March 1985

RADio COMmunication

THE "FIRST LADY" OF THE RSGB

Bob Barrett, GW8HEZ, instals Joan Heathershaw, G4CHH, as the 1985 President

Journal of the Radio Society of Great Britain

Amcomm of London

INTEREST FREE HIRE PURCHASE ON MANY ITEMS

2 YEAR GUARANTEE on MANY PRODUCTS

01-422 9585 FOR FAST DELIVERY

HF TRANSCEIVERS

YAESU FT 980	1299:00
ICOM IC 751	1059:00
TRIO TS 930S	1150:00
YAESU FT 757GX	719:00
TRIO TS 430S	739:00
ICOM IC 745	799:00
YAESU FT 77	499:00

All accessories available for above.
Carriage and VAT included.

2M TRANSCEIVERS FM

YAESU FT 230R 25w mobile	269:00
ICOM IC 27E 25w mobile	289:00
TRIO TM201A 25w mobile	269:00
YAESU FT 208R H/Held 3w	239:00
YAESU FT 209R H/Held 5w	259:00
ICOM IC2E H/Held	169:00
ICOM IC02E H/Held keyboard	239:00
FDK Multi 725× 25w mobile	239:00
YAESU FT 290R	Phone

Carriage and VAT included.

2M TRANSCEIVERS MULTIMODE

YAESU FT 726R 2M/70cms/6M/HF Basic	769:00
ICOM IC 271E 25w base stn	625:00
ICOM IC 271H 100w base stn	799:00
TRIO TR 9130 25w mobile	449:00
MULTI 750XX 20w mobile	349:00

Carriage and VAT included.

70CM TRANSCEIVERS

YAESU FT 790R Multimode portable	259:00
YAESU FT 703 H/Held	T.B.A.
YAESU FT 709 H/Held	T.B.A.
ICOM IC 4E H/Held	229:00
TRIO TW4000A 70/2M mobile	469:00
MICRO 7 3 channel 70cms H/Held	99:00

Carriage and VAT included.

HF/VHF RECEIVERS

YAESU FRG 7700 RECEIVER	385:00
ICOM IC R70	539:00
ICOM IC R71	629:00
TRIO R2000	429:00
TRIO R600	259:00
AR 2001 25/550Mhx ★ STAR BUY ★	325:00
NRD 515	965:00

Carriage and VAT included

AR 2001 Receiver 25/500 MHz

£325:00 inc VAT

add £3:50 carriage

ANTENNA COUPLERS

THP HC200 1.8-30MHz 20w pep	82:95
THP HC400L 1.8-30MHz 350w pep	149:00
THP HC2000 1.8-30MHz 25w pep	T.B.A.
AMTECH 300B 1.8 300MHz 300w pep	54:00
ICOM IC AT500 AUTOMATIC	399:00
ICOM IC AT1000 AUTOMATIC	Phone
YAESU FC 757 AUTOMATIC	245:00
YAESU FC 102 WARC 2Kw	Phone
WELZ AC38 1.8 300MHz	73:95

VAT included. Amtech 300B 1.50 others £6 Securicor.

TELEGRAPH ACCESSORIES

Hi Mound Keys

HK 708 Hand Key with base	13:67
HK 707 Hand Key with base and dust cover	14:48
HK 706 Hand Key with base and dust cover	15:60
HK 702 Key with marble base and dust cover	29:65
MK 704 Dual lever paddle, no base	12:76
MK 705 Dual lever paddle marble base	23:78
COK-2 Practice oscillator	7:99
Swedish Brass	49:00
KENPRO Iambic Electronic Keyer KP100	75:00
KENPRO Iambic Memory Keyer	149:00
DAIWA DK210 Electronic Keyer	50:00

VAT included. Add £1 carriage per item.

HEIL ACCESSORIES

HEIL HC3 Microphone Element	22:85
HEIL HC5 Microphone Element (Icom SM5/6)	25:40
HEIL HM 5 Desk Microphone (300Hz-3KHz) cardoid fwd	59:00
HEIL SS2 SPEAKER ... see page 00	65:00
HEIL EQ300 Mic Equaliser when ordering equaliser state make of rig	65:00

Carriage and VAT included.

SWR/POWER METERS

WELZ SP200 1Kw	82:00
WELZ SP300 1Kw	115:00
WELZ SP400 150w	82:00
WELZ SP15M 200w	41:00
WELZ SP250 2Kw	57:75
TOYO TM1X 3.5 150MHz 120w	18:80
TOYO T430 145/430MHz thru line watt meter 120w	44:65
TOYO T435 145/435MHz thru line watt meter 200w	49:35

VAT included. Add £2 per item carriage.

VHF LINEAR AMPLIFIERS

THP HL30V 0.5-3w in 30w out	39:99
THP HL82V 10w in 85w out	144:50
THP HL110V 10w in 110w out	179:95
THP HL160V 10w in 160w out	244:52
THP HL160V 25w in 160w out	209:73
MML 144/30LS	75:00
MML 144/50S	92:00
MML 144/100S	149:95
MML 144/100HS	149:95
MML 144/100LS	169:95
MML 144/200S	245:00

UHF LINEAR AMPLIFIERS

MML 432/30L	139:95
MML 432/50	129:95
MML 432/100	245:00
THP HL20U 1-3w in 20w out	77:99
THP HL45U 10w in 45w out	152:77
THP HL90U 10w in 90w out	268:59
ALINCO ELH250C	114:95

B.N.O.S. complete range also in stock.
VAT included. Add £2 per item carriage.

Prices correct going to press, E. & O.E. **CLOSED MONDAY** **Goods normally despatched by return.**

Amcomm SERVICES LTD., 194 NORTHOLT ROAD, SOUTH HARROW, MIDDX. HA2 0EN. ENGLAND. (Opp. South Harrow Underground Station) TEL: 01-422 9585. TELEX: 24263

MARCH 1985

VOLUME 61 No 3

RADio COMmunication

All contributions **(including Members' Ads)** and all correspondence concerning the **content** of *Radio Communication* should be addressed to:

The Editor, RSGB,
88 Broomfield Road,
Chelmsford,
Essex CM1 1SS

Tel 0245 84938

Office hours: 0915 to 1715

Correspondence concerning the distribution of the journal and all other Society matters should be addressed to:

RSGB Headquarters,
Lambda House,
Cranborne Road,
Potters Bar,
Herts EN6 3JW

Tel 0707 (from London, 77) 59015

Business hours: 1000 to 1600

CONTENTS

171 **Editorial—RSGB User Report, First Reactions**

172 **RSGB Presidential Installation 1985**
Amateur Radio News

174 **Special Event Stations**

175 **Council Proceedings**
Mobile Rallies Calendar
Other Events
Obituaries

177 **Members' Mailbag**

178 **Amateur packet radio**—Peter Robinson, G3MRX, and Alan Jones, G8WJL

184 **A modulation meter for ssb**—John Stebbings, G4BTV

186 **Critical study of the swr meter**—H Du V Ashcroft, G4CCM

188 **Technical Topics**—Pat Hawker, G3VA

195 **Microwaves**—Mike Dixon, G3PFR

196 **4-2-70**—Ken Willis, G8VR

199 **SWL News**—Bob Treacher, BRS32525

201 **Ephemeris**—Bob Phillips, G4IQQ

202 **The Month on The Air**—John Allaway, G3FKM

205 **HF Propagation Predictions**

206 **QRP**—George Dobbs, G3RJV

207 **Contest News**
Contests Calendar

208 **Club News**

210 **Members' Ads**

Technical articles on subjects of amateur interest are always welcome and should be sent to: The Editor, *Radio Communication*, 88 Broomfield Road, Chelmsford, Essex CM1 1SS.

All articles received are reviewed for technical merit by the RSGB Technical & Publications Committee, or an acknowledged expert on the subject, before acceptance. Payment at high competitive rates will be made for all articles published.

A contribution will only be considered for publication on the understanding that the person submitting it is the original author and owner of the whole copyright, and that on acceptance for publication such copyright will become the property of the RSGB in consideration of the above-mentioned payment by the RSGB to the contributor.

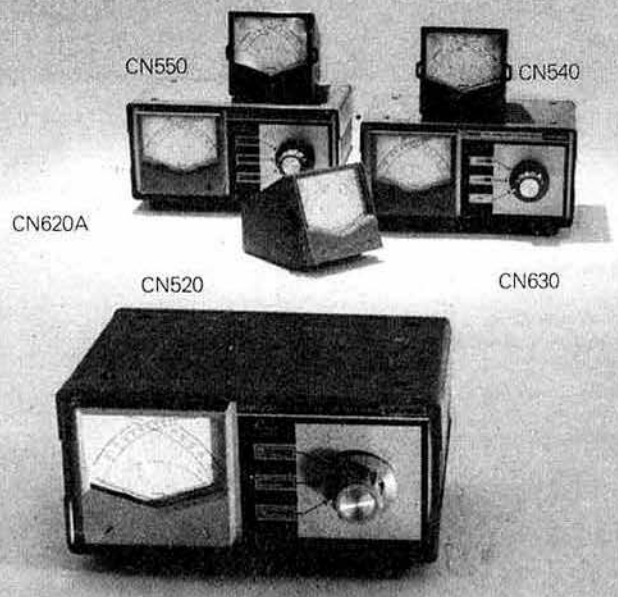
The editor will be pleased to send intending authors a manuscript preparation guide and to give any other advice and assistance requested.

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

ABC MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS 33,778 copies per issue average circulation in 1983

Closing date for contributions unless otherwise notified: five weeks before publication date

for "cross needle" metering, DAIWA



What's so special about "cross needle" metering? Well, it's typically Daiwa to go direct to the heart of the matter and develop a system which will give you the true value of forward power, reflected power, and SWR all at a single glance. The elegant simplicity of the idea hides a great deal of thought, which of course is the hallmark of Daiwa products.

You will see from the photographs that the meter displays have two scales, one reading forward power, the other reflected power. Since SWR is calculated using these two values, Daiwa have arranged the meter pointers so that SWR is shown at the crossing point of the two meter needles.

Why don't other makers use the idea? Basically it's a question of power meter accuracy. The usual type of single or twin meter "SWR/power meter" uses a simple strip line to measure the VSWR on the transmission line. You will note that I have said "VSWR", and this is important. These so-called power meters are in fact only measuring the voltage standing wave and in order to display power, you need to monitor both voltage and current in the line. Daiwa meters of course, do just that, and consequently are very accurate indeed. The cheaper so-called power meters depend for their accuracy in being terminated in a load, and exhibit wild inaccuracy when terminated in a reactive load. In other words, when the indicated VSWR on the meter is other than 1:1, their accuracy is quite badly affected.

To summarise; the Daiwa cross needle power meters give you easy, unambiguous readings at a glance, and what's more those readings are accurate even in lines displaying high SWR, and since Daiwa meters measure true power, they are accurate at any point in the feedline from transmitter to aerial.

As with all Daiwa products, their meters show the Daiwa approach design, combining accuracy, ease of use and interpretation, and that indefinable feel of quality which is the sure sign of a good product. Once owned, never discarded.

CN520	1·8-60MHz		£39.50 inc VAT
A500	mounting bracket for above meters		£2.10 inc VAT
CN620A	1·8-150MHz	up 1kW	£66.21 inc VAT
CN630	140-450MHz	up to 200W	£98.11 inc VAT
CN650	1·2-2·5GHz	up to 20W	£129.50 inc VAT

Carriage on "5" series meters £1.50, on "6" series £2.50.

FREE **RADSOFT** RTTY receive/transmit package with each 32K COLOUR GENIE!

Many radio amateurs, very wisely, have not yet **added a computer** to their shack. Apart from the difficulty of which computer to choose, they consider it **over expensive** to purchase the necessary additional soft and hardware to transmit and receive RTTY, receive only CW, create logging facilities or compute distances between themselves and other radio amateurs. **Things have now changed.** LOWE ELECTRONICS have put together a substantial package which includes **FREE OF CHARGE** with every COLOUR GENIE sold from Matlock, the following:

RADSOFT RTTY FULL RECEIVE/TRANSMIT SYSTEM (afsk) with the following features . . .

Split screen . . . enables incoming messages to be displayed whilst you "type ahead" your reply.

Memory . . . The facility exists to pre-write information for later transmission. The information can be saved to cassette for future use.

Incorporated in to the program are a selection of messages often used by a RTTY operator, eg: **RYRYRYRYRYRYR . . . THE QUICK BROWN FOX . . . QRZ DE** (your call sign), **DE** (your call sign).

Connections could not be easier . . . a cassette is used between the computer and the 3·5mm socket of the supplied terminal unit (hardware). To input an RTTY or CW signal from the receiver requires a lead from the audio output of the rig to the 3·5mm socket of the terminal unit (one 3·5mm jack plug is supplied). Transmit audio is generated inside the COLOUR GENIE, a lead from the computer audio out to the microphone input of your transceiver completes the connections.
The **List price** of the RADSOFT package is **£56.00** inc VAT. With the LOWE ELECTRONIC computer the system is **FREE!**

In addition, purchases of the **COLOUR GENIE** will receive two other programs also **FREE OF CHARGE.** One is a log system enabling up to 700 stations together with their signal report and QRA locator to be stored, ideal for a contest. The second can be used to quickly tell you the distance between yourself and the station you are working. A map of the UK or, for the DX-er, Europe appears on the screen with flashing dots locating yourself and the other station.

Don't be carried away in your enthusiasm for RTTY, **don't forget**, you will own a COLOUR GENIE, a proven 32K home computer. This is a considerable advantage over the dedicated RTTY system. The COLOUR GENIE has a **"proper"** keyboard just like today's electronic typewriters, not indefinite touch pads. It is not a games plaything but is capable of introducing the family to computing. **That's if you'll ever let it out of the shack.**

complete package £168

INCLUDING VAT. CARRIAGE £7.00

LOWE ELECTRONICS LTD.

Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 2817, 2430, 4057, 4995.

send £1 for complete mail order catalogue.

TR9130 TWO METRE ALL MODE TRANSCEIVER

This rig is proof, if one needed it, that TRIO do not bring out new models just for the sake of it. The TR9000 is remembered as a classic rig and today people are still asking for second hand ones. They're even a rarity on our S/H shelf. The TR9130 incorporates the improvements that all amateurs asked for, green display, reverse repeater, tune whilst transmitting, higher power, more memories and of course memory scan. TRIO's answer, the TR9130.
TR9130 . . . **£499.00** inc VAT.

TS780 DUAL BAND BASE STATION TRANSCEIVER

The TS780 is the perfect base station VHF/UHF transceiver for the enthusiastic operator. The rig has all the necessary control functions essential for operating on both today's busy two metre band and the wide open spaces of seventy centimetres. Full repeater facilities plus reverse repeater are included and the transceiver has the usual memory channels (10), two VFOs, up/down frequency shift microphone. IF shift, two priority channels, memory and band scan etc. A superb rig, I have one myself, write for a full enthuse!
TS780 . . . **£981.42** inc VAT.

TR7930 TWO METRE FM MOBILE TRANSCEIVER

Those who have used or owned a Trio TR7800 will know what I mean when I say that Trio, with the introduction of the TR7930 have improved on the unimprovable. The Trio TR7930 improves on the TR7800 by giving a green floodlit liquid crystal display, extra memory channels, both timed and carrier scan hold, selectable priority frequency and correct mode selection (simplex or repeater). The most significant change is the liquid crystal display, but closely following this must be the ability to omit specific memory channels when scanning and the programmable scan between user designated frequencies.
TR7930 . . . **£354.92** inc VAT.

R2000 GENERAL COVERAGE RECEIVER

The amateur bands are only a very small part of the radio spectrum, many other transmissions are available for the short wave listener. Broadcast stations provide an alternative source of current information both political and regarding the life style of the country. Fitted with the internal VHF converter the R2000 covers continuously frequencies from 118 to 174MHz giving access to amateur two metre transmissions (am, fm, ssb and cw) plus a lot more. Having 10 memories, memory scan and programmable scan the R2000 provides in one rig the perfect receiver.
R2000 . . . **£479.47** inc VAT.

TS930S HF TRANSCEIVER WITH GENERAL COVERAGE RECEIVE

Much has been said about the TS930S transceiver and it now has a place high in the affection of those amateurs fortunate enough to own one, indeed it has become the "flagship" of the TRIO range. Providing full amateur bands plus a general coverage receiver (150kHz to 30MHz), the TS930S has every conceivable operating feature for today's crowded frequencies.
TS930S . . . **£1350** inc VAT.

TR2500/TR3500 HANDHELD TRANSCEIVERS

Two first class hand held transceivers, one for two metres and the other for seventy centimetres. Ten memory channels, band and memory scan, repeater shift, reverse repeater and a low power position make the rigs extremely useful for the radio amateur who wishes to keep in touch with his local scene. A comprehensive range of accessories, base station charger, speaker microphone, mobile mount etc, can be added to enhance operation, accessories used with one rig being compatible with the other.
TR2500 . . . **£270.47** inc VAT.
TR3500 . . . **£291.85** inc VAT.

TS530SP HF AMATEUR BAND TRANSCEIVER

A logical progression from the reliable TS520 series the TS530S was the most popular HF rig in the range. I use the term "was" because TRIO decided to cease production and supplies were no more, however the demand from radio amateurs worldwide for the transceiver have continued and TRIO have reintroduced the rig. A standard HF valve transceiver without the frills but providing today's amateur with all necessary facilities for reliable worldwide communication, the TRIO TS530SP now with notch filter.
TS530SP . . . **£735.11** inc VAT.

just a part of the range

The following TRIO models although not shown are still current and available.

TS930S	£1350.00	TM211E	£396.08
TS780	£981.42	TS130S	£633.06
TR3500	£291.85	TR2500	£270.47
TR7930	£354.92	TM401A	£340.68
TS530SP	£735.11	TM411E	£452.58
TR9130	£499.00	R2000	£479.47
TM201A	£309.95		

All prices include Vat. Carriage £7.00

LOWE ELECTRONICS LTD.

Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 2817, 2430, 4057, 4995.

send £1 for complete mail order catalogue.

EMPORIUM NEWS

Good Morning

On a different **tack** this month, I have put together a **comprehensive** Price List for your information. Take a look at the **TRIO** accessories, most of which are **in stock** here at Matlock. By dealing with Lowe Electronics, not only do you have access to first class service facilities, but we also hold those **rarer** items; for example, as I write we have **eight** SO1 temperature compensated oscillators in stock for the TS930S—not an item that is sold every day but reassuring to know on the off chance that one day you may want one.

This same policy applies throughout our range. You will see that not only do we have the transceivers but we stock those other bits and pieces that complete the station. **Now please read on.**

		Inc VAT £	Carr £
TRIO EQUIPMENT			
TS930S	160-10M transceiver	1350.00	7.00
AT930	Automatic ATU 80-10M	165.13	7.00
SP930	External speaker with filters	69.13	2.50
SO1	Temperature compensated oscillator	161.28	1.00
YK88A1	6kHz AM filter	38.94	1.00
YK88C1	500Hz CW filter	38.94	1.00
YG455C1	500Hz CW filter	89.98	1.00
YG455CN1	270Hz CW filter	106.41	1.00
TS430S	HF transceiver 160-10m	769.50	7.00
PS430	Mains PSU for TS430S	145.00	7.00
SP430	Matching speaker for TS430S	39.50	2.50
AT250	Automatic ATU for TS430S	305.01	7.00
MB430	Mobile mounting bracket for TS430S	13.17	2.00
FM430	FM option unit for TS430S	45.00	1.00
YK88A	6kHz AM filter	38.94	1.00
TS830S	160-10m transceiver	832.75	7.00
VFO230	Digital VFO	283.60	7.00
AT230	All band ATU and power meter	157.99	7.00
SP230	External speaker with filters	47.73	2.50
DS2	Optional dc pack for TS830S	58.14	1.50
YK88C	500Hz CW filter	37.31	1.00
YK88CN	270Hz CW filter	43.33	1.00
YG455C	500Hz CW filter	87.78	1.00
YG455CN	250Hz CW filter	68.00	1.00
SM220	Station monitor scope	243.02	7.00
KB1	Deluxe knob for TS830/530 series	12.06	1.00
TS530SP	160-10m transceiver	735.11	7.00
VFO240	External VFO	99.76	7.00
TS130S	8 band 200W pep mobile transceiver	633.06	7.00
TL120	200W pep linear for TS120/130 series	195.29	7.00
MB100A	Mobile mount for TS120/130 series	20.56	2.50
YK88SN	1·8kHz SSB filter	37.86	1.00
SP120	Base station speaker	30.74	2.50
SP40	New mobile speaker unit	16.46	1.00
AT130	100W aerial tuner	108.62	2.50
MA5	TRIO 5 band mobile aerial system	123.44	7.00
TL922	160-10M 2kW linear. 3-500Z tubes included	1150.00	7.00
MC50	Dual impedance desk microphone	36.19	2.50
MC60N4	Desk microphone	59.79	2.50
MC60S6	Desk microphone with up/down shift	59.01	2.50
MC60A	Desk microphone with built in pre amp	65.29	2.50
PG4	Mic lead for MC60A 4, 6, or 8 pin	7.50	1.00
MC80	Electret desk microphone with UP/DOWN	42.80	2.50
MC85	Desk microphone with Audio Level Compensation	85.03	2.50
MC35S	Fist microphone 50k impedance	17.01	1.50
MC40S	Up/down microphone for TR9000/7800	15.35	1.50
MC42S	Up/down hand microphone for TS930S	17.56	1.50
MC55	NEW mobile microphone	43.87	2.00
LF30A	HF lowpass filter. 1kW rating	24.68	2.00
TS780	2M/70cm all mode transceiver	981.42	7.00
SP71	Speaker for all TS700 series	39.51	2.50
BU1	Backup battery case	9.22	0.75
TR9130	2M multi mode mobile transceiver	499.00	7.00
BO9A	Base plinth for TR9130	54.29	2.50
TS670	All mode transceiver 6, 10, 15 & 40M. 10W	751.57	7.00
GC10	Gen. cov. rec. unit for TS670. 0.5-30MHz	57.04	1.50
TR9300	6M multi-mode transceiver similar to 9130	569.97	7.00
TH21E	2M FM Micro transceiver	188.46	7.00
BT2	Dry battery case for TH21E/41E	9.89	0.75
DC21	DC power supply for TH21E/41E	20.85	0.75
EB2	External battery case for TH21E/41E	15.92	1.50
HMC1	Headset unit with VOX for TH21E/41E/2600/3600E	27.43	2.00
PB21	Ni-Cad battery pack for TH21E/41E	20.31	1.50
SC8	Soft case for TH21E/41E	9.89	0.75
SMC30	Speaker microphone for TH21E/41E/2600/3600E	23.60	1.00
TR2500	2M FM synthesized handheld	270.47	7.00
VB2530	30W amplifier for TR2500	81.21	2.50
ST2	Base stand and quick charger	60.36	2.50
SC4	Soft case and belt hook	15.92	0.75
MS1	Mobile stand and power unit	37.31	2.00
SMC25	Speaker/microphone	18.66	1.00
PB25	Spare Ni-Cad battery pack	29.10	1.50
BT1	AA size manganese battery case for TR2500	6.59	0.75
DC25	DC power supply for TR25/3500 from 12 volts	17.77	1.00
TR2600E	2M FM transceiver with DCS	295.69	7.00
BC2	Charger for TR2600/3600E	12.06	1.50
DC26	DC/DC converter for TR2600/3600E	21.38	1.50
EB3	External battery case for TR2600/3600E	15.92	1.50
PB26	Ni-Cad battery pack for TR2600/3600E	33.44	1.50
SC9	Soft case for TR2600/3600E	20.31	0.75
TM201A	2M FM mobile transceiver	309.95	7.00
FC10	Remote display for TM201A	46.08	1.50
TM211E	2M FM transceiver with DCS	396.08	7.00
TR7930	Mobile 2M transceiver	354.92	7.00
TW4000A	2M/70cm FM mobile transceiver	536.51	7.00
MA4000	2M/70cm dual band antenna with diplexer	38.41	2.50
VS1	Voice synthesizer for TW4000A	26.88	1.00
SP50	Mobile speaker as used with the TM210A etc	16.46	1.50
TS711E	2M base station multimode transceiver with DCS	831.77	7.00
CD10	Callsign display unit for DCS system	115.76	1.50
AC10	A/C adapter for CD10	14.81	1.50
TH41E	70cm FM micro transceiver	214.50	7.00
TR3500	70cm handheld transceiver	291.85	7.00
TR3600E	70cm FM transceiver with DCS	314.87	7.00
TM401A	70cm FM transceiver 12W output	340.68	7.00
TM411E	70cm FM transceiver with DCS	452.58	7.00
TS811E	70cm Base station multimode transceiver with DCS	964.97	7.00
MB2	Mobile mount for TR2300 and VB2300	10.50	2.00
RA1	Rubber flexible antenna for TR2300 or TR2200GX	4.22	0.75
RA3	Telescopic whip antenna for TR2500 or TR2400	10.96	0.75
RA4	Rubber flexible antenna for TR3500	9.89	0.75
RA5	Telescopic whip antenna for TR2500/3500	15.35	0.75
PL1	Spare power/charge lead for TR2300/3200/2200 series.	1.30	0.50
R600	Synthesized GC receiver 150kHz-30MHz	299.52	7.00
R2000	General coverage receiver	479.47	7.00
VC10	VHF converter for R2000 118-174MHz	128.36	2.50
HS7	Miniature headphones	12.60	1.00
HS6	Ultra light headphones	19.21	2.00
HS5	Headphones	26.88	2.00
HS4	Economy communications headphones	13.71	2.00
MJ86	8/6 pin mic adaptor, also MJ84, MJ68, MJ64, MJ48, MJ46.	5.50	1.00
SW100A	SWR/power meter 1·8-150MHz	41.69	2.50
SW100B	Mobile SWR/power meter 140-450MHz	41.69	2.50
SW200A	SWR/power/pep meter 1·8-150MHz	89.98	2.50
SW200B	SWR/power/pep meter 140-450MHz	89.98	2.50
SWC1	Optional coupler for SW200 1·8-150MHz	24.68	1.50
SWC2	Optional coupler for SW200 140-250MHz	24.68	1.50
AL1	Lightning and static protector 100W SO239	26.35	1.00
AL1N	Lightning and static protector 100W N	31.81	1.00
AL2	Lightning and static protector 1kW SO239	31.81	1.00
PG3A	Mobile transceiver DC line filter	8.25	1.50
SWT1	2M antenna tuning unit	31.81	1.50
AX2	Shoulder strap antenna	23.60	1.50
JRC EQUIPMENT			
NRD515	Synthesized HF monitoring receiver	965.00	7.00
NHD518	Multi channel memory unit for NRD515	264.00	7.00
NCM515	Remote frequency controller	169.75	7.00
NVA515	Matching loudspeaker unit	45.41	3.00
CFL260	600Hz CW filter for NRD515	56.72	1.00
CFL230	300Hz CW filter for NRD515	78.53	1.00
JST100	Synthesized 160-10M transceiver	998.00	7.00
NBD500G	Matching PSU for JST100	181.35	7.00
NVA88	Matching speaker for JST100	44.19	3.00
NFG97	ATU/SWR/power meter for JST100	150.00	7.00
OTHER 2M PORTABLES			
LS20XE	2M FM synthesized pocket transceiver	139.00	2.50
SH2	Headset with boom microphone	21.85	1.50

LOWE ELECTRONICS LTD.

Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 2817, 2430, 4057, 4995.

send £1 for complete mail order catalogue.

		Inc VAT £	Carr £
CS612	Mobile 12V charger for LS20XE	6.90	1.50
SH1	External speaker/microphone	14.95	1.50
SFT20	Soft case for transceiver	4.80	0.50
AAA	Ni-Cad batteries (4 required)	1.32	0.50
CP615	External battery pack (no batteries)	10.21	1.50
LS202E	2M SSB/FM handheld transceiver	195.01	7.00
LA207LU2	Mobile mount and linear amplifier	118.00	3.50
LA207	Mobile mount with provision for linear amplifier	86.94	3.50
NP6	Standard Ni-Cad pack	26.90	1.50
NP9	High power Ni-Cad pack	36.94	1.50
SFT207	Soft case for transceiver	4.80	0.50
AN2	Quarter wave telescopic whip	8.07	0.50
CA910E	AC charger for NP6	10.15	1.50
CA110E	AC charger for NP9	10.50	1.50
DBC	Spare dry battery case for LS202E (no batteries)	6.90	0.75
CHT	Charger terminal to allow Ni-Cad packs to be charged off rig	3.39	0.50
MX2	2M SSB handheld transceiver	69.20	2.50
RX22	Special 9V Ni-Cad for MX2/4	4.68	1.00
CH122	Special charger for above Ni-Cad	8.50	2.00

VHF/UHF MONITOR RECEIVERS AND SCANNERS

SR1000E	DAIWA 1000 channel PLL receiver 144-154MHz	96.04	2.50
AR2001	Scanning receiver 25-550MHz continuous coverage	378.01	7.00
IF232C	RS232 interface board for computer control of AR2001.	195.00	2.00
MB2001	Mobile mounting bracket for AR2001	8.40	1.00

KEYS AND KEYERS

CW3	Self contained morse oscillator	9.80	1.50
HK708	Straight key. Ball bearing pivots	16.30	2.50
HK702	Deluxe version of above on marble base	31.03	3.00
MK704	Squeeze paddle	15.40	1.50
EK150	Electronic keyer. Built in sidetone	103.48	3.00
MK1024	Electronic keyer with 1024 bit memory	185.52	3.00

ROTATORS. . . DAIWA

DR7500R	As for DR7500X but using round controller	153.67	7.00
DR7600X	Heavy duty. Preset control	189.37	7.00
DR7600R	As for DR7600X but using round controller	213.41	7.00
KS065	Bearing for fixing stays to rotating mast	27.30	3.00
KR500	Elevation rotator (not Daiwa)	144.90	7.00

DAIWA POWER and SWR METERS

CN410M	3·5-150MHz mobile cross needle power/SWR meter	48.00	1.50
CN460M	140-450MHz mobile cross needle power/SWR meter	52.00	1.50
CN520	1·8-60MHz mini cross needle power/SWR meter	39.50	1.50
CN500	1·8-60MHz mini cross needle power/SWR meter	19.50	1.50
A500	Fixing bracket for CN500 series	2.10	0.30
CN620A	1·8-150MHZ cross ptr pw/SWR meter. Up to 1kW	66.21	2.50
CN630	140-450MHz cross ptr pw/SWR meter. Up to 200W	98.11	2.50
CN650	1·2-2·5GHz cross ptr pw/SWR meter. Up to 20W	129.50	2.50
CNW419	1·8-30MHz 200W general coverage tuning unit	159.64	7.00
CNW919	2M power meter and antenna tuning unit	104.99	3.00
CNW518	3-30MHz 8 band hi power tuner cross needle pointer	233.09	7.00
CL680	1·8-30MHz 200W general coverage ATU (100W at 1·8MHz)	81.50	3.00

DAIWA POWER SUPPLY UNITS

PS300	PSU 30A max 22A continuous	176.80	7.00
PS120M	PSU 3-15V variable 12A maximum	87.33	7.00
PS80M	PSU 3-15V variable 8A	72.68	3.00
PS50M	PSU 9-15V variable 5·6A	55.91	3.00

DAIWA ACCESSORIES

AF606K	All mode active filter. PLL system with incredible performance	69.50	2.50
LA2035	2M lin amp, very small. 0·5-3W/30W at 13·8V	56.00	2.00
LA2155	2M 150W SSB/CW/FM amplifier	198.00	7.00

HOKUSHIN MOBILE AERIALS

2E	2M 5/8, 3·4 dB gain, foldover base	11.26	2.00
2NE	2M 7/8, 4·5 dB gain, foldover base	17.06	2.00
HS430HB	430MHz mobile gain aerial on half wave	8.30	2.00
OSCAR430	70cm 5/8+5/8+5/8 supergain mobile aerial	21.45	2.00
320	2M stainless 1/4 wave on PL259 plug	2.62	1.00
HSF1	2M rubber helical on PL259	3.00	0.75
RG4M	Base for all above units inc coax fitted with PL259	5.00	1.00
12B	Car wing mount with SO239 top and bottom	4.60	1.00
RB144	2M rubber helical on BNC plug	4.60	0.75
GSS	Gutter/boot mount to take RG4M base	5.00	1.25
HSTMB	Trunk mount base with SO239 socket and cable	12.04	1.50
HS8BK	Half wave extender for bumper mounting mobile whips	15.58	2.00
HS770	145/435MHz Diplexer	17.80	1.50
OSCAR720	145/435MHz dual band antenna	18.86	2.00
MA200S	Magnetic base	18.50	2.00

HOKUSHIN BASE STATION AERIALS

HF5	80-10M HF vertical	67.60	7.00
HF5R	Radial kit for use when mast mounting HF5	42.76	7.00
GPV5	2M Base station colinear	42.68	7.00
GP23	2M 3 section colinear	46.80	7.00
GPV720	144/430MHz dual base station vertical	35.35	7.00
GPV7	70cm 5/8+5/8+5/8 base station colinear	35.27	7.00
REVCONE	30-500MHz Discone antenna. British and well made	25.00	7.00

ANTENNA ACCESSORIES

CS201	Two way 50ohm coax switch. 0-500MHz	17.24	2.50
CS401	Four way 50ohm coax switch. 0-500MHz	49.66	2.50
CS4	Four way coax switch BNC connectors DC—1·5GHz	23.50	2.50
CX3A	3 way coax switch. 0-30MHz. Rec or low power tx only	6.95	1.50
EIS	Small egg insulator. Glazed ceramic 4cm long	0.40	0.50
EIL	Large egg insulator. Glazed ceramic 5cm long	0.65	0.50
HS50B	HF BALUN 1·8-50MHz. 1:1 ratio 1kW if < than 2:1 SWR	18.74	1.50

DATA COMMUNICATIONS EQUIPMENT

CWR685E	TX/RX unit for RTTY/CW/ASCII with built in monitor	771.64	7.00
CWR670E	RX only unit RTTY/CW/ASCII requires external monitor	392.80	7.00
CWR675E	RX only unit RTTY/CW/ASCII with built in monitor	449.17	7.00
PK675	Printer kit for above unit	189.00	7.00
CWR610E	RX unit RTTY/CW/ASCI Code practise generator built in	195.00	3.00
AMTOR10A	Comprehensive AMTOR unit	253.20	3.00
DR100	TRIO DATA-MITTER Modem for transmitting ASCII	148.10	3.00
NOVEX12A	Good quality 12" monitor. Amber. Ideal text display	85.00	7.00
NOVEX12G	12" green monitor	89.00	7.00
DM091G	9" green monitor. All have metal cabinets	79.50	7.00

AIRBAND RECEIVERS

AP12	12 ch pocket rcvr. Computer turned (crystals extra)	65.00	2.50
APCC	Leatherette case	2.50	0.50
R532	NEW synth air band rcvr 110-139·995MHz 12V supply	189.00	7.00
LCBP532	Ni-Cad battery pack and leatherette case for R532	38.50	2.00
SP532	Mobile extension speaker for R532	4.96	1.00
BNC6	Telescopic whip for portable use with R532	6.00	0.50
CH532	AC charger for LCBP532	8.50	2.00
R528	High performance pocket scanner. Crystals extra	98.00	2.00
R537	Air band portable. Tunable 118-144MHz plus xstal con	55.00	2.00
R537L	Soft case	3.00	0.50
RX22	Special 9V Ni-Cad for R528	4.68	1.00
CH122	Special charger for above Ni-Cad	8.50	2.00
CRYSTALS	For the AP12, R512 and R517	4.60	0.50
	The postage of 50p will cover up to 20 crystals		
	N.B. The crystals for R512, R537 and R528 are interchangeable		
LAB	Air band ground plane aerial	18.42	2.50
ABM	Air band magnetic car mount aerial	5.75	2.50
ABG	Air band mobile gutter mount	5.75	2.00

HONOR MULTIMETERS

KRT100	Mini pocket meter. Up to 1000V ac/dc. 1000ohm/V	7.00	1.00
KRT200	18 Range 20k/V station test meter	14.00	1.50
KRT500	43 range 50k/V top quality test instrument	22.00	2.00
KD508	Excellent digital multimeter at a reasonable cost	32.64	1.50

BASIC TOOLS

CPK	Set of 5 chassis punches and tapered reamer	10.50	2.00
T414	Multi arm instrument vice system with magnifier	5.50	1.50

Well, having looked at the price list, I hope you've found something that takes your **fancy** and, yes, we do have an efficient mail order service: same day despatch on orders received before lunch and **we'll bend over backwards** with those received later, but do remember, the Post Office and Securicor collect from us around four in the afternoon. We accept Visa, Access and, of course, our own Lowe Card orders by 'phone. If it is more convenient send in your order and payment by post.

Anyway, that's about it for now. There will soon be a new **Lowe** Shop **in Bournemouth** but more of that next month.

Gud DXes 73es FBYLS, XYLS, esFBOM, etc.

David G8GIY

MICROWAVE MODULES LTD

2 METRE MULTIMODE TRANSVERTER MMT144/28-R

NEW RELEASE

FEATURES

- **25 Watts Tx Output**
- **GaAsFET RF stage**
- **Transmit ALC Circuit**
- **13.8V DC operated**
- **Repeater Shift (normal, simplex, reverse)**
- **High Level Double Balanced Rx Mixer**
- **LED Bargraph Power Meter**
- **RF VOX — Adjustable Delay and PTT Override**

SPECIFICATION

GENERAL

INPUT FREQUENCY RANGE	:	28 – 30 MHz
OUTPUT FREQUENCY RANGE	:	144 – 146 MHz
MODES OF OPERATION	:	SSB, FM, CW, FSK, AM
REPEATER SHIFT	:	Simplex, Normal (– 600 kHz) Reverse (+ 600 kHz)
INPUT/OUTPUT IMPEDANCE	:	50 ohm
RF CONNECTORS	:	SO239 (PTFE)
POWER CONNECTOR	:	5 pin DIN socket
DC POWER REQUIREMENTS	:	13.8V DC at 6 Amps peak

TRANSMIT SECTION

OUTPUT POWER	:	25 Watts
INPUT LEVEL RANGE	:	¼ mW to 300mW
ALC RANGE	:	20dB
LEVEL OF SPURIOUS OUTPUT	:	– 65dB or better

RECEIVE SECTION

CONVERSION GAIN	:	22dB + / – 1dB
NOISE FIGURE	:	2dB or better
3rd ORDER INTERCEPT	:	+ 19dBm (output)

DESCRIPTION

The MMT144/28-R is a high performance solid-state 2 metre multimode transverter, designed to allow users of existing HF band transceivers to establish a first-class transceive capability on the 144 MHz band.

The transverter incorporates many new and exciting features previously not found on equipment of this nature, which combine to make this product simply superb.

The MMT144/28-R can be used with virtually any 28 – 30 MHz transceiver having a low level output power in the range ¼ mW to 300mW. (An external attenuator can be used to allow a higher power level to be used if necessary.)

A noise-matched NEC GaAsFET preamplifier together with excellent filtering and a double balanced mixer produces a rugged receive converter, which has excellent strong signal handling characteristics and excellent immunity to overload and cross-modulation.

The transmit section produces a highly linear 25 watts output and incorporates an ALC circuit to ensure that a particularly clean signal is produced. This is an important feature which will virtually eliminate compressed signals and the resultant problems caused to local stations. A visual indication of relative output power is displayed by the front panel mounted LED bargraph display.

The unit incorporates the usual repeater features:— simplex, normal repeater (– 600 kHz), and reverse repeater (+ 600 kHz) and is ideally suited for all modes of communication on the 2 metre band.

The MMT144/28-R is housed in an aluminium extruded enclosure, which has both excellent electrical screening and thermal stability characteristics. Connectors are located on the rear panel together with the input level control and the DC supply fuse. Protection against reverse polarity is included. Antenna changeover at 144 MHz is achieved internally by a low-loss PIN diode switch.

This new design utilises 15 transistors, 4 regulator IC's, 3 other IC's and various diodes and PIN diodes.

All plugs are supplied.

PRICE: £215 inc. VAT (p + p £3.50).

ACCESS BARCLAYCARD VISA

HOURS:
MONDAY-FRIDAY
9 – 12.30, 1 – 5.00
E. & O.E.

MICROWAVE MODULES LTD.
Brookfield Drive, Aintree, Liverpool L9 7AN, England.
Telephone: 051-523 4011.
Telex: 628608 MICRO G.

the TH21E two metre hand-sized handheld

I am not for one moment suggesting that current hand-helds should be photographed with an elephant but I have heard many amateurs refer to their existing hand-helds as "bricks". That the TH21E could not be called. In fact, I am tempted to say it is the rig that not even a mouse could hide behind. Over the fourteen years I have watched amateur radio equipment develop from cumbersome to perfection. I remember John, G3PCY, showing me the first TR2400 and our mutual amazement at how TRIO could put so much radio in such a small package. Later developments produced the TR2500 and its 70 centimetre version, the TR3500 and left me in no doubt that TRIO would soon produce a compact inside pocket transceiver. At the same time it became apparent that a simpler rig with performance would have great appeal. That transceiver is the TH21E and being typically TRIO is right first time. Size is not the most important feature, it's just the way the transceiver feels when picked up, impossible to put down. I am not going to give its dimensions, I will just say that it is hand-sized, the true inside pocket transceiver. As an owner and with the rig always on your person the hobby of amateur radio expands to an all day event.

Never miss a contact, never miss a friend.

TH21E 2 metre handheld..... **£188.46** inc. VAT
TH41E 70 centimetre model..... **£214.80** inc. VAT

LOWE SHOPS

In Glasgow the LOWE ELECTRONICS' shop (the telephone number is 041 945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret's Drive. That's the right turn off Great Western Road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical Gardens are well worth a visit . . .

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (the telephone number is 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham road out of town. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

Cambridge, not only a University town but the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (the telephone number is 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1309, past the science park and turn left at the first roundabout, signposted Chesterton. After passing a children's playground on your left turn left again (between the shops) into Green End Road. Very quickly, and without you noticing it, Green End Road becomes High Street. Easy and free street parking is available outside the shop.

For South Wales, the LOWE ELECTRONICS' shop is located in Cardiff. Managed by Richard GW4NAD, who hails from Penarth, the shop (the telephone number is 0222 464154) is within the premises (on the first floor) of South Wales Carpets, Clifton Street, Cardiff. Clifton Street is easily found, being a left turn off Newport Road just before the Infirmary. Once in Clifton Street, South Wales Carpets is the modern red brick building at the end of the street on the right hand side. Enter the shop, follow the arrows past the carpets, up the stairs and the "Emporium" awaits you. Free street parking is available outside the shop.

LOWE ELECTRONICS' London shop is located at 223/225 Field End Road, Eastcote, Middlesex (the telephone number is 01 429 3256). The shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings and as such being on the Metropolitan and Piccadilly lines (approximately 30 minutes from Baker Street main junction). For the motorist, we are only about 10 minutes' driving time from the M40, A40, North Circular Road (at Hanger Lane) and the new M25 junction at Denham. Immediately behind the shop is a large car park where you can currently park for the day for 20p. There is also free street parking outside the shop.

Although not a shop there is on the South Coast a source of good advice and equipment—John G3JYG. His address is 16 Harvard Road, Ringmer, Lewes, Sussex. (telephone 0273 812071). An evening or weekend telephone call will put you in touch with John.

Finally, here in Matlock. David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

MAIL ORDER

You don't need a 1750 Hz tone to gain access to the fastest mail order service for all radio amateurs and short wave listeners. With a copy of the LOWE ELECTRONICS catalogue and antenna book in the shack (send £1 for your copy) the best in amateur radio is quickly available. Comprehensive stock, here at Matlock, means that all orders received are despatched the same day; of course there are exceptions, certain items, usually new products occasionally produce a situation where demand exceeds supply and not even LOWE ELECTRONICS can cope. If this is the case then you can be sure that LOWE ELECTRONICS will not cash your cheque or process your credit card until the goods are available for despatch. **Our secret is simple:** treat the customer how we ourselves would expect to be treated.

LOWE ELECTRONICS LTD.

Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 2817, 2430, 4057, 4995.

send £1 for complete mail order catalogue.

* 4,000 WORLD-WIDE USERS

Isn't it about time you switched to Icom?

IC-745

ICOM's IC-745 is the all-in-one transceiver featuring an HF all band SSB, CW, RTTY, AM (receive only) ham transceiver, plus a general coverage receiver. Options for FM transceive and an internal power supply make the IC-745 the complete transceiver in an all-in-one package.

The receiver section features a 100KHz to 30MHz general coverage receiver, this allows access to all HF bands plus all the frequencies in between. The IC-745 has an adjustable AGC circuit and DFM (Direct Feed Mixer) giving a wide dynamic range of 103dB with an intercept point at + 18dBm. Exceptionally clean reception is achieved with a low noise PLL circuit and a 70MHz first IF.

The IC-745's features include IF shift, 16 programmable memories with lithium battery back-up, passband tuning, a noise blanker both wide and narrow, threshold level control, notch filter, receive audio tone control and an all mode squelch. Also available is a front end switchable receiver preamp providing 12dB gain. RIT has a ±1KHz range.

We could go on all day about the 745, but if you need the full story get in touch with us and we will send you a detailed leaflet.

IC-290D/290E

290D is the state of the art 2 meter mobile, it has 5 memories and VFO's to store your favourite repeaters and a priority channel to check your most important frequency automatically. Programmable offsets are included for odd repeater splits, tuning is 5KHz or 1KHz.

The squelch on SSB silently scans for signals, while 2 VFO's with equalising capability mark your signal frequency with the touch of a button. Other features include: RIT, 1 KHz or 100Hz tuning/CW sidetone, AGC slow or fast in SSB and CW, Noise blanker to suppress pulse type noises on SSB/CW.

You can scan the whole band between VFO's/scan memories and VFO's. Adjustable scan rate 144 to 146 MHz, remote tuning with IC-HM10 and HM11 microphones. Digital frequency display, Hi/Low power switch. Optional Nicad battery system allows retention of memory.

Special Offers for 1985: 25 watt IC-290D reduced to £469 and the 10 watt IC-290E reduced to £399. The 70cm version IC-290E is reduced to £529. Take advantage of this money-saving offer.

* AT THE LAST COUNT

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM

0,000
RS CAN'T BE WRONG

IC-R71E

For those who like the easy life, the R71E has the option of an infra-red remote control unit, making it a very sophisticated rig indeed, here are some details.

100 KHz – 30 MHz all mode (with FM option). Quadruple conversion superhet. IF frequencies 70MHz 9MHz and 455KHz with continuous bandpass tuning and notch filter. Virtually immune from adjacent channel interference with 100dB dynamic range. Adjustable AGC, noise blanker and switchable pre-amplifier. Direct keyboard into twin VFO's with 32 programmable memories. 5 year lithium memory backup cell. Memory and band scan with auto-stop. Tuning rates 10Hz, 50Hz and 1 KHz with 6 digit readout. AC mains operation. Auto squelch tape record function.

Options:- Synthesised voice readout, infra-red remote controller, 12V DC kit, mobile mounting bracket, two CW filters 500 and 250 Hz, FM unit, computer interface, headphones.

Agent: Gordon G3LEQ, or telephone Knutsford (0565) 4040. Please telephone first, anytime between 0900-2200 hrs. **Gordon also sells Yaesu products.**

IC-02E, IC-04E

The direct entry microprocessor controlled IC-02E is a 2 meter handheld features include: scanning, 10 memories, duplex offset storage in memory and odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are included. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority.

The IC-02E has an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions. New HS-10 Headset, with earphone and boom microphone, which operates with either of the following:- HS 10-SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS 10-SA Voice operated switch box, with pre-amplifier, mic gain, vox gain and delay. The IC-2E and 4E continue to be available.

You can get what you want just by picking up the telephone. Our mail-order dept. offers you: free, same-day despatch whenever possible, instant credit, interest-free H.P., telephone Barclaycard and Access facility and a 24 hour answering service.

Please note that we now have a new retail branch at 95, Mortimer Street, Herne Bay, Kent. Tel: 69464. Give it a visit, BCNU.

ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet

Thanet Electronics
Dept RC, 143 Reculver Road, Herne Bay, Kent.
Tel: (02273) 63859/63850

NEC SHOW SPEC

You haven't shown any TRIO prices, Bernie!

STILL THE BEST

ICOM ICR71
The latest superior grade receiver, with keyboard entry, 32 tunable memories, three rates of tuning + (as options) infra red remote, F.M., voice frequency synthesiser, additional filters.

£669 OR £699 WITH REMOTE UNIT OR FM BD

SUPERB 2 METRE BASE STATION

ICOM IC271E
2m base station for the eighties, 25w O/P, 32 memories, scanning, 10/100Hz auto shift tuning rates + (as options) voice frequency synthesiser, internal 12V psu, GaAS FET preamp.

£659 OR £689 WITH ICSM6 ELECTRET BASE STATION MIC OR AG20 INTERNAL GaAS FET ICOM PREAMP

REACH FOR THE SKY & CATCH A SATELLITE

YAESU FT726R
Multiband base station transceiver.

£775

HOW LOW CAN WE GO!

YAESU FT2700 DUO BANDS
2M & 70cm
Full DUPLEX operation
25 watts on each band

£499 with Antenna Duplexer FREE

EXTRA–SPECIAL OFFER

FT726R WITH 70cm CARD FITTED £1,099–WITH DUPLEXER/SATELLITE MODULE WORTH £100!

EXTRA VERY SPECIALS

- **MUTEK 6M Transverter 2M to 6M** — **£169**
- **SX400–The Professional Scanner** — **£549**
- **AOR2001 Scanner Rec Gen Coverage 25-525mHz** — **£325**
- **CENTURY Gen Cov HF Rec** — **£169**

ACCESS · BARCLAYCARD VISA · **INSTANT HP AVAILABLE** WRITTEN DETAILS ON REQUEST

PRICES CORRECT AT TIME OF GOING TO PRESS
ALL OFFERS SUBJECT TO AVAILABILITY
ALL PRICES INCLUDE V.A.T.

* NEC Special Offers are available to the public only at NEC – and to ARE Club Members at time of publication.

IALS* FROM A.R.E.

I'm keeping low on those until the SHOW!

WORLD BEATER

YAESU FT290R
The design team on this one at YAESU definitely deserve full marks–probably the best selling 2m multimode in the world.

£299 WITH MUTEK BOARD OR NICADS & CHARGER

RECEIVE THIS

NEW

YAESU FRG 8800
Receiver with very special features:

- **Frequency coverage 500kc to 30mHz**
- **Memory and scan facilities**
- **VHF converters available**

£495

KENWOOD/TRIO SPECIAL OFFERS

TS930 TS530
TS430 TS2600
TW4000 TS3600
TS830

HURRY!! LIMITED STOCKS ONLY!!

ICOM AT ITS BEST

ICOM IC745
H.F. transceiver/gen. coverage receiver. The IC740 was, and still is, popular–the introduction of the IC745 with its additional features makes it our recommendation for the serious H.F. operator.

£898 WITH FREE ICSM6 BASE STATION MIC AND ICEX242 FM MODULE

THE ULTIMATE

YAESU FT757GX TRANSCEIVER
Compact–dual VFO's–general coverage–100W O/P.
FM/SSB/CW.
All options fitted incl. CW Filter and electronic keyer.

£739 WITH FREE AERIAL TUNING UNIT

CLOSED – MONDAYS
OPEN – TUES, WED, THURS, FRI 9.30-5.30.
SAT 9.30-5.00.

LONDON:
373 UXBRIDGE ROAD,
ACTON,
LONDON W3 9RH.
Tel: 01-992 5765/6

NORTHERN:
38 BRIDGE STREET,
EARLESTOWN, NEWTON LE WILLOWS,
MERSEYSIDE WA12 9BA.
Tel: 092 52 29881

more on your wavelength

AMATEUR RADIO EXCHANGE LTD

FREE FINANCE

HAMPSHIRE, DERBYSHIRE, LOTHIAN, STAFFORDSHIRE

FT290R "MULTIMODE PORTABLE"

Multimode 2M Transceiver
Dual VFO's
Microprocessor Control
Selectable Synthesiser Steps
Large LCD Display
Ten Memory Channels
'+' & '−' Repeater Function
Nicads for Portable Available
2.5W/0.5W RF Output
58(H)/150(W) × 195(D)mm

FT726R "MULTI-BANDER"

Synthesised Multimode Base Station
10W Output on HF, VHF & UHF, Possible
Full Duplex! (Crossband, with Option)
Continous RF Power Control (0-10W)
Dual VFO's—Crossband Operation
Eleven Memories—Mode & Frequency
LED Display, Dual Meters (S. & P.O.)
8 Bit Microprocessor Control
IF Shift/Width System
129(H) × 334(W) × 315(D) mm

FT730R "70cm-MOBILE"

Synthesised FM Transceivers
Full Microprocessor Control
Dual VFO's
Ten Memory Channels c/w Priority
Selectable Synthesiser Steps
LCD Readout/Analogue 'S' Meter
Switchable '+' & '−' Repeater Split
Better than 0.25uV for 12dB Sinad
Outputs—10W FT730R/25W FT230R
50(H) × 150(W) × 174(D) mm

SITUATIONS VACANT

Located at Southampton

Service Engineer

Applicant should be experienced in servicing synthesised HF, VHF and UHF equipment. An ONC/HNC/BSc in a related subject and PMR experience and/or amateur radio licence would be an advantage.

Sales Person

To work in busy modern amateur radio showroom/mail order house. Applicant should ideally have proven sales record. An amateur radio licence is essential and preference will be given to candidates with related technical or service qualifications.

Salaries are negotiable, dependent on experience and qualifications.

Please contact Michelle on Totton (0703) 867333 for an application form.

LEEDS
SMC (Leeds)
257 Otley Road
Leeds 16, Yorkshire
Leeds (0532) 782326
9-5.30 Mon-Sat

CHESTERFIELD
SMC (Jack Tweedy) Ltd
102 High Street
New Whittingdon, Chesterfield
Chesterfield (0246) 453340
9-5 Tues-Sat

BUCKLEY
SMC (TMP)
Unit 27, Pinfold Lane
Buckley, Clwyd
Buckley (0244) 549563
10-5.00 Tues-Fri

STOKE
SMC (Stoke)
76 High Street
Talke Pits, Stoke
Kidsgrove (07816) 72644
9-5.30 Mon-Sat

GRIMSBY
SMC (Grimsby)
247A Freeman Street
Grimsby, Lincs
Grimsby (0472) 59388
9.30-5.30 Mon-Sat

JERSEY
SMC (Jersey)
1 Balmont Gardens
St Helier, Jersey
Jersey (0534) 77067
9-5.30 Mon-Sat
Closed Wednesday

EDINBURGH
SMC Scotscomm
23 Morton Street
Edinburgh EH15 2HN
Tel: 031-657 2430
10-5 Tues-Fri, 9-4 Sat

BANGOR
SMC (N Ireland)
10 Ward Avenue
Bangor, Co Down
Bangor (0247) 464875

Southampton showroom open 9-5.30 Mon-Fri, 9-1pm Sat

HQ & MAIL ORDER S.M. HOUSE, RUMBRIDGE ST. TOTTON, SOUTHAMPTON,

SMC = South Midlands

2 YEAR GUARANTEE

YORKSHIRE, HUMBERSIDE, CO. DOWN, CLWYD, JERSEY

FT757GX "GEN. COV. HF"

100W Multimode HF Transceiver
Fully Computer Compatible
Dual VFO's
100% Duty Cycle
General Coverage Rx
FM & CW Narrow as Standard
Programmable Memory Scanning
All Mode Squelch
Triple Microprocessor Control
Matching Automatic ATU (Opt)
Full Break-in CW
93(H) × 238(W) × 238(D) mm

FT77 "SUBERB VALUE HF"

100W Output Transceiver
LSB/USB CW Modes Standard
Large LED Display/'S' Meter
Optional CW Narrow Filter
Optional FM (or AM) Unit
2M or 70cms with Matching Transverter
Matching Antenna Tuner Available
Matching Scanner VFO/Memories
95(H) × 240(W) × 300(D) mm

FRG 8800
£525.00 inc

FT 2700RH
£520 inc

FT270R £325 inc
FT270RH £380 inc

STOP PRESS

FRG 9600
60-900 MHZ
AM, NBFM, WBFM, SSB
SCANNER

FL 7000
500W HF
SOLID STATE
LINEAR

***FREE FINANCE**
On many regular priced items SMC offers Free Finance for invoice balance over £120.
20% down and the balance over 6 months or
50% down and the balance over a year.
You pay no more than the cash price!!
Details of eligible items available on request.

SMC SERVICE
Free Securior delivery on major equipment.
Access and Barclaycard over the phone.
Biggest branch agent and dealer network.
Securior 'B' Service contract at £5.00.
Biggest stockist of amateur equipment.
Same day despatch whenever possible.

GUARANTEE
Importer warranty on Yaesu Musen products.
Ably staffed and equipped Service Department.
Daily contact with the Yaesu Musen factory.
Tens of thousands of spares and test equipment.
Twenty five years of professional experience.
• 2 year warranty on regular priced Yaesu products.

Stock Carrying Agent: John Doyle, Transworld Comms, Neath (0639) 52374 Day (0639) 2942 Eve.

SO4 4DP, ENGLAND. Tel: (0703) 867333 Telex: 477351 SMCOMM G

Communications ltd.

AUTHORISED YAESU

SCANNING RECEIVER

MS-8400

From S.M.C. the MS-8400 VHF/UHF microprocessor controlled scanning receiver with 40 programmable memory channels, keyboard entry of frequency or command; automatic band search, AM and FM selectable, 4 selectable scanning steps, priority channel, connections for external antenna, DC supply and loudspeaker. Supplied c/w telescopic antenna mounting bracket, etc.

SPECIFICATIONS

Frequency Range:	Low VHF 68,000 MHz ~ 88,000 MHz Mid VHF 108,000 MHz ~ 136,000 MHz High VHF 136,005 MHz ~ 174,000 MHz UHF 360,000 MHz ~ 512,000 MHz
Scanning steps:	5, 10, 12.5 and 25 kHz VMF (10, 12.5 and 25 kHz UHF)
Channels:	40 programmable memories
Modes:	AM or FM selectable
Scan rate:	Approximately 18 channels per second
Scan delay:	2 seconds Priority sampling: 4 seconds
Audio output:	1.2 Watts
Selectivity:	Better than -60 dB @ ±25 kHz
Power supply:	DC 12V ~ 16V 0.6A max
Memory backup:	9 volt, battery (PP3)
Antenna:	Telescopic antenna or External
Loudspeaker:	2.5" x 4" oval speaker
Size:	190(W) x 250(D) x 85(H) mm
Weight:	1.7kg

£249.00 inc.
Price includes free carriage

POWER METERS

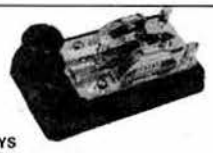
IN LINE POWER/SWR BRIDGES P.E.P., AVERAGE 1·8-440MHz

The Hansen range covers 30 quality models with top-of-the-line the FS710. This is a flat frequency response, peak envelope power and average in-line wattmeter with many novel features. Notable being the 'power independent' SWR scale—no forward power calibration knob, just direct reading SWR.

				£
		HANSEN		
FS710H	1.8-60 MHz	15/150/1500W	PEP Auto SWR	P.O.A.
FS710V	50-150 MHz	15/150W	PEP Auto SWR	107.80
FS500V	50-150 MHz	20/200W	PEP	81.95
FS300H	1.8-60 MHz	20/200/1000W		53.50
FS300V	50-150 MHz	20/200W		53.50
FS602M	50-150 MHz	20/200W	PEP	P.O.A.
FS210	1.8-150 MHz	20/200W	Auto SWR/ Power Meter	65.50
FS301M	2-30 MHz	20/200W		42.25
FS301MH	2-30 MHz	200/2000W		42.25
FS711H	2-30 MHz	20/200W	Head/ Display	43.65
W720S	130-430 MHz	20/200W	Head/ Display	41.50
FS5E	3.5-150 MHz	20/200/1000W	(1KW HF only)	42.75
SWR3E	3.5-150 MHz	20/200/1000W	(1KW HF only)	28.75
SWR50B	3.5-150 MHz	Twin Meter		30.50
FS20DL	3-150 MHz	1/10W Dummy/SWR/Power		43.65
FS20D	3-150 MHz	5/20W Dummy/SWR/Power		43.65
		JD		
JD110	1.5-150 MHz	10/100W		16.50
		SMC		
S3-30L	Mini (CB style)			9.20
T3-170L	3.5-170 MHz	Relative	Twin Meter	17.25
		WELZ		
SP300	1.8-500MHz	20/200/1KW	SWR/ Power	121.50

NB: PRICES INCLUDE VAT AT 15%
Carriage free by post

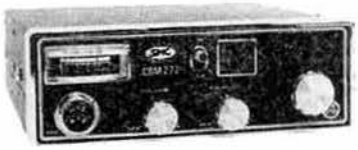
MORSE EQUIPMENT



			p.p.
MORSE KEYS			
HK703	Straight Key	£29.35	£1.20
HK704	Straight Key	£19.95	£1.20
HK706	Straight Key	£16.65	£1.00
HK707	Straight Key	£15.50	£1.00
HK710	Straight Key	£39.95	£1.75
HK808	Straight Key	£49.95	£1.75
HK711	Key Mounting	£32.75	£1.50
BK100	Mechanical Bug	£24.95	£1.75
MK701	Single Lever Paddle	£28.50	£1.60
MK702	Single Lever Paddle	£29.75	£1.60
MK703	Squeeze Key	£28.95	£1.75
MK705	Squeeze Key	£25.65	£1.75
MK706	Squeeze Key	£23.50	£1.75
IKP60	Iambic	£9.95	FOC
HK802	de Luxe Brass Key	£86.30	£2.00
HK803	de Luxe Brass Key	£82.65	£2.00
HK804	de Luxe Brass Key	£78.25	£2.00
MHK831	Super de Luxe squeeze & straight key	£189.00	£3.50
MORSE EQUIPMENT			
KP100	Squeeze 230/13·8V	£82.50	£2.00
KP200	Memory 4096 Multi Ch Mem Back Up 230/13·8V	£169.50	£2.50
D70	Morse Tutor (Datong)	£56.35	FOC
MMS1	Morse Tutor (M/M)	£115.00	FOC
MMS2	Morse Tutor Advanced	£169.00	FOC
MICROWAVE MODULES—RRTY EQUIPMENT			
MM2001	RTTY to Video	£189.00	FOC
MM4001	RTTY Transceiver	£269.00	FOC
MM4001KB	RTTY Tx/Rx keybd	£299.00	FOC
MM1001KB	Morse Keyboard	£135.00	FOC
MM1000KB	ASCII CW conv c/w keybd	£135.00	FOC

PRICES INCLUDE VAT at 15%
Carriage as shown

10M FM CORNER



Join the many others who have found that operating 10M FM can be a pleasant alternative to the overcrowded 2M band. The SMC Oscar 2 10M gives you 40 channels, channel 1 being 29.310 MHz and channel 40 29.7 MHz, a power o/p of approximately 4 watts and a receive sensitivity of better than 0.3μV for 12db sinad. Also for your enjoyment when the band opens up, we have incorporated a - 100kHz repeater shift (by using the original panel Hi/Low power switch), so from the car or at home you can enjoy 10M FM.

OSCAR 2 10m FM £65.00 inc

ACCESSORIES		INC	P/P
SMCGP27	¼ Wave vertical	£29.00	£2.65
SMCVA27	¼ Wave vertical no radials	£29.00	£2.65
SMC11V11S	Glass fibre loaded radials	£32.15	£2.65
SMC10SE	10M Mobile whip	£15.95	£2.00
RSL-28b	Yaesu 10M mobile whip	£10.65	£2.00
SMCGCCA	Gutter mount and cable	£11.50	£2.00
SMCSOCA	4M cable assembly 10SE	£5.65	£1.50
FLEXI 10	G. Whip mobile 10-80M	£52.33	£2.35
MULTI-M	G. whip mobile 10/15/20	£33.92	£1.85
FLEXIWHIP	G. Whip 10M mobile	£19.21	£1.85
GW BASE	Base for all G. Whips	£6.90	£1.00
SMTC3170L	Twin meter SWR bridge	£17.25	FOC
SMC100LP30	Low pass filter	£5.30	FOC
120406	4 Amp DC power unit	£14.95	£2.35
SP55	Extension L/S	£16.50	FOC

NB. PRICES INCLUDE VAT AT 15%
and carriage by post or Securicor

PUBLICATIONS

	£	p/p
I.P.C. (PRACTICAL WIRELESS)		
Out of Thin Air	1.20	0.75
Passport to Amateur Radio	1.50	0.75
Wires and Waves	3.00	0.90
Are the voltages correct?	1.00	0.50
Introducing R.T.T.Y	1.50	0.50
R.S.G.B.		
Teleprinter Handbook	11.65	1.35
Radio Communications Handbook	8.95	2.05
Test Equipment (Radio Amateurs)	4.70	1.30
Amateur Radio Techniques	4.75	1.35
HF Antennas for all Locations	4.75	1.35
Guide to Amateur Radio (Soft)	2.75	0.75
Radio Amateur Operators Manual	4.25	0.75
1983 Call Book (UK)	1.00	0.80
1984 Call Book (UK)	5.00	0.50
R.A.E. Manual (10th Edition)	2.75	0.75
T.V.I. Manual	1.50	0.50
Morse Code for Radio Amateurs	1.00	0.50
VHF/UHF Manual (3rd Edition)	4.25	2.00
VHF/UHF Manual (4th Edition)	8.50	2.00
Prefix Map	2.25	1.25
Great Circle Map	1.50	1.20
Amateur Radio Logbook	2.30	1.25
S.M.C.		
Countries List	0.35	1.20
Q.R.A. Locator Map (Special Coating)	0.50	1.20
Transparent Overlay 50km Rings	1.00	
Maidenhead Locator Map	1.50	1.20
TAB BOOKS		
Hidden Limited Space Antennas	6.95	0.75
Complete Handbook (Transmitters)	8.25	0.75
Secrets of Ham Radio DXing	6.50	0.75
Complete S.W.L. Handbook	9.95	0.85
S.W.L. Antenna Handbook	8.45	0.75
Guide to Scanners and Monitors	9.50	0.85
Radio Communications Receivers	11.75	0.90
Secret Shortwave Spectrum	6.50	0.75
UNIVERSAL ELECTRONICS INC		
Clandestine Confidential S.W.	6.35	0.85
World Press Frequencies (RTTY)	6.35	0.85
RTTY Today, Modern Guide	6.35	0.85
MISCELLANEOUS PUBLISHERS		
Amateur Radio (Stokes/Budd)	8.95	1.30
Log Book (Jaybeam)	2.30	1.25
Maidenhead Locator Map	1.50	

Prices include V.A.T. at 15% (where applicable) Postage extra. U.K. and B.F.P.O. rates for one off items only shown. N.B. For larger orders (any mix) p/p may be much lower than sum of individual charges

ROTATORS

The finest range: be it Kenpro, C.D.E., Channel Master, SMC has over 19 models to choose from. Ask the experts for the right model to suit your requirements—it should save you money. Write, phone or call.

