to cross-modulation. Julian would like to hear from anyone who has experienced similar problems and overcome them. He will be happy to pass such information along to any other TC7 user who cares to write to him, QTHR.

Down under

Mike Farrell, VK2AM/G4DJV, is currently in this country and is impressed by the level of vhf/uhf activity compared with that in Australia. He is not so impressed, however, with the amount of "sick sideband" to be heard, especially during contests, attributing much of it to the failure of some people to appreciate the adverse effects of overdriving the transmitter. Mike suggests that any prospective emigrant or visitor to Australia requiring information on general amateur radio matters should write to the Federal Manager, Wireless Institute of Australia, PO Box 150, Toorak 3142, Victoria. Mike also suggests that those with a specific interest in vhf could do worse than contact the editor of *6 UP*, a vhf magazine, at 47 Ballast Point Road, Birchgrove 2041, NSW.

Pirate warning

G8CVC of Lichfield has had several reports recently of his call being used in the Portishead area of Bristol by someone signing /M. G8CVC points out that he has never operated mobile and would appreciate the help of stations in the Bristol area in tracking down this misguided individual (the authorities have been informed). G8CVC sees little point in illegal operation in view of the help now available to aspiring amateurs, both in the form of RAE courses and individuals like himself who would be only too happy to assist anyone having difficulty with the examination.

Miscellany

The efforts of GM8HXQ and GM8BBA to operate from Benbecula in the Outer Hebrides came to naught when bad weather prevented erection of the aerials. However, the Hebrides Radio Clubs hope to be active shortly with high power on 2m, weather permitting.

From a 630ft asl location near Camborne in Cornwall, G8IXN is keeping watch on 144·2MHz every hour on the hour. He has 100W of sideband to a 14-el Parabeam, and a clear take-off which resulted in 100 per cent successful skeds being run with G8FEP in Stoke until recently.

Alan Cameron, GM3OGJ, of Sauchie, Clackmannanshire, would welcome skeds on 2m, any mode, any frequency. He has only 10W at the moment but is prepared to raise his power in the event of a good response to his sked request.

The 1975 WAB VHF Contest will be held on 20 July from 0900 to 2100gmt. Further information will appear nearer this date, but full details of all WAB contests, lf, hf and vhf, can be obtained from G4BFY, QTHR.

If activity seems difficult to find on 70cm, try putting out a few calls on Monday and Friday evenings. Several stations in the Midlands have plans to encourage as much activity as possible on these evenings, so why not join in?

Finally, news, views and items of interest for inclusion in the March issue to G3NHE as soon as possible, please. □

MICROWAVES

by DAIN EVANS, G3RPE*

The second microwave round table

About 40 people attended the round table held on 7 December at Kidlington Airport near Oxford. They brought along with them much equipment for display, and sufficient bits to make it worthwhile having an impromptu junk sale—quality junk which included even complete TWTs for 10GHz.

During the morning discussion the need was again expressed for a telephone net to spread the news of impending 10GHz expeditions. Interest was also expressed in having activity periods, and the last Sunday of each month was favoured.

G3KSU described the progress made in the construction of the GB3IOW 10GHz beacon which was on display, and also the siting of it at St Catherine's Point at 800ft asl. Initially the beacon will consist of a 80mW Gunn oscillator, and will be operated from Cowes to confirm its reliability. G8BGP discussed the design of the omnidirectional aerials he has produced for this beacon: the first one to be used has a gain of 11dB. G3JHM briefly gave his predictions of its coverage, about which more in a later issue.

Inevitably there was much discussion on talk-back frequencies in which all the advantages of 144 and 432MHz again were put forward, with many differing views on the best mode. Eventually it was pointed out that it was most important that an early decision be made because the present confusion was resulting in many missed opportunities for contacts. The talk-back frequency that seemed to have the fewest disadvantages was 432MHz, with fm the preferred mode. *All* present agreed to get on the common frequency of 432·9MHz as soon as possible. It was hoped that a design for a simple channelized transceiver could be produced quickly.

The afternoon session was an exchange of ideas on 1,296MHz equipment and practice. G3RPE suggested that current "standard" equipment, a few watts of rf, dishes 4ft in diameter and receivers having a noise factor of 10–15dB, happened to be an unfortunate size. It demanded a fair amount of effort in construction, which no doubt discouraged many from attempting to get on the band, and yet was not potent enough to provide a communications system in its own right. Much smaller equipment with transmitters developing a few milliwatts to a similar aerial system, or its equivalent, would still be able to work all line-of-sight paths with some dx during good openings, and would involve a much lower initial outlay. On the other hand, rather larger equipment, but still within the capabilities of most amateurs, could take advantage of the more reliable propagation mode of tropospheric scatter to regularly work over distances of a few hundred kilometres.

Other speakers then introduced various aspects of improving the performance of equipment, and these triggered off many contributions from those present—enough information to fill this column for a year. G3JVL compared the advantages of dishes and Yagi aerials, and it seems that a stacked Yagi system wins the day at this frequency at least. G8DEK discussed mixers and preamplifiers and the interaction between them. He felt that a ring mixer was probably the safer method for achieving a low noise figure (7dB to only half-way to infinity) rather than trough lines (7dB to infinity). Preamplifiers could reduce the noise factor to 4–5dB, but there was a real risk that they could even degrade the performance of a good mixer if not properly used.

G3WDG briefly described a simple method for generating a few watts of ssb by using a 2C39 to mix 144MHz ssb with 1,152MHz. In his equipment this stage was followed by a 2C39 amplifier to give about 30W p.e.p. G4ALN described a similar system which mixed 28MHz ssb with 1,268MHz. They made it appear very straight-forward.

A third meeting will be arranged, provisionally at Winchester, where 10GHz will be the main focus of attention. A Sunday meeting appears to be more convenient for most people, and this will be borne in mind.

A waveguide 16-coaxial cable transition

A difficulty in working with waveguide sometimes can be its mechanical rigidity, which leads to problems in aligning various parts of a piece of equipment. Flexible waveguide is an obvious answer but it is expensive. An alternative is to use coaxial cable: if this is of high quality, then the losses may be acceptable. Suitable cables are RG58 and RG214U which have a loss of roughly 1dB and 0·5dB/ft respectively. RG8 is not suitable at 10GHz.

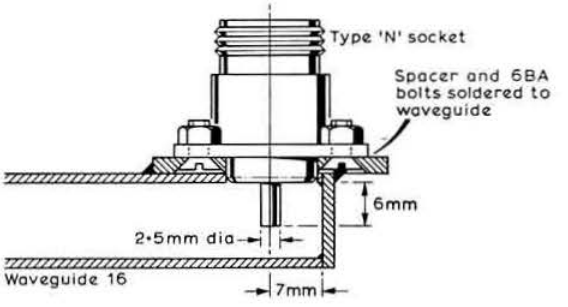


Fig 1. A waveguide 16-coaxial cable transition

The use of coaxial cable, of course, requires waveguide-coaxial cable transitions; a simple design due to G8DEK is shown in Fig 1. This consists basically of an N-type socket mounted centrally on the broad face of the waveguide. A spacer of thickness to suit the particular socket is fitted so that the shoulders of the socket are flush with the inside of the guide. Four countersunk-head screws used to retain the socket are fitted through this plate as shown and are soldered in place with the spacer. The inner of the socket is extended to produce a probe 6mm long. □

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

THE MONTH ON THE AIR

by JOHN ALLAWAY, G3FKM*

AS mentioned on page 881 of the December 1974 issue of *Radio Communication*, the 1975 BERU Contest (8–9 March) is to be the last conducted under the traditional rules originally introduced in 1930 and occasionally modified since. The whole structure of the world has changed politically during the 45 years which have passed and many former Empire, now Commonwealth, areas have a smaller amateur population or one whose most active members do not favour the use of cw. Other former Empire territories are no longer associated with Britain. Readers' views on the structure of a new Commonwealth Contest—from both the UK and overseas—would be most valuable to the HF Contests Committee, and if sent to your scribe will be forwarded to the committee for consideration.

A reminder that photographs of amateur operators and their stations are always welcome for publication in *MOTA*. Every effort will be taken to return these to their owners (if so desired), but no absolute guarantee can be given.

A request has been received from W4MDB (Mike Atlas, PO Box 99115, Louisville, Ky 40299, USA) for information on the present whereabouts of Ken Fraser, G2BTG.

News from overseas

G4CFK has written from Port Moresby in Papua New Guinea to say that he hopes to be on the air this month as P29LS. He will be particularly looking for contacts with the UK on 14 and 21MHz, and will be using an FT101B transceiver and trap dipole or inverted-V aerials. A beam may be used later. He will be there for two years and anyone interested in fixing a schedule is invited to write to the address in *QTH Corner*.

Ron Radley, (ex-G4ABI/9J2GE), is back in Ghana and using his old 9G1GE call. He frequents 14,040kHz most evenings after 1700 and would be pleased to work British stations.

DX news

The latest list of nets published in *DX News Sheet* includes the following (callsigns listed in brackets indicate usual net controller): Asia/Carribean, 14,175kHz at 1100 on Wednesday, Friday, Saturday and Sunday (XU1DX, HI8XKP); Africana, 21,355kHz 1800–2000 daily; Arabian Knights, 14,195kHz at 1330 on Friday (JY3ZH); Amateur Radio Mobile Society, 21,370kHz at 1330 on Saturday; International DX, 14,250kHz at 0500 Friday (JY3ZH); Royal Signals Club, 14,275kHz 1400–1600 Wednesday; Ex-G Radio Club, 14,357kHz at 1900 Sunday and on 14,065kHz at 1900 Saturday (for Pacific members a net is held on 14,347kHz at 0500 on Saturday, and for VKs on 3,650kHz on Wednesday at 0900); USA County Hunters, 14,336kHz at 1400 daily, 14,070kHz at 1400 and 2000 Saturday, 7,055kHz (cw) at 1430 Sunday and 2300 Wednesday. During the winter there is also a net on 3,574kHz (cw) at 2359 Monday. While many dxers disapprove of the use of net contacts for various operating achievement awards, many interesting and elusive stations are to be heard taking part.

BV2A is now active on ssb as well as cw, and on this mode uses the callsign BV2B. W1JFL reports having trouble getting logs from A51PN, and likewise W3DJZ has difficulty with VP8LV and VP8JV.

