May 1978

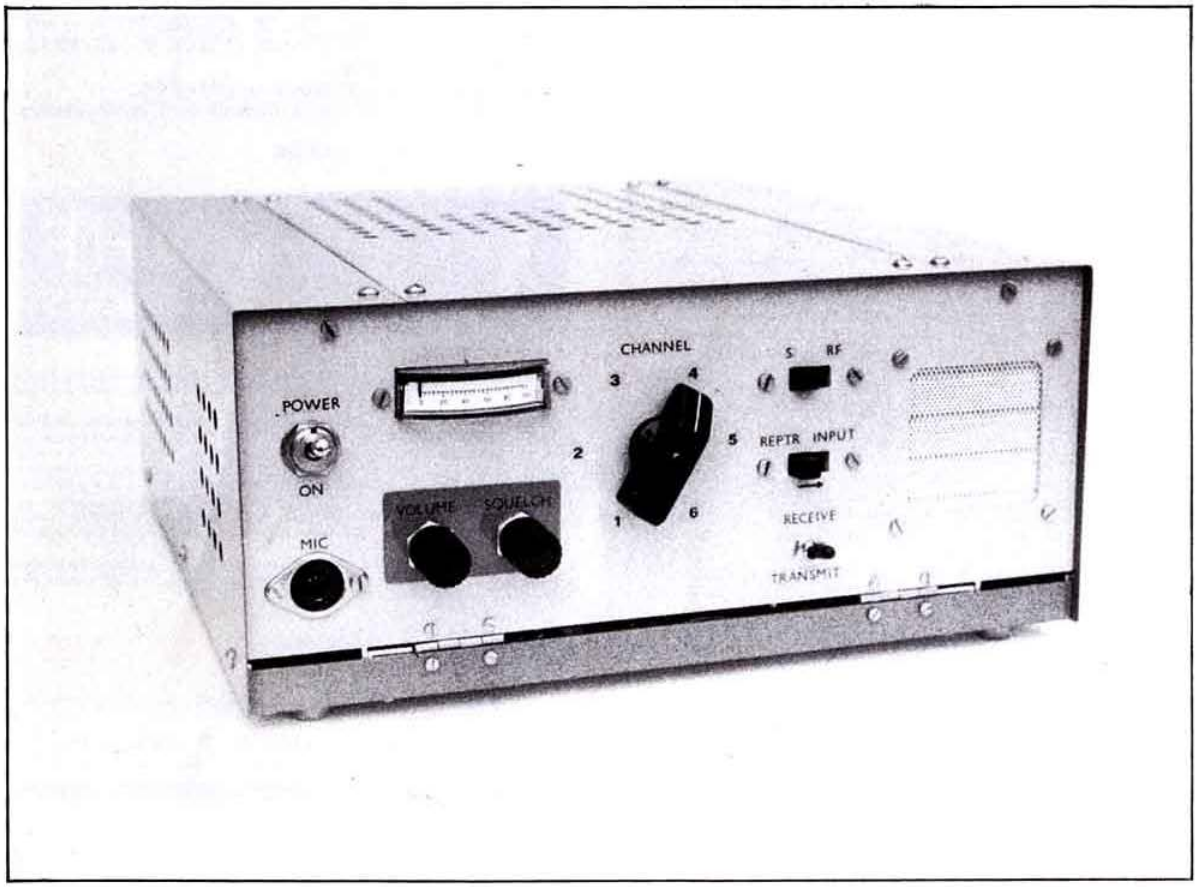
radio communication

journal of the Radio Society of Great Britain

IN THIS ISSUE

A channelized 144MHz fm transmitter - receiver

by N. G. HYDE, CEng, MRAeS, MIERE, G2AIH



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G3PLX RTTY VIDEO DISPLAY UNIT

(April 1977 Rad Com)
Complete Kit (excluding modulator, keyboard and P.S.U.), **£77.15**
Set of printed circuit boards **£14.85.** Veroboards also available at **£4.30** each. Set of i.c.s. including programmed 74188s, **£56.15;** 2513, **£8.50;** AY5-1013, **£6.25;** 2102-1, **£2.85;** SN74188, **£4.00** each or ready programmed **£8.80** per pair. 7MHz Xtal, **£2.85.**
Flashing cursor kit **£7.70.**
Diode Matrix kit **£11.50.**
Suitable mains P.S.U. Transformer £2.75.
Catronics UHF Modulator, £15.00.