KR600RC

9502B

FU200	Thro'	3 Core	Light Duty	£49.95
KR250	Bell	6 Core	Lighter Duty	£61.95
9502B	Offset	3 Core	Lighter Duty	£69.49
AR40	Bell	5 Core	Medium Duty	£115.00
KR400	Bell	6 Core	Matches KR500	£109.95
KR500	Thro	6 Core	Elevation	£139.95
AR50	Bell	5 Core	5 Position (AR40)	£139.00
KR400RC	Bell	6 Core	Medium Duty	£132.50
CD45	Bell	8 Core	Heavy Duty	£189.95
KR600RC	Bell	8 Core	Heavy Duty	£189.50
HAM IV	Bell	8 Core	Heavier Duty	£299.00
KR2000RC	Bell	8 Core	Heavier Duty	£366.50
T2X	Bell	8 Core	Very Heavy Duty	£365.00
HDR300	Bell	8 Core	Digital Readout	£699.00

Control Cable			p.p.
RC5W	5 Way	mtr £0.44	£1.90
RC6W	6 Way	mtr £0.59	£1.90
RC8W	8 Way	mtr £0.67	£1.90
9523	Support Bearing for 9502b F4200	£19.65	£2.50
KC038	Lower Mast Clamp for KR400 600, etc	£12.85	£2.50

Prices including VAT and carriage, but carriage on accessories is extra unless sent with rotators

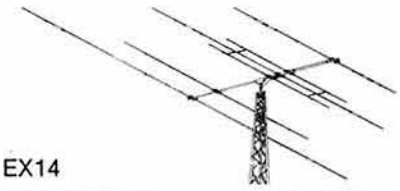
STOCK CARRYING AGENTS WITH DEMONSTRATING FACILITIES

John Doyal GW4FOI
Transworld Communications, Neath
Day (0639) 52374
Eve (0639) 2942

John Stringer GI3KDR
SMC N. Ireland, Bangor
(0247) 464875

HF ANTENNAS

SMC have the greatest range of HF antennas eg. Multi Beams/Quads, over 20 models. Shown below is the sensational new Explorer 14—contact us for full details.



EX14

MULTIBAND BEAMS		Inc VAT	P&P
EX14	Explorer 10-20m	£499.00	£7.50
TH3JNR	3 Ele 10-20m	£298.00	£4.50
TH5Mk2	5 Ele 10-20m	£649.00	£7.70
TH7DXX	7 Ele 10-20m	£755.00	£9.75
TB3	3 Ele 10-20 Jaybeam	£212.75	£5.90
HQ1	Mini Quad 10-20	£199.00	£4.00
G4MH	Mini Beam 1-20	£88.50	£4.50
TA33JNR	3 Ele 10-20 Moseley	£177.10	£6.00
Mustang 2	2 Ele 10-20 Moseley	£177.10	£6.90
Mustang 3	3 Ele 10-20 Moseley	£220.80	£6.90
GQ2E	2 Ele 10-20 Quad	£299.00	£5.90
GQ3E	3 Ele 10-20 Quad	£536.00	£9.20
GQ4E	4 Ele 10-20 Quad	£745.00	£10.00
Hyquad	2 Ele 10-15M dipole 20M	£345.00	£8.00
LP1007	Log Periodic 13-20 MHz	£2195.00	DIST
3Y1015D20	3 Ele 10/15M Dipole 20M	£179.00	£5.95
DB10/15A	3 Ele 10-15m	£209.00	£4.80

TB3

MONO BAND BEAMS			
103BA	3 Ele Yagi 10m	£99.00	£3.95
105BA	5 Ele Yagi 10m	£220.00	£3.95
153BA	3 Eli Yagi 15m	£135.00	£3.90
155BA	5 Ele Yagi 15m	£339.00	£5.90
203BA	3 Ele Yagi 20m	£259.00	£4.90
204BA	4 Ele Yagi 20m	£420.00	£7.30
205BA	5 Ele Yagi 20m	£499.00	£9.40
18TD	Dipole Tape 10-80m	£230.00	£2.80

HF5V

HF5R

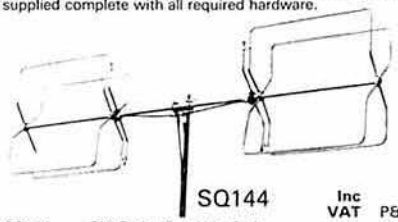
VERTICALS			
12AVQ	Vertical 10-20m	£54.00	£2.75
14AVQ	Vertical 10-40m	£73.00	£2.75
18AVT/WB	Vertical 10-80m	£119.00	£2.75
18V	Vertical 10-80m taped	£38.50	£2.75
C4	Vertical 10-20m	£89.00	£2.50
SMCHF5V	Vertical 10-80m	£66.50	£3.00
SMCHF5R	Radial Kit for above	£41.00	£3.00
TRAP DIPOLE			
SMCTD/HP	High Power 10-80m	£49.00	£2.65
SMC TD/P	Portable inc coax	£69.00	£2.65
MOBILE			
Tribander	10-20m Slide sw.	£29.33	£2.20
Multimobile	10-20m	£33.92	£1.85
Flexiwhip	10m only	£19.21	£2.20
Extra coils	For above to 160m	£7.25	£1.00
Flexiten	2, 10, 12, 17, 15, 20, 30, 40, 80M	£52.33	£2.35
Bases	For above	£6.90	£1.00

NB: PRICES INCLUDE VAT AT 15%
Carriage extra. Mainland rate shown.

SMC-HS

HF, VHF, UHF, BASE STATION ANTENNAS

SMC-HSA range of bse station antennas covers from 80M through to 70cm. All have S0239M connectors and are supplied complete with all required hardware.



SQ144

		Inc VAT	P&P
SQ144	2M Swiss Quad Vertical Mounting	£67.95	£2.85
GP2M	2M½ c/w groung plane 3·4dB ↓	£22.95	£2.85
GG144W	2M2 × ½ colinear 6·5dB ↓	£33.95	£2.85
GP23	2m3 × ½ colinear 7·8dB ↓	£49.95	£2.85
GP432X	70cm 3 × ½ 6·8dB ↓	£36.95	£2.85
70N2V	2M/70cm colinear 2·8dB ↓/5·8dB ↓	£36.80	£2.85
HS770	2M/70cm Duplexer 50W 30dB isolation	£17.65	£1.95
VHFL	65-520MHz Discone Rx only	£19.60	£2.85
GDX1	80-480MHz Discone 3dB ↓	£49.50	£2.85
GDX2	50-480MHz Discone 3dB ↓	£62.85	£2.85
GDXA	100-480MHz Discone 3dB ↓	£41.85	£2.85
LT606	50-500MHz Log Periodic 7-8dB	£159.95	£3.50
HF5V	Trapped Vertical 10-80M 5 bands	£66.50	£3.00
HF5R	Loaded Radial Kit	£41.00	£3.00
3Y1015D20	3 ele 10, 15M dipole 20M	£179.00	£5.95
GP714	70cm 14 step colinear 10dBi	£88.20	£2.85

POWER SPLITTERS

144MHz 2 way N connectors 1kW	£30.65	£1.50
144MHz 4 way N connectors 1kW	£33.75	£1.50
432MHz 2 way N connectors 1kW	£29.15	£1.50
432MHz 4 way N connectors 1kW	£31.80	£1.50
1296MHz 2 way N connectors 1kW	£24.55	£2.00
1296MHz 4 way N connectors 1kW	£25.70	£2.00

JAYBEAM

4 METRES				
4Y/4M	Yagi 4 element	7dBd	£32.78	£2.65
PMH2/4M	Phasing harness 2 way		£17.82	£1.65
2 METRES				
H0/2M	Halo head only	0dBd	£6.53	£1.50
HM/2M	Halo with 24" mast	0dBd	£7.48	£1.65
C5/2M	Colinear omni vert	4·8dBd	£86.25	£2.65
LW5/2M	Yagi 5 element	7·8dBd	£15.53	£2.65
LW8/2M	Yagi 8 element	9·5dBd	£19.56	£2.65
LW10/2M	Yagi 10 element	10·5dBd	£25.30	£2.65
LW16/2M	Yagi 16 element	13·4dBd	£35.07	£3.65
PBM10/2M	10 ele Parabeam	11·7dBd	£49.45	£3.65
PBM14/2M	14 ele Parabeam	13·7dBd	£60.95	£3.65
Q4/2M	Quad 4 element	9·4dBd	£31.63	£2.65
Q6/2M	Quad 6 element	10·9dBd	£41.40	£2.65
Q8/2M	Quad 8 element	11·9dBd	£51.75	£2.65
D5/2M	Yagi 5 over 5 slot	10dBd	£27.60	£2.65
D8/2M	Yagi 8 over 8 slot	11·1dBd	£37.95	£2.65
5XY/2M	Yagi 5 ele crossed	7·8dBd	£29-90	£2.65
8XY/2M	Yagi 8 ele crossed	9·5dBd	£38.53	£2.65
10XY/2M	Yagi 10 ele crossed	10·8dBd	£43.80	£2.65
PMH2/C	Harness cir polarisation		£11.50	£1.65
PMH2/2M	Harness 2 way 144MHz		£13.23	£1.65
PMH4/2M	Harness 4 way 144MHz		£31.62	£1.65
70CMS				
C8/70	Colinear Vertical	6·1dBd	£92.00	£2.65
D8/70	Yagi 8 over 8 slot	12·3dBd	£28.18	£2.65
PBM18/70	18 ele Parabeam	13·5dBd	£34.50	£2.65
PBM24/70	24 ele Parabeam	15·1dBd	£46.00	£2.65
LW24/70	Yagi 24 element	14·8dBd	£31.05	£2.65
MBM28/70	28 ele Multibeam	11·5dBd	£23.00	£2.65
MBM48/70	48 ele Multibeam	14·0dBd	£37.96	£2.65
MBM88/70	88 ele Multibeam	16·3dBd	£51.75	£2.65
8XY/70	Yagi 8 ele crossed	10dBd	£45.85	£2.65
12XY/70	Yagi 12 ele crossed	12dBd	£55.20	£2.65
PMH2/70	Harness 2 way		£12.07	£1.85
PMH4/70	Harness 4 way		£24.73	£1.85
23CM				
CR2/23CM	Corner reflector	13·5dBd	£43.13	£2.65
PMH2/23CM	Harness 2 way		£32.78	£1.65

NB: PRICES INCLUDE VAT AT 15%
Carriage extra, mainland rate shown

SMC-HS

HF, VHF, UHF ANTENNAS MOBILE VERTICALS

SMC-HS Mobile Elements, tabulated below, feature an inbuilt PL259M connector, which mates with the SO239M on any of the four standard mounts. This arrangement is ideal for easy removal —band changes, comparative test, car wash, anti-vandal, system checks from the feed point, portable operation and for ease of garaging etc. All models have fold over bases (either lift and lay or locking collar) except the 78B which has an inbuilt ball in case the mount must be fitted askew.

SMC 78F

GCD

SMC258

GCD

	SMC-HS MOBILE ANTENNAS	£	P&P
SMC6P2T/PL	Telescopic 2M PL259 fitting ¼λ	5.75	0.85
SMCT144h	Telescopic 2M ¼ wave BNC	10.35	0.85
SMC6P2T/BNC	Telescopic 2M BNC fitting ¼λ	6.90	0.85
SMC2H/PL	Helical 2M PL259 fitting	5.95	0.85
SMC2H/BNC	Helical 2M BNC fitting	6.90	0.85
SMCHS430S	70cm ½ wave BNC 2.5dB↓	8.75	0.65
SMC2QW	2M ¼ wave 0dB↓ 1.6'	2.70	1.85
SMC2NE	2M ⅝ wave fold 3.0dB↓ 4.3'	7.95	2.00
SMC2VF	2M ½ wave fold 3.0dB↓ 3.5'	14.66	2.00
SMC78F	2M ⅞ wave fold 4.5dB↓ 5.7'	14.74	2.50
SMC78B	2M ⅞ wave ball 4.5dB↓ 5.6'	14.74	2.59
SMC78SF	2M ⅞ wave short 4.7'	16.95	2.50
SMC88F	2M 8/8 wave 5.2dB↓ 6.5'	22.95	2.50
SMC118M	Colinear 2M 11/8 7dB↓ 9.7'	39.85	2.65
SMC258	70cm 2×½ fold 5.5dB↓ 3.1'	26.95	2.00
SMC268E	70cm 2 section colinear 6dB↓	29.95	2.00
SMC358	70cm 3×½ 6.3dB↓ 4.7'	20.95	2.00
SMC70N2M	Dual band 2M 2.7dB↓ 70cm 5.1dB↓ (½λ & 2½λ)	20.95	2.00
SMCHS770	144/432 Duplexer 50W	19.55	1.85
SMC20SE	20M 1.72M 100W PEP	21.50	2.50
SMC15SE	15M 1.72M 130W PEP	16.85	2.50
SMC10SE	10M 1.72M 200W PEP	15.95	2.50
SMC17SE	17M 1.915M 200W PEP	18.75	2.50
SMC12SE	12M 1.915M 200W PEP	16.85	2.50
RSL-28b	Yaesu 10M mobile whip	10.65	2.00
SMCGCCA	Gutter clip 4 mtrs cable	11.50	2.00
SMCSOCA	Cable assembly 4M PL259	5.65	1.50
SMCSOCAL	Cable assembly 6M PL259	5.95	1.50
SMC50CALLR	Cable assembly 5M PL259	6.65	1.50
SMCROL	Rollet, 10mm thick (for above)	1.15	0.50
SMCTMCAS	Trunk mount c/w 6M cable	10.65	2.00
HDTMCA	HD trunk mount c/w 5M cable	16.10	2.00
SMCSOMM	Magnetic base c/w 4M cable	11.95	2.00
SMCSOWM	Adjustable wing mount base	4.95	0.90
SMCGCD	Gutter clip deluxe	5.30	1.50
SMCBSD	Bumper strap deluxe	10.95	1.50
HS88BK	Bumper mounted extension for 144 MHz antennae	23.35	2.00

SOMM

HS770

NB: PRICES INCLUDE VAT AT 15%

Head office
Mail orders
Service & Spares

S. M. HOUSE, RUMBRIDGE STREET, TOTTON, SOUTHAMPTON SO4 4DP, ENGLAND
Tel: Totton (0703) 867333, Telex: 477351 SMCOMM G, Telegram: "Aerial" Southampton
See preceding pages for complete addresses and phone numbers of branches

RADIO SOCIETY OF GREAT BRITAIN

THE NATIONAL SOCIETY REPRESENTING ALL UK RADIO AMATEURS

Founded 1913 Incorporated 1926 Limited by guarantee A member society of the International Amateur Radio Union

PATRON: HRH PRINCE PHILIP, DUKE OF EDINBURGH, KG

Membership is open to all those with an active interest in radio experimentation and communication as a hobby. Applications for membership should be made to the general manager, from whom full details of Society services may also be obtained.

Headquarters and registered office: **Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JW**
Telephone (Dialling code 77 from London, 0707 from outside London) 59015. Telex 25280 (RSGBHQ G)
Secretary and general manager: D A Evans, G3OUF

COUNCIL OF THE SOCIETY

PRESIDENT: J Heathershaw, G4CHH (Mrs)

EXECUTIVE VICE-PRESIDENT
W J McClintock, MSc, G3VPK

IMMEDIATE PAST-PRESIDENT
R G Barrett, GW8HEZ

HONORARY TREASURER
P F D Cornish, FCA, G3COR

ORDINARY MEMBERS OF COUNCIL

E J Allaway, MB, ChB, MRCS, LRCP, G3FKM
D S Evans, PhD, FIM, CEng, G3RPE
H M Holmden, G4KCC
G R Jessop, CEng, MIERE, G6JP
B O'Brien, G2AMV
D M Pratt, BEng, CEng, MIEE, MIERE, G4DMP
G R Smith, BSc, MBIM, G4AJJ
K E V Willis, BSc, ARCS, CEng, MIEE, G8VR

ZONAL MEMBERS OF COUNCIL

Zone A	*(Regions 1, 2 and 18)*	D S Smith, G4DAX	**Zone E**	*(Regions 10 and 11)*	*(Post vacant)*
Zone B	*(Regions 3, 4 and 5)*	H S Pinchin, BSc, MBIM, G3VPE	**Zone F**	*(Region 15)*	J T Barnes, GI3USS
Zone C	*(Regions 7, 8, 16 and 19)*	W J McClintock, MSc, G3VPK	**Zone G**	*(Regions 12, 13 and 14)*	F Hall, GM8BZX
Zone D	*(Regions 6, 9, 17 and 20)*	J N Gannaway, G3YGF			

REGIONAL REPRESENTATIVES

Region 1	*(Cheshire, Cumbria, Gtr Manchester, Isle of Man, Lancashire, Merseyside)*	B Donn, G3XSN.
Region 2	*(Humberside N of Humber, North, South, West Yorkshire)*	*(Post vacant)*
Region 3	*(Hereford and Worcester, Salop, Staffordshire, Warwickshire, West Midlands)*	G Ross, G8MWR.
Region 4	*(Derbyshire, Humberside S of Humber, Leicestershire, Lincolnshire, Nottinghamshire)*	M Shardlow, G3SZJ. Tel 0332 556875.
Region 5	*(Bedfordshire, Cambridgeshire, Northamptonshire)*	J S Allen, G3DOT. Tel 0582 21151.
Region 6	*(Berkshire, Buckinghamshire, Oxfordshire)*	F S G Rose, G2DRT. Tel 0494 814240.
Region 7	*(Gtr London S of Thames, Surrey including part of London N of Thames administered by Surrey)*	R Sykes, G3NFV. Tel 0372 372587.
Region 8	*(Kent, East Sussex, West Sussex)*	M Elliott, G4VEC. Tel 0795 70132.
Region 9	*(Cornwall, Devon)*	*(Post vacant).*
Region 10	*(Dyfed, Gwent, Mid Glamorgan, Powys, South Glamorgan, West Glamorgan)*	E J Case, GW4HWR. Tel 0222 810368.
Region 11	*(Clwyd, Gwynedd)*	B H Green, GW2FLZ. Tel 0492 49288.
Region 12	*(Grampian, Highland, Island Authorities, Tayside)*	M R Hobson, GM8KPH. Tel 0796 2140.
Region 13	*(Borders, Fife, Lothian)*	A Givens, GM3YOR.
Region 14	*(Central, Dumfries and Galloway, Strathclyde)*	T G Wylie, GM4FDM. Tel 0505 22749.
Region 15	*(Northern Ireland)*	R R Parsons, GI3HXV
Region 16	*(Essex, Norfolk, Suffolk)*	A Owen, G4HMF.
Region 17	*(Isle of Wight, Channel Islands, Dorset, Hampshire, Wiltshire)*	T M Emery, G3KWU.
Region 18	*(Cleveland, Durham, Northumberland, Tyne & Wear)*	I Gibbs, G4GWB
Region 19	*(Greater London N of Thames, Hertfordshire)*	R J Broadbent, G3AAJ.
Region 20	*(Avon, Gloucester, Somerset)*	N F O'Brien, G3LP.

HONORARY OFFICERS

Aerial Planning Panel co-ordinator: (c/o MSO, RSGB HQ)
Audio Visual Library co-ordinator: R G Auckland, G2PA
Awards managers. HF: P Miles, G3KDB; **VHF:** Jack Hum, G5UM
HF manager: E J Allaway, G3FKM
Microwave manager: D S Evans, G3RPE
Observation Service organizer: R J Osborne, G4FJN
Slow morse practice transmissions organizer: *(Post vacant)*
VHF manager: K A M Fisher, G3WSN

Correspondence to RRs and honorary officers should be addressed directly to them (QTHR), not to RSGB HQ

ANNUAL SUBSCRIPTION RATES

Corporate member: UK and overseas (*Radio Communication* by surface mail): **£16.50 UK associate member under 18: £6.20 Family member: £6.60**
UK students over 18 and under 25: £9.30 (Applications should give applicant's age at last renewal date and include evidence of student status)
Affiliated club or society/registered group (UK): £16.50 (including *Radio Communication*); **£9.90** (excluding *Radio Communication*)
(Subscriptions include VAT)

RSGB QSL BUREAU

QSL cards for distribution should be sent to:
Mr E G Allen, G3DRN, QSL Bureau manager, 30 Bodnant Gardens, London SW20 0UD

A list of QSL Bureau sub-managers was published in January issue of *Radio Communication*, and amendments will be published under "Amateur Radio News".

RSGB NEWS SERVICES

Headline News
Telephone 0707 (77 from London) 59312 for a recording of the latest amateur radio news.

GB2RS Broadcasts
Sunday news broadcasts from stations throughout the UK using the callsign GB2RS on frequencies in the 3·5, 7 and 144MHz bands. Details of frequencies, locations and times were last published in the July 1984 *RSGB News Bulletin*.

Amendments are published under "Amateur Radio News". A full schedule can be obtained free on request by sending a large sae to the Membership Services Dept, RSGB HQ.

EDITORIAL

RSGB User Report—First Reactions

The January issue of *Radio Communication* contained a loose insert which we hope will be the first of a regular series asking members to report on their experience with their amateur radio equipment. In view of the response to date, we are taking this opportunity to provide an early feedback.

At the time of writing, a mere three weeks after members received the questionnaire, nearly 500 replies had been received, covering many dozen equipment types. Most members supplied details about one piece of equipment. Some photocopied the original questionnaire to report on other equipment—the record is 11—which is most acceptable. A few managed to squeeze in details of three or four pieces of equipment onto the one sheet, which is not so convenient for us. For the record, the top three in terms of members' replies are the FT290R, the FT101 series and the TS830.

Although there has barely been time even to begin sorting the data, a number of general points have emerged from an initial skim through. First, it is gratifying to note that callsigns and BRS numbers were given in all but four cases. These represent the whole range from newcomers to old-timers: it will be interesting to relate them with the corresponding views on the equipment. Most replies came from the UK, from Cornwall up to the Orkneys, but there were also replies from France and the Netherlands.

The overall impression given is that of general satisfaction of amateurs with their equipment. The numbers who complained strongly, sometimes bitterly, were surprisingly few; we had, perhaps, expected to attract a disproportionate number of these. Most had bought their equipment from "authorized dealers", although this phrase needs to be defined more clearly in future. The majority seem to be satisfied with the service they had received; an initial estimate suggests that less than 10 per cent would not use the same source again. The next most popular way of buying equipment was from fellow amateurs. In the small sample examined, none had regretted purchasing their equipment in this way.

The above observations are consistent with the impression gained of the relatively high reliability of commercial equipment. Most had never required any servicing, and even when this was necessary, more often than not the cost was at a reasonable level. Only with relatively few items had there been major problems. Approximately 90 per cent indicated that, even with the benefit of hindsight, they would still have bought the same equipment, although most had "improvements" they would have liked to see.

It is intended, in the first instance, to critically analyse the general information contained in the questionnaires, as there is already a statistically large sample, and then to begin more detailed reviews on an equipment-by-equipment basis as and when sufficient questionnaires to form a representative sample have been received. We asked those who wished to return the questionnaire to do so as soon as convenient so that the Technical & Publications Committee could begin what surely will be a mammoth but most interesting task of analysis. In the near future, a second questionnaire, improved as a result of the experience gained from the first, will be circulated which will probably ask for information on specific equipment. Meanwhile, our thanks to those who have taken the trouble to reply to the first questionnaire; we hope they will do so again in the future.

David Evans, G3OUF

RSGB PRESIDENTIAL INSTALLATION 1985

The Society's first lady President, Mrs Joan Heathershaw, G4CHH, was installed at a social function held at the Post House Hotel, York, on 19 January 1985. Over 150 members and guests attended the function despite the severe winter weather; by far the largest number being from the Yorkshire area. Not only did it appear that Yorkshire had taken over the RSGB, but that the RSGB had taken over the Post House!

The 1984 President, Bob Barrett, GW8HEZ, introduced G4CHH to all present, and spoke warmly of her work for the Society in the past, and of the pleasure it gave him to install the "First Lady". In front of the video floodlights and to an accompaniment of flash-guns, Bob then invested her with the Presidential chain of office.

In response Joan thanked the Society for the great honour it had done her, and of her pride in becoming the "First Lady". When she was first introduced to amateur radio by her husband Duncan, G3TLI, she never dreamed that she would ever be elected a member of the RSGB Council, let alone becoming its President. During the course of her speech, which was enthusiastically received by the audience, she spoke of the enjoyment and satisfaction which amateur radio had given her, and of the support she had received locally and nationally from her fellow-members of the Society.

A fitting illustration of this widespread regard followed Joan's speech, when Terry Barnes, GI3USS, RSGB Council member for Northern Ireland, presented her with a cut-crystal vase on behalf of all GI amateurs, and then conferred on her honorary membership of the Bangor & D ARC. Nearer home, Joan's own club, the Hornsea ARS then paid its own tribute by presenting her with a hand-made silver-plated morse key.

The formal proceedings then being completed, everyone enjoyed an excellent meal, followed by much informal socializing; rounding off a most enjoyable and outstanding evening.

Amateur Radio News

Executive vice-President

At its meeting on 19 January 1985, Council elected Mr W J McClintock, MSc, G3VPK, as RSGB executive vice-President for 1985.

Region 15 representative

Only one nomination was received by the due date to fill the vacancy of Region 15 representative caused by the election to Council of Mr J T Barnes, GI3USS. This was for Mr R. R. Parsons, GI3HXV, whose appointment as Region 15 representative has been confirmed.

Region 18 representatives

The result of the ballot to elect a Region 18 representative was:

E W Bate, G3LUC.....28 votes
E W Malone, G4MRT.....11 votes
I Gibbs, G4GWB.....84 votes
(Invalid votes 6)

Mr I Gibbs, G4GWB, was thereby elected.

Hissing Sid?

Woodruff T Sullivan, Associate Professor of Astronomy at the University of Washington, is writing a book on the early development of radio astronomy. As is well known, radio amateurs played an important part in the discovery of the radio effects of the sun during the 'thirties, and the strange "hissing" phenomenon associated with the emission of radio waves from the sun was noted by Denis Heightman, G6DH, and others, and reports from amateurs contributed to the work of Hey and Appleton in this area.

Professor Sullivan would very much appreciate any further information on the detection and study of the "hiss" phenomenon by radio amateurs relating to the period prior to the second World War. He would also be most interested in any information relating to detection of the "hiss" during the solar maximum in the late 'twenties; he believes that amateurs may have detected solar radiation at that time but he has no specific information. Professor Sullivan's address is the Department of Astronomy, FM-20, University of Seattle, Seattle, Washington, USA 98195.

The Society has been privileged to see a draft of part of the book dealing with the contribution of radio amateurs to this branch of science, and it looks most interesting.

Obvious, really . . .

Those who feel that British legislation is sometimes rather obscure in its meaning may be amused by the following extract from the Australian Radiocommunications Act 1983:

"5 (1). Without prejudice to its effects apart from this sub-section, this Act also has, by force of this sub-section, the effect it would have if the reference in the definition of 'radiocommunication' in sub-section 3(1) to things and things were a reference to parts of things and the same or other parts of the same things"

So that's quite clear, then . . .

GB3SF news

Even though GB3SF has been operational from Sheffield for some six months, it has been found that some operators are still attempting to access it with normal suppressed carrier ssb (J3E). As Dr A J T Whitaker, G3RKL, puts it, "it can't be done!". He points out that although GB3SF is a conventional 144MHz repeater in every other sense, with 600kHz frequency split and 1,750Hz access tone, both its transmission and reception modes are "pilot carrier ssb", which means that some carrier needs to be transmitted along with the required upper sideband. The required carrier level is 16dB below peak ssb output; hence some 0·25W of carrier would be required with a 10W p.e.p. ssb transmitter. There are various ways of achieving this, but it is quite satisfactory to "unbalance" the balanced modulator of the ssb exciter slightly; many transmitters have a preset variable resistor for carrier balance, and the initial adjustment need take only a few seconds. Fine adjustments may then be made by using the repeater itself, utilizing the overmodulation indication and reports from other users.

The frequency accuracy requirement is more demanding than that for an fm system, and it is necessary for the transmitted signal to be within about 200Hz of the input frequency of 145·185MHz for the repeater to be able to lock on to it. The high/low indication from the repeater can then be used to set the transmitter precisely on frequency.

The GB3SF repeater represents a "world-first", and it is hoped that as many people as possible will use the unit and pass their comments to Dr Whitaker. The unit transmits on 145·785MHz and receives on 145·185MHz, and the transmitted output can be copied on a normal ssb receiver.

News from America

The FCC has released a Notice of Proposed Rule-Making which would permit the use of A4, A5, F1, F3, F4 and F5 emissions in the 1·8MHz band in the USA. This is by way of response to an ARRL petition seeking to authorize F1 emissions in that band. However, the threat of the re-allocation of the 1,900–2,000kHz portion of the band to the radiolocation service on a primary basis still remains.

The ARRL is to develop a programme designed to increase ARRL membership by

RSGB HOME CONSTRUCTORS COMPETITION
RSGB NATIONAL CONVENTION
NEC, 13-14 April 1985

Prize: The winner will receive the Horace Freeman Trophy and a cash prize of £100.

The rules for the above competition, as agreed by Council on 19 January 1985, are as follows:

1. The equipment must be an original design for use in the amateur station.
2. The item shall be capable of reproduction at home without the use of professional facilities.
3. In the opinion of the judges, the cost of the materials required to make the equipment must not exceed £50.
4. The competitors must be members of the RSGB.
5. The winner will be required to prepare a constructional article and to offer it for publication in *Radio Communication* or any other Society publication. If published, it will receive the normal author's fees in addition to the above cash prize.
6. Entry forms can be obtained from the membership services department at RSGB HQ, or from the organizer's office at the Convention. Entries, together with a completed entry form, shall be handed in at the organizer's office by 3pm on Saturday 13 April 1985.
7. Entries will be judged by the chairman of the RSGB Education Committee or his deputy, with appropriate advice. Their decision on who shall receive the award, or whether to withhold the award if entries are of inadequate standard, shall be final.

25,000 by the end of 1985, and by 20 per cent per year thereafter.

A news release concerning packet radio has also been released by ARRL: it reads as follows:

"The ARRL . . . has approved a standard protocol for packet radio. A document with detailed specifications, AX25 Amateur Packet-Radio Link-Layer Protocol, by Terry Fox, is available (from BARTG in the UK, under the auspices of the Society) . . .

"This protocol was developed over a three-year period by amateur volunteers and amateur packet-radio clubs throughout North America. Earlier versions of the protocol have been in daily use since early 1983 by approximately 2,000 amateur packet-radio stations. Many of these are in populous areas of the US, such as San Francisco, Boston, Miami and Washington DC, and others are active in Europe, Africa, East Asia, Australia and New Zealand. Amateur packet-radio enthusiasts ("packeteers") have a wide choice of transmission modes: high-frequency ionospheric, very-high-frequency terrestrial, amateur satellite and meteor-scatter communications. Transmission speeds are now in the 300 to 1,200wpm range and will be much higher in the near future as new equipment designs are completed.

"Although it is early in the development of amateur packet radio, it will eventually become an international integrated network offering a wide variety of data communication services to amateur radio operations. It will be capable of providing the public with emergency communication in times of disaster as "hams" have done for many years by manual message processing. Other network services will be automatic weather reporting, data bases, still photographs, and compressed-bandwidth television."

Noisy Ambassadors

Judging by information received from members in response to items carried in the *Council Letter* and on GB2RS, it now appears fairly certain that the BT "Ambassador" telephone can, in some circumstances not yet fully understood, be a source of interference in the 144MHz band. The interference from the "Ambassador" appears to take the form of four wideband signals sounding like "hash" when tuned in on an ssb receiver. The Society has sent a report on this problem to the DTI and, as this item was written, was awaiting a reply. It also appears that some other newer-generation telephones are capable of radiating interference in amateur bands, and investigations are continuing.

Got any pictures?

The Society is wondering whether individual members or club officers may have made video recordings of events with an amateur radio flavour which might be useful for external publicity purposes. If you have any material which you feel might assist the Society in publicising its work, or amateur radio in general, please write to the secretary at RSGB headquarters giving details. Please do not send tapes at this stage!

UK/Israel reciprocal licence

Some confusion arose recently concerning the nature of the reciprocal licensing agreement between the UK and Israel. The position is that the Israeli Class A and Class B licences are accepted for the UK Class A licence. Also, although there is no formal agreement covering the UK Class B licence, it appears that the Israeli authorities "unofficially" grant UK Class B licensees a temporary operating permit.

Although there are no set prefixes for Israeli Class A and B licences, the associated callsigns consist of five symbols as opposed to six symbols for the Class C and Novice licences. The Novice callsign is easily distinguishable from the Class C, since the fourth symbol is always "N".

73

In the course of a recent interview for BBC local radio, a member of headquarters staff was asked the origin of the expression "73", meaning "best wishes". He confessed he did not know, but later research produced the following (with thanks to the Australian *Amateur Radio* magazine:

"The origin of 73 as the telegrapher's conventional signal of greeting has been ascribed to a dinner given to Andrew Carnegie on his 73rd birthday by the Order of Military Telegraphers. The dinner referred to was given on 27 November 1908, and the signal 73 was played upon in connection with his 73rd birthday. However, investigation indicates that the term "73" was used for many years prior to that time.

"The following material, believed to be authentic, is quoted from the *Telegraph and Telephone Age* dated 1 June 1934.

'It appears from a research of telegraph histories that in 1859 the telegraph people held a convention, and one of its features was a discussion as to the saving of "line time". A committee was appointed to devise a code to reduce standard expressions to symbols or figures. This committee worked out a figure code, from figure 1 to 92. Most of these figure symbols became obsolete, but a few remain to this day (je 1934—*Ed*) . . . the following were still in effect in 1905:

1 Wait a minute
4 Where shall I start in message?
5 Have you anything for me?
9 Attention, or clear the wire
13 I do not understand
22 Love and kisses
25 Busy on another circuit
30 Finished, the end (ie VA)
73 My compliments, or Best regards
92 Deliver'

So where did "88" come from?"

Fifty years ago (from the *T & R Bulletin* March 1935)

"G2HG has been busy re-arranging his gear so that rapid QSYs can be made when testing with long-distant stations on 28mc. He has had his reception of VE1GZ confirmed, the signals being a harmonic from 14mc.

"2BIW finds difficulty in receiving local fundamental transmissions, but is successful in receiving harmonics. He attributes this state of affairs to the masses of steelwork around his station. He has tried various aerial systems in the hope of effecting a cure, but so far with no success.

"Meagre details of the new "Acorn" valve, made in America and specially designed for ultra short wave work, have recently made their appearance, but the valve is unobtainable in this country and in any case will probably prove expensive, owing to high manufacturing costs.

"The Band Monitoring Group are not policemen of the ether, but are performing a sound voluntary task for the benefit of the Society as a whole, with the thought in mind that, when the time comes, they, with us, will be able to prove that out of many hundreds of transmissions checked only a fractional percentage have been found off frequency. Evidence of this nature will, we hope, suffice to convince the GPO that British amateurs have earned the right to use the full international amateur band widths."

Scouts on the air

The World Scout Bureau in Geneva recently conducted a survey concerning JOTA. One of the questions referred to the matter of unlicensed Scouts being able to speak into

RMG OPEN MEETING

SCOTTISH BORDERS

An open meeting of the Repeater Management Group will commence at 2pm on Sunday 31 March 1985 at Lilliardsedge Caravan Park, which is on the A68 road between Jedburgh and St Boswells. The meeting is being organized by the Scottish Borders Repeater Group, which will be holding its agm on the same morning.

Members of the RMG will be in attendance, and all repeater users and builders are invited to attend.

Further information from Bruce McCartney, GM4BDJ; Colin Dalziel, GM8LBC; or Chris Young, G4CCC.

the microphone at JOTA stations. Of 38 countries taking part in the event, only 10 did not allow unlicensed Scouts to speak. The countries allowing this privilege were Australia, Belgium, Canada, Colombia, Costa Rica, Cyprus, Denmark, Fiji, France, Hong Kong, Israel, Jamaica, Japan, Luxembourg, Malaysia, the Netherlands, New Zealand, Norway, Papua New Guinea, Phillipines, Portugal, Sweden, Uruguay and Zimbabwe. With some restrictions, Brunei, Eire, the UK and the USA also permitted unlicensed Scouts to speak into the microphone.

Raised in the House

On 9 January 1985 Mr Moynihan, the Member for Lewisham East, asked the Secretary of State for Trade & Industry what conclusions he had reached on the future of Bands 1 and 3 in the light of the response he had received to the consultative document, Cmnd 9241. Mr Moynihan also asked the Secretary of State for Trade & Industry whether he would make a statement. Mr Geoffrey Pattie replied that he hoped to let the House know later in the month what conclusions the Secretary of State had reached.

IPAARC

The British section of the International Police Association ARC will hold its first agm in a Midlands hotel on 13 April 1985 during the RSGB Convention at the NEC, Birmingham.

Membership of the club is open to both serving and retired police officers, and it has a worldwide membership of about 1,000. National and international nets are held regularly, and there is an annual contest in November. The German section issues and promotes the "Sherlock Holmes Award".

Further information can be obtained from Brian Boon, G4TRE, secretary IPAARC, 32 La Plata Grove, Brentwood, Essex CM14 4LA.

Red face corner

We apologise on behalf of one of our reporters for the two errors which appeared in the "Happy birthdays" item on page 100 of our February issue.

in the first paragraph, third line, "one year" should have read "three years", and in the third paragraph, first line, "50th" should have read "48th".

RSGB psu handbook

Correspondence and discussions with a number of members have suggested that a book devoted to power supplies of all types would be a welcome addition to the RSGB book list. The Society plans to go ahead with this project and is beginning to look for suitable authors to assist with the work.

An essential feature of the book will be that, although it is intended to describe a wide range of practical equipment, every effort will be made to provide background technical information in such a way that amateurs will be able to design and use the equipment in the most effective way.

The provisional list of chapters covers:

a "systems" approach to psus at the block diagram level;
a wide range of circuit "building blocks" using practical designs to illustrate the principles involved;
a range of standard mains psus (both low voltage, high current and high voltage, low current);
a range of dc inverters (dc to mains and dc to dc);
miscellaneous psus, eg constant current supplies, switched-mode psus batteries and chargers;
generator supplies;
construction and testing;
general relevant information.

Anyone who feels able to make a significant contribution to the book is asked in the first instance to contact the chairman of the Technical & Publications Committee at RSGB HQ, giving details of relevant experience and particular areas of expertise.

RAOTA

There will be an extraordinary general meeting of the Radio Amateur Old Timers Association at 2.30pm 13 April 1985, during the RSGB National Convention at the NEC, Birmingham. Apart from formal proceedings, it will be necessary to consider matters affecting the constitution, and ways to improve the activities of the association.

The weekly RAOTA net at 11am on Thursdays is now held on 3,762kHz ± to avoid QRM from commercial stations.

What do you give the amateur radio couple who've got everything—including each other? When Brenda and Bernie of Amateur Radio Exchange added a marriage certificate to their other qualifications (the happy day was 16 December 1984) even the wedding cake entered into the spirit—with a pair of Icom handheld transceivers in place of the conventional three-tiered edifice. The happy couple, now officially Mr and Mrs Godfrey, will still be *Brenda*, G4VXL, and *Bernie*, G4AOG, to customers and friends! Note for the technically-minded: the base was fruit cake covered with marzipan and white icing; the "radios" were sponge and cream covered with marzipan and black icing.

1985 G3PAO Memorial Lecture

The Verulam ARC announces that this year's G3PAO Memorial Lecture will be given by Jim Bacon, G3YLA. The title will be "There's a bit of a lift on", reflecting Jim's professional knowledge of the effects of weather on propagation. The lecture takes place on 26 March at the RAFA HQ, New Kent Road, St Albans, commencing at 8pm. All visitors welcome. Further details from G4JKS, tel St Albans 59318.

Sidebands

Morse tests are likely to be available at this year's NEC, by appointment—further details later. BT have also reminded us that stamps are no longer acceptable as payment for the morse test.

We hear that both the Vauxhall Cavalier SRi and some Ford Sierras may experience problems from 144MHz mobile installations—does any member have any more details?

Martyn Comley, G4JGC, is the overworked unpaid station engineer at Middlesex Hospital Radio, a registered charity in Central London. All staff are volunteers, and he urgently needs extra help with construction and maintenance. If you have the time and knowledge to spare, please call him on 01-636 4913.

Special Event Stations

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

1 March, GB2SDD
To celebrate St David's Day, BSC Port Talbot ARS will operate on all bands from midnight to midnight. Special QSL cards will be sent. SWL reports will be acknowledged; ircs appreciated. St David's Day Award available for contact with GB2SDD and (a) five other Welsh stations during February and March (for residents outside UK), and (b) 10 other Welsh amateurs during February and March (for UK residents). Copies of logged entries, plus cheque or postal order to value of six ircs payable to SDD Station; should be sent to Mr R R Jones, GW4HOQ. "Bryn-Ynys", Strawberry Place, Morriston, Swansea, W Glam SA6 7AG.

1-31 March, GB2HW
To mark the 700th mayoral anniversary of High Wycombe. Active on all bands. Details G2DRT.

2-3 March, GB4CRA
This station will be operated in connection with the Claybrook Radio Appeal to help raise funds for famine relief in Ethiopia. It will be located at the Claybrook First School; and will work phone, rtty and cw on the hf bands, and phone only on 144MHz. Details G4SWR or G4SOA, both QTHR, tel Redditch 20042 or 26567.

20 March, GB2DC
As part of the Dunstable College Arts Fortnight, Dunstable Downs RC will operate this station on hf, vhf, rtty and sstv at the college in Kingsway between 2pm and 5pm. Details G6EES, tel Dunstable 607623.

7, 9, 25 April GB2GWR
Operated from the main entrance of Temple Meads Station, Bristol, to celebrate 150 years of the Great Western Railway. From 10am to late, on 144 and 432MHz ssb, and 3·5, 7 and 144MHz ssb. Some cw may be included. Details G4ZCK, tel 0272 712675.

COUNCIL PROCEEDINGS

A brief report on the Council meeting held on 9 November 1984

Present: Mr R G Barrett (President, in the chair), Messrs D E Baptiste, J T Barnes, Dr D S Evans, Messrs F D Hall, L N G Hawkyard, Mrs J Heathershaw, Messrs H M Holmden, G R Jessop, T I Lundegard, W J McClintock, B O'Brien, H S Pinchin, D M Pratt, K E V Willis (members of Council), D A Evans (secretary/general manager), Ms H M Norman (minutes secretary).

Apologies for absence were received from Messrs Hutchinson, Smith and Thomas.

Honorary treasurer's report
In the absence of the honorary treasurer, Mr O'Brien reported that book sales had their biggest profit ever in the last financial year, and he circulated a sheet of figures comparing book sales and profits, plus advertising revenue and Council/committee expenses since 1978.

This prompted several questions, and a discussion took place on book sales, advertising and committee expenses.

Secretary's report
The secretary distributed the latest membership figures, which continued to show a growth in membership.

Mr Evans reported that he was planning a further survey of members, to be sent with subscription reminders as before, and invited Council members to send him potential questions. It was agreed that the Presidential Advisory Group would look at the final draft of the survey form.

Recent progress with the DTI in a number of areas, including 50MHz, third-party greetings messages, crossband working, Class Bs use of morse code, and mutual licensing was discussed. On the subject of spectrum abuse, much background work was going on, and the future for RIS/DTI-RSGB Observer Service liaison looked bright.

The secretary described in some detail the new project to make information available to members via a computer-telephone link.

Committee recommendations
Raynet Committee
That the award of the Raynet Trophy for 1984 go to Dr Peter Best, G8CQH, for his service to Raynet in the West Midlands and nationally. This was approved.

Technical & Publications Committee
That the 1984 Wortley Talbot Trophy be presented to Mr Paul Elliot, G4MQS, of the Leicester Repeater Group, being the builder of the first 1·3GHz tv repeater.

That the Ostermeyer Trophy be presented to Messrs T P Hopkins, G8TYY, and D R Bolton, G8UQC, for "The Beer Mat Mk 2 144MHz direct-conversion receiver", published in *Rad Com* July 1983.

That the Norman Keith Adams Prize be awarded to Mr I Braithwaite, G4COL, for "A sampling fm monitor" published in *Rad Com* October 1983.

All were approved unanimously.

Microwave Committee
That the Marconi Medal be presented to the DF0EME Group, comprising DL5AU, DJ4UR, DL5FBE and DJ8QL, for active promotion of moonbounce on 2·3GHz.

That the Fraser Shepherd Award be presented to the expedition group specializing in the X squares, comprising GW3NYY, GW4LXD, G8TFI and GW8TVX, for outstanding work in activating rare QTH squares on the microwave bands, including 2·3GHz.

Both were approved unanimously.

VHF Contests Committee
That the Surrey Trophy be awarded to the Sheppey Combined Contest Group, as winners of the open section of the 1984 VHF NFD.

That the Arthur Watts Trophy be awarded to the Cotswold and Big M Contest Group, as winners of the restricted section of 1984 VHF NFD.

Both were approved unanimously.

Finance & Staff Committee
That Council members elected for the first time should be invited to HQ, prior to taking up their duties, for a general discussion on the responsibilities of Council members, affairs of the Society and facilities at HQ.

Agreed unanimously.

IARU Committee
That an affirmative vote be given by RSGB to the admission of the Brunei Amateur Radio Transmitting Society to the IARU Region 3 Association when received.

Presentation of awards
Mr Glaisher, G6LX, chairman of the HF Contests Committee, had requested that hf contests awards be presented at the agm rather than at the HF Convention. After some discussion, Mr Hawkyard proposed that only non-contest awards be presented at the agm, as the inclusion of contest awards would take up too much time. This was seconded and agreed unanimously.

The secretary was asked to write to Mr Glaisher explaining that the notice of his request had been too short, and asking the HF Contests Committee to submit a paper to Council if it wished to pursue this request.

Membership and representation
The granting of reduced subscriptions in respect of 10 members was noted.

Dr Evans proposed acceptance of the five waived subscription applications listed on the supplementary agenda. This was seconded by Mr Pratt. Eleven voted in favour of the proposal, three against, and one abstained. The waived subscriptions could therefore not be processed.

The granting of affiliation to the following was noted:
Aycliffe & Shildon ARC, Co Durham;
Guildford County College of Technology AR & Electronics Club;
Lakeland Fells AR Repeater Group, Kendal;
Plessey Radio Club, Ilford;
Sunspots ARC, Belfast;
Thames Television ARS, Teddington;
Arnold & Carlton College of Further Education ARS, Nottingham;
Felixstowe & DARS, Suffolk;
Hambleton ARS, Northallerton, N Yorks;
Pennine ARS, Huddersfield;
RAF St Athan ARC, Barry, S Glam;
Washington & District ARC, Tyne & Wear.

The following area representatives had been appointed:
R P Mountfield, G6HPX....Bury St Edmunds and District.
L V G Turner, G4CUT....Chelmsford.
D H Vance, GI3XZM....North Ulster.
E S Whitworth, G4TUO....Rochford district.

EMC Committee chairmanship
Mr Hall proposed that Mr Hawkyard be appointed chairman of the EMC Committee. This was seconded by Mr Willis and carried unanimously.

Awards
Founders Trophy—for services to the Society.

Mr Hall proposed that this be awarded to Mike Dennison, G3XDV, for his considerable work as chairman of the RMG. This was seconded by Mr McClintock, and agreed unanimously.

Calcutta Key—for outstanding service to international friendship.

Mr Eric Godsmark, G5CO, was proposed by Mr Baptiste, in recognition of his services as secretary of IARU Region 1. This was seconded by Mr Jessop, and agreed unanimously.

Censure on Mr Holmden
Several Council members voiced their concern at Mr Holmden's action in writing to other magazines to express his criticisms of the Society and Council.

After discussion, a secret ballot was conducted which indicated that 13 were in favour of the censure and one was against.

The President asked Mr Holmden to note the item headed "Communication with outside bodies" in the revised Green Book and to bear in mind that if he was in any doubt about writing to other magazines he should ask the opinion of more experienced members of Council before taking any action.

Propositions
Council members expressed their views on the proposals made at Council's previous meeting regarding the chairmanship and vice-chairmanship of the Finance & Staff Committee.

All the proposals (*Rad Com* January 1985, p24) were rejected.

Spectrum managers' reports
Council noted the reports of the hf and microwave managers. No report had been received from the vhf manager. After discussion it was decided that, unless specifically asked to report on any matter, the spectrum managers need not submit written reports. However, the spectrum manager could report to Council as and when necessary.

Year-end changes
This being the last meeting of 1984, the President thanked Messrs McClintock and Lundegard for their work and, in noting that both were candidates for election for the 1985 Council, added that he hoped that one would be re-elected to provide continuity.

Mr Barrett also expressed his thanks to Mr Hawkyard, who would not be on Council next year. He paid tribute to the work done by Mr Hawkyard on various committees.

Finally, the President warmly thanked Mr Baptiste, saying that if it had not been for his considerable efforts over the past two years, the Society would not be in the good shape that it was today. The Society owed Mr Baptiste much gratitude.

In his response, Mr Baptiste said that it had been a pleasure to have worked with the Society for the past two-and-a-half years. He conveyed his good wishes to the Society for the future.

Mobile Rallies Calendar

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

10 March
Northern ARS Association Exhibition & Mobile Rally. Central Hall, Belle Vue, Redgate Lane, Longsight, Manchester M12 4WH. Details G8NRF, QTHR.

10 March
Pontefract & DARS Components Fair. For the home-constructor and d-i-y enthusiast. Components, surplus equipment and antennas; no new black boxes. Open 11am–4.30pm, Carleton Community Centre, Pontefract, on A1 between Darrington and Pontefract. Details G4ISU or G4KMW, both QTHR, tel 0977 792784 or 792654.

24 March
White Rose Rally, University of Leeds. Details G4NDU, QTHR, or Box 73, Leeds LS1 5AR.

29 March
Lagan Valley ARS (GI4GTY) Hamfest, Lisburn Market, Smithfield Square, Lisburn. Details GI4LKG.

31 March
Barry Radio Rally, Barry Leisure Centre, Greenwood Street, Barry, South Wales. From 11am to 5pm Talk-in on S22. Details GW4TWU, QTHR.

8 April
Wakefield Amateur Radio & Computer Fair, Bretton Hall College, Bretton, Wakefield, organized by North Wakefield RC. From 11am (10.30am for disabled visitors). One mile from junction 38 and four miles from juction 39 on M1. Talk-in on S22 and GB3WU (RB15). Details G4RCH, tel 0532 536633.

21 April
Lough Erne ARC Mobile Rally. Killyhevlin Hotel, Enniskillen. Details GI4CZW, tel 0365 24500.

28 April
Humberside Radio Rendezvous, Grange Farm Hobbies Centre, Franklin Crescent, Scunthorpe. From 11am to 5pm. Talk-in on S22 from 10am. Details Ida G4ZGJ, tel Scunthorpe 732268.

28 April
Southend & DRS Mobile Rally, Rocheway Centre, Rochford, Essex. Talk-in on S22, 145·550MHz fm. Details from G4DEZ, tel 0702 617749; or G4RDS, tel 03745 50494.

5 May
Swansea ARS Mobile Rally, Patti Pavilion; adjoining St Helen's CC Ground on Swansea-Mumbles road A4067. Open 1030am–5pm. Talk-in on S22, GB2SWR. Details GW4HSH, QTHR, tel 0792 404422.

5 May
Second Anglo-Scottish Rally, Kelso's Tait Hall,

11am-5pm. Talk-in on S22. Entrance £1. Organized by Kelso, Borders and Galashiels ARSs. Details André Saunders, GM3VLB, Physics dept, Kelso High School, or GM4UIB, QTHR, tel 0573 24664 and 24654, eveings only.

5 May
BATC Rally, Post House Hotel, Crick, close by junction 18 on M1, from 10am. Details G8CJS, QTHR, tel 0532 670115.

6 May
Mid-Cheshire ARS Mobile Rally, Winsford Civic Hall, High Street, Winsford, Cheshire. On A54 eight miles from M6 junction 18. Details G4VOH, QTHR, tel 06065 4719.

12 May
Swindon Radio & Electronics Rally. Oakfield School, Marlowe Avenue, Swindon, Wilts. Open 1030am. Talk-in on 144MHz (S22) and 432MHz (SU8/GB3TD). Details G8SFM, QTHR, tel 066689 307.

12 May
Drayton Manor Mobile Rally, Drayton Manor Park, near Tamworth, Staffs, on A4091 one mile south of A5/A4091 junction. Open from 11am to 5pm. Talk-in on 144 and 432MHz, callsign G3MAR/A. Details G8BHE, QTHR, tel 021-422 9787.

19 May
Mid-Ulster Mobile Rally, Parkenaur, Co Tyrone. From 12 noon. Details GI1CFS, QTHR.

19 May
Northern Mobile Rally. Great Yorkshire Showground, Wetherby Road, Harrogate. Open 11am. Caravan site at showground. Details H. Moore, 269 Leeds Road, Ilkley, West Yorks LS29 8LL.

26 May
Plymouth Mobile Rally, Devonport High School, Devonport, Plymouth. Opens 10am. Talk-in on S22. Details G8XTE or G6XZG, PO Box 46, Plymouth, tel Cornwall 319.

26 May
East Suffolk Wireless Revival. Details later. Info G4IFF, QTHR, tel Ipswich (0473) 44047.

26 May
Maidstone YMCA ARS Biennial Mobile Rally. Y Sports Centre, Melrose Close, Cripple Street, Maidstone. Details later.

2 June
Spalding & DARS Mobile Rally. Talk-in from 10am. Details Betty Whitley, G4ZGT, 45 Exeter Drive, Spalding, Lincs.

9 June
Elvaston Castle Mobile Rally, Elvaston Castle Country Park, 5 miles SE of Derby on B5010. Organized by the Nunsfield House ARG. Open 10am. Talk-in GB2ECR on 144 and 432MHz. Details G4PZY, tel Derby (0332) 767994; G4CTZ, tel Derby (0332) 799452; or club hq tel 0332 755900.

16 June
Denby Dale Mobile Rally, Shelley High School, Nr Skelmanthorpe, Huddersfield. Talk-in on S22 and SU8. Open 11am. Details G3FQH, QTHR, tel 0484 862390.

16 June
RNARS 25th Anniversary Mobile Rally, *HMS Mercury*, Leydene, near Petersfield, Hants. From 10am to 5.30pm. Talk-in on 144 and 432MHz. Details G3WAO, 3 Humber Close, Stubbington, Fareham, Hants, tel 0329 665757.

30 June
Rolls Royce ARC Mobile Rally, RR Sports & Social Club, Barnoldswick, 10 miles N of Burnley, six miles S of Skipton, between A56 and A59. Details G4ILG, tel 0282 812288.

30 June
Buxton Mobile Rally. Pavilion Gardens, Buxton. Details G6MIF, QTHR, tel 0298 6174.

30 June
28th Longleat Amateur Radio Rally, Longleat Park, Warminster. Details G4FRG, QTHR, tel 0272 848140.

14 July
Sussex Mobile Rally, Brighton Racecourse. From 10am. Talk-in on 145·50 and 3·5MHz. Details G6YPY, QTHR, tel 07918 5103.

14 July
Droitwich Mobile Rally, Droitwich High School. Details G4ASO, tel 0905 351565.

21 July
Cornish RAC Rally, Cornwall Technical College, Redruth. 10am-5pm. Talk-in on S22. Details G4RVP, tel Penzance 763549.

21 July
McMichael ARS Mobile Rally, Bells Hill, Stoke Poges, Nr Slough. Talk-in on S22 and SU8. Open 11am. Details G8IHF, c/o McMichael Ltd, Wrexham Road, Slough, Berks.

21 July
Anglian Mobile Rally, Stanway School, Colchester, Essex. Talk-in on 144MHz. Open 10am-5pm. Details G6HQI, 26 Pondfield Road, Colchester, tel 0206 860403.

28 July
Scarborough ARS Rally. The Spa, Scarborough. Open 11am. Talk-in on 144MHz (S22), 432MHz (SU8), and RB0, GB3NY. Details G4YWR, QTHR, ex-G6CXK, tel 0723 360587.

25 August
18th Preston Annual Rally, Lancaster University. Details later.

5 September
Vange Mobile Rally, Nicholas School, St Nicholas Lane, Basildon, Essex. From 10am to 5pm. Talk-in on 144MHz, GB4VMR. Details G4OJN, QTHR.

8 September
Lincoln Hamfest, Lincolnshire Showground, on A15 four miles north of Lincoln. From 10.30am to 5.30pm. Talk-in on 144 and 432MHz (S22 and SU8). Details G4STO, QTHR.

15 September
Peterborough Mobile Rally, Wirrina Sports Stadium, Bishops Road, Peterborough. 10.30am-5pm. Details G3EEL, tel Peterborough 62881 after 6pm.

Other Events

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

3 March
Doncaster Amateur Radio Show, Doncaster Institute of Higher Education Annexe, Ellers Road, Bessacar. Opens 11am. Admission 30p. Talk-in on S22. Details G8XTU, tel Doncaster 531365.

23 March
RSGB National VHF Convention, Sandown Park Racecourse.

13-14 April
RSGB National Convention, National Exhibition Centre, Birmingham.

4-6 June
Scotelex '85, the 16th Annual Electronics Exhibition & Convention, organized by the Institution of Electronics. To be held in the Exhibition Hall, Royal Highland Society, Ingliston, Edinburgh EH28 8NF. Details from Exhibition Organizer, Institution of Electronics, 659 Oldham Road, Rochdale, Lancs OL16 4IE, tel 0706 43661.

OBITUARIES

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

Mr K Bailey, G3EPU
Ken Bailey died on 17 November 1984, aged 73. He was active on 160, 80 and 2m, and was a founder member of the Wimbledon & District ARS where in his latter years he was elected public relations officer. Ken was also a member of the South London Mobile Club.

Mr J H Barton, RS41974
Jack Barton died on 30 November 1984. He was a member of the West of Scotland ARS and a founder member of the Glasgow Battalion of the Boys Brigade ARC.

Mr H Biltcliffe, G5HB
Harry Biltcliffe died on 8 December 1984, aged 74. Licensed for over 50 years, he was active on phone and key until a few months ago.

Mr W J A Carlton, G2CPX
Bill Carlton died on 4 December 1984, aged 81. He was a Raynet area controller for SW Surrey in the early 'seventies, and also president of the UK (FM) Group Southern 1978-81. Bill had been active on 144MHz until a few years ago, and was well known to Surrey and Hampshire radio amateurs.

Mr E Edwards, ex G3FYG
Eddie Edwards died on 10 October 1984, at the age of 77. Always an active radio amateur in the UK, he continued in Canada as VE7DAR and was involved in the social and public side of the hobby.

Mr F E Howell, GW3LYB
Fred Howell died on 3 January, at the age of 83. Fred operated phone and cw on most bands, eventually becoming exclusively cw on 3·5MHz, and kept a strong association with Torbay ARS.

Mr D Latto, GM4OXP
Dave Latto died on 12 January, aged 67. Although Dave was only recently licensed he had a keen interest in amateur radio for over 40 years.

Mr E R Martin, G6MN
Eric Martin died on 23 December 1984, aged 83. First licensed as 2BLG in 1927 he was an early member of the Society. Being a printer Eric was involved in printing the Society's stationery, and became well known for his QSL cards and log books. In 1927 he took over as district scribe for Nottingham and was a founder member of RAOTA and the Radio Fraternity Lodge of Freemasons.

Mr L E Pratt, G3DKT
Leonard Pratt died on 1 December, aged 71. He was active on 3·5MHz and made many friends in the St Dunstan nets.

Mr L Ricaud, G4XLR
Louis Ricaud died on 19 October 1984. he was a new but very keen radio amateur, and derived great pleasure from contacting other people. He was proud to belong to the RSGB.

Mr K Spargo, G4WRF
Ken Spargo died on 22 April 1984, at the age of 60. He was a member of the Royal Signals ARS.

Mr W A Spencer, G4MYM
Mr Spencer died on 3 May 1984. Though licensed only a few years he always kept a radio with him on his travels.

Mr J S K Stephens, G8WC
James Stephens died on 11 January. He was a member of the RSGB for over 50 years.

Mr E D Walker, G3MNX
Ted Walker died on 9 January. He was active until a few days before his death and was a keen dxer on the 14MHz band, having made many contacts with friends in Australia.

Mr S Walker, G6UOR
Sydney Walker died on 17 November 1984, aged 64. He joined the RSGB in 1982, and as a white-stick operator he took his RAE at home, obtaining a distinction for part one and a credit for part two. He was also a member of the RAIBC.

Mr D H Welchman, G6CPU
Dennis Welchman died on 1 October 1984. As a radio engineer in his early years he had an active interest in amateur radio and was a founder member of the Bath & District ARC.

Also:
Mr L G Barrett, RS85626, on 15 November 1984;
Mr B Bates, G4JQZ, on 12 December 1984;
Mr J W Cooper, G3PGS, on 9 September 1984;
Col E H Cox, G3CT;
Mr J Dockerty, G3NLH, on 4 November 1984;
Mr F E Epps, G4NPK, on 29 March 1984;
Mr J Foster, G3TRQ, on 30 November 1984;
Mr G S Hall, G3ZLA, in October 1984;
Mr A D Hardy, G4RFY, on 18 August 1984;
Mr H R McLean, RS34751, on 30 November 1984;
Mr N Meredith, G4NGZ, on 20 September 1984;
Mr J R Miller, G2QZ, on 6 June 1984;
Mr J C Milner, G4UGZ;
Mr C A Needham, G3DVO;
Mrs P Pawsey, RS85223, on 10 December 1984;
Mr G Pokova, OK2IZ, in April 1984;
Mr M J Quentin, RS36007;
Mr E J Taussig, RS86336, on 19 November 1984;
Mr R Taylor, G1CHD, in October 1984;
Mr A G Thorburn, G3WBT, on 30 December 1984;
Mr R Wallace, G4KNB, on 5 September 1984;
Mr W J Webber, G8RQV;
Mr R G Wills, G4IXG, on 3 January;
Mr C W Wilson, RS85380;

Members' Mailbag

QSL CARDS

Sir—QSL cards were originally intended to confer technical information, especially in the days of homebrew equipment, as well as confirming contact with the other station.

While still doing this today, the standard technical information matter on the card, especially from most European countries, seems mainly relative to the use (myself included) of commercial black box units and well-known antennas, so the card seems to have become more of an operator's calling card.

Whether or not one wishes to collect or send QSL cards is purely a personal matter for the individual operator concerned. How much operating and contacts one has must account for the percentage of cards one has in return.

I use two cards, one a personal glossy card for individual contacts, and the other a cheap card, obtained through the local radio society for club members, which I use for confirmations when requested to QSL during a contest.

Perhaps we should be looking towards expanding the information on a QSL card. For instance, the type of key or keyer one uses for cw work. There is quite a wide range of hand keys, paddle keys, bug and electronic keyboards in use today, these could be abreviated as follows: SHK, straight hand key; MBK, mechanical bug key; EPK, electronic paddle key; ESK, electronic squeeze key; EKB, electronic keyboard; SSK, side-swiper key; 2PBW, two pieces of bent wire (for emergency operating or lids without a key—NFD ops take note).

So it's up to the individual operator what his QSL card is to convey and be informative to the full. They can be interesting or dull, even to the stage of feeling impersonal.

E M Farland, G3GMM

Any comments? G3GMM's idea sounds worthwhile

Sir—I recently received, via the bureau, a rather rare QSL card. It was from U0CR, the Komsomolskaya Pravda Polar Expedition, on Kotel'nyy Island in the Novosibirskiye Ostrava (New Siberian Islands) at 75°N, 140°E, in the Arctic Ocean, and was for a QSO on 10 May 1979.

It was addressed to GU4VIB, and eventually reached me, but as V.. suffixes were not issued until 1982, the Russian station obviously misread the callsign. I am sure that this card would be greatly valued by the amateur for whom it was intended, and I would be pleased to send it to him on confirmation of correct frequency and time.

J H Endersby, GW4VIB

Sir—May I through your columns make a request to all holders of G4GAA to G4GZZ callsigns. I am the QSL Bureau sub-manager for this series, and I would like to appeal to all amateurs within this series to think about the QSL card system. I am holding thousands of these cards awaiting your envelopes, or a short note telling me how to dispose of them. If any of you care to give me ring on 021-444 3114 after 6.30pm I can possibly give some idea of how many cards are here for you. There are some really good scarce ones among them: for instance, Hawaii, Ascension Island, Chile, Antarctica, and so on, dating back to 1978-79.

I'm not joking when I tell you that my house is gradually becoming overcrowded with shoe boxes full of QSL cards. Should there be quite a lot for you, I can always make them up into a parcel and send them, on receipt of a postal order of course, this way will save you the expense of a load of envelopes and stamps.

If you know of anyone in the series who is now a silent key perhaps you could let me know.

Jim Terry, G4GEU

Sir—Reading the letter from Ron Grove, GU4???, in your December issue regarding QSL returns, prompted me to share my experiences as a QSL sub-manager for the G8s and G4J series. During 1984 I sent out 12,839 cards, the vast majority being for the G4J range. On the G8s range four amateurs were sent 211 cards. On the G4J range 15 amateurs received between 100 and 200 cards; seven received 201-300 cards; two received 301-400 cards; two received 401-501 cards, with the most sent being 540 and 557 cards. So certainly some amateurs are receiving a large number of cards!

So why is Ron only obtaining approximately a 50 per cent return? (Incidentally, a figure that I believe most older amateurs would rejoice in reaching). As a sub-manager maybe I can provide some reasons which may have contributed to his returns. Firstly, the lodging of envelopes with the managers. I frequently receive cards being returned to the sender (a G8s or G4J call), typically due to incorrect details, and marked clearly on the cards the comment "please QSL via bureau".

The only problem here is that they have not lodged envelopes to receive any cards! Even dx managers are at fault, with 8Q7BT (G4JMM), 3V8DX (G4JDT) and G4JVG/SM/OH0/OJ0 all failing to keep a supply of envelopes with me, resulting in literally hundreds of cards stacking up without any prospect of them reaching their destinations.

Even when envelopes are lodged some can cause significant delays due to the nature of stamps used. Some are understamped so that it is touch and go whether the PO will deliver them. Others are vastly overstamped, resulting in envelopes being filled and sent once every five years! Other delays are caused by infrequent "clearing" of foreign bureaux, possibly only twice a year, or the amateur you have contacted not sending the card for you to his bureau for several months.

All the previous comments illustrate how cards can be delayed, particularly if the recipient of your card waits to receive it before he replies. So my advice would be to make sure that your "end" (ie envelopes, stamps, etc) does not add delay, and if that card is needed quickly then QSL direct. If that side is okay then just sit back and wait for the cards to come in. However, be prepared for occasional long waits, as witnessed by my record of over seven years for a QSL return.

Keith Baker, G3WTV

Headquarters staff who are active on the air consider that although envelopes are correctly lodged with sub-managers etc, a 50 per cent return rate is about average.

RIPOSTE

Sir—I feel I must reply to Mr Tony Skaife's letter in your December issue.

For the information of G4XIV, I am a member of the West of Scotland Amateur Radio Society, which is one of the finest radio clubs in Scotland.

Colin Watson, BRS46598

"THE BLACK DEATH"

Sir—I write wearing the hat of my other hobby, that of flying radio-controlled model aircraft, in the hope that I can tap the vast field of experience available via your pages, and help both myself and my fellow modellers.

The problem concerns a phenomenon we have named "The Black Death" which involves the corroding away of negative leads on nicad battery packs. Most radio control equipment usually consists of a four-cell 500mA/h "flight pack" and a similar eight-cell pack in the transmitter, both of which can suffer from the "disease"! As I tend to be the first-line "fixer" for our local flyers, I can confirm that the problem is not by any means limited to isolated cases, and is both dangerous and expensive if allowed to progress to its final conclusion. I have spoken to several manufacturers of both radio-control gear and nicad cells, and the trouble has also been "aired" in the model press from time to time, but never with any conclusive answers.

So, perhaps someone within our amateur ranks may be able to provide an explanation and/or cure and help give a lot of models a longer lifespan! The known facts are:

1. The corrosion always attacks the negative lead, and can progress from the cells for 12in or more along stranded insulating wire, completely eating the entire conductors.
2. Plugs, sockets and switches do not form a break or barrier, the corrosion will continue right up to the pcb.
3. No one type or manufacture is immune.
4. Problem knows no age limits, it has been found on brand-new equipment.
5. Can occur in a short space of time, eg checked and found clear, then six weeks later can be at an advanced state of decay.
6. Abuse or misuse cannot be suggested; it happens to the best of us!
7. Model gear does tend to be used and left in damp situations (cold garages).
8. The "use cycle" is generally of a 20 per cent discharge, followed by a 15h 50mA charge.

So please, explanation and advice most welcome.

Peter Walton, G4WAL

Any offers from those familiar with nicads? We understand that the problem is not unknown in hand-held portable transceivers either.

"MORSEMAN" FEEDBACK

Sir—May I say what an excellent idea the "Morseman" is, and in particular the kit of parts needed to make a good-looking job. Unfortunately I have already passed the morse test, but I look forward eagerly to similar articles, particularly in areas such as rtty, sstv or Amtor.