West Coast DX Bulletin says that a block of "A" prefixes has been released by the US Army for use by the amateur service, and that the US Navy has also given up some "N" prefixes. It is believed that WD6 is already being issued to permanent stations in California. It seems that the ZD3 prefix was dropped by Gambian stations at the end of 1974, and that it has been replaced by C5 (eg ZD3G has become C5G).

At the time of writing, FR7AI/T was appearing regularly between 14,030 and 14,040kHz almost daily and at almost any time. Those still looking for Upper Volta may like to know that XT2AE is often to be found on 14,310kHz around 1700 on Wednesdays and Fridays.

HC8GI is leaving Galapagos Is and heading for Pitcairn Is. This could mean the appearance of another VR6 as he has applied for a licence. HC8FC has been active on 14MHz ssb and is said to be at the Franciscan Mission on the islands.

WB9IAX/KC4 is located near the South Pole, some 600 yards from KC4AAF. He uses a KWM2/30S1 transceiver combination and has a beam. CE9AT is located in the South Shetland Is, as is LU4ZS, and the latter keeps a schedule with LU7DRL (his QSL manager) at 1900 on 14,320kHz. He has also been noted around 14,207kHz from 0400 and QSLs should be sent to Base Aerea Commandante Maraubiu, Argentine Antarctic. CE9AT is at Base Arturo Pratt and his QSL manager is CE2AD.

JA0CUV and JA1MCU were not allowed to take their equipment into Bangladesh during their recent SE Asian trip, but were permitted to use the gear belonging to PA0IWH/S2. They made 2,100 contacts before moving to the Maldive Is where as 8Q6AG and 8Q6AH they made a further 1,800 QSOs. An attempt to take the gear into Burma was unsuccessful and Tack and Jiro confirm previous opinions that it may be many years before amateur radio operation is possible from that country.

FG7XT no longer has a QSL manager and is asking for cards to be sent to him direct in future. W6NJU, who acts as QSL manager for YJ8BL, says that the supply of the latter's cards is still awaited from the printer. W6NJU's own YJ8GS operation QSLs should become available this month.

3B8DL operated for four days from Rodriguez Is during December and hopes to be 3B9DL again in June. This time he will have an FTDX560 with him so that he will be able to use both cw and ssb. QSLs go to WA5ZWC.

Dxpeditions

DX'ers Magazine of 13 December reports that Gus Browning, W4BPD, has received the go-ahead for his plans for another world trip. He promises plenty of good clean operating on all bands from 1·8 to 28MHz, both cw and

* 10 Knightlow Road, Birmingham B17 8QB

Maurice Caplan, VS5MC, after his fruitless foray to Spratly Is last August

phone and maybe sstv. He anticipates starting out towards the end of 1975, and is now inviting contributions from well-wishers to help him to extend the range of his expedition as far as possible. Gus may be reached at *The DX'ers Magazine*, Drawer "DX", Cordova, SC 29039, USA.

West Coast DX Bulletin quotes from the *Wall Street Journal* of 26 November which said that a Dublin lawyer and his friend were soliciting funds to support an expedition to Rockall as the ownership of the rock was being disputed by Eire. A helicopter was being sought.

Dxpedition contest

The Long Island DX Association is sponsoring a contest to develop a set of precepts and/or suggestions for dxpedition operations. Entrants should compile a list of criteria to be observed by both the dx station and those amateurs wishing to work it. LIDXA will award a three-year subscription for the LIDXA *Bulletin* to the winner, and a two and one year subscription to the second and third place entrants, respectively. Winners will be announced in June and entries should reach LIDXA, PO Box 73, Westbury, NY 11590, USA, no later than 28 February 1975.

SSTV

SSTV News reports that W8YEK contacted EA6BQ on 12 November for his one hundredth two-way sstv country. This is believed to be an international first. Among the more unusual countries now active on the mode are DU, HL, HS, KC4 (Antarctica), KG6, KS6, KX6, TJ, TR, TU, VK9 (Christmas Is), P29, VQ9, FL, HZ, 5W1 and YB, and well over 100 are available.

The *Fifth Worldwide SSTV Contest* will take place between 1500 and 2200 on 8 February and 0700 and 1400 on 9 February. All bands 3·5 to 28MHz may be used and exchanges consist of callsigns, reports and serial numbers (from 001), and they must be made exclusively by sstv. Each contact counts one point except on 28MHz where it counts as two. The multiplier is five for each continent and two for each DXCC country worked on each band. W/K and VE/VO call areas count as countries. There are two sections (1) entrants transmitting and receiving video, and (2) those receiving video only. Logs should give date, time, band, station worked, numbers sent and received, points, multipliers and final score, and should be sent to reach Prof Franco Fanti, Via A. Dallolio 19, 40139 Bologna, Italy, before 26 March.

QTH Corner

BV2A **BV2B**	PO Box 101, Taipei, Taiwan.
CE9AT	Correo Naval, Punta Arena, Chile.
EP2DB	via W3KT, J. Bieberman, RFD 1-Valley Hill Rd, Malvern, Pa, 19355, USA.
EP2SN	via WA3BZA, N. W. Styer Jr, RFD 1, Elverson, Pa, 19520, USA.
FH0RX	via DJ9ZB, C. Kistnerstrasse 19, 7800 Freiburg Breisgau, W Germany.
FK0IC	via K6YFZ, 18406 Delano St, Reseda, Cal, 91335, USA.
HS2AIG	PO Box 5815, APO San Francisco, Cal, 96330, USA.
JY9CR	PO Box 2788, Amman, Jordan.
KS6EZ	J. Clausing, Dept. of Education, Pago Pago, 96799, American Samoa.
P29DV	via W8PD, 3891 Weigel Lane, Hamilton, Ohio, 45015, USA.
P29LS	L. S. Smith, c/o Posts & Telegraphs, Burns House, Port Moresby, Papua New Guinea.
P29RJ	via JH3HPX, T. Taira, 9-13 Koyoen, Honjo, Nishinomiya, Hyogo 662, Japan.
PY0ZAE	PY1ZAE, PO Box 1044, 20000 Rio de Janeiro, Brazil.
PZ5FB	via W2FCR, Box 7, Weston Canal Rd, Somerset, NJ, 08873, USA.
PZ9AA	PO Box 1810, Moengo, Surinam.
TA3HB	via WA4ZSB, 12015 NW 21st Ct, Miami, Fla, 33167, USA.
VK0DM	WA4NRE, Box 1895, Knoxville, Tenn, 37901, USA.
YB0ABV	Lt. Col. R. J. Brown, NAMRU-2 Jakarta, APO San Francisco, Cal, 96356, USA.
ZD7PS	Box 34, Jamestown, St Helena.
5Z4RT	via DJ9ZB (see FH0RX).
6V8FID	Box 971, Dakar, Senegal.
9G1GE	via G3USE, S. J. Down, 304 Devon Rd, Luton, Beds LU2 0RZ.
9H3P	via G4JA, Powis Cottage, Ruyton-Eleven-Towns, Shrewsbury, Salop.
9L1JM	via W4BAA, PO Box 1, Captiva Is, Fla, 33924, USA.
9M8FDS **9M8HJ**	via GW3OJB, 15 Church St, Pembroke Dock, Dyfyd.

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

Contests

The Ten-Ten Net QSO Party

0000 8 February to 2400 9 February.

Organized by the Ten-Ten International Net of Southern California, and awards are limited to their members. However, all others are encouraged to enter and send in logs and apply for membership. Phone or cw may be used and exchanges consist of name, location, and 10/10 number (if member). Members score one point per contact, and two if with another member. Logs go to Grace Dunlap, K5MRU, Box 445, La Feria, Texas 78559, USA, before 15 March.

Vermont QSO Party

2100 22 February to 0100 24 February.

Exchanges consist of QSO number, RS/T, and QTH. Vt stations indicate their county. The same station may be worked on each band and mode. Contacts with Vermont count three points and the multiplier is the total number of Vermont counties worked on each band added together (14 per band possible). Activity will centre around 3,685, 7,060, 14,060, 14,290, 14,325, 21,060, 21,375, 28,100 and 28,600kHz. Send logs before 30 April to Peter Kragh, 170 Summit Av, Ramsey, NJ 07446, USA.

In the **1974 French Contest** (cw section) **G4ALG** scored 16,450 and **GW3INW** 15,190 points. G8VF (10,710), G3TOK (9,000), G3BTO (8,163) and G4BXN (2,688 points) also entered. In the phone section **G4ACQ** (19,788 points) led the UK entry followed by G8VF (6,300) and G2WQ (6,290).

Awards

Worked British Fishing Ports

This (and other awards including the Norfolk Broads award, and the Norfolk and Suffolk award) are issued by the Lowestoft & District ARC and full details may be obtained from G3XSK, 28 Springfield Gdns, Lowestoft, Suffolk NR33 9EE.

Band reports

The past month has produced little in the way of sunspot activity, but conditions on the lf bands have been excellent. Several 160m logs have contained reports of signals from all continents except Oceania, and that from G3UBR noted the calls of over 80 W/VE stations worked during the ARRL 160m Contest.

Many thanks to the following for the information used in compiling this section of *MOTA*: G2HKU, G4RZ, G5JL, G6GH, G3GVV, G3UBR, G3UOL, G4DFN, BRSs 17567, 17991, 25429, 29419, 31301, As 8306, 8312, 8428, 8713, 8752 and 8849. Calls listed in italics were cw, the rest ssb.

1·8MHz. **0000** *KV4FZ, KIPBW, W1BB/1, W1HGT, W2LWI, W3GM, WA8OSE, WB8APH.* **0100** *PY1RO, VX1XE, W3JSX, K4GSU, W4QCW, YV5CKR.* **0200** *FY0BHI*, PT9DM, *VE3BMV.* **0300** EP2BQ, K4SA, W4BR, *W9FIU.* **0500** *HC1CW, W4BGO/TI2, K8RRH, WA8IJI, YV4AGP.* **0600** *HC1XG, KZ5AA, VE2UN, W5RTQ, K5PFL, K7ICW, WA7OAH, K9YWO.* **0700** *K3SEW, K4RDU, K7QQP*(?), *W0NFL.* **0800** *VE3s BMV, EKS, VE7UZ.* **0900** *W6DAO.* **2200** *PY1RO, PY2FUS.* **2300** *KV4CI, VS6DO, 4S7UD, 9G1AR.* (Note—ST2AY is believed to keep a schedule on Wednesdays and Fridays on 1,834kHz at 2100).