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

MULTIMODE 1600 TRANSCEIVER

(Oct/Nov 1977 Rad Com)
Special price for complete kit, £210.00.
Receive only kit also available, £191.00.
PCB, **£10.50;** QC1246AX, **£31.50;** Less carrier xtals, **£27.50;** XF9-E, **£27.80;** XF9-M, **£25.50;** 8545kHz xtal, **£3.00;** 400ns delay line, **£1.50;** MD108, **£7.65;** RS12V Relay, **£2.25;** Toroid **30p.**
MiniKit 1 (containing all the above) **£147.00.**
MiniKit 2 (semiconductors) **£54.50** or **£29.85** (receive only).
MiniKit 3 (R's and C's) **£19.55.**

Before I took VHF Comms I got on well with my wife—now she builds their 23cms kits. How often have you heard that on the air? Never! Then it's time a few more wives saw VHF Comms!

Let's talk about 23cms. Many designs have appeared in the magazine, from the preamp with printed lines (DJIEE002) of edition 2/72 and the printed hybrid ring mixer converter (DJ5XA004) of edition 2/76, through the linear 144/1296 transmit converter (DC8NR006) of edition 2/76 to the current batch of designs. Now edition 4/77 includes a three stage preamp (DCODA) using BFR34A transistors and a printed line PCB (in stock) NF 2·5dB, gain 21dB; a simple-to-make tuned line filter; and a 28/1296 linear transverter (DF8QK) 10mW in/300mW out; and aerials. Make your own to the design of DL3WR (edition 1/75), or DL6WU (edition 4/77).

That was 23cms, but articles on just about everything else appear in the various editions of the magazine, back copies of which are stocked at Communications House.

Individual back copies—£1.25
Annual subscription (inc. post)—£4.50
PCB DCODA004—£4.63

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CONTENTS

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TS 820

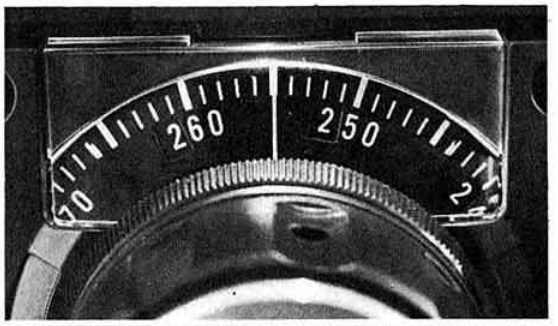
What makes the TS820 the finest HF transceiver available to the radio amateur? It's a unique combination of the unequalled design ability of Trio engineers together with their determination to make every function on the transceiver, both electrical and mechanical, perform at the highest level of perfection. That they have achieved their aim is amply demonstrated by the ever increasing demand for the TS820 all over the world.

The TS820 provides, in one package, a complete all band HF station with several design features which are exclusive to Trio and make this transceiver the leader in its field. Let's consider some of these more closely.

THE TUNING DIAL

Probably the most used control on any rig, but so often lacking in attention to detail. The common approach is to have two dials, one calibrated 0-100 KHz in 1 KHz steps, the other 0-500 KHz in 100KHz steps. This means that the operator has to mentally add together two readings when trying to decide what frequency he is on.

Trio adopted a different system for the TS820 and the result is the twin disc monoscale dial.



This dial reads from 0-500 in 1 KHz steps and as you can see from the photograph, is completely unambiguous—you know where you are all the time. This is Trio attention to detail.

PASSBAND TUNING SYSTEM

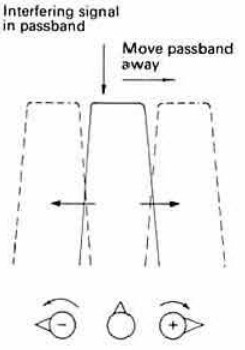
The insignificant little knob labelled "IF shift" on the front panel of the TS820, controls a system which is such a powerful operating aid in today's crowded bands that it has to be used to be appreciated.