C N Bauers, G4JUV

Sir—This design will obviously appeal to many, but I must make comment on the section "Calibration". The word "Paris" does not now consist of 48 bits as it did when the inter-word space was five bits. An amendment to the RR and ARR annexe to ITC 1959 increased this to seven, hence "Paris" is 50 bits long. This means that in the original article Table 1 gives incorrect values. A correct version is given below.

The bit length of an English word has long been accepted to be 50, and a recent investigation has been carried out by A S Chester ("Did Morse get it right?". *Wireless World*, August 1983), who gives the average result of 49·4. Furthermore, if characters are taken at random, then on average the standard five-letter group becomes 60 bits long and figure group 89. This information can be used in the calibration of "Morseman", as if the morse rate oscillator is set to, say, the plain text rate of 12wpm (10 bits/s) then only 10 random letter groups or 6·7 figure groups per minute will be formed. The latter two rates can easily be timed with a stopwatch. I hope this information will be of use.

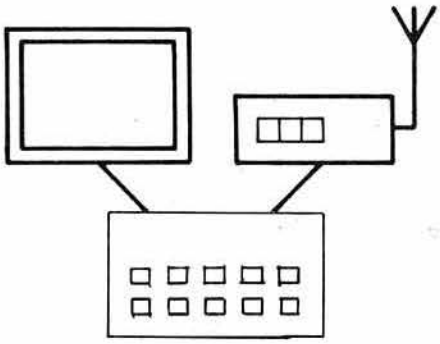
Table 1. Frequency/period of Morseman rate oscillator (IC6, pin 2)

WPM	Frequency (Hz)*	Period(ms)
6	5	200
8	6·7	150
10	8·3	120
12	10	100
14	11·7	85·7
16	13·3	75
18	15	66·7
20	16·7	60
24	20	50
26	21·7	46·2
28	23·3	42·9
30	25	40
32	26·7	37·5
34	28·3	35·3

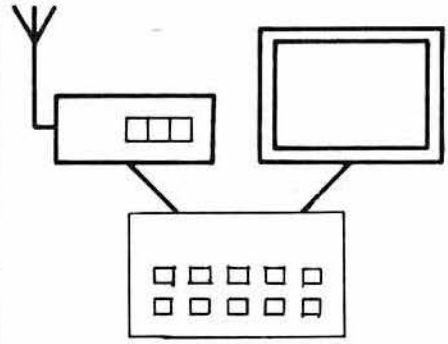
*This is numerically equal to random letter wpm rate

K L Barfield

Several technical projects are in the pipeline, and we hope that they will fit the bill. Mr Barfield's letter was most interesting, and we stand corrected! In practice, the error in the Morseman's calibration is very small and would probably be taken up by tolerances elsewhere in the circuit.



AMATEUR PACKET RADIO



Peter Robinson, G3MRX* and Alan Jones, G8WJL**

Peter Robinson (left) was introduced to amateur radio at the age of eight by his uncle, whose callsign he now holds. He works on the research staff of the Computer Laboratory at Cambridge University, investigating design automation for integrated circuits, having previously studied interactive computer graphics for a PhD.

Alan Jones (right) is a research student in the same laboratory, looking at the properties of large groups of solidstate sensors. His amateur radio activity is mainly on the constructional side, with packet radio giving the ideal opportunity to experiment without the usual crop of damaged components.

PACKET RADIO is a system of communication where a single, simplex radio channel is used to provide reliable data transmission between several pairs of stations. It is usual for the data being transmitted to be digitally encoded and for computers to be used to handle special protocols which ensure that each item of data is transmitted precisely once from its source to its destination.

This paper describes a packet radio system suitable for use by radio amateurs. It is unusual in that it will operate using a normal amateur transceiver together with a standard home computer—no special hardware has to be built. An experimental computer program for packet radio has been in use for over a year, providing reliable multiplexed communications on a common channel.

The paper concludes with a performance analysis and suggestions for further experiments.

Introduction

Radio amateurs have a long history of experimenting with unusual methods of transmission, and the use of digital encoding of data has been no exception. Radio teleprinter (rtty) has been used for many years, and a form with automatic error correction (Amtor) has gained some popularity.

A rather different approach has been adopted in some communications systems linking computers. Rather than sending items of data as they are typed, the characters are accumulated into blocks (typically corresponding to a line of typing) before transmission. The transmission of this block is only attempted when its contents are complete, and the recipient of the data checks its integrity on receipt, causing retransmission after a failure. While one block is being transmitted, further lines of data can be typed and transmission attempts are interleaved with the reception of messages from other stations.

A group of licensed radio amateurs in the Cambridge University Computer Laboratory have been experimenting with a simple packet radio system, to provide reliable digital communications using radio with the following goals:

- transmission should use a single, shared, simplex radio channel with a bandwidth of no more than 3kHz on which several distinct contacts can be multiplexed—in particular, the calling frequency can be used for the whole contact;
- modest data rates—perhaps a hundred characters per second;
- a fully-distributed system with no master station;
- no new hardware should need to be built, so as to encourage wide use —the system uses unmodified amateur transceivers and BBC home computers (although other computers would suffice).

Our design uses synchronous frequency-shift keying (fsk) to transmit bits, and the standard RS232 format for bytes; packets comprise destination and source callsigns together with the actual data and a check-sum. Acknowledgements and timeouts ensure reliable transmission.

We now have a working program (written in Basic by Alan Jones, G8WJL) that runs on a BBC Model B computer, and we have tested this with four stations on the frequency.

Our next steps will be aimed at simplifying the program and increasing the digital bandwidth. Longer-term goals would involve getting the mode officially approved and then setting up remote service stations to store and forward messages, and possibly expanding the coverage of the network by setting up linked repeaters—rather like cellular radio.

Background

Data communication between computers and data communication by radio are two areas that have been quite extensively studied, and have even been studied in conjunction. Two goals frequently recur:

- the provision of a reliable transmission service from an unreliable communications medium; and
- the use of a single communications channel to provide several disjointed transmissions.

The basic principle underpinning these systems is the use of packets of digitally encoded data as the unit of transmission. Each packet contains protocol information as well as the data; this usually comprises destination and source addresses for the data, control codes indicating the status of the data, and a check-sum to identify packets that have been corrupted in transmission. This extra information, together with a set of rules for acknowledging receipt of data and re-transmitting corrupted data, allows multiplexed use of unreliable channels to construct a reliable communications system.

One of the first systems based on these ideas was the Arpanet [1], built

*48 George Street, Cambridge CB4 1AJ.
**31 St Regis, Chesterton Road, Cambridge CB4 1BY.

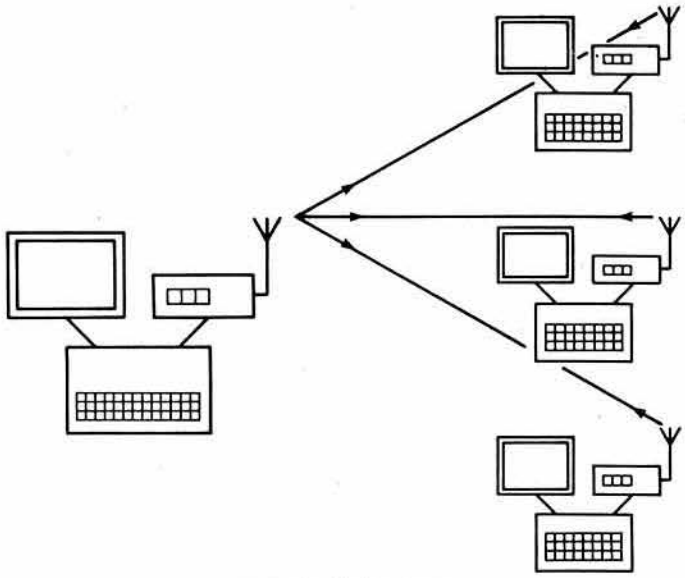


Fig 1. The Aloha system

for the Advanced Research Projects Agency of the American Department of Defence. This consisted of a collection of small computers scattered across America linked by moderately fast landlines (about 50kbits/s). Client computers were connected to the nearest network computer and could then launch data into the system. These packets were routed through a sequence of computers through to their ultimate destination, giving the name "packet switching" to this sort of network.

The underlying communications medium—the landlines—were thus shared between all the users, with the multiplexing being controlled by the various small computers. When radio communication is used, a further problem arises: who controls the multiplexing of the radio channel? One approach is time-division multiplexing, where time is divided into slots, each allocated to a different transmitter. However, this divides the effective bandwidth of the channel by the number of potential transmitters, which is very wasteful if only a small number are active at any one time.

The general solution to this problem is simply to allow anyone to transmit at any time. A clash may occur if two or more stations transmit simultaneously, but the protocols can be designed to detect this possibility and to re-transmit the lost data.

One early experiment in this area was the Aloha network in Hawaii [2] providing remote access to a time-sharing computer from distances of up to 300km. Fig 1 shows the general scheme; this uses two 100kHz channels, one for inward transmission from stations and one for replies from a central controller. Outward transmission is considered to be reliable, but clashes may occur on inward transmissons; these are detected by the absence of an acknowledgement from the central station, which in turn provokes retransmission.

The system is inappropriate for our purposes because it uses large bandwidth, duplex radio transmission, and requires a master station.

A different form of contention system is the "ethernet" [3]. Fig 2 shows this, sharing a single coaxial cable as the transmission medium, with stations transmitting freely when they feel inclined. Clashes are detected by listening while transmitting and observing corruption of the data, again provoking retransmission after some random pause. Receiving stations

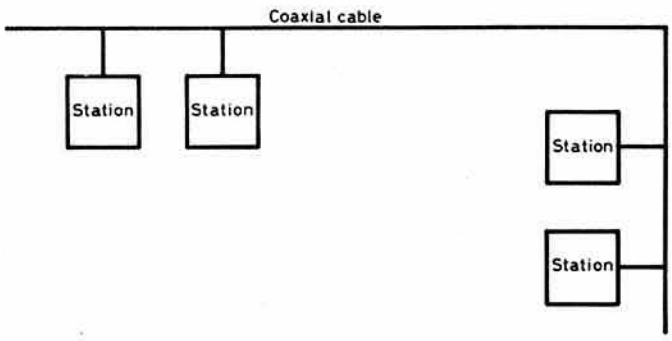


Fig 2. An ethernet

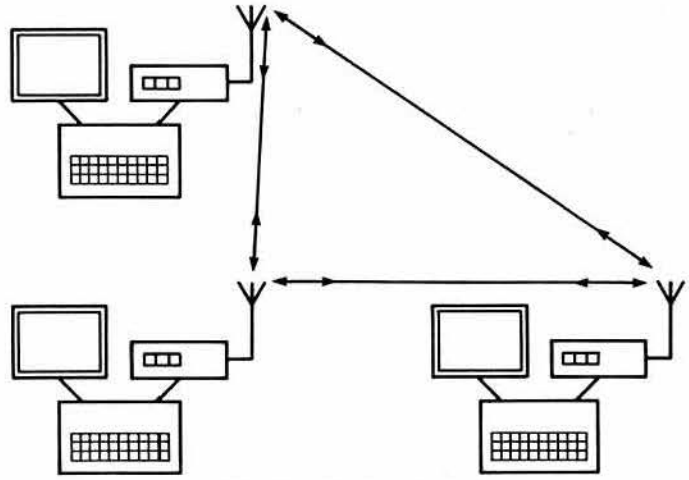


Fig 3. A packet radio network

send acknowledgement packets in return for data packets, and can use these to indicate data corruption (detected by the check-sum).

Packet radio closely models this, albeit at lower bandwidth, using a radio channel in place of the coaxial cable. Fig 3 shows the general picture.

Unfortunately clash detection on a radio channel is extremely difficult, requiring special antennas and fully duplex communications. A system of timeouts to detect transmission failure therefore seems more appropriate.

Previous limited bandwidth digital communication by radio has attempted to link just two stations on a single frequency without catering for sharing of the communications medium. Such a scheme is specified as CCIR 476 and has appeared in amateur guise as Amtor [4]. The main goal of the system is effective transmission through poor conditions, and it does not consider sharing the transmission medium or handling contention.

More recently, amateurs in Vancouver and Tucson have designed and built packet radio controllers that link computer terminals using amateur transceivers [5, 6]; and this scheme had been codified by the ARRL under the name of AX25. These systems use special terminal node controllers (tncs) to manage the protocols; are now widely available in kit form for about $200, and require an additional terminal or vdu as well as the transceiver. They both use the same protocols and achieve all of our initial goals but the last—simplicity.

The Cambridge system implements a slightly different protocol that can be managed purely by software within a home computer to achieve a similar result with rather less equipment. Given a BBC home computer and a transceiver, all that is required is a connection from the cassette port to the radio; the computer modulates and demodulates the audio signals and switches the transmitter on when necessary.

A packet radio protocol

The system will be presented in stages, corresponding to layers of control in the construction of the protocol.

The basic radio transmission uses a 3kHz bandwidth audio channel on approved amateur frequencies. So far we have used fm in the 144MHz band, with occasional excursions into ssb. Our studies show that a clean audio channel is beneficial (suggesting the use of fm, or perhaps careful filtering to match the particular audio spectrum used), but there is nothing special about 144MHz—we were just Class B licensees!

Each node comprises a transceiver and a BBC home computer, but the network might just as well be heterogeneous with other computers emulating the same protocol; it just happens that BBC machines are particularly easy to use.

Bits are transmitted at 300 baud (although 600 or 1,200 would also be possible) using synchronous fsk (2,400Hz for a "1" and 1,200Hz for a "0"). This gives an audio signal to be transmitted in the 3kHz radio channel. The observant reader will note that this is the encoding scheme used on cassette tapes by the BBC machine, which means that the serial processing chip (the Ferranti ULA2C199) can be used, giving a certain simplicity. Moreover, the BBC machine produces an audio signal that is a reasonable approximation to a sine wave rather than a square wave, so the modulation does not splatter across too wide a bandwidth.

Bits are packed into bytes comprising:

- a start bit (0);
- eight data bits, comprising
  —a seven bit Ascii code sent with the low order bit first and the high

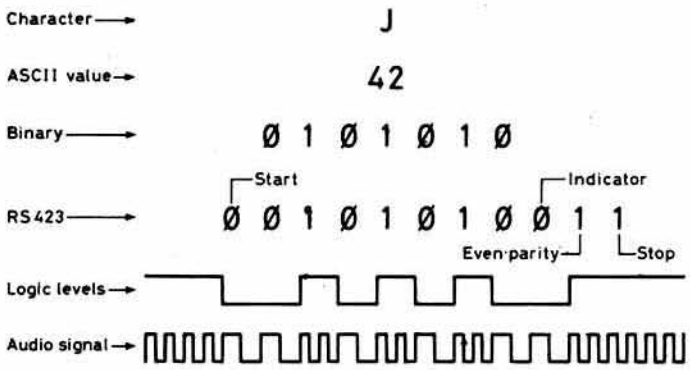


Fig 4. Format of a data byte

order bit last
—a flag bit indicating a control byte;
- a parity bit for even parity, and
- a stop bit (1).

Again, the machine's asynchronous communications interface adapter chip (the 6850 ACIA) can be used, so that transmission and reception of bytes is handled by existing hardware. Fig 4 shows how the letter "J" would be sent.

Note that the sending of eight bits of data in a byte is excluded—one bit is reserved for control functions. This does not matter for the transmission of text, but inhibits the transmission of binary. The solution is to transmit binary as a sequence of characters using two hexadecimal characters for each eight-bit byte, although this does sacrifice some bandwidth.

These bytes are assembled into packets with the following format:
- three leading nulls (#00: NUL);
- start of packet (#81: flag + SOH);
- destination callsign in Ascii;
- separator (#88: flag + BS);
- source callsign in Ascii;
- beginning of message, one of
  —synchronize (#80: flag + NUL)
  —even (#82: flag + STX)
  —odd (#8D: flag + CR);
- message in Ascii;
- end of message (#87: flag + BEL);
- check-sum byte computed as the exclusive OR of the Ascii identifiers and message; and
- end of packet (#8E: flag + SO).

When received with correct parities and check-sum, this is acknowledged by a similar packet with the source and destination fields swapped and the beginning of message, message and end of message fields replaced by a single code:
- acknowledgement, one of
  —even (#84: flag + EOT)
  —odd (#8F: flag + SI).

Incoming packets with faulty parity or check-sums are ignored.

Fig 5 shows the format of a packet and a response. Fig 6 shows the sequence of operations involved in the successful transmission of a packet

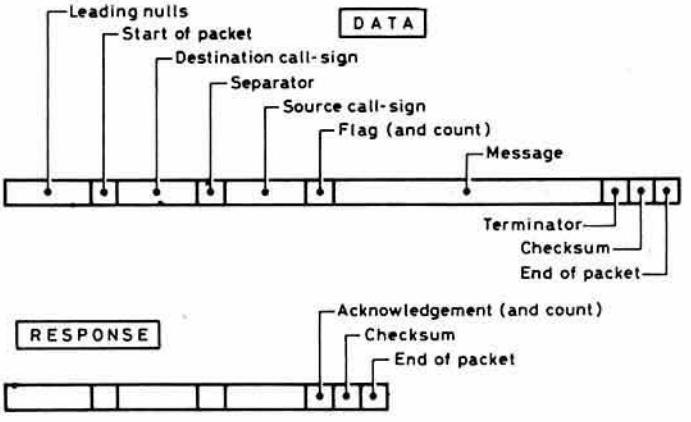


Fig 5. Format of a packet and response

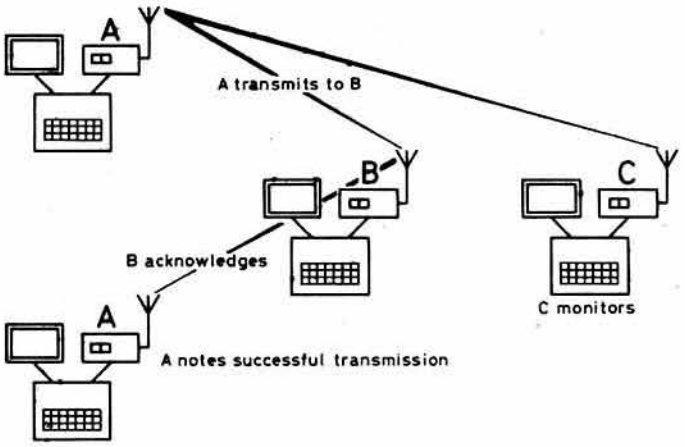


Fig 6. Normal transmission

from Station A to Station B; note how the third party, Station C, monitors the traffic.

Each transmitter maintains a timer while waiting for the response to a packet that it has sent, and retransmits if no acknowledgement is received within some timeout period. Fig 7 shows the sequence of events. This takes care of collisions or interference during data transmission, but a problem arises if an acknowledgement is lost—a spurious retransmission would be provoked.

This is handled by maintaining a counter associated with each sequence of packets flowing between a particular source and destination. This counter is incremented for each new packet of data to be sent. If the transmitter receives no acknowledgement within a given timeout period, it sends the packet again including the same counter value. Whenever a packet is received it is always acknowledged immediately, but if the counter in the packet is the same as the previous counter from the source station then the data can be ignored. Fig 8 shows this sequence of events.

If only one packet is allowed to be outstanding for communication between a given pair of stations at any one time, then the counter need only occupy one bit, alternating between packets with even and odd indicators. A special count is used for the first packet between two stations, or after a break in transmission, to re-establish the synchronization, and is acknowledged with either type of reply. This counting takes care of duplicate packets.

It is worth noting here that the American AX25 system allows up to seven packets to be in transit between any pair of stations at any time, and so their count has to be larger. Of course these packets would not all be transmitted simultaneously, the idea is to allow packets to be buffered in repeater stations along the way.

Each station listens before it transmits, and ensures that the channel has been free for some short time before transmitting. The exception to this is

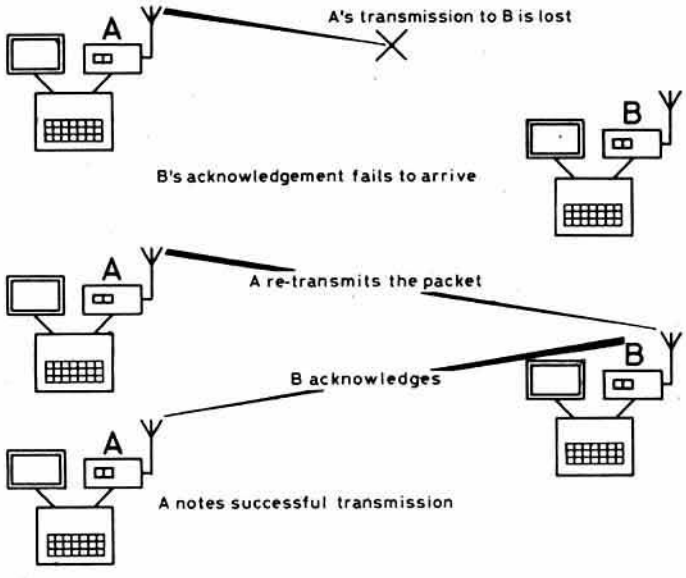


Fig 7. Lost data

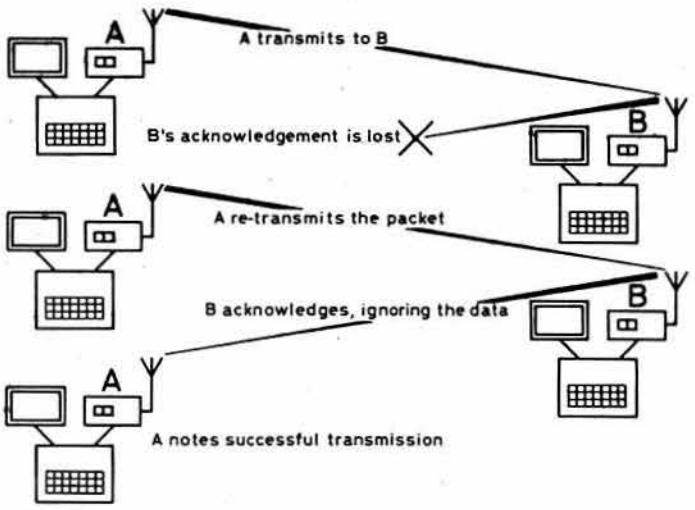


Fig 8. Lost acknowledgement

the sending of acknowledgements, which is done as quickly as possible. The pause before initiating a transmission allows a receiving station to make its acknowledgement immediately. Thus many collisions can be avoided.

Broadcasting to other stations in general is achieved by using a destination callsign of CQ—no acknowledgement packet will be received after this, but any station responding would address its reply specifically to the first station.

Implementing the protocol

The most critical parts of the protocol are to do with the transmission of bytes as a sequence of bits, and the modulation of bits as audio, together with the demodulation and byte assembly for reception. Fortunately the BBC computer includes hardware to achieve this, but users of other computers could probably write assembly code routines to handle these operations without having to resort to building special hardware. Given a system for the transmission of individual bytes, the next problem is to manage the assembly of packets; to transmit them (possibly with retransmissions); to receive packets from other stations, and to display the traffic. Care must be taken in choosing timeouts to ensure that data is transmitted quickly, but without spurious retransmissions.

Our program is completely self-contained—all source data and control commands are entered on the BBC machine's keyboard, and all messages are displayed on its screen. It would be possible, however, to separate-out the transmission and screen-handling parts of the program so that the transmission part could be implemented in a separate "black box" like the Tucson TNC. The program has been written entirely in Basic, using some fairly eccentric calls into the machine's operating system. Ideally it would be written as a set of asynchronous tasks running in parallel on the computer, each handling some separate part of the operation. This is not possible in Basic, so a polling scheme was adopted instead, with the general structure shown in Fig 9.

The main control loop of the program is thus:

- *repeat*
  - —listen for a packet arriving; if successful, transmit an acknowledgement and display the data
  - —transmit a packet if one is ready.
- *forever*

The transmission and reception routines contain calls to a third routine which monitors keyboard input, distinguishing:

- characters to be appended to the current line;
- carriage return completing a packet; and
- commands to switch channels

all of which can be processed fairly quickly.

The lowest-level routines are concerned with transmission and reception of single bytes via the ACIA. This chip has double buffering on both the transmit and receive paths, allowing the user to read or write one byte while the other is being processed.

To transmit a character, the status register of the ACIA is examined repeatedly until it indicates that another character can be loaded, at which time the data is written into the ACIA data register. Between examinations the screen handling routines are called so that the time is not wasted.

More care must be taken when receiving a character, as there may be no incoming data or it may be corrupt. First, the status register is checked, and

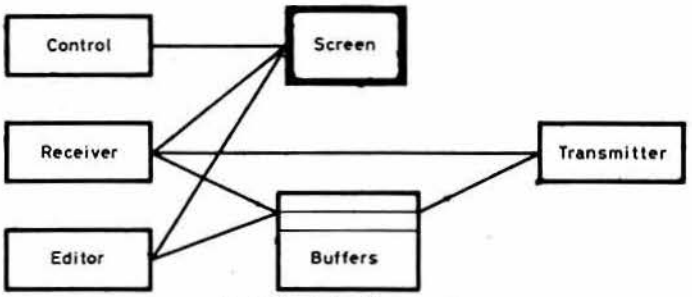


Fig 9. Packet radio program

if there is no character ready, then some time is usefully spent in the screen handling routines before checking it again. After seven such attempts and failures, the routine will exit, giving an indication of failure. If there is a character in the receive buffer, then it is read, and the routine will exit, giving an indication of success only if the status register shows that there were no inconsistencies.

The transmission of a string of characters is simply a matter of repeatedly calling the single character routine described above, passing it each character in turn. Complete packets are transmitted in this fashion, but only when the channel has been free (detected by framing errors in the ACIA, caused by random noise in the absence of a signal) for half a second. This delay reduces the probability of clashing with acknowledgements (which are sent immediately).

The transmission routine returns immediately if there are no outgoing messages waiting; it also returns immediately with a probability that decreases with the number of pending messages, so that faster typists will get more bandwidth so long as they are not shutting out other stations too much. In case the channel becomes clogged with stations that are retransmitting unacknowledged packets, there is also a possibility of immediate return that increases when the number of attempts exceeds 10.

Finally, a further check is made to ensure that the channel is still free before the transmitter is activated and the packet sent. The time between this final check and the carrier coming on is critical in reducing the number of collisions where two transmitters begin at the same time, both thinking that the channel is free.

Reception of incoming characters is slightly more complex, since the packet has to be divided into its constituent fields and these processed separately. This allows a faster acknowledgement to a correctly received packet, and allows packets to be removed from the transmission queue when they have been acknowledged.

A simple telegraph system

Given this packet transmisson system, the next requirement was to make a control program that could display incoming messages, edit outgoing messages and set up channels to new stations. The program was designed by setting fairly ambitious objectives and then trying to reconcile these with the display quality, memory size, available network information and processor power available.

The general scheme of operation is as follows:

1. A number of channels can be set up to other packet radio stations, and lines of data sent to these individually. This is controlled by the function keys on the BBC computer, each one of which is associated with a separate channel. Pressing a key selects the corresponding station as the current destination, while pressing SHIFT and a function key prompts for a new callsign to be associated with that key. Of course, the operator's own callsign has to be specified before the program starts.
2. Any ordinary characters typed are assembled into a buffer until 60 characters have been typed or CARRIAGE RETURN is pressed, when the line is turned into a packet and queued for transmission. Simple line editing using the DELETE key is available.
3. Packets that have been successfully transmitted or received are displayed in a separate area on the screen.

Fig 10 shows how the screen is divided into three separate areas or windows which scroll independently; one shows lines of data waiting for transmission, the second shows successful traffic, and the third shows diagnostic information such as the currently selected destination or transmission failures. The data window shows the source and destination callsigns of each packet monitored, as well as the data and a flag indicating;

- an acknowledged packet arriving from another station (A);
- third-party traffic noticed on the frequency (R);
- the number of transmissions required to send a packet (n); or
- a failed packet, unacknowledged after 15 attempts (!!)

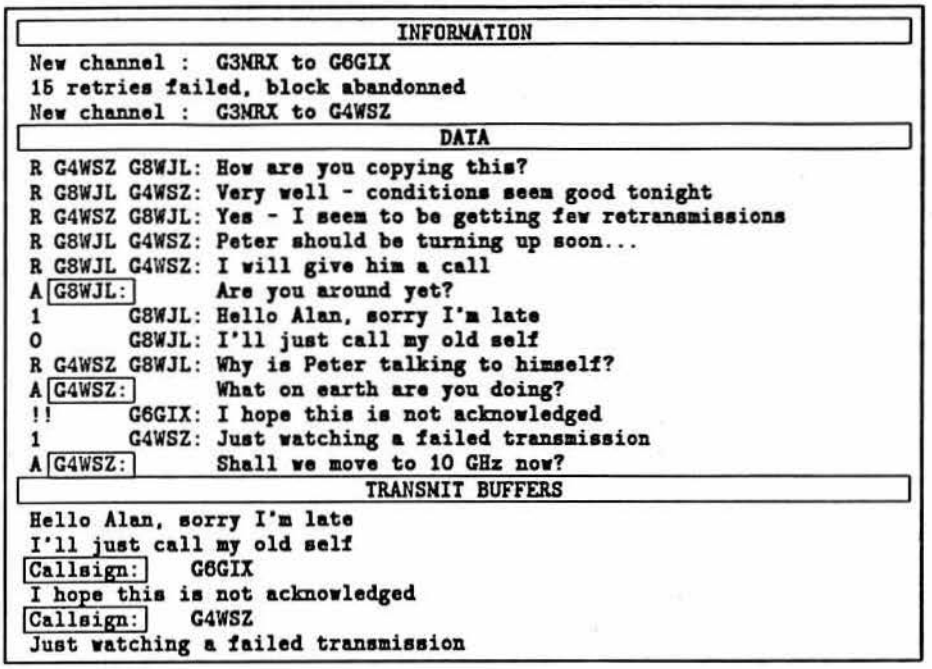


Fig 10. The packet radio program in operation

The program has to maintain the one-bit counters for every pair of stations using the frequency to avoid displaying retransmissions. Colour is used to distinguish these classes of message in graphics modes that permit it; it is also possible to have any messages written to the data window copied to a printer to give a permanent record of the QSO.

Thus, in Fig 10, the sequence of events was roughly as follows:

1. G4WSZ and G8WJL were having a QSO when the new station (G3MRX) came on the air. The messages are recorded as third-party traffic in the data window.
2. In response to a message arriving from G8WJL, G3MRX sends a couple of messages back, and then opens a new channel to G6GIX and tries to send a message which fails to get through.
3. G4WSZ observes this and sends messages to both G8WJL and G3MRX, the latter message getting through while G3MRX is still attempting his futile transmission.
4. G3MRX then opens a channel to G4WSZ and replies.

Information contained in boxes would normally be displayed in inverted video on the monitor.

It proved quite difficult to fit a program of this complexity into the memory available on the BBC computer, and some sacrifices had to be made.

1. If packets are being lost, the network traffic may appear in slightly different orders at each end of a conversation. This is a well-understood problem with such protocols, and cannot be overcome; however, the order of messages in each direction is guaranteed to be the same.
2. Lines are not removed from the input area of the screen when they are sent, they stay there until they scroll out of the top. The code to do this properly would take up too much time and space in the present implementation.
3. Packets queued for transmission are handled strictly in sequence. It would be better if each destination was treated independently.

A future, compiled version of the program should incorporate more of the desired features.

Performance analysis

One question that should, perhaps, be asked is "Why bother?". Apart from the obvious answer of "Because it wasn't there", packet radio is worth investigating because it does provide effective use of radio bandwidth together with reliability. A person speaks at about 200wpm, but often has to repeat information or spell phonetically in order to guarantee correct reception. The same 3kHz channel could transmit digital data at 1,200bits/s, or over 1,000wpm, although bad conditions might require retransmissions, reducing the effective throughput.

The communications system is intended to transmit data at a normal rate of typing between two stations—say, 50wpm, or one line of 60 characters every 15s (a speed which is unlikely to be sustained for long). With packaging this would amount to 79 bytes, and a further 18 for the response. If an underlying digital transmission speed of 300baud were to be used, this transmission and acknowledgement would take about 3·5s with an extra 0·7s for delays in changeover relays and standing off for half a second after another transmission, thus occupying about 28 per cent of the available bandwidth. Similarly this volume of transmission would take 16 per cent of a 600baud channel or 10 per cent of a 1,200baud channel (data transmission is faster, but the delays still total 0·7s).

As the number of transmitters sharing the channel goes up, so the probability of a clash increases and more of the channel is taken up with retransmissions. This cursory analysis suggests that a 300baud channel would only support one or two pairs of communicating stations before collisions began to affect throughput seriously. Pushing the basic communication rate up to 600baud would allow three pairs of stations on the frequency before the probability of a clash went above 50 per cent, and using 1,200baud (as in the American systems) would allow five pairs.

Increasing the packet size (thus reducing the ratio of protocol overhead to real data transmitted) would also improve sharing. Transmitting 80 characters of data every 20s would allow a further pair of stations to share the channel without additional clashes. However, the longer packets would be more susceptible to corruption by interference, and so would consume bandwidth in retransmissions.

Moreover, these figures assume a clean audio channel, free from interference. Clearly the system will suffer when there is additional retransmission to ensure correct delivery of corrupted packets. A proper statistical analysis and simulation of the protocol [7] is needed to measure its effectiveness.

A further problem is the considerable attenuuation of the 2,400Hz tones, compared with the 1,200Hz tones used in the encoding, by the 3kHz bandwidth of the transceivers. This limits the digital bandwidth to 600baud if excessive data loss and consequent retransmission is to be avoided. Active filtering of the signals to balance these and to reproduce the phase shift with increasing frequency inherent in tape recorders (and compensated for in the BBC machine's hardware) would make 1,200baud transmission more reliable. However, a further problem would then arise—a program written entirely in Basic is unlikely to be fast enough to cope with the higher data rates.

Longer term experiments

The initial experiment provides a district network for computers communicating by radio, and a number of further experiments can now be undertaken. Principally these would be the design and construction of—"servers"—computer systems connected to transceivers operating under special callsigns to provide additional facilities.

Most usefully, a gateway could be provided into other computer networks. This would appear as a single node in the packet radio network, forwarding communications to computers. Clearly some fairly stringent access controls would have to be implemented and, given the broadcast nature of the packet radio system, would have to use some form of public key encryption.

Unfortunately the legality of offering such a communication service is somewhat suspect, as is the use of encryption in amateur radio, so the gateway might have to be limited to providing a simple message storage and forwarding service—a sort of radio filing system.

The system has the range that is to be expected for the mode and band —a few tens of kilometres. This could be extended by the existing schemes of repeaters or satellites, but it does also lend itself to extension in unusual ways. One approach would be to set up a network of digital repeaters, each serving a district and linked to the others by long-range radio (achieved by greater power or directional antennas). These could maintain directories coupling network identifiers (that is, amateur callsigns) with repeater locations and forward traffic accordingly. This would be rather like cellular radio.

Alternatively, the same effect could be achieved by each packet radio station observing failed traffic and voluntarily repeating it to see if its own range was better than the original source. Packets could thus be relayed for long distances as a sequence of small steps and, of course, the integrity of

the data would be guaranteed by the digital encoding. Again, it is not clear that such relaying of third-party traffic would be legal under the conditions of the amateur licence.

Legal aspects

These experiments have all been conducted under the terms of the amateur licence, and in particular the schedule item giving permission to experiment with novel forms of data transmission provided that:

- the callsign is announced in telephony at least every 15min; and
- they are contained within the bandwidth normally used for telephony.

If this method of communication is to be taken seriously, it would be convenient for the first restriction to be lifted (after all, both callsigns are given in each packet); the second is already satisfied. This would be possible if the system were recognized by the Radio Regulatory Department of the Department of Trade & Industry as an approved mode of transmission.

Any network service stations such as gateways or repeaters would have to be individually licensed as unmanned stations with licensed keepers nominated as responsible for them, in much the same way as existing beacons and repeaters.

Conclusions

The first QSO using this packet radio system was held on 30 October 1983 between the authors, using fm at 145·300MHz. Shortly thereafter multi-way contacts were held involving other amateurs in the Cambridge area.

Since that time numerous copies of the program have been distributed, and several hundred amateurs around the UK have used the system. In some areas, regular packet nets are run using this program.

The Radio Amateurs' Microcomputer Techniques, Operations and Programs group (Ramtop) has kindly agreed to act as distributors for the program, and anyone who would like a copy should write to the Rev Richard P Butcher, G4NWH, Ramtop, Great Billing Rectory, Northampton, NN3 4ED. A nominal charge of £2.50 for a cassette tape and £4.50 for a disc is made to cover costs. The group also acts as a forum for discussions on packet radio, and their newsletter includes technical articles on this and other uses of computers in amateur radio.

The Technical & Publications Committee of the RSGB has set up a Packet Radio Working Group which has been looking at the implications of this new mode on amateur radio generally. In particular, they have decided to follow the ARRL in adopting the AX25 protocol as a standard for British operations. Of course, this does not stop people from using alternative systems such as the one described in this article, but packet radio service stations will have to accept at least that protocol (and possibly others). It is therefore worth noting the differences between AX25 and the system described here.

The most important advantages of AX25 are:

1. It is based on the ISO model for network communications, so it incorporates ideas which make it possible to build further service layers on top. However, it is not clear how relevant this approach is to the needs of amateurs, where links between pairs of stations appear and disappear as conditions change.
2. It uses the Bell modem tones of 1,200Hz and 2,200Hz, which are better suited for narrow-bandwidth operation. However, 1,200Hz and 1,800Hz would be better still.
3. It runs at 1,200baud using the synchronous hdlc transmission, giving about six times the data rate and the added error detection of cyclic redundancy checks. However, forward error correction would probably be a more profitable approach for amateur experiments.
4. It allows several packets to be transmitted between any pair of stations at any time. This would be useful where packets were being buffered in relay stations along some extended path.

Also, perhaps more importantly, AX25 is the accepted standard, and further work will have to build round its peculiarities.

Nevertheless, the system presented here, despite its deficiencies, *is* a proper packet radio system with reliable multiplexed transmission on a single channel. As such it serves as a relatively inexpensive introduction to the mode and is a useful vehicle for further experimentation. Think of it as the QRP rig of digital communications—it is fun to make, it is fun to use, it is educational, but it makes no claim to be the ultimate in technology. Try it and see!

References

[1] "Computer network development to achieve resource sharing," L G Roberts, Spring Joint Computer Conference, 1970.

[2] "The Aloha system—another alternative for computer communications, Norman Abramson, Fall Joint Computer Conference, 1970.

[3] "Ethernet: distributed packet switching for local computer networks, R M Metcalfe and D R Boggs, *Communications of the ACM* July 1976.

[4] "Amtor—an improved radioteleprinter system using a microprocessor", J P Martinez, G3PLX, *Rad Com* August 1979.

[5] "Amateur packet radio, parts 1 & 2", Margaret Morrison, KV7D, and Dan Morrison, KV7B, *Ham Radio* July & August 1983; reprinted in *Practical Wireless* December 1983 & January 1984.

[6] "Join the packet radio revolution" Lyle Johnson (WA7GXD), *73 Magazine,* September 1983.

[7] "Local area computer communication networks", Andrew Hopper, Cambridge University Computer Laboratory, April 1978.

APPENDIX

This note gives operating instructions for a packet radio program written by Alan Jones for the BBC model B computer.

Preparation

Given a BBC model B computer with version 1.20 (or later) of the operating system and a radio transceiver, the first requirement is for a connection between the two. This can usually be effected by a single cable from the microphone socket on the transceiver to the cassette port on the computer. the obvious connections are made:

- radio ground to computer ground (pin 2);
- radio earphone into computer (pin 3);
- radio microphone from computer (pin 1 or 4); and
- radio push-to-talk to computer relay (pins 6 and 7).

Note that the microphone and earphone must share a common earth; if this is not the case with the transceiver being used, some isolation may be necessary.

The program relies on hearing random noise to identify a clear channel; with fm this means that the squelch control must be fully open at all times. The audio level must be quite low; the easy way to set this is to type a packet and then bring it slowly up from zero until the program starts transmitting. It is prudent to have a loudspeaker monitoring the received audio in case a conventional QSO arrives on frequency.

Operation

The program is large and uses a lot of screen memory and store for buffering packets, which may present problems on machines with disc filing systems, econets or other service proms. These will manifest themselves in the form of "out of store" messages when the program is running; solutions include unplugging the unwanted chips, trimming out the initial messages and mode selection in the program, or using a low-resolution screen mode.

Alternatively the program can be moved down in memory over the filing system buffers as follows:

- LOAD the program;
- move the program in memory by typing the three lines
  —p = PAGE
  —PAGE = &E00
  —FOR w = p TO TOP STEP 4: !(PAGE+w-p) = !w: NEXTw
- cause TOP to be recalculated by typing ESCAPE

It may also be necessary to cause non-maskable interrupts to be ignored; this is most easily achieved by planting an RTI instruction at the beginning of the interrupt handling routine:

- ?&D00 = &40

Of course, this should be done before over-writing the buffers. BBC machine wizards can load all these commands into a function key by EXECuting a suitable file from disc.

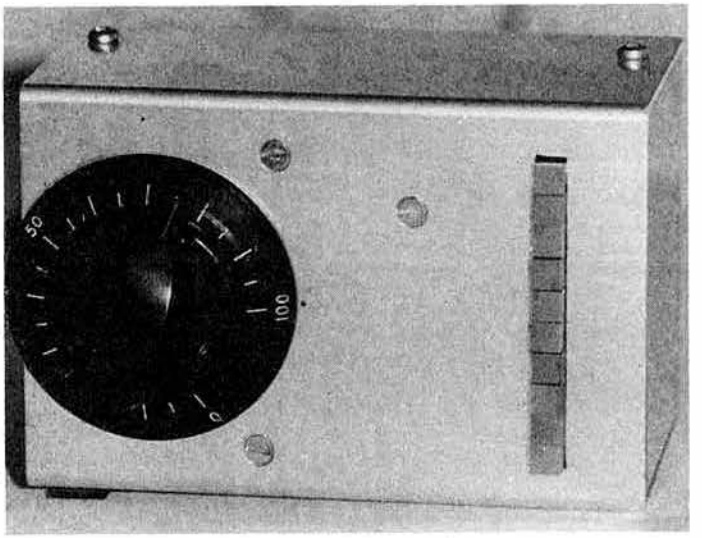
RUN the program and it will enter a question and answer phase. The default answer for each question is displayed and can be given simply by typing RETURN.

- *Are you debugging?* [no]—the answer Y provokes a further set of questions:
  —*How real is this?* [2]—low numbers are for testing the program without a radio attached to the computer;
  —*Report level?* [3]—low numbers suppress diagnostic output;
  —*Inter-char delay?* [0]—delay between individual characters in a packet;
  —*Rx char timeout?* [7]—how many framing errors indicate a clear channel (a low number will make a station break-in more quickly, too low a number will cause clashes);
  —*Ack tx timeout?* [20]—how many centiseconds to wait before acknowledging a packet;

(Continued on page 194)

A MODULATION METER FOR SSB

John Stebbings, G4BTV*



View of the bargraph unit showing the sensitivity control and the 10-l.e.d bargraph

G4BTV is a retired chartered civil engineer who started, while still at school, constructing wireless sets in the days of crystal sets. Later he became a short-wave listener, and adapted war surplus equipment for radio and tv.

He obtained a Class A licence in 1973, and still makes most of his own gear; at present he is adapting a telescope for the observation of sunspots. Active mainly on 21, 28 and 144MHz, he prefers to chat rather than collect QSL cards, and does not enter contests.

Introduction

The level of modulation of an ssb transmitter is usually judged by the movements of a moving-coil meter measuring the anode current supplied to the power amplifier. We are advised in the literature to determine, by means of an oscilloscope, the current at which distortion commences and the onset of "flat-topping" is observed. This is shown in Fig 1, which indicates the traces obtained from an audio two-tone sine-wave signal fed to the microphone socket.

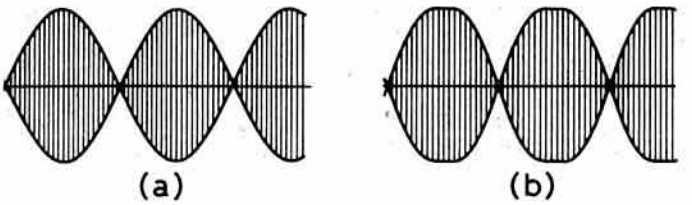


Fig 1. Oscilloscope trace from two-tone test: (*a*) normal undistorted modulation; (*b*) "flat-topping" of peaks due to overdriving

This test is, of course, under steady conditions, and meter readings will show the current which should not be exceeded when speaking into the microphone. A snag arises because the meter, due to its inertia, cannot respond quickly enough to the speech waveform. The modulation will reach a peak level and decay before the meter needle reaches the peak current value.

The advice usually given is to limit the indicated current on speech peaks to half that determined by the two-tone test. I have found in practice that the advice is difficult to implement. First, meters vary in their response to spikey waveforms, some being heavily damped and others extremely lively. In the latter case, mechanical resonances come into play as well, and the needle can dance all over the place and give no real guide as to what is happening.

The bargraph

It was decided that an indicator in the form of an l.e.d bargraph would solve this problem, since the diodes have little inertia compared with the moving coil mechanism of the normal meter.

The bargraph will be described first (Fig 2), followed by the rf detector head which supplies dc to drive the bargraph display. IC1 is an LM3914 which drives 10 l.e.ds. Nine of these are green, and the top one is yellow to give warning of excessive modulation. An input of 1·25V dc at pin 5 will light all 10 l.e.ds. The level of dc from the detector head is adjusted by the level control RV1 so that, for a particular transmitter, nine l.e.ds light at maximum modulation. By providing RV1 with a dial, settings may be determined for other transmitters or linear amplifiers having different power ratings. IC1 requires a supply of 5V at 150mA, and this is provided

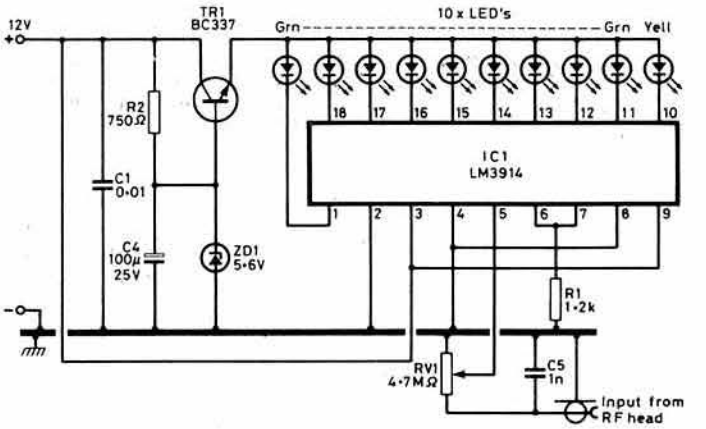


Fig 2. Circuit of the bargraph unit. The top l.e.d connected to pin 10 is yellow. All the rest are green

by a voltage regulator consisting of TR1, ZD1 and R2. The input voltage may be from 12V to 15V dc. An integrated circuit regulator, such as the 7805 could be used instead of the separate components which happened to be on hand.

The display was constructed on a piece of Veroboard 60mm square (22 holes by 22 holes) as shown in Fig 3. Care was taken to mount all l.e.ds at the same height above the board so that, when projecting about 4mm

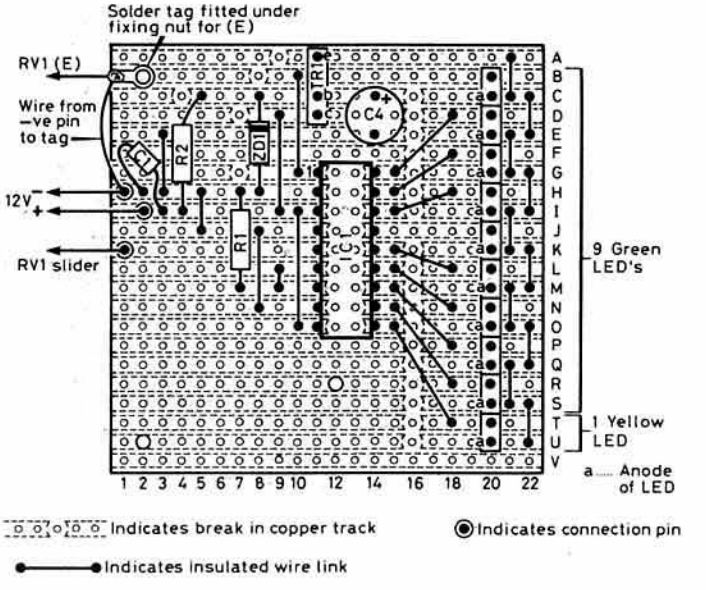
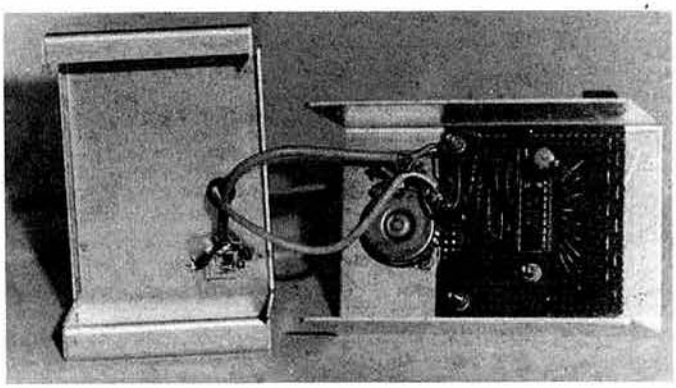


Fig 3. Layout of bargraph components on Veroboard

*16 Maylings Farm Road, Fareham, Hants PO16 7QU.



The internal arrangement of the bargraph with output 3·5mm jack socket at rear. The centre resistor of the group of three was not fitted in the final version

through a slot in the case, a straight and neat display was formed as shown in Photo 1. RV1 and its dial are also mounted on the front of the case. The 12V supply lead passes through a grommet in the back of the case, which also has a 3·5mm jack socket for the input from the detector head (Photo 2).

The rf detector head

The circuit of the detector head is shown in Fig 4 and the unit provides a tapping on the 50Ω coaxial antenna lead from which a sample of rf may be rectified and smoothed to drive the bargraph. The signal from the potentiometer R3/R4 is detected by diode D1 with rf being decoupled by C3, leaving dc of varying amplitude which corresponds with the instantaneous rf power level. C2 was included as dc block, since my 144MHz transceiver has dc on the antenna lead for the control of a linear amplifier. All components are mounted on the case, which is a simple box of sheet aluminium just large enough to mount an SO239 socket on one end.

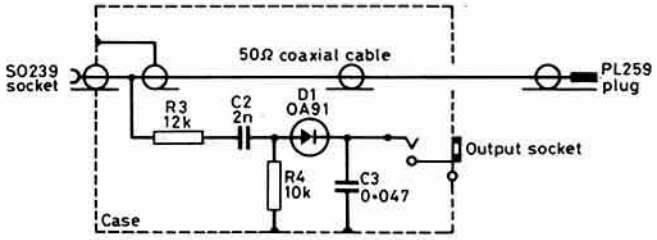


Fig 4. Circuit of rf detector head

The arrangement of components is shown in Fig 5, and cutting details for the case in Fig 6.

The rise time of the circuit for a step input is determined by R3 and R4 in parallel, and C3. Thus the combination of a resistance of 5,450Ω and a capacitance of 0·047μF gives a time constant of 256μs. In order to show up short modulation peaks of a few milliseconds, the fall time needs to be greater than, say, 0·1s. This is determined by RV1 (4·7MΩ) and C3 (0·047μF) leading to a time of 0·22s.

In use

The separate detector head allows the display to be located in any convenient position, while the head can be inserted at any suitable point in the coaxial antenna lead—between filters, switches, linear etc.

Calibration of the bargraph input permits the monitoring of different power levels. In my case R3 and R4 were adjusted so that 3W p.e.p. from

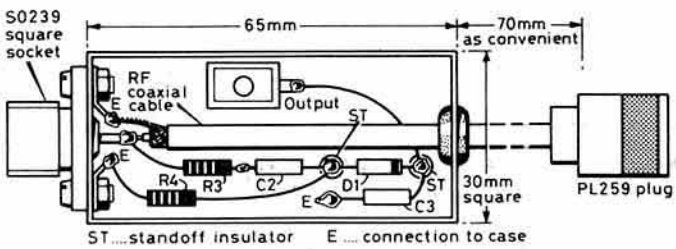


Fig 5. Arrangement of components in rf detector head

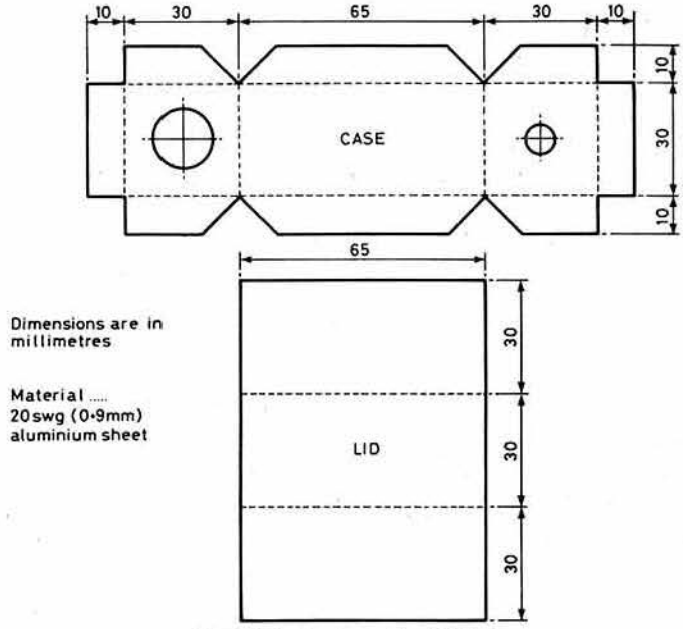


Fig 6. Details of case for rf detector

the 144MHz transceiver just lit nine l.e.ds at a setting of RV1 near 100 on the dial. The lower readings for 25W and 100W outputs were then recorded, using an oscilloscope to indicate the onset of "flat-topping". The component values are such that the unit should work satisfactorily at hf down to 1·8MHz.

Construction of the unit was a simple project and has been found to be a great improvement on the moving coil meter.

Components list

R1 1·2kΩ 0·25W
R2 750Ω 0·25W
R3 12kΩ 0·25W
R4 10kΩ 0·25W
RV1 4·7MΩ
C1 0·01μF
C2 2nF 160V
C3 0·047μF
C4 100μF 25V
C5 1nF
IC1 LM3914
D1 OA91
ZD1 5·6V zener 400mW
TR1 BC337

Miscellaneous
Nine l.e.ds 5mm × 5mm green Maplin
One l.e.d as above, yellow
Two 3·5mm jack sockets
Two 3·5mm jack plugs
SO239 socket
PL259 plug
Two stand-off insulators
Knob and dial
Case 100 × 65 × 50mm
Audio and rf cable

Appendix

Choosing the values of R3 and R4

The unit was designed for a maximum transmitted power of 100W. For higher powers the potentiometer ratio needs to be altered to ensure that the OA91 diode is not subjected to a peak inverse voltage (piv) greater than 115V. Alternatively a number of diodes may be placed in series..

(1) First find the rms voltage on the 50Ω coaxial line:

$$\frac{V1^2}{50} = W \text{ and } V1 = \sqrt{50W}$$

where W = transmitter output in watts.

(2) Let V2 = rms voltage at the diode anode.
Then:

$$V_2 = \frac{V1 \times R4}{(R3 + R4)}$$

(3) PIV on the OA91 $= \dfrac{2{\cdot}83\ V1 \times R4}{(R3 + R4)}$

Choose R3 and R4 accordingly but subject to (4)

(4) The wattage of the resistors must be checked:
(*a*) to avoid overheating, and (*b*) so that too much of the transmitter output is not wasted.

$$W_{R3} = (\text{dissipation in R3}) = \frac{(V1 - V2)^2}{R3}$$

$$W_{R4} = \frac{(V2)^2}{R4}$$

W_{R3} and W_{R4} would normally be limited to about 0·5W each. □

CRITICAL STUDY OF THE SWR METER

G4CCM joined the Hull & District Wireless Society in 1922 before taking up a career in electrical engineering in 1924. In the commercial field he held senior positions with BTH, Dorman & Long and Brush Electric Company until 1955, when he joined the Air Ministry works department as a specialist on electrical machines, generating and converting plant. From 1967 to his retirement in 1973 he was the electrical engineer ship surveyor in the DTI.

by H. Du V. Ashcroft, G4CCM*

FOR YEARS I have believed that there is no reflected power, in the accepted sense, and that the swr meter really reads something related to the displacement between voltage and current and hence to the power-factor. Certainly there is no such thing as reflected current, and nowhere have I seen an acceptable explanation as to how the meter works. The current-transformer part of it carries the same current in each direction, positive and negative half-cycles are the same, so why should the two rectifiers see different currents? Why should the meter read watts or volt-amps when there is nothing in the circuit to multiply? I decided to slog it out laboriously, as we had to do in dealing with such problems before the days of computers or data plotters.

Fig 1 is a typical circuit, more or less taken from the *Radio Communication Handbook*, and the components are approximately correct for 100W full scale into a load of 50Ω. The toroid is a current-transformer, so that the current in R_F and R_R will be one-twelfth of the line current and the voltage V_{CF} and V_{CR} will be proportional to this current. The 5kΩ and 220Ω resistors form a potential divider so that

V_V will be $\frac{220}{5{,}000 + 220}$ = approximately 1/24 of the line voltage.

The arrows are to show the instantaneous polarity, and half a cycle later all the arrows will be reversed. Each meter with its diode and resistor R_L forms an AC voltmeter and, in the case of the forward meter, reads $V_V + V_{CF}$, while the reflected meter reads $V_V - V_{CR}$. It should be noted that $R_F = R_R$ and, therefore, $V_{CR} = V_{CF}$. The fact that they are added to or subtracted from a voltage provides the different readings for forward and reflected meters. In designing or calibrating the meter, the potential divider is adjusted so that at 100W 50Ω $V_V = V_C$, and the sensitivity is adjusted so that $V_V + V_C$ gives full-scale deflection and indicates 100W.

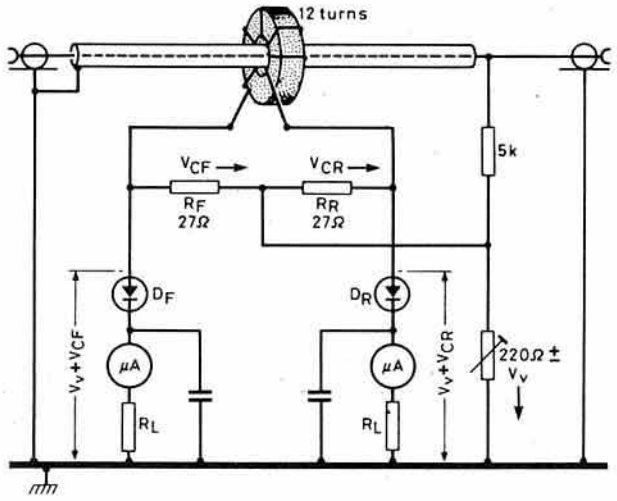


Fig 1. Typical single-range swr meter circuit

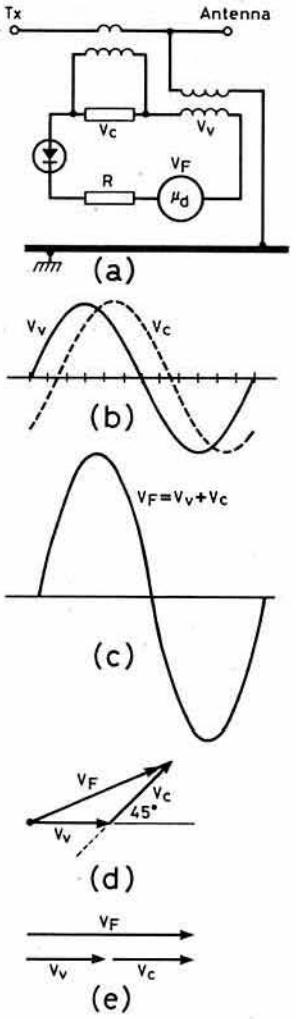


Fig 2. (a) Equivalent circuit for forward power meter. (b) Voltage waves proportional to the feeder voltage and current at the swr meter with 45° phase displacement (SWR = 2·33). (c) Voltage proportional to feeder voltage plus current; forward meter. (d) Phasor representation of (b) and (c). (e) Phasor diagram showing condition for forward meter at SWR = 1

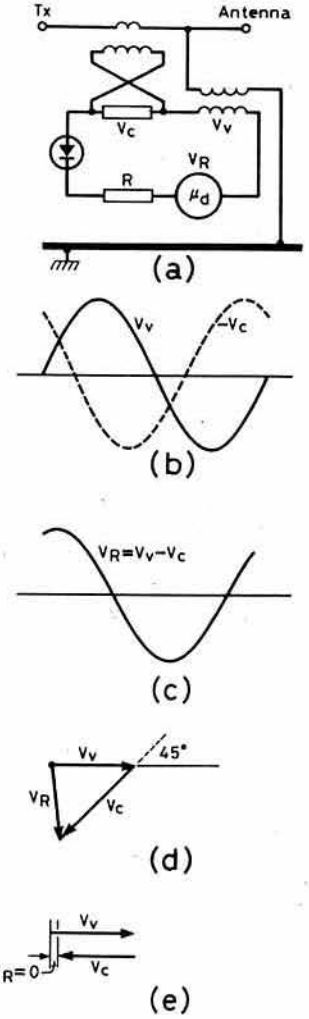


Fig 3. (a) Equivalent circuit for reflected power meter. (b) As Fig 2 (b) but with the current reversed. (c) Voltage proportional to feeder voltage minus current; reflected meter. (d) Phasor representation of (b) and (c). (e) Phasor diagram showing condition for reflected meter at SWR = 1 (Reflected power = 0)

The forward and reflected meter circuits have been taken apart in Figs 2 and 3 and, to show the conditions more clearly, the potential-divider has been replaced by a step-down transformer of the same ratio. Figs 2 and 3 (b) show the instantaneous values of V_V and V_C, and for clarity the curves have been separated by 45°. This implies that the load is not in complete resonance and has some reactive components. Fig 2 (c) is derived from adding the two curves, and this is what the forward meter sees. Fig 3 (c) is derived from the difference of the two curves by process of inverting one curve and adding, and this is what the reflected meter sees. If the peak value of V_V and V_C is 1, then in Figs 2 and 3 (c) the forward meter sees 1·85 peak, 1·308 rms, and the reflected meter sees 0·759 peak and 0·537 rms. Fig 4 shows Figs 2 and 3(e) combined.

At this stage it is as well to digress and study the use of the single-coil meter for indicating watts or voltamps. SWR meters are variously scaled in

*86 Avondale Avenue, N Finchley, London N12 8EN.

Table 1. Tabulated results

1	2	3	4	5	6	7	8	9	10	11	12	12
$\theta°$	V_V%	V_C%	ϕ	Line Volts	Line α LA	Volt/Amp	Cos ϕ	Watts	ZΩ	RΩ	Parallel XΩ	Watt-less VA
0	70	30	0	98·98	0·848	83·93	1	83·93	116·72	116·72	α	0
30	68	34·2	25·5	96·15	0·97	93·26	0·90	83·93	99·1	110·15	228·86	9·33
60	62	43·5	40	87·67	1·23	107·83	·766	82·6	71·28	93·05	110·89	25·23
90	54	54	45	76·35	1·53	116·8	·707	82·6	49·9	70·57	70·57	34·2
120	44	62	40	62·21	1·75	108·87	·766	83·39	35·5	46·41	55·1	25·48
150	34	68	26	48·07	1·92	92·29	·9	83·06	25·04	27·82	57·46	9·23
180	30	70	0	42·42	1·98	83·99	1	83·99	21·42	21·42	α	0

Columns 2, 3 and 4 are measured from the vector diagram.
Column 5 is derived as follows: 100 per cent volts is 2 × 3·18 and the line-voltage is 22·2 times this.

Column 6 is based on 100 per cent volts = 2 × 3·18 and the current in R_F and R_C is $\frac{2\times3\cdot18}{27\Omega}$ and the line current is 12 times this.

Column 7 is the product of columns 5 and 6.
Column 9 is the product of columns 7 and 8.
Column 10 is from volts² divided by voltamps.
Column 11 is from volts² divided by watts.

Column 12 is from columns 10 and 11 using $X = \frac{ZR}{\sqrt{R^2-Z^2}}$

Column 13 is volt-amps minus watts.

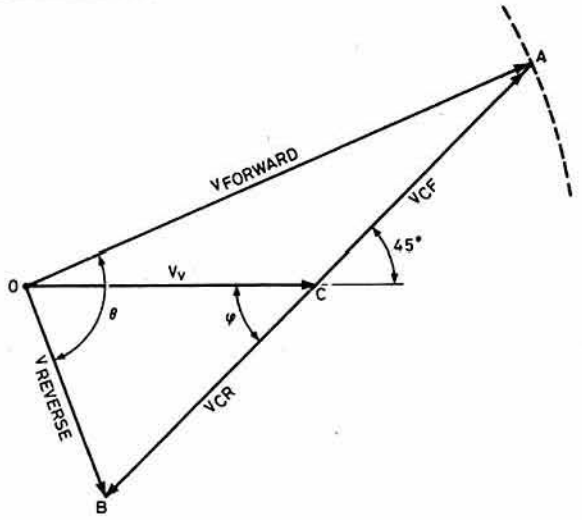


Fig 4. Detailed diagram combining Figs 2 (d) and 3 (d)

forward watts, reflected watts, swr, and fraction or percentages of full-scale (Fig 5 shows a comparison of these scales). Sometimes, for crude metering in power circuits an ammeter is provided with a linear scale in voltamps; eg half of full-scale reads half of rated voltamps. Readings are only valid if the voltage is constant and correct, and the power is only varied by changing the load impedance and hence the current. Once an antenna is tuned, its impedance is fixed, so changing the transmitter voltage also changes the current; eg half volts, half current, quarter voltamps, which is the square-law scale. The load impedance must be matched to the meter scale or the readings will be incorrect.

However, the swr meter is neither of these, it measures volts plus amps or values proportional to them. The arrangement could not be used on a constant voltage system as on no watts it would read half-scale. Reverting to Fig 1, the circuit is arranged so that at 100W into a 50Ω load the forward meter reads full-scale when $V_{CF} = V_{CR} = V_V$, when the line voltage × line current = 100 (so-called watts) and the

$$\frac{\text{line voltage}}{\text{line current}} = 50\Omega$$

It is the practice to set the transmitter so that the forward meter reads full-scale; ie 100W, so to fulfil this condition for our meter the voltage will be 70·7V and the current 1·414A.

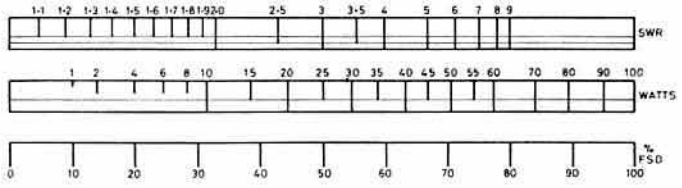


Fig 5. SWR meter scales

Then V_{CF} will be $\frac{1\cdot414}{12} \times 27\Omega = 3\cdot18V$

V_V will be approximately $70\cdot7 \times \frac{220}{5{,}220} = 2\cdot98$

but in calibration this will be adjusted to 3·18; ie

$$\frac{\text{line volts}}{22\cdot2}$$

The forward meter sees $V_{CF} + V_V = 3\cdot18 + 3\cdot18 = 6\cdot36$, and the resistance R_L is set to give full-scale reading at this voltage. If the load is perfectly tuned and there is no phase shift the conditions will be as Figs 2 and 3 (e), the forward meter seeing twice 3·18V and the reflected meter 0V or swr = 1. A *Post Office Engineering Journal* article refers to this as double or quits.