3·5MHz. **0000** EP2VJ, FP8DH, PA0IWH/S2, TR8AC, VP1FF, VP2MRA, VP5VB, XU1DX, 4S7PB, 9X5PT. **0100** ST2AY, W6NLZ, WA6MWG, W0AR. **0200** 9Y4NP. **0400** *ZF1RD.* **0500** HC2TV. **0600** K6OZL. **0700** KS6DH, W7LGJ, ZL3s, ZL4s, 6W8DY, 9L1JT. **0800** VP9AD, W0MOQ, XE1CX, ZL4DH. **0900** KV4FZ. **1000** K2LWA. **1500** VS6FB. **1600** *JA5PL*, JY9GR, UA0TO, 9K2DC. **1700** YB7AAU, ZL4KE. **1800** OX3RA, ZC4AK. **1900** EA9FB, EL7F, JX2HK, VO1KM, ZB2CF. **2000** HZ1TA, JY3ZH, OE5CA/P/YK, 3A2AH, *4S7UD.* **2100** CO7AM, VQ9M, YV4ANS, 5B4ES. **2200** CP2BD, FM7AB, UA9VH/JT1, KV4FZ, SU1MA, VP2VBH, 7X4OM/A, 9M2s DQ, FX. **2300** JA8LQ, SU1MA, UA0TO, YB0ABV, VS6s DO, FB, VU2BX, ZD7FT, 8P6ES, 9M2MW.

7MHz. **0000** OD5IO, *UH8BAH*, YVs. **0100** VU2GDG. **0400** *DL2GG/YV5.* **0700** *HI3PC.* **0800** FY0BHI, JH1EIG, ZL2IR. **1500** CN8BC. **1600** 7X2SMA. **1700** CR6AK, HV3SJ, VQ9BP. **1800** JY9GR, XU1DX. **2000** *FC2VN, KV4CI.* **2200** CR7IK, PYs, VK6LK, 6W8FP. **2300** HK0BKX, LUs, *PJ3SF*, TJ1EZ, UJ8AE, VP9GE.

14MHz. **0700** P29BO. **0800** HM1AQ, P29FV TA1MB, ZLs. **0900** CE2IC, VK9JA, YK1AA. **1000** FY7AQ (QSL to WB4VUP), JT0AE, KG6JBE, VP8HZ, XW8CO, ZD3M. **1100** HH2WF, KL7HMN, UA9VH/JT1, YB0AAV, 4S7DA. **1200** HK0BKX. **1300** XU1DX, 4S7AS. **1400** VE3CUD/SU, VK6s, *VS5MC*, XE1J. **1500** A2CCY, VE5s, W6s. **1600** FR7AK, *FY0BHI*, VS6FT, W6s, W7s, ZSs. **1700** VE7s, 4W1GM. **1800** ZD9DP. **1900** G3LSQ/MM (27N 17W), VE6s, ZD7FT, ZS1ANT, 5Z4PI/A (QSL to W3HNK). **2100** VP1FF. **2200** and **2300** W6s, W7s.

21MHz. **0900** VKs, ZSs, 9G1, 9J2. **1000** VQ9HCS, ZD7FT, 5N2ESH, 5X5NK. **1100** EL, VK, ZP, ZS, 9G1AR. **1200** HS4AFD, VK6, ZD3. **1300** *FR7AI/T*, HZ1s AT, KE, HP1XJS, PZ1AP, TJ1AF, 3B8AD. **1400** *FL8CE*, OA4OS, VP2MRA, ZE, ZS, 5V7WT. **1500** LU, VE, ZS3. **1600** YS, 7P8AQ.

28MHz—no reports.

Once again thanks to all correspondents and to the authors of the following for items copied from their publications: **World Radio News,** the **DX'ers Magazine** (*W4BPD*), **Long Skip** (*Nick Sawchuk*), the **West Coast DX Bulletin** (*WA6AUD*), **DX'press** (*PA0TO*), the **Ex-G Radio Club Bulletin** (*W3HQO*), and **DX News Sheet** (*Geoff Watts*).

Please send all items for **March** issue **to reach G3FKM** no later than **5 February,** and for **April** no later than **4 March.**

Propagation Predictions

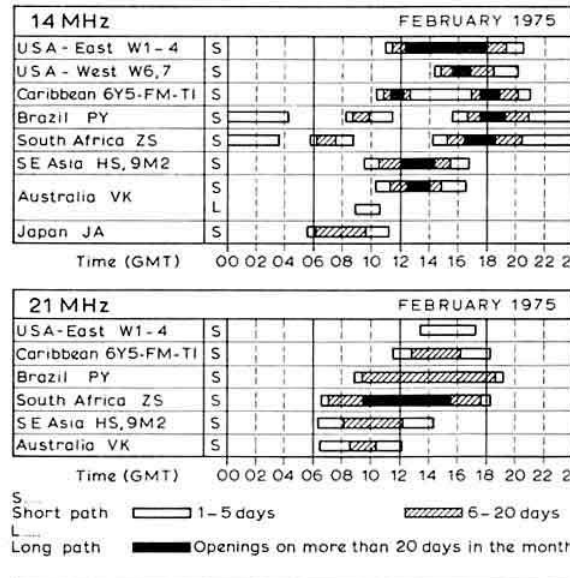
During February the winter conditions in the northern hemisphere come slowly to an end, days lengthen, and towards the end of the month **14** and **21MHz** will remain open longer than in previous months. During the present minimum sunspot conditions, chances of traffic with Africa on **28MHz** between 1000gmt and 1530gmt will be very slight and traffic with South America will be almost impossible between 1300 and 1600gmt.

This decrease of solar activity will also be noticed on **21MHz.** Only Africa will be heard with certainty. Eastern North America will sometimes be heard on days with above average F2 MUFs. Western North America, Hawaii and Alaska as well as Japan will probably not be heard at all. These are not very encouraging prospects for the forthcoming ARRL DX Contest; conditions from southern Europe will be much better than from countries further north.

Conditions on **14MHz** will greatly improve towards the end of the month compared to the previous two months, as days will be longer and therefore the band will remain open longer. Only from about May will this band remain open all night for dx. Chances for dx on the indirect path will decrease from now on. Traffic with Hawaii and Alaska will only be possible on favourable days on the direct path on 14MHz, between 1700gmt and 1830gmt.

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

The provisional sunspot number for December 1974 from the Swiss Federal Observatory was 20·4, with the greatest amount of solar activity occurring between the 12th and the 24th of the month. The Telecommunications Sciences Centre at Boulder reports that during December MUFs were near seasonal normals and that solar activity was generally low. The predicted smoothed monthly sunspot numbers for April, May and June 1975 are 24, 23 and 21 respectively. The solar activity indices from Boulder based on 12-month moving average Zurich numbers show a steady fall to a figure of 13 in November 1975.



Election of Regional and Area Representatives 1975-7

Regional Representatives

Not later than Friday 21 February 1975 any five corporate members resident in a particular Region may nominate any other qualified corporate member resident in the Region for the office of Regional Representative by delivering their nomination in writing, together with the written consent of such person to accept office if elected, to the Membership & Representation Committee at RSGB headquarters. Each such nominator shall be debarred from nominating any other person for this election of Regional Representatives.

The names and addresses of the present Regional Representatives are given on page 97 of this issue.

In the event of no nomination being received from the corporate members in any Region by 21 February 1975, the Council reserves the right to make an appointment.

The composition of each region, subject to any minor border adjustments, is:

Region 1 Cheshire, Cumbria, Greater Manchester, Isle of Man, Lancashire, Merseyside.
Region 2 All that part of Humberside north of the River Humber, North Yorkshire, South Yorkshire, West Yorkshire.
Region 3 Hereford and Worcester, Salop, Staffordshire, Warwickshire, West Midlands.
Region 4 Derbyshire, all that part of Humberside south of the River Humber, Leicestershire, Lincolnshire, Nottinghamshire.
Region 5 Bedfordshire, Cambridgeshire, Northamptonshire.
Region 6 Berkshire, Buckinghamshire, Oxfordshire.
Region 7 Greater London south of the River Thames, Surrey.
Region 8 Kent, East Sussex, West Sussex.
Region 9 Cornwall, Devon.
Region 10 Dyfed, Gwent, Mid Glamorgan, Powys, South Glamorgan, West Glamorgan.
Region 11 Clwyd, Gwynedd.
Region 12 Grampian, Highlands, Orkneys, Shetlands, Tayside, Western Isles.
Region 13 Borders, Fife, Lothian
Region 14 Central, Dumfries and Galloway, Strathclyde.
Region 15 Northern Ireland.
Region 16 Essex, Norfolk, Suffolk.
Region 17 Isle of Wight, Channel Islands, Dorset, Hampshire, Wiltshire.
Region 18 Cleveland, Durham, Northumberland, Tyne and Wear.
Region 19 Greater London north of the River Thames, Hertfordshire.
Region 20 Avon, Gloucestershire, Somerset.

Note: The regions in England and Wales are based on the counties as set out in the schedules to the Local Government Act 1972.

The Channel Islands and the Isle of Man are not dealt with by that Act.

The regions in Scotland are based on the county boundaries to become effective on 1 April 1975.

Area Representatives

Not later than Friday 21 February 1975 any five corporate members resident in an Area may nominate any qualified corporate member resident in that Area for the office of Area Representative, by delivering their nomination in writing together with the written consent of such person to accept office if elected, to the Membership & Representation Committee at RSGB headquarters.

An Area is a conveniently sized geographical district, town or group of towns which has at least 10 members.

In the case of London, Area Representatives may be nominated for groups of postal districts. In the case of certain other large towns, Area Representatives may be nominated for groups of postal districts. In the case of certain other large towns, Area Representatives may be nominated on a geographical basis, eg North Birmingham, South-East Manchester.

Ballots

In the event of more than one person being nominated for a particular office a ballot will be conducted, details of which will be published in the April 1975 issue of *Radio Communication*.

Resignations

If, for any reason, an elected representative wishes to resign his office, he should notify headquarters who will advertise the vacancy. Local members cannot automatically appoint another member to undertake the duties of a representative who has resigned.