In effect, the IF shift system gives the set operator the facility of moving the IF filter with its 8 pole selectivity, across the spectrum of signals appearing at the receiver mixer output, and it operates without changing the frequency to which the receiver is tuned. In practice, take the case of the VK3 who is S2 above the noise level and has just replied to your call. You have settled down to listen when I9XYZ comes up 2KHz away and splatters into your receiver passband—so just turn the IF shift knob to move the passband away from him, and there is your VK3 still readable whilst I9*I* vanishes.

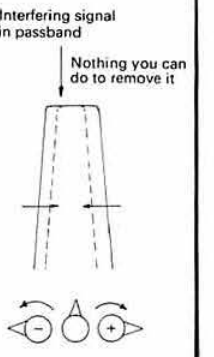
The facility also works with the CW filter fitted and it is then incredible, since you can tune the receiver to the middle of a bunch of stations and by turning the IF shift knob, pick them off one by one with no interference between stations.

This IF shift system is unique to Trio and must not be confused with "IF width" tuning using overlapping filters since this operates in a different fashion entirely. The "IF width" system gives the operator a basic filter bandwidth of, say, 2.5KHz for SSB and then allows him to mske this gradually narrower by double mixing an overlap filter in the IF. It has two snags, one in that you cannot move the IF passband away from an interfering signal and secondly, the overlap filter requires the use of two mixers in the IF chain which may degrade the IF performance—the TS820 of course is truly single conversion using only one fully balanced receive mixer.

Perhaps a couple of diagrams will help in understanding the two approaches.



I.F. SHIFT operates by retaining complete passband width but moving it so as to reject interfering signals



I.F. WIDTH operates by narrowing I.F. passband but remaining at same frequency. Little or no rejection of signals within passband.

DIGITAL READOUT SYSTEM

So often, the digital readout systems in transceivers do nothing more than count the VFO frequency and present this as the operating frequency—usually the counter reads 0-500 and the MHz digits are permanently wired to the bandswitch. It looks impressive but is usually inaccurate because it takes no account (a count?) oh never mind; of inaccuracies in heterodyne crystals or carrier oscillator frequencies. Let's face it, there's hardly any point in having readout to 100Hz if the only thing you have to set the readout against is the 100KHz calibrator in the receiver, but if you see a "CALIBRATE" knob associated with a digital readout unit, it's a sure sign of just such a system.

Trio, of course, did the job correctly, and in both the TS520S and TS820, the digital readout system measures all the oscillator frequencies used in the transceiver, does the calculations and presents you with your exact operating frequency regardless of band, mode, RIT shift or being on transmit or receive. It's again typical of the Trio attention to detail.

As a follow on to this point, consider what happens when you change modes in a transceiver. With the TS820, the carrier oscillator outputs are injected into the PLL system so that changing from USB to LSB does not change your operating frequency. In most other equipment, such a switch results in an operating frequency change of around 3KHz, and if in the same rig you have the simple so called digital readout system, that system will insist that you have remained on frequency when in fact you are yelling your head off 3KHz down the band.

From an ergonomic (lovely word that) standpoint, the TS820 panel layout further reflects the Trio care in design. You will notice that the controls are very sensibly arranged with AF and RF gain controls on concentric shafts as are the mic gain and carrier controls. Two more controls likely to be used together are the IF shift and RIT—so they're arranged to be together. It sounds simple in description but look at some rigs where the controls are arranged in seemingly haphazard fashion and you will see how difficult they could be to operate.

Whilst looking at the knobs, you might care to notice that Trio have provided, in addition to all band 160–10m coverage, an extra uncommitted band. This is to allow for the fact that at WARC, there may be additions or changes to the existing amateur bands. Looking ahead, the Trio design team made provision for this so there's no cause for concern if you own an 820 or 520S but it may be an idea to check on the bandswitch of the rig you just bought and figure out where that additional 18MHz band will go!!

Trio metering in the TS820 gives you a complete picture of station operation, including as it does, measurement of PA HT (how else can you calculate your power) and also compression level in dB so that you can set up the compression to suit your requirements, without relying on preset control settings and guesswork.

The fully variable, metered speech processor is a fast-acting low-distortion RF compressor as opposed to an IF clipping system which can introduce unacceptable loss of speech quality. Up to 40dB of compression is available without blowing the tops off the PA tubes.