It follows that an swr other than 1 is indicated if the voltages across the reflected meter do not cancel out and this occurs: (a) when the impedance of the load is incorrect; or (b) if there are reactive components not tuned out, causing phase shift, or both these conditions together. The meter does not show which condition applies or what to do to correct it. It does not really indicate standing waves. If a 72Ω purely resistive dummy load is connected straight on the output socket of the meter I would expect to see an swr of 1·43 when there is nowhere for the waves to stand, and a reflected 3·24W, but resistors do not reflect. There may be standing waves in a feeder, but all the meter sees are volts, amps and phase.

A study has been made to see how imprecise is the indication and how much the conditions can vary, still to give the same swr reading. For this purpose an swr of 2·33 has been chosen, which means a reflected reading of 40 per cent fsd. The forward meter is set on full-scale and OA is drawn to scale of 100 per cent, OB is drawn to scale of 40 per cent and AB represents $V_{CR} + V_{CF}$. The angle θ can be anything from 0° to 180°, but as long as OB and OA remain at 40 per cent and 100 per cent the swr will be 2·33. OB can be considered fixed, but point A can be anywhere on a circle of centre O, as shown in Fig 6.

(Continued on page 194)

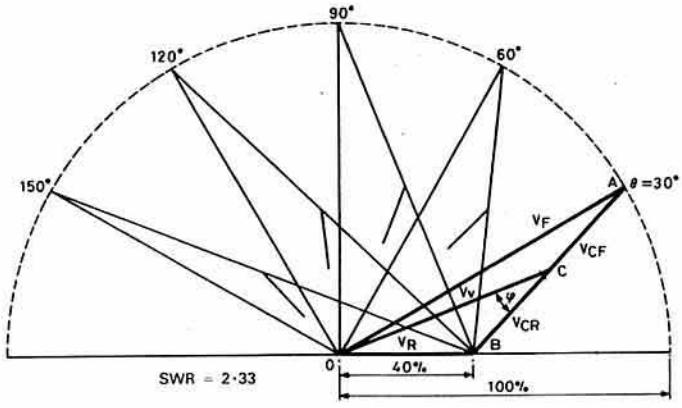


Fig 6. Phasor diagram of the whole range of feeder voltages and currents, all showing swr of 2·33. This is the basis for Table 1

Technical Topics

by Pat Hawker, G3VA

AS SOMEONE who increasingly finds it difficult to wax very enthusiastically about "new technology", I find it necessary from time to time to remind myself that Rab Butler, sometimes described as "the best prime minister Britain never had", warned us that "all too often those who do not seek to change with the times find that the times leave them changed for the worse." The battered British consumer-electronics industry has been known to dismiss the highly-successful Japanese technologists as being mainly derivative rather than creative, yet, as *Nature* has put it: "From ships to video recorders, Japanese technologists have been able to design and manufacture high-quality products more cheaply than others, and at the same time make sure they function reliably. If this ingenuity is not creative, many of us should be wondering what is meant by creativity".

THIS MONTH

Hybrid microelectronics—the coming thing
Stuck with what you buy
Whither experimentation?
A poor man's log-periodic
Comparision with log-periodic arrays
Wires in parallel
Safety standards
Mercury is dangerous
144MHz, 134MHz and dbs tvi
Ripple on dc supplies
Testing a high-current psu
Flash-over protection for high-power linear amplifiers
Self-amalgamating tape—a cautionary tale

It may have been true in the 'sixties, when Japanese amateur-radio products began to appear on the world market, that those first designs used strikingly familiar ideas, but there was a new emphasis on cost-effective production engineering that brought them within the reach of far more amateurs. It has long been apparent that reliability of modern equipment is related more to mechanical engineering, metallurgy and chemical engineering than to innovative electronic circuitry.

Hybrid microelectronics—the coming thing?

As we indicate below, current developments all over the world in how equipment is assembled will bring about changes that many of us will much regret, since inevitably they make further inroads into some of the traditional do-it-yourself and learning-by-doing aspects of the hobby. But one must hope that there will prove to be at least some compensating advantages for those who are prepared "to change with the times" and turn more to those areas of radio communication where there are still opportunities for genuine experimental work.

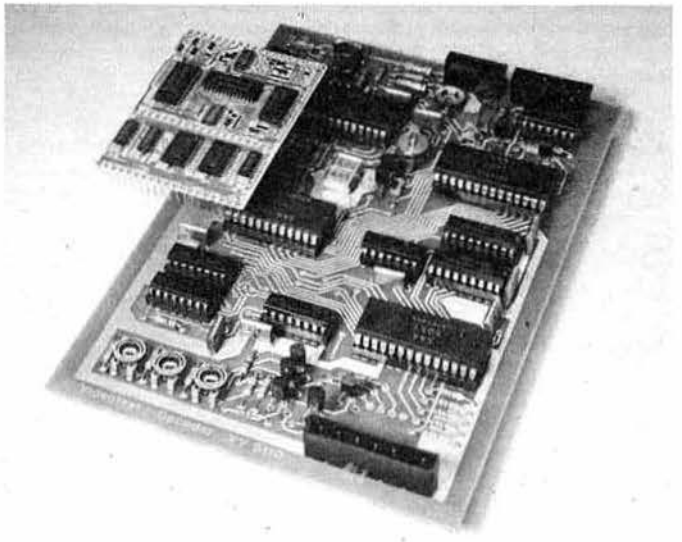


Photo 1. Comparing the size of two boards that fulfil identical functions. In general, boards using surface-mounted devices, chip components etc require only a third of the board area of conventional pcb assemblies. *(Mullard Ltd)*

In *TT* December 1981 (pp1127-8) and more recently in *TT* January 1984, I drew attention to new forms of "hybrid microelectronics", "surface-mounted multi-layer assembly" and other closely-related methods of assembling equipment using tiny chip-type components, with the ic devices and semiconductors automatically located and then glued into place on compact printed circuit boards before being wave or dip soldered. It was pointed out that because of the very small size of chip-components and chip-carrier-type semiconductor devices, complex circuits could be assembled economically at high rates on much smaller boards than with the established forms of pcb technology. I expressed the opinion that the economics of these forms of assembly would ensure that they would find their way into the factory construction of amateur radio equipment, at least in those areas which justify the setting up of high-volume production lines.

To quote what I wrote in January 1984: "While there are obvious advantages to the manufacturers, the users benefit from the improved reliability and consistency of performance that is possible (but) at the same time it does represent a further step along the path towards 'throw-away' electronics; that is, the disposal of the complete circuit board (or even the complete equipment) should a fault occur. Tracing and replacing individual faulty components in such assemblies is virtually impossible. The chip components of millimetric dimensions are often far too small to carry identification marks or values, while the high packing density renders traditional forms of fault-tracing extremely difficult . . . it is not technology for experimental bread-board units."

Some of these new constructional techniques are already being used in recent Japanese models, and fully bear out the points made above, although the user advantages in terms of better value-for-money, due to reduced manufacturing costs, are being rendered invisible in the UK by the dramatic decline in the pound-sterling/yen exchange rate.

But there is one important consequence of the new technology that was missed in my earlier notes: the virtual impossibility of making *any*

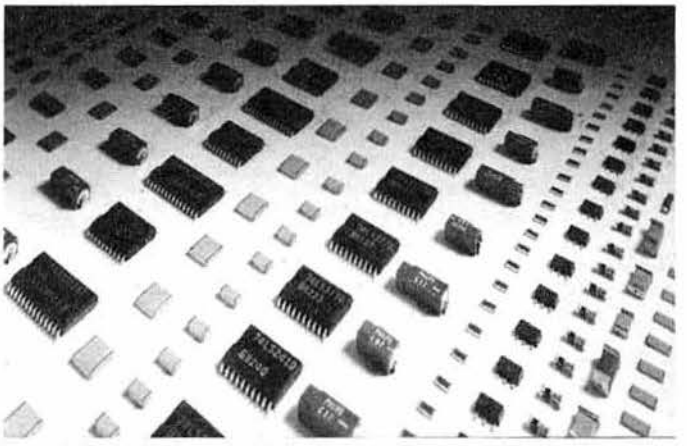


Photo 2. Examples from the Mullard range of components used in surface mounted assemblies. Included are chip resistors, wet aluminium electrolytic capacitors, blue chip capacitors, ceramic multilayer capacitors, SOT packaged transistors and diodes, and SO packaged integrated circuits. All are of miniature dimensions, and few carry any identification or values. Similarly packaged components are increasingly being used in many countries in conjunction with automatic assembly

Photo 3. A far cry from the kitchen table! A modern, multi-head automatic placement machine. Typically with eight placement heads, each mounting 25 components, some 200,000 components are put on to 1,000 boards in an hour. Despite the need for specialized servicing and virtual impossibility of d-i-y modifications, this—for better or worse—is the way the electronics industry is going. *(Mullard Ltd)*

modifications to equipment made using the new production techniques, either to improve performance or to modify for UK use models intended for operation elsewhere.

Stuck with what you buy

Kjell Stroem, SM6CPI, who is currently the European representative of Yaesu Musen based in Italy, admits that in the past, he—like many other European amateurs—has occasionally by-passed the "authorized dealers" and brought in Japanese transceivers as personal imports, then changed a few components to make them work to European standards, frequency bands, channelling etc; tackling the odd bit of troubleshooting and repair during the initial phase of the bath-tub reliability curve that is normally taken care of by the guarantee. This practice meant that equipment could be acquired at prices below those set by authorized dealers to cover the cost of guaranteed after-sales service, the stocking of spares etc. (See *TT* January 1984, p 45).

SM6CPI now writes: "From correspondence arriving at the headquarters of Yaesu Musen, I understand there is now a further complication that can lead to disappointment and embarrassment to those attempting personal importing.

"With the advent of melf-type chip components there is no longer any easy way of modifying equipment from one version into another. It is also extremely difficult to troubleshoot and repair them without access to the specialized techniques that are now required. Some of the complications include:

(a) There is no identification on components; only on the parts magazine that is used for automatic assembly.

(b) The part is secured not only as the result of dip soldering but also because it is glued on to the pcb with epoxy glue (in order to stay put during the soldering); this is then oven hardened and further hardened by the heat during the soldering process.

(c) There is always the risk that if you attack the epoxy bond with, say, a chisel, you will also remove a number of the under-lying fine-line foil conductors.

"One result, is that it is no longer practicable to add repeater shift and change from 20kHz to 12·5/25kHz channel spacing on a Japanese home-model of a 144MHz transceiver by just moving a couple of diodes (as often possible in the past). In many cases not even the factory can carry out such modifications once the soldering process has been carried out.

"This may be seen as an undesirable loss of flexibility, but there are several good reasons why these forms of assembly have come to stay. A highly automated production system makes it possible to offer better value for money. Production costs have been rising rapidly in Japan, and new production techniques are being constantly introduced to counter this trend. It has already been shown (for example with the Walkman type of portable cassette players which have been based on the new techniques for several years) that equipments manufactured in this way prove more reliable and require less servicing.

"The problem of rising costs is one reason why so many new models are being introduced; few people like to pay substantially more this year than they would have paid a few years ago for the same model. Gone are the days when the FT101 or FRG-7 could stay on the production lines until their metal stamping tools were completely worn down."

SM6CPI notes also the problems that come from the high rate of inflation and the decline in exchange rates which tend to distort the pricing of both new and secondhand equipment in the UK, and which conceal the fact that there has been almost continuous improvement in real value-for-money terms. He wonders why, in the UK, unusually high prices are asked for the second hand equipment that he sees advertised in "Members Ads" etc. "In most countries the value of electronic equipment drops some 30 per cent just after you have opened the box and plugged the lead into the wall socket, yet it seems to take some five years of use before the same price drop is reached in the UK."

He also believes, with some justification, that there is little demand for simple, low-budget equipment. Attempts to introduce "economy" designs have not met with the sort of response that would be needed to encourage the Japanese firms to make further efforts in that direction. "Is it a question of a status symbol, the strange practice whereby amateurs announce to the world what brand and model of radio they are using, that is to blame for this?" SM6CPI wonders. He also raises some other matters on which *TT* has commented, including the standard of the equipment reviews that appear in many magazines. He shares some of my own views on this subject, including the fact that there will always be a spread in the measurements made on different models, and the evidence that by no means all of the readers, or apparently even some of the writers, are really sure of the practical significance (or otherwise) of some of the measurements—although he specifically excludes *Rad Com* reviewer Peter Hart, G3SJX, from this criticism.

SM6CPI thus echoes the theme of my 1981 paper "Effect of receiver specifications on practical performance" in which I suggested that it is increasingly difficult to interpret makers' and retailers' promotional material in terms that relate meaningfully to operational performance, and noted that "the assistance that can be provided by 'reviews' in the technical journals is often limited by the circumstances under which these normally have to be prepared (generally based on a single receiver selected and loaned for the purpose by the manufacturer or importer)". I also added that "many of the features now found on receivers intended for the amateur market add only marginally to the on-air performance in the amateur service; complexity is a disease".

Whither experimentation?

The new factory production techniques are here to stay, even though they remove some opportunities for amateur radio operators to engage in experimentation and development in the course of improving or "personalizing" their black boxes. These changes, however, need not be accepted as implying that the traditional role of the experimentally-minded amateur, or those seeking to "learn by doing", has now vanished and the soldering iron and multimeter finally discarded. But they may well mean that for the majority of us, emphasis and technical interest must swing increasingly away from basic electronic circuitry for transmitters and receivers into those other areas where opportunities still abound for d-i-y innovation: "kiss" and QRP rigs; linears; power supply units; microwave technology etc.

One major such area still offering tremendous opportunities for innovation is that of hf antennas. A few years ago for the IERE Radio Receivers and Associated Systems Conference at Leeds, I wrote: "Long- and medium-distance amateur two-way communication is often conducted under marginal conditions; increasingly the relative performance of different (and often 'competing') stations tends to be determined primarily by the strength of the signal received by the distant station; in turn this will be set by propagation conditions; power-gain, directivity, height and siting of the transmitting antennas. Amateur radio, in the professional jargon, has increasingly become a competitive, interference-limited service, rather than signal-strength-limited as in earlier days".

The performance of the transmitting antenna represents the single most important factor affecting station results—and the most promising area for further development. The old adage "if you can't hear them, you can't work them", putting emphasis on the receiving side, has almost lost its point. Most hf receivers, even with a moderate antenna, will bring in all the dx that we have any hope of working. The *useful* sensitivity of hf receivers tends to be limited far more by local levels of electrical and signal interference than by their design. Of course, the classic criteria of good sensitivity, selectivity filters of good shape factor and providing minimum noise bandwidth, reasonable stability and freedom from spurious responses —and in some circumstances a wide dynamic range—continue to be important. But both for transmission and reception it is the efficiency and particularly the directivity of the antenna, and the skilful exploitation of site factors and hf propagation that contribute to consistent dx performance. There is nothing more frustrating than to have an extremely sensitive receiver but an inefficient transmitting antenna!

Fortunately for the future of amateur radio, the development of practical

antenna systems for the wide variety of situations and locations in which we may wish to establish a station continues to provide the chance to engage in genuinely useful development work, ranging from those who seek only to find a new low-cost flexible solution for undemanding bands and undemanding contacts, to the most professional and painstaking investigations of fundamentally new principles. Which brings us, naturally, to the latest instalment of Les Moxon's painstaking work on hf antennas.

A poor man's log-periodic?

TT (April 1984, pp316–7) under the heading "Antennas that slow the wave" provided detailed information on a novel form of loaded folded dipole element developed by G6XN. Though, as he pointed out, the design lacked "sales appeal" it had the remarkable property that, despite its small size and multiband properties, it could be fed with any length of open-wire feeder without degrading its 14MHz bandwidth. This, G6XN reported, was in marked contrast to his experience with other multiband systems based on the use of open-wire lines which tend to involve fairly critical adjustment of the atu. G6XN admitted that this characteristic had been completely unexpected and was, in effect, yet another case of the serendipity that from time to time comes to the rescue—the obverse of Murphy's Law.

Fortunately, G6XN is of a disposition that does not just accept an apparent anomaly but seeks to find out just why it occurs and then to investigate whether it might provide a clue to further useful developments. In this instance, he confesses that it took him quite a long time to arrive at the explanation and to appreciate fully its practical significance. He writes:

"What has now emerged is, I believe, an entirely new and (potentially) very important family of multiband beam antennas. These can include many different forms of construction and a wide range of options. The earlier "loaded folded dipole" owes its membership of this family to the fact that, at the lowest frequency of operation, although physically reduced in size, it is electrically a full wavelength loop *with the two half-wavelengths having different values of Z_o so that they act as quarter-wave transformers providing an impedance step-up equal to the square of the Z_o ratio*. The current is stepped *down* by the Z_o ratio, so that in the case of, say, a quad or delta loop having low Z_o at the top, *most of the radiation comes from the top of the loop, thus increasing the effective height*. This effect tends to be greatly augmented in practical designs which in most cases lead to relatively short lengths and less uniform current distributions for the high-Z_o portions of the loops.

"Fig 1 best illustrates the principle; Fig 2 shows the first version of the new beam to be tried in practice. The helix loading of Fig 1 has been

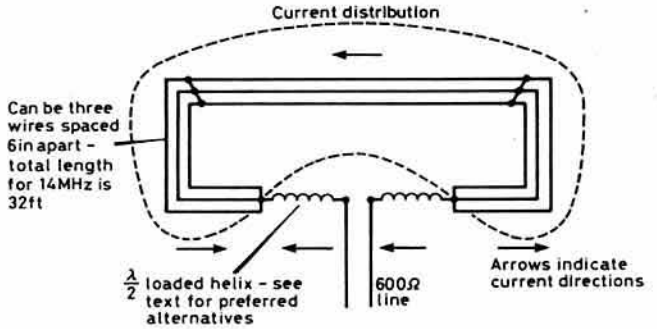


Fig 1. Basic concept of the reduced-size multiband folded-dipole element. The 600Ω feeder can be any length but, if long or thin, matching stubs switched in at ground level are an improvement and may be essential at the highest frequencies

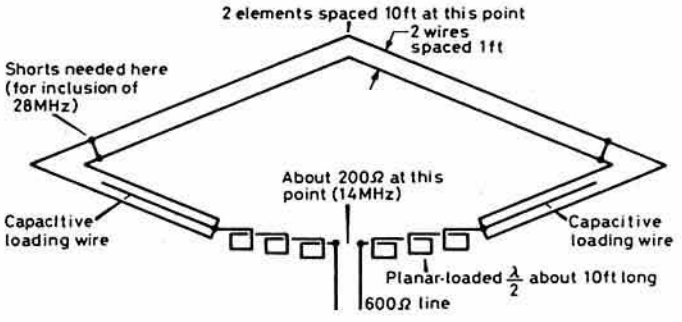


Fig 2. Practical implementation of arrays using multiband folded-dipole elements. This is G6XN's Mark 1 design. With 6ft spacing at the bottom, and 2ft at the ends between the two sections, there was severe overcoupling on 14MHz, cured by neutralization. Total span about 20ft

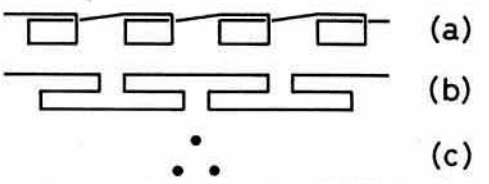


Fig 3. (a) VK5HA-type planar loading is preferable to helix loading and is a near optimum solution. (b) Meander-line loading is another alternative. (c) Triangular configuration for three parallel wires

replaced by 'planar loading', an idea for which I am indebted to VK5HA. This involves a string of one-turn loops as in Fig 3 (a). For these I have used three cords arranged as in Fig 3 (c), with appropriate spacers, instead of a solid former. With three loops each side of centre, I was able to fold a half-wave dipole element into about one-third of its normal length, at the cost of an increase of only some 15–20 per cent in total wire length. This is a big improvement over a helix or another alternative such as a form of the 'meader' system shown recently in *TT* (November 1984 Fig 6 (b)) as a means of reducing the overall span of a dipole element and which can be implemented as in Fig 3 (b).

"A Mark 2 version, dubbed by others 'The Claw', shown in Fig 4, has

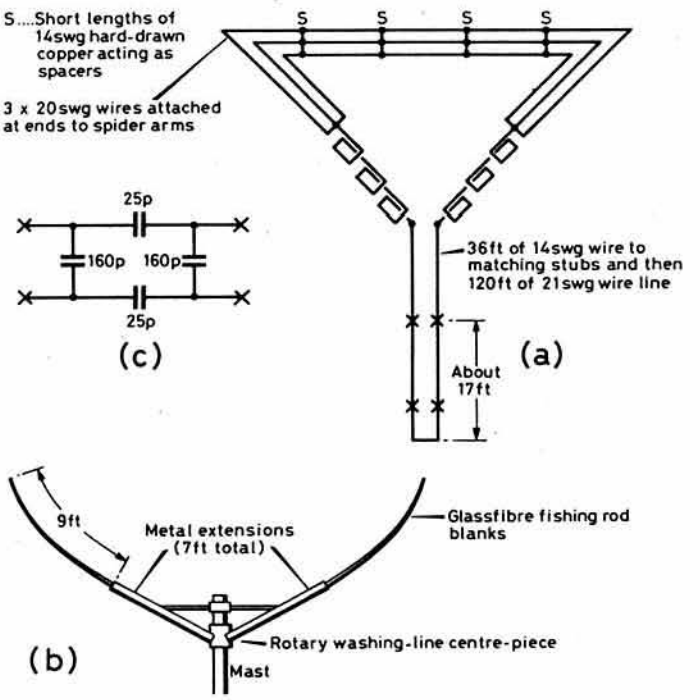


Fig 4. "The Claw" or Mark 2 design. (a) Basic shape of elements; (b) construction of supporting arms; and (c) matching/coupling network for 10MHz switched in by relays at point X in the feeders

been my main antenna for several months, but has not been without problems due to a number of mechanical design errors. Planar loading, unfortunately, is ideally suitable for getting caught up in bushes etc, and the antenna sustained considerable damage en route from the lawn to the mast. Flimsy construction, relying partly on nylon fishing line ties, plus bending the top section down along thin glass-fibre arms, meant that the whole thing is top heavy and (the nylon line being elastic) wobbles like a jelly! Almost unbelievably, it survived the severe gales of December 1984.

"Worse problems have arisen from the resulting asymmetry (one arm broke in transit) in conjunction with a resonant mast which, on 10MHz, caused the current in the reflector to be either normal or zero depending on whether I was holding on to the wooden or metal part of the mast! Confusion abounded. Erratic results on 21 and 28MHz can be attributed partly to this and partly to other factors which came to light during development of the Mark 3 array, shown in Fig 5.

"This has now been completed and is being evaluated at relatively low height pending the advent of better weather (G6XN's letter was written in January). This is a relatively neat and clean arrangement and so far appears to have no vices. Inductive loading has been avoided by going to a larger loop size, and it has been found just possible to achieve this without pattern break-up at 28MHz, where the current zeros occur in the exact centre of the

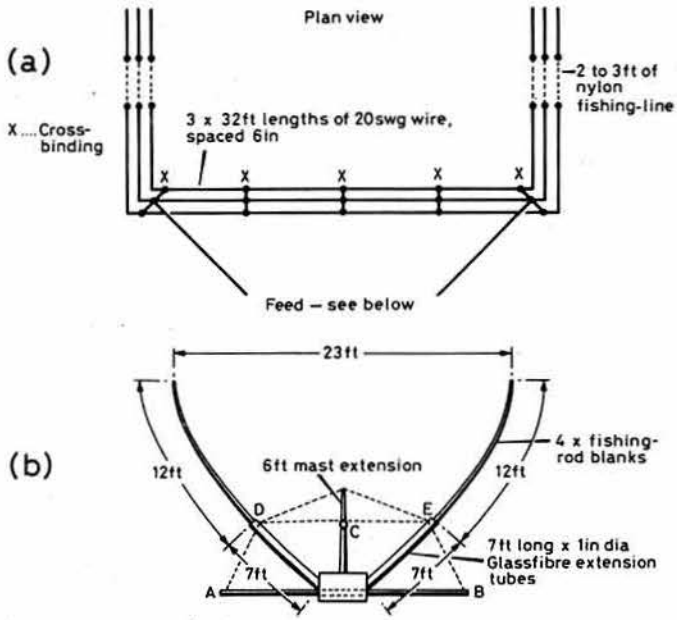


Fig 5. G6XN's latest Mark 3 design. (a) Shows basic shape, but when erected the elements are almost invisible. The arrangement is similar to the VK2ABQ flat array, and only one element is shown here in full. The feeders are single 20swg wires dropped down through the spider arms, then open-wire resonant lines (40ft) to the transmitter. (b) Shows supporting structure using fishing-rod blanks and glass-fibre extension tubes. AB is a 6ft dural tube and there is a short transverse tube at C, the arms being guyed back to the ends of these tubes which are insulated from the mast. The spacing rods (6ft of tube, 0·5in od, with insulated end pieces) are located at the glass-fibre rod junctions. Horizontal metal rods, if used, must not exceed about 8–10ft. The metal extensions almost certainly causing problems even though the elements in Fig 4 are are held clear of them

sides, which should therefore not radiate. This should maximize the effective height, but there is a bandwidth penalty unless one is prepared to retune; this can be done in the shack provided the feeders are not too long.

"The larger loops mean increased effective height at the lower frequencies, though this is largely offset by radiation from the sides, and the main incentive for the larger loops has been an improvement in gain, as predicted, of about 2dB at 10MHz. The Mark 2 design (Fig 4) has a predicted gain of only 2 to 3dB at 10MHz, after allowing for losses (and curing the mast resonance), but has given a pretty good account of itself over the long path to Australia.

"So far I have used only two elements, and this inevitably involves compromises at the extremes of the frequency range because of non-optimum spacings. With three elements a spacing of 8ft would be consistent with optimum performance all the way from 14 to 28MHz. The use of the outer two elements would give improved performance (due to the wider spacing) on 10MHz. However, for feeder lengths in excess of about 30ft it is essential to use some form of switched matching at 10MHz; this also provides independent control of coupling between the elements, as shown in Fig 4.

"This introduces yet another valuable feature of the new system: the ability to control coupling by the connection of small capacitors between the feedlines in a readily accessible position. The array of Fig 2 was so badly overcoupled that at 14MHz there was no f:b ratio at all, but neutralization produced (at the first attempt) 38dB of rejection! The array of Fig 4 was badly *undercoupled*, giving at first only 10dB f:b ratio, but with the in-phase connection of a pair of 5pF capacitors about 8ft from a current maximum I am getting 20–30dB of rejection. The null can be set for any frequency or back direction with a single knob at the operating position, controlling the resonant frequency of the reflector.

"The design of Fig 5 resembles very closely the well-known VK2ABQ design. Drawing on past experience (as reflected in *TT* items and in *HF antennas for all locations*), the coupling has turned out to be very nearly optimum on all three bands (14/21/28MHz) without further adjustment."

Comparison with log periodic arrays

It will be appreciated that the object of this new family of designs is to provide a rotatable, directional antenna that can be used on 10MHz and on any frequency between 14 and 28MHz without the radiation pattern breaking up, characteristics normally associated with large and heavy log-periodic arrays whose use is virtually confined to professional communications and hf broadcasting. G6XN continues his explanatory notes as follows:

"With three elements one can expect a gain of 6dBd from 14 to 28MHz, plus 4dB at a spot frequency of 10·1MHz. This is directly comparable to what can be achieved with the size of log periodic arrays practicable for amateur radio. The log periodics have the advantage that there is no tuning operation needed and no theoretical limit to the frequency range. Nevertheless with the new array the tuning could be preset. Similarly, extending the coverage of a log-periodic to cover 7MHz would require an extremely large structure unlikely to be within the means of many amateurs. The new family of beams, on the other hand, offers the possibility of achieving the ultimate in lightness, low cost, low windage and miniaturization. They could be designed to 'look good', although it must be admitted that supplies of glass-fibre rods are difficult to find and it may be necessary to settle for compromises that would make it look less aesthetically attractive.

"The arrays have the big advantage that they can be made instantly reversible from the shack so that sufficient rotation can be achieved using two cords from a single position, so eliminating the need for a beam rotator. No adjustment is needed before erection, and dimensions become critical only when the operating range is being pushed to its limit. The need for symmetry, noted earlier, applies to *all* horizontal beams (lack of it may well account for the disappointing results of, for example, the TET antenna based on the principles formulated by VK2AOU). Mast resonances are probably the cause of much confusion. In this respect, serious problems arose on 21 and 28MHz due to resonances of metal struts used to reinforce the Fig 5 design at its centre, leading to considerable mechanical redesign. A slight tendency to overcoupling (rather than the anticipated undercoupling) at 21MHz is believed to be due to two short spacing rods, the ends of which are insulated but come close to points of high voltage."

Wires in parallel

The use of parallel wires rather than tubular elements in the new arrays has brought to light an important finding that would seem to apply to virtually any use of this technique for multiband systems. This is the need to make *several* cross connections between the wires. G6XN identifies a link between this and his experiences with groundplane antennas (*TT* March 1981). It may be recalled that G6XN then noted that the *one* length of radial which should be avoided is the *usual* quarter-wave. This is because the impedance of a quarter-wave radial changes very rapidly near resonance; phase reversals could thus occur were it not for losses which have never been specified or investigated! Unfortunately this message, expressed both in *TT* and in G6XN's book, has failed to get through with the use of $\lambda/4$ radials still apparently universal.

This rapid change of impedance near resonance turns up in other guises. G6XN himself was caught out twice in quick succession. In one case he had a vertical monopole with three thin wires joined in parallel at the base, but operation was haywire until the wires were joined also at a point some 2 to 3ft up from the base: Fig 6. With the beam of Fig 2, care was taken to put the short-circuit at a voltage point (14MHz). Nevertheless a big difference in wire currents resulted at 28MHz because the points of maximum voltage on 14MHz were current points on 28MHz.

G6XN therefore postulates, *as an axiom*, that wires in parallel must *never* be connected *only* at points of current maximum. This axiom clearly condemns virtually all conventional groundplane antennas (I shudder to think of the irate letters this statement may attract!). G6XN points out that the cure is trivial; it remains the fact that there is no *need* for long radials, and only a single radial is needed provided that it is short enough not to upset the radiation pattern. Planar loading in the VK5HA style (Fig 3 (b)) should prove a good way to construct such radials. Fig 6 shows one of G6XN's recommended forms of helix-loaded "counterpoise" type of radial for a groundplane antenna as discussed in *TT* (March 1981, pp 235–6) and *HFAfal.*

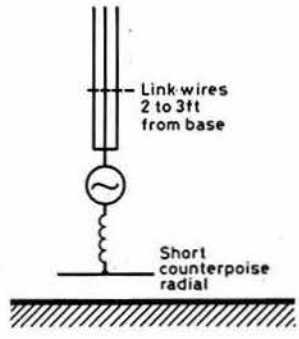


Fig 6. Multi-wire vertical groundplane antennas should always have the wires linked 2–3ft above the base. The diagram shows the use of G6XN's preferred form of artificial earthplane using a single-loaded counterpoise "radial"

Fig 7. Current distribution of loaded elements: (a) distributed loading results in sinusoidal current distribution; (b) centre loading gives triangular current distribution

The basic principle of the short multiband folded dipole element, such as those shown in Figs 4 and 5, can provide other options. For example, single-elements or arrays could be suspended between two masts or trees, using spreaders for the arrays. Similar principles can be applied to any shape or size of loop provided that it is small enough not to result in pattern break-up at the highest frequency. As a challenge, G6XN has considered trying to build an antenna with flat folded-dipole elements and a 12ft diameter turning circle, yet providing a gain approaching that of full-size performance. This would require either helical or, probably better, multi-turn planar loading.

Finally, G6XN adds a note on the impedance of multi-wire elements: "Three thin wires spaced 6in provide a Z_0 of about 600Ω compared with 1,100Ω for a single wire. The latter figure can be expected to be increased by inductive loading, and one can use either distributed loading *or* centre loading (see Fig 7). The latter may be preferable, a reversal of the usual situation arising from the fact that we are not in this case trying to *increase* radiation but rather to *stop* the wrong part of the loop from radiating. The top portion of the loop can be *capacitively* loaded (stretched) as is done to a small extent in the arrangement shown in Fig 2."

For this type of array he considers three wires in parallel are about optimum. Beyond three, one is in the region of diminishing returns, but with only two the impedance ratio is reduced significantly.

Safety standards

As discussed in *TT* on various occasions, consumer electronic products are expected to conform to the safety standard BS415:1979, including the fitting of double-pole on-off mains switches, non-accessibility of high voltages, the use of isolation components on antenna sockets in the absence of double-wound mains transformers, etc. Television set makers and others go to considerable lengths to ensure their products meet BS415, and issue warnings when things are found to have gone wrong. For example a large firm recently told dealers that: "It has become known that a component used in the manufacture of Brand X tv sets during 1977–80 is susceptible to an ageing defect which can give rise to the risk of fire". Local authorized dealers were requested to carry out a modification to such sets for which they would be reimbursed by the manufacturer. One hopes that the warning was followed up and the sets duly modified.

There would appear, however, to be no obligation for distributors or retailers to ensure that imported amateur radio equipment complies fully with BS415, and it would take a sharper legal brain than mine to unravel the extent to which the Consumer Safety Act, 1978 covers such equipment; noting that; if it does, then it would apply also to buying or selling second-hand equipment.

In *Electrical and Radio Trading* (22 November 1984, p22) Sant Kharbanda, G2PU, chairman of Labgear Cablevision Ltd, notes that the many smaller manufacturers of tv accessories, such as mains-powered antenna masthead and set-top preamplifiers, do not necessarily carry out the detailed attention at the design, development and production stages required by BS415. This should involve the correct choice of raw materials and components; the manufacturing processes; and testing and quality control. He quotes tests on a competitor's masthead preamp power supply which showed:

(*a*) mains transformer windings substantially exceeded the maximum permitted temperature rise after 17min;
(*b*) the transformer core similarly after 55min; and
(*c*) the housing similarly after 32min.

There was also non-compliance with BS405 in the mains cable being directly soldered to the conductors of a printed circuit board; with the result that, in the absence of a thermal cut-out etc, under fault conditions this might result, in extreme cases, in fire, release of noxious fumes or a shock hazard.

G2PU drew attention to the importance of adequate creepage and clearance distances between "live" and accessible points even under extreme humid conditions.

Elsewhere it has been pointed out that the Home Office advice on removing the mains plug of a tv set from the mains socket overnight is being modified. It is recognized that fires can arise through "spontaneous combustion" of tv sets even when these are turned off and disconnected; presumably this is due to overheating during operation, with later combustion.

As shown during the Falklands campaign of 1982, pvc-insulation on cables is not only combustible but, when burning, gives off extremely toxic fumes.

The wideband amplifiers (covering vhf *and* uhf channels) used in some tv preamplifiers are something of a menance to amateurs, as they may be greatly overloaded by any local transmitters using bands intermediate between the tv bands, such as 70, 144 and 430MHz. It is to be hoped that with the ending of vhf television in the UK, manufacturers will take steps to ensure that their preamplifiers are less sensitive to signals below 470MHz and above 860MHz. However, since virtually all other countries are continuing to use both vhf and uhf bands for television, it should not be assumed that this will necessarily happen. UK amateurs benefit in several ways from the use of uhf-only tv, but this hardly applies to either British tv viewers or the broadcasters. As somebody not entirely disinterested in tv transmission, I would still argue that Band 3(175–216MHz) is the optimum tv broadcasting band!

Mercury is dangerous

As a very small child I reputedly once bit a medical thermometer and must have swallowed at least some of the mercury. I seem to have survived the incident, although some unkind readers may suggest that it obviously resulted in brain damage. Today, the dangers of mercuric poisoning are more widely recognized, particularly in Japan where there were major outbreaks of Minimata disease in 1956 and 1964, caused by the victims eating shellfish contaminated by methyl mercury contained in factory effluent.

One result has been growing alarm in that country over the disposal of the many millions of alkaline-manganese batteries which contain a significant amount of mercury and which are regularly used in the popular walk-about audio recorders etc. Japan now manufactures some 3,000-million dry batteries a year, the majority finishing up on municipal rubbish dumps and later used as landfill. There is also, of course, mercury in the small mercury button cells and some in discarded fluorescent lighting tubes etc. Some part of all this mercury becomes converted into organic mercury by the action of bacteria and leached away. Such sites, it has been calculated, have an average battery-derived mercury content of about three parts per million, or roughly a thousand times more than the permissible level of mercury in water supplies.

There have been public demonstrations in Japan over the risk from batteries. As a result Japanese battery manufacturers are reportedly seeking ways of making high-energy batteries free of mercury, and seeking to encourage more use of incineration in the disposal of alkaline-manganese batteries.

But this provides an interesting example of how hazards can arise initially unnoticed when a change in technology, such as the introduction of walk-about audio, alters the pattern of consumption and so changes what was virtually a negligible risk into one requiring positive action.

Fortunately, for most amateur radio applications, the traditional carbon-zinc battery or, more especially, the rechargeable nicad, is considerably more cost-effective.

144MHz, 134MHz and dbs tvi

In the February *TT* (Fig 7, p116), I included a block diagram showing a typical arrangement for future 12GHz dbs television receivers, *inter alia* noting the vulnerability to breakthrough of 1·3GHz amateur transmissions with the broadband first i.f. of 0·9 to 1·7GHz. In practice, however, there is hope that the receivers will avoid tuning through 1·3GHz by shifting the lower edge up to about 1·4GHz.

But there is another, potentially far more serious problem facing the many thousands of amateurs who use 144MHz. This is the question of breakthrough into the second (fixed) i.f. amplifier stages, which need to have a bandwidth of around 30MHz in order to cope with the wide-deviation fm vision signals. G8AAE notes that Philips, for example, are currently offering surface acoustic wave (saw) i.f. filters for satellite receivers having a nominal centre frequency of 134MHz, with pass bandwidths of either 28 or 30MHz; in other words, passing signals between about 120 to 148MHz.

It is certainly the case that 134MHz is already being considered as a "standard" i.f. by a number of committees, and is being supported by the results of investigations into potential problems of emc. But there is no doubt whatsoever that receivers using this i.f., to be clear of tvi from local 144MHz signals, will need to be built to standards higher than those usually found in mass-produced consumer-type receivers.

I recall the days shortly after the second world war when a number of British tv receivers, before the adoption of the standard tv i.f. between 34 and 40MHz, had i.fs that impinged on several of our hf bands, including 14, 21 and 28MHz. Curing tvi on such sets was extremely difficult and at times virtually impossible.

The DTI(RRD), BREMA and broadcast engineers (with RSGB representation) have certainly been at pains to check that 134·2MHz can be used without tvi being inevitable. They have recognized the problem of 144MHz pick-up on the coaxial cable linking indoor and outdoor units, or from direct breakthrough into the indoor unit. Their conclusion, which personally I suspect is rather over-optimistic, is that 134MHz is suitable provided that manufacturers observe a series of recommendations.

Using an experimental receiver, they have shown that it is *possible* to build-in sufficient isolation in respect of cable pick-up and direct breakthrough provided that, for example, the indoor unit is in a complete metal enclosure, the linking cable has excellent braid coverage and is used with high-quality connectors, and the 144MHz signals are attenuated by entering the building etc. In other words, *if* all dbs receivers are mass-produced to the proposed very high standards, a local 144MHz transmitter should not cause tvi—though the margins are narrow.

Even if all the recommendations are accepted by British and European industry, this is no guarantee that they will be followed elsewhere, particularly as there is much pressure for the costs of dbs receivers to be reduced to a minimum. And initial isolation of a tv receiver can soon degrade, or be reduced by inexpert servicing. Even if the RIS teams are prepared to tell affected viewers that their tvi is due to the receiver and not the amateur transmitter, we have learned how unsatisfactory this can be, with irate viewers then using every possible means of harassing the amateur.

Clearly it is very difficult to find a suitable i.f, but a choice that includes the most heavily populated amateur band is storing up trouble for years to come. The West Germans have proposed 471MHz, which would certainly be far more acceptable to amateurs, but shifts the problem to broadcasters using Channels 21, 22 or 23 at up to 1,000kW erp!

Ripple on dc supplies

The technique of float-charging heavy-duty lead-acid batteries to form a relatively low-cost and almost ideal form of self-regulating power supply capable of supplying the high peak currents required for ssb transceivers etc, has been discussed several times in *TT*. It is normal practice to use low-cost garage chargers for this purpose, relying on the battery to smooth out the heavy ripple on such units.

However, it needs to be recognised that even a small residual ripple can sometimes degrade the performance of equipment powered in this way. This has been pointed out by Jerry Connolly, an engineer with the UN field operations in conjunction with Middle East peace-keeping activities and based in Cyprus. He writes:

"Unfortunately the ripple level on many battery chargers can prove a serious nuisance on the various transmission modes, including cw, ssb, fm, rtty etc. I encountered some serious problems last year in cases where our people used some fairly cheap (and some not so cheap) battery chargers without first checking, with the aid of an oscilloscope, the ripple content riding on the battery 'bus'. This ripple level increases as the output current drawn from the charger increases, with particularly deleterious effects on the filtering of multiplexed channels.

"I found that if the ripple on the bus is between about 2 and 20mV all is well; otherwise queer things can happen. Many (professional) transceivers today use complex logic and expensive chip-type regulators complete with over-voltage protection, reverse polarity protection, current fold-back, soft-starting, switching-mode systems, and often appear to have a distinct dislike for 'fuzzy-dc' supplies."

While nobody has reported to me similar problems arising from the use of float-charged batteries with amateur radio equipment, it may well be a point worth investigating should incoming reports suggest that all is not well—or equally if all other transmissions seem to have problems.

Testing a high-current psu

Testing and setting-up a high-current psu is clearly not something to be carried out using expensive equipment as a test load. One needs a substitute load that is capable of taking the full output of the psu, and a common practice is to use vehicle headlight lamps in parallel. However, these can easily be fused by excess voltage, and have a number of other disadvantages. They are fairly delicate physically, and also exhibit a very low switch-on resistance that can present problems when used with a fast-trip current-sensing circuit.

B. Bracewell, G3GED, suggests an alternative solution which he has found more satisfactory than lamps. This is to use a number of inexpensive power transistors, such as the 2N3055. Even devices rejected because of high leakage should prove satisfactory for this application. He writes: "Two, three or four transistors may be grouped around a single brass nut and bolt, to secure and provide a terminal tag point for the collectors: Fig 8. Coat the unit in silicone grease and immerse in a pot of cold water".

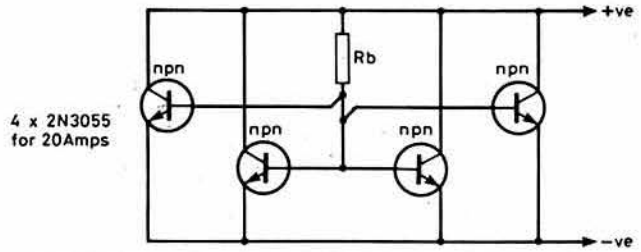


Fig 8. G3GED's use of power transistor to provide test load for heavy-current power supply units. Rb should be a 5-15Ω wire-wound resistor

Flash-over protection for high-power linear amplifiers

From Stuart Jones, GW3XYW, comes the circuit diagram (Fig 9) for a flash-over protection unit suitable for the 430MHz K2RIW high-power linear amplifier. This was originally published in K2VYH's *Lunar News Letter* and has proved very useful over the past three years. He writes:

"If standard 1A glass cartridge (1·25in) fuses are used for ht flashover protection, the filament sometimes evaporates and recondenses on the inside of the glass fuse enclosure; where it again forms a current-path, with dramatic results. I have had a fuseholder actually disintegrate. Since fitting the protection circuit, a flash-over is hardly noticed; the unit is just reset, and if it happens too often the 4CX250B valves are changed. It is quite fast in operation, thus limiting electrical and physical damage.

"While I use the K2RIW amplifier on eme and may be pushing it a bit, there must be quite a few similar amplifiers in general use for tropospheric propagation etc with similar problems."

GW3XYW also mentions that a colleague recently tested a BICC type C2218 20μF (BB-7-70) capacitor packaged in an oval aluminium case, and confirmed that it contained a considerable amount of dangerous polychlorinated biphenyls (pcb) (see *TT* October 1984, p861).

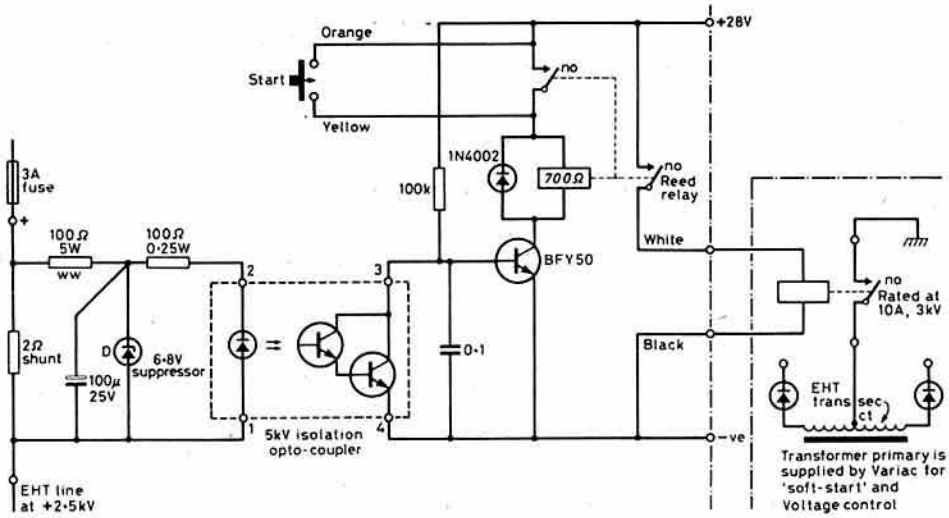


Fig 9. EHT current trip at about 2A to provide protection for flash-over in high-power linear amplifiers, and avoid unnecessary blowing of fuses. D is an RS high-speed pn silicon transient voltage suppressor (6·8V), stock No 283-225 *or* 5-7V 10W zener diode. The opto-coupler is an RS high voltage opto-isolator, stock No 302-148

Self-amalgamating tape—a cautionary tale

TT (January) carried an enthusiastic report from G8YZW on his discovery of "Rubbaweld self-amalgamating marine tape" and his use of this thin adhesive tape as a means of waterproofing outside joints in feeders and antennas. Nev Kirk, G3JDK, has no knowledge of this particular brand of tape but two years ago he bought some self-amalgamating tape from RS Components and used it to seal the various bits of a new trap vertical antenna. When completed, this looked as though it should last for many years. Unfortunately, in practice, one good summer reduced the sealing to a tattered pinholed mess.

He contacted the suppliers and they advised that self-amalgamating tape is intended for *indoor use only* as it is rapidly destroyed as a sealer by the action of the ultraviolet component of the sun's rays. G3JDK has no information on whether CC Marine Services Ltd who sell the tape for marine applications have overcome the uv problem, but will be interested to learn whether, by the end of the year, G8YZW still believes that "for outside joint sealing it is the best stuff I have come across next to well-applied Evostik." Evostik, at least, has a proven record for waterproofing cable joints.

Tips and topics

Numbers of readers have commented on, or provided additional information on, topics discussed recently in *TT*, including the adjustment of semi-automatic keys, antenna tuning units, safety and the ac mains, rccbs, Goyder-lock oscillators etc. I hope to return to these subjects in turn, but with space limitations it is necessary to strike a balance between introducing new ideas and continuing with previously discussed topics. But writers can rest assured that none of their letters has gone into the wpb.

Mullard have recently introduced plastic TO-220 versions of the popular 2N2955 and 2N3055 power transistors, respectively the MJE2995T and MJE3055T. Mullard have also introduced a number of uhf power transistors intended primarily for 900 or 470MHz mobile radio equipment, but some of which are suitable for use on the 1·3GHz amateur band. For example, the BLU99 can provide 4W output power at 900MHz with a typical gain of 7dB from a 12·5V supply in an SOT-122 package.

Dave Sugden, G4CQS, adds his vote in favour of the use of a float-charged car battery rather than a heavy-current mains psu. His elderly car battery with a 4A Halfords charger is well able to provide 30A or more peak for 100W ssb operation, and has proved the ultimate in "kiss" technique. □

AMATEUR PACKET RADIO

(Continued from page 183)

—*Ack rx timeout?* [50]—how many centiseconds to wait before declaring a transmission lost.

- *Traffic selection?* [0]—high numbers filter out third-party traffic on the frequency.
- *Which mode would you like?* [3]—BBC screen mode.
- *Do you want hardcopy?* [no]—using the Centronics parallel printer interface.

The screen will then be set up for operation with windows for information, data and transmit buffers; and two further questions will be asked:

- *What is your callsign?*—give this in the form that you expect other users to quote it—without spaces and without any alternative or portable suffixes (the program will convert any lower case letters to capitals).
- *Who are you calling?*—the callsign of another operator

A message will appear in the top information window noting that a new channel has been opened.

Anything that you type now will be sent to that station; capitals and lower-case letters may be mixed freely. Packets are queued for transmission when 60 characters have been typed or RETURN is pushed. The current line in the bottom transmit buffers window can be edited with the DELETE key, but the cursor and COPY keys must not be used. It is also extremely unwise to send control characters (other than control-G) as these are likely to disrupt the operation of stations receiving them, so they are filtered out too.

The middle data window shows all traffic on the frequency, and anything written to it will be copied to the printer if this was requested when the program was started. For each packet the source and destination callsigns are shown together with a flag indicating:

- an acknowledged packet arriving from another station (A);
- third-party traffic noticed on the frequency (R);
- the number of transmissions required to send a packet from this station (n); or
- a failed packet from this station, unacknowledged after 15 attempts at transmission (!!).

Different destination stations are associated with the function keys f0 to f9—pushing a function key selects the corresponding station as the current destination for transmissions and pushing SHIFT together with a function key will cause the program to prompt for a new callsign to be given which is then associated with that key and selected. Again it is wise to type the callsign without spaces or suffixes.

Conclusion

It is worth noting the legal issues involved in using this packet radio system. This system is operated under the clause in the amateur licence schedule permitting experiments with novel forms of data transmission, which requires that the callsign is announced in telephony as least every 15min. It is important that this is respected, as the intermittent nature of the transmissions might confuse other stations. The appropriate mode designations for automatic telegraphy are F2B on fm and J2B on ssb, although D should be substituted for B if data such as programs are being transmitted rather than messages (I think!). Recommended frequencies for experiments are 144·550MHz and 144·675MHz.

The citizens' band licence only permits the use of telephony, and it would be illegal to use this system with cb radios.

The authors are keen to receive reports of users' experiences with the program, and would be grateful if they could be sent to the Computer Laboratory, Corn Exchange Street, Cambridge CB2 3QG. Further enhancements are always being made to the program, so reports of defects and deficiencies are particularly welcome. □

Critical study of the swr meter

(Continued from page 187)

Whatever length AB takes, C is always the centre, OC represents the line voltage, and ϕ the phase displacement. Table 1 gives the tabulated results, plotting θ from 0° to 180° in 30° steps, V_V and V_C being measured and listed in columns 2 and 3.

The voltage and current should be 70·7V and 1·414A. Columns 5 and 6 show that there can be a considerable variation from 99V to 42V and from 0.85 to 1·98A still with an swr of 2·33. The reflected meter does not show the true wattless VA of column 13, but a reading of 16W corresponding to the swr of 2·33.

The true watts of column 9 are practically constant and equate with the indicated forward minus reflected watts.

A considerable amount of information could be obtained if only we knew which line referred to our equipment. For instance, on the 30° line we have a load impedance of 99·1Ω made up of a pure resistance of 110·15Ω shunted by a reactance of 228·86Ω. It is not indicated if the reactance is inductive or capacitive, but this can be found by swinging the frequency. This should give all the information for atu correction by tapping to correct the resistance and by adding shunt reactance of the correct sign. Alternatively, the correction can be calculated as proposed in [1]. The table has only been produced for one swr and it is not necessary to repeat it. I am now suggesting that a very useful adjunct to the swr meter would be the addition of a third meter to read V_{CR} or $V_{CR} + V_{CF}$. This would then give three sides of the triangle of Fig 4, and by bisecting AB to give V_V and the angle ϕ we should have all the information to evaluate our particular case and to make the necessary correction.

Reference

[1] "Design of L-networks for matching antennas to transmitters," J. E. Ewen, G3HGM. *Rad Com* August 1984, pp663-5. □

Microwaves

*by Mike Dixon, G3PFR**

Operating news and photo-spot

Much as expected, the prolonged cold snap in January failed to produce much in the way of "lifts", at least as far as I was concerned. Conditions on all the bands on which I am able to listen at the moment (50, 70, 114, 432 and 1,296MHz) can only be described as having been completely flat, with even the usually easily-audible GB3VHF into and out-of the noise for most of the time. It is thus perhaps not too surprising that few reports have been received this month!

Perhaps now is the time to overhaul and "fettle-up" the equipment in anticipation of steadily improving weather and propagation conditions which must surely come with the spring. Arising from last year's activities, a number of photographs have been received, two of which are reproduced here. Both show typical 10GHz portable activity under what has come to be recognized by many as "atypical" microwave weather—that is, clear, sunny and reasonably warm! My thanks to Steve, G4FPV, for the photographs, both taken by his brother during one of the 1984 10GHz Cumulatives while operating from the Malvern Hills.

In *Microwaves,* December 1984, reference was made to the Merseyside Microwave Group, callsign G1GHZ. Keith, G6HHV, has indicated that activity in the Wrexham area has, so far, only taken place on dates coincident with the 10GHz Cumulatives. Normal weekend activity does, however, take place along the nearer North Wales coast and along the Wirral Peninsula. He says that usually one or more of the group can be contacted via the local 432MHz repeaters (presumed to be GB3LI, GB3LL or GB3CR) and that, when active, group members tend to favour 432MHz operation rather than 144MHz for talk-back.

Chris, G4HCL, sent a copy of the Cambridgshire Repeater Group newsletter to remind me to indicate that GB3PS (input 1,291·075MHz, output and beacon 1,277·075MHz) is now on-air from Barkway and reports would be welcomed. In beacon mode an fsk callsign is sent at 15s intervals, and talkthrough access requires the usual 1,750Hz tone with a maximum of 5kHz deviation. The response, when accessed, is a low-pitched "pip" followed by four "bleeps" at 2s intervals, followed by an afsk callsign: timeout is 10min. The repeater/beacon is operational on a single Alford slot using a circulator and fed with LDF5-50 heliax: it is hoped to be able to improve power output in the near future with the acquisition of a better circulator.

Operation on 10GHz from the Malverns. L to r: Graham, G8ADH; Paul, G4GMV, and Steve, G4FPV. The weather was good enough to allow solar-powered operation, and the solar panel can be seen in the foreground

Setting frequency on 10GHz. The 144MHz talk-back antenna is located close to the 10GHz equipment, enabling both sets of gear to be operated simultaneously. When not operating full duplex, this will considerably speed-up operation and it will also allow the received signal to be retransmitted via talk-back, permitting easy optimization of the (distant) dish

From the Midlands, Frederick, G6FK, mentions a total of some 33 callsigns heard or worked on 1·3GHz since the 10/12 December "lift", and reports carrying out tests with six more stations, but notes a sad lack of signals from the south east. His list consisted almost exclusively of Midlands and northern callsigns. Frederick also noted the growing interest in 2·3GHz, mentioning five or six stations active on or constructing for this band, saying that "tests often yield some surprising results in comparison with 1·3GHz, bearing in mind that power-ratios may be 50:1 in favour of 1·3GHz. I think much of this must be due to updated low-noise systems on receive, plus the use of good antennas (dishes) and a great deal of know-how on the part of the current operators on 2·3GHz".

Jack, G5UM (microwave awards manager, QTHR), has noted several new awards in the first week of 1985. Dave, G4FRE/P gained a two-band Microwave Award "stickered" for five squares on 3·4 and 10GHz, and it was noted that the only other 3·4GHz award so-far issued was the 10-Square Award which went to another East Anglian station, G4BYV, exactly a year ago. On 1·3GHz the Standard Award (No 57) goes to Bob, GM8MBP (Aberdeen); Bob had, in fact, amassed enough countries for a Senior but not yet enough counties. Bob's cards revealed that many were endorsed "You are my first GM on 1·3GHz." or words to that effect! Also on 1·3GHz, Cliff, G6ADE, was awarded the Senior certificate (No 11) and Jack noted that, of the few Seniors awarded since its inception in 1976, *all* have been for fixed-station working.

RSGB National Convention 1985

This event at the NEC, Birmingham, takes place on 13-14 April, and should be of interest to all. The Microwave Committee stand will, hopefully, present a good cross-section of equipment and information for those interested in the upper parts of the spectrum. This year there will be a 10GHz counter available for easy alignment of Gunn oscillators, and it is hoped that operators will bring along their equipment for checking and/or setting to frequency; sensitivity is such that the counter only needs to "sniff" output to give readout!

From here and there

Apropos bits and pieces for microwave construction (other than electronic components), I have just received the latest Whiston catalogue. For those unfamiliar with the name, this catalogue (obtainable from K R Whiston, New Mills, Stockport SK12 4PT) contains details of all kinds of engineering "goodies"—stock materials, tools, screws, nuts and bolts and what is described as "engineering haberdashery". The attractive feature is that goods are available in small quantity and often at surplus prices: many metal stockists will either not deal in small quantities or will push the small-quantity price so high as to make it uneconomic for the amateur. Among the section on solders, for instance, I noted no less than four grades of silver-solder melting over a combined range of 608 to 780°C. This range, and at least two different soft-solders, should allow the constructor considerable scope for good mechanical construction where needed! □

*"Woodstock", Gaze Bank, Norley, Warrington, Cheshire WA6 8LL

4-2-70

*by Ken Willis, G8VR**

MARCH IS THE MONTH WHEN vhf addicts meet at the annual VHF Convention at Sandown Park (23 March), and the VHF Committee hopes for another record turn-out and eye-ball contacts with as many vhf operators and swls as possible. In more years on the air than I care to remember, I have never yet met someone for the first time whom I had previously known only by his voice who looked remotely like my mental picture. This works both ways of course. Someone at the Midlands VHF Convention told me that he had always pictured me as "over six feet and very well-built". Those who know me know how far this is from the truth, so look out for someone less *macho* if you want to meet me at Sandown Park.

As usual the *4-2-70* postbag this month was both heavy and full of interesting material, so here are some of the things you told me about . . .

Aurora

John Branegan, GM4IHJ, is working on an auroral modelling program for his computer which is being checked out in practice by three UK amateurs and three from the USA. It is early days to comment further on this, but no doubt John will keep us informed of his progress in this interesting field. For amateurs living in more southerly latitudes the prediction of a radio aurora is very significant now that we are heading towards a sunspot minimum, when events of this type will tend to be less frequent and far less intense than those of the past two or three years. Mention has been made previously of the SABRE project (Sweden and Britain Radar Experiment), in which the "UK end" is a radar at Wick operated by University of Leicester staff. This radar on 153·213MHz, forms an important role in John Branegan's auroral studies, since he uses it as an indicator of auroral activity. (For readers in other areas, the "other" radar in the experiment is near Uppsala, Sweden, and is on 142·585MHz). Others may wish to monitor these frequencies to see what they can hear when auroral activity is present. GM4IHJ says that the use of his computer program, plus observations of Wick, have enabled him to catch some "very odd little precursors to big events".

Some other GM stations are now following Wick, one of them being GM4JJJ, who found a cheap marine-band converter which translates the Wick frequency down to just below 28MHz with good copy using a tunable sw receiver as i.f. Best reception is said to be in the a.m. position.

GM4IHJ reports auroral activity on 2, 3, 16, 17, 21 and 26 December, and on 1 January, much of it confined to auroral tv from Scandinavia; Wick radar being audible, and GB3LER also heard with Au tone—John is alerted to GB3LER becoming auroral by first hearing Wick. Signals to GB3LER becoming auroral by first hearing Wick. Signals on 144MHz from Scandinavia were heard in the events of 21 December and 1 January. Just to indicate the complexity of the subject, GB3LER often comes up when Wick reaches S5-6, but sometimes the roles are reversed and the beacon comes up first!

50 and 70MHz

Martin Blythe, G4HFO (St Austell), one of the latest 50MHz permit holders, says he is the only station in Cornwall on the band at the present time. He uses a Mutek 144 to 50MHz transverter which he "thoroughly recommends" to anyone wanting to get on the 50MHz band. This feeds a five-element Tonna at about 25ft above ground. He has a very bad take-off to the north, but says that he has been amazed how 50MHz signals get over the hills. Chris, G4DGU, is his nearest 50MHz station, difficult to work on 144 or 432MHz, but no problem at all on 50MHz with signals 5 and 6 both ways. Martin has also worked GM3WOJ via ms ssb, completing in under 10min. Other stations worked have been GJ3RAX, GJ3YHU, G6XM, G3MCS and G3COJ, all on tropo. He has been monitoring for beacon GB3NHQ, but hears the Gibraltar beacon ZB2VHF more often, saying that it is surprising how often it surfaces through the noise; so if you haven't listened for it recently, try monitoring its frequency. G4HFO is on each morning between 0730 and 0830gmt, monitoring 3,718kHz also for crossband or inband skeds. Martin makes an interesting point: he suffers very bad interference—which goes away when it has been raining—from an 11kV line on a pole some 100m to the east of his QTH. The local interference office of the DTI suspects a faulty binding post, and the electricity authority has been very co-operative and promises to get rid of the problem as soon as the source has been definitely pin-pointed. The moral seems to be, don't sit and suffer, but report any such QRN and get it sorted out.

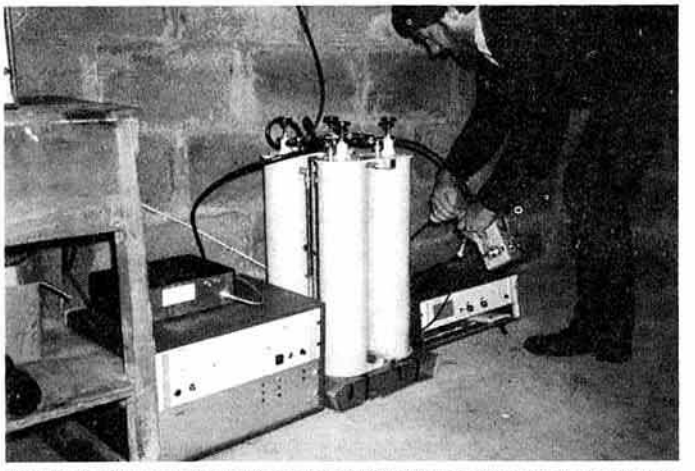
With all these stations reporting ms contacts on the band, why did we not hear more about this form of propagation in the "old days" when we had allocations around this part of the spectrum? Was equipment so poor that reflections went unnoticed, or were they put down to signals bouncing off aircraft or passing space-tramcars, or is my memory playing tricks in assuming that reports of long bursts were never received? Any old-timer with knowledge of such matters could perhaps oblige with the facts.

That there is life on 70MHz is proved by the fact that G4CMZ (Derby) recently claimed a Standard award on that band, having amassed the required number of contacts and cards using a mere 1W, plus much patience and the use of cw when necessary. Another Standard went to G4ESU (Nuneaton) after only six months operation on the band.

Repeater news

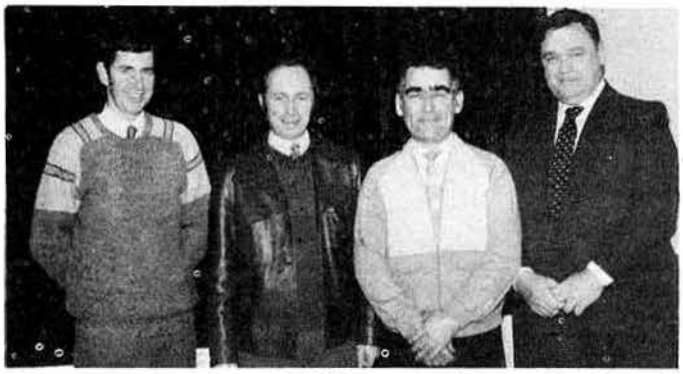
Bruce McCartney, GM4BDJ (Dumfriesshire), is secretary of the Scottish Borders Repeater Group, which looks after GB3SB and GB3HK. He suggests, I suspect with tongue ever so slightly in cheek, that the "best repeater" is GB3SB. He hastens to add that it is not only he who says so, for he overheard GM3OPW/M and GM4KTJ say it, and neither is a member of the group! Bruce goes on to claim a less enviable title however, that of the quietest repeater, for which he nominates GB3HK, also in his group, having counted only six different stations heard through it on its busiest day so far. I know repeaters where this state of affairs would be most welcome. Bruce lives in a valley with 1,500ft hills surrounding it, so one can imagine the benefit which access to a good repeater can bring to such a QTH. Despite these limitations, Bruce occasionally hears GB3VHF from down in Kent.

The group which manages the Port Talbot repeater, GB3WG (RB6) have reported for the first time to *4-2-70*. After working continuously since May 1981 with only a single breakdown, GB3WG was recently taken out of service for routine maintenance which took only one week. The repeater now has a 2min timeout and uses GB3US Mk 2 logic. A second transmitter-receiver has been purchased and is being modified for 432MHz, and a second set of G3VEH dipoles are under construction. These will be mounted on top of the tower, the existing antennas being only part-way up, and when this is done the transmitter will be operated at increased power.



Not the local gas-works, but repeater GB3SB having its output checked by GM4EZJ. Transmitter and logic in cabinet to left of duplexer, receiver to the right. Repeater has recently had a complete "face-lift"

*11 Old Downs, Hartley, Kent DA3 7AA



The men who keep GB3WG (Port Talbot) on the air. L to r: Steve GW3VPL, Mervyn GW8TBG, Wynne GW3WWN and Gary GW4HNT. Wynne and Gary live in Tonna, S Wales. How can they fail with a QRA like that?

When all the work is completed, GB3WG will have back-up in every department, including cavities and heliax. Since this all costs money, the group would greatly appreciate donations on a "one-off" basis from clubs and individuals which should go to Wynne, GW3WWN, QTHR, who is group secretary.

Chris Young, G4CCC, vice-chairman of the Repeater Management Group, has accepted responsibility for RMG publicity and is producing a regular newssheet containing information on developments within the repeater field. In the first of these he mentioned that whereas the licensing authority had taken, on average, some nine months to process a repeater licence, change of site or channel etc, recently five repeaters were licensed within three months. These were GB3IM (to become GB3GD), GB3AN (RB4), GB3DC (RB11), GB3OV (RB1) and GB3LF (RB14). Chris also reported that GB3FE, Fifeshire, (RB6) was due to become operational again on 15 January after 34 months off the air; the Glenrothes Amateur Radio Club has put the repeater back on with encouragement from the RMG. The Goole uhf repeater GB3GC (RB4) also became operational on 19 December 1984. G4CCC also reported that GB3RE documents are now with the RMG being processed, while GB3GD, IoM was due to start up on 1 February 1985.

Note that the RMG will hold an open meeting in the Borders region at St Boswells on Sunday 31 March (see notice in "Amateur Radio News").

GB3MT (Winter Hill, RB12) the rtty repeater has been testing for "non-interference" with the co-sited Mould system. Since none was experienced, MT was due to become operational on 5 February 1985.

RMG has licences for repeaters on RB1 and RB3 which they cannot issue pending a solution to the "Denmark" frequency problem which was the subject of discussion at the IARU Cefalu conference.

Meteor scatter

Please note an important error in the suggested times for random ms activity listed in *4-2-70* last month. The Saturday times (2200 to 0200) are correct, but on Sunday dates, the times should be 0400 to 0800, NOT 0400 to 2400. These are the activity periods suggested by G4ASR.

It was perhaps fortunate that most readers received their copy of *Rad Com* after the Quadrantids had peaked, because I stated that the peak would be "on or around 4 January". Since 1984 was a leap year, the peak in fact occurred on 3 January. Not many reports have come in regarding this shower, but John Branegan, GM4IHJ, said that for him the peak was at 1230gmt on 3 January when he received continuous tv pictures on 48MHz from Sweden, and some short, loud bursts from Wick radar, but nothing longer than 5s.