The Council reserves the right to call upon any representative to resign his office if, in their opinion, he is considered to be unsuitable or unsatisfactory.

YOUR OPINION

The Editor
Radio Communication

Sir—At the risk of flogging some already very dead horses I should like, through the medium of *Radio Communication*, to express my own thoughts and views on our hobby as it is today and as it could be tomorrow.

The commercial-v-home-brew war has been raging for a long time, but the old arguments still apply for and against both sides. Let the other chap do as he wishes—many amateurs just do not have the time to design and build their own station; but I would say this: "How many commercial gear operators actually know what is inside their 'black boxes'?" Amateurs are not the improvise and mend brigade any more; we, and I mean we, are no longer the pioneers and forerunners that we were a relatively few years ago. Unless we are very careful we shall find ourselves with an allocation of land lines after the next ITU Conference.

Perhaps an early warning came with the Class B licence concessions when the MPT gave incentive for people not wishing or not able to pass the morse test to do some useful work in the vhf and above spectrum. Today, few people are actively engaged on such work; the overwhelming majority have congregated on to the lowest frequency band allocated to them—the easiest one to provide equipment for—and spend the whole of their time chatting to each other like a gaggle of schoolboys with a new toy. Let us drop the question of why they do not take the morse test, the simple answer is that they have no desire to! Instead, let us ask the question of why they do not use the concession for the purpose for which it was given. If the answer to that is that they—or anyone else for that matter—do not want to, then I would suggest that we all give up the amateur radio and make better use of the telephone service.

The question of operating manners comes up time and again. We have all heard—and probably suffered—fellow amateurs blasting their way through to a rare piece of dx regardless of who is in QSO with the station at the time. This increasingly common habit is nothing short of just plain bad manners; but then it is always the other chap who is at fault.

The time has come, I feel, for us to take an appraisal of ourselves, to work with and not against each other because in five years time we shall all be fighting for our existence on the bands. It is time to show that the world still needs amateurs to pave the way as we once did with our new ideas and concepts. Time we started to enjoy our hobby once again instead of describing it as a rat race; the more we describe it as one the more it will become one with all the bitterness and bad feelings that go with it.

We must all remember that we have a unique hobby, one with immense potential for furthering the interests of the society in which we live and also one from which it is possible to derive a great deal of enjoyment and pleasure. Let us bring back the true spirit of amateur radio, for there is surely no finer hobby.

S. R. Alderton, G3UXV

The Editor
Radio Communication
Sir—As one who regularly operates from (and pays rates on!) fixed locations in two UK countries, may I protest about the present attempt to wreck our callsign system for the benefit of day trippers. Particularly so when the solution of the problem is so simple. The unique part of a British amateur callsign is not the prefix, but the numeral and the letters which follow it. If a QSL sub-bureau handled, say, *all* prefixes in the series in which the numeral and first subsequent letter lay between 2A and 2G, the problem of changes in prefix would be completely eliminated, as when G2AAA was working under that call, or as GM2AAA/P or GC2AAA/A, all his cards from other operators would end up in the same slot at the sub-bureau. I wish to put this forward as a constructive solution, even although it may mean that I lose the valued services of two of the best sub-bureau managers in the business.

A. D. Taylor, GW8PG/G8PG

The Editor
Radio Communication
Sir—I would like to reply to Mr Pharaoh regarding the "case of the unheard sideband" (November issue).

Much as I distrust statistics, I can, however, quote results from 4m contests entered during 1974. Out of 161 contacts, 49 were on ssb × 2, 36 ssb to a.m., 27 a.m. × 2, 38 cw × 2, and 11 others. In other words, over a third of the phone contacts were on two-way ssb. This does not appear to support Mr Pharaoh's findings; maybe the fact that he did not hear the ssb stations (who *were* there) explains his relatively low scores. It would also seem that he was not active on the band prior to 1974, and that his activities have been confined to three 4m contests and VHF NFD. Most regular 4m operators acknowledge the increasing use of ssb over previous years, both during and between contests. Last year's VHF NFD can hardly be taken as typical (we hope) and in any case it is unwise to draw conclusions from this event without taking into account the "once a year brigade".

With regard to mistaking (?) a.m. for ssb, most operators will agree that tuning with the bfo on makes one realise how many more stations would be readable if they were using ssb or cw.

As far as a mode war is concerned, there is less risk of this on 4m, because all operators can use cw (and in contests most of them do).

It is not as difficult to build ssb gear for 4m as is sometimes made out, nor is a large amount of test gear required. Certainly for those possessing hf ssb rigs the vhf transverter provides a quick and easy way of getting started (as G3OQT's recent article showed).

Finally, I must point out that there has been little "official" encouragement of ssb (or anything else) on 4m compared with that given to the other vhf/uhf bands, although we can well do without the recent gem aimed at 70cm enthusiasts, ie "it only requires the advent of a Liner 2 for 70cm to establish the ssb monopoly of high scores"!

I hope that this letter will be of some interest to those members who have not yet experienced 4m, and that it will allay some of Mr Pharaoh's misgivings.

Ken Eastty, G3LVP (Member, G4KF Contest Group)

The Editor
Radio Communication
Sir—May I offer my congratulations to G8AMU for his superb receiver design, outlined in the October issue of *Radio Communication*. I feel sure that many will duplicate or copy parts of it. The problem, however, is where does one acquire some of the difficult bits; namely a Nikko Denshi B10F12A filter, and D10D30A crystal discriminator, and how much are they roughly? I feel that this is the sort of information which is lacking from nearly all magazine articles (not only in *Radio Communication*). With the all-too-common complaint of amateurs being appliance operators, I feel that lack of information on source of supply is often the main deterrent against the home building of equipment.

E. Taylor, G3YJM/G6AIO/T

The Editor
Radio Communication
Sir—*Radio Communication* is halfway through its 50th year of publication. Its administration and its contents, by a variety of individuals over the years, has done more for amateur radio in this country than anything else that I know of. In this, its Golden Jubilee year, I have noted no words of praise; it has been bereft of thanks from anyone as yet.

I take the opportunity therefore of thanking all who have been concerned with its publication through the years. Can I have a seconder, please?

E. G. Kendall, G3APA

RAYNET

by P. BALESTRINI, G3BPT

Current comment this month is being perpetrated on a "captive audience" by the chairman of the Raynet Committee.

Communications
Communication is our business and yet inter-group and widespread committee/group general communication has proved nearly impossible to maintain at an acceptable level of certainty. Quite apart from the physical problems of editing, production and distributing of the *Raynet Newsletter*, escalating costs of paper, duplicating and postage have combined to price it out of today's market, so that this monthly column is now the main medium for circulating Raynet news in print. It should, therefore, reflect Raynet comment, technical tips and information. Any column or regular feature can only be as good as the information received by the resident scribe, he does not "write by the yard".

Still on the communications theme, the Raynet Committee wishes to encourage local controllers meetings, organized by the controllers themselves, to discuss their individual problems and local user service liaison. It is suggested that these meetings could be held, say, three or four times a year, venue being by common consent. This form of inter-group communication and subsequent recommendations and suggestions to the committee is already in operation in the south-eastern and northern regions.

The future
With the ever-increasing pressure from commercial users on the shrinking resource of "frequency availability", the committee feels that the provision of an emergency service that is recognized by official bodies is a most effective way to counter this pressure and help to preserve amateur allocations, both at national and international conferences when delegates may be hostile to the amateur service, thinking that there may be no return from their investment in frequency availability.

The committee will continue to work towards having some of the restrictions in the licence relaxed to enable members of Raynet to provide communications for the police, fire and ambulance services at the request of these organizations, even when no real disaster is upon us. For example, at county shows or other large public functions (this will help to bring the radio amateur into the eye of the public). Without user services members would only be carrying out an academic excercise in communications.

Efforts are being made to attract younger people to membership of Raynet, in the interests of the whole of the amateur radio movement. This encourages self-discipline and acceptance of discipline in the personal sense, as well as training in sound operating procedures and tolerance towards other users of our bands. As has been said before "Raynet is the only way in which the radio amateur can use his knowledge and expertise as a service to the community". This sense of service is never far below the surface of radio amateurs; to harness and encourage this sense of service can only be for the good of amateur radio and to the credit of the RSGB.

Noticeboard
The Raynet Committee for 1975 will be G3BPT and xyl, G3IIR, G3PAZ, G3MBQ, G3GJW, G2UK, Ron Bassett, and new member M. J. Barker, G8CAC, to whom we extend a hearty welcome.

Although at short notice, the Raynet net on 80m (3,610kHz or thereabouts) got off to a good start on the first Monday in December with some eight group stations being logged at G3BPT. We look forward to the future success of this net.

There appears to be some slight confusion regarding junior members: the *Manual* quotes "... persons under the age of 16 maybe accepted subject to the written permission of parent or guardian and with the agreement of the local Raynet officers".

The supplies officer reminds new members that she has armbands, lapel badges, car window stickers, manuals and headed notepaper available.

In conclusion, both personally and on behalf of the Raynet Committee, I wish all members and families a happy New Year and "thank you for all your good work and continued interest".

Your regular scribe takes up his quill again next month. □

CONTEST NEWS

NFD 1975 rules

1. The general rules for RSGB hf contests, published in the January 1975 issue of *Radio Communication*, will apply. The provisions of General Rules 4b and 8 are amended by NFD Rules 7 and 13 respectively.

2. Applications. Each group intending to compete must send in a properly completed application form to the RSGB HF Contests Committee, c/o A. Davis, 41 Gainsborough Road, Crawley, Sussex RH10 5LD, not later than 30 April 1975. Application forms are available from RSGB headquarters (ask for Form HFC 10/75); entries made other than on those forms will not be accepted.

The information required on the application form includes the following:

(*a*) Callsign of station(s).
(*b*) Name and address of the RSGB member responsible for the entry.
(*c*) Exact site location six figure National or Irish Grid Reference. In addition, entrants are required to give full site access information to enable a site to be located by station inspectors who may not be familiar with the district. Incorrect or inadequate information may be grounds for disqualification.

3. When. From 1700gmt Saturday 7 June to 1700gmt Sunday 8 June 1975.

4. Eligible entrants. All clubs, affiliated societies and RSGB groups within the prefix zones G, GC, GD, GI, GM and GW. NFD is a multi-operator contest as provided for in General Rule 5b.