As a further aid to setting up the rig, Trio include a monitor facility which samples the SSB signal from the transmit IF chain and demodulates it to allow you to check the quality of the transmitted signal.

When it comes to signal quality, Trio are the acknowledged leaders. The years of experience in the use of proper PA tubes (6146B in the 820) have given them this lead and the use of RF negative feedback around the PA and driver stages of the TS820 have made the already excellent intermodulation performance even better. If you want to check how a good signal should sound, just listen to a TS820, or a TS520 for that matter; don't simply take my word for it.

These notes give only a brief insight to the TS820 system. The entire transceiver is designed with extreme skill and only the TS820 can provide you with the best possible HF transceiver around today.

To complete the description of the TS820, we should also cover the ultra stable PLL system which gives single conversion on all bands, both in transmit or receive modes; the fully encapsulated VFO system; the automatic receiver audio bandwidth shaping to suit the mode in use; the true FSK system built into the rig with adjustable shift from 170-850Hz; the silent PA cooling fan; built in 25KHz calibrator; provision for extra bands and for fixed channel operation; the advanced noise blanker system; the switchable time constant AGC system; the "TUNE" facility that you can use all day without damage and no time limit; the front panel VOX controls; the digital hold facility; the provision of rear panel connectors for every possible use, including transverter, linear, phone patch etc etc.

ACCESSORIES

To complete the station, Trio offer a range of accessory units with design engineering to match the TS820 standards. The SP820 matching speaker unit is unique in having built-in high-pass and low-pass audio filter networks to assist you in digging out the last DXCC contact. The SP820 also has facilities for switching between two rigs so that you can make use of the speaker with your standby receiver or your VHF rig.

Finally, the specification which anyone can check at any time—these figures are correct and typical of any TS820. Let's face it, most of the leading DX operators and discerning amateurs are now using the TS820. Why not join the club and find out about Trio quality and engineering?

SPECIFICATIONS

Frequency Range	160 meter band 1.8 to 2.0 MHz 80 meter band 3.5 to 4.0 MHz 40 meter band 7.0 to 7.5 MHz 20 meter band 14.0 to 14.5 MHz 15 meter band 21.0 to 21.5 MHz 10 meter band 28.0 to 28.5 MHz 28.5 to 29.0 MHz 29.0 to 29.5 MHz 29.5 to 30.0 MHz WWV 15.0 MHz (receive only) A U X band uncommitted
Mode	CW, USB, LSB, FSK
RF Input Power	SSB: 200 watts PEP CW: 160 watts DC FSK: 100 watts DC
Antenna Impedance	50 to 75 ohms, unbalanced
Carrier Suppression	better than 40 dB (Mod. freq. at 1.5 kHz)
Sideband Suppression	better than 50 dB (Mod. freq. at 1.5 kHz)
Receiving Sensitivity	0.2 μV for 10 dB S + N:N or better
Image Ratio	160 to 15 meter band: better than 60 dB 10 meter band: better than 50 dB
IF Rejection	better than 80 dB
Frequency Stability	Within ±1 kHz during one hour after one minute of warm-up, and within 100 Hz during 30 minute period thereafter
Receiving Selectivity	SSB: 2.4kHz (–6dB)/4.4 kHz (–60dB) CW: 0.5 kHz (–6 dB)/1.5kHz (–60 dB)* *) with optional CW filter
AF Output Power	More than 1.5 watts into 8 ohms
Audio Output Impedance	4 to 16 ohms (speaker or headphone)
Tube and Semiconductors	3 tubes, 5 ICs, 30 FETs, 74 transistors, 165 diodes
Power Requirements	120/220 VAC, 50/60 Hz or 12–13.8 VDC (with optional Power Converter DS-1)
Power Consumption	Transmit: 280 watts, Receive: 26 watts
Dimensions (W × H × D)	333 × 153 × 335 mm
Weight	16kg

The AT200 aerial tuner is, as you can see from the photograph, a comprehensive control centre incorporating not only wide range matching networks for 160-10 metres but also in line power metering, SWR measurement facilities and switching for up to three aerials, any or all of which can either pass through the matching section or be connected directly to the rig. The AT200 is of course suited to any rig but matches the TS820 and 520 series equipment in size and style.