Reporting for the first time, I think, Erik Gedvilas, G8XVJ (Cheshire), sent a long list of ms calls and contacts for the period 9 December 1984 to 3 January 1985, thus embracing both the Geminids and Quadrantids in a single report. In that period he had no fewer than 25 complete contacts, the majority of them on the 144·200MHz random channel, and all on ssb of course. In the Quadrantids he worked IW5BML, SM5MIX, LA1K, LA1BOA, SM7GEP, LA6VBA, DF8VK, HB9PUW, OK2BFH, OE5EFM, DH2NAF, YU2RQQ, I0NLK, plus G and GW using backscatter, so Erik seems to know how to use this mode to good advantage. He was up all night on 2/3 January, and found the night-time very good indeed, with most reflections coming on a beam heading of 60°, moving to 125° around 1400gmt on 3 January. He uses a TS700S with BF981 preamplifier, a 2 × 8874 Tempo, a homebrew 4CX250F, MGF1200 masthead preamp, 19-element Boomer and an FT290R, though presumably not all at the same time!

Last month I gave some details of the pioneer ms work carried out by John Stace, G3CCH, in the 'sixties. To complete the picture, here is what he says about antennas for ms work. Height is more important than gain, but a large, heavy 40-element colinear was built with a centre height of about 30ft for the TF3EA skeds, with the aim of achieving optimum take-off angle after taking into consideration the slope of the ground. This resulted in a great improvement. Some time later, in February 1976, a diversity system was used with a 10-element Yagi at 55ft and the 40-element colinear at 25ft, each feeding a separate receiver. On a long series of tests with SM3BIU, it was noted, for example, that one burst would start on the colinear, continuing at much greater strength but shorter duration on the 10-element, then continuing on the colinear. Some pings were copied on both channels simultaneously, mostly being stronger on the 10-element. John warns that misleading results can be obtained if the audio gains are not equalized on the two receivers. Final conclusions were that an ms antenna needs a wide vertical polar diagram but a narrow azimuth, so he concedes that a single long Yagi is probably the answer. For dx in excess of 800 miles, height is all important, says John, plus as much power as possible, since he says there is not much point in hearing the other station if he cannot hear you. The final ingredient is patience; several times G3CCH completed a contact in the very last period of a sked. Although John's work was mainly on 144MHz, 423MHz was also used and TF3EA copied some signals from G3CCH on this band though John never heard him. The 28MHz band was also tried, but reflections were weak, probably due to insufficient antenna height to get low-enough take-off angles. Maybe we can persuade some ms enthusiasts to enliven the 28MHz band with similar tests during the sunspot minimum. It would at least maintain our occupancy of that part of the spectrum.

The vhf awards manager reports that recent applications for 144MHz awards by G4RGK (Marlow) and G4BWS (Canterbury) both included several cards for ms contacts, showing how this mode is now being used more generally and by stations with quite modest equipment. As we have said here many times before, 80–100W plus a nine-element Tonna or similar will give excellent results with practice and patience.

Beacon information

G3WSN, the vhf manager, reports that beacons EA3XS on 144·152MHz and EA3URE on 144·157MHz are both QRT. In a recent visit to EA5, G8VR was able to hear (for the first time ever!) beacon EA6VHF on Ibeza on 144·917MHz, with a rather chirpy signal and only able to be copied on vertical polarization at that particular location.

G3WSN also says that 9H1VHF in Malta, JM75FV, is operational on 144·830MHz with a transmitter power of 1W. This might be a good one for sporadic-E monitoring.

An application is being processed by headquarters for a proposed auroral warning beacon on 50·06MHz with callsign GB3RMK, located at Mount Eagle, Munlochy, Scotland. The signals would be beamed towards the north and, if authorized, would provide a most valuable indication of a radio aurora for more southerly 144 and 70MHz stations, since 50MHz Band 1 tv signals have, in the past, always been useful in this context.

From OZ7IS comes news that for some time now, OY6VHF and OY6UHF beacons have been QRT due to antenna damage and other problems. A rebuild of the beacon installation has been undertaken so that in future OY6VHF will use two four-element Cue-Dee antennas, donated by that company, on 144·885MHz, one pointing NE (aurora) and the other to the SE (tropo, Es). For OY6UHF on 432·885MHz, an "eight-element encapsulated group antenna pointing to the southeast" will be used (if you don't know what this means, you are in good company). One further problem exists—who will pay the electricity bills to keep these most useful beacons on the air? Some £100 per annum is required, so any donations from individuals, clubs or societies would be most welcome by OZ7IS (Ivan) or OY9JD (Jon), both QTHR if you have the international callbook, otherwise write to me if you want to contribute.

From the same source (OZ7IS) we learn that since October 1984, two new vhf beacons have been QRV from the same site in Greenland, specifically from Danmarkshavn (IQ06PS) which is in the NE part of the island. A common callsign, OX3VHF, is used for transmissions on 50·045MHz (20W to groundplane antenna omni) and 144·902MHz (10W to 16-element beaming SE). The purpose of these beacons is stated to be an investigation of the mode of propagation which has led to 144MHz signals from the UK being identified on several occasions. Both beacons are on continuous 24h/day service, but when conditions permit they can be manually operated by Tommy Frost-Hansen, OX3BX, on a separate 144MHz band frequency. If you copy OX3VHF and want to work Tommy, you can call him via Inmarsat (operator-handled call) 299 16 10 225. This was the information given by OZ7IS.

Incidentally, in a very detailed 50MHz report which it is hoped to

comment upon when space permits, Jeremy Whitfield, G3IMW, reported that GM3BZE copied OX3VHF on the stated frequency of 50·045MHz from 1927 to 1935gmt at 599 on 15 November 1984 via aurora (Jeremy stated 599, not 59A), so, if this was so, was it auroral-E for which John, GM4IHJ, so frequently asks us to be on the lookout?

The 432MHz beacon GB3WHA, which lost its site at Crowborough, may soon reappear from a new location at Wych Cross, Sussex, with a beam heading "up country and to the east". However, there are some problems of site rental costs to be settled before this can happen.

432MHz—a theme for 1985/86

In view of the continued growth of amateur radio, particularly the influx of Class B operators who must work on vhf/uhf, the VHF Committee has decided to adopt as its theme for 1985–86 the encouragement of activity on 432MHz. In the more densely populated areas of the UK the 144MHz band is becoming ever more crowded, while on the higher bands there is much more free space in which to operate. Not only that, but 432MHz is a band capable of real dx using simple equipment, and a 23-element antenna looks quite tiny when erected, unlike the large 144MHz arrays which tend to attract so much neighbourly attention in built-up areas. Starting from the VHF Convention this month at Sandown Park, the VHF Committee plans to do everything possible to encourage more activity on 432MHz. At the convention on the VHF Committee stand some typical pieces of equipment for this band, both homebrew and commercial will be on display. The committee also suggests that Monday evenings starting at 8pm local time be set aside for 432MHz cw activity throughout the country to provide stations to work during flat conditions and to give the opportunity for morse practice. At the 1986 VHF Convention it is intended to award the Constructor's Trophy to the amateur who builds, what is in the judges' view, the best piece of 432MHz equipment during the year.

We need much more activity on this band, so why not give it a try this year? If you have never tried it, you could be very surprised at what can be worked without great blowers cooling bulky linear amplifiers, and you'll be able to access Oscar 10 as well which will open up a whole new realm of vhf/uhf communication. The strength of 432MHz repeater signals can be very surprising, too, while with much more band occupancy we may find that far more auroral activity on this higher band is possible than we imagined. Why not keep a simple antenna on 144MHz to work the Es during the summer and to receive 0-10, plus a modest number of watts feeding a suitable antenna on 432MHz to provide the main station activity during 1985-86?

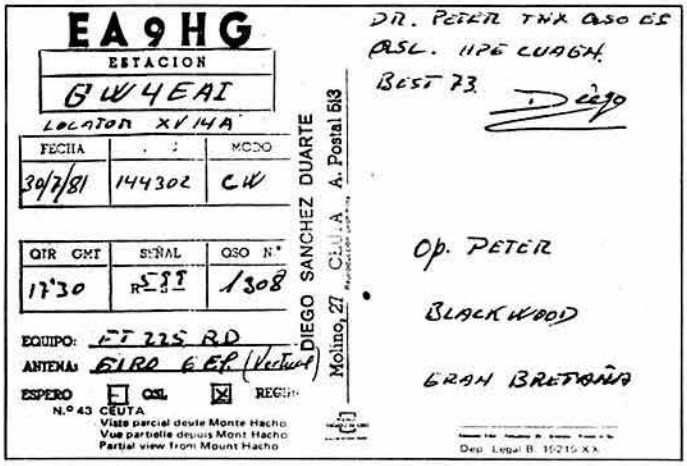
BARTG

The British Amateur Radio Teleprinter Group goes from strength to strength, no doubt underlining the impact of the microcomputer on amateur radio, since BARTG is concerned not only with rtty, but with packet radio, facsimile transmission, Amtor and the like. The group now has some 2,600 members, two-and-a-quarter times the number only one year ago, and their quarterly journal *Datacom* should be compulsory reading for all who seek to link together a micro and a transceiver. The winter edition, just published, contains an enormous amount of information on both packet radio and fax, as well as some interesting constructional articles. To get more information on this group's activities, write to Pat Beedie, GW6MOJ, QTHR, who is membership secretary. At this month's VHF Convention at Sandown Park, Ian Wade of BARTG will be delivering his lecture "How packet radio works", aimed at beginners to data communications, well illustrated by slides, tape recordings and visual aids, plus the introduction of what Ian calls "a very special piece of string". Should be most interesting!

Trevor Tugwell, G8KMV, who has reported his interests in all forms of data communication to *4-2-70* previously, has moved from Stevenage to Fareham, where he has stirred up some local enthusiasm for packet radio, and with some success, since five amateurs in the area are now using the system in conjunction with their BBC micros. Trevor says that there is a lot of Amtor activity there also. Drop him a line to the old QTH in the callbook if you want his views on software or operational information on these data communication systems.

The perils of /P in GM

Last June, Clive O'Hennessey, GW4VVX, made a trip to the rare XS square, taking with him equipment for some hf bands and for 144MHz operation. He had a very enjoyable trip, and comments most favourably on the hospitality shown to him by local amateurs, and even by one cb operator who has promised to help him find a better site for an expedition in 1985. Clive had limited time on the air as this was also a family holiday, but in 12 days he had only 23 contacts on 144MHz, including some made during



QSL for first-ever GW-EA9 contact claimed by GW4EAI. Note that the EA9 was using a barefoot FT225RD and a vertically-polarized small antenna

a big aurora (18 June) when he gave G3IMV his last remaining square in the UK (XS) and even a first-ever XS contact with a GM station.

What is interesting about Clive's report on his experiences is his listing of the problems he encountered, well worth study by anyone contemplating a trip to the northern regions or similar terrain. For Lairg, in Sutherland, Clive noted that:

(a) 300ft asl sounds like a good location, but not when the surrounding land rises to 1,500ft, and the Cairngorms to 4,000ft lying to the south.

(b) The Cairngorms are very good rf attenuators!

(c) 50W and a 13-element antenna was not enough erp under such conditions.

(d) 25km to the nearest amateur is too far for keeping in touch in this mountainous terrain. The Black Isle repeater was therefore a boon in this location, and its users proved to be a most friendly and co-operative group.

(e) The north of Scotland is too near to the South and Midlands for successful ms contacts. Only very short pings resulted in skeds with south Wales, even though offset antenna headings to UO and UP squares were used, and meteor activity was high (Perseids).

(f) Listening and calling on 144·300MHz is of little use from such a location as the southern QRM blots out all but the very strongest of signals.

(g) Much of the auroral work in GM is on ssb, usually close to the calling channel. Doppler shift is very marked, as high as 2kHz in the case of some signals from the east and south. This causes problems for stations not accustomed to auroral work (it was GW4VVX's first experience of auroras).

(h) Following an aurora, many GM stations will beam south in an attempt to hear southerners still beaming north towards the aurora, so weak tropo signals should be listened for, or calls made towards GM even though the Au activity has diminished.

There is a clear case for enlisting the aid of some locals before picking out a spot on the map and setting off laden with gear to what might turn out to be a poor location for all sorts of reasons.

Awards

In December 1984 it was reported in *4-2-70* that GW8FKB had claimed the first-ever contact between GW and EA9 on 7 July 1983. Peter Whitburn, GW4EAI (Blackwood), has disputed this and has sent a copy of the QSL card which confirms a contact which he made on 30 July 1981, some two years before the GW8FKB QSO. It was a cw contact, though, so maybe GW8FKB made the first-ever ssb contact. Either way it is pretty good dx for 144MHz.

G5UM reports having issued no fewer than six Supreme certificates during 1984, the two most recent ones going to G6NVC (Essex) and (who else!) GW8FKB!

CQ Contest DVL

On Sunday 10 March 1985 between 0700 and 1100gmt, the Belgian Diplome du Valeureux Liégeois Contest will be staged on the vhf/uhf bands. Participants should call "CQ DVL Contest" and exchange report and QSO number. Belgian stations will give their province also. One point will be gained for each contact, except that stations worked in Liége will count three points while a QSO with club station ON5VL will rate five points. Multipliers (11 in all) for each band used are made up of the nine Belgian provinces, plus one for Belgian Forces in Germany, and one for Liége contacts.

Deadline for logs is 30 April, sent to ON7HS, 216 Vielle Voie de Tongres, B-4000, Liége. A diploma and cup will be awarded to the winner in the vhf section. There is also a swl section with similar prizes. Repeater contacts will not count.

From here and there

Alan Owen, G4HMF, chairman of the Ipswich Radio Club (G4IRC) has sent details of the club's Jubilee Award. The club, in association with Ipswich Borough Council and Arrow Electronics, will present a special certificate to stations who during 1985 make contacts as follows: Suffolk station contacts, two points; Ipswich station contacts, three points; club station contacts, (G4IRC, G1IRC, or GB2IRC) five points. Any band or mode may be used, with contacts above 1,296MHz counting double. Fifty points will qualify for an award if 25 or more are for Suffolk and Ipswich Radio Club contacts. Applications to G4HMF, QTHR, accompanied by six irc's or £1, to arrive before 31 March 1986. No QSL cards should accompany applications. Repeater contacts are not acceptable. Same station can be worked on more than one band, but only once on any given band.

Gus Taylor, G8PG/GW8PG, Merseyside, who is communications manager of the G QRP Club, says that from 1 April 1985 the club will award its CW Novice Award to Class B licensees who meet the requirements set out on page 506 of June 1984 *Rad Com*. The 50 stations must be worked in the 12 months following the date of issue of the notice of variation, and morse-reading machines, including home computers, must not be used. Gus says that judging by the number of Class A operators who have said that working for the award greatly improved their morse operating skill, this should appeal to many Class B operators too. The agreed guide-lines, ie that Class B licensees must not use the cw segments of the 144 and 430MHz bands, must be observed.

George Haylock, G2DHV (Sidcup), expects to be in the Channel Islands between 30 March and 7 April 1985 on a Geological Association of London field trip to mark the 40th anniversary of the liberation of the islands. Listen for him as GU2DHV or GJ2DHV on 144MHz ssb/cw, since he will be taking with him an MX2 and HB9CV antenna.

Apologies to Paul Thompson, G6MEN, for assigning to him the exotic call G7MEN in last month's tropo report.

It was good to hear again from Gordon, G4BPY (Walsall), after a very long period. His 50MHz monitoring in past years has added to our knowledge of that band. He lost his tower on 13 January 1984 but now has another, with antennas for 50 and 28MHz only at present. During the December tropo opening he was receiving tv believed to be from Italy on 53·750MHz, plus pictures from PA, ON and DJ on Band 3.

On 2 December, while doing some paperwork in the shack, John Dunlop. GM6LNM heard two Italian and one Austrian station calling "QRZ DX" on the 144MHz band at 0915gmt. He says it sounded like sporadic-E, but has since heard report that there has been some form of emission from a satellite which gives the "impression" of *Es*. Does anyone has anything to add to this? □

SWL News

*by Bob Treacher, BRS 32525**

80m dx

In *MOTA* January, G3FKM commented on increased 80m dx activity compared with the corresponding period of the last sunspot cycle, which was undoubtedly due to new technology in receiver and transmitter design, better antenna installations and the arrival of 5BDXCC. However, it is my opinion that this winter season has not produced the dx of which we know the band is capable.

Although I have not listened much during the pre-sunrise hour to judge fully whether conditions at that time are on a par with recent years, I would say that they have not been so good. Good openings to ZL and the Pacific seem to have been few, as have good conditions to the west coast of the USA. Activity from the Caribbean has been sparse, so most of it has been from rather run-of-the-mill USA stations with their own exotic prefixes which cause much excitement among the prefix chasing community.

At grey-line time, just before and after sunset, conditions have been equally poor. In past years KG6, ZK2 and VS6s have been copied around 1530, but this year nothing of such a dx nature has been heard. Even signals via the long path to W6/W7 have been poor. JAs have kept the interest alive, together with the odd ZL and BY4AA, 1Z9A and KC6IN, all of whom I have missed. Early-evening conditions have also been average. JAs have not been very strong, but ZS6BCR was copied at around 1730 with good signals, as had FH4AA. 9M2CO, YB0JH, A71AD and A92EB were regulars, and C21RK and T32AF were worked by better-sited Europeans, although nothing was heard from KH6 or other similarly exotic dx locations which are normally workable at this time of year. Some interest later on in the evenings was prompted by the arrival of African dx; eg 9L1, 3X4, D4, 3D6 and 6W.

However, I consider that the band was at its best from 2300 to 0100 during the peak of the dx season, when a great variety of dx was heard—9M2, 9V1, J3, 3X4, PY, YV, KP4, ZS, VU, AP, PZ, HK, 5N3, CE, 8R1 and HI. It will be interesting to compare this opinion with that of others, especially those who took part in the January lf challenge, and those who respond to G3FKM's broad question.

HF Challenge results

This "challenge", set to coincide with the CQ WW contests last year, produced 19 logs compared to 23 in 1983, the decrease probably being associated with poorer band conditions. Countries logged on the higher frequency bands were well down, especially on 28MHz where only 69 countries were heard by contestants compared to 137 in 1983. On 7MHz, however, dx traffic showed a marked increase and a total of 113 countries were noted in the logs. A similar number of countries were heard on 3·5 and 1·8MHz in both years, around 80 and 56 respectively. The standard of log keeping in 1984 was very high, with very few doubtful callsigns noted in the logs. Congratulations are extended to Jean-Jacques Yerganian, ONL383, who was placed first in both the ssb and cw multiband legs. In the single-band category of the ssb leg, the band winners were ONL5810 (21MHz), BRS62088 (14MHz), Eric Carling (7MHz), ONL6945 (3·5MHz) and BRS25429 (1·8MHz). However, many scores were down on those of 1983. ONL383 scored 594,780, over 100,000 less than his 1983 score. The entries showed lots of hard work and few hours of sleep, and some new countries were added to 1984 scores, even if all-time new ones were somewhat hard to find. In general, 28MHz provided one good opening during the Sunday, while 21MHz was full of strong North American signals during the afternoons. The 7MHz band was very good, while 1·8MHz came up with some good dx early on the Saturday morning. On 1·8MHz HZ1AB, D44BC

HF CHALLENGE

SSB MULTI-BAND

Posn	Station	28		21		14		7		3·5		1·8		Total
		Pts	DXCC	Pts	DXCC	Pts	DXCC	Pts	DXCC	Pts	DXCC	Pts	DXCC	points
1	ONL383	105	53	242	107	226	100	329	91	218	70	173	39	594,780
2	A. Miller	61	27	214	88	149	75	208	65	165	57	143	36	323,640
3	ONL5810	75	37	184	80	134	66	149	49	108	42	51	17	203,991
4	BRS32525	12	8	104	50	101	54	175	56	104	40	182	42	169,500
5	BRS8841	71	31.	178	74	100	50	110	34	119	43	39	13	151,165
6	OH2-159	13	11	161	77	137	69	146	46	131	49	0	0	148,176
7	BRS44395	44	22	91	47	48	32	101	40	83	34	61	18	82,604
8	BRS84664	0	0	17	9	139	69	74	28	67	29	0	0	40,095
9	WDX1D	20	12	104	42	74	30	13	5	56	13	31	8	32,780

SSB SINGLE BAND

Posn	Station	28		21		14		7		3·5		1·8		Total
		Pts	DXCC	Pts	DXCC	Pts	DXCC	Pts	DXCC	Pts	DXCC	Pts	DXCC	points
1	ONL5810	—	—	184	80	—	—	—	—	—	—	—	—	14,720
2	BRS62088	—	—	—	—	116	61	—	—	—	—	—	—	7,076
3	E. Carling	—	—	—	—	—	—	358	101	—	—	—	—	36,158
4	A. Miller	—	—	—	—	—	—	208	65	—	—	—	—	13,520
5	ONL620	—	—	—	—	—	—	152	43	—	—	—	—	6,536
6	ONL6945	—	—	—	—	—	—	—	—	111	42	—	—	4,662
7	BRS25429	—	—	—	—	—	—	—	—	—	—	212	45	9,540
Total countries heard during ssb leg		69		124		124		113		80		56		

CW MULTI-BAND

Posn	Station	28		21		14		7		3·5		1·8		Total
		Pts	DXCC	Pts	DXCC	Pts	DXCC	Pts	DXCC	Pts	DXCC	Pts	DXCC	points
1	ONL383	22	10	187	83	141	73	263	76	158	55	152	39	310,128
2	BRS8841	12	6	133	51	74	42	241	68	133	47	181	44	199,692
3	BRS44395	33	9	96	49	87	48	170	53	91	38	107	31	133,152

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

(a new one for many, courtesy of DJ6QT, who seems to deliver a new one in this contest every year), VP2VCW, VP9AD and 6Y3M, together with UA9, UF6, UG6 and UL7, were heard by entrants in Europe. The log from WDX1D in New Hampshire showed that CE1ABF (0306), 4V2C (0311), V2ARS (0319), TI1C (0300) and HK0HEU (0355) were also on the band. On the other bands VK9MR, YI1BGD, 9U5JB, 5H3BH and VQ9DX were notable entries, while on 7MHz there was much good dx, such as P44A, V44KF, 4K1GAG, ZS3E, K4YT/DU9, FR0FLO, N4NW/3D6, KL7RA and VK9MR. The log from Eino Sarri, OH2-159, indicated that he was the president of the OH SWL Club, which has its own station, OH3SWL, located at Riihimäki, 60km north of Helsinki. Its main operator is OH3GZ, who is secretary of the club. The club would like listener reports, and can often be found on 14·150kHz during afternoon hours.

The cw leg produced three good logs. Conditions could have been better (contesters always say that!): 28MHz was poor, with only 17 countries between the three logs; QRN seemed to affect 21MHz; heavy QRM blotted out some good dx on 14MHz; 7MHz was fairly good, Robert Small, BRS8841, copied several JA's at 1200; and 1·8MHz was good with 47 countries heard, including FY0GA and RL8PYL.

Both events were again enjoyed by all the contestants. Antennas, receivers and ears were given a good examination, and those who took part will have increased their skill level in resolving ssb or copying contest speed cw, which will benefit them in the future. The idea will be repeated for the 1985 CQ WW events, and I hope that the number of entries increases, but, most of all, that entrants enjoy themselves. Congratulations again to the winners, and thanks to everyone for supporting the idea.

DX news

While conditions on 3·5MHz were only average, 7MHz certainly did not seem to be its usual self during January. The ZL2AAG net provided ZL7PA and 3D2MP, while 5R8AL was a potent signal at around 1730 on many evenings. VK6s at 1715 and VU2s at 1430 were examples of good conditions, as was KL7U one morning at 0830. Again, no KH6s and very few signals out of the USA—at least when my reporters listened.

The 14, 21 and 28MHz bands have been poor according to our reporters. Even Robert Small, BRS8841, who normally does much listening on 14MHz, could only offer TT8CW, VP2VA, 8P6IB and 9K2YA as his best dx in December. The 21MHz band only provided J28EB and TU2HS/5N0 of any note. Meanwhile, on 28MHz nothing stirred.

It was nice to hear again from Ian LePage, BRS40292, who reported many other commitments to distract him from listening during 1984. His best on 21MHz—his best band in 1984—were YJ8RG and HK0HEU. Douglas Johnstone, BRS54163, also reported a poor month; VQ9YS being his best on 14MHz.

The 1·8MHz band was the star turn from Christmas to the time of writing, just after the *73 magazine* contest. Dave Whitaker, BRS25429; Brad Bradbury, BRS1066; Paul Crankshaw, BRS48909; Robert Small, BRS8841, and I all burnt some midnight oil or missed some sleep to add to all-time lists, which will be published next month. Pick of the dx must be ZL2BT, 57 at 0815 on 12 January, and W7EJ heard by '25429, and 3B9CD heard on cw by '1066. There was much good dx on the band, and it was very exciting to tune the band as more and more dx stations became active, providing new countries in abundance. The full story will unfold when the LF Challenge logs are reviewed, but upwards of 70 countries on the band in January can be expected. The *73 magazine* contest provided some good Caribbean and South American dx, including CP8HD, HC1BI, HK6IMU, HP3FL, YV2IF, 6Y5IC and 9Y4VU.

More "worst QSLs"

I did not expect to run this series of faults, errors, and criticisms for so long, but there are a few more examples this month. Indeed, at least two amateurs have actually admitted that they do not know how to QSL an swl report. Let me explain. Assuming the amateur station has the now familiar "six-box" card, an acceptable way is:

TO	DATE	TIME	FREQ.	MODE	RST
BRS32525	15.1.85	1825	7,045	1 × ssb	Tnx

The verification should also indicate the callsigns of the stations worked; details of the equipment in use etc; and any helpful remarks about the listener's report, eg "informative", "glad to know my signals were received in G", "would appreciate a report on my 1·8MHz signals if you hear me", "tnx for taking the time to report on my signals"; or, alternately, offer any constructive criticism. For those who do not QSL swl reports it might be useful if I add that many listeners who collect cards for awards, DXCC etc, often send cards to well-known dx stations who know they are 59+20dB in G-land; but simply writing "confirmed" on the card and returning it to the swl via the bureau is perfectably acceptable for all awards. It saves a QSL card, while the swl will be pleased that you took the trouble to acknowledge his report rather than simply condemning it to the waste bin.

This month's worst swl report comes from OK1-22857, who in a pretty ordinary way told A4XJQ that he worked DL5...(full callsign not given by the swl) at 1520 on 21MHz. The A4 got a "44 QRN" report from the swl. Apart from not giving the full callsign of the station being worked, the report was ok as far as it went. Wouldn't it have been far better, however, for the OK listener to have waited until the A4 was slightly better copy to enable him to read the full callsign of the station worked, or to give two, three or four callsigns of stations worked? The report would have been far more useful and better received.

Colin Watson, BRS46598, told of a G4U...station who wrote to say that the station Colin heard on GB3AS was a "pirate" and would he return his postage! This could have been a real "pirate", but could also have been a misheard callsign due to poor or non-use of phonetics—something which seems to plague repeater users. The report also brings into question the usefulness of sending swl reports to stations heard via repeaters. Only if the station is copied on the repeater input can you say that you have actually "heard" the station. If you report on signals heard on the repeater output, you are only sending reports to amateurs informing them that you were copying the repeater at 59+, thus making the report of no real value. I imagine that the station receiving the report would not find it of any use and would probably not reply. Finally, two items on this topic from G4VUN (ex BRS47513) who reported receiving a card from (a) an SP by air mail for a swl report sent 12 years earlier!—a record?; and (b) from a German who asked him to confirm the G1 prefix—a little awkward if you are a G4!

1984 UHF/VHF TABLE

FINAL PLACINGS

Posn	Station	QTH loc	70MHz Squares	70MHz DXCC	144MHz Squares	144MHz DXCC	432MHz Squares	432MHz DXCC	Total via*
1	BRS52543	YN	27	7	91	20	31	12	188 a-d
2	BRS25429	ZN	—	—	89	24	47	11	171 a-d
3	BRS32525	AL	—	—	69	23	26	7	125 a,b,d
4	BRS31976	AL	—	—	84	23	—	—	107 a-d
5	BRS62088	AL	—	—	29	8	10	3	50 a,b,d
6	FE8957	BF	—	—	30	8	2	2	42 a
7	BRS18529	AL	—	—	20	5	—	—	25 a
8	BRS49875	YN	—	—	13	5	2	2	22 a
9	BRS44984	AL	8	2	—	—	—	—	10 a

* a = tropo, b = ES, c = AR, d = MS.

Newcomers

Rod Colvin, RS86091, has a Yaesu receiver and a half-sized G5RV, also a Dragon 32 and hardware and software by G4BMK for rtty and cw. He has started to build a transceiver to a design in one of the magazines, as he is keen to get on the air.

A newcomer to this column, but not to radio, is Mick Toms, BRS31976. He is particularly interested in 1·8MHz ssb and 144MHz, and has a λ/4 antenna for 1·8MHz and a nine-element Yagi for vhf. His QTH is 200ft asl and has a clear take-off in all directions. In 1984 he heard 36 countries on 1·8MHz, and 23 countries and 84 QTH squares on the higher band. He caught the aurora in mid-November and picked up new squares in the shape of YP, HS, XR, WP, XQ and YR. Gotaways included MQ and MS squares. On meteor scatter, the Geminids produced I5WAC, I6CXD, HG8CF, OE6WIG, F1JG, I5YNO, HG1YA, DG8FAB, YU2RSD, I0JLY, IV3GBL, IW2BNA and I0CUT. He was looking forward to the Quadrantids shower, and we look forward to his report. Mick also felt that the beacon chain on 144MHz had largely outlived its usefulness. Harsh words indeed! He considers that in the days of low activity they were justified, but with the proliferation of repeaters, which tend to serve the same purpose, and the increased occupancy of the band, he feels that the 150kHz could be put to better use. Beacons tend not to be a reliable indicator of conditions because they are often well sited, whereas amateur stations are more often located in the valley below. He quoted examples: GB3CTC (Cornwall) and FX3THF (Paris) are always audible but amateur stations can rarely be heard. GB3ANG and FX4THF (AF68) were heard during a "lift" in August last year, but very few stations were copied from either area. An interesting argument, but beacons do have their uses, they tend to be a useful early warning of good propagation conditions and will be with us, probably in increased numbers, for a long time to come. Perhaps this topic will take over from the "worst QSL" as the "in thing" to comment on in 1985! Has anyone any further views?

Finale

The final HF Countries table for 1984 and the All-time list have been held over until next month to allow more time for contributors to submit entries.

News, views and comments for the May issue should reach me no later than 18 March, with late copy by 26 March. □

EPHEMERIS

Satellite news and views

*by R. O. Phillips, G4IQQ**

Uosat

As a result of further feedback from the users of Uosat 1, it was decided to make another refinement to the operating schedule of the satellite. The main change, which came into effect on 18 January, concerns the format of the 145·825MHz transmissions at the weekend. In order to allow greater prospect of reception of the 1200 bps bulletin, this service will now be provided for a period of approximately 6·5min followed by 3min of 1200 bps telemetry. Since each complete bulletin takes about 2min to transmit, there should be plenty of time for successful reception even on some of the less favourable passes.

I should perhaps repeat that the transmissions are very easy to receive, and provide a great deal of up-to-date information on all aspects of amateur satellite operations, including orbital elements for all of the current satellites. Recent tests at my QTH, using an indoor, homebrew crossed-dipole antenna, have provided excellent results with almost error-free reception when the elevation angle to the satellite exceeded about 20 to 25°. In order to avoid some of the ignition interference problems that sometimes occur here, a simple digital time-switch has been used to switch on the equipment for the overhead, descending node passes which occur between three and four o'clock in the morning. Even without automatic frequency control to eliminate the frequency shift due to doppler, good copy is obtained for periods of 5 to 6min. With the new schedule this guarantees reception of at least one complete bulletin as well as telemetry.

The revised schedule for Uosat 1 is as follows:

Friday	Load bulletin
Saturday	Bulletin/1200 bps telemetry
Sunday	Bulletin/1200 bps telemetry
Monday	Digitalker/1200 bps telemetry
Tuesday	CCD camera—next week radiation data
Wednesday	Computer check-summed telemetry
Thursday	Whole orbit telemetry survey

Still on Uosat 1, some consideration is being given to changing the format of the telemetry data transmissions from this satellite to that used by Uosat 2. The change would mean that instead of simply transmitting the two-digit channel number followed by the three-digit parameter value, a computer check-sum would be added for error-checking purposes. This makes the readout rather less easy on the eye but should allow for greater use of home computers in the checking and decoding of the data. The University of Surrey would welcome comments on the proposal.

There has been considerable activity on Uosat 2, particularly as concerns the digital communications experiment (dce). After the preparation of some new control software for the 1802 on-board computer, the dce hardware was available for use as a simple digital store-and-forward facility, and this was demonstrated successfully in mid-January. The aim of the tests is to develop software and operational protocols for an eventual packet communications satellite. While the limited facilities on Uosat 2 will not allow widespread participation in the experiment, it should be possible to monitor progress by checking the 145MHz transmissions occasionally.

Oscar 10

Modifications to the attitude of the spacecraft with respect to the earth were carried out during January, and these resulted in a noticeable improvement in its sensitivity. At the time of writing, no indication had been received of any further changes to the operating schedule, though some are expected around March or April.

I have been considering for some time how to present information on the availability of Oscar 10 while recognizing the problems of limited space. After juggling with the relevant figures on a spread-sheet computer programme and displaying the results in various ways I have selected the form indicated in Fig 1, since it gives fairly detailed information, yet is easy to read. The figure shows, for each day of the month, when the satellite is in view from a location in the London area. The times indicated will be different for other locations, depending on their latitude and longitude, but in most cases the data will give a good guide. The time for acquisition of signal (ads) is indicated by the lower end of the vertical lines and the time for loss of signal (los) by the upper end. The 18-day cycle of the satellite is clearly visible, as well as the days when access is possible for more than a single period. It would be possible to include additional information, such as maximum elevation angle, but this would most likely reduce the readability of the figure. Any comments on this method of presentation would be most welcome, including, perhaps, suggestions for better methods.

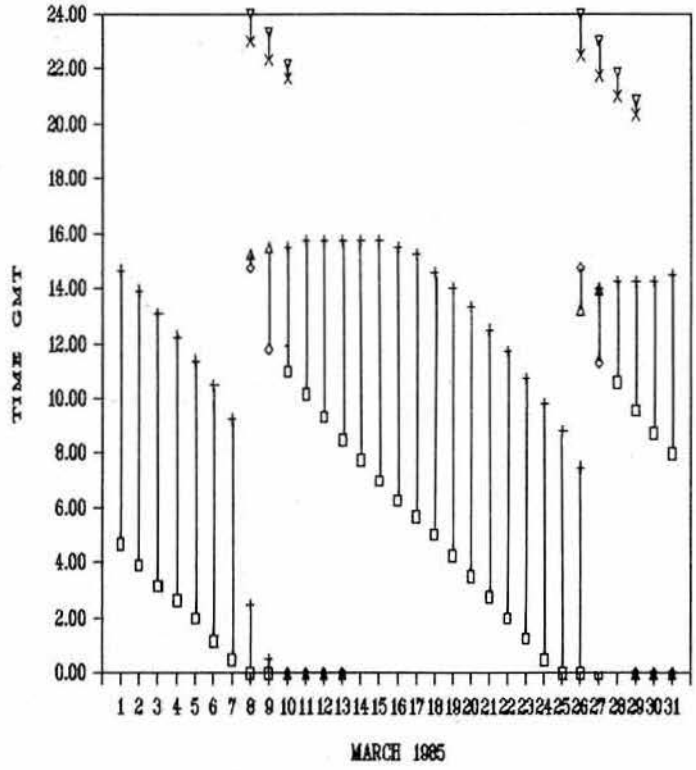


Fig 1. Availability of Oscar 10

As far as the availability for March is concerned, the satellite will be visible mainly in the morning and early afternoon, with the occasional late evening period. The maximum elevation throughout the month will remain fairly high, peaking to 52° on 1, 18 and 19 March.

Further consideration of the use of Amtor through Oscar 10 has indicated that it should be possible to use Mode A (arq) operation when the distance between the two stations via the satellite lies in the range 68,000 to 82,000km. Under these circumstances the sending station transmits each block of three characters twice, and the required acknowledgement is provided in respect of the first transmitted block. This method of working should provide error-free communication, but is not particularly efficient. Use of the forward-error-correction mode, B, should work under all path-length conditions as it does not rely on any critical timing for response signals. (Further discussion of this topic is given in the February issue of *OSCAR News* from AMSAT-UK.)

Other news

A contract for the launch of the Phase 3C satellite has been signed between AMSAT and the European Space Agency. Construction of the spacecraft has now commenced in the USA and the Federal Republic of Germany, and a launch on Ariane 4 is expected in mid-1986. It has also been confirmed that the French amateur satellite, Arsene, will be carried on the same flight.

The first issue of the new AMSAT journal, to replace the ill-fated *Orbit*, has been published under the title *AMSAT Satellite Journal*.

In *Ephemeris* January 1985, I referred to rumours of further satellites from the USSR. I am glad to report that these have been confirmed, and the transponders for RS9 and RS10 are currently being tested in Moscow. It is understood that each satellite will carry two transponders, 21 to 28MHz and 144 to 28MHz, and launch of both spacecraft is expected to take place in December this year. No information is available on the type of orbit to be used, but the availability of further Mode A satellites will come as good news to many operators. □

* 170 Shirehall Road, Hawley, Dartford, Kent DA2 7SN.

The Month on The Air

*by John Allaway, G3FKM**

"NEVER GIVE UP" and "it pays to advertise" are two useful bits of advice to MOTA readers who are still short of QSLs for contacts with stations in rare countries who were on the air years ago and are no longer where they were! November 1983 *MOTA* contained a plea on behalf of K1HDO who was searching for the former 5A1TK, who turned out to be Ted Keeler, G4FPM. Not as a result of publicity in this column, but G3WYN reports chasing an ET3USF QSL for a contact in 1973—he succeeded in getting it from WA5TKC who still has his logs.

G3WYN is now seeking the present whereabouts of C9MAF who was on the air from Mozambique in 1975. His normal callsign was CR7AF, and any information on Renato's present whereabouts would be most welcome.

G3YBH is looking for a QSL for a contact in 1969—this time with EA9ER (Angelo) who operated from Rio do Oro at that time.

G4TNL reports that his callsign is being pirated by an operator calling himself John and claiming to be in Southend-on-Sea. Some of the QSLs arriving are dated for a time 12 months before the call was issued. Any information please to G4TNL, QTHR. G3GFC has received a QSL from KD8V for an alleged 1·8MHz QSO—Nigel has been QRT for the past few years.

Readers will be very sad to learn that Pier Leoni, aged 23, only son of Sylvia and Lee Leoni, 9J2LL, was killed in the Italian train bombing at Christmas time. He was educated for part of his youth at The Royal Grammar School, High Wycombe.

New DXCC country

A News Release from ARRL dated 10 January 1985 concerns the future of the British Sovereign Bases in Cyprus from a DXCC point of view. The ARRL Awards Committee has voted six to one to accept the recommendation of the DX Advisory Committee that the bases shall be counted as a separate DXCC country from Cyprus. Any credit submissions will not be accepted until 1 June 1985, and will be handled in the following manner: Credits for ZC4 contacts made before 16 August 1960 will continue to be credited to the Cyprus listing, as will all 5B4 contacts of any date. Not all ZC4 QSOs made since that date have been with stations operating from within the base areas. QSLs that indicate operation from within the bases for contacts since 16 August 1960 will be credited for the new country. If in doubt, applicants should submit more than one ZC4 card for potential Sovereign Base credit. DXCC members who already have Cyprus credit for a ZC4 QSO made after the changeover date, may resubmit the card for credit for the new listing and also submit an acceptable card for Cyprus (5B4). The DXCC desk will try to help anyone with a problem following these administrative guidelines.

January *QST* contained a complete listing of members of DXCC who have joined or increased their totals in the two-year period from 1 October 1982 to 1 October 1984. It contains the calls of 99 UK stations in the mixed category, 72 in the telephony, and 26 in the two-way cw listing.

Welcome . . . .

. . . . . to the following amateurs from overseas who joined the Society during November and December: DA4AS, EI4BIB, EI7FB, EI8AT, J6LDB, ON7NY, SP7EWL, TZ6FE, VE4AHT, VK3ALP, W2CVL, WB9PYM, YC0BVV, 4S7MD, 5B4NX, 5B4OP, and 5N0ASO. New listener members included: J Ivory, (EI), K Sweet, P Flower, J Burrows and G Schaumanns (ON), K Lakdes (OH), F Gliederer (OE), J Ayser (LX), S Emam (EP) and Ming Wah Siu (VS6).

Japanese 14MHz beacon

The Osaka City ARC, JA3ZJI, is testing a beacon on 14MHz—its callsign is also JA3ZJI and it is located at Osaka University Amateur Radio Club, c/o Dr. S. Minami, 3 Sugimoto Sumiyoshi, Osaka 558, Japan. The beacon runs continuously and has an output power of 300W into a three-element full-size Yagi directed northward from Osaka. Emission types are given as F1/A1. Transmission is on 14,000,008Hz for 3min 30s and then goes to 14,000,800Hz (ID by A1) for 30s. It is hoped to study wave propagation through the auroral region (signal to noise ratio dependence, effects of doppler shifts caused by the ionospheric dynamics, etc). Signal reports would be most welcome—please send them to the address above.

DX news

Until the end of March HI stations are using the HI0 prefix. W2WSE is in Montserrat until 17 March using the callsign VP2MDB. According to *DX News Sheet* 4K1CEY recently told Y39XO that a Soviet base called Progress will shortly be established on the South Sandwich Is. Amateur activity may take place later with a station using the callsign 4K1I.

The attempt by a Norwegian group to activate Bouvet Is seems to have been abandoned. All necessary permissions are reported to have been obtained, and return transportation could probably have been arranged with the Norwegian Antarctic Expedition. The problem was getting to the island, and a South African expedition would have been the only way of doing this. The group says, "For political and practical reasons it has proved not feasible to establish the necessary co-operation for transportation with this expedition".

Betty Christian (wife of VR6TC) has recently passed her RAE in New Zealand and is VR6YL. Another Betty—WD9BQV—should also be on the island now, and her call is VR6BR. VR6TC keeps a schedule with DL8FL on 7,050kHz at 0700 on Sunday.

It is reported that all four stations on Macquarie Is are to be found in the P29JS net from time to time—on 14,220kHz from 0700. The Soviet Antarctic station 4K1CEY is located at Molodezhnaya Base in Antarctica and is at 67°S 45°E and therefore is in CQ zone 39. The Japanese base is at 69°S 39°E and is operated by JR1FVH—its callsign is 8J1RL.

TZ6FE—an RSGB member (see "Welcome")—has an FT757GX with an FL2100Z linear and a TH7DX antenna, and he is believed to be on the air most days around 14,135 and 21,235kHz. Alain, 5R8AL, is now looking for Europe on 7,045kHz at 0215 for 5min. After this he moves up the band to look for Ws. He has been heard also on 3,795kHz at this time. From Mayotte, FH8CR has been worked on 14,222kHz around 1300. Rodriguez Is activity by 3B9CD on 14MHz ssb in the afternoon and on 3,503kHz cw at 0030 has been reported.

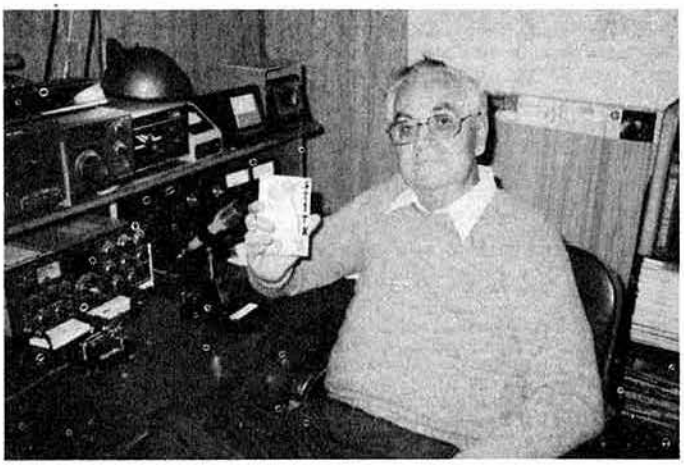
Stations in the USSR are using the EM, EO, EU, EV and EW prefixes with /R until 9 May to mark the 40th anniversary of the end of second world war hostilities in Europe. An award—"Popeda 40" is available to those who work 40 stations using the special prefixes and who apply to PO Box 88, Moscow, USSR, before 1 January 1986. JW0EQ is the callsign of the Polish base station on Svalbard, and it is operated by SP5EXA who will remain there until early autumn.

Those interested in net operations may like to know that the Russian 80m DX net meets on Wednesdays at 0100 and on Thursdays at 2100 on 3,640kHz. The French DX Information net now takes place on 14,170kHz from 1730.

A reminder that VU2CVP and VU2DVP appear on 3,895kHz or nearby

Jean Michel Duthilleul, F6AJA, editor of *Les Nouvelles DX*, the French DX news-sheet *Photo*: G3ZAY

*10 Knightlow Road, Birmingham B17 8QB



Ted Keeler, G4FPM, ex-5A1TK

for about 15min around 0030. They listen on 3,795kHz for ssb callers. They will arrange schedules (write to Box 6330, Coimbatore 37, India).

Overseas news

The VERON Branch ZVL will be on the air from Eede, SW Netherlands, with a special event station PI4ZVL/A on 12 and 13 March to celebrate the return of Queen Wilhelmina via the village at the end of the second world war. Look around 3,650kHz between 0900 and 2100. Special QSL cards will be issued.

V3TV has returned to the UK, but a few QSLs are still available from his former QSL manager G3ATK. The latter has now taken over the same task on behalf of Joe Phillips, G3KSK, who is operating from Ascension Is with the callsign ZD8JP until mid-summer. He has an Argonaut and a matching linear which gives him about 50W of output to his trap dipole (for 7 to 28MHz in an inverted-V configuration) and sloping half-wave 3·5MHz dipole. Joe uses both cw and ssb.

Readers may wonder what has happened to Iris and Lloyd Colvin, who were scheduled to be expeditioning in Africa. The *Northern California DX Foundation Newsletter* says that this has had to be postponed indefinitely. It seems that family and business problems have arisen, and that for the time being at least Iris and Lloyd are needed to supervise the running of their company.

The same publication says that a considerable number of reports on the 14,100kHz beacon system are being received (407 by early October) and more would be welcome. Top reporter is Ron Cross, RS84869. So far the NCDX Foundation has 36 members in the UK—it could do with many more. The subscription is $25 a year or $10 for foreign members. Write to NCDXF, PO Box 2368, Stanford, Cal, 94305, USA.

Expedition

A bulletin from W6SZN dated 16 January gives the news that the proposed expedition to Clipperton Is should depart from San Diego on 27 March, pick up the operators in Mexico on 30 March, and reach Clipperton on 3 April for a seven- or eight-day operation by three stations on the air 24h daily on all bands 1·8 to 28MHz, cw, ssb and possibly rtty. They hope also to use Oscar and to be able to operate on cw and ssb on a band simultaneously. Operators will include W6SZN, W6OAT, W6RGG, N6GJ, KK6X, N7NG, K3NA, WA7NIN, F6GXB, F9LX, DJ9ZB, TI2CF, XE1ZZA, JG3LZG, FO8HL and FO8GW, and they will travel on the 115ft fishing vessel *Royal Polaris*. Callsign/s were not known, but QSLs should go to the YASME Foundation (see "QTH Corner").

The cost of the expedition is high ($3,500 per operator) and help is urgently needed. Contributions, large and small, will all be acknowledged, and returned if the expedition fails. Please make contributions payable to: N California DX Foundation, c/o Rusty Epps, W6OAT, 948-H Kiely Blvd, Santa Clara, Cal, 95051, USA.

F9LX, DJ9ZB and F6GXB, the three European members of last year's abortive Clipperton dxpedition. *Photo*: G3ZAY

ALL-TIME BAND TABLE

	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total	
G3KMA	95	**222**	**301**	331	**332**	**317**	1,598	
G3GIQ	61	188	241	332	331	309	1,462	
G3MCS	48	202	253	320	322	306	1,452	
G3UML	21	196	211	332	295	254	1,309	
G4DYO	50	139	201	309	302	284	1,285	
G3XTT	**101**	177	211	275	274	246	1,284	
G3HTA	58	161	213	306	280	242	1,260	
G3ALI	2	204	212	313	275	233	1,240	
G2DMR	45	154	168	298	309	264	1,238	
G4FAM	50	149	213	265	264	242	1,183	
GW4BLE	23	149	172	268	266	242	1,120	
G3RUV	6	142	161	285	285	234	1,113	
G3XQU	37	129	164	273	267	239	1,109	
G3TXF	58	162	176	252	250	209	1,107	
G3NOF	4	84	77	**341**	323	277	1,106	
G3RUR	1	142	179	284	259	225	1,090	
G3IGW	98	140	228	224	197	181	1,068	
VK9NS	36	141	200	270	223	173	1,043	
G3YMC	73	92	157	229	234	184	969	
G3VJP	14	110	161	255	238	184	921	
G4LJF	1	131	149	235	207	188	911	
G4BWP	29	127	131	167	186	236	876	
GW4OFQ	45	170	138	192	181	126	852	
G3JFF	25	78	112	232	225	179	851	
GM3YOR	61	94	129	198	187	176	845	(cw only)
GM3PPE	45	122	146	182	167	138	800	
G4KPE	1	146	162	176	165	134	785	
9K2BE	41	70	84	127	175	181	678	
Average	40	143	177	260	251	223	1,091	

Next deadline for the "Current All-Time" listing is 15 April (to G3GIQ please). Minimum total for entry is 650 countries. Band leaders are listed in bold type.

1984 ALL-BAND TABLE No 6

	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
G3XQU	31	1	**129**	**186**	**193**	**142**	784 (all ssb)
G3SXW	49	95	**129**	148	137	88	646 (all cw)
GW4OFQ	38	**152**	116	145	116	61	626 (all ssb)
G3TXF	54	98	118	148	118	85	621 (all cw)
G3KDB	48	74	107	125	141	99	594 (all cw)
G3XTT	**81**	96	106	117	97	80	577
G4OTU	31	46	84	131	125	55	472 (all cw)
G4SKI	2	46	9	111	131	109	408
G4VJK	8	22	25	84	115	108	362
G4GOF	6	26	25	70	64	54	245

Band leaders in bold type. The first deadline for the 1985 table will be 15 March (to G3GIQ please).

1985 28MHz Countries Table

One entry only to date—last year's winner G3XQU (final score 142)—who has five! Please keep trying . . .

Contests

Bermuda Contest

0001 16 March to 2359 17 March

3·5, 7, 14, 21 and 28MHz cw and phone, but no crossband or crossmode QSOs allowed. Actual operation not to exceed 36h maximum; off periods must be of at least 3h duration and clearly shown in the log. All stations must be single-operator and operate from their own private residence or property. Top winners of the 1980/81/82/83 and 84 contests will be eligible for area awards only. Exchanges consist of RS/T plus county (for UK stations), state (for Ws), province (for VEs), and parish (for VP9s). UK stations work only W, VE and VP9. Each completed QSO counts five points, and a station may be worked on both phone and cw on a band provided that at least 30min has elapsed between the contacts. The same VP9 may be worked on each band. The multiplier is the number of VP9 stations worked on all the bands added together (each counts once only per band even if worked on two modes). The top scorers in the UK, Canada, the USA and FR Germany will receive a trophy which will be presented at the RSB's annual dinner in October. Air fares and accommodation charges will be paid. Country winners will receive a certificate.

Dates/times must be in gmt, and a separate log sheet submitted for each band—if 200 or more QSOs are made on any one band a "dupe" sheet should be sent. A penalty of three QSOs will be deducted for each duplicate QSO for which points have been claimed, and an excess of these can result in disqualification. Each page should clearly show callsign, band, and year of contest, and all entrants must enclose a signed declaration that all rules of the contest have been obeyed and that their licence terms have been observed. Logs must reach the Contest Committee, Radio Society of Bermuda, PO Box HM275, Hamilton, Bermuda, no later than 5pm (local) on 31 May 1985. Overseas logs should be sent by airmail, and if a good score has been achieved it is suggested that, in addition, registered mail is used.

QTH CORNER

CE9AP	Ricardo Vasquez, Division Antarctica, Correo Naval, Punta Arenas, Chile.
CY0SAB	VE1CBK, W E King, RR1 Site 35 Box 32, Windsor Junction, NS, B0N 2V0, Canada.
FT8XA	F6FYD, Vannick Delatouche, PO Box 8, Andresy, F-78570, France.
G4LRS	J A Holmes, 14 Blandford Cres, Kings Head Hill, Chingford, London E4 7NT.
PI4ZVL	PA3DTD, PO Box 87, 4350 AB Terneuzen, Netherlands.
SV5YS	Box 251, Rhodes, Greece.
TZ6FE	DL4BC, K Breitfeld, Merzigerstr 37, D-2800 Bremen 44, FR Germany.
V3DI	G3LQP, R Brown, 32 Albert Rd, Sutton, Surrey SM1 4RX.
V3TV	(see ZD8JP).
VP2MDB	W2WSE, Dave Benton, 201 Sea Girt Av, Sea Girt, NJ, 08750, USA.
VR6BR	KA9W, Jo Henderson, PO Box 179, Forest Park, I1/1, 61030, USA.
ex-XW8BP	JH1ARJ, M Inami, 5-6-2 Oji, Kita, Tokyo, Japan.
ZD8JP	Dr E Young, G3ATK, Orchard House, Camel St, Marston Magna, Yeovil, Somerset BA22 8DB.
1S1CK	(1983) WB0TEC, C Baker, Box 507, North Sioux City, SD, 57049, USA.
9J2LO	DL1FX, W Wallatis, Bonnerstr 100 Haus 4, D-5050 Porz Eil, FR Germany.
YASME Foundation	PO Box 2025, Castro Valley, Calif, 94546, USA.

DARC International Slow Scan TV Contest
1200 16 March to 1200 17 March
For all sstv authorized bands (within the sstv segments). Three classes—Class 1 (short wave bands), Class 2 (vhf and uhf), and Class 3 (receiving stations), single-transmitter only. Exchange two-way video-callsign, report and QSO number. "Calling CQ-SSTV-Contest" may, however, be called on telephony. Classes 1 and 3 score one point per contact on 3·5–28MHz, Classes 2 and 3 five on the vhf/uhf bands. The multiplier for Classes 1 and 3 is the total continents and DXCC and WAE countries worked per band. Final score is total QSO points times multipliers added together from all bands. Logs should show date, time, callsign and complete exchange and name and address of entrant. Submit separate log for each band and clearly show multipliers. Cross-check list and summary sheets are mandatory. Logs must reach Heinz Moestl, DE8BUS, PO Box 1123, D6473 Gedern 1, FR Germany, not later than 45 days after the event.

CQ WW WPX SSB Contest
0000 30 March to 2400 31 March
1·8 to 28MHz. Contacts with own continent count two points on 14, 21 and 28MHz, and four on 3·5 and 7MHz. QSOs with other continents count three and six points respectively. Own country may be worked for multiplier credit only. The multiplier is the total of different prefixes worked—note that each counts once only. Exchanges consist of RS and serial QSO number (from 001). There are single-operator, single-and multi-band, and multi-operator, multi-band (single-transmitter) classes. The last mentioned must only use one transmitter and stay on a band for at least 10min—changing bands to work a multiplier is not allowed during this period. There is also a multi-operator, multi-transmitter class in which all equipment must be located within a 500m radius, and a QRP section for stations running no more than 5W output—in this case "QRP" must be marked clearly on the entry sheet. The final score is the total QSO points multiplied by the number of different prefixes worked. Note that single-operator entrants may only operate for 30h, and the rest period may be taken in up to five parts. To qualify for an award single-operator entrants must take part for at least 12h—in the case of multi-operators this period is extended to 24h. Logs should show date, time, station worked, numbers sent and received, if new prefix, and points claimed. A prefix check list must be included. Entries must be postmarked no later than 12 May and sent to *CQ Magazine*, WPX Contest, 76 N Broadway, Hicksville, NY, 11801, USA. Please be sure to mark the outside of envelopes "SSB" as there is a cw event later in the year.

Vigo '85 World Fishing Contest
1000 20 April to 1500 21 April
3·5 to 28MHz ssb only. Top scorer in single-operator category will receive an all expense paid trip to Vigo (Spain) for six days during September. Photocopies of rules are available from G3FKM (sae please).

Awards

Bermuda Award
Those taking part in the Bermuda Contest may like to work towards this very attractive certificate which is awarded to those who have confirmed contact with each of the nine Bermuda parishes: Sandys (SAN), Pembroke (PEM), Southampton (SOU), Hamilton (HAM), St. George (STG), Devonshire (DEV), Warwick (WAR), Smiths (SMI) and Paget (PAG). Only one portable or mobile contact may be counted. The award is free—send applications to: Awards Manager, Radio Society of Bermuda, PO Box 275, Hamilton, Bermuda. It is worth noting that Hamilton parish appears to be the most difficult to work—Hamilton town itself being in Paget.

Europa Faksimile Diploma "EU-FAX-D"
This is being awarded by DARC to encourage fax activity. It is issued in three classes: EU-FAX-D 3, EU-FAX-D 2 and EU-FAX-D 1. EU-FAX-D 3 requires confirmations (QSLs or fax prints) from at least five different countries (from the WAE list) and a total of 10 "prefix" points. Each official European prefix counts for one prefix point per band. EU-FAX-D 2 and EU-FAX-D 1 require 10 countries and 20 prefix points and 20 countries and 40 points respectively. All bands may be used and all confirmations must confirm "two-way fax". They must be dated on or after 1 January 1980. Send a list of confirmations certified by an official radio club plus DM10 or 15 ircs to: DARC FAX Manager, Hans-Juergen Schalk, DJ8BT, Hammarskjoeldring 174, D-6000 Frankfurt 50, FR Germany.

WASM 60
This award is offered by Sveriges Sandareamatorer (SSA) to celebrate its 60th anniversary in 1985. The award is available to all licensed radio amateurs and swls. All contacts between 1 January and 31 December 1985 are valid. European applicants should work one station in each SM lan (county). Non-Europeans need to work one station in each of the eight call areas. Oscar QSOs are valid but not those via active repeaters. Special event stations count as "jokers" and each may replace a missing lan or call area. Swedish lan are as follows: Lan A (SM0,SM5), B (SM0,SM5), C, D and E (SM5); F,G and H (SM7); I (SM1); K, L and M (SM7); N, O, P and R (SM6); S and T (SM4); U (SM5); W (SM4); X, Y and Z (SM3); and AC and BD (SM2). The award is free and applicants should send a verified log entry list to: WASM-60 Award Manager, Bengt Hogkvist, SM6DEC, Blabarstigen 118, S-546 00 Karlsborg, Sweden.

Ipswich RC Golden Jubilee Award
To celebrate its golden jubilee in 1985, Ipswich RC, in association with Ipswich Borough Council and Arrow Electronics, will present a special certificate, signed by the Mayor of Ipswich and the club's president for contacts with Ipswich club members and others in Suffolk during 1985. Fifty points are required—25 must be for Suffolk and Ipswich club contacts. QSOs with a G station count one point, with a Suffolk station two points, with an Ipswich RC member three points, and with special stations G4IRC, G1IRC and GB2IRC five points. Several special event stations using these calls will be active during the year. Contacts may be on any band/mode, and a station may be worked once on each band for credit. Repeater QSOs do not count. Band/mode endorsements are available on request. (UHF users acquire double points for contacts on bands above 1,296MHz.) Send list of QSOs, signed by a club chairman or secretary or national society representative, with six ircs, £1, or US $2, to: Alan Owen, G4HMF, 102 Constable Road, Ipswich IP4 2XA, no later than 31 March 1986. Listeners may apply by supplying details of QSOs made by the appropriate G stations.

St George's Day Award
Issued by the Wisbech & District Radio & Electronics Club, which will be running a special station, GB0SGD, from 0001 21 April to 2400 18 May. One QSO with this station plus (for UK) eight Gs, (for Europe) five Gs, or (rest of world) three Gs during this period. Send log details (certified by two other amateurs) plus £1.50 (from UK), six ircs (Europe), or eight ircs or US $3 to: D. Wilkinson, G4KEF, "Leon", Lutton Gowts, Long Sutton, Spalding, Lincs PE12 9LQ. Band and mode endorsements will be issued on request and listeners may apply.

Tel Aviv Award
For working stations in Tel Aviv-Jaffa only. Any bands/modes. Stations may be contacted on different bands for credits. Applicants need 10 points—QSOs with 4X75TA count as 10, with stations in Jaffa five points with others one, and all contacts must have been made since 1 January 1984. Send list of QSOs certified by an awards manager or two licensed amateurs plus $3, or £2, to: 4X6LM, Shlomo Mussali, Postbox 8225, Tel Aviv 61081, Israel. Listeners may apply.

Around the bands

The cold weather and mid-winter conditions have not really encouraged much activity on the hf bands. Reports on 10MHz are still disappointingly sparse—on a band which should be outstandingly useful at this time—and a 1985 10MHz Countries Table will appear in *MOTA* starting next month (entries to G3FKM please by normal closing dates).

Thanks to the following for sending along logs: G2HKU, G3s YY, BFR, GVV, KSH, SXW, YRM, G4EHQ, GW4KGR, GM4KHE, G4s LRS, OBK, UOL, UYR and XKR, and RS10906.

Stations listed in italics were using A1A. The rest J3E.

1·8MHz. 0000 *EA9KF, UZ9AWZ.* 0100 C31YA, *OH0BA, UD6DRN, 4X4NJ.* 0400 UG6GAW. 0500 AB1A, *SV0AA, TK5VN, W1PL.* 0700 *K6NA, WN4KKN* (Ala). 0800 *VE1ZZ, W2-4, W8,* ZL2BT, *ZL3GQ.* 1900 *JW0EQ.* 2000 *VE1ZZ,* UA2FPH. 2200 *LX1EA, OY6FR.* 2300 *EM8CSB, TF3KG, VS6DO, W8MSY.*

3·5MHz. 0000 *FM7WD, AD8J/J6L, OA4ZV, 3B9CD,* 6Y5IC. 0100 *EA9EO, JW0EQ, W7.* 0300 CN2AQ, RD6DM, T77V, UL7LCW, UM8TDX. 0700 W0GYH. 1900 *UA9CBO.* 2100 VO1TI. 2200 7X2LS. 2300 C31SD, EA8QO, K4JPD, W2HCW, YV5APF.

7MHz. 0000 *AD8J/J6L, UM8MBA, VP2VES, 4K1A.* 0200 *PZ1AP.* 0800 JA7EAI, JG1MVA, T77C, 8R1RBF. 0900 EA9RM, OA4ARQ, W2VP, ZB2EO, 6W1CK. 1100 *W8.* 1200 *W4. 1300 JW0EQ.* 1600 *UA9CIO.* 1900 A71AD. 2300 *A92EM.*

10MHz. 0800 *VK3DXF, ZL4NH.* 0900 *HL0CBD, VK2NN, ZL3BJ.* 1000 *VK2DUY, VK7RY.* 1500 *ZC4CZ.* 2000 *W1-W5.*

14MHz. 0800 AH2AW, J4DIT, JA, VK2-5 (until 1400), VP8BDG, VP8MT, VS6PW, ZL. 0900 C53BA, K4YT/DU1, FK8CP, HL9TM, JA, VP8AQK, VS6DF. 1000 A92EB, KD7P/KH2, P29DL, VS6CT, YI1BGD. 1100 P29LB, SU1ER, VU2JNY, YB9AFG. 1200 A71BK, JT1AO. 1400 S79CW, AJ5P/TF, VK6AS, VQ9YR, ZD9CC, *ZF2AQ.* 1500 C6ARD, HV1CN, S83H, SU1ER, TR8DR, VQ9YR, XT2BR, YB4FW. 1600 VE7, W6-W7 (until 2300), 4S7ZHR, 5R8AL. 1700 Z27BG, 3B8YP, 7X5AV. 1800 J5WAD, S79WHW, VE7. 1900 VP8QP, 5N6KD. 2000 KH6OR, ZD7BJ, ZD9CC, 3X4EX, 9X5WP. 2100 FM, LU, PY, TU2FI, ZD8LIK. 2200 C53BU, OE8AJK/YK. 2300 VE6-7, VP8ML, W6-W7.

18MHz. 1600 *LU1DOW, ZS5BH.*

21MHz. 0900 YB0DPO. 1000 5N6SKD. 1100 A4XKG, A92EB, VP8QP, 9L1CISV. 1200 D44BC, JY5ZM, OD5ST, 5N2DC. 1300 CP8HD, CT2DG, J28DN, SV5TS, VK4BJD/6, VP5SD, W1-W4, ZP5RG. 1400 J73AH, KV4GD, VP2MP, VP9KK. 1500 HC1SK, *T77C,* 6W1NQ, 7P8CM. 1600 *ZD8KM, 5L8E.* 1700 J37AH, LU, PY, W1-W6, ZD9CC. 1800 C53FD.

24 and 28MHz. No reports.

Many thanks to all who contributed to this month's column and to the editors of the following for information extracted: *DX News Sheet* (G4DYO), the *Ex-G Radio Club Bulletin* (GI3OEN/W6), *Long Skip* (VE3XN), the *Lynx DX Group Bulletin* (EA2JG/EA3CBQ), *DX'press* (PA0GAM), *CQ Magazine* (W1WY), *DXNL* (DL3RK) and *Long Island DX Bulletin* (W2IYX).

Please send all reports for **May** issue **to reach G3FKM no later** than **26 March.** □

HF propagation predictions for March 1985

Using the table

The time is presented vertically at two-hour intervals 00(00)gmt to 22(00)gmt for each band, ie 0 = 0000, 2 = 0200, 4 = 0400 etc.

The probability of signals being heard is given on a 9 (indicated by a dot) to 9 scale; the higher the number the greater the probability, with 1 meaning 10 to 19 per cent of days, and so on. Additionally 50MHz F-layer and 1·8MHz openings are indicated by a dagger (†) sign in the 28 and 3·5MHz columns respectively. The higher probability figures are printed in BLACK, lower probability in RED and lowest probability in GREEN type.