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

6. Sections.

(a) Double station. Each competing group must operate two portable stations; the one using the lowest frequency shall be called the "A" station, and the other the "B" station.

Each "A" station may operate on a maximum of three of the above bands; and up to three of the remaining bands may be allocated to the "B" station.

The "A" and "B" stations need not be operated from the same site provided that they are located within the same RSGB region.

(b) Single station. Each competing group must operate one portable station on one or more of the above six frequency bands.

7. Apparatus. General Rule 4b applies, and in addition the site must not be used for any portable activity for the seven days prior to the contest.

8. Aerials. No part of any aerial shall be higher than 45ft above the ground.

9. Equipment.

(*a*) Only one transmitter and one receiver, or one transceiver, may be used at any one time at each station.

(*b*) Monitoring stations, ie stations specifically nominated to observe and report on band conditions, activity, etc during the contest for the benefit of competing stations, are not permitted.

10. Power. The valve(s) energizing the aerial shall have a total maximum rated anode dissipation not exceeding 13·5W.

When semiconductor devices are used, the total maximum rated dissipation (at an ambient temperature of 25°C) of the device(s) energizing the aerial shall not exceed 35W. Manufacturers' published ratings only will be accepted for this purpose.

11. Scoring. Points will be scored as follows:

(*a*)	Fixed station in the British Isles	1 point
(*b*)	Fixed stations in the rest of Europe including Eire	2 points
(*c*)	Fixed stations outside Europe	3 points
(*d*)	Fixed stations in the British Commonwealth ...	6 points
(*e*)	Portable and mobile stations in the British Isles ...	3 points
(*f*)	Portable and mobile stations in the rest of Europe including Eire	4 points
(*g*)	Portable and mobile stations outside Europe ...	6 points
(*h*)	Portable and mobile stations in the British Commonwealth	12 points

A multiplier of two will be applied to the **TOTAL CLAIMED SCORE** for contacts on the 1·8MHz band only.

12. Group contacts. Points must not be claimed for contacts made by a competing station with members of its own group, whether fixed, mobile or portable.

13. Entries. These are to be in accordance with General Rule 8, 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 claimed must be totalled separately for each band.

(*c*) Entries must be sent to the RSGB HF Contests Committee, c/o A. Davis, 41 Gainsborough Road, Crawley, Sussex RH10 5LD.

Entries sent to RSGB headquarters will not be accepted.

14. Trophies

(*a*) National Field Day Trophy to the group obtaining the highest combined score.

(*b*) Gravesend Trophy to the group obtaining the second highest combined score.

(*c*) The Scottish NFD Trophy to the Scottish group scoring the highest number of points.

(*d*) The Frank Hoosen Memorial Trophy to the group with the highest score on the 14MHz band.

(*e*) The Bristol Trophy to the group having the highest score in the single-station section.

(*f*) Commemorative certificates to the groups having the highest scores on the 1·8, 3·5, 7, 21 and 28MHz bands.

15. 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 that he has contributed the most points to competitors.

16. Inspections. All stations are subject to inspection by nominated representatives of the HF Contests Committee.

These representatives will make every endeavour to interfere as little as possible with the stations' operation, and to assist them entrants should make it easy for the inspectors to see the final stage(s) of the transmitters.

Groups who refuse to allow the inspector to examine their transmitters will be disqualified.

Contest code letters—amendment

In the list of "Code letters for use in RSGB contests" published on page 50 of the January 1975 issue of *Radio Communication*, delete Forth—FRH and add Fife—FFE, and Lothian—LTH.

144MHz Open and Listeners' Contest rules

1600–1600gmt 1–2 March

All entries and checklogs to: VHF Contests Committee, c/o G2HIF, 20 Harcourt Road, Wantage OX12 7DQ.

The following general rules, published in the January 1975 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8a, 9a, 10a, 11–22.

The Mitchell-Milling Trophy will be awarded to the overall leader.

Listeners' contest rules 1–6.

2nd 1·8MHz Contest 1974 results

This event, as keenly fought as usual, was won by D. W. Dalrymple, GM3OLK, using an SB102 and transverter into a dipole at 70ft. In second place was P. F. Linsley, G3PDL, with a modified KW2000B feeding a dipole at 45ft through a Z-match. The winner of the Certificate of Merit for the leading station under 18 years, F. Robinson, G4BJM, is also third overall. His equipment was a KW2000A into a 180ft wire at 50ft.

DX conditions appear to have been quite good, with many Europeans worked and a number of North Americans reported. Not commented on, but noted by the adjudicator, was an ST2 working into Europe.

Comments, including the following, have all been noted. "Recommend 2100 clock time start for all 1·8MHz contests"—G3TLF. "What about an 'Over 65' section?"—GI3JEX. "Mobile, having taken down my 160m dipole"—G4BUE/M. "Suggest extra information, such as NGR, should be exchanged"—G3GC. "Keep the rules simple"—G3ORP. "I feel there is a case for an overseas certificate"—G3XTJ.

A number of logs were received without an official cover sheet or not on RSGB log sheets. Entrants should note that these are available from RSGB HQ on receipt of a large sae. The use of official stationery does help adjudicators, as it saves time spent searching through odd sized pieces of paper looking for information which sometimes is not even there!

Subject to Council approval, the Victor Desmond Trophy will be awarded to D. W. Dalrymple, GM3OLK, who also leads the field for the Maitland Trophy.

Check logs are gratefully acknowledged from White Rose Radio Society, G3XEP; Solway Radio Club, G4BBX; G3LCH, G3RSD, G3XZK, G3ZRZ, OK1FCW, OK2PAW, OK2PEG, OK2PGU, OK3KVE, OL2AQM, OL5AQC, OL6AQP, OL8CCR, OL8CDQ, OL9CBJ.

Posn	Callsign	Pts		Posn	Callsign	Pts	
1	GM3OLK	785		22	GM3KHH	418	
2	G3PDL	757		23	GM3PFQ	411	
3	G4BJM*	725		24	G3GC	404	
4	G3ORP	721		25	G3IGZ	394	
5	G3UBR	713	Op G4BCH	26	G3YRZ	365	
6	G3MXJ	704		27	GW3GWX	358	
7	GW3UCB	687	Op G4BRK	28	G3TLF	338	
8	G3SJE	628		29	G4CWH*	297	
9	G3XSC	627		30	GI3JEX	282	
10	G3XDY	599		31	G3VDF	270	
11	G3JEQ	577		32	G3FJE/A	264	Op G4BWP
12	G3JVJ	561		33	G2BTO	262	
13	G3XTJ	553		34	G4CMY	240	
14	G4BUO*	546		35	G3TPJ	194	
15	G3OUR/A	500		36	G4CZB	178	
16	GM3YOR	485		37	G8QZ	150	
17	G3XWZ	472		38	G4BUE/M	140	
18	G4BMK/A	442		39	G3FVW	138	
19	G3YMC	436		40	G2CIL	136	
20	G3KKQ	434		41	GW3XNS	30	
21	G3KZR	428					

* Entrant under 18 years.
Disallowed—G3SSO, General Rule 8f (late entry).

6th BARTG VHF RTTY Contest results

Posn	Callsign	Points 144MHz	Points 432MHz	Total	QSOs	Best dx (km)
1	DJ1QT/P	49	120	169	11	269
2	DJ8EA	78	—	78	10	380
3	OE1VKW/3	71	6	77	8	368
4	G3OUF	44	—	44	14	145
5	G3NYK	34	6	40	9	153
6	G3PLX	36	—	36	7	208
7	G3RED	35	—	35	7	200
8	G3OZF	33	—	33	11	152
9	G3IIR	25	—	25	9	116
10	DK3QA	15	—	15	3	246
11	HG5KDQ	9	—	9	1	226
12	G8ART	6	—	6	2	80
13	DK1AQ/P	3	—	3	1	80

The following stations were active during the contest and gave points to stations who submitted logs: DC4MW, DC5ZT, DC6AT, DC6OV, DC6IVA, DC9UP, DF1FO, DJ4KW, DJ5BV, DJ6JG, DJ8QL, DK1QC, DK2DRX, DK4AI, DK4LI, DL2XP, DL8VX, OE1HZ, OE1FWA, OE3VXW, G3HXT/A, G3LOU, G3NPF, G3SUY, G3THQ, G3VPC, G3YKB, G4AFQ, G8LT, G8DWA, G8FYH/A, G8HPU.

Generally speaking logging was good but one or two operators made slight errors in distance calculations and corrections had to be made. Some confusion was caused in England by operators using different speeds and the committee will have to consider this when formulating the rules for this year's contest.

Mobile rallies calendar

30 March—White Rose rally, Lawnswood School, Leeds (Junction of A660 and A6120). From 12 noon. Many trade stands, grand raffle, well-stocked canteen, ample free parking, talk-in facilities (to be arranged). Details from G3VTY QTHR.
20 April—North Midlands rally, Drayton Manor Park, Tamworth. Details from G3ZKQ QTHR.
18 May—Amateur Radio Mobile Society rally, London.
18 May—Northern Mobile Rally, Victoria Hall, Keighley, Yorks.
25 May—Maidstone trade exhibition and rally, "Y" sportscentre, Melrose Close, off Cripple Street, Loose, Maidstone. GB3YSC talk-in on 160, 80ssb, and 4 and 2m multimode. Details from G3WXL QTHR (trade) and G3ORP QTHR.
1 June—RNARS rally, *HMS Mercury*, near Petersfield, Hants.
29 June—City of Bristol RSGB Group rally, Longleat House, near Warminster.
20 July—Cornish RAC rally, Cornwall Technical College, Pool, Camborne. (Provisional.)
24 August—Torbay ARS rally.