	28MHz				21MHz				14MHz				10MHz				7MHz				3·5MHz			
GMT	000	001	111	122	000	001	111	122	000	001	111	122	000	001	111	122	000	001	111	122	000	001	111	122
	024	680	246	802	024	680	246	802	024	680	246	802	024	680	246	802	024	680	246	802	024	680	246	802
EUROPE																								
Moscow						23	342			477	778	6	1 1	655	556	862	765	322	223	688	†† 3			3††
Malta						33	444	2		377	778	83	332	765	557	884	997	532	234	689	†††	2		4††
Gibraltar						1	222	1		67	778	83	12	376	556	882	786	753	334	688	†††	42		3††
Iceland										4	666	61		46	667	871	441	453	334	677	†††	42		34†
ASIA																								
Osaka						1				155	311	1		142	223	42		1	1	461				3
Hong Kong						23	41			155	443	3		22	224	63	1		1	474				42
Bangkok			1			134	55			135	554	4	1	2	224	742	2		1	477				244
Singapore		1	11			145	553			135	456	5	1	2	124	743	2		1	476				244
New Delhi		1	11			145	55			234	455		2 1	1	124	453	62		1	478	4			24†
Teheran		11	11			255	564			533	456	51	523	2	124	765	852		1	478	†3			24†
Colombo		11	11			245	664			223	456	61	11		124	765	51		1	478	3			24†
Bahrain		12	22			255	674		1 1	422	456	511	733	1	124	776	862		1	478	†3			4†
Cyprus		22	231			277	777	3	211	766	667	842	866	533	345	888	985	21	112	589	†† 2			25†
Aden		23	331			256	676	2	2	322	356	842	843	1	24	788	862		1	478	†4			4†
OCEANIA																								
Suva (S)										13	442	3		132	223	61		31	1	4				
Suva (L)						2		2	1	363	21	451	1	532	112	63		31	1	3				
Wellington (S)							11			34	444	2		342	224	61		21	1	41				
Wellington (L)									11	141		151	12	442		431		21		31				
Sydney (S)						34	11			465	445	3		232	224	62		1	1	44				2
Sydney (L)										53		52	1	142	11	152		1	1	33				
Perth		11	1			256	51			355	454	41	2	22	124	763	1		1	475				242
Honolulu											1 1	41		22	113	31		31	1	1		2		
AFRICA																								
Seychelles		13	332			256	777	2	21	222	356	842	852		124	788	851		1	478	†2			4†
Mauritius		23	342			256	787	3	31	322	456	852	852		124	788	841		1	478	†2			4†
Nairobi		23	453			256	688	4	31	422	256	863	873	1	24	788	883		1	478	††			4†
Harare		24	564	1		166	688	6	32	522	256	873	883	2	23	688	884		1	478	††			4†
Capetown		13	675	2		56	788	71	31	443	346	884	874	41	13	688	885	1	1	478	†† 2			4†
Lagos		13	666	3		66	678	82	34	452	225	884	893	62	2	688	897	3		478	5†5			4†
Ascension Is		3	225	3		56	557	83	141	63	223	693	787	44		488	888	41		168	†††	2		3†
Dakar		2	444	3		47	667	83	132	64	223	683	787	441	1	488	888	51		158	5††	2		2†
Las Palmas		1	222	2		36	777	72	121	177	667	882	687	664	334	688	999	631	111	379	†††	3		4†
S AMERICA																								
South Shetland			234	3		1	678	73	132	125	445	562	687	532	112	335	678	51		13	345	2		
Falkland Is			344	3		3	777	73	122	35	444	562	687	442	111	236	788	51		14	4††	2		
Rio de Janeiro		2	212	3		6	656	73	22	15	322	362	687	432	1	147	888	41		16	†††	2		3
Buenos Aires			223	3		4	766	73	22	25	433	352	577	432	1	135	788	51		13	5††	2		
Lima			1 1	1			544	52		1	432	232	355	231	1	3	688	41		1	3††	2		
Bogota				1			434	42		12	432	232	344	132	1	4	688	41		2	4††	2		
N AMERICA																								
Barbados			1	1		2	544	52		5	422	252	455	122	1	26	887	41		4	†† 5	2		
Jamaica				1			333	42		1	442	232	332	22	21	14	687	41		1	3††	2		
Bermuda							333	42		3	433	352	332	12	21	135	787	31		3	5††	2		
New York							122	31		1	443	452	321	2	221	124	686	31		2	3††	2		
Mexico							22	31			243	221	221	2	121	1	266	31			4†	2		
Montreal							122	31		1	444	451	22	2	221	134	575	21		2	3††	2		
Denver							1	1			34	32	11		122	112	254	21			3†	2		
Los Angeles							1	1			15	32	11		23	1 1	133	21	1		5	2		
Vancouver											2	22			13	211	132	21	1		4	2		
Fairbanks											1	11		11	113	431	111	31	1	211		2		

The provisional mean sunspot number for December 1984 issued by the Sunspot Index Data Centre, Brussels, was 18·2. The maximum daily sunspot number was 30 on 16 December, and the minimum was 9 on 20 December. The predicted smoothed sunspot numbers for March, April, May and June are, respectively: (classical method) 33, 32, 31 and 29; (SIDC adjusted values) 27, 25, 24 and 23.

QRP

*by Rev George Dobbs, G3RJV**

IARU approves QRP endorsement for WAC

The International Amateur Radio Union has finally approved a QRP endorsement for its well-known Worked All Continents award, effective from 1 January 1985. A sticker endorsing the standard WAC certificate for low-power operating will be available for proof of contacts with the six continents for QSOs on or after that date; it is *not* available for contacts made prior to that date, according to the IARU rules.

Power during the contacts must not exceed 5W output or 10W input, the rules stipulate. The effort to secure the QRP endorsement began in July 1983 at the IARU meeting in Cali, Colombia, when the idea was advanced by Carl Smith, W0BWJ, vice-president of Region 2, at the request of some union members. It won final approval at the IARU meeting last summer in Paris.

To qualify for the award, an applicant must submit QSL cards from amateurs in each of the six continental areas as defined by the IARU rules and as shown on the ARRL world map. No photo copies of cards are acceptable. QSLs must show contacts made from one station, in terms of callsign from one location (an area or metropolis not exceeding 40km or 25 miles in diameter), and the mode and/or band used for any endorsement applied for.

The Yeovil RC QRP Convention

The Yeovil Amateur Radio Club's pedigree in QRP goes back to 1954 when some transistors (mysterious, new fangled devices) were obtained as surplus from a local company. G3CFV managed to get some of them to oscillate on the then remarkably high frequency of 3·5MHz. The oscillator was keyed, and a contact was made with another station in the home counties. This was probably a unique QSO for its day, and the event was well reported in the radio press of the time. Under the guidance of G3MYM, the club organized what is believed to be the first convention entirely devoted to QRP operation on 14 October 1984.

The event had an impressive programme of technical lectures, a display of home-built equipment, and an interesting array of QRP stations on various bands. The homebrew equipment varied from the sophisticated to the basic, and included a receiver built on screwblocks and Blue-tack, and a transistor transmitter soldered onto sewing pins on a wood base. The QRP stations worked the 3·5, 7, 10, 14 and 144MHz bands using both commercial and homebuilt equipment.

About 100 people attended the convention, and the feedback I have received from those who attended suggests that they will all return when the event is repeated this year. In fact, Tony Smith, G4FAI, who travelled from London for the event, enjoyed it so much that he has already offered the spare seats in his car for people who would like to join him at the event in 1985. In all a very worthy effort by a local club.

Antennas and QRP operation

It is often assumed that low-power operators use very special antennas, perhaps even hf beams on tall towers, to achieve any reasonable results. Oddly enough, the reverse is more often the case. The ethos of low-power operation, especially if it is with home-built equipment, is against the use of commercial antenna systems. Most QRP operators use some form of simple wire antenna matched as nearly as possible to the output of the transmitter. It is not unusual for QRP operation to be successful from limited space locations and even small flats. Several operators I know work with indoor antennas and achieve remarkable results. A combination of ingenuity, skill and making full use of what is available is all part of the fun for such operators.

There are many books which describe varieties of simple wire antennas. Among those popular with QRP operators are: *Simple Low-cost Wire Antennas for the Radio Amateur*, William Orr (Radio Publications Inc); *ARRL Antenna Book* and *HF Antennas for all locations*, L A Moxon (RSGB). I regret the passing of *Digest of Horizontal Wire Antennas*, D. Hoult (Spalding ARS), although I understand that J. Birkett of Lincoln still has a few copies of this privately produced booklet.

*St Aidan's Vicarage, 498 Manchester Road, Rochdale, Lancs OL11 3HE.

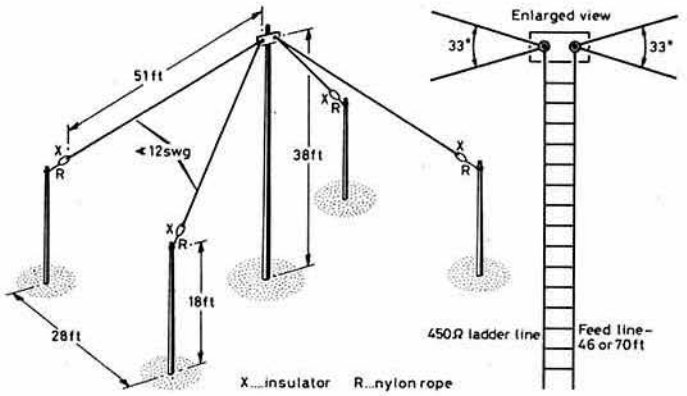


Fig 1. The all-band cone antenna

Antenna tuning units have been a perennial subject of debate amongst QRP operators. Just about every conceivable configuration has appeared over the years in *Sprat*, the journal of the G QRP Club. I have used a good many types of circuit for antenna matching, but most frequently use a simple Z-match to match my open-wire-fed antennas. QRP operation highlights a frequently overlooked problem with atu circuits, in that although they should assure a better matching between the transmitter and the antenna, they are the cause of rf losses in themselves. A piece of work undertaken some years ago by members of the G QRP Club revealed how depressingly high these losses could be for a low-powered station. A firm favourite with QRP operators, which gave less intrinsic losses than any other unit tested, is the circuit described in "A pi-tuned balun antenna coupler for the hf bands", G3CCB, *Rad Com*, November 1980, pp1146–50. Seasoned atu builders describe this as the best circuit they have tried, capable of matching almost any antenna on any band.

The types of wire antenna in the literature are legion, and many operators have favourites which they have used to good effect over many years. There are other wire antennas, some of which have never (or not for a long time) been described in the amateur radio literature, which are popular and capable of good results. One of my favourites is the cone antenna published in *73* November 1963, *TT* November 1964, and all editions of *Amateur Radio Techniques*, ascribed to WA5DEL. It has also appeared in *Sprat* and the *QRP Quarterly* in the USA. The idea first came to me in the form of a sketch from Bob Spidell, W6SKQ, which he had obtained from W6XF. I put one up for a trial and continued to use it, very successfully, for five years. More recently John McNeil, WA2KSM, with KA2GAT, has given it an impressive write-up when compared with other wire configurations he has used at the 1W QRP power level.

The all-band cone arrangement is shown in Fig 1. The discerning will say that it is just two G5RV antennas, 33° apart fed by a common open wire feeder; so it is. The actual mounting of the two dipole sections appears reasonably uncritical. My version was 45ft high at the apex, and the ends came down to about 14ft, with the angles between the legs much less than 33°. WA2KSM has his angles at 45° and feeds it with 300Ω feeder. I have fed my version very successfully with 240Ω oval twin-feeder. Some surprising claims have been made for the gain of this arrangement on some bands, but I am just happy to say it gives some gain over a dipole on all bands from 3·5 to 28MHz. The antenna is cheap, simple and can, because of its inverted-V nature, fit into a surprisingly small space.

The G QRP Club retains the CW Novice Award

Two years ago the G QRP Club sponsored the Novice CW Award, inspired by Angus Taylor, G8PG, to encourage new Class A licensees to continue using morse code on the air. The award was retained for last year, and the response has been so great that it is now to be a permanent award offered to any newly-licensed amateur. The rules are as follows:

1. Eligibility. The award is only open to stations during the first 12 months that they are licensed.

2. Period of award. All contacts claimed for the purpose of the award must be made during the first year. Contacts may be made on any amateur band for which the applicant is licensed; they must all be on cw.

3. Required contacts. For the purposes of the award the applicant must have contacted 50 other amateur stations.

4. Classes. The award will be issued in two classes. For the Class A award all contacts must have been made when the applicant was using a dc power input which did not exceed 5 or 3W rf output when making the contacts claimed.

5. Application fees and address. UK applicants must send 50p in UK stamps with their application. Overseas applicants must send three ircs. Applications must be addressed to: Communications Manager, G-QRP Club, 37 Pickerill Road, Greasby, Merseyside L49 3ND, England. □

Contest News

Second 1·8MHz Contest 1984 results

Being blessed with good conditions that brought an improved number of entries, particularly from overseas, the very fine balance between going for any contact or searching for new counties is clearly shown in the first six or seven places of the results table. GW3YDX takes the top place by virtue of 10 extra contacts made, while those following match him for county/country bonus totals, they fall behind on contacts. The highest number of bonuses was 69, but there were others to be had. The total possible from the logs exceeds 80, with 29 being DXCC prefixes.

First-time entrant GM4ZRR/A carries forward 634 points to the first 1985 top band contest and the chance of claiming the Maitland Trophy. The number of first-time entrants shows the continued interest being maintained in top band contests. It is to be hoped that all the first-timers will take part again. It was pleasing to receive three logs from the swl fraternity, all of whom entered good logs.

From the adjudicator's point of view it is the same story that has been told repeatedly. The majority of logs presented cause no bother at all, but the minority still create problems. Out-of-date log sheets, others photo-copied or torn from the home log, made up cover sheets or no cover sheet at all (could be disqualified!). Several unmarked duplicate contacts were found (two in one log), all of which have been penalized as per the rule.

Despite the last paragraph it was a good contest which was enjoyed by all, several people contacting W and VE for the first time, and five stations made contact with VK6HD. Check logs were received with thanks from G3IGW, G3WYK, G3ZRZ, PA3BFH, SP4GFG and UA4CGZ.

BRS20249

UK SECTION

Posn	Callsign	QSOs	Bonuses	Points
1	GW3YDX*	205	68	951
2	G3FXB*	194	68	928
3	G3VMW*	190	69	915
4	G3XTT	179	68	877
5	G3MXJ	180	67	875
6	G4BUO	178	67	868
7	G3PDL	176	63	843
8	G3RFS	164	67	824
9	G4NUT/A	176	67	803
10	G6UT	167	60	800
11	G4BYG	154	65	787
12	G4OBK	146	56	718
13	G3RSD	131	56	673
14	G3SJX	127	57	666
15	G4UPS	126	57	665
16	G4KHC†*	128	56	664
17	G3ZGC/A	129	52	647
18	GM4ZRR/A†	125	53	634
19	G3FKH	105	56	595
20	GM4SID	109	53	592
21	G3SJJ	101	53	568
22	G3SWH	103	45	534
23	G2MJ	100	49	515
24	G3SWC	91	52	503
25	G4IUZ	78	45	459
26	G3JFF	79	44	457
27	G3CCZ	82	41	451
28	GW3JI	74	44	442
29	G4OTU†	77	42	441
30	G4KJD†	65	42	405
31	G4XFB	64	38	382
32	G4OGB	65	37	380
33	G3VYI	60	37	365
34	G3ZRH†	55	37	350
35	G3KSH‡*	53	35	332
36	G3MCX	52	35	331
37	G2FNK	47	34	308
38	G3BGM	49	32	307
39	GI3GAL	46	32	296
40	G3AWR	45	32	295
41	G3WRR	46	31	293
42	G3BPM	41	31	278
43	G3HRY	36	29	253
44	G4PYD†	42	25	251
45	G3GMM	36	25	233
46	G4SLE†	27	22	189
47	G3FVW	29	20	186
48	G4EBK	27	20	181
49	G3TXF	10	9	75

OVERSEAS SECTION

Posn	Callsign	QSOs	Bonuses	Points
1	PA3BFM*	95	46	515
2	UA2FF*	81	39	438
3	OZ1W*	71	43	428
4	OK1DFF*	77	37	416
5	HB9AGA*	67	35	376
6	OE5KE*	65	34	365
7	OK3KMY	60	33	345
8	F9KP*	59	32	337
9	Y39XO*	49	34	317
10	F6AML	49	31	302
11	DL4BAS*	53	28	299
12	OK1DVK	44	29	277
13	OK3CZM	42	29	271
14	PA3AMA	40	28	260
15	OL1BIR	42	26	256
16	OK1DKW	41	26	253
17	OK1DTM	36	26	238
18	DK5OS	36	25	233
19	DL1TH	33	26	229
20	OK1DRO	37	23	226
21	SP5HS*	32	24	216
22	F6HMU	28	21	189
23	OH7VR*	28	20	184
24	F8TM	25	21	180
25	SP9BAA	26	20	178
26	OL5BFO	27	19	176
27	DL1SN	28	17	169
28	OK2BQU	23	18	159
29	OK1NV	20	16	140
30	OL6BHV	16	15	123
31	UA9CBO*	16	14	118
32	OK3RRF	15	14	115
33	OH2BCV	16	13	113
34	UC2IDZ	15	13	110
35	OE1TKW	10	8	70
36	UB5VK	4	4	32
37	VK6HD*	5	3	30

RECEIVING SECTION (UK)

1	BRS1066*	93	54	547
2	BRS44395*	75	45	450
3	BRS52868*	75	42	435

OVERSEAS

1	UC2-006-43*	19	16	137

* Certificate winner. † First time entrant. ‡ Senior citizen.

ROPOCO 1 1985 rules

1. The general rules for RSGB hf contests, published in the "Operating Guide" supplement, *Rad Com* January 1985, will apply.
2. Eligible entrants. All paid-up members of the RSGB resident in the British Isles holding a Class A licence. Single-operator entries only.
3. When. 0800-1000gmt, Sunday 7 April 1985.
4. Contacts. CW in the 3·5MHz band only. Entrants are requested to confine their operations to 3,510-3,590kHz. Send RST plus—for the first contact, entrant's own postal code; for the second and subsequent contacts, the postal code received in the previous contact. Contacts with European stations will not count for points.
5. Scoring. 10 points per contact.
6. Entries. Logs must be sent to G3KDB, PO Box 73, Lichfield, Staffs WS13 6UJ, postmarked not later than Tuesday 23 April 1985.
7. Awards. Certificates will be awarded to the first, second and third placed entrants.

Contests Calendar

2, 3 March	144/432MHz *(Rules in February issue)*
2-3 March	ARRL DX Phone *(Rules in February* MOTA)
9, 10 March	Commonwealth *(Rules in October issue)*
10 March	70MHz Cumulative
16 March	Town & County *(Rules in March issue)*
16-17 March	Bermuda *(Rules in March* MOTA)
16-17 March	DARC International SSTV *(Rules in March* MOTA)
23-25 March	BARTG Spring RTTY *(Rules in January issue)*
24 March	70MHz Cumulative
30-31 March	CQ WW WPX SSB *(Rules in March* MOTA)
31 March	432MHz CW *(Rules in February issue)*
7 April	ROPOCO 1 *(Rules in March issue)*
13-14 April	BARTG Spring VHF/UHF RTTY *(Rules in March issue)*
20-21 April	Vigo 85 World Fishing *(Rules in March* MOTA)
21 April	Low Power *(Rules in February issue)*
21 April	70MHz *(Rules in February issue)*
May-September	10GHz Cumulatives
May-September	Microwave Cumulatives
4, 5 May	432MHz-24GHz
12 May	WAB LF *(Rules in February* MOTA)
18, 19 May	144MHz
19 May	Region Round-up
1, 2 June	HF NFD *(Rules in February issue)*
8 June	1,296MHz Trophy
9 June	432MHz Trophy
22, 23 June	Summer 1·8MHz
6, 7 July	VHF NFD
13, 14 July	SWL
21 July	Low Power Field Day
27 July	432MHz Low Power
28 July	144MHz Low Power
18 August	1,296/2,320MHz
25 August	ROPOCO 2
7, 8 September	IARU Region 1 FD
7, 8 September	144MHz Trophy and IARU
2, 10, 18, 26 September	28MHz Phone Cumulative
22 September	70MHz Trophy
5, 6 October	432MHz-24GHz and IARU
8 October	432MHz Cumulative
13 October	21/28MHz Phone
16 October	1,296/2,320MHz Cumulative
20 October	21MHz CW
24 October	432MHz Cumulative
27 October	70MHz Fixed
1, 17 November	1,296/2,320MHz Cumulative
2, 3 November	144MHz CW
3 November	WAB CW *(Rules in February* MOTA)
9, 25 November	432MHz Cumulative
9, 10 November	2nd 1·8MHz
11, 19, 27 November; 5, 13 December	28MHz CW Cumulative
1 December	144MHz Fixed
3, 19 December	1,296/2,320MHz Cumulatives
11 December	432MHz Cumulative
15 December	70MHz CW

1·8MHz Town & County Contest rules

TRANSMITTING SECTION

1. Eligible entrants. All fully paid-up members of the RSGB resident in the British Isles (G, GD, GI, GJ, GM, GU and GW) holding a Class A licence. Single-operator entries only. All entrants must operate within the terms of their licence.
2. Period. From 2100 to 2400gmt Saturday 16 March.
3. Frequencies/mode. 1·915-2·0MHz phone only.
4. Contest exchange. RS and serial number (starting at 001) together with operator's town and three-letter county code (as published in this issue of *Rad Com*). In the case of "country" entrants the nearest town in the same county must be given. Scottish entrants should use their region code.
5. Scoring. Three points for each completed contact with a station in the British Isles, with a bonus of five points for the first contact with each new county/region. Contacts with stations outside of the UK will not count for points.
6. Logs. All logs must follow the standard RSGB contest log-sheet format, with 40 contacts per page (one side only). Columns should be headed: date/time (gmt); callsign; RS/serial number sent; RS/serial number received; town/county code received; bonus points; QSO points. The entry must be accompanied by the following declaration: "I declare that this station was operated strictly in accordance with the rules and spirit of the contest and I agree that the decision of the Council of the RSGB shall be final in all cases of dispute." The declaration must be signed and dated. The entrant must give details of the equipment and the antenna used and show the town and county

code sent. (RSGB log sheet HFC1 and cover sheet HFC2 fully meet these requirements).
7. Address for logs. HF Contests Committee, c/o Mrs R L Glaisher, G4RWW, 279 Addiscombe Road, Croydon CR0 7HY.
8. Closing date for logs. Logs must be postmarked no later than 1 April 1985.
9. Awards. Certificates of merit will be awarded to the leading three stations.

RECEIVING SECTION
1. Rules 1, 2, 3, 5, 7 and 8 as for the transmitting section will apply.
2. Logging. A station may only appear once in the column headed "station heard". The callsign of the stations being worked may only be repeated once in every five contacts logged. Entrants should log the callsign of the station heard, RS/serial number and town/county code given by that station, and the callsign of the station being worked.
3. Awards. Subject to a minimum of 10 entries, certificates of merit will be awarded to the leading three receiving entries. If less than 10 entries are received, certificates will be awarded at the discretion of the HF Contests Committee.
4. Holders of British Class B transmitting licences may also enter the receiving section.

432MHz-24GHz Contest rules

1400-1400gmt, 4-5 May 1985
Multi-operator stations may operate concurrently using different callsigns. Individual band and overall tables will be published. On 432MHz scoring will be by the radial ring system, and at 1pt/km on the other bands.

The following general rules, published in the "Operating Guide" supplement, *Rad Com* January 1985, will apply: 1, 2, 3, 4d, 5a, 6a, 7a & 7b, 8b, 9, 10b, 11a, 12b, 13-24.

All entries and check logs to: VHF Contests Committee, c/o Mrs P Suckling, G4KGC, 46 Windsor Close, Towcester, Northants NN12 7JB.

May 144MHz and SWL Contest rules

1400-1400gmt, 18-19 May 1985
The following general rules published in the "Operating Guide" supplement, *Rad Com*. January 1985, will apply: 1, 2, 3, 4d, 5a, 6a, 7a, 9 10a, 11a, 12b, 13-24.

A multiplier system will be used in this contest. Contacts should be scored as per general rule 7a, and the final score multiplied by the total number of QTH locator squares worked (including that of the station). A QTH locator square is taken to be that defined by the first four characters of the new six character "Maidenhead" locator system.

All entries and check logs to: VHF Contests Committee, c/o B J Morton, G4HWA, 39 Green Lane, Blackwater, Hampshire, GU17 9DG.

BARTG Spring VHF/UHF RTTY Contest rules

1800gmt 13 April-1200gmt 14 April 1985
Rules for this contest can be obtained by sending an sae to: Peter Adams, G6LZB, BARTG Contests Manager, 464 Whippendell Road, Watford, Herts WD1 7PT.

Club News

The following is the latest information received by RRs from RSGB affiliated societies, clubs and groups in time for inclusion in this issue. Basic unchanged information on other affiliated organizations will be published again in the July 1985 issue.

RSGB affiliated organizations are requested to report all programmes and new items to their regional representatives regularly. Information for inclusion in the **May** issue should reach them by **15 March** and for the **June** issue by **15 April.**

Club programmes are given in order of date, subject, time and place of the meeting. All callsigns of club secretaries and other contacts are QTHR (correct in the current *RSGB Call Book*) unless otherwise stated.

All clubs welcome visitors and would be pleased to hear from potential new members.

REGION 1—RR B Donn, G3XSN, 7 Thurne Way, Liverpool L25 4SQ. Tel 051-722 3644.

Ainsdale (AARC)—12, 16 March (Normal). 8pm. Scout HQ, Marine Drive. 5, 19 March (Natter nights). The Mount, Manchester Road. 3, 17, 31 March (DF hunts, 1030 start from Mere Brow OS squares). Sec David Norris, G4TUP, tel 35947.

Blackburn (East Lancs ARC)—5 March (Surplus equipment sale), 26 (Informal), 2 April ("Crime prevention" by the local police). 7.30pm. Conservative Club, Rishton, Blackburn. PRO Stuart Westall, G6LXU, tel Gt Harwood 887385.

Bury (BRS)—12 March (Film show), 5, 19, 26 March and 2 April. (Informal) 8pm. Mosses Community Centre, Cecil Street, Bury. Sec Brian Tyldsley, G4TBT, tel Burnley 24254.

Eccles (E&DARS)—Tuesdays, 9.30pm. Duke of York Hotel, Church Street, Eccles. Sec Chris Harrison, G8KRG, tel 061 773 7899.

Fylde (FARS)—5 March ("Home-brew transceivers", Ken Porter, G3KEN), 19 March (Informal with morse). 7.45pm. The Kite Club, Blackpool Airport, Sec H Fenton, G8GG, tel 725717.

Liverpool (L&DARS)—5 March (Surprise talk, G4PVI), 12 March ("Ham radio while travelling in USA and Canada" by Phil, G3YBH), 19 March ("Our solar system", by G6XBK), 26 March ("Valve amplifiers", Harry, G8FHD). 8pm. The Churchill Conservative Club, Church Road, Wavertree. Sec G6XBK.

Liverpool (Sefton ARC)—6, 20 March, 3, 17 April, Liverpool Prison Officers Club, Hornby Place, Walton. Sec Jim, G6PVQ, tel 051 523 3971. At the recent agm the following were elected: chairman, Len, G4LBJ; sec G6PVQ, tres Frank, G4YPD. PRO Les, G1HDU.

Manchester (South Manchester RC)—8 March ("Radio location techniques", D Holland, G3WFT, G6LCS and G4JLG), 15 March ("Antenna matching techniques", Chris Ward, G4HON), 22 March (Grand surplus equipment sale), 29 March (Morse code—learn it—master it), 5 April (2m/160m DF Contest). 8pm. Sale Moor Community Centre, Norris Rd, Sale. Sec David Holland, tel 061 973 1837.

Oldham (OARC)—4 March (Committee), 11 March ("Antennas" G2JT). 8.30pm. Wheatsheaf Hotel, Derker Street, Oldham. Sec John, G3SAO.

Preston (PARS)—14 March (Visit by RR Bert Donn, G3XSN), 28 March ("A beginners guide to foxhunting", Mark G8RIP, and Derek, G3SYA), 11 April ("QRP", Rev G C Dobbs, G3RJV). Lonsdale Club, Fulwood Hall Lane, Fulwood, Preston. Sec George Earnshaw, G3ZXC, tel 0772 718175.

St Helens (StH&DARC)—7 March (Rally preview), 14 March (Junk sale), 21 March (HF-VHF on the air). 28 March (Film), 4 April ("Crime prevention", Liverpool Police). 8pm. Conservative Rooms, Boundary Road, St Helens, Details from Alan Manchester, G6FJU, tel 56025.

Stockport (SRS)—13 March (Microwave cookers), 27 March ("Hints and Kinks", A Buxton), 10 April ("Basic electronics", B Turley), Every third Wednesday in each month informal meetings and morse class. Magnet Inn, Wellington Road, Stockport (new venue). Sec Mel Betts, tel 061 224 7880.

Tarporley (Mid-Cheshire ARS)—6 May (Mobile rally, Winsford Civic Hall, High Street, Winsford), Details D Card, G4VOH, 7 Glebe Green, Winsford, Cheshire, tel 06065 4719.

Thornton Cleveleys (TCARS)—4 March (Visit by RR B Donn, G3XSN), 11 March (Advanced Morse class, Ian Cobbe, G3ZRZ. Club operating night), 18 March ("Further thoughts on antennas and atus", Len Green, G3AOW), 25 March (Informal). 7.45pm. 1st Norbreck Scout HQ, Carr Road, Bispham, Blackpool. Sec Mrs E E Milne, G4WIC, tel 0253 821827.

Warrington (WARC)—5 March (Preparations for NARSA club stand), 12 March ("The black box", Bill Green, G8HLZ), 19 March ("Construction techniques", George Fare, G3OSQ), 26 March (Contest operating—The Contest Group). 8pm. Tuesdays, Grappenhall Community Centre, Bellhouse Lane, Grappenhall, Warrington. Sec W Green, G8HLZ tel 0925 814740.

Wirral (WARS)—6 March ("Past dxpeditions", slide show, G3EGX). 20 March (Problems night), 3 April (Sale of surplus equipment). 8pm. Heswall Parish Church Hall, Heswall. Sec Cedrick Cawthorne, G4KPY, tel 051 625 7311.

Wirral (W&DARC)—6 March (D&W The Wheatsheaf, Ness), 13 March ("Reliability", talk with slides, Jack Rowe of Plessey), 20 March (D&W, The Primrose, Liscard), 27 March (TBA). Irby Cricket Club, Mill Hill Road, Irby. Sec Gerry Scott, G8TRY, tel 051 630 1393 or 227 1018.

Would secretaries please keep me informed of their club activities. I have been waiting to hear from some clubs since July 1984!

I shall be at NARSA, Belle Vue, on Sunday 10 March, and look forward to meeting you. My thanks to those clubs who have sent me their magazines, and also to Oldham and Stockport for their kind hospitality. *RR1*

REGION 2—RR *(To be elected)*

Maltby (MARS)—1 March ("The Novice licence", debate by G3ZHI and G4BVV), 8 March ("Home-brew test gear", G4BVV, 15 March ("Planning and building problems in amateur radio matters", G4TVD), 22 March (Equipment checking night, bring your rig along, G3ZVG), 29 March (AGM, all members asked to attend). 7pm. Old School Buildings, Church Lane, Maltby. Details I. Abel, G3ZHI, tel Rotherham 814911.

York (YARS)—15 March (Junk sale). 7.30pm. United Services Club Room, 61 Micklegate, York. Sec Keith Cass, G3WVO, tel York 36230. At the agm the following officers were elected: president, G3TMW; chairman, G4ESU; vice-chairman, G4NPQ; hon sec, G3WVO; committee, G3FTS, G4EMA, G1IDB.

REGION 5—RR J S Allen, G3DOT, 77 Rosslyn Crescent, Luton LU3 2AT. Tel 0582 508515, or at work on 0582 21151.

Bedford (B&DARC)—6 March (Open forum, a chance to put your questions to a panel of experienced amateurs), 13 March (HF operating night, using the club's equipment), 20 March (Formal talk or visit: tba), 27 March (Social evening, a chance to meet and discuss informally mutual topics of interest). 8pm. Club House, Ravensden. Sec L R Hewett, G4PBE.

Cambridge (C&DARC)—1 March ("Computers and the radio amateur", Mike Newport and Steve Platt), 8 March ("Operating the club hf station", G2XV), 15 March (Constructors evening, also the 50mV centre-zero meter competition), 22 March (Informal), 29 March (AGM). Visual Aids Room, Coleridge Community College, Radegund Road, Cambridge. Sec D M Leary, G8JKV, The Farmhouse, Blackers Hill Farm, Lowndes Drove, Needingworth, Cambs PE17 4NE.

Dunstable Downs (DDRC)—1 March ("Software protection", G8PTP), 15 March ("A bit of a lift on", Jim Bacon, G3YLA), 29 March ("Computer networks", G8AHS). 8pm. Chews House, High Street South, Dunstable. Sec P A Morris, G6EES.

Luton (Kent Process Control ARS)—Contrary to rumours that have been circulating, the members of this club have not all been made redundant and still meet on the first Wednesday in each month in the club house, Tenby Drive, Luton, Bedfordshire. Sec J S Allen, G3DOT. The club is open to all employees of Brown Boveri et Cie and Brown Boveri Kent.

Leighton Linslade (LLRC)—4 March ("Watchmaking engineering", John Walker, G8KKU, 18 March (Community College Week, we hope to run a special event station). 7pm. Vandyke Community College, Room A64, Vandyke Road, Leighton Buzzard.

Milton Keynes (MK&DARS)—11 March (MK&DARS construction contest). Tongwell Room, Lorat Hall, Silver Street, Newport Pagnell. Sec David White, G3ZPA.
Shefford (S&DARS)—7 March (TBA) 14 March (Computer evening), 21 March (Modern tv design), 28 March (Technical topics). 8pm. Church Hall, Amptill Road, Shefford, Bedfordshire. Sec Alan, G4PSO.

REGION 6—RR F S G Rose, G2DRT, 84 Cock Lane, High Wycombe, Bucks HA3 7EA. Tel Penn (049481) 4240.

Aylesbury (AVRC)—19 March ("Wavelength radio astronomy", Dave Vizard, G3UKS). 8pm. Haydon Hall Community Hall, Dickens Way, Aylesbury. Details Mrs C Clark, G1GQT, tel Kingston Blount 0844 51461.
Marlow (Mid-Thames RDFC)—21 March. The Two Brewers, St Peter's Street, Marlow, Bucks. NGR SU 852 862. Details Doreen Pechey. G8MNO, tel 0491 6805552.

REGION 7—RR R Sykes, G3NFV, 16 The Ridgeway, Leatherhead, Surrey. KT22 9AZ. Tel 0372 372587.

Ashford (Echelford ARS)—11 March ("Synthesizers"), 28 March ("Radio control"). The Hall, St Martins Court, Kingston Crescent, Ashford, Middx. Sec Bob Crane, G4PHS, tel 01 977 4157.
Biggin Hill (BHARC)—19 March ("Raynet", N Perrott, G4TAW). 8.30pm. St Marks Church Hall, Church Road, Biggin Hill. Sec Ian Mitchell, G4NSD, tel 09598 376.
Coulsdon (CATS)—11 March (Surplus sale), 28 March (Morse tuition). 8pm. St Swithuns Church Hall, Grovelands Road, Purley, Sec A Bartle, G6HC tel 01 684 0610.
Cray Valley (CVRS)—7 March (Junk sale), 21 March (Natter night). 8pm. Christchurch Centre, Eltham High Street, Eltham SE9. Sec P Clarke, G4FUG.
Croydon (SRCC)—4 March (Surplus sale). 8pm. TS Terra Nova Mess Deck, 34 The Waldrons, South Croydon, Surrey. Sec John Simkins, G8IYS, tel 01657 0454.
Crystal Palace (CP&DRS)—16 March ("Lights from space", NASA slide lecture by Charlie Newton, G2FKZ). 8pm. All Saints Parish Room, Upper Norwood, SE19. Sec Geoff Stone, G3FZL, tel 01 699 6940.
Surbiton (308 ARC)—26 March (Surplus sale). 8pm. Coach House, Church Hill Road, Surbiton. Details Ray Lancaster, G1EOO.
Sutton and Cheam (S&CRS)—15 March (Constructional contest), 30 March (36 annual dinner). 8pm. Downs Lawn Tennis Club, Holland Avenue, Cheam. Sec Alan Keech, G4BOX.
Thames Ditton (TVARTS)—5 March (AGM). 8pm. Thames Ditton Library, Watts Road, Giggs Hill, Thames Ditton. Sec R Muir, G3LHN.
Wimbledon (W&DRS)—8 March (Grand bazaar, with traders and other stands), 29 March ("The performance and measurement of hf receivers", Peter Hart, G3SJX). 8pm (Bazaar 7.30pm). St John Ambulance HQ, 124 Kingston Road, Wimbledon SW19. Sec George Cripps, G3DWW, tel 01 540 2180.

REGION 8—RR M Elliott, G4VEC, 20 Haysel, Sittingbourne, Kent ME10 4QE. Tel 0795 70132.

Canterbury (East Kent ARS)—7 March ("Various aspects of propagation", G4DVC), 21 March (Natter night). 7.30 for 8pm. The Cabin Youth Centre, Kings Road, Herne Bay. New sec Mike Bryant, G6TRM, tel 02273 69454.
Chichester (CARC)—5 March (Club meeting in the Long Room), 21 March (AGM and contest for home-constructed equipment for the Talbot Trophy, in the Green Room). 7.30pm. Fernleigh Centre, 40 North Street, Chichester. Details Chris Bryan, G4EHG, tel Chichester 789587.
Crawley (CARC)—27 March (Exhibition of homebrew equipment). 8pm. Trinity Church Hall, Ifield. Details David, G4IQM, tel Crawley 882641.
Dartford (DDFC)—5 March (Pre-hunt meeting), 10 March (Club hunt). Horse & Groom PH, Leyton Cross, Dartford Heath, Dartford, Kent, after 9pm. Details Pete, G8DYF, tel Greenhithe 844467.
Eastbourne (Southdown ARS)—4 March (Junk sale). 8pm. Chaseley Home, South Cliff, Eastbourne. Every Tuesday and Friday at new club rooms, Hailsham Leisure Centre. Details Peter, G8IQO, tel Eastbourne 763123.
Hastings (HERC)—20 March (AGM). 8pm. West Hill Community Centre. Details Dave Shirley, G4NVQ, tel Hastings 420608.
Maidstone (MYMCAARC)—8 March (RSGB presentation by RR8). 8pm. YMCA Sports Centre, Melrose Close, Cripple Street, Maidstone. Details from new sec Alan, G6FZD, tel 0622 50709.
Margate (Radio Club of Thanet)—Second and fourth Tuesdays in each month. 7.30 for 8pm. Grosvenor Club, Grosvenor Place, Margate. Details from new sec John Bax, G4SBD, tel Thanet 33213.
Tunbridge Wells (West Kent ARS)—8 March ("Adventures in amateur radio", Viv Slight, G6SX), 22 March ("Amateur radio awards", Alex G4FDC, Dave, G4OTV, Nigel G4KIU). 8pm. Adult Education Centre, Quarry Road, Tunbridge Wells. Details Brian Guinnessy, G4MXL, tel after 7pm, 0892 32877.

REGION 10—RR E J Case, GW4HWR, 2 Abbey Close Tyrhiw, Taffswell, Mid-Glam CF4 7RS. Tel 0222 810368.

Blackwood (B&DARS)—Fridays 7pm. Oakdale Comprehensive School, Oakdale, Blackwood, Gwent. During 1985 the club will celebrate its anniversary and is offering an anniversary award for stations working B&DARS club members. Bronze, silver and gold awards will be presented to stations working 10, 15 or 25 club members respectively. A cup will also be presented to the station working most club members, and there will be an award for swls. There is no charge for entry. Full details on request to: Blackwood & DARS, Anniversary Awards, c/o GW4VVX, PO Box 21. Blackwood, Gwent NP2 2YT. Sec Wynn Wright, GW4UAM.
Bristol Channel Repeater Group (GB3BC)—Please note sec Roy Sellek, GW6MBU, 12 Norseman Close, Rhoose, tel Barry 711146. This was incorrectly quoted in the January issue.
Cardiff (CRSGBG)—11 March ("Modern trends in uhf/vhf equipment", Richard, GW4NAD). 7.30pm. Pantmawr Hotel, Tyla Teg, Pantmawr Estate, Whitchurch, Cardiff. April meeting will be on 1 April to avoid Easter Monday. Sec Cyril Laws, GW6ZHP, tel Cowbridge 3212.

Region 10 now has two area representatives: Reg, GW4ESV, representing the Port Talbot area; and Cyril, GW6ZHP, representing the Cardiff area. My congratulations and thanks to them both.
73, John RR10.

REGION 11—RR B H Green, GW2FLZ, 1 Clwyd Court, Tan-y-Bryn Road, Colwyn Bay, Clwyd LL28 4AH. Tel 0492 49288.

Colwyn Bay (Conwy Valley ARC)—14 March (Discussion on members equipment problems). 8pm. Green Lawns Hotel, Bay View Road, Colwyn Bay. Sec Mr J N Wright, GW4KGI, 46 The Dale, Woodlands, Mergele, Clwyd LL28 7DS, tel 0745 823674.
Porthmadog (P&DARS)—21 March ("Earthquakes unexplained noises and other phenomena", GW4KEV and GW4UKU). 8pm. Harbour Cafe, Ffestiniog Railway, Porthmadoc. Sec Mrs L Jones, GW4WKQ, Henllys Back, Llanbedrog, Pwllheli, Gwynedd LL53 7PG, tel 0758 740445.
Rhyl (R&DARC) GW4ARC—4 March ("Propagation and antennas, Part 3", Gordon Adams, G3LEQ), 18 March (Activity night). 7.30pm. The Mona Hotel, Market Street, Rhyl. Sec Mr M Illington, GW1ART, 13 Bronallt, Groes, Denbigh, Clwyd LL16 5RT, tel Nantglyn 469.
Wrexham (ARC)—6 March ("Morse procedure", John Roberts, GW3RBM), 20 March (Activity night, GW4WXM). 7pm. Friends Meeting House, Holt Road, Wrexham, Clwyd. Sec Andrea C Allen, G4HRH, The Hollies, Sedgeford, Whitchurch, Salop 5Y13 1EX.

Note to secretaries of societies in Region 11. Please send your club programmes for "Club News" to GW2FLZ. *RR11*

REGION 13—RR A Givens, GM3YOR, 41 Veronica Crescent, Kirkcaldy, Fife KY1 2LH. Tel Kirkcaldy (0592) 200335.

Dunfermline (DARS) (GM3IDS)—Thursdays 7.30pm, Outh Wireless Station, Knockhill, by Dunfermline. Future programme under discussion, any suggestions welcome. Transport available from town centre by arrangement. Details Ray, GM4WYR, tel 736401.
Glenrothes (G&DARC) (GM3ULG/GM4GRC)—17 March ("Computers in amateur radio," GM4ANB). 7.30pm. Provosts Land, Leslie, Fife. Details, Jim, GM4TNP, tel 755958.
Lothians Raynet Group—Details Vic, GM3OWU.

REGION 14—RR T G Wylie, GM4FDM, 3 Kings Crescent, Elderslie, Strathclyde PA5 9AD. Tel Johnstone (0505) 22749.

Ayr (AARC)—8, 22 March. Leisure Centre, Wellington Square, Ayr. Sec R D Harkess, GM3THI, QTHR, tel 0292 42313.
Dumfries (Maxwelltown ARKlub) GM0AEE. Formed in October 1984 to cater for the practical and operational side of amateur radio. Wednesdays, twice monthly. 8pm. "The Tam O'Shanter Inn", Queensbury Street, Dumfries. New members welcome. Details Crosbie Rodgers, GM4NNC.
Motherwell (Mid-Lanarks ARS)—8 March ("The compilation and reading of Ordnance Survey maps"; to assist the "nouveau's" for the future fox-hunt contest to be held in May 1985). The secretary would also like to remind secretaries of all Scottish clubs that nominations for the GM3EHI Award should be in her hands by 2 April 1985. The award is given to the person who has provided a unique service or activity in order to promote the hobby of amateur radio. Details Anne Hood, GM4UXX, tel 0698 350926.

REGION 16—RR A Owen, G4HMF, 102 Constable Road, Ipswich, Suffolk IP4 2XA. Tel 0473 51319.

Bury St. Edmunds (BstERS)—19 March (Visit to Martlesham Police HQ), 7.30pm. Guildhall, Guildhall Street, Contact John Munro, G3GBD, 29 Angel Hill, Bury St Edmunds.
Colchester (CRA)—7 March ("How is your interference", Robert, G3DPW), 21 March ("RNLI", Norman Clark). 7.30pm. Colchester Institute, Sheepen Road, Colchester. Sec Frank Howe, G3FIJ, tel 0206-851189.
Ipswich (IRC)—13 March (Constructors contest), 27 March ("History of Marconi", Part 3). 8pm. Rose and Crown, Norwich Road, Ipswich. Sec Jack Toothill, G4IFF, QTHR, tel 0473-44047.
Leiston (LARC)—5 March ("Walters musical machine", G2FXR bring xyls), 12 March (Practical evening), 21 March (Antenna construction), 2 April ("RSGB, G3VPK and G4HME). 7.30pm. Sizewell Sports and Social Club, St George's Avenue, Leiston. Sec Mrs I Westcott-Freeman, G6ORK, tel Leiston 831 597.
Stowmarket (S&DARS)—4 March (AGM). 7.30pm. Red Cross Hut, Station Yard, Stowmarket. Details, Jim Lowe, G8SCB, QTHR, tel Needham Market 721296.

REGION 17—RR T Emery, Wilverley Old Lyndhurst Road, Cadnam, Southampton SO4 2NL.

Basingstoke (BARC)—4 March ("Contest operating techniques", G3NNG and the Harwell Group), 8pm. First Monday in each month. Forest Ring Community Centre, Sycamore Way, Basingstoke. Please note change of day and location. Sec G4WIZ, Tel Tadley 5158.
Blackmore Vale—12 March ("The RSGB", G3KWU). 7.45pm. The Bell and Crown, Zeals, (on the A303). Sec M Bailey, Tel (0963) 70969.
Devizes (D&DARC)—Fridays 8pm. Devizes Football Club Social Club, off Nursteed Road, Devizes.
Eastleigh (Itchen Valley ARS)—1 March (AGM), 15 March (HM Coastguard), 29 March (Talk by G2HNI). 7.30pm. The Scout Hut, Brickfield Lane, Chandlers Ford. Sec G6DIA, tel (0703) 863039.
Farnborough (F&DARS)—13 March ("QRP operation", G4BUE), 27 March ("Meteor scatter communication", G8VR). 7.30pm. Railway Enthusiasts Club, Access Road, off Hawley Lane, Farnborough. PRO G4MBZ, tel Farnborough 837581.
Fareham (F&DARS)—6 and 20 March (Natter nights). 13 March ("TVI and rfi", G3GVM), 27 March (Junk sale). 7.30pm. Portchester Community Centre, Portchester. Sec G4ITG, tel Fareham 234904.
Horndean (H&DARC)—4 March ("Space technology", John Bennett), 1 April ("Working mobile—Suppression", G4DIU). 8pm. Merchiston Hall, London Road, PRO G4BEQ, QTHR.
Liphook (Three Counties ARC)—6 March ("Slow scan tv", G8VOI), 20 March (AGM), 3 April ("Amateur radio satellites", AMSAT-UK), 8pm. The Railway Hotel, Liphook. Sec G3TBT, tel Passfield 368.
Swindon (S&DARC)—7 March (Open evening for visitors), 21 March ("Antenna tuning units", G4RZP). 7.30pm. Oakfield School, Marlowe Avenue, Swindon. PRO G4ZAZ, tel (0793) 37489.
Weymouth (SDRS)—5 March (Constructors contest and junk sale), 2 April (AGM). 7.30pm. Army Bridging School, Wyke Regis, Sec G6HKD, QTHR.
Wimborne (FRARS)—Results of recent AGM:

chairman, G8MCP; treasurer, G4BGT; secretary G8ZLH. Sundays 7.30pm. Flight Refuelling Social Club, Mereley, Wimborne Sec G8ZLH, QTHR.
Winchester (WARC)—16 March (Mini lectures by members), 7.30pm. The Log Cabin, Stockbridge Road, Winchester. Sec G3SHQ, Tel Twyford 713003.

REGION 19—RR R J C Broadbent, G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQ. Tel 01-989 6741.

Cheshunt (C&DARC)—6 March ("Meteor scatter", G4IJE), 13 March (Natter night), 20 March (Junk sale, G4TQG), 27 March (Natter night). 8.15pm. The Church Room, Church Lane, Wormley, Nr Cheshunt, Herts. Details Roger Frisby, G4OAA, tel 09924 64795. Club magazine *Hamster*.
Chiswick (Acton, Brentford & Chiswick ARC)—19 March ("Vmos power mosfets", G4GRM). 7.30pm. Chiswick Town Hall, High Road, London W4. Sec W G Dyer, G3GEH, tel 01-992 3778.
Harrow (RSH)—1 March ("Multichannel networks", Peter Marcham), 8 March (Activity night on 3·5MHz), 15 March ("Your RSGB", John Nelson, 22 March (Activity night on 7MHz), 29 March (AGM). The Harrow Arts Centre, High Road, Harrow Weald. Details G8XBZ or G4AUF, tel Rickmansworth 779942 or 01-868 5002.
Havering (H&DARC)—6 March (Informal), 13 March ("144MHz dx", Ken Willis, G8VR), 20 March (Informal), 27 March ("Shack security", Metropolitan Police). 8pm. The Fairkytes Arts Centre, Billet Lane, Hornchurch, Essex. New sec D C St John-Gray, G1HGQ, 6 Devonshire Road, Hornchurch, Essex.
Hillingdon (HARC)—Now meets at the "Green Man", corner of Greenway and Uxbridge Road, Uxbridge, Tuesdays, 8pm. Sec Howard, G6STI, tel 01-561 2917.
London (Civil Service ARS)—First and third Mondays in each month. 12.30pm. Civil Service Recreation Centre, Monck Street, London SW1. G3CSR on 7 and 14MHz operated from the centre. Net Tuesday evenings on 144·575MHz and 1,960kHz; controller G3ENV. Details G Goslin, tel 01-632 6444 daytime.
St Albans (Verulam ARC)—12 March (Informal), 26 March (G3PAO memorial lecture "Weather and its effects on propagation" Jim Bacon, G3YLA). 7.45 for 8pm. RAFA HQ, New Kent Road, St Albans. Sec Hilary, G4JKS, tel St Albans 59318.
SW Herts Repeater Group—This group maintains GB3HR on RB14, now located at Stanmore. Coverage of NW and W London much improved by the move. Thanks to RS of Harrow for generous support. Group also operates GB3SWH on 10·368GHz from Bushey Heath, Herts. Thanks to Les, G3BNL, for assistance with repairs during recent inclement weather. Donations to maintain repeaters and pay for rental and electricity welcomed by Brian, G3THQ.

REGION 20—RR N F O'Brien, G3LP, 26 Southfield Road, Gloucester GL4 9UD. Tel 0452 34890.

Bristol (BARC)—5 March ("PLL Lecture", G8GFZ), 12 March ("CB to 10m conversion", G4TRN), 19 March (Club projects), 26 March (Computer night), 2 April (Specialist video). 7.30pm. YMCA, Park Road, Kingswood, Bristol. Details D Gully, G4YOC, tel Bitton 4116.
Bristol (BRSGBG)—25 March. 7.30pm. Small Lecture Theatre, Bristol University. Details, Brian Goddard, G4FRG, tel 0272 848140, or Tony Capel, G4ROX, AR, tel 0272 513573.
Bristol (North Bristol ARC)—15 March (Homebrew competition and visit by member of *Practical Wireless* editorial team). 7.30pm. SHE, 7 Braemar Crescent, Northville, Bristol. Details Ted Bidmead, G4EUV.
Bristol (South Bristol ARC)—6 March ("Air traffic control", Gary, G3HKA), 13 March (HF activity night, Colin, G4SQQ), 20 March (TBA), 27 March (RTTY activity night, Mark, G4KUQ), 3 April ("10GHz equipment", Glen Ross, G8MWR). 7.30pm. Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol BS14 0LN. Details Len Baker, G4RZY, tel 0272 834282.
Cheltenham (CARA)—1 March (Annual constructors competition), 15 March (Natter night), 7.30pm. Stanton Room, Charlton Kings Library, Cheltenham. Details Tim Kirby, tel 36723.
Cheltenham (Smiths Industries RS)—7, 21 March, 4 April. 8pm. Club House, Newlands, Bishops Cleeve. Details Roger Hawkins, G8UJG, tel Bishops Cleeve 2175, or Bishops Cleeve 3333 ext 2511.
Gloucester (GARS)—6 March ("Colditz", G3LP), 3 April (Construction contest). 7.30pm. St John Ambulance Headquarters, Heathville Road, Gloucester.
Portishead (Gordano ARG)—27 March (Film *Air Traffic Control*). 7.30 pm. Ship Hotel, Down Road, Portishead. Details John Davies, G3LJD.
Weston-super-Mare (WsMARS)—11 March ("Technical topics", Steve Cole, G3YOL). 7.30pm. Rugby Club (off Drove Road), Weston-super-Mare. Details Dave Restrick, G4/KA0NGP, tel W-s-M 28482.
Yeovil (Y&DARC)—7 March ("Antenna radio patterns", G3MYM), 14 March ("Demonstration of 1938/9 transmitter", G3GC), 21 March ("Radiation pattern of two antennas", G3MYM), 28 March (Natter night), 4 April (Junk sale). 7.30pm. Recreation Centre, Chilton Grove, Yeovil. Sec Eric Godfrey, G3GC, tel 0935 75533.

Members' Ads

CONDITIONS OF ACCEPTANCE

These subsidized flat-rate advertisements are accepted as a service to members of the RSGB only. They must be submitted on the Members' Ad form printed on the back of a *recent* address label carrier used to mail *Rad Com* to the advertiser: this will automatically provide proof of membership and should not be more than two months old. No acknowledgement of receipt will be sent, and advertisements not clearly worded or punctuated, or which do not comply with the conditions of acceptance, will be returned. No correspondence concerning this service will be entered into.

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

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions, or for the quality of goods offered for sale. Advertisements for citizens band equipment will not be accepted.

Warning. Members are advised that they should, as far as possible, ensure that the equipment they intend to purchase is not subject to a current hire purchase agreement. The "purchase" of goods legally owned by a finance company could result in the "purchaser" losing both the goods and the cash paid.

The current rate is £2 for 40 words or less: advertisements containing more than 40 words will cost an additional £1 for every additional 40 or less words. Each advertisement must be accompanied by the correct remittance, either as a cheque or postal order made payable to Radio Society of Great Britain.

The closing date for the **May 1985** issue is **Tuesday 19 March**

Post to: MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS
Do not post to RSGB HQ or Advertising officer.

FOR SALE

FL2100B Yaesu hf linear amp, little used, mint, £239. MM144/100S 2m 100W linear amp, vgc, £75. Datong D70 morse trainer, £29. G4FGJ, QTHR. Tel 02302 4457.
TS120S, £310. PS30, £65. MB100, £10. All boxed. Strumech Versatower ground post, £100. 21in × 13in bottom section, incl winch cable, £50. CDE AR22R, £30. Shure 444D, £20. Datong rf clipper, £25. Tel 0565 873205.
Azden PC300 2m fm tx/rx, fully synthesized in mint cond, orig packing, £150. Kenwood KP202 2m fm tx/rx handheld six channels, £60. Creed teleprinter and terminal unit, incl rolls of paper, £15. G8WPM, QTHR. Tel Winchester 883328.
Solartron CT436 double-beam 'scope not wkg but repairable, with manual, £35. Telequipment type 2 × 10 probes, £10 each or £50 the lot. Marconi 1·75-16MHz rx, complete, not wkg, no power supply, £25. Buyer collects. Tel Joe, 0625 20835.
G3JKB consolidating, Drake TR7 hf tx/rx, mint cond, ext vfo, £600. Heathkit HW QRP tx/rx with Heath power supply, £100. G3JKB, QTHR. Tel 044282 6122.
HF mobile base, Yaesu FT7, mobile mounting bracket, FL110 linear, £180. TA32 Mosley 2el tribander, £70. G4KHG, QTHR. Tel Newton-le-Willows (Merseyside) 5927.
Yaesu FTV901R transverter, fitted 2m unit, mint cond, in box with leads, £180 ono. G4SNS, QTHR. Tel (Redditch) 0527 22955.
FT707, FP707, FC707, fitted cw filter, exc cond, £475. GW3YKZ, QTHR. Tel 0633 858314.
IC251E 2m all-mode base station, 15W o/p exc cond, manual, mic, large circuit diagram, £400 no offers. Reason for sale: want 2m/70cm base station. Will send by Securicor. Tel Medway (0634) 30822.
Trio TM201A 25W 2m fm mobile, cond as new, £210 ono. Adonis mobile mic, (clip on type), £15. G6DBX, QTHR. Tel 04446 48767.
Yaesu FT726R v/uhf all mode tribander fitted 2m 70cm, as new, boxed, book, mic, six months old, £850. G4URK. Tel John, Maidstone 28401.
Going QRT so, TS130S MC30S mic nar filter, very powerful unit, £385. 40A P/S, £60. Welz SP250, £45. Exc homebrew linear with pair 4-400, with SEM tranzmatch, 50Ω 500W dummy load, thrown in, £250. G4SDP, QTHR. Tel 060548 287.
FT7B mobile hf tx, £285. Linear to match FT7B, 200W, £80. 10A psu, £35. SWR, £20. SWR, £20. ATU morse key, electronic key, dummy load, plus lots of other items. Tel Julian, Reading 599876 home, 866123 work.
FDK Multi 750E 2m multimode tx in good order, £150 or part exchange for decent 28 to 144 transverter. Tel P. Thompson, 0704 74792 evenings.
TS780 dual bander all modes, as new cond, orig packing, £700. Trio 7730 25W-5W mobile, £165. G6YIO, QTHR. Please call or write.
SX200N scanner vgc with psu and manual in orig box, £165. Discone antenna, £10. Tel 0282 59320.
Yaesu FRG7 rx, £95. Trio 2300 2m portable tx/rx, nicads, charger, etc, £90. Both boxed, as new. G3VFI, QTHR. Tel Locks Heath (04895) 84092.
Yaesu FT757Gx only used as rx, including MDI base mic, £650. FT290 gd cond, nicads and whip antenna, £170. MML144/100S, used once, £100. G1AXW. Tel Chris, 0594 26211.
NAG144XL linear, one hour use only, £400. G3XNH. Tel Godalming 29757.
Yaesu FT290R, gd cond, orig packing, plus mobile mount, carrying case, flexi whip, nicads and charger, also mobile antenna and folded dipole, the lot, £250 ono. G6TNM. Tel Mike, Southampton (0703) 872451, after 6pm or weekends.
Selling service manuals for following equipment. Hallicrafters S20, £3. SX28, £6. SX62, £3. Heathkit SB301, £15. Kenwood TR8300, £3.50. KW Vanguard 2, £3. Marconi CR100, £11. 2232B, £5.50. AR88, £4.50. T1154/R1155, £10. Postage incl. Mr Small, 8 Cherrytree Road, Chinnor, Oxfordshire OX9 4QY.
Slim crank up tiltover mast 35ft wall mounting and

rotator mounting, £60. Five inch high-res green screen monitor in wood case, £30. 2m ssb tx/rx digital readout, rit, af, rf, power, controls, gd performance 144-145, £70. Tel Jim, Bournemouth 0202 518828.

LAR hf omnimatch all band incl WARC as new, £70. Triple meter swr power model rated to 500W, as new, £35. Panasonic stereo cassette recorder, perfect cond, £30. Medco 75Ω low pass filter, £5. G3OAZ, QTHR. Tel 0256 465126.

QRT sale. FT102 tx/rx, fm/a.m., cw narrow filter, £580. SP102 with 5 filter options, £35. Both as new, prefer sell together. TS510 tx/rx, six band, £120. To allow for overhaul tx ok but rx audio level low on spkr, ok on phones. PS510, psu inc, spare valves. Heathkit continuing course, three parts with model ET3100 trainer, complete with unused components and records, £60. Ultra mains/batt portable tv, fb for computer monitor, £25. Pair Wightraps for W3DZZ five band dipole, £6. AVO sig gen 50kHz to 80MHz, £20. Hygain masthead balun, £6. Matt black, square section, vertical stacking shelving, six, three foot wide shelves, £15. MFI hobby workbench, £10. KW77 rx wkg but noisy capacitor somewhere, £25. *Wanted* FRG7 or similar. Carriage at cost, delivery up to 50 miles, prefer cash and carry. G4HBU, QTHR. Tel Bristol 611093.

TET 21MHz 2-el driven mini-beam, £25. 1926 Brandes battery radio and Amplion horn LS, 1935 HMV mains s/het model 422, original cond (inc dust), both sets wkg, offers. G3ONU, QTHR. Tel 0923 676344.

Surplus PYE W30AM mid-band tx/rx only, £12. PYE PFI rx, £3. Lowe FX1 wavemeter, £18. 100mm axial fan, £4. Hi-mound HK706 key, £8. G4WCO, QTHR. Tel Don, 051-426 2546.

Super 3500 linear amplifier covers 80-40-20-15-10m, £200. Tribander TH33DX beam with balun, seen wkg, £100. Trio 520S with separate vfo, cw filter, fitted mic, etc, £350. Avo sig gen! fun! 250MHz, £35. 25amp psu 12V ex computer, £60. 5amp psu 0-20V, £30. Lafayette HA600 rx, £45. G4HZO. QTHR. Tel Burton-on-Trent 0283 217809.

Trio R600 rx, exc, as new, boxed with all manuals, etc, £250 ono. RS48510. Tel John, 0276 63311 ext 3064 (daytime, weekdays), 0276 685108 (evenings).

Rad Com 1979/84 incl, clean and complete, £9. H/B 2m linear, built-in psu, 10W in 45W out, £30. G3VRT, QTHR. Tel Chippenham 651008.

Trio TR2400, ST1 base unit, hard case, soft case, spkr, mic and spare nicad packs, £180 ono. GW8CQK, QTHR. Tel 0222 866836.

Yaesu FT757 GX tx/rx, mint cond, £625. BNOS 30 amp power supply, £75 ono. Buyer collects. G8ZME, QTHR. Tel Mike, 01-994 1249.

Wood Douglas 70cm tx 6-channel fm RB2, SU8, RB6, RB14, RB15 toneburst ptt mic built-in aluminium box with a meter, 6Ah nicads single channel or scan l.e.d indicators 700mw o/p, £90 or swap for MM432/28 transverter or w.h.y. G4GMT. Tel Huddersfield (0484) 643124.

52 IRCs value £18.20 received in payment of parts sent to station behind iron curtain. First £10 secures. 8·5in teleprinter paper, £1 per roll, buyer collects or carriage extra. G6VS. 71 Hey Park, Huyton, Liverpool L36 6HS. Tel 051-480 6603.

Yaesu FRG7700M boxed, FRA7700 active ant, FRT7700 atu, FRV7700 vhf converter, M/M 144/10 converter, antenna for vhf/uhf, less than 10hrs use, gift, £425 lot. G4VTL, QTHR as G6PLK. Tel 0209 820410.

TH6 DCXX 6-ele tribander, new never been assembled, £300. 30ft Altron wind-up tilt-over mast with KR400RC rotator, £250. 23cm UPX6 cavity linear with psu, £110. MM432/28/S transverter, £100. G6HKT not QTHR. Tel 0272 633869 daytimes only.

Standard C110E handheld tx fm case, antenna, manual, rechargeable batteries, charger, all in mint cond bargain, £135. G4XZX. Tel 038 677 727 (day) 798 evening.

FT221R Mutek front end, remote digital display, variable power o/p, manual, £300. FT780R used once, £250. No offers, G4UKP not QTHR. Tel Dave, 0785 815759 (night), 0782 813426 (day).

Armstrong A10 amplifier, preamp, FM56VHF tuner, AM44 4 band tuner, Truvox 3 motor tape deck, Goldring turntable, all in mahogany cabinet by Armstrong, with matching spkr cabinet, Goodmans audiom 12in and 5in treble, immaculate and wkg, £50. G3TEK, QTHR. Tel Basingstoke (0256) 20991.

Kenwood AT130 atu mint cond, £80. Bauer single paddle key, £10. G4DPJ, QTHR. Tel 0272 621509.

Icom IC720A cw filter, mic, £575. G3TXQ, QTHR.

Home laboratory disposal. Tinsley potentiometer, volt box, unused standard cell and comparator, lot £22. Wayne Kerr B221A 0·1 per cent bridge plus low impedance adapter, £45. WK vhf frequency standard, £12. Manuals with all Sullivan inductance bridge, £7. P/E considered. Tel Brewood 850760.

Amstrad locator. 26K converts ngr or map reference in decimal or sexagesimal to locator and reverse. Includes contest bearing, distance, score, time etc, eight parts fully menu driven and documented, loaded as protected program, £5.50. G4ZFI, QTHR as G4SFI.

Pye 2m a.m. base station converted to fm, 640 in final for 35/45W o/p, useful as linear, £22. G4DID, QTHR. tel Downland (07375) 54130.

Datong D70 morse tutor as new, £40. GM1BVD, QTHR. Tel 080622 406.

FDK430 70cm expander, £180. Hygain 18avt vertical 80-10, £30. Jaybeam 10x/y beam, £25. G4TFN, QTHR. Tel Leicester (0533) 832717.

Microwave Modules 2m/23cms transverter, (new model) 2W out, £185 ono. Metal fayre 2m 6ele, cross YAGI (new), £31. FT726 70cms module (new), £225 ono. Kenwood SM220 scope/station monitor, £215 ono. G4XHF. Tel Paul, 0293 515201 evenings.

Dragon 32k computer, Coutant 6-30V 28A psu both gwo for sale or exchange for, damaged or wkg hf tx, preferably QRP but would consider anything. GW4KWV, QTHR. Tel Pete, 0656 880723 after 6.30pm.

G2DYM dipoles. Two trap model 10-80m, £35 ono. Six trap model 10-40m, £45 ono. Half size G5RV, £6. Jaybeam combined 2m and 70cm beam, slight damage, £20. Tel Phil, Gravesend (0474) 64224 anytime.

M1ZUHO SB2M, £70. Jaybeam MBM48-70, £17.50. Handbooks, Heathkit cantenna load, HM102 power meter, HFW1 tv genr, Drake MN2000, £2 each. Mullard 437BGYA module, £5. Xtal filters, KVGXFM1078, £5.50. YTKYF90H, YF90H12, YF90F, YF90H600, £8.50 each. Relays PYG354, £2.50. GM3MGT, QTHR. Tel 0383 822932.

Yaesu FRG7700 rx, used little and as new, £210. G3NJP, QTHR. Tel Cranbrook (0580) 714482.

Drake L4B linear, very nice cond. TS430 as new. *Wanted* Ant rotator, heavy duty must be good. Any Collins radio, only gd cond please. Alpha linear required. Tel Derby 557705.

IC255E 1W 25W fm tx/rx five memories scanning etc, in original packing, £175 ono. Tel 03224 38774.

Old items. Marconi Marine tx, TGY2 similar but bigger than 1154. Large coaster roller boxed. Pile GPO telephone circuits, old car radios, Grundig Memorex unit, Admiralty battery rx B19 1·5 to 3M/cs, Edison voice writer, no con. *Wanted* Mullard scope tube E10-11GH, G3XLG QTHR. Tel 0782 311811.

HQ1 mini beam, virtually unused, perfect cond, original packing, £55. G4CEM, QTHR. Tel 0462 32990.

KW2000 ac p/s mic, handbook. Also KW dc p/s and leads, gd cond, £150. G3JEQ, QTHR. Tel 0372 52459.

Valves! valves! valves! Many rare types, 7 and 14 series, Loctal DA30, 1S5, 1T4, EBL31 etc. Please ask, I may have the one you need. Creed 444 with dial unit, £60. PCB's full of chips, 50p each. G4IOY, QTHR. Tel 01-455 0540 evenings.

HQ1 minibeam and rotator, first class cond, because installed in May 1984. Spare new spokes included. G4WDW not QTHR. Tel Bournemouth 57379.

Hallicrafters equipment. Collectors/enthusiasts. SX101A rx with matching tx HT37, and also SX24 rx. All not wkg, but complete with manuals and circuits. SAE details, G3XYF, QTHR. Tel (Driffield E Yorks) 0377 44441.

Swap my Trend telegraph and data signal analyser for a modern 20MHz dual trace scope, preferably with delay. Present cost of type 1 analyser, £1400 plus vat. G4WNO. Tel Bill, 0908 368761 evenings.

Equipment of the late G3SM. Heathkit hf tx/rx's HW101, £220. HW100, £130. Both very gd wkg cond, manuals, power supplies and spkrs. AR88D, gd wkg cond, £50. 1000 plus QSL cards over 200 countries, some pre-WW2, plus certificates, £20. G3UAS, QTHR. Tel 01-428 8505.

Eddystone rx 770R 19-165Mc/s, £100. Ex-govt R109 2-12MHz 6V with HD6V battery, £30. 3HRO coilpack 50-850kHz, £10. KW Viceroy power supply, rough, £5. 10 years *Rad Coms*, £10. All, buyer collects. G6PIK, QTHR. Tel Peter, G4VUN. 0845 567249 after 6 pm.