Contests calendar

8-9 February —1st 1·8MHz (Rules in January issue)
15-16 February—ARRL DX CW
22-23 February—French Phone
1-2 March —144MHz Open and SWL (Rules in February issue)
1-2 March —ARRL DX Phone
8-9 March —BERU (Rules in December issue)
15-16 March —ARRL DX CW
5-6 April —70MHz Open and SWL
12-13 April —EEC DX
13 April —80m Low Power
27 April —1,296MHz Open
4 May —432MHz Open and SWL
31 May-1 June—144MHz Portable
7-8 June —HF NFD (Rules in February issue)
22 June —Microwave
28-29 June —Summer 1·8MHz
5-6 July —RSGB VHF Open and SWL (Jubilee)
12-13 July —SSB Field Day
27 July —144MHz QRP
9 August —70MHz Portable
6-7 September—VHF NFD and SWL
14 September —80m Field Day
4-5 October —RSGB UHF Open and SWL
11-12 October —21-28MHz
18-19 October —7MHz CW
1-2 November —144MHz Open
1-2 November —7MHz Phone
8-9 November —2nd 1·8MHz
16 November —432MHz Open
7 December —144MHz Fixed

OBITUARIES

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

Mr H. Andrews, G5DV
Harold Andrews died on 12 December aged 77. He was an active member of the Weston-super-Mare RS, his call being used by that society in contests, and he was well known as a result of his hf cw operation.

Mr C. H. Edlin, G3QC
Harold Edlin died at the age of 67 on 30 November. He was interested in radio from its earliest days and since retirement had been active on 2m and with constructional projects. During the early 'fifties he jointly held the world record of a 1,200MHz QSO over 100 miles, and he also operated on 2,400MHz over the same period.

Mr J. J. Fleurbaey, ON4ZA
Joe Fleurbaey died in mid-December. He was known to many fellow-members of RSGB as a result of 40 years' activity on 80m and many visits to this country. His "deep bass voice" will be missed.

Mr F. H. Warren, G3TPC
Sid Warren died in November. He was a disabled member of the Weston-super-Mare RS and interested in all modes.

Mr S. W. Watts, G3FWW
Sid Watts, another member of Weston-super-Mare RS, also died in November. He was a keen 2m operator and his voice was well known in the Burnham-on-Sea area.

Mr C. Wileman, G2HDK
Cyril Wileman died on 6 November aged 67. He was an accomplished cw operator and up to a few years ago his voice was always to be heard on top band. He helped many amateurs in the Northampton area to obtain their licences.

We have also been advised of the deaths of:
Mr A. A. Houchin, G3GZ, of Slough; and
Mr E. G. Levey, BRS34644, of Tunbridge Wells, in June 1974.

MEMBERS' ADS

These subsidized flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed in each issue of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 40p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

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

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way.

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.

Members are advised to enclose a stamped addressed envelope when replying to advertisements.

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

FOR SALE

Eddystone 940 in exc cond. Must sell, hard up OAP, £105 or very near offer. J. Penberthy, 162 Hills Road, Cambridge CB2 2PB.

Sentinel 144–146MHz converter 4–6MHz i.f. mint cond, £12. 2m pre-amp never used, £5.50. Joymatch tuner as new, £8. Damaged vfo, £5. Trevett, 10 Moor Road, Broadstone, Dorset, Tel Broadstone 3400.

BC107 transistors ex-brand new equipment, long leads, money back if not satisfied, 25 for 70p or 100 for £2.50. AM10B Cambridge modded for 2m less xtals, £20. G8BYL, QTHR.

Geloso front end requires attn, offers. Class D wavemeter, £2.50. PM70 phasing harnesses, £1.25 each. G8ATD, QTHR.

HW-101 Heath tx/rx spkr and psu, Shure mic, complete station only £125. Also SB102, SB600, HP23B tx/rx, ssb and cw filters, £240. Cost over £345 new. All first-class cond. G3WY, QTHR. Tel Evesham 45497.

Wharfedale 9ft³ sandfilled corner panel with W12 FS spkr also 4ft³ bass reflex cabinet with 10in "Golden" spkr. Also ARRL *Radio Amateur Handbook* 1971. Any reasonable offer. Chorley, 6 Calton Road, New Barnet, Herts EN5 1BY.

Admiralty B40C, mint cond, orig ext spkr, connectors, mounting rack, manual, trimming tool, £42. Hickok valve tester, US military model, mint, test data, adapters, £16. HRO g/c and b/s coils, sae list. *Wanted*: HRO500 or Collins digital rx. G3GUU, QTHR.

HR10B, £45. 160 twin tx, £15. T28, £12. 160 cvtr, £10. AR22 beam rotator, £20. *Wanted:* Gen cov rx. GW3COI, Penrhynbach, Bwlchtocyn, Pwllheli, Gwynedd.

Squire Electronics 144MHz converter, i.f. 28–30MHz, £10. 160m mobile a.m./cw tx with inverter and control box, £10. DX-100 and SB-10, offers? *Wanted:* KW Ezee Match, KVG XF-9B filter or SEI equivalent. Russell, 13 New Road, Bolter End, High Wycombe HP14 3NA. Tel 0494 882108.

KW2000 with ac and dc power supplies, £115 ono. G3MKR, QTHR. Tel 0625 26126.

AM10B/2m Cambridge, 6 channels 12·5kHz, 12–24V, control box, cables, two rx xtals, one tx xtal, Anteck ½ aerial, slim mic, exc cond, £29. Ex-WD multimeter, wkg cond, £3. QQZ03-20, £1. B44 mk3. xtal on 4m, vgc, offers. *Wanted:* FL50B tx. D. Crompton, Hilltop, North Road, Carnforth, Lancs.

Collins S-line 75S3B rx, 32S3 tx with psu, 30LI linear with four 872Bs, 312B4 control unit with wattmeter, complete package, £725. G3GIQ, QTHR. Tel 01-567 6389.

Philips cctv camera LDHO 050/03 with Schneider lens, focus 6in to infinity, 625 lines, mains and 12V inputs, 1V video and rf outputs, new with handbook, £120. Mint FRDX400S deluxe with SP400, £160. AR88D, £35. Offers to F. J. Crisp, 27 Market St, Falmouth, Cornwall. Tel 311094.

Pye Bantam HP1AM modified to 2m with xtals for 144·35MHz, offers. RS 3W stereo amp, professional appearance, £10. G8BTY, QTHR. Tel 0823 87247.

Datong rf speech clipper, 1 week old. Mosley TA31 20/15/10m rotary dipole. G whips 160 to 10m. Tavasu 160m whip. 2m 14-el Parabeam. G3XVF, QTHR. Tel Norwich 56782.

HRO with psu and five gen cov coil packs, good clean cond and wkg, £22 ono. *Wanted:* Teleprinter 7B, 7E, 54 etc. G4COU, QTHR. Tel Markfield 2525.

Yamaha cassette tape recorder type TB700 with Dolby recording system, complete with handbooks, chrome tapes etc, mint cond, £75 ono. Tel Littlehampton 6161, ext 55 (daytime).

LA600 linear 80–10m, £35. Tempo One ssb tx/rx (FT200 for USA market), complete with handbook and two spare final tubes and matching mains psu, £140. *Wanted:* R1155 tuning knob and grub-screw. G3JFC, QTHR. Crayford 22489.

Pye Westminster W15AM on 2m. Ferrograph 634, 4 track tape recorder, very little used. FT101 mk1. 18AVT. Leak mono Trough Line tuner. Leak 30/30 stereo amplifier. All in exc cond. Offers to G4AOI, QTHR. Del reasonable distance.

C45 23–38MHz tx/rx fm, 12V psu, with details, £28. B44 tx/rx ideal 4m, £9. Pye Vanguard nearly on 145MHz, £12. Command rx 190–550kHz, £4.50. Hi and lo Pye receivers, £3 each. McCarthy, Southend 711742.

Eddystone EA12, vgc, £120, buyer listen and collect. Down, 95 High Street, Henlow, Beds. Tel 0462 812253.

6-over-6 2m Jaybeam, with balun, aluminium mast, 2m odds, mobile psu, 12V input, various ac supplies, sell or would exchange for compact mains tape recorder. *Wanted:* Decent dynamic fist mic. Brewer, 28 Hillcrest, Downham Market, Norfolk.

Xtals 145MHz rx, 51·9MHz ie (51·9 × 3) —10·7 = 145, HC6U, 60p incl pp. Also other freqs near 145MHz, eg 51·8916(144·975), 51·8333 (144·8), 35p incl pp. SAE for list and free sample. J. B. Hodgson, 234 Gillingham Road, Gillingham, Kent ME7 4QT.

Regulator 6–24V with 0–2A current limit, £2. Klystron 723A/B, £3. 100mH 1·6A choke, 75p. British Standards electrical subject index, for sorting magazine articles, £1. 100μs delay line, 50p. All post free. Mann, 45 Old School Lane, Milton, Cambridge.

FR400SDX, mint cond, £150. Fielding, 455 Ripple Road, Barking, Essex. Tel 01-594 8992.

Eddystone EC10, mk2, comp with ac pp, £35. TW2 tx comp with pp, mic etc, £10. Quantity of 8MHz FT243, HC6U and 10X xtals, 25p each. G6XD, QTHR. Tel 2611.

Drake 2B, incl Q-mult, spkr, £80. Yaesu tx FL400, few hrs use only, £130. Blower motor 240V ac shaded pole, silent, £2. Buyer inspects and collects tx or rx. G2UZ, QTHR. Tel Leeds 784074.

Eimac 4–65A (2) and bases, boxed, pair, £8. 813 (4), boxed, £3 each. 6L6 (4), £1 each, all unused. Woden UM1, UM3, £2/£4, used. Heath aerial xtals 10X base 500kHz (2), 5MHz (2), £1 each. Post extra. G2BPC, QTHR.

AR88D, recent professional realignment, meter, spkr, superb cond, £50. Also BC1031A Panadaptor and tx 1131. Manuals, full spares for above items. Offers please. G5RW, 47 Wharncliffe Road, Ilkeston. Tel 06072 71933.

Homebrew linear, 80–10m, four pa valves, new, suit KW2000 series, no mods, £45. G2FFM, QTHR. Tel 52441.

Hallicrafter SX101A amateur bands only, bandwidths 500Hz–5kHz, notch filter, nl, S-meter, etc, comp with handbook, circuit, 117V transformer, £55. G3XYK, QTHR. Tel 01-504 7417.

"Bulletins" 1931–1949 comp 10 years with index, £10. Incomplete sets 1941–1971, offers. SAE for detailed list. R. B. McKinty, GI3GTR, 3 Rhanbudy Park, Craigavad, Holywood, Co Down, N Ireland. Tel Holywood 3890.

Microwave Modules 144MHz mosfet converter, 28MHz i.f., unwanted gift, £14 including postage. G8IHI, QTHR. Tel 01-727 7796.

Telefunken 85KL Magnetophon tape recorder, twin track, vgc, £25. G4ADX, QTHR. Tel 021-373 1841 (evenings).

Versatower, telescopic, wall mount, galvanized, comp with winch, 40ft max height, masthead will take CDR44 rotator. Will del 50 miles. J. Doyle, 54 Bryncatwg Road, Cadoxton Neath, Glam. Tel Neath 2942.

Five Newnes "R & TV Servicing" vols 1 to 5. Two Newnes *R & TV Servicing* 1956–57, 1957–58. *2nd Thoughts on Radio Theory, WW*, 1956. *Cal and Measurement of Ind & Cap*, by W. H. Nottage, Wireless Press, 1916, *Radio Designers Handbook*, Australasia Ltd, (pre-war). *PW Service Manual* by Camm, 1940. *Basic Maths for Radio & Elect*, Iliffe, 1957. All clean, offers. John Tye, Inter-Nos, Swanton Morley, Dereham, Norfolk NR20 4NU.

Multimeter, new EP-20KN, £5. Asahi power/swr twin meter, new, £5. ETM2 el-keyer, fb cond, £20. Pair 813s with base, £4. QQV06-40, new, £2. 832, £1. 4in hi-fi spkr, £3. Pair lightweight phones, 50p. Post extra. G2GM, QTHR. Tel Freshwater 2709.

Moving QTH. HQ1 Minibeam, £36. 2m 14-el Parabeam, £8. Both mint cond, 2 weeks use only. FR50B, £45. Datong rf clipper, £36. Europa 2m transverter with valves, £48. Quick heat QQ203/20, £1. Buyer collects. G4BBI, QTHR. Tel Chesterfield 72440, after 7pm.

FTDX401, FP401, FV401 acc as new, £315. 30ft lattice tower, £20. AR40 rotator with 50yd rotator cable, £25. Shure 444 and speech processor, £18. 10 and 15m beam, £25 and extras. G4DOJ/G8GJD, QTHR. Tel 061-437 4716 evenings for details.

100/18kHz converter usb/lsb/cw output, 8¾in panel spkr and psu, £20. Mullard DP13-2 5in crt, £3. 40 miniature panel mounting 2-pole 6-way switches, £2 lot. 3in Rotax 0/300V ac voltmeter, £1. G6HL, QTHR. Harvington, Worcs.

Trio 9R59DS rx mint cond, SP5DS spkr, voltage stabilizer, manual and spare set of valves, £42. P. M. Cleaver, 86 Main Road, Dovercourt, Harwich, Essex CO12 3LH. Tel Harwich 2195.

Portable 16ft mast Jaybeam, as new, £5. Class D No 1 wavemeter, transit case and handbook, £7. B & W 2Q4 ssb phase-shift network, £3. KVG XF9A and xtals, unused, £15. Collect or carriage extra. G3JGO, QTHR.

AM10D Cambridge on 2m, rx fully tunable, exc cond, with one tx xtal, £24 ono. 4m a.m. tx/rx 12V, 3–10 pa, cascode front end, int/remote tune, vol, with one tx xtal, £10 ono. Trio JR60 rx, 0·5–30MHz and 2m, a.m., fm det, prod det, Q-mult, good cond, with manual, £30 ono, carr free. Sanwa transistor and diode tester, leakage, Hfe etc, wkg but no manual, £4. G3SVL, QTHR. Tel Camberley 64330.

30W Cossor base 4m tx, new cond, with xtal, £15. 2m, £16.50. 10W 2m tx similar TW, xtal, psu, mic, nuvistor converter, £10. All components 400W TT21 linear, £24.50. Tavasu mobile aerial 160/80m coils, £6.50. Handbook swr bridges, £1.50. G2HCV, QTHR. Tel 01-954 2960.

FL-2100, one spare 572B, £150. EA12, £130. IC-20 fitted nine channels, ¾λ G-whip, £95. 12V dc PSUs, sae details. G5RP, QTHR. Tel East Hendred 384.

SSTV monitor, homebrew with psu, £60. Spacemark sstv pc boards, £5. Creed 7B teleprinter, 24V with cover and psu £15. G3RDI, QTHR.

Heath Q-mult GD125, £5. Philips battery/mains cassette tape recorder incl 9V-7½V-6V psu and mic, £10. G8AEV converter, 28-30 i.f., £7. SAE for details. Bernard Rhead, 17 Field Avenue, Milton, Stoke-on-Trent ST2 7AN.

Telford TC7 mk2 plus G8AEV converter, exc cond, £35. Walker, G4DIU, 4 Woodcroft Gardens, Lovedean, PO8 9PZ.

KW107 atu, unused, mint cond, £40. 4-250A valves, used but tested OK, £5 each. G3OGQ, QTHR. Tel Warrington 67553.

Property late G6LK. Swan 500CX with TV2B transverter, £200. G3FPD, QTHR. Tel Loxwood 752141.

Yaesu VF401, valve voltmeter CT54 with mains and battery psu, two-tone oscillator, 400W dummy load, Solartron psu AS1165, signal generator type 329, xtal calibrator type CT432, DJ4BG speech processor unit for Yaesu tx. Offers to G3RFG, QTHR.

Property late G4AAP. LG300 tx plus psu, Heathkit gdo GD1U, Heathkit oscilloscope, Class D wavemeter, Pye Cambridge, Racal 80m tx, radio magazines, numerous other items. Contact G3ZAG, QTHR. Tel 01-205 5601 or Mr Stevens, tel 01-952 2172.

Heathkit DX100U tx exc cond, 150W all bands cw/a.m., solid state psu (no other mods), cabinet resprayed in original colour, £40 ono. Buyer please collect. Tel Slepe 8439 (near Huntingdon).

Gen rx Trio 9R59DE, fair cond, with stabilizer, £22. Hovey, 10B Warwick Place, Leamington Spa CV32 5BJ.

Shack clearance: Creed 7B, silence cover, 250V ac. A.M./cw tx homebrew, wkg, OK for bits. 2m Nuvistor converter 4-6MHz i.f., wkg, needs tweaking. Cossor 339 scope. Much other junk. All very cheap, must go. SAE for full list. G3YKR, QTHR. Tel Emsworth 5612.

Shack clearout prior to going vhf. Panda Cub tx, all hf bands, £15 ono. Hammarlund rx, £12. Also various equipment and junk. Call or write to Morris, 10 Heol Gelynog, Yorkdale Garden Village, Beddau, nr Pontypridd, Glam.

Swap all my photo darkroom eqpmt plus 35mm camera system, all film, papers etc in one lot, approx £200 of gear for best offer of radio gear. G3AAJ, QTHR. Tel 01-989 6741. All mail answered.

Microphones: Shure 440, £4; Cadenza ribbon, £3. Philips 3¾ips mono tape recorder E3515, £10. National rf choke R175, £1. Joystick with tuner, £3. 3BP1 with mu-metal shield and base. ZC3141 with base. Offers. G3DOG, QTHR.

FT200, year old, with psu, £110 only for quick sale. Need space, going QRT. G4CGZ, QTHR. Tel 01-679 1378.

Infra-red 12V car ign, suit Ford (Lumenition), offers. *Wanted:* Circuit diag wavemeter Class D No1 mk2 and any gen. Postage refunded, please help. Tel 0691-5730.

Eddystone 840A gen rx, 0·5 to 30MHz, hardly used, good cond, spare valves. Prefer buyer inspects and collects but would del reasonable dist, £30 ono. G8HHI, QTHR. Tel Yateley 871555.

2m fm tx, homebrew QV03-10 pa gives 10W rf, built on die-cast box, £20 ono. Homebrew vswr bridge (75Ω) in die-cast box (less meter), £1. Sangamo 240V hour-meter, 4 digits plus tenths, £2. Transformer 240V i/p 10V at 1A o/p twice, £1.50. G8CHE, QTHR. Tel 01-953 2030, ext 3394, office hours only.

New Grundig 600 rx 510kHz to 30MHz, £25. New masthead preamp, psu, £7.50. Nuvistor 2m converter, psu, £5. Jason Mercury fm tuner, £5. Garrard 210 turntable and plinth, £5. Pye Ranger on 2m rx tunable tx fault, £5. G3IDW, QTHR.

Codar AT5, mains psu, £13. Codar CR70A variable bfo, spkr, £13. Hamgear PM3 160m converter, £6. Class D wavemeter, mains operation, £5. G4AYF, QTHR.

FR400SDX rx 160-2m coverage, SP400 spkr, exc cond, £160. Will del 50 miles of London area. G4DFI, QTHR. Tel 01-304 3991.

AR88D, immac, S-meter, handbook, spare dial, valves, £40. 2m Europa transverter, exc performance, £60. 2m QQV03/20A tx, transistorized modulator and inverter, 12V input, ptt mic, 3 xtals, vxo, smart case, meter, etc, £14. All carriage extra. G8ENI, QTHR. Tel Cheslyn Hay 415374.

Solartron CD1014.3 db scope, dc to 5MHz, exc cond with manual, buyer collects, £45. 8·035MHz xtal, new, for cw segment on FT220 miniature can, 0·005%, £2. 1024 bit auto memory keyer, £45 ono. G3WZT, QTHR. Tel Partridge Green 710565.

Hallicrafters S27 rx, comp 28-144MHz coverage, fm or a.m., needs S-meter, vgc, £16 ono. G8BXM, QTHR. Tel Welwyn 4950.

Heathkit 2m converter for SB300 rx, £10. Heathkit HW17A tx/rx a.m./fm, £55. BC221, calibration book, mains psu, £15. Pye Cambridge AM10D, 12·5kHz spacing, wkg on 145MHz, offers or exchange for 2m fm hand-held portable. G8CJM, QTHR. Tel Medway 47280.

QRT 2m new Microwave Modules tx, a.m./cw, 10W o/p cw 3 xtals, valve tx, 2 converters, sig gens, Channelmaster beam rotator, 4-el Jaybeam, halo, Q max gdo, power supplies, many components, mains tranformers, 8 and 6MHz xtals for 2m. SAE list. G2ANT, 7 Acorn Gardens, London SE19. Tel 01-653 8208.

Grand shack clearance. Wide range of components, transformers, variacs, equipment, transmitters, transceivers, and valves including 810s etc, all reasonable offers considered for the lot, or separate items, from callers by appointment. Experimenters' enquiries worthwhile. G5RM, 50 Palace Grove, Bromley, Kent.