Storno 500 2m handheld 3 channel, with toneburst, case, spare nicad packs, charger, discharger checker, handbook, helical antenna plus some spares, xtalled S20 and R5, the lot, £40. G8AKA. Tel Reading 701163.

Microphones, Trio MC60 fitted eight pin plug not used, £20. Shure 444, £10. Reyco traps KW40, £8 the pair. KW20, £8 the pair. KW10, £8 the pair. Six off, £20. G3XNP, QTHR. Tel Waltham Cross 32434.

Pye Westminster 70cm six channel, £85 ono. Liner 2, £85 ono. G4JZQ, QTHR. Tel St Albans 34969 after 6 pm.

KD1T mobile TCR 11W scanner tone burst plus ½ and ⅞ mag mount ants, £85. 10m fm TCR RM40 plus Zitagi 50W amp, extras, £75. Buyer collects, carriage extra. G3MLP, QTHR. tel Peterborough (0733) 63851.

Datong D70 morse tutor, £35. HRT morse cassettes course, £5. Amateur radio book by G Stokes and P Bubb, £4. Collect or post extra. G4XKT. Tel Locks Heath (Southampton) 84340.

BRT400E communications rx, as used by BBC monitoring service, with handbook, 150kHz-30MHz, £60. Bell and Howell super 8 cine camera with case, £25. G4UTG, QTHR. Tel Poole (0202) 674285.

Telequipment oscilloscope type S61, 5MHz, as new cond, screen size 8 × 10cm with service manual, £110. G6IGW, QTHR. Tel Crewe 60062.

Brand new handbook with circuits for PYE pocket fone tx/rx PF2UBIIC, £5. Also Icom ICB1050 tx/rx, suitable for modification to 10fm, £20. *Wanted* BC375 transmitter. would exchange BC348 rx or cash. G3JDK, QTHR. Tel Wickersley 541606.

Amateur bands rx, Trio JR599 custom special (x), solid state, internal 50 and 144MHz converter, vgc, service manual, £150 ono, or exchange for hf tx, digital readout, one or more bands. Drae morse tutor, £35. Buyer collects. G1EMQ. Tel Seaford 89515.

R537 airband rx as new, original packing, under guarantee, £35, or ptx for small 2m linear suitable FT290. G4VEQ, QTHR. Tel Sheffield (0742) 667242 (5.30-6.30pm).

Parts sale. 500 microamp meter cal. SWR ex KW, £3. Eddy 898 dial, £9. 10m 16db preamp, £7. Cambridge audio two tone osc boxed switched, £8. Eddy 2·5in former, £4. HB160m converter SBL-1mix tuning 20m, £14. 5B/254m, £7. 6BW6, £3. G3RHM. Tel 01-423 0306.

FT102 with a.m./fm board fitted plus 102 matching switched filter spkr, gwo, £450 ono. Tel 01-697 8436.

Trio TM201A 25W compact mobile tx with FC10 remote controller, mic, spkr, six months to run on G/tee, vgc, cost £320 new, will accept, £260 ono. Tel 02993 6035.

Old mains radios, about 20, mostly wkg. Also several old tape recorders, Grundig etc. Emi disc recorder on trolley, valves test gear etc. Clearing out, reasonable offer/exchange Braun rx, W.H.Y. G6RXM. Tel Kent (0227) 264850.

Eddystone 940 gen cov rx, nice cond, offers or exchange for hf tx similar HW100. Faulty rig acceptable if repairable. *Wanted* 2mm spacing 200pf (or more) twin gang or split stator capacitor. G4ILA. Tel Lymm 2388.

Temporary QRT sale. Trio TS930S with MC60A mic, £975. Dentron 1000B hf linear, £250. Superb Swan ST3 atv with twin swr meters multi i/p, £90. Adonis AM502 comp mike, £25. C4 vertical 10/20 coverage, two spokes broken, £15. G3MIN, QTHR.

Fed up with QRM/QRN? Why not relax to distortion free hi-fi sound? Superbly powerful pair Kenwood 4-way (1 × 12in 1 × 5in 2 × 2½in) spkrs. They not only sound gd but look gd with classic elegant lines, £75 ono. G1JPP. Tel Fleet (Hants) 02514 7962.

101ZD six band fan desk mic, filter, £400. FT708 hand 70cms, charger, £150. FC902 atu, £95. Electronic keyer EK150 new, £35. 10m 30ch tx new, £30. HQ1 miniquad, 2m 8ele X-Yagi, 15ele 70cms, rotator, controller, 30ft tower and mast, £250. Buyer collects. tel 021-3730060.

KW2000 with ac psu, £100. Bencher paddle, £20. KW101 swr meter, £6. EK150 iambic keyer, £40. G-whip multiband mobile hf antenna, £20. G3EPT, QTHR. Tel Steeple Morden (925) 852384.

New digital readout module with all details for fitting to FRG7 rx, £22. Breach 1, Massey Park, Belfast. Tel 0232 63598.

Yaesu FTDX560 hf tx/rx, many spare valves, pa's driver, £200. FV400S vfo, £30. G4RJC, QTHR. Tel Upminster 04022 21523 evenings not Sundays.

CR100/2 gwo, spare valves, £30 ono. Star Roamer rx, a.m., five bands, gwo, £25 one. Corres course RAE, £20. G4LUT. Tel Grays Thurrock 72114.

TS930S. Unwanted first prize in Lowes free Christmas raffle, for quick sale, £500. Tel Dave Monk, 0629 2817.

Linear MML 144/50S, £50. Icom 10fm, £20. ADK10M inline preamp, £10. 10m 50W linear, £30. Dragon 32, Sekosha printer, cassette, software, including word processor, £220. Delivery possible Kent to Norfolk. All perfect and boxed. G4UGV, QTHR. Tel 0732 823662.

TS700G 2m multimode. Best offer over £150. G4MIB, QTHR. Tel 01-675 0280.
Heathkit aerial tower, HT-1G 32ft free standing galvanised mast, £100 ono. G3SBJ, QTHR. Tel 0293 35485.
Tono 9000E communications terminal, best offer over £200. G4MIB, QTHR. tel 01-675 0280.
Pye PF8 pocketphone, wkg on 70cms two sets xtals inc RB14 SU8, £65. Tel 021 3609307.
NAG144XL amplifier, £250. Ferguson videostar vhs macro zoom lens, £240. G8WPL, QTHR.
Trio oscilloscope CO-1303D modern small size 5MLG, £140. MM 2m to 10m receive converter, £16. G4FAS, QTHR. Tel 061-437 7784.
FDK700EX 2m fm 25W, £115. Trio JR310 amateur band rx, fault on 15m, £55. Homebrew 2m converter, £5. *Wanted* 2m linear for FT290R. G4RNN. Tel Marlow 6497.
FTDX401, mic, spkr, spare valves, pwo, £225 ono. Welz SP200 swr/power meter, boxed, £50 ono. G4NEF, QTHR. Tel 0843 594154.
48K Spectrum with DKtronics keyboard, Alphacom 32 printer, suitable cassette recorder and £50 worth of software, £129 the lot. Carriage extra or buyer collects. G4UHM not QTHR. Tel 0245 468149.
Scarab interface for Spectrum 48K rtty with split screen and single screen programs, also morse reader program, as new, £25 ono. G4RWY, QTHR. Tel Andy, (Birmingham) 021-421 3316.
KW2000A tx, KW110 Q multiplier, Shure 401A mic and spare valves, £160. Amtech CWF250 audio filter, £8. LAR antenna traps, new, £12. G3ECS, QTHR. Tel Ken 0272 622055.
Trio TR2400 2m fm 1·5W synthesized handheld tx, mint cond, original carton, c/w manual, charger, leather case, £135. Datong D70 morse tutor, £35. Carriage extra or delivery free Glasgow area. Reason for sale buying computer. GM4JRF, QTHR. Tel 041-956 4770.
Sony ICF7600D world rx, latest model 150kHz-30MHz a.m./ssb and fm, virtually unused, complete with case etc, cost £180 for £120. Tel 041-334 2811 after 6pm.
Collins Collins Collins. Do you own Collins equipment? Join the Collins owners club. Regular newsheet and list of fellow club members. Send details of equipment owned and large sae to Bob Ralph, G4KSG, 4 Leam Crescent, Solihull, West Midlands.
Collins 136B-2 noise blanker. TD1 hygain tape dipole. MP2 mobile power supply. CC2 and CC3 Samsonite carrying cases. 70E15 vfo for 51J4. Racal syncal TRA921. WW2 German rx UKW EE, offers. tel Bob Ralph, 021-743 4242 ext 13 daytime.
Racal 117 cased and (manual) Himound key. Codemaster cwr 610E reader for cw and rtty atv, and Datong broad band preamp, airmec 'phones, AEA BTI morse tutor. All in pwo, £220. Tel 0908 612280 after 8pm.
Exchange/sale. Complete r/c aeromodelling set-up. Two sets of Fleet gear with four flight packs, unflown aircraft, power and gliders, kits, new engines. s/h value approx £1,400. Want radio/computing, but not 2m. Tel Winchester (0962) 66739 evenings or weekends.
MMA144V rf switched preamp, £19. MMS384 384 MHz source, £15. MMC144/28, £13. MMT144/28 tatty but works ok, £45. Project omega: CIFPU, complete board, no controls, £35. Logic/antenna switch (pcb only), £3. QRP pa (pcb only), £2. G4FRE, QTHR. Tel Dave, 0394 271622.
Various 2m equip. KDK vhf mobile model FM2016A 144/148, £130 ono. Transverter m/m 144 ssb, £70 ono. P/S for above, £15. Various 2m ant, all pwo, the lot, £200. G4VKX not QTHR. Tel Lowestoft 730523.
Datong D70 morse tutor gd cond, £35. ATV microwave modules converter, 435/600, unwanted gift 11 months guarantee to run, £20. G4PQP, QTHR. Tel 0263 511978.
FT200, TR120S, both complete, wkg. M280K, very little use, 2732 Eproms, £300. G3KJX, QTHR. Tel 0609 2702 after 7pm.
Collectors: WS19, 22, 38, R1155, TR1143. *Wanted* German WW2 equipment, parts, manuals. Buy or swap, w.h.y? Will be in UK by car OZ8RO. R Otterstad, Vejdammen 5, DK-2840 Holte, Denmark. Tel 02-80 1875 home, 02-973366 work.
Rad Com 1978/83, *Elector* 1-36, *HRT* January 83-June 84, *Ham Radio* 1975/6, *VHF Comms* 1969/75. *New Scientist* 1978/84, offers. Tektronix 180A, 105, 107, untested, £5 each. Pye car stereo booster, £10. 70cm 46ele multibeam, £10. Buyers collect. G3ZMD, QTHR. Tel Luton 24448.
Complete package for hf and vhf radio amateur. Detached three bedroomed house, mock Georgian style, freehold, 6yrs old with garage, exc decorative order; with TA33 Junior tribander, Kenpro 600RC rotator, tilt-over mast, 26-40ft. Separate 34ft vhf mast with Jaybeam C5 colinear and full size G5RV 14SWG hard drawn copper wire antenna. Small bedroom fitted as shack. To include all above, fitted carpets and curtains. Near Swansea and Gower Peninsular, for quick sale, £27,500. GW4MTY, QTHR. Tel 0269 844061.
Oscar 10 antennas, Jaybeam 10x/y for 2m Jaybeam 12x/y for 70cm, complete with KR500 elevation rotator, £175. Also, Trio R1000 rx, £185. MM 2m converter, £15. Jaybeam MBM48/70, £25. Datong morse tutor, £38. G6ZEK, QTHR. Tel John, 0782 721395.
C58 c/w nicads, £175. Welz SP400, £50. Toko HL30V 145MHz linear, £30. 8/8 mobile whip, £10. Sabtronics 8610A DFM, £55. TF995 s/g, £25. C/W manual, W & D 70cm synthesized tx, offers. Having clearout many other goodies, psu's etc. G6DTT, QTHR. Tel 01-840 3663.
Trio R300 gen cov rx exc cond, £85. AR88D almost mint, £75. Eddystone EC10MK2 mains/battery psu, manual, £65. Avominor Mk5 mint, £17. Hitachi colour video camera, VK/C770E, manual zoom, mint, £220. Tel Ken or Ray, (Basingstoke) 0256 56732.
Racal 117E rack mounting, manual, perfect, £225. Hammalund SP600 super pro, manual, gd cond, £185. Rack cabinet 19in approx 4ft 6in, gd cond. £25. G6XNC, QTHR. Tel 01-462 4461.
Toshiba colour monitor 14in RGB i/p, no case, wkg on my BBC ok, £75. G3BDK, QTHR. Tel Towcester (Northants) 52309.
Tower 40ft heavy duty telescope tiltover with mounting post and winch, ready for pick-up in Whitstable, Kent, £190. *Wanted:* 70cm ssb/cw equip suitable Oscar 10. G4LQI, Tel 01-852 3594 Tues to Friday, 0227-266 480 Saturday, Sunday, Monday.
Yaesu FRG7 comm rx, exc cond, £110. Q6 (2m) quad antenna, £18. 48ele (70cm) multibeam antenna (MBM48), £18. G8YOS, QTHR. Tel Harrow 01-422 8833 evenings.
Microwave Modules 28-144 transverter, this unit hardly used cond, and performance as new, £75. Icom IC255 25W mobile, £150. AOR 140/150MHz hand-portable, £85. Marconi 2951 radiotelephone test set, 12 months old. G4OBN, QTHR. Tel Stewart 02568 3528.
Yaesu FT77 100W tx/rx, only four months old, genuine bargain, includes MH1B8 mic with scan facility, £400. Also, Shure 444D, £30 or £420 for both items. Nearest offer secures. tel Mike, 051-645 7996.
Ferguson 14in colour tx (swop for Commodore monitor), 30A reg 13·8V power supply (over voltage), current limit, £60. FT902DM, £550 ono. ATU to match, £80. *Wanted* Top section for converting P40 to P60 linear (hf) w.h.y? G4KD2, QTHR. Tel Tony, 0375 78783.
Autek QF1A ssb/cw filter, as new with instructions, £45. *QST* beautifully bound, 18 volumes each covering six months period between 1939 and 1958, period January 1949 to December 1953, is complete, £15. Buyer collects or delivery at cost. G3AAE, QTHR.
Microwave Modules transverter 70cm/2m, £110. Icom IC240 2m synthesized fm mobile, £80. Pye Westminster W15V 70cm bootmount SU8, SU18, SU20, RB10, RB11, one spare. Auto Toneburst Ambit preamp, £80. G6IAF, not QTHR. Tel 0482 651827.
FDK Quartz 16 10W 10 channels, psu mobile mount gd station for, £85. Star SR200 amateur band rx vgc, £30. VHF Tetrode 5894 (rugged QQV0640) new, £10. *Wanted* Zycom 7500. NEC CQP2200E, TS7300, IC215 or similar. GW4PVK, QTHR. Tel 09747 281.
FC102 atu with antenna select facility fitted, select any one from four antennas, boxed, vgc, £150. G4PVN, QTHR. Tel 0642 587134 evenings.
70cm Standard C78 1W mobile/portable rig, hardly used, case, nicads, charger, £160. Trio 120 vfo, never used, original packing, £50. G4LJZ. Tel Wells (Somerset) 0749 77250.
High voltage psu 1000V 0·5amp, mercury rects, two units at £35 each. Also, 3-speed MSS studio disc cutter, variable pitch traverse, offers. Carriage TBA items viewable North London. G4NLF, QTHR. tel 0277 822527 before 8am or after 6pm.
Marconi 600Ω variable attenuator, £5. Cossor 4in CRTs 89 series, £4 each. Collectors items: General radio oscillator 65 to 500MHz, £12. Gee Navaid atu, £6. All ono. Cooper, 11 Radical Ride, Wokingham, Berkshire. Tel 0734 734312.
ITT (marine) ex ships auto morse and sos sender, as new, £25. TBS8 wartime rx, £20. TR8300 uhf t/r, as new, £180. Lambda psu 24V 14A, £20. Meters, transformers. *Wanted* dual xtal 100/1,000kHz for class D wavemeter. QTHR. Tel Barnes, 0229 54466.
ZL special 12ele 2m beam as new, £20. 8ele Jaybeam 2m Yagi, £8. Buyer collects. G6SXB. tel March 0354 740660 after 4.30pm.
FT290R Nicads, charger, desk-mic, Mutek mod, £220 ono. MM1296 2W transverter, £150 ono. 4 x 23ele 23cm tonnas, £100 ono. MM30W amp with preamp (144MHz), £45 ono. G6RDX not QTHR. Tel Lymington (0590) 79680.
118 receiving valves in boxes, as new, will sell in one lot. List can be made, three boxes approx split. G4MUX. R Pritchard 171 Somerfield Road, Bloxwich, Walsall, West Midlands.
Daiwa automatic atu (500W PEP), £80. 12in high res. Green monitor, £45. Video Genie 48k, RS232, disc 8 printer interface, joystick, sound synthesizer, S100, £250. Selection of V/G/TRS80 software, books, eight add-ons, ssae. G4CVZ, QTHR. Tel 051 220 5470 weekends only.
Microwave modules 2m to 70cm tripler, £15 ono. 70cm to 10m receive converter, £15 ono. Both are old models. Large number *Practical Electronics* 1971/83 and *Electronics Today* 1974/79, 75p each. Sae all enquiries. G6MXL not QTHR. 45a Lulworth Avenue, Poole, Dorset.
Trio TS430S with fm board, plus PS430 psu, three months old never used, £800. G4ODK not QTHR. Tel Basildon 418058 evenings/weekends.
Heathkit HW7 cw only, clean condition, QRP complete with key. Tel Dave Burnham 64567.
FRG7000 communications rx 0·25-29·9MHz, built-in 24hr clock/timer, £190. TS830S all amateur band hf tx with AT230 matching atu, £690. FT290R 2m portable multimode with case, nicads and charger, £210. All in gd cond. G4CUS, QTHR. Tel Battle 3205.
Telequipment Oscilloscope, S51B approx 7 x 8 x 13in, graticule 4·5 x 3in, single beam, £30. Homer radio transistor with self contained battery compartment BC and NAV, completely waterproof dessicator, complete with bulkhead fitting, £7.50. G3BDK, QTHR. Tel Towcester 52309.
BRT402E gen cov communications rx, 150-350kHz, 550kHz to 33MHz, wkg order with spare valves and handbook, £60. *Wireless World* 1949 to 1982, offers. G8AKM, QTHR. Tel Newbury (0635) 43501.
Trio TR9000 145MHz multimode, 10W mobile tx/rx, £275. Trio TR9500 435MHz multimode, 10W mobile tx/rx, £300. JIL SX200N vhf/uhf rx 26/88MHz, 108/180MHz, 380/514MHz a.m./fm 12VDC or 240VAC telescope or external aerials. Green display 16 memories, £150. G6JXA. 01-648 0028.
IC202 2m ssb tx with nicads, carrying case and original packaging, £100. Homebrew 2m and 70cm transistor ssb tx, 1·5W on 2m, 5W on 70cm plus 50W 70cm linear, and MM432/28 rx converter, £160. G8IXK. Tel Luton 584280.
IC25E 25W fm mobile, £275 or exchange for multimode 144MHz, eg FT290/FDK. UHF Cambridge boot mount, £25. Datong morse tutor, £35. Grundig 1400 Satellit RxR, £150. IC2/4E leather case, £3. Ken, G4UQN. 14 St Peters Road, Wisbech. Tel 0945 61029.
R1155N rx, R103 WW2 rx, "Star" SR550 comm, rx 1·8-54MHz, all with handbooks, 500W isolation tfmr, offers. R Mense, 14 Oakcroft Road, London SE13 7ED. Tel 01-852 4759.
144MHz linear parts. A number of 4CX250 valves, bases, lines case etc, £30. G3AOS. Tel 061-969 9305.
Back issues of *Rad Com, Bulletin* 1956-84, few missing, offers. Back issues of *Short Wave* Mag 1968-84, few missing, £15. G3AOS. Tel 061-969 9305.
Icom 2E and case, as new, under guarantee, £125. MM 30W linear, £47. Swr and power meter, £8. SCC R357 airband rx, £35. All gear in good mint cond. G6XYZ, QTHR. Tel Radcliffe on Trent 2327.
Swan 100MX tx, £250. Atlas 210X tx, £225. Take QRP P/EX w.h.y? Audiologic hi fi bookcase amp tuner cassette, cheap, offers. 35mm Kowa camera, 50mm lens 1·8, £20. *Wanted* Desk mic, Yaesu FT301 atu and/or any other accessories. G3MXO. Tel 021-788 0518.
WW2 wireless set, No38 mk2 complete with ant, headphones, throat mic, j-box, valve kit, CCT, diagrams, gd cond, £40. Buyer collects or arranges. G1DVZ. Tel West Drayton 421398.
Liner 2 2m ssb 10W out, preamp fitted, new mic insert, variable xtal oscillator controlled 144·000-144·335, recently professionally overhauled at great expense, £80. G4XFV, QTHR under G6UBQ. Tel 0734 872366.
AR2001 scanner 25 to 550MHz, only three months old, £290. Realistic Tandy DX302 rx, their top model with frequency readout 0·01 to 30MHz, perfect, inc atu, £150. G4XRU, QTHR under G6TGK. Tel Worthing (0903) 690415.
FT102 TCVR immac cond, only 10h use from

new, (house move), with fm board, £525. FT290R TCVR Mutek F/end with nicads case and charger, immac cond, £200. Morse autokeyer with memory and paddle, £50. G4EVK, QTHR (1985). Tel Nottingham 812287.

Eddystone 730/4 rx manual, some spare valves, £75. Tel Bath 330588 after 2.30pm.

Sony 2001 with mains power supply, £90. Ambit FC177 DFM module, £25. Trio 9R59DS, £25. Panasonic RQ443DS radio cassette 2·3 to 22MHz and mw, £20. All ono. Egerton, 35A Franklin Road, Brighton. Tel Brighton 608514.

JIL SX200N scanner, 26-51MHz, all accessories vgc, £185 ono. Inc p and p or exchange with cash adjustment, for Trio TM201A 2m mobile. Sony HVC 2000P colour video camera, all accessories, tripod, converters etc, offers. G6MUK not QTHR. Tel 0837 3207.

Yaesu FT707 boxed, exc cond, covers 80-10, manual and mic, £330 ono. Oskerbloc swr/power meter, £25 ono. Tel Boston (Lincs) 57410.

Rad Com May 1966 to December 1980, offers by volume. BC453B rx 190-550kHz, offers. Jaybeam antennas 2m 5el Yagi, £5. 6el quad, £15. G8IEM, QTHR. Tel Hayling Island (0705) 466825 after 7pm.

Icom IC720A, gen cov tx/rx, £600. ICPS15 psu, £100. MML 432/50 linear, £100. Dressler Masthead pre-amp GaAsfet plus interface, £60. G4TTQ, QTHR. Tel Bob, Brentwood (Essex) 228134.

FT102 owners look! I have one only new cw, ssb, a.m. filters for the FT102, £12 each or £30 for the three. G3SED. Tel 0705 591057 after 6pm.

Icom 25TE 2m base multimode ac/dc, as new, £465. BNOS linear LPM144 10-180, £195. May accept FT290R as P/EX for 251E. Microwave modules transverters MMT70/28, £95. MMT28/144, 10m out, £75. Wideband 100W hf linear, £70. G4RNI, QTHR. Tel 0632 381441.

Bargain. Astro 200 mobile rig, includes mic, leads, h/book, unused, £200. Plus ac psu, £50. Also Trio TS700 2m rig, £150. Will consider part exchange or cash adjustment for 20/30W multimode 2m rig. Brian Silverman, G4CSB, QTHR.

Leak stereo 70A 35W per channel, teak case, looks and works like new, orig packing, £27 ono. Pye 2277 car cassette player with spkrs, current prodn, hardly used, vgc, £14. G3XSJ. Tel Bristol 0272 685280.

Quitting vhf/uhf. All units recent and unmarked, Yaesu FT726R with hf, 144, 432 and satellite modules, cw filter and Mutek preamp, £950. Icom IC251E with Mutek front end, £450. MM 50W 432 linear and preamp, £85. SEM 100W 144 linear and preamp, £75. SEM power unit for both linears, £33. Hansen FS7 144/432 swr/power meter, £33. G2RO, QTHR. Tel Kingsbridge (Devon) 580616.

Icom IC260A 2m fm/ssb 143·8-148·2MHz 10W o/p, £250. MM2000 rtty to tv converter, slight fault hence, £100. RTTY ttl level terminal unit with filters, £60. Similar to ICS RM-1. *Wanted* TR9130 AMT-2. G6HQK not QTHR. Tel Wolverhampton 69285.

70cms 50W linear Tokyo labs HL45U as new, £95. Welz SP350 dual sensor, hf/vhf/uhf power and swr meter, £55. 12V regulated psu 7A o/p ex-computer unit, £15. Datong RF speech processor, £18. G4YBU, QTHR as G8FIH. Tel Tim, 01-394 1499.

Microwave Modules morsetalker MMS1 in immac cond, ideal aid to obtaining the 'A' licence, cost new, £115 bargain, £75. G0AMA, QTHR as G6VBI. Tel 0980 23062 after 5.30pm.

70cm TR3500, handheld in February issue, too late for January. If not sold will swop for 2m TR9000 base station. G4KFW. Tel 021-357 2009.

Good clean liner 2 144 ssb tx/rx Piptone, £60. Mutex SLNA 144S pre-amp, £20, or exchange good Sphinx 160/80/20 tx. G4XSM. Tel Bury St Edmunds (Suffolk) 68084.

Cleartone fm base station (Australian) in 19in case, as new cond, high band, £120 plus carriage. GW8HWS. Tel 0446 760802.

R106/HRO, US Army signal corps, 1944 coilpacks for 500kHz to 30MHz, £45. HRO coilpacks 1·7-4, 3·5-7·3, 7-14·4, 14-30MHz, £3 each. Buyers view/collect. Can anyone help with information on Labgear hf tx/rx type LSM100P please? G4NCE, QTHR. Tel 021-357 6139.

Property of the late G4BKU. Ten-tec Omni D and 252 psu remote VFO and 160m with filters, £475. FT101 vgc and LLLFM converter, £260. SB200, £200. FLI filter, £30. KW109 atu, £60. KW160 atu, £25. TR2200, £50. TH3, £50. G3TKF, QTHR. Tel Keynsham (02756) 3965.

Kenwood PS20 psu, exc cond, £35. Kenwood PS30 psu 20A 13·8V, £60. Remote VF0120, £50. Mic MC60, £30. All in gd cond. Buyer collects. G4MBP, QTHR. Tel Cheltenham 527651.

Trio 120S hf tx 200W PEP, Trio 35S mic, Trio PS30 matching psu, mobile connecting lead, with manuals and boxes, bargain for someone wanting compact hf station, £370. G3XFB, QTHR. Tel 0902 850033.

Weston model 692 oscillator (sig gen) circa 1930, complete with coils and cal. chart, £10. Ruhmkorf coil 4·5ins spark mod 240Vac 130kV, £25. BC453 rx unmod dynamotor, £10. Radio compass, £5. Hammarlund HX50 tx, £25. Buyer collects. G3EHM, QTHR. Tel Stoke on Trent 397240.

Swan Astro 150 tx 80-10 235W PEP microprocessor, controlled variable rate scanning, full break-in, narrow filter, £300 ono. Robot 400 sstv slow to fast converter, £300. No offers, both plus carriage. G4GOZ, QTHR. Tel Eric 0282 813530.

Icom IC215 fm portable 15ch, xtalled for 14, S18 to S22 plus all repeaters, rubber duck mod, £65 ono. GW1IFC. Tel 0443 223275 after 7.30pm.

Heath HW100 with HW101 mods and cw filter, SB610 monitor scope. SB650 digital frequency display, SB600 mains psu and spkr with manuals, leads, package deal, £200. G3TFM, QTHR. Tel Stratford-on-Avon (0789) 294055 after 6pm.

Shack clearance. Airmec rf sig gen 30kHz-30MHz, exc cond, manual, £75. KW202 rx, nine bands Q multiplier, notch filter, manual, suit swl, £75. Mains transformer 20-0-20V at 20A, £10. Other items. G4VUX. Tel Watford (0923) 776254.

£22,500 vacant 3 bed semi with garage near M62, West Yorks. Superb take off, planning permission and 33ft tower 670° asl, close to golf course and amenities. G3VQQ not QTHR. Tel to view, Mr Ingham, Bradford 672973.

KW2000B with power supply, mic, handbook, pwo and in mint cond, never used mobile, with extra xtal for 10m, a bargain, £210. G4RUJ. Tel Paul, Clacton-on-Sea (0255) 431435.

AR240 2m fm synthesized handheld 140-150MHz, 1W, nicads, charger with 10W homebrew amp, £100. NR56-VF1 2m monitor rx 12ch (7 installed) and vfo 144-146MHz, £30. G4GYO, QTHR. Tel 09274 21732.

Trio TR2300 fm portable nicads case charger, £95. GHLLG, not QTHR. Tel Warrington (0925) 825573.

CPU2500R 2m rig and mic YM2500L, £100. Filter, swr meter, psu car aerial, £28. Kenpro rotator, controller cables, £80. TET SQYO85 aerial, £20. HFS and radial kit, £60. Two sets wall brackets, £20. Transverter MMT144/OS, £70. G4PJV, QTHR. Tel 066478 347.

Offers invited. FT707, FC707, FP707, FV707, FDK morse keyer, bencher key KR600 rotator, 50 and 80W 2m linears, FT480R, standard C78, linear and MMNT, 60ft versatower. 4ele tribander, various 10m antennas, voice processor, Telequip 551B scope, many other items. Tel Barry, 0483 810590.

Welz SP15M meter, mint cond, £29. *Wanted* 2xSK620A bases for current project. Also Bird Thruling 144MHz, 1kW element. G6HKS, QTHR. Tel Wisbech 584640.

FT726R tx fitted with both 2m and 70cm modules, as new, £850 or offers. *Wanted* 5CX1500. Tel 0207 570352.

Icom IC490E 70cm all mode, little used, £395. Drae 12A power supply, £60. MML144-S linear amp, £90. Yaesu FT203R 2m h/held, £40. G8ZTQ, QTHR. Tel Windsor 57882 evenings.

Kenwood Trio 9000 multimode cw BO9A base vgc, £250. Matching power supply with spkr, £20. Sony ICF 6700L gen cov rx ssb-a.m.-fm, as new, £100. G6ZJP, QTHR. Tel Trowbridge 68165 after 6pm.

KW107 supermatch with instruction manual, purchased new, one owner, reason for sale, now obtained atu including top band, £100 ono. Buyer collects and inspects or pay carriage. G4LHI, QTHR. Tel Huntingdon, Cambs. (0480) 52304.

FDK Multi U11 70cm fm mobile, £95. Icom IC30A 70cm fm mobile, £90. Hewlett-Packard 175A DB scope, £95. Marconi vhf sweep generator, with plug-ins, £150. Various C mount tv lenses, 40ft Versatower, £250. MTV435 tv tx, £120. G8AYN. Tel 045 55 57790.

RXs Nems-Clarke 1302 vhf/uhf 50-900MHz, £125. Eddystone 770V/2, £70. Eddystone 770R, £50. Above with manuals. Scopex 456 oscilloscope, £40. MM 2m converter, £15. Signal R517 airband rx, £35. G6NYL, QTHR. Tel Market Deeping 345293.

FT757, FP707, FC757AT, complete station, scarcely used, £735. Splits considered. Morse and rtty reader MBARO contains own display, £100. Literature packing complete. Prefer demonstrate and collection. Vibroplex lightning bug in original cond (worthwhile offers invited for this item). Consider TS520 as part ex on station. Tel 0442 59970.

CR100 rx 60kHz to 30MHz (WW2 vintage), some mods, with manual, £13. Vero KM4C double eurocard frame, £10. G8ISI, QTHR. Tel Liphook (0428) 723168.

Leader model LDM815 transistorized dip meter, covers 1·5MHz to 250MHz, mint, boxed, £32. Oric 1 48k mint, boxed, £70 ono. *Wanted* MM4000 (not MM4001KB). G4JLV, QTHR. Tel David, 01-954 9180.

Icom 25E fm mobile, unused in box as new, also 5⅛ whip gutter mount, new, £210. G4CBO, QTHR. Tel Castle Rising 489 evenings.

KW2000B hf tx 160-10m with matching ac psu, all in immac cond with manual and boxes, £230. Also AR88D gen cov rx in gwo and manual, £35. Trio 2200GX 2m fm portable tx fitted with xtals for 12 channels, complete with telescopic and helical antennas, ever-ready case and shoulder strap, Nicads mains charger, with manual and box, as new, £115 ono. G3XFB, QTHR. Tel 0902 850033.

T4188 QRO aircraft transmitter, hf with two 4 x 150 chimneys, motorised, rollercoaster, blower, £30. 500kHz distress transmitter with handcrank gen, £30. ITT vhf starphone unconverted with case, nicad manual, £30. *Wanted* 2C39 or similar valves. G4RUL, QTHR. Tel Eastbourne 503618 evenings.

Yaesu FRG7000 digital gen cov rx, mint, £150. SX200N scanner, perfect boxed, £175. Belcom LS20SE handheld case Nicads charger, £95. HQI with Balun, £65. *Wanted* Dentron MT3000, Tokyo HC2000, Shure 444T, 2m mobile rig, Datong FL3. G4EMG, QTHR. Tel 01534 3460.

Monitor scope, KW/DECCA with two tone oscillator plus manual, £60. Scarab MPTU-1 rtty terminal unit, complete with interface board plus rtty programme for Spectrum 48K, £80. G3UQZ, QTHR. Tel 021 373 8806.

FT290R nicads, case, £190. AOR30 linear, 20W out, £25. Mutek SLA144S, £25. Datong D70 tutor, £28. 12V 5A psu, £8. FT200/FP200 (black), £210. AC22 rotator, £35. 2m 10-el Yagi, £5. G6BFS. Tel Chris, 0228 41222 office, 0228 31033 home.

FDK multi 700E, multi channel 12·5kHz spacing 25W 2m tx/rx, complete with mic, manual and mobile mount, little used, £150. BL40X 50 1-1 Balun 1kW, £10. SWR bridge 3·5-150MHz, £12.50. G3XSZ. Tel Reigate (07372) 46051 after 7pm, or weekend.

Kenwood TS5305 mic, h/book, immac, orig packing, £450, carriage fwd. G3CDC, QTHR.

Drake accessories. MN2700 2kW atu, £195. RU7 remote vfo, £95. SP75 speech processor, £65. Microwave modules MMC144/28 2m converter, £15. LAR linear OMNI match, £10. Jaybeam 2m 14ele, £15. 2m 10ele parabeam, £10. 70cm 88ele multibeam, £10. Datong RF clipper fitted with Wood and Douglas K/T tones, £25. Buyer to collect antenna, others postage extra. G3WHK, QTHR. Tel 01-3350 5795 after 6pm.

FT726, with 2m 70cms and satellite modules, very little used, current price £1,209 asking price, £850. Tel 0482 802706.

TR7 Drake with PS7 psu, and MS7 spkr, full manual 500Hz cw filter, very gd rig, £850 ono. *Wanted* Argosy 2 or 10 tec omni. Jackson, G4HYY, QTHR. Tel Todmorden (West Yorks) 5342.

FT230R 25W 2m fm tx, £220. FTV901R 2m transverter, £130. BNOS 100W linear, £85. 10 ele parabeam, £35. 12V 12A psu, £35. Welz SPISM, £35. ZX81 16k keyboard, £50. Exchange for FT290, FT790 monitor scope for FT101ZD. Tel Lapford (Devon) 471 evenings.

Viscount electronic church organ Domus-8, as new, illness causes sale, cost £3,200, would exchange for new receiving equipment, if any dealer interested. Mr O'Connor, Tel Northampton (0604) 402861.

Robot 400 with 'interface' three colour memories fitted professionally. Robot 800 keyboard, sstv rtty various speeds and Ascii 110 bauds, also cw, seeking offers which might be sufficient to contribute to purchase of very expensive Robot 1200C. G3CDK, QTHR. Tel 01-647 1866.

23cm home brew beams, £10. 70cm 18ele beam, £15. Pye olympic 12ch, £30. Reel to reel, £5. Vox loud spkr telephone, £30 ono. Old sig gen, £5. Lots of radio mags, £5 ono. 4m transverter 2m if, £120 ono. Tel Watford (0923) 662567.

Going QRT. FT101 Mk2 tx fan, Shure 201 G3111 clipper, spare valves, £250 ono. Hamtower, 30ft lattice mast, needs base grillage, £100 ono. TH3 jnr tribander with balun, £75 ono. CDE40 rotator and 100ft control cable, £75 ono. Arrange pick-up. Tel Coventry 471841.

Two 0·5in reel-to-reel video recorders with tapes and manuals, Shibaden SV620 colour and Sanyo VTR200E mono; offers please. Free to good home, most parts for Shibaden SV700. Tel Nick, Swindon (0793) 641988 evenings or 641932 day.

Trio 2300 with case, nicads, charger, £100. Icom IC24G with remote head, £110. Trio DG5 digital display, £90. Heath IM17U voltmeter with case,

£30. Akai CS34D stereo cassette deck, £40. G3UCE. Tel Hest Bank (Lancs) 822125.

Keyer based on G3RVM design published *Rad Com* Feb '80, featuring iambic squeeze operation, cmos, internal PP3, dot-store, auto inter-character spacing, integral Brown Bros paddle, heavy base, £40. G3RVM, QTHR. Tel Newbury 0653 66037.

Trio 9130 multimode, exc cond, comp with mic, mobile bracket, swr meter, instruction manual, power supply and Securicor delivery, £400 ono. G8ZUS. Tel IoW (0983) 295275.

Murphy B40C rx, £35. *Wanted:* AR88D wkg or not, for rebuild; 19-set psu vib/dyno, commercially-made psu for R1155N rx. M Cleaver, 86 Main Road, Dovercourt, Harwich, Essex CO12 3LH. Tel Harwich 502195.

FDK Multi-700AX 144-8MHz fm, 100kHz, 10kHz tuning and 5kHz shift, single memory and recall, repeater shift ±600, 25W, toneburst, reboxed, unmarked, £125 incl delivery. G1IAI, QTHR. Tel 0983 529953.

Yaesu FT230R 25W mobile, boxed, as new, unwanted gift; also, gutter clip with cable and connectors, with whip fold ant for the above, new condition, £200 ono. G4PJY. Tel Oakham 2721.

On behalf of G8WNP, temporarily QRT. IC251E, £400. FRG7700, £300. Sharp MZ80K (48k memory), monitor and built-in rtty option, plus much software. Tel D Waterworth, 0734 875373 ext 457.

WANTED

Xtals for Motorola Triton Marine vhf channels 17 (45·150 fundamental), 28 (46·866), 37 (45·483), 72 (45·075), 88 (46·875). G3WHC, QTHR. Tel 0300 20675 weekends.

Courier CTR-1 circuit diagram please to copy. All expenses paid. G3RHM, QTHR. Tel George, 01-423 0306.

Large tower/HD Versatower, heavy duty linear, 40m monobander, bencher paddle, SP230, pair new 3-500Z. Tel 0565 873205.

Swan Astro 103BX. G2KF, not QTHR. 1 Nathan Close, Newquay, Cornwall TR7 25P. Tel 063-7378741.

Pre-1940 domestic radios, service info on German domestic radio Siemens 14W, valves EL11 EM11. Early 1930s valves. Sets of knobs, books, magazines. Any information relating to broadcasts from Radio Normandie and similar stations. G4OOW. Tel Hinckley (0455) 612091 after 7pm.

Ham Radio Today required by collector. The following issues, Jan 83, Aug 83, Sept 83, Nov 83, Dec 83, June 84. Also the first issue of *Amateur Radio.* I will pay your price. G1IMR. Tel T. Smith, 0326 280 470.

Telescopic tower 35ft extended, also 10-15-20 full size beam with suitable heavy duty rotator. G4WXD. Tel 0823 442512.

Yaesu FC902 antenna tuner in gd cond. G4PJU, QTHR. Tel 0274 637972.

Oldest ancestor of *Rad Com* was born July 1925. Endeavouring to complete collection, I require July 1925 to December 1926 inclusive, also July 1933, January and February 1934, November 1972 and August 1982. GM3AYR, QTHR. Tel 0334 54105.

Icom IC402 portable 70cm ssb tx, also ICSM2 desk mic. G6LRY, QTHR. Tel Chris, (Wantage) 02357 2205, evenings.

Information. Eddystone 640S rx, circuit, manual, any information welcome, loan or purchase, all letters will be answered. G4KBZ, QTHR.

SP101B Yaesu extension spkr cabinet for FT101B, will accept without loudspeaker but cabinet must be in reasonable cond. G4EPA, QTHR. Tel 0788 822750 after 6pm.

Eddystone S-meter, black crackle, or parts thereof. Acos xtal mic. G3KXF, QTHR. Tel Lancing (Sussex) 0903 764599.

Bird 43, elements required, ranges L or M. Cash payment. G4KCT/G8SFI, QTHR. Tel 0904 59861 ex 294, office. 0904 411864, home.

Two eight inch disk drives. IBM soft sector format 128 bytes per sector, (single or double density). Preferably cheap, as student. Graham, G6UTK not QTHR. Tel 0225 330617 evenings.

FV401 external vfo for FTDX401 TCVR. Also, copy of circuit diagram and possibly manual as well, for Marconi TF2201 oscilloscope. G4TSH, QTHR. Tel Penzance 68788.

Top price paid for exc cond MK123, MCR1, WS62, WS8, WS28, B2 psu (wkg), Paraset, w.h.y?, I have AZDEN 6m brand new UP 4500, 10 memories, scan, t/tone, sale/trade. Tony Grogan, WA4MRR. 5 Rollingwood Drive, Taylors SC 29687 USA.

IC22A TM280FM or similar, collect anywhere Scot, Wales, England, Holland or Belgium. *For sale* WS38 Mk3 circuit and info, no mods or bits. Valves for RF24 unit and case, chassis. G4EUW, QTHR. Tel Brightlingsea (Essex) 020630 3071.

FV301, external vfo for Yaesu FT301 tx/rx. Non-working HRO rx's or parts for spares, cond unimportant. Also original HRO power supply units and spkr units. Tel St Albans 39333.

Heavy duty tower. Can collect and dismantle if necessary. Also Trio TS700 tx. T. Price, Pen-yr-allt, Llanddeusant, Holyhead, Anglesey LL65 4AE. Tel 0407 730636 after 6pm.

HAG 144MHz 7el antennas, cash waiting. G4MVR, QTHR. Tel Vaughan, 01-851 9085 evenings.

Condenser reformer for Mk123 spyset. 51/1 miniature transmitter. Icom ICB1050 in any cond for spares. G4RJC, QTHR. Tel Upminster 04022 21523 evenings not Sundays.

KW2000 B or E model, in gwo, any mods well documented, 2m all mode tx/rx. G2DCF. 16 Himley Road, Clayton, Manchester M11 4JF.

Icom 402, Might consider FT790 if no 402's available. G1DRC. Tel Sheffield 381781 evenings.

Three element beam, TA33JNR, TH33JNR or similar. Plus heavy duty rotator. Both must be in gd cond. G4TYS not QTHR. Tel Rampton (Notts) 8080.

HF linear homebrew or components also considered. HF mult-ele beam. Manual, circuit for advance oscilloscope OS25B, not OS250. G2AQJ, QTHR. Tel 0722 25929.

Drake L4B linear amplifier or similar. G2ACK, QTHR. Tel 0342 21221.

Circuit diagram of Marconi sig gen, TF144/G/4 to buy or borrow for copying. GU8GGC, QTHR.

B2 or A Mk3. Would be interested in any of the suitcase or resistance sets, spares, manuals in any cond. G4OFO. Tel 01-9492317.

Valves, type BW1124, BR1126, BW1121 as used in RF industrial induction heating, closed circuit tv camera and monitor, microwave intruder alarm. G3SMK, QTHR. Tel Earlswood (Warks) 3423 after 7pm.

GEC courier, type RC550TR 3-channel handheld thought to be low band xtal, information or photocopy, handbook/circuit, will pay costs. Also information on rx conversion of ITT Starphone to 70cm and problems. G1BWW. Tel 0462 711500.

Belcom liner 2, or liner 10 2m, or 10m tx/rx, w.h.y? G4RNW. Tel 0730 61859 anytime.

SB 220/200 linear, or similar and Robot sstv unit. Also has anyone a program for a Spectrum to produce large text 4 lines of 9. G3GRX, QTHR. Tel 0768 64890.

Kokusai MF455-10K filter with USB-LSB xtals, if possible or alternative filter for G2DAF rx. Dial lamp BRKT fitted over S meter aperture on AR88. G3ESB, QTHR. Tel 0332 67 1536.

YG88C 500MHz cw filter for TS820, also, wide spaced air variable capacitors, one 500pf, one 350pf and one dual section 200pf air variable capacitor. G4MQF, QTHR. Tel 0272 676269 after 6pm.

For Brighton club: hf triband beam, 144MHz contest beams. Exchange, TR2400 handheld plus extras for older fm mobile rig like IC240. G4IIL, QTHR. Tel Brighton 607737 evenings.

Service manual and alignment instructions for GEC RU11 rx. Any reasonable price paid. G D Hornsey, Thornfield, Newlay Wood Road, Horsforth, Leeds LS18 4LF. Tel 581217.

Burndept 470 or 471 uhf handportable, any cond considered, but will pay up to £100, plus carriage if necessary for a gd example. GM4XDA. Not QTHR. Tel Garrey, 041-638 3343.

Wireless set, (Canadian) no29, any items for this set particularly connecting leads, etc. Suitcase tx/rxs of WW2 or post-WW2, any literature, old instructions manuals, or connected publications, any damaged sets or parts welcome. M Taylor, G3UCT. 8 Government House Road, York. Tel 0904 29777.

For the wireless museum: old radio books, magazines, catalogues, QSL cards, callbooks, *"Radio Times"*, manuals, valves, car radios, knobs. Hon curator, G3KPO. 52 West Hill Road, Ryde, IoW. PO33 1LN. Tel Ryde (0983) 67665.

Buy or borrow, manual or any information on AR88, especially details on correct alignment. Also diagrams for Spectrum rtty interface and software. G6GAK, Oakfield House, Bebden Green, Loughton, Essex IG10 2NY.

HF linear, SB200, FL2100B or similar, must be reliable. Full details first please to F Robertson, GM3GIV. 5 Rae Street, Stenhousemuir, Larbert FK5 4QP. Tel Larbert (0324) 558784 after 2pm.

Mains psu FP200 to suit FT200, wkg or not, must be 100 per cent complete. Also ancillary plug for FT200, 11 pin. G1EEB, QTHR. Tel 0733 42439.

MML432/20 or MML432/30 microwave modules, 70cm linear Jaybeam, 4el 70MHz Yagi (4Y/4M), Pye PF2UB without xtals. G4FRE, QTHR. Tel Dave Robinson 0394 271622.

Hallicrafters, SX28A rx in gd wkg cond, no mods, delivery if possible. G8WTY, QTHR. Tel Malvern (06845) 4968.

SSB filter XF9-B and RING mixer MD108 (or equivalents). Also xtals to convert two channel cb to 10m. Jim Leigh, G4ILK. 14 Score View, Ilfracombe EX34 8EZ.

Europa or similar. Also QQVO6-40 PA unit from low band Pye transmitter. *For sale:* LG300, DT600, type rtty tu, Commodore C2N 1520 cassette deck, Seagull century outboard with clutch and recoil start. G3AZI, QTHR. Tel 0772 37815.

Iambic key, complete with memory keyer. Also Tono morse-rtty reader. G6JNS, QTHR. Tel 0905 620041 evenings or weekends.

Antenna system, lattice telescopic tower around 30ft, also, 10-15-20m beam and rotator. Cash payment for gd quality items at the right price. G3SRJ, QTHR. Tel High Wycombe 442869.

KW2000 or comparable rig. CCTV camera less lens, cheap. *For sale or px:* two 12in spkrs in cabinets, one 12in spkr chassis, new. G4IOY, QTHR. Tel 01-455 0540 evenings.

PSU for FT200 in gd wkg order. Tel 0432-850 600 evenings.

Hewlett-Packard plug-ins or manuals for 140A main frame 'scope'. Also external sampling head for 1411A plug-in. G4ZAZ, QTHR under G8WYC, Tel 0793 37489.

Video heads for Grundig SVR4004 video recorder, or possibly whole machine. Also pair 813 valve bases and manual for AMF Venner model 7735 dfm. G4AHT, QTHR. Tel 01-857 7810 evenings.

Information, problems with ETI Niccady (Sept 83) nicad regenerator charger. Digital tachometer for Golf diesel, especially engine pick-up. VHS video player recorders without tuners available UK. Will pay expenses. Dr. A. Birt G4RDN. Apartado 347, Correos Altea (Alicante) Spain.

Yaesu FT780R 70cm multimode. G3BZW, QTHR. Tel Bob, 07374 2696 QTH or 01-686 4391 work.

The Norwegian Defence Museum in Oslo needs following British equipment: radio station No1, No8, WS53 and 68. Can anyone help? Also German WW2 radar/radio units, parts, literature. Will collect in UK. R. Otterstad, 0Z8RO/LA5HE, Vejdammen 5 DU-2840 Holte, Denmark. Tel 02-801875.

43 per cent distributed load o/p tfmr 7000Ω, 50W 410-0-410 power TXFR 180M/A or complete "beam echo" power amplifier DL7-35. Also UM2 TXFR 6AN8 valve. R. Mense, 14 Oakcroft Road, Lewisham, London SE13 7ED.

Eddystone rx's 770U, 770R, 770S, any cond. GM8MLH, QTHR. Tel John, 08382 304.

Rotator for 2m antenna. Must be in gd cond wkg order, must have gd wind loading. G1GRJ. Dean Shelton, Upphall Lodge, Braughing, Nr Ware, Herts SG11 2PS. Tel Ware 822445 evenings.

Ham M rotator, must be gd cond. G3YBG. J Rabjohns, Quarries Bungalow, Barley Lane, Exeter EX4 1TA. Tel Exeter 74607.

Valve data for CV2130, QY3-125, 4-125A types. Also any designs for power amplifiers using these valves, can copy and return all information by next day. All costs refunded. G4WZQ, QTHR as G6MVM. 24 Seaview Road, Herne Bay, Kent CT6 6JA.

Yaesu FL110 linear amplifier, must be in exc cond. G3NJP, QTHR. Tel Cranbrook (Kent) 0580 714482.

Trio TS820S in fb cond plus extras, atu, remote vfo, service manual. Also 12AVQ vert trap antenna. D. MacKay, 16 Henley Drive, Timperley, Cheshire WA15 6RY. Tel 061 928 6894.

Heathkit atu SA2060 required. Good price paid. GM4TOQ, QTHR. Tel 0389 74409.

HF linear FL2100Z, TL922 or similar quality, essentially first class cond. G2BSR, QTHR, Tel 0452 713300.

Datong D70 morse tutor, must be in mint cond. G8DQZ not QTHR. Tel 01-567 0897 evenings or weekends.

Bird elements 1000D or 1000E. 4CX250B valves and vhf bases. G4NRG. Tel Brentwood 810831.

Trio 120V, or Yaesu FT7, and Trio 5305, or Yaesu FT101ZD. Also Yaesu SP901 spkr, and Y0901 or Y0901P multiscope. G3XFB, QTHR. Tel 0902 850033.

Yaesu FT221-FT221/R, or FT225/R-FT225/RD in gd cond and wkg order. G8ZLH, QTHR. Tel The Sec FRARS, 0202 570894.

RCA 8122 valves in gw cond. G8HHI, QTHR. Tel Yateley (0252) 871555 after 7pm. please.

Bird 43 elements, low power for vhf uhf. G8HHI, QTHR. Tel Yateley (0252) 871555.

Manual or copy for Trio 9R59DS rx. Tel 0294 71552.

Apple 2E cw rtty program 45·5/50 baud, purchase or program exchange. G6XD, QTHR. Tel 06267 2611.

WATERS & STANTON ELECTRONICS

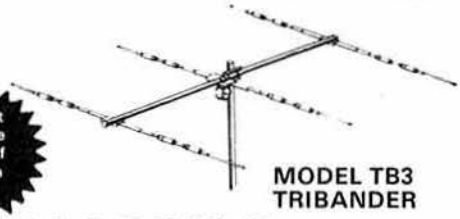
18/20 MAIN ROAD, HOCKLEY, ESSEX, Tel: (0702) 206835
12 NORTH STREET, HORNCHURCH, ESSEX. Tel: (040 24) 44765

OUR HOCKLEY SUPER STORE
ALL MAKES OF NEW AND SECOND HAND EQUIPMENT IN STOCK.

NEW

JAYBEAMS SUPER DX PACKAGE—3 MODELS
10-15-20 Mtrs. 3 ELEMENT YAGI

Almost half the price of Hygain TH2!*



MODEL TB3 TRIBANDER

TB1 Rotary Dipole 2kw EL. 7.7m Rad. 3.85m **£77**
TB2 2 Element Beam 2kw gain 5dbd F/B 15db **£143**
TB3 3 Element Beam 2kw gain 8dbd F/B 25db **£212**

Securicor £6 extra

These highly rugged antennas are superbly built and represent the very best in engineering. Details, booklets are available upon receipt of SAE.
Jaybeam TB2 = £143. Hygain TH2 = £279.

"G5RV" DIPOLE OFFER

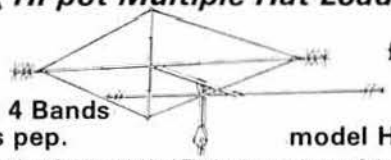
Probably the most famous all band dipole in the history of amateur radio. The 5RV antenna covers 80 to 10 metres without traps and is 102ft long. These ready tuned antennas are fully assembled and include 30ft of low loss feeder. All you need is the mast supports and the necessary extra length of 50ohm feeder. The half size version is similar but is only 51ft long and covers 40-10 metres. Now heavy duty models!

FULL SIZE **£17.95**
HALF SIZE **£14.95**
Carr and ins £2.00 extra

WELZ CP5 80-10M £139 (40-10M CP4 £109)

The Welz CP5 is Unique. It is the most highly efficient aerial system for the HF bands for the small garden. Less than 16ft high and yet providing automatic operation on all 5 bands 80-10 metres. It comes complete with a rigid radial system comprising 5 loaded radials (approx 6ft long) that can be either spaced 360 degrees around the antenna base or in a fan shape. All hardware is provided and the aerial is ready to be mounted atop a convenient mast. An alternative model is available, the CP4 which covers 10 to 40 metres.

NEW *Hi-pot Multiple Hat Loaded!*



£199

6m-20m 4 Bands
12 watts pep. model HQ-1

There is no substitute for the real thing! That's what purchasers of alternative models tell us. We've been selling this for 12 years and its superb construction and performance protected by World patents leaves the competition standing. Boom length 4.5ft. Element length 12ft, weight 15lbs. This antenna can be operated without an atu and really gets the DX even in the smallest QTH.
Free 24 hr delivery on this item.

SECONDHAND EQUIPMENT GALORE

Stocks are always changing so please telephone

Trio SP120 **£22**; Ex dem CP4 **£85**; AM unit for FT101ZD **£6**; Yaesu FTV707 **£109** FT101 + FTV101 **£329**; IC202s + desk mic **£89**; TR2200gx (12 ch.) + 10w amp **£129** COK2 **£6**; Liner 2 **£89**; Realistic scanner **£79**; FRG7700 **£279**; FRV7700A **£59**; FRT7700 **£35**; TS430s **£549**; FT7 + mic **£189**; Belcom LS101L 10m **£189**; Microwave MMT144/28 **£79**; FDK700AX 2m FM **£139**; Global AT1000 **£35**; Datong FL3 **£95**; FRG7700 **£269**; FRA7700 **£29**; Microwave MMC435/600 **£22**; Microwave MTV435 70cms TV transmitter **£119**; FDK M750E **£239**; Icom R70 **£469**; TR3200 (12 ch) **£129**

WE'LL GIVE YOU CASH! FOR YOUR MODERN SECONDHAND GEAR TEL (0702) 206835

STOP PRESS! Offers for March or whilst stocks last

FT290R's SPECIAL OFFER **£287**
As above but with Nicads and charger **£309**
New Electronic Keying Kit **£18.95**
As above with paddle **£34.00**

T... 2M ...MODE

£319*

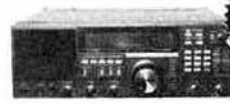
*Plus your FT290R in PX.
SAE for technical leaflet.

TRIO R2000 RECEIVER

£322*

*Plus your R1000 in PX.
A superb receiver by any standards.

YAESU FRG8800 RECEIVER



£299*

*Plus your FRG7700 in PX.
The lates receiver from Yaesu.

AOR 2001 RECEIVER

25-550MHz
12VDC-230VAC
AM-FM-WFM
138mm × 80mm × 208mm
LCD display etc

£249*

*Plus your Reacat 220 in PX.

WELZ SP200 VSWR/POWER METER

£82

The Welz SP200 SWR meter is the ideal unit for any HF station. Its large size meter and accurate sensors means that you can accurately check both your VSWR and output power. The frequency range is 1.8MHz to 160MHz and there are 3 power ranges of 20, 200 and 1000 watts. The meter accommodates 2 antennas and full scale sensitivity is 1 watt.

WELZ SP400 VSWR/POWER METER

£82

The Welz SP400 is the ideal meter for the VHF/UHF operator. With the large meter you can at last learn what is happening in your antenna system on both 144 and 432 MHz. The frequency range is 130-500MHz and 3 power levels are provided; —5, 20 and 150 watts. Full scale sensitivity is 1.5 watts.

NATIONAL PANASONIC RF-3100 RECEIVER

FEATURES: — ★ Proper S-meter ★ Power/battery indicator ★ 230v AC or dry cell ★ Digital display to 1kHz ★ Built in speaker ★ Headphone jack ★ RF gain control ★ AM wide/narrow switch ★ Rec. socket ★ USB/LSB/CW reception ★ 31 bands ★ Built in whip ★ Dual IF for good image response ★ Phased locked loop synthesizer ★ FM broadcast reception ★ External aerial connector ★ Ferrite antenna for MW/LW

FREQUENCY RANGE: — 150kHz-1·6MHz; 1·6MHz-30MHz; 87·5-108MHz (FM)

£239

Voted best buy by the Japanese SWL Society!

FDK M750XX—2M SSB-CW-FM

The FDK M750XX 2m transceiver is the latest all-mode rig from FDK. A full 20 watts output ensures that when there is DX about you'll stand a better chance than many of making it. The transceiver features dual vfo, up/down scanning microphone and comes ready to operate from a 12v DC source.

£389

MAIL ORDER SLIP *(all orders despatched same day)*

To: — Waters & Stanton, 18-20 Main Road, Hockley, Essex.

Name.....
Address.....
Items required.....
.....
.....

Carriage: — Items under £10-£1.00; Over £10-£2.00; Larger aerials £6; Securicor £6

DEWSBURY ELECTRONICS

G4CLX

APPROVED TRIO DEALER

TRIO R-2000

The fabulous TRIO R2000 General Coverage Receiver offers the ease of operation and features hitherto offered only on the professional grade receivers; a ten channel memory unit, retaining not only the frequency but also the mode. All channels can be used as a separate VFO. Stability is such that a TOR station will be held all day on frequency. The optional VC10 VHF converter covers from 118 to 179MHz usefully extending the 150kHz to 30MHz range. TRY ONE. You will be pleased.

APPROVED TRIO DEALER

TRIO TS-930S

TS930S, truly an HF transceiver to savour. From the superb smooth tuning to the basic simplicity of controls, makes HF operating a most enjoyable and memorable experience. DEWSBURY options on the TS930S are 16, not 8 memories, an extra digit giving readout accuracy to one hundredth of a kHz. Both at no extra cost.
The TS930S is a sought-after treasure. Be sure to check availability before sending your cheque.

For those who like to listen only DEWSBURY ELECTRONICS is proud to announce the POCOMTOR AFR 2000 code converter. We believe it to be the first Automatic converter to read RTTY—AMTOR—SITOR—TOR—ASCII—its so easy to use, simply tune in the desired station. Press the automatic button, lo and behold 15 seconds later the AFR 2000 has selected BAUD RATE, PHASE, SHIFT, and commences to print on the user supplied screen. It will even receive the 200 baud ASCII press broadcasts. FULL DETAILS WILL BE SENT ON RECEIPT OF A LARGE SAE. Price of AFR 2000 £427.00 inc.

Dewsbury Electronics stock the entire Trio range. From the simplest of plugs to the top of the range TS930S.
Dewsbury Electronics is the only full time specialist amateur radio dealer in the Midlands. We do not sell PMR, we do not sell computers or cordless telephones. We do not sell CB. Our efforts are directed solely at the radio amateur.
PERSONAL SERVICE is a bye word at this emporium. Sales under the personal care of TONY DEWSBURY G4CLX, Engineering and repairs under the EAGLE eye of JOHN BILLS G3KZG, both ably assisted by MARTIN G4VZO together offering over 43 years of Amateur Radio Experience.

MAIL ORDER We are happy to supply our equipment to addresses all over the world, arrangements can be made to supply goods for export by ourselves or for personal export. All the necessary documents prepared. For your next purchase DEWSBURY ELECTRONICS promise satisfaction, next day delivery often included in the price.

Simply send us CASH, Cheque, Barclaycard, Visa or ACCESS accompanied by your name and address we will do the rest. IF THE REQUIRED GOODS ARE NOT IN STOCK YOU WILL BE INFORMED IMMEDIATELY.

SORRY WE DON'T SPEAK JAPANESE OR GERMAN, HEBREW WE CAN TRY, BLACK COUNTRY VERNACULAR A SPECIALITY.

Dewsbury Electronics offer a full range of **Trio Equipment** always in stock

We are also stockists of DAIWA—MET ANTENNAS—MUTEK—WOOD & DOUGLAS—TASCO TELEREADERS—MICROWAVE MODULES—ICs AMTOR—AEA PRODUCTS—DRAE

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands.
Telephone: Stourbridge (0384) 390063/371228.
Telex: 337675 TELPES G

BARCLAYCARD VISA

Instant finance available subject to status. Written details on request.

Access

GOING-GOING GONE!

Selling your rig can be fast, easy and painless when you use the services of *G3RCQ ELECTRONICS*. We advertise in all the magazines, our turnover of equipment is fast, this means we can offer the *BEST PART EXCHANGE* deal and the *BEST CASH DEAL*. Our advertising is there to help you sell your used equipment without delay. *REMEMBER* if you are selling *USED EQUIPMENT* – Contact G3RCQ Tel: (040 24) 55733

★ AUCTION ★

Auction your surplus equipment from the comfort of your own home! *HOW?* Lets say you have an "XYZ" rig for disposal and you value it at £150 you send me 10% (£15) for inclusion into the auction, plus FREE entry into *LIST-A-RIG* your estimated price of £150 will not be quoted so you may even receive bids over and above what you expect. There are no further charges. If your rig does not sell within 2 months (that's two auctions) your 10% fee will be returned in full.

★ NATIONAL ADVERTISING FREE ★

I will advertise nationally lists of items to be auctioned. Potential purchasers will be invited to submit their bids by post to me before a specified date (auctions are monthly). All bids will be forwarded to you the seller. It is then up to you to contact the bidder of your choice and conduct the sale.

★ LIST-A-RIG ★

Imagine a data base which is constantly being updated and contains items for sale or wanted. The list encompasses Dealers' and Readers' adverts. LIST-A-RIG is sent *FREE* upon receipt of a S.A.E. To include your own advert the fee is £2 for *TWO MONTHS ADVERTISING*

★ A FAIR DEAL IS MY POLICY ★

When you deal with *G3RCQ* you get a straight deal. A full no quibble guarantee, coupled with free advice covering 25 years of Amateur Radio.

BUY & TRY

If you buy a rig from me you have one month to change your mind! If during the first month of purchase you decide that you have made a mistake or you simply cannot get on with the rig I will allow you 90% in part exchange for another rig of equal or greater value. If you want cash back without another rig I will give you 80% of your purchase price.

MARCH AUCTION

ICOM 271 2M TRANSCEIVER
SANYO RP8800 RX
ICOM IC 740 HF TRANSCEIVER
YAESU FT480R 2M MULTIMODE
TV CAMERA & MONITOR
TECH TE20D SIGNAL GENERATOR
SC7000 SCANNING RECEIVER
MM ATV CONVERTER
YD148 BASE MICROPHONE

★ BUY & TRY ★

KW 103 SWR/POWER
HF TRAP DIPOLE WITH FEEDER
ADVANCE VALVE VOLTMETER
70CMS BEAM 2-14 ELEMENT
DATONG PC-1 GEN/COV 2M CONV.
TANDY TRS80, MONITOR, CASSETTE
YAESU FT230R
NAG LINEAR (2m)
TRIO 530S
STANDARD C78 (70cm)

CCS 100MHZ FREQUENCY COUNTER
STANDARD C146 2M HANDIE
ICOM BASE MIC, IC SM6
QM70 2M LINEAR AMPLIFIER
YAESU FT707 TRANSCEIVER
YC-601 DIGITAL DISPLAY
YAESU YM-38 SCANNING MIC
TRIO AT 230 ATU
TRIO 2600E
YAESU FT230R

ICOM IC25A 2M FM TRANSCEIVER
YAESU FT720RU 70CMS FM
KW204 TRANSMITTER
TRIO TM-201A MINIATURE FM
MM RECEIVE CON 28/144
TRIO SIG GENERATOR SG-402
YAESU FT902DM
YAESU FTV 901R
FRG 7700 (MEMORY)
YAESU FT 790R
YAESU FT1012D

If you are interested in purchasing any of the above please send your bids to the address below. (Equipment may be sold by private treaty).

Send S.A.E. today for current list and full information

USED EQUIPMENT CENTRE, G3RCQ ELECTRONICS
65 CECIL AVENUE, HORNCHURCH, ESSEX.

Telephone: Hornchurch (040 24) 55733 Please leave a message on the answerphone. 73's de DAVE & CORAL G3RCQ & G4RCQ.

ALYNTRONICS

AUTHORISED YAESU DEALER
AUTHORISED ICOM DEALER

IC 751 – The latest H.F. transceiver from Icom

FT 757GX – the complete H.F. transceiver – with general coverage on receive!