Pye Rangers, high band, less mics, otherwise comp, dash or boot mounting, circuit available, £5 each, carriage extra. Creed 7B pageprinter, mint cond, with psu for motor, £25. G3TPX, QTHR. Tel Darton 2517 (STD 022-678).

KW2000A with ac psu, £140. GW8IMB, QTHR. Tel 0745 53493.

Standard Electrik marine fm (25kHz) radio telephone, 146-174MHz, 10-15W, 6/12V dc, tx/rx solid state, valve pa, £50. Ex-equipment, solid-state exciter module, emission A1, A3, A3h, A3j (lsb), 9MHz filter, size 6 × 3 × 3in, £15. G3JMJ. Tel 073-271 3467.

Microwave Modules 2m converter 14-16MHz i.f., £10. SE-406 swr meter, £3. Hallicrafters CRX-102 portable vhf rx, 144-174MHz, £6. Xtals 7·000MHz, B7G, £2. 9·255MHz and 8·500MHz, HC-6U, 50p each. 8·0555MHz HC-6U, £2, postage incl. G8ILO, QTHR. Tel 03742-6611 (Rayleigh, Essex).

Hallicrafters SX28 Super Skyrider, £20. Lowe I420C 6ch fm monitor rx xtals 145·0, 145·775 R7, £25. Sentinel 2m cvtr 28-30 i.f., £10. Electroniques QP166 hambands front end, £5. G4AFY, 37 Cairndhu Drive, Kidderminster, Worcs. Tel 63358.

Hallicrafters SX101A, hambands plus special band for vhf converters, comp with matching spkr and auto transformer, imported and now offered by original owner, mint cond, £65. *Short Wave Magazine* April 1955 to December 1970 comp, offers. Lowe pulser, £2. Shure 401 mic, £5. G6XY, QTHR. Tel Kenilworth 52679.

Liner 2, £115. FT75, FP75, DC75, FV50B, £145. Pye base tx a.m. wkg on 4m with four xtals, £16. G3WHL, QTHR. Tel Doncaster 23564.

WANTED

RTTY demodulator terminal unit, silence cover for Creed 7B, 19in rack cabinet, reasonable prices paid, will arrange collection. G8GYC, QTHR. Tel Kingsley 88123.
Ferrograph 713. G3THY, QTHR. Tel 01-551 1467.
Orr's "Radio Handbook", say one of the last six editions. Edwards, St Lawrence Rectory, Wolfscastle, Dyfed SA62 5NR.
Timebase type TD42 for Telequipment scope. Handbooks for copying or purchase of Type 88 transceivers and xtal calibrator No 10. G3TBS, QTHR.
FL200 tx. Must be good cond. GM4BDJ, QTHR. Tel Peebles 21219.
Selling your stn? Member has know how but as yet unlicensed. Funds available for (initially), good rx and aerial system. Aerials ultimately suitable tx. Offers, advice, recommendations welcome. Grain, 290 Penn Road, Wolverhampton WV4 4AQ.
Heathkit SB220 linear. Eddystone 888A rx. KW Vespa mk2 or 204 equipment. Must be in good cond. G3YBG, QTHR. Tel Exeter 74607.
SSB tx, 180-240W p.e.p. Please state model, age and price. G3MUT, QTHR. Tel 061-485 1217.
Asahi AS33 Tri-Band beam, dimensions or assembly instructions for photocopy and return. G3CEG, Rhoda's Cottage, Whiteway, Stroud, Glos. Tel Miserden 395.
Rotator suitable for HQ1 Mini-Beam. *For Sale:* Codar PR30X pre-selector, £5. G4BJM, QTHR. Tel Milton Keynes (0908) 72463.
HRO for rebuilding. Must be complete with good dial and drive plus 80m coil. Fair price paid, does not have to be wkg. Power pack not essential. G3XCJ, QTHR.
Cambridge dash mount for case and audio o/p stage. Cond of rest does not matter. Please quote price incl carriage and cond. Cook, Old Lodge, Seven Hills Road, Cobham, Surrey. Tel Cobham 3117.
FT101 mk1 or mk2, would consider FT100. G4BAN, QTHR. Tel 01-882 4288 (evenings).
Urgently req: dash mounting Pye Cambridge 2m comp and wkg, reasonable cond and price. Also bandspread coils for HRO and Class D wavemeter. Tel Welwyn Garden 30241 (evenings/weekends).
432MHz mosfet converter, 28/30 i.f., must be immaculate and low cost. G5NN, QTHR. Tel Winslow 2498.
Elan TA33JR hf beam, why? AR-22R rotor and control box, or similar. SWR meter. 1⅛in swr 500μA meter. Full details please, c/w prices and cond to G4BMG, QTHR.
Heathkit SB610 monitor scope. Please state cond and price. G3ZWW, QTHR, or tel 0621 815027 anytime.
Yaesu FT200 or similar transceiver with or without psu. Offers with price to G8EKN, QTHR.
Woden transformer 1,250-1,000-0-1,000-1,250V 300mA. Aerial base No28 (ZA41843). Valveholder B17, B26A, or B27A. G3IFV, QTHR.
Crystals in the 3,500-3,800kHz and 7,000-7,425kHz range, preferably FT243 type. G3ZCO, QTHR. Tel 78066.
Racal enthusiast requires TA99 and PU99, any cond considered, will collect. Morris, 3 Astley Road, Bradshaw, Bolton, Lancs. Tel Bolton 52384.
Frequency counter, must be perfect, home-constructed considered if really good. Microwave Modules 432MHz with 116MHz output for transverter. 67·333MHz crystal. Antique bc band crystal set. *QST* 1974, 1973, 1972, 1971. G6XY, QTHR. Tel Kenilworth 52679.
RAFARS urgently wish to purchase Labgear LG300 modulator power unit for use with LG300 tx being donated to Cheshire Foundation amateur radio fund. Offers of fully serviceable item please to RAFARS, RAF Locking, Weston-super-Mare. Tel Banwell 2131 ext 206.
Urgent: HRO (any model), HRO coils all ranges, your prices paid, collection may be possible N England, Scotland. All letters answered. Martindale, 20 St Conans Road, Lochawe, Dalmally, Argyll PA33 1AL.
Grid dip oscillator, transistor or valve (not fussy) in good cond. Also scope, not too large, prefer Heathkit or Telequipment. G4BXP. Tel Plymouth 39096.
Converters for 4m and 70cm, 28MHz i.f. Also 2m portable tx. G3KIW, QTHR.
EC10 marine version to buy, or exchange for Mark 1 non-marine. Carlile. Lowestoft 4572.

NEW! Universal R.F. Speech Clipper

INCREASES 'TALK POWER' — ELIMINATES 'FLAT TOPPING'

Easy to install — long battery life

- ★ **Simply connect in series with your microphone lead. Needs no internal connections to your transmitter. Push-to-talk facilities are retained.**
- ★ **Can give increased "punch" or "talk power" comparable to a times-ten power increase, plus improved speech characteristics**
- ★ **Ideal for SSB, AM, or FM.**
- ★ **Advanced circuit uses optimised combination of digital and analogue techniques for long-term reliability and stability.**
- ★ **Seven integrated circuits, one transistor, three diodes.**

£45 + VAT

See August Rad. Comm. for a review of this equipment

DESCRIPTION: The Datong R.F. Clipper brings the unique benefits of rf clipping to any conventional transmitter. It should not be confused with agc-type speech compressors or af clippers. The Datong R.F. Clipper is a complete closed-circuit ssb transmitter and receiver. Amplitude clipping of the internally generated ssb signal (at 60kHz) greatly increases the average-to-peak amplitude ratio of the speech input signal. This is achieved without harmonic distortion.

Price, including delivery by parcel post, only £45 plus VAT. Add 43p for delivery by registered first class mail.

Write or phone for full information, including a copy of the installation and operating instructions.

LOW-IMPEDANCE MICROPHONE INPUTS

To remove any misunderstandings we wish to point out that the Datong R.F. Clipper matches perfectly well into transmitters such as the LINER 2, TRIO TS700, PYE CAMBRIDGE, which have low impedance microphones and low impedance inputs. In fact it matches any commercial microphone/transmitter combination which we know of.

The "minimum external load" of 4K referred to in our data sheet applies only where a transmitter requires the full 400mV pk-to-pk output from the clipper. This is likely to arise only with home-built equipment.

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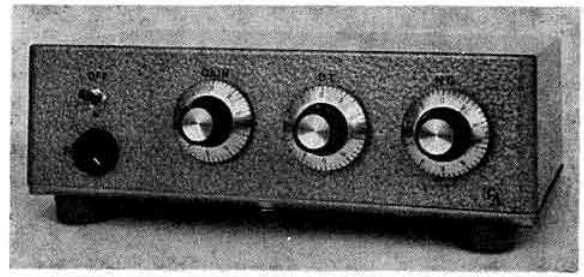

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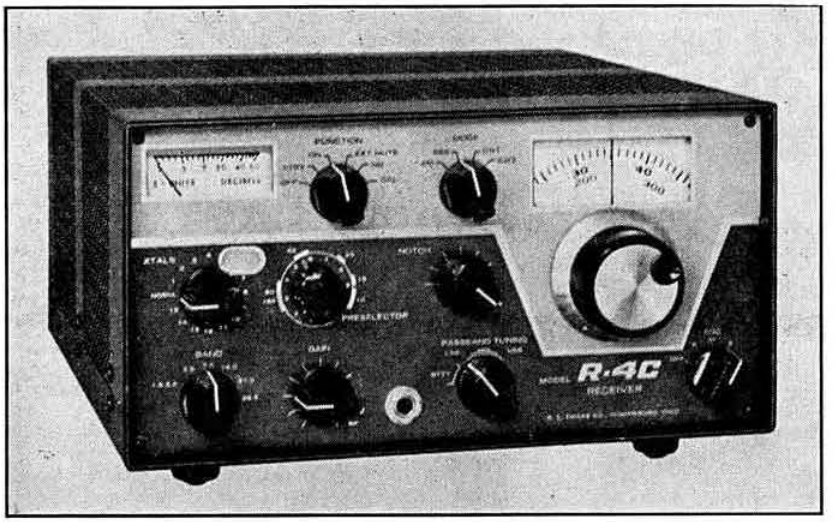

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