IC 271 – Icom's v.h.f. multimode base station

FT 726R – Yaesu's v.h.f. & u.h.f. multimode base station

Approved stockists for all of the following companies:
ICOM – YAESU – K.D.K. – TONNA – DATONG – MICROWAVE MODULES – WELTZ – SHURE – HANSEN – KENPRO – C.D.E. – DAIWA – TONO – HY-GAIN – A.E.A. – A.K.D. – T.A.L. – I.C.S. – TASCO – G. WHIP – HI-MOUND – S.M.C. ANTENNAS – WESTERN ANTENNAS

Always in stock, a large selection of plugs and sockets. Antenna mounting hardware – R.F. cables (H-100, URM 43, 67 and 76, 300Ω Ribbon) plus 5, 6 and 8 core rotator cable

129 Chillingham Road, Newcastle-upon-Tyne
Tel: 091-276 1002
Mail Orders Welcome
Open Tues-Sat 10 am to 6 pm

GWM RADIO LTD

All prices include VAT and post

TATUNG VT4100 COMPUTER KEYBOARDS. 85 keys. TTL serial input/output 5v supply. Separate numeric and function keypads. Totally soft operation, can be programmed to generate any codes. Independent reset key output, 8 wire interface. With circuit information. Unused condition, **£25. AVO TESTMETERS,** Ex-Ministry, fully overhauled Model 7, no case or leads, **£28.** Model 8 with leather case and AVO leads, **£70. POCKETFONES PF1,** Rx and Tx **£22 pair** with circuits, etc, batteries **£5.50 pair.** Rx only **£6,** with battery **£9**—Prismatic **MARCHING COMPASSES,** latest issue type NATO 6605-99-331-2510, calibrated in MILS, Mother of Pearl dial, **£27. Ex-NAVY BINOCULARS,** 7 × 50 with case, **£45. WRIST WATCHES.** A rare opportunity, all black faced and centre seconds and all reconditioned by Ministry. International, **£25.** Hamilton, **£20** or Smiths, **£16.** Spare AVO movements with dials for model 7 or 8, **£10. Airlite HEAD & MIKE sets** type 62, as new **£12** or used less mike **£6. RABONE CHESTERMAN** type 251 leather cased tape measures, 7 metres/25ft, **£5. Ex-Navy Zenith Deck Watches.** Centre seconds, can be worn or kept in polished wood case, **£45. Mains CHARGERS for BANTAM** batteries, **£5. DOSIMETERS** 0-5Mill; Roentgens**£2.50** or **5 for £7. 'PARVALUX' MOTORS** 36v DC Shunt with gear box 8 R.P.M. 300 Lbs/Ins, **£12,** new. **RACAL CHARGERS** type MA4061A, New, **£15. AERIALS** 10 GHz, small for test equipment, **£5. METERS** 2½"" × 2½"" 1 ma 100 ohms calibrated 0-1, 0 to 5, **2 for £4.**

40-42 Portland Road, Worthing BN11 1QN. Tel: 0903 34897

THE G8KBQ COMPONENT CLEAROUT

0.5 to 6pf. Glass Piston trimmer caps. **30p.**
20pf. Silver plated air spaced trimmer caps. **20p.**
Plastic Film trimmer capacitors, all types, **15p.**
0.5-6.5pf. 2-22pf. 2-25pf.
100pf. C804 type variable caps. ¼" spindle. **£1.50.**
150pf. C803 type, preset version of above. **60p.**
MC1./SBL. 1-8-D/Bal. Schottky ring mixers like MD108. **£5.50.**
TIS88A VHF/UHF JFET's. **25p.**
MANY LINEAR PARTS & NEW BOXED METERS. SEE LISTS.
HC6U Xtal sockets, pcb type: **12p.** Chassis type: **10p.**
4KV.2 Amp Silicon rectifier diodes. **85p.**
330UF. 350V. Electrolytics, 2.72A ripple. **60p.**
32UF. + 32UF. 350V. Electrolytics. **40p.**
4700UF. 35V. & 2200UF. 63V. Electrolytics. **35p.**
220K. OHM. 2Watt carbon resistors. **10p.**
MANY MICROWAVE & WG.16. PARTS AVAILABLE. LISTS: **30p.**
Postage on small orders 40p. Extra on large parcels.

JOHN MOXHAM, 22 Whiting Road, Glastonbury, Somerset BA6 8HP
TEL: (0458) 34105

DRESSLER (U.K.) LTD.,

191 FRANCIS ROAD LEYTON E10
TEL 01-558 0854 TELEX 8953609 LEXTON G
01-556 1415

HP FACILITIES AVAILABLE

BARCLAYCARD VISA

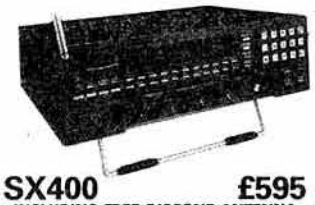
EAST LONDON HAM STORE
WHERE YOUR POCKET COUNTS

PROMPT MAIL ORDER

Access

FREE DELIVERY ON ALL RIGS: Phone us last for best prices

ICOM R71 £699
INCLUDING DATONG AD270 ACTIVE ANTENNA



SX400 £595
INCLUDING FREE DISCONE ANTENNA

ICOM R71 SPECIAL OFFER
FOR ONE MONTH ONLY
£699 inc. ARA 30 ACTIVE ANTENNA
* * * * *
RS 2000 £450
INCLUDING DATONG AD 270 ACTIVE ANTENNA
ALSO AVAILABLE THE DC 10 VHF CONVERTOR
IF BOUGHT WITH ABOVE – £15

£365 AOR 2001
INCLUDING FREE DISCONE ANTENNA

ICOM IC751 £1239
INCLUDING SWR200 METER OR 5 BAND TRAPPED VERTICAL ANTENNA WITH RADIAL KIT

ICOM ICO2E OR ICO4E
+ FREE SPEAKER MIKE AT
£259 ICO2E
£269 ICO4E

ICOM IC745 £898
INCLUDING SWEDISH BRASS MORSE KEY OR BASS MIKE

ICOM IC271E £699
INCLUDING 9XY TONNA OR SWEDISH BRASS MORSE KEY OR PS25 INTERNAL POWER SUPPLY

FT757GX+FC757+FP757HD
INCLUDING 5 BAND VERTICAL + SWEDISH BRASS MORSE KEY

TW4000 £510
INCLUDING DIAWA DUAL BAND ANTENNA + GUTTER MOUNT OR VS1

TR9130 £445

FT726 + 70cm ± SATELLITE INC.
FREE 9XY + 19XY TONNA + SWEDISH MORSE KEY

Communications Terminal New Tonno 777 Tx/Rx, use it with any Micro with RS232. AMTOR/RTTY/CW. For £399. Also Tonno Q5000 AMTOR/RTTY/CW/ Keyboard + 5" Monitor. P.O.A.
Also many others in stock. Also available TONNA ANTENNAS, DATONG, MUTEK & DIAWA. Also VAT FREE on all exports of Amateur Radio, Video & T.V.

Swedish Key £60.00

NEW

THE LATEST FRG 8800
P.O.A.

TS 711E
FOR £775 INC. 9XY TONNA OR SWEDISH MORSE KEY

TH21
ONE OF THE MOST POWERFUL, NEATEST AND SMALLEST 2M PORTABLES.
£175

TR2600
INCLUDING DIGITAL CODE SQUELCH
£270

dressler – ara 30 – active antenna
200 kHz . . . 40 MHz

Professional electronic circuitry with very wide dynamic range. Meets professional demands both in electronics and mechanical ruggedness. 120 cm long glassfibre rod. Circuit is built into waterproof 2,5 mm thick aluminium tube. Ideal for commercial and swl-receiving systems.

£90

KENWOOD TRIO TM201A SPECIAL OFFER
£295.19
FOR ONE MONTH ONLY **£265.00**

VHF POWER AMP.

D200 2MTR. 300w F.M. 550w SSB	£675
D200S 2MTR. 400-500w 1Kw. D.C. in	£799
D70 70cms 325w F.M. 500w SSB	£799

NEW MODEL DUE TO ARRIVE
1296 MWZ. 1w-in-10w out.

MAST HEAD PRE-AMPS GAAS FET
POWER HANDLING UP TO 1KW
·7 to ·9dB NOISE
15 to 19dB GAIN
0·2dB INSERTION LOSS

EVV200 GAAS 2MTR. 750W SSB	£80
EVV2000 GAAS 2MTR. 1KW SSB	£90
EVRPS receive 2MTR. only	£50
EVRPS receive 70cm.	£49
EVV700 GAAS 70cm. 500W SSB	£90
EVV70 GAAS 70cm. 100W	£60
EVV2 GAAS 2MTR. 100W	£60
VV200VOX GAAS 2MTR. 250W SSB	£85
INTERFACE	£21
DRESSLER ASA12 Mast Head Coaxial 2 in 1 out Switch with 'N' Connector 1Hz-1GHz 1KW. PEP 0.15dB Insertion Loss	£45

see us at NEC!

From Scarab Systems

From U.K.'s leading radio software and hardware house.

SSTV 48K SPECTRUM This slow scan TV program cassette enables you to receive photographs or diagrams without additional hardware. It provides the facility of syncing and the ability to change the grey scale. Images may be transferred to a printer if required. **£17.25 inc. VAT and postage.**

COMMODORE 64 RTTY PROGRAM. This program has several new features which make it the most up to date available. It has five screens and a feature is the instantaneous transmit mode (ITM) which can be used to interrupt the type ahead buffer and insert 'live' information. Other features include CW ident and PTT, automatic repeat on all keys, delete key for type ahead buffer and transmittable real time clock. All you need to join your Commodore 64 to the radio is a terminal unit (MPTU-1) and connecting user port plug.

Cassette £10.50. Cassette plus MPTU-1 £78.00. User Port plug £2.50, all inc. VAT and postage.

MPTU-1 TONE ENCODER/DECODER. This phase lock loop circuit is 100% reliable and extremely sensitive. **£69.70 inc. VAT and postage (all plugs supplied).**

Trade enquiries welcome. Prices correct at time of going to press.

SCARAB SYSTEMS

Scarab Systems produce many other top-quality programs and equipment for the radio amateur. Use the coupon now for details.

39 Stafford St, Gillingham, Kent ME7 5EN. Tel: 0634 570441

Please send me

- ☐ SSTV for 48K Spectrum £17.25
- ☐ User port plug £2.50
- ☐ Commodore 64 RTTY Program Cassette £10.50
- ☐ MPTU-1 only £69.70
- ☐ Cassette and MPTU-1 £78.00
- ☐ Free details of other equipment and programs.

I enclose a cheque/postal order for .....

I wish to use my Access/Visa Card No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name .....

Address .....

.....

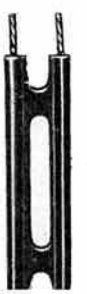
Tel. No. .....

Signature .....

I understand that, if I am not fully satisfied within 21 days, I can return the equipment with full reimbursement. 14 days delivery. RC

Access VISA

FORTY OF THE BEST



1 H100 50 ohm Low Loss COAX **80p per m** 50m less 10% 100m less 20% (post 5p p/m)
2 POPES RG213U 10.3mm low loss Coax N/C PVC **60p per m** (p 6p p/m)
3 PERMANIOD or BICC UR67 10.3mm Low Loss 50 ohm **60p per m** (p 6p/m)
4 UR76 50 ohm stranded conductor Coax **23p per m** (p 3p pm)
5 POPES RG58C/U (UR76) with NC PVC **23p per m** (p 3p pm)
6 Mini Coax RGI74/U 50 ohm **25p per m** (p 1p pm)
7 UR70 6mm 75 ohm Coax **23p per m** (p 3p pm)
8 UR57 10.5mm low loss 75 ohm COAX **60p per m** (p 6p pm)
9 75 ohm Double Screened 8mm 75 ohm Coax **25p per m** (p 4p pm)
10 Low Loss UHF TV Coax 75 ohm **20p per m** (p 3p pm)
11 75 ohm Twin Feeder **18p per m** (p 2p pm)
12 NEW! RG62AU 95Ω 7mm dia coax **50p per m** (p 5p pm)
13 BOFA GMP6 Slotted 300 ohm Feeder **20p per m** (p 3p pm)
14 Strong PVC covered Aerial Wire **6p per m** (p 2½p pm)
15 14 SWG Copper HD Aerial Wire **20p per m** (p 2½p pm)
16 500m Mixed equipment Wire on Reels **£5** post £1.40
17 ROTATOR CABLE—6 core and 8 core **35p per m** (P&P 5p/M)
18 GREENPAR 50 ohm N Plugs for H100/UR67/213 **£2.40** each
19 GREENPAR 50 ohm N line Sockets H100/UR67/213 **£2.20** each
20 GREENPAR 50 ohm N Chassis Sockets **£1.80** each
21 GREENPAR 50 ohm N Plugs for UR43/76 **£2.40** each
22 GREENPAR PL259s Silver/PTFE for H100/67/213 **£1.15** each
23 GREENPAR BNC 50Ω plugs—Silver/PTFE **98p** each
24 Self Amalgamating Tape large roll **£3.80**
25 Egg Insulators glazed ceramic 1¼" long **50p** each
26 Egg Insulators large polyprop 2¼" long **65p** each
27 Standard chrome plated PL259s UR67/H100 **50p** each
28 As above but for UR43/76 **45p** each
29 2×SO239 Coupler two sockets back to back **70p** each
30 As above but Plugs (PL259) back to back **70p** each
31 SO239 Chassis Sockets either square or round **50p** each
32 In line lightning arrestors SO239 **£1.20** each
33 50 ohm 30 watt Carbon Dummy Load fitted PL259 **£4** (normally £6)
34 REVCO/SBE External Quality Speakers **£7.95** (post £1)
35 Bridge rectifiers—10A 100V **£1.25**
36 DRAE WAVEMETER to UHF **£27** (post free)
37 DRAE 3 Way AERIAL SWITCHES to 500 mhz **£15** (post free)
38 COSSOR Mid Band Transistor Radio Telephones with data. 20 watt 703 **£18** less speaker
39 PYE LB/AM boot Westminsters with Tone Call. Complete all acc. **£30** (p&p £3)
40 Computer electrolytic caps, 90,000 m/u 40V **£2** (P&P 75p)

Postage is 40p per order on items not otherwise quoted. Vat included in all prices. 10% discount off 5 or more Greenpar items.

W.H. WESTLAKE, CLAWTON, HOLSWORTHY, DEVON
(0409) 253758

FARNBOROUGH COMMUNICATIONS

97 OSBORNE ROAD, NORTH CAMP,
FARNBOROUGH, HANTS

AUTHORISED YAESU

*YAESU*FDK*ICOM* ICOM

Stockist of Drae psu's, Jaybeam and Cue Dee Antennas, Microwave Modules, Oskerblock SWR, CDE, RSGB publications, quality cables, our own TVI filters, Welz, Bencher, Mirage amps.

Open Monday to Saturday 10am–6pm

ACCESS + H.P. Available + BARCLAYCARD

Telephone: Farnborough (0252) 518009

IQD

North Street, Crewkerne, Somerset TA18 7AR
Tel: (0460) 74433 Telex: 46283 INFACEG

FREQUENCY STANDARD, MARKER & CONVERTER CRYSTALS
5·0, 10·0, 10·7 & 38·66667MHz 18U **£3.10**; 1·0MHz 6U or 33U **£3.40**; 100·0kHz 13U or 34U, 116·0MHz 18U **£3.45**; 455·0kHz 6U **£4.03**; 200·0kHz 6U **£4.26**; 1·0MHz hi-stab 6U **£4.90**; 10·0MHz hi-stab 36U **£6.90**.

CRYSTAL FILTERS
Super selective 250Hz 8-pole CW filters for FT-101, FR-101, FT-301, TS-520, TS-820, FT-901 & FT-101Z **£25.88** each (9MHz types with appropriate carrier crystals):

9MHz SSB	6 pole, BW 2·5kHz at −6dB and 5kHz at −60dB	£23.58
9MHz SSB	8 pole, BW 2·4kHz at −6dB and 4·3kHz at −60dB	£27.60
9MHz CW	5 pole, BW 500Hz at −6dB and 2·2kHz at −60dB	£25.88
9MHz FM	8 pole, BW 12kHz at −6dB and 21·6kHz at −60dB	£27.60
10·7MHz FM	8 pole, BW 7·5kHz at −3dB and 17·5kHz at −70dB	£27.60
10·7MHz FM	8 pole, BW 15kHz at −3dB and 35kHz at −70dB	£27.60
21·4MHz FM	8 pole, BW 15kHz at −3dB and 50kHz at −80dB	£28.98
455kHz CFU series ceramic filters, various bandwidths in stock		£1.73

POST AND VAT INCLUDED

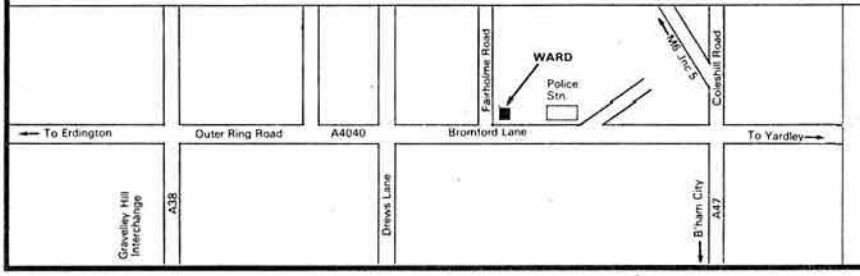
APPROVED TRIO DEALER WARD ELECTRONICS APPROVED TRIO DEALER

TS430S
Deservedly popular HF Transceiver
NOW..... **£769**

TS711E
2m Base Station. **£831**
TS811E
70cm version..... **£964**

TS930S..... **£1350**	TS780..... **£981**	TH21E..... **£188**
TS830S..... **£832**	TR9130..... **£499**	TH41E..... **£214**
TS530SP..... **£735**	TW4000A..... **£536**	TR2600E..... **£281**
TS130S..... **£633**	R2000..... **£479**	R600..... **£299**

DAIWA ROTATORS AND SWR METERS ● HOKUSHIN ANTENNAS ● RSGB BOOKS
COMMODORE – BBC – ACORN – TATUNG COMPUTERS ● ICS AMTOR
G3LIV, SSTV and RTTY COMPUTER INTERFACES ● SCARAB ● G3WHO SOFTWARE



WARD ELECTRONICS
422 BROMFORD LANE,
WARD END
BIRMINGHAM B8 2RX
TEL: 021-328 6070

ANTENNES TONNA (F9FT)

YOUR NUMBER ONE CHOICE FOR
6m, 2m, 70, 24 and 23cm ANTENNAS

Below is a list of our complete range of Tonna antennas, and accessories. We believe that our antennas offer the best value today. Purchase with the confidence that our products are backed by nearly 40 years of experience in amateur antenna design and manufacture . . . . c'est magnifique!

50MHz		
20505	5 element	£34.30(a)
144MHz		
20104	4 element	£14.95(a)
20110	5 element crossed	£26.30(a)
20109*	9 element fixed	£17.71(a)
20209*	9 element portable	£20.00(a)
20118*	9 element crossed	£32.43(a)
20113	13 element portable	£31.05(a)
20117*	17 element	£37.66(a)
435MHz		
20409	9 element	£16.10(a)
20419*	19 element	£20.70(a)
20438*	19 element crossed	£34.27(a)
20421*	21 element 432MHz	£29.67(a)
20422*	21 element ATV	£29.67(a)
144/435MHz		
20199	9&19 element Oscar	£34.27(a)
1250MHz		
20624	23 element	£25.90(b)
20648	4 × 23 element – power splitter – stacking frame	£140.00(a)
1296MHz or 1269MHz Oscar Uplink		
20623	23 element	£25.90(b)
20696	4 × 23 element – power splitter – stacking frame	£140.00(b)

*Denotes available for 50Ω or 75Ω all other 50Ω only. All antennas supplied complete with mast clamps for up to 50mm masts.

Power Splitters		
29202	2 way 144MHz	£35.94(c)
29402	4 way 144MHz	£41.26(c)
29270	2 way 435MHz	£34.21(d)
29470	4 way 435MHz	£39.39(d)
29224	2 way 1250MHz	£29.19(d)
29424	4 way 1250MHz	£30.19(d)
29223	2 way 1296MHz	£29.19(d)
29423	4 way 1296MHz	£30.19(d)
Portable aluminium telescopic masts		
50422	4 × 1m 3.7 metres	£20.70(a)
50432	3 × 2m 5.7 metres	£24.15(a)
50442	4 × 2m 7.7 metres	£36.66(a)
Galvanised steel telescopic masts		
50223	2 × 3m 5.9 metres	£30.48(a)
50233	3 × 3m 8.8 metres	£54.77(a)
50243	4 × 3m 11.7 metres	£88.41(a)
50523	5 × 3m 14.6 metres	£119.60(a)
Stacking frame kits for 4 antennas		
20014	20109 or 20118	£39.39(a)
20044	20419 or 20421/22	£28.61(a)
20016	20623/24 horiz	£17.71(b)
20017	20623/24 vert	£13.80(b)

Andrew Heliax LDF4-50A coaxial cable
Attenuation per 100ft. 144MHz-0.8dB. 435MHz-1.6dB. 1296MHz-2.9dB.
£4.00 per metre (a)
'N' type connectors for LDF4-50 male or female **£14.90**

Rotators – coaxial cables – connectors

All prices include VAT. Carriage extra

FOR FULL SPECIFICATIONS FOR OUR RANGE OF ANTENNAS SEND 40p FOR OUR CATALOGUE. PLEASE ADD CARRIAGE AS SHOWN. (a) £4.00. (b) £1.95. (c) £2.20. (d) £1.10. MAINLAND ONLY Cash with order. ACCESS, VISA CARDS – telephone your card number for immediate despatch. **CALLERS WELCOME, BUT BY TELEPHONE APPOINTMENT ONLY, PLEASE.**

UK DISTRIBUTOR
RANDAM ELECTONICS (R)
12 Conduit Road, Abingdon, Oxon OX14 1DB. Tel: (0235) 23080 (24 Hours)

PLEASE REMEMBER

THE ADVERTISERS APPRECIATE KNOWING WHERE YOU SAW THEIR ADVERTISEMENT.

TELL THEM YOU SAW IT IN

RADIO COMMUNICATION

SPECIALIST RF COMPONENTS

RF power transistors and special components. UNELCO capacitors. Transmitting mica trimmers. Low noise VHF/UHF front end transistors. Japanese equivalents.
Sale Agent for SSM (Thomson CSF) RF transistors.
Phone for Prices. SAE for lists

MODULAR ELECTRONICS
1 Coniston Close, Felpham, (Bognor Regis), Sussex PO22 8ND. Tel. (0243) 823603

VALVES VALVES VALVES

The following valves in matched pairs 6JS6/C, 6KD6, 6JB6/A, 6LQ6, 6HF5, 6146A, 6146B. **YES** the 6JS6/C is Japanese and works in the FT101. Most amateur radio valves including difficult to obtain types **EX STOCK**. Quotations without obligation. If we don't stock your type we may be able to import for you, PLEASE ENQUIRE. REMEMBER over 200 types **EX STOCK**. Sae for list. 'Phone for assistance re types suitable for your equipment. USA and Jap manufacture of popular types available.

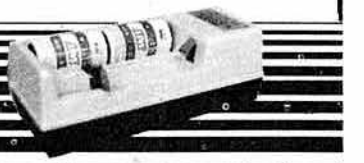
DON'T DELAY 'PHONE TODAY 045 75 6114, G4AZM
Wilson, Peel Cottage, Lees Road, Mossley, Tameside, Manchester

Just Some of our Success Stories...

•POWER SUPPLIES

•LINEARS

•NICADS & CHARGERS



HIGHEST QUALITY, SUPERBLY CONSTRUCTED

"A" series power supplies

- Continuous rated output
- Over voltage crow bar
- Over current protection
- Fully R.F. protected
- Large current meters

13.8V. 6amps-12/6A £52.90
13.8V.12amps-12/12A £95.45
13.8V. 25amps-12/25A.....£138.00
13.8V. 40amps-12/40A.....£276.00

Access VISA

• ALL PRICES INCLUDE V.A.T.

Incorporating over 40 years' design expertise made to highest engineering standards utilising highly regarded Mosfets and GaAs FETS.

LINEAR PART NUMBERING SYSTEM

LINEAR / PREAMP / RF METER — LPM144-3-100 — FREQUENCY (BAND) — OUTPUT POWER — INPUT POWER

2M Range

LPM 144-1-100	£172.50
LPM 144-3-100	£172.50
LPM 144-10-100	£149.50
LPM 144-25-160	£207.00
LPM 144-3-180	£235.75
LPM 144-10-180	£235.75
L 144-1-100	£143.75
L 144-3-100	£143.75
L 144-10-100	£120.75
L 144-25-160	£178.25
L 144-3-180	£207.00
L 144-10-180	£207.00

70 cms.

LPM 432-1-50	£184.00
LPM 432-3-50	£184.00
LPM 432-10-50	£155.25

NICADS

Format	Cap. (AH)	Height (mm)	Diam. (mm)	Prices 1-9	10-24	25-99
AAA	0.18	45.0	10.51	1.47	1.39	1.32
⅓AA*	0.10	17.4	14.7	1.38	1.31	1.24
½AA*	0.225	25.0	14.7	1.04	0.99	0.94
AA	0.50	49.5	14.7	1.08	1.02	0.96
AA*	0.50	49.5	14.7	1.14	1.08	1.02
NEW AA (SUPER)	0.60	49.5	14.7	1.18	1.12	1.08
½A*	0.45	28.0	17.2	1.18	1.12	1.08
RR*	1.20	42.1	22.6	1.86	1.76	1.66
C	2.20	49.7	25.9	2.85	2.70	2.56
D (SUB)	1.20	60.5	33.5	2.85	2.70	2.56
D	4.00	60.5	33.5	5.06	4.80	4.56
D*	4.00	60.5	33.5	5.10	4.84	4.60
F*	2.00	94.0	33.5	7.36	6.98	6.62
SF*	10.00	91.3	41.7	POA	POA	POA
PP3	0.11	49x26.5x17.5		4.52	4.29	4.07
PP9	1.2	81x52x66		POA	POA	POA

* DENOTES SOLDER TAGS FITTED

AC.1 SAFT MAZDA AA CHARGER, CHARGES 1 to 4 AA CELLS — £5.75
PC.3 SAFT MAZDA PP3 CHARGER, CHARGES 1 or 2 PP3 CELLS — £5.75
MC.4 JECKSON MULTICHARGER, CHARGES 2 or 4 AA, C or D CELLS £2.00
MC.6 SAFT MAZDA MULTICHARGER, CHARGES 1 to 4 AA, C or D CELLS, or 1 or 2 PP3 CELLS £8.75

B.N.O.S. ELECTRONICS

B.N.O.S Electronics Ltd. (Dept RC)
Bigods Hall Great Dunmow
Essex CM6 3BE Tel: (0371) 4677

• CARRIAGE FREE ON ALL MAINLAND UK ORDERS OVER £5 — THOSE UNDER PLEASE ADD 60p
• AVAILABLE DIRECT FROM MANY U.K. AGENTS AND AT MOST RALLIES AND EXHIBITIONS

Bredhurst electronics

BREDHURST ELECTRONICS
HIGH ST, HANDCROSS, W. SX.
(0444) 400786 RH17 6BW

Access BARCLAYCARD VISA

MAIL ORDER AND RETAIL
MON-FRI 9-12.30/1.30-5.00
SAT 10.00-4.00p.m.

THE COMMUNICATIONS CENTRE OF THE SOUTH—

HF TRANSCEIVERS

		£	(c&p)
TRIO	TS930S	1250.00	(—)
YAESU	FT980	1475.00	(—)
ICOM	IC751	1239.00	(—)
ICOM	IC745	899.00	(—)
TRIO	TS430S	733.00	(—)
TRIO	TS830S	793.00	(—)
YAESU	FT757GX	759.00	(—)
TRIO	TS530SP	698.00	(—)
TRIO	TS130S	598.00	(—)
YAESU	FT77	479.00	(—)

ANTENNA TUNER UNITS

ICOM	IC-AT500 Auto	429.00	(—)
ICOM	IC-AT100 auto	299.00	(—)
TAU	Super ATU	349.95	(—)
TRIO	AT250 auto	290.00	(—)
YAESU	FC757 auto	249.00	(—)
YAESU	FC102 High Power	189.00	(—)
TRIO	AT230	150.90	(2.00)
YAESU	FC700	105.00	(1.50)
WELZ	AC38	77.95	(1.50)
YAESU	FRT7700 Short Wave Listening	48.25	(1.00)

HF RECEIVERS

ICOM	R70	599.00	(—)
ICOM	R71	699.00	(—)
TRIO	R2000	456.00	(—)
TRIO	VC10 VHF Converter for R2000	122.00	(—)
YAESU	FRT7700 antenna tuner	48.25	(—)
TRIO	R600	285.00	(—)
YAESU	FRT8800 Gen Cov Rx	P.O.A.	(—)

VHF RECEIVERS

JIL	SX200N	299.00	(—)
AOR	AR2001 25—500MHz	365.00	(—)
FDK	ATC720 Handheld Airband	179.00	(—)
FDK	RX40 Handheld 141-179MHz	149.00	(—)

TRIO TL922 LINEAR £1021.00

2M FM TRANSCEIVERS

		£	(c&p)
TRIO	TM201A 25W Mobile	295.00	(—)
ICOM	IC27E 25W Mobile	359.00	(—)
YAESU	FT230R 25W Mobile	269.00	(—)
TRIO	TR2500 Handheld	257.00	(—)
FDK	Multi 725X 25W Mobile	369.00	(—)
YAESU	FT209R (FNB3)	239.00	(—)
ICOM	IC2E Handheld	199.00	(—)
ICOM	IC02E Handheld	259.00	(—)

2M MULTIMODE TRANSCEIVERS

TRIO	TS780 2M and 70cm base	934.00	(—)
YAESU	FT726R 2m fitted (70cm optional) base	839.00	(—)
TRIO	TS711E 2M base station	792.00	(—)
ICOM	IC271E 25W base	699.00	(—)
ICOM	IC290D 25W Mobile	469.00	(—)
TRIO	TR9130 25W Mobile	479.00	(—)
YAESU	FT290R Portable	309.00	(—)

70cm TRANSCEIVERS

TRIO	TW4000A Mobile 2M/70cm	510.00	(—)
TRIO	TM401A 12W Mobile	324.00	(—)
TRIO	TR3500 Handheld	277.00	(—)
YAESU	FT790R Multimode portable	299.00	(—)
ICOM	IC4E Handheld	259.00	(—)
ICOM	IC04E Handheld	269.00	(—)
TRIO	TS-811E Base	898.00	(—)

MORSE EQUIPMENT

HK 707	Straight Key	14.95	(1.00)
HK 703	"deluxe" straight key	27.95	(1.20)
HK 802	"deluxe" Brass key	85.00	(2.00)
MK 704	Squeeze paddle	11.95	(1.00)
CW-3	Practice Oscillator	8.75	(0.75)
EK 150	Electronic keyer	96.00	(1.00)
D 70	Datong Morse tutor	56.35	(—)
MMS-1	Morsetalker morse tutor	115.00	(1.00)
GW	Brass Key on slate	34.50	(2.00)
MK	Datong morse keyboard	137.42	(—)

NEW AKD WAVEMETER (VHF) £24.95

SPEAKERS

		£	(c&p)
TRIO	SP230 (TS830, 530)	45.45	(1.50)
TRIO	SP430 (TS430)	32.40	(1.50)
TRIO	SP120 (TS130, 120)	29.27	(1.50)
YAESU	SP102 (FT102)	52.50	(1.50)
TRIO	SP40 Mobile speaker	15.67	(0.75)
YAESU	SP55 Mobile speaker	14.95	(0.75)

ANTENNA BITS

HI-Q Balun 1:1 5kW pep		11.95	(0.75)
7·1MHz RAL-TRAPS—Epoxy—pair		8.95	(1.50)
Self Amalgamating Tape 10m × 25mm		3.95	(0.75)
T-piece polyprop Dipole centre		1.50	(0.30))
Polyprop Strain Insulators		0.50	(0.10)
Small ceramic Egg Insulators		0.50	(0.10)
Large ceramic Egg Insulators		0.75	(0.10)
75 ohm Twin Feeder-light duty	per metre	0.16	(0.04)
300 ohm Twin Feeder	per metre	0.14	(0.04)
UR67 Low loss coax—50 ohm	per metre	0.67	(0.20)
UR76 50 ohm coax—dia 5mm	per metre	0.25	(0.05)
UR70 70 ohm coax	per metre	0.30	(0.05)
4mm Polyester Guy Rope, strength 400kg	per metre	0.16	(0.04)
50 metres 16 swg hardrawn copper		6.90	(0.75)

WELZ SWR-POWER METER

SP15M	SWR-Power HF/2M 200W	45.00	(1.00)
SP45M	SWR-Power 2M/70cm 100W	65.00	(1.00)
SP250M	SWR-Power HF 2kW	59.95	(1.00)
SP350M	SWR-Power HF/2M/70cm 200W	75.50	(1.00)

COAXIAL SWITCHES

SA450	2 Way Diecast SO239 (500MHz)	12.95	(0.75)
SA450N	2 Way Diecast N plug (500MHz)	15.95	(0.75)
CH20A	2 Way Welz 50239 (900MHz)	21.95	(1.00)
CH20N	2 Way Welz N plugs (900MHz)	38.75	(1.00)
DRAE	3 way SO239 sockets	15.40	(0.75)
DRAE	3 way N sockets	19.90	(0.75)

METEOR 600 FREQUENCY COUNTER £141.00

GOODS NORMALLY DESPATCHED WITHIN 24 HRS.—PRICES CORRECT AT TIME OF GOING TO PRESS—E&OE

CLASSIFIED ADVERTISEMENTS

Classified advertisements **30p** per word, minimum **£4.80**
Box Number £2.00 extra to wordage or minimum.
Semi-display 1/8 page 2¼" × 3½" (57 × 91mm) **£81.00**
3/32 page 1¾" × 3½" (42 × 91mm) **£63.00**
1/16 page 1" × 3½" (26 × 91mm) **£44.00**
Please write clearly. No responsibility accepted for errors.
Latest date for acceptance—7 weeks before 1st of issue month.
All classified and semi-display advertisements MUST be prepaid.

Copy and remittance to: **M. J. HAWKINS G3ZNI, RSGB Advertisements, PO Box 599, Cobham, Surrey KT11 2QE.**
(Cheques should be made payable to RSGB.)

Members' Ads must be sent to the editor at Chelmsford.

FOR SALE

QSL CARDS printed to your own specification on white or coloured gloss card. Send S.A.E. for sample pack to: The Caswell Press, 11 Barons Way, Woodhatch, Reigate, Surrey.

AMIDON TOROIDAL CORES, ferrite rings for TVI filters, ferrite beads. Send SAE for data and prices. SMC (TMP electronics), Unit 27, Pinfold Works, Pinfold Lane, Buckley, Clwyd.

QSL & LISTENER CARDS. Quality printing on coloured and white gloss card at competitive prices. SAE for samples. S. M. Tatham, "Woodside", Orchard Way, Fontwell, Arundel, West Sussex.

G5RV TYPE AERIALS. Half-size £13.00, full-size £14.95. New hard drawn copper aerial wire. 140ft 14swg, £7.90; 50 metres 16swg, £6.90. Soft enamelled copper wire 10 metres 12swg, £3.50. 50 metres 1.4mm, £5.75. Ceramic egg insulators. Large 50p; small 40p. Guy rope, 4mm polypropylene, 50 metres £3.95. 4mm nylon, 50 metres £6.90. All items post paid. S. M. Tatham, 1 Orchard Way, Fontwell, Arundel, West Sussex.

D.I.Y. QSLs/SWLs (state which!!). 100 mixed designs/colours, £2.50 (c.w.o.). Q/Cards, 87 Derwent Street, Blackhil, Consett DH8 8LT.

PERSONALISED QSL CARDS, 1000 £15.00, 5000 £50.00. Sae for samples. Q/Cards, 89 Derwent Street, Blackhill, Consett DH8 8LT.

50m (165ft) AERIAL WIRE. Strong PVC covered copper only, £4.40 inc postage. W. H. Westlake, Clawton, Holsworthy, Devon.

QSL CARDS. Gloss or tinted cards. SAE for samples to Twrog Press, Penybont, Gellilydan, Blaenau Ffestiniog, Gwynedd.

CREED TELEPRINTERS 444(TP15) complete with perforator and reader. Tested working. Available to Raynet members only. £40. Details Mike Watson G8CPH, Ipswich (0473) 831448.

PAG, RTTY TERMINAL UNIT KIT. PLL, AFSK, auto start stop. Complete with PCB, power supplies, case components; £56. Details Mike Watson G8CPH, Ipswich (0473) 831448.

"RAYNET" YELLOW REFLECTIVE TABBARDS with RAYNET front and rear similar to Police and Ambulance, etc. Also "RAYNET CONTROLLER". 2 sizes. Prices from £6.90 inc p&p. Details Mike Watson G8CPH. Ipswich (0473) 831448.

200 DIY QSL's—mixed designs, colours £5.00 Hampshire Logbook £1.90. SAE lists. RWW, PO Box 11, Romsey, Hampshire SO5 8XX.

PHONE-ATLAS GAZETTEER—with maps, giving approximate location of all U.K. telephone numbers, £5.75. RWW, PO Box 11, Romsey, Hampshire SO5 8XX.

30FT TELESCOPIC/TILTOVER MASTS, £170 complete. SAE. M. White, 14 Pingle Lane, Northborough, Peterborough. (0733) 76682.

AMATEUR RADIO EQUIPMENT bought, sold, exchanged. For the best deal, Guaranteed! Phone Dave, (040 24) 57722 or send SAE for list. G4TNY Electronics, 132 Albany Road, Hornchurch, Essex RM12 4AQ.

HIGH CLASS QSL CARDS. Keen prices. SAE for samples and prices to J. S. Coates, Dept RC, 57 Worrall Street, Morley, Leeds LS27 0PJ.

SERVICE MANUALS for amateur radio, vintage wireless, test etc. LSAE enquiries. Mauritron (RC), 8 Cherrytree Road, Chinnor, Oxfordshire.

MONOLOCK SAFETY MICROPHONE SYSTEM £32.95. Timer + pre-amp Ni-Cads + electret lapel microphone. Suits most rigs including Icoms. Microphone plug fitted. R & A Sudron Ltd, Colliers Lane, Leeds LS17 8LP. (0532) 737120.

G4TJB QSL CARDS Personal and standard designs, DIY cards, Log Books, SAE for samples and price list. G.C. Patterson, 16 Peartree Road, Great Barr, Birmingham B43 6HY.

REALISTIC COMMUNICATIONS RECEIVER DX300 Digital Readout—Mint Condition. £120 o.n.o. For Quick Sale. Phone (0734) 596635 office hours.

AMATEUR RADIO INSURANCE SCHEME

"ALL RISKS" INSURANCE for portable/mobile/base station amateur radio and ancillary equipment. A service for RSGB members only. Also public liability and equipment insurance for affiliated clubs and societies. Details and leaflets from Nick Gibson, Amateur Radio Insurance Services Ltd, 19 Quarry Street, Guildford, Surrey. Tel: 0483 33771.

MISCELLANEOUS

COURSE FOR CITY & GUILDS, Radio Amateurs Examination. Pass this important examination and obtain your licence, with an RRC Home Study Course. For details of this and other courses (GCE, Career and professional examinations, etc) write or phone—THE RAPID RESULTS COLLEGE, Dept JT5, Tuition House, London SW19 4DS. Tel: 01-947 7272 (9am–5pm) or use our 24hr Recordacall service 01-946 1102 quoting JT5.

GB NEWS 1985—packed with information for your Continental Holiday, 2 × 13p stamps. GB Car Club, FREEPOST 1, Romsey, Hants SO5 8ZT.

COMPUTER SOFTWARE/HARDWARE

SPEED UP CALLSIGN IDENTIFICATION by sending for our 48K Spectrum tape giving Country, Continent, CQ zones, ITU zones. All bearings from London. Price £6.50 per tape incl. p&p. Send to Comtom Programmes, 11 Apperley, West Denton, Newcastle-upon-Tyne NE5 2JS.

SPECTRUM 48K "4/2/70" AWARD manager. Log calls/QRA, summaries, prefix directory inc. Maidenhead. £6.50. "Wire" scheduler construction aide 48K, £6.50. "Parts" order—48K, £6.50. SAE enquiries. G4INP Software, 3 Redhouse Lane, Leiston, Suffolk.

"DX" ON SPECTRUM 48K. Bearings, distances, F1/F2 hops, Lat/Long or Maidenhead plus nearly 400 pre-programmed co-ordinates including full DXCC. World map flashes locations. Run it during HF QSO's! Tape, £5.99. Autocraft, 10 Brocks Drive, Fairlands, Guildford, Surrey.

AMTOR, SUPERB STANDALONE PROGRAM for Dragon 32/64 and TRS80 Color. Needs any RTTY T.U. and our time/PTT board. ARQ, FEC and Listen modes. Split screen, type ahead, QSO review etc. Advanced RTTY programs also for CBM64, Vic20 Atom (Utility ROM). Also for Dragon; Morse transceiver, tutor, Basicode receiver, Alldream assembler, monitor, dis-assembler. On tape, cartridge and Dragon disk. SAE for details. Grosvenor Software (G4BMK), QTHR. (0323) 893378.

MORSE READER PROGRAMMES. Off air onto screen. Programmes for BBC B, Spectrum, ZX 81 16K, Dragon, Amstrad 464, Commodore 64 and any VIC 20. Sinclair computers need no interface, others use simple one transistor (BC107) interface. Programmes self tracking 8/30 WPM. All connections to existing sockets. Cassette with full instructions and circuit £6.00. J. E. Price, 4 Housman Walk, Offmore, Kidderminster.

RTTY PROGRAMS FOR THE SPECTRUM AND ZX81. Probably the best available. Hundreds of copies already in use. Programs written by a radio amateur who is a professional programmer. These programs require an interface and TU, but give real RTTY performance. They are not just 2 metre toys. For prices and full info send an SAE to: G4IDE Micro Systems, 79 South Parade, Boston, Lincs PE21 7PN.

BBC MICRO SOFTWARE. RTTY transceive program in ROM which is entered simply by typing "*RTTY". Terminal unit pcbs, kits and built boards now available. Sophisticated morse teacher, slow morse broadcast software, morse beacon. Written by professional software designers. Send large SAE for detailed technical specifications. GOC Software Limited, "CQ Cottage", Longhill Lane, Audlem, Cheshire CW3 0HU.

AMSTRAD CPC464 morse tutor program. Features Random letters, words, figures or plain language. A full featured tutor program. £6.90 inc VAT & p&p. Available soon, a RTTY transceive program—please enquire. Full range of RTTY & morse terminals available. Please enclose SAE with all enquiries. PNP Communications, 62 Lawes Avenue, Newhave, East Sussex BN9 9SB Tel (0273) 514465.

BBC MICRO PROGRAMS . . . HF Field Day Contest Checker (2500 Calls). Auto duplicate check. Direct print to Form HFC1 . . . Get ready for the 1985 Contests. Also Morse Tutor. Send SAE for Program Specs. G MacKenzie GM4NUN, 278 Ayr Road, Newton Mearns, Glasgow G77 6AQ.

RTTY AND CW transceive with no TU. Very sophisticated program yet easy to use. Split screen, type ahead, 26 saveable memories, CW ident, QSO review and much more. Needs only a very simple interface (kit, pcb and user port connector supplied). For CBM64, BBC-B, VIC20. Tape, instructions, interface kit £20 inc p&p. Ready-made interfaces available. CW-only version for Spectrum £10. Technical Software (GW3RRI), Fron, Cesarea, Caernarfon LL54 7RF. (0286) 881886.

MORSE TUTOR CBM64, VIC20, BBC-B, Spectrum, ZX81-16k. Superb program, very easy to use. Absolute beginner to over 40 wpm. Learn in stages, random letters, figures, words, plain language. Any amount, any speed. Tape, instructions, comprehensive learning guide £6 inc p&p. GW3RRI, see ad above.

RAE MATHS CBM64, VIC20, BBC-B, Spectrum, ZX81-16k. Gives unlimited practice and testing in all RAE formulae to make you perfect in this vital part of the exam. Don't let maths make you fail. Pass with this program. Tape, instructions, complete reference sheet £8 inc p&p. VIC20 needs expansion. GW3RRI, see ad above.

LOCATOR CBM64, VIC20, BBC-B, Spectrum. QTH or Maidenhead Locators or lat/long. Distance, beam and return headings, VHF contest points and totals, long path details, converts between locator and lat/long. Tape, instructions £6 inc p&p. GW3RRI, see ad above.

LOGBOOK CBM64, VIC20, BBC-B, Spectrum. Records date, band, mode, callsign and large space for remarks of all your contacts. Superfast M/C callsign search. Easy, fast updating of files. Output to screen or printer. Tape, instructions £6 inc p&p. GW3RRI, see ad above.

CONTEST LOG GBM64, VIC 20, BBC-B. All details for RSGB HF/VHF contests. Instant duplicate check. Calculates distance and points for VHF. Outputs in required page format. Tape, instructions £6 inc p&p. GW3RRI, see ad above.

G3WHO BBC SOFTWARE. Full feature AMTOR program now available on Eprom. Works with ordinary T.U. and timer unit (supplied). Split screen, memories, clock, mailbox etc. Phone or SAE for details. RTTY program also available on tape (£7.50), Disk (£9.50) and Eprom (£20). P.J. Harris, 10 Appleby Close, Great Alne, Alcester, Warwickshire B49 6HJ. Tel. 078981 377.

AMSTRAD CPC464 MORSE TUTOR. 34k program. Simple to use. For the beginner and improver. Teaches and tests you in stages right through to simulated morse tests. Cassette £7 inc. Yeovil Electronic Developments, 44, St. Mary's Crescent, Yeovil, Somerset BA21 5RR.

AMSTRAD CPC464 QSO INDEXING system. Records callsign, QSO date, band, mode, name, QTH, QRA, medium used, and remarks. Comprehensive file handling and editing facilities. Duplicate file check, callsign search and file display. Easy updating of files etc. £7 inc. Yeovil Electronic Developments, see ad above.

ATMOS RTTY £9.50, Morse Tutor £6, QTH Locator £5, all three for £17. Electron/BBC Ham package: Morse, QTH Locator, ATV test card £11, for Sinclair QL £17. AX.25 Packet Radio boards assembled/tested £249, in cabinet £289. SAE details: Vomek Software, 50 Mayridge, Fareham, Hants PO14 4QP.

HOLIDAY ACCOMMODATION

GET FAT AT FAIRMOUNT! Enjoy our wonderful meals, beautiful en suite bedrooms, warmth and comfort, in a tranquil setting near historic Cockington village. Family holidays with FREE accommodation for children; dogs most welcome too. Special Spring Breaks, and pensioners reductions. From £15.50 B.B.E.D. Also meet G6GR, licensed 63 years, use the rigs if you are licensed also, and try the new TONO communications-terminal computer. Telephone (0803) 605446, Fairmount House Hotel, Herbert Road, Chelston, Torquay.

SELF-CATERING CHALETS. Explore by day, DX by night. My aerials, your rig. £15-£120 per chalet per week. Green, G0ATS, 'Chylean' Tintagel, Cornwall PL34 0HH. Tel. (0840) 212262.

PEMBROKESHIRE—SOLVA. Quality cottages on magnificent, unspoilt coast. Near sandy beaches and bays. All home comforts, warmth and privacy. Free use of HF and VHF gear in your own cottage. For colour brochure, phone M. Probert GW4HXO—(0437) 721491.

LANZAROTE—Canary Islands. Enjoy the sunshine this winter on the interesting and fascinating island of Lanzarote. Superb villas, elegantly furnished, peaceful location, just 300 yards from the beach. Only 15 minutes from airport. Resident management. Rental only or fully flight inclusive. M. Probert GW4HXO—(0437) 721491.

TORQUAY (0803) 607333. Self-contained holiday flats open all year. Example —early June flat for two, £55.00 weekly inclusive TV, linen. Linden House, Ruckamore Road, Chelston, Torquay.

HOLIDAY SRI LANKA? WHY NOT? Of our own tourists last year 16 were hams. 6 of them obtained licence and operated. Write to Mrs Antoinette Perera, Spangles, 84 Templer Road, Mount Lavinia plus £1 or 5 IRCs.

CORNISH HOLIDAY COTTAGE sleeps four, fully equipped, colour TV, near coast. From £70 per week. Phone A. Jeffery G4YRL (032 65) 3617.

INDEX TO ADVERTISERS

AJH Electronics....221
Allweld Engineering....216
Alyntronics....218
Amateur Electronics UK Ltd 162/3
Amateur Radio Exchange 164/165
Amateur Radio Shop....228
Amcomm Services....Cover II
J. Birkett....222
BNOS Electronics....22?
Bredhurst Electronics....229
Cambridge Kits....228
CR Supply Co....224
Datong Electronics....227
Davtrend Limited....223
Dewsbury Electronics....217
Dressler (UK) Ltd....219
EMA Electronics Engineers....216
Eurover Electronics....228
Farnborough Communications 220
Garex Electronics....227
GWM Radio Ltd....218
G2DYM Aerials....224
G3RCQ Electronics....218
G4TNY Electronics....224
Hately Antenna Technology...228
ICS Electronics Ltd....225
IQD Ltd....220
Jaycee Electronics....224
J. Klingenfuss....222
KW Ten-Tec Ltd....221
Lowe Electronics Ltd 154/157 & 159
Microwave Modules....158
Modular Electronics Ltd....226
J. Moxham G8KBQ....218
Mutek Ltd....Cover III
Newnes Technical Books....224
Practical Wireless....216
QuartsLab Marketing Ltd....228
Radio Shack....225
Randam Electronics....226
R. F. Devices....226
Scarab Systems....220
South Midlands Communications Ltd 166/169, 221 & 231
Stephens-James Ltd....223
Thanet Electronics....160/1
Uppington Tele Radio Ltd....231
Reg Ward & Co. Ltd....222
Ward Electronics....226
Waters & Stanton....215
W. H. Westlake....220
White Rose Rally....216
C. Wilson....226
Wood & Douglas....222
Yaesu Musen Co Ltd....Cover IV
Zycomm Electronics Ltd....231

RSGB MAIL-ORDER PRICE LIST

RSGB books

	Non-members' price	Members' price
A Guide to Amateur Radio (19th edn)	£3.91	£3.52
Amateur Radio Awards (2nd edn)	£3.68	£3.31
Amateur Radio Operating Manual	*(Out of print)*	
HF Antennas for All Locations	£7.35	£6.62
How to Pass the Radio Amateurs' Examination	£3.42	£3.08
Microwave Newsletter Technical Collection	£6.83	£6.15
Morse Code for Radio Amateurs	£1.64	£1.48
RSGB Amateur Radio Call Book (1984 edn)	£7.14	£6.43
Radio Amateurs' Examination Manual (10th edn)	£3.84	£3.46
Radio Communication Handbook (5th edn) Vol 2	£8.46	£7.61
Radio Communication Handbook (Vols 1 and 2 combined, paperback)	£11.79	£10.61
Raynet Manual (1984 edn)	£2.78	£2.50
Teleprinter Handbook (2nd edn)	£12.72	£11.45
Television Interference Manual (2nd edn)	£2.31	£2.08
Test Equipment for the Radio Amateur	£6.41	£5.77
VHF/UHF Manual (4th edn)	£10.58	£9.52
World at Their Fingertips (paperback)	£7.75	£6.98

RSGB logbooks

Amateur Radio Logbook	£2.77	£2.49
Mobile Logbook	£1.23	£1.11
Receiving Station Logbook	£2.87	£2.58

RSGB maps, charts and lists

HF Awards List and Countries List	48p	43p
Great Circle DX Map (wall)	£2.43	£2.19
IARU Region 1 Beacon List	40p	36p
Locator Map of Europe (wall)	£1.95	£1.76
Locator Map of Europe (card for desk)	70p	63p
UK Beacon List	40p	36p
UK Repeater List and maps	50p	45p
World Prefix Map in full colour (wall)	£2.53	£2.28
Meteor Scatter Data	£3.51	£3.16

RSGB members' sundries (members only)

Radio Communication Easibinder	—	£6.71
RSGB badge car sticker	—	49p
RSGB belt (real leather)	—	£7.57
RSGB hf contest log sheets (100)	—	£2.10
RSGB vhf contest log sheets (100)	—	£2.10
RSGB tie (coffee, maroon, green or blue)	—	£3.18
RSGB callsign cap	—	£4.98
RSGB logo rubber stamp	—	£3.16
RSGB station callsign plaque*	—	£9.50
RSGB teeshirts (med, large, exl)	—	£4.90
Standard callsign lapel badge*	—	£1.96
De-luxe callsign lapel badge*	—	£2.80
Lapel badge (RSGB emblem, pin fitting)	—	59p
Mini lapel badge (RSGB emblem, pin fitting)	—	68p
Members' headed notepaper (50 sheets) quarto	—	£1.20
Members' headed notepaper (50 sheets) octavo	—	75p

**Delivery approximately five weeks*

Miscellaneous

"Amateur radio" (two colours) car sticker	73p	66p
DX Edge (HF propagation prediction aid)	£14.09	£12.68
"I'm on the air with amateur radio" (four colours) car sticker	84p	76p
"I'm monitoring ·5 are you?" (two colours) car sticker	73p	66p
QSL card holders	£1.23	£1.11
Radio Communication back issues *(As available)*	£1.32	£1.19
Radio Communication bound volume, 1980 (Parts 1 and 2)	£14.93	£13.44
Radio Communication bound volume, 1981	£14.93	£13.44
Radio Communication bound volume, 1982	£15.93	£14.34
Radio Communication bound volume, 1983	£16.90	£15.21
Smith charts, pad of 25 (Chartwell D7510)	£2.23	£2.01

Other publications

	Non-members' price	Members' price
Active-filter Cookbook (Sams)	£12.71	£11.44
All About Cubical Quad Antennas (RPI)	£5.83	£5.25
Amateur Single Sideband (Ham Radio)	£5.46	£4.91
Amateur Television Handbook (revised) (BATC)	£2.94	£2.65
Amateur Television Handbook Vol 2 (BATC)	£2.77	£2.49
Antenna Anthology (ARRL)	£6.00	£5.40
ARRL Electronics Data Book (ARRL)	£4.47	£4.02
Beam Antenna Handbook (RPI)	£6.83	£6.15
Better Short Wave Reception (RPI)	£6.83	£6.15
Care and Feeding of Power Grid Tubes (Varian)	£6.99	£6.29
CMOS Cookbook (Sams)	£13.07	£11.76
Complete DX'er (W9KNI)	£7.77	£6.99
Complete Shortwave Listener's Handbook (Tab)	£12.21	£10.99
Design of VMOS Circuits with experiments (Sams)	£8.50	£7.65
FET Principles, Experiments and Projects (Sams)	£8.04	£7.24
FM and Repeaters for the Radio Amateur (ARRL)	£4.30	£3.87
G-QRP Club Circuit Book	£4.52	£4.07
Guide to Oscar Operation (AMSAT)	£1.78	£1.60
Hints and Kinks for the Radio Amateur (ARRL)	£4.47	£4.02
How to Troubleshoot and Repair AR Equipment	£10.47	£9.42
IC Op-amp Cookbook (Sams)	£11.76	£10.58
International VHF FM Guide	£2.45	£2.21
Newcomer's Guide to Simplex and Repeaters on 2m (UK FM Group)	£1.24	£1.12
**Power Supply Handbook* (Tab)	£10.99	£9.89
Radio Amateurs Antenna Handbook (RPI)	£6.88	£6.19
Radio Amateurs Callbook (1985) (DX listings) (ARC1)	£16.63	£14.97
Radio Amateur Callbook (1985 USA listings) (ARCI)	£16.93	£15.24
Radio Amateurs Handbook (1984) (ARRL)	£6.66	£5.99
Radio Amateurs Handbook (1985) (Softback) (ARRL)	£15.80	£14.22
Radio Amateurs Handbook (1985) (Hardback) (ARRL)	£21.90	£19.71
RTTY Today (UEI) (A modern guide to rtty)	£7.19	£6.47
Radio Frequency Interference (ARRL)	£4.18	£3.76
Satellite Experimenters Handbook (ARRL)	£10.11	£9.10
Satellite Tracking Software for the Radio Amateur (AMSAT-UK)	£4.47	£4.02
**Secrets of Ham Radio DXing* (Tab)	£7.92	£7.13
Semiconductor Data Book (Newnes)	£7.97	£7.17
**Shortwave Listeners' Antenna Handbook*	£10.10	£9.09
Shortwave Propagation Handbook (Cowan)	£7.79	£7.01
Simple Low-cost Wire Antennas (RPI)	£6.83	£6.15
Solid State Design for the Radio Amateur (ARRL)	£7.87	£7.08
Television for Amateurs (BATC)	£2.23	£2.01
Towers International Transistor Selector	£13.95	£12.56
Towers International MOS Power & FET Selector	£10.95	£9.86
Towers Op-Amp Selector	£9.50	£8.55
**UHF-Compendium Parts 1 and 2*	£14.93	£13.44
Understanding Amateur Radio (ARRL)	£4.73	£4.26
Understanding the Oscilloscope	£10.10	£9.09
VHF Propagation Handbook (Nampa)	£3.75	£3.38
Weekend Projects for the Radio Amateur (ARRL)	£4.95	£4.46
World Atlas (RACI)	£3.35	£3.02
World Radio TV Handbook 1984	£12.81	£11.53
**99 Test Equipment Projects You Can Build*	£8.00	£7.20

***Items marked with an asterisk may not be available immediately. Please telephone before ordering to confirm availability.**

RSGB kits

Morseman kit 1	£12.78	£11.50
Morseman kit 2	£19.52	£17.57
Morseman kit 3	£36.11	£32.50
CMOS Z80 ic for Morseman	£8.17	£7.35

MORSE INSTRUCTION AID

RSGB morse course Stage 1 (to 5wpm)	£4.54	£4.09

MAGAZINE SUBSCRIPTIONS

QST (including ARRL membership). One year	£31.53	£28.38
Two years	£60.00	£54.00
Three years	£89.74	£80.77
By air via KLM (to W Europe only) one year	£44.81	£40.33
Ham Radio Magazine (per annum) (incl air delivery)	£25.35	£22.81

NEWSLETTER SUBSCRIPTIONS

Microwave Newsletter, VHF Newsletter, DX Newsletter. For details contact the membership services department at RSGB headquarters.

ORDERING INFORMATION

NON-MEMBERS. Use left-hand price columns. Note that members' sundries are only available to members of RSGB.

MEMBERS. Use right-hand price columns. It is essential that you quote your call sign or BRS number so that you can be recognised as a member.

PRICES. These include postage, packing and VAT where applicable. For airmail despatch, please ask for price before ordering. Goods are obtainable, less p & p, at RSGB headquarters between 10am and 4pm, Monday to Friday.

POSTAL TERMS. Cash with order. **Stamps and book tokens cannot be accepted.** Cheques and postal orders should be crossed and made payable to "Radio Society of Great Britain". Our Giro account number is 5335256. Please write your name and address clearly on the order, and allow up to 28 days for delivery.

ORDER FROM: RSGB Publications (Sales), Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JW

(Raynet supplies should be obtained from Mrs J. Balestrini, Merrivale, Willow Walk, Culverstone, Gravesend, Kent)

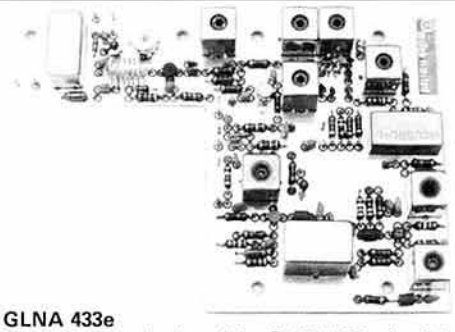
A Matter of Trust . . .

In these times of 'wonder claims' and cut-price merchandising, it's perhaps worth reflecting upon the less obvious but equally important after-sales back-up. We at MuTek have always operated a fairly open-ended warranty system. Whilst we do reserve the right to charge for repairs etc outside of the statutory 12 month period, it's in fact very rare for us so to do. It all costs money of course, so it is hardly surprising that some manufacturers and retailers are found running rapidly in the other direction should problems occur!

I mentioned 'wonder claims' too in the opening line above. While we should consider ourselves fairly fortunate that although there are fewer wildly exaggerated performance figures quoted in UK advertising than is the case on the other side of the Atlantic (or indeed in some European countries), there are still many areas of concern to those of us in the business who prefer to sell products in an honest fashion. Not only are some performance figures presented in a manner likely (or intended) to confuse and obfuscate the equipment's true performance, but some specifications are quite simply downright dishonest! Since the beginning we have striven to maintain our standards, not only of product excellence but of engineering honesty and integrity – that's why we're still in business!

73 Stephen Prior G4SJP

Our recent move into the area of transverter manufacture doesn't mean that we've forgotten about all our other products. There is a full list below, and I would like to pull a couple of things out for special attention.



RPCB 271ub

We've recently slightly re-engineered the RPCB 271ub replacement front-end to allow fairly painless fitting to both the Icom IC271e and 'h models. The performance is unchanged, and is all you'd expect from a muTek front-end: good low noise figure (2dB typically) and quite superlative strong signal performance. The onboard antenna changeover relay switches the transmitter output in the 25W 'e version, and is employed as an isolation relay in the 100W 'h model. The price of the RPCB 271ub is still **£89.90** plus £1.50 p&p inc VAT.

GLNA 433e

Since the introduction of the GLNA 433e shortly before Christmas, it has quickly established itself in the 70cm scene. Housed in a highly durable polycarbonate environmental enclosure, the preamplifier uses a MGF 1202 'professional' GaAsfet (no cheap television 'gasfets' here!) in a circuit configuration designed to provide an optimum combination of low noise figure (typically 0.9dB), and good strong signal performance (third order input intercept −3dBm. That's +10dBm output intercept for those of you interested in the ignoble art of specmanship).

A two-pole high performance filter provides a good bandpass response ensuring that the preamplifier is suitable for use anywhere within the 430-440MHz band. The GLNA 433e is priced at **£79.90** plus £2.50 p&p inc VAT.

		£
TVHF 230c	High performance 2m to hf transverter	334.90
TVVF 50c	High performance 2m to 6m transverter	189.90
SLNA 50s	500MHz low-noise switched preamplifier using BF981	44.90
SLNA 144a	144MHz low-noise switched amplifier using BF981. 15dB typical gain, 0.9dB typical nf, 100W through-power	39.90
SLNA 144u	Unswitched version of the SLNA 144a	22.40
SLNA 144ub	Unboxed version of the SLNA 144u	13.70
SLNA 145sb	Transceiver optimised preamplifier for the FT290	27.40
SBLA 144e	Masthead mounting 144MHz high performance low-noise high dynamic range preamplifier with balanced pair of BF981's 13dB typical gain, 1.1db typical nf, 250W through-power	89.90
GFBA 144e	Ultra-high performance masthead mounting GaAsfet 144MHz preamplifier using advanced negative feedback circuitry for superb dynamic performance. Supplied with ATCS 500 sequence-controller. 13dB typical gain, 0.9dB typical nf, 1000W pep (ssb) through-power	139.90
GLNA 432e	Masthead-mounting 430-440MHz ultra-high performance GaAsfet preamplifier. Supplied with ATCS 500 sequencer-controller. 13dB typical gain, 0.9dB typical nf, 250W pep (ssb) through-power.	149.90

		£
TLNA 432u	Unswitched bipolar 430-440MHz preamplifier. 12dB typical gain, 1.5dB typical nf.	29.00
TLNA 432ub	Unboxed version of the TLNA 432u	20.40
BLNA 432ub	Sub-miniature 430-440MHz preamplifier. 14dB typical gain, 1.3dB typical nf. Requires external filtering	13.70
BBBA 500u	20-500MHz high dynamic range preamplifier, ideal for scanners	32.90
RPCB 144ub	Complete replacement front-end for the FT221 and FT225	74.90
RPCB 251ub	Complete replacement front-end for the IC211 and IC251	79.90
RPCB 271ub	Complete replacement front-end for the IC271e	89.90
GDIF 107ub	Gunn diode WBFM 'back-end' processing board	49.65
XBPF 700ub	Microstripline bandpass tvi filter	2.95
CISA 001	UHF (f) to BNC(m) coaxial adaptor	1.60
ATCS 500	Sequence-controller	33.90
VFAT 206	25W 6dB attenuator (suitable for use with the TVHF 230c and TWF 50c)	19.65

Carriage/Postage Rates

GFBA 144e, SBLA 144e, GLNA 432e, GLNA 433e	2.50
TVHF 230c, TWF 50c	5.00
All other products above	1.50

ALL PRICES INCLUDE 15% VAT

muTek limited –the rf technology company

Dept. RC, Bradworthy, Holsworthy, Devon EX22 7TU (0409 24) 543

Access BARCLAYCARD VISA

YAESU

NEW MOBILES

AUTHORISED YAESU

2M & 70cm FULL DUPLEX FT2700RH

The FT2700R, virtually two transceivers in one case, is designed to be the ultimate in convenience, for FM mobile or base station operation, on the 144 *and* 430MHz bands. Using Yaesu's new one piece die-cast aluminium chassis concept, the FT2700R provides 25 Watts continuous output on either band, for full duplex (or simplex!) operation whilst obtaining optimum circuit shielding and efficient heat dissipation.

SCANNING
Two 4-bit CPU's provide convenient control together with simple operation of the dual VFO's, 10 channel memory with back up and two calling frequencies.

Dual, receiver front ends, local synthesisers, IF's and transmitter RF stages make this the first mobile transceiver capable of *true* full duplex cross-band operation.

PRIORITY
Comprehensive scanning features include "PMS" (programmable memory scan) which permits continuous or skip-scanning between two memory channels in the same band. A MHz 'stepping' switch is fitted for quick transition from one band to another. Priority channel monitoring is available whilst on the same or another band!

CROSS BAND
Independently programmable transmit and receive frequencies, standard repeater shifts (with reverse facility), offers total freedom of operation.

READOUT
The large green back-lit dimmable LCD offers an aesthetically pleasing and easy to read display of the complete operating status of the transceiver, including memory and reverse repeater indications at a glance. The PO/S meter incorporated in the main display is a distinctive graphical two colour type. (Optional Voice Synthesiser available, see FT270R/RH text.)

The FT270R/RH is constructed on a unique massive diecast aluminium ducted heatsink which enables significantly larger output powers to be obtained from a transceiver substantially smaller than any similar radio to date. The FT270RH, with fan assisted cooling provides 45W RF output whilst the conventional R version offers 25W. Both FT270R and RH are fitted with a "low" power switch which provides around 10% of full output.

DISPLAY
The FT270R/RH uses a high visibility back-lit LCD, with large 5mm digits, providing a readout of frequency and all important transceiver functions. Pleasant green illumination and newly developed wide angle LCD ensure easy visibility day or night from most angles.

MICROPROCESSORS
The dual 4-bit microprocessors of the FT270R/RH provide maximum ease of use combined with an extremely wide range of operating functions. Dual VFO's, ten memories and programmable band scan limits are all easily selectable from the front panel.

MEMORIES
The FT270R/RH can memorise a number of scanning parameters for maximising performance. Upper and lower limits may be set (for quick scanning of the band). The ten memories may be scanned for a busy channel or for monitoring a priority channel. The scanning can be either manually or carrier controlled.

VOICE SYNTHESISER
For easier and safer 'eyes on the road' mobile operation an optional voice synthesiser (FVS-1) is available to give an audible indication of frequency, memory channels and VFO selections at the touch of a convenient microphone mounted button. The FVS-1 is of course ideal for those with impaired vision.

45 WATTS OUTPUT FT270RH

GENERAL SPECIFICATIONS

Mode	: FM (F3, G3E)	Antenna	: 50ohms, unbalanced
Supply	: 13.8V ± 15%	Modulation	: Variable reactance
Circuit	: Double Conversion	Deviation	: ± 5KHz
	: 21.6MHz, 455KHz	Tone Burst	: 1,750Hz
Sensitivity	: 0.2μV @ 12dB Sinad	Spurious	: −60dB (or better)
	: 1.0μV @ 30dB Sinad	Maximum BW	: 16KHz
Selectivity	: 14KHz −6dB	Microphone	: 600ohms, nominal
	: 28KHz −60dB	Temperature	: −10°C + 60°C
Image	: −60dB (or better)		
Audio	: 4 to 16ohms	**OPTIONS**	
	: 2W in 8ohms (10% THD)	FVS-1, MF-1B3B, SP55, YH1, SB10	

FT2700RH

Frequency	: 144-146MHz
	: 430-440MHz
Power out	: 2m 25/3W
	: 70cm 25/3W
Supply	: 7A (25W Tx)
	: 3A (3W Tx)
	: 0.6A (Sq Rx)
Stability	: 2M ± 10ppm, −5 +50°C
	: 70cm ± 5ppm, −5 +50°C

DIMENSIONS (Ex/Inc Projections)
150W, 50H, 130/185D mm, 1.6Kg

FT270R/RH

Frequency	: 144-146MHz
Power out	: RH; 45W/5W
	: R; 25W/3W
Supply	: RH; 9A/3.5A Tx
	: R; 6A/2.5A Tx
	: 0.6A (Sq Rx) R/RH
Stability	: ± 10ppm (−5 +50°C)

DIMENSIONS: (Ex/Inc Projections)
140W, 40H, 143/175D mm, 1.25Kg

SMC

South Midlands Comms Ltd
Rumbridge Street
Totton
Hants SO4 4DP

YAESU MUSENS ONLY AUTHORISED DISTRIBUTORS

Amateur Electronics
508-514 Alum Rock Road
Alum
Birmingham

G3FIK

Printed in Great Britain for the RADIO SOCIETY OF GREAT BRITAIN, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JW
by E T Heron (Print) Ltd, Silver End, Witham, Essex