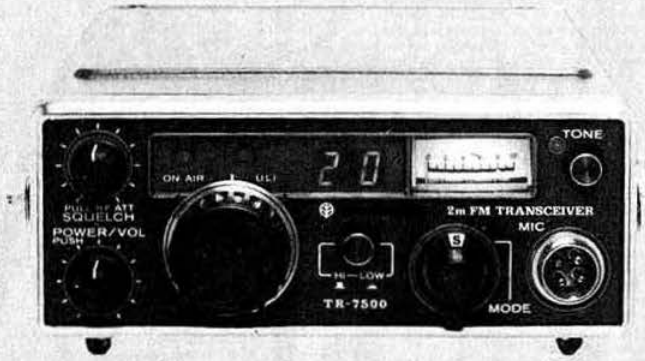
SP820 £36 inc. VAT

AT200 £86 inc. VAT

LOWE ELECTRONICS LTD

TR-7500

Why settle for anything less?



The TR7500 is the very latest 2 metre FM mobile to be introduced by TRIO and will delight the owner with its combination of performance, reliability and unique design. It represents another step forward in the TRIO product line and is designed to give you the very best FM transceiver available in its class.

Whatever you now own, or may have been thinking of buying, it would be foolish to settle for anything less than the TR7500.

PLL Synthesiser, no crystals to buy, ever, with the TR7500 since the operating frequencies are generated by a TRIO designed LSI phase locked synthesiser. This provides 80 FM channels at 25 KHz spacing from 144-146 MHz, all 10 repeater and reverse repeater channels. The channels are selected by a single knob and *no programming is required from the user*—just unpack the rig, connect 12 volts dc and you are on the air.

Unique display

TRIO attention to detail at its very best is shown in the method used to display the channel number. TRIO believe that ease of use is the priority consideration, and have arranged the large LED display to show the correct channel number at all times. If you want to operate on S24, turn the channel knob until the display shows 24—simple isn't it? Need R7? Turn the knob until the display shows 7. There's no need to wonder "did I programme S24 into channel 15 or channel 9?"

Repeater operation

Available at the touch of a front panel switch. Turn this to "N" (normal) and you operate normal repeater with 600 KHz receiver up-shift. If you wish to listen on the input, turn the switch to "S" (Simplex), and you are there — and can operate simplex on the input frequency. Need reverse repeater? Turn the switch to "R" (reverse) and you operate with transmit up-shift of 600 KHz. This facility is most useful when you hear several stations calling into a repeater with only one (of course) appearing at the output. Using reverse repeater operation you can call into the pack to invite anyone to a simplex channel for direct QSO.

Automatic tone burst is provided, with a front panel LED to remind you that you have the tone burst on. Needless to say, the 1750Hz is generated by TRIO's unique tuning fork oscillator which guarantees spot on frequency at all times and in all temperatures.

Performance plus

A combination of multi section helical filtering at signal frequency, monolithic crystal filters at 10.7 MHz, and sharp multi pole filters at 455 KHz allows the TR7500 to keep on working under strong adjacent signal conditions when other rigs give up.

The receiver performance for sensitivity is excellent. On the samples checked so far, we obtain 12dB SINAD for a startling 0·18 microvolts and under mobile conditions, we copy repeaters in terrain which previously presented real signal problems.

The transmitter generates a true FM signal at 10·7 MHz which is translated directly to two metres in a fully balanced mixer system. This guarantees a superbly clean signal with no unwanted multiplier products, and an all new PA system with specially developed transistors, gives rugged reliable power in excess of 10 watts.

As a final test for freedom from unwanted in band signals, we ran the TR7500 at full output with a TS700G coupled to it on the bench. Tuning from 144-146 MHz on the TS700G, we found just one signal—the wanted one. It was impossible to find a single unwanted signal coming out of the TR7500 under these extremely severe conditions. Wideband checks using the analyser revealed no spurious outputs detectable above noise level. At this point we retired happy!

Attention to detail

As is well known, TRIO introduced the since copied variable power SWR protection system, and it is of course fitted to the TR7500 with an improved high gain dc amplifier for tighter and faster control.

High/low band change is by push button, with S-meter illumination colour change to remind you of the band in use.

Another simple but typically TRIO thoughtful provision is the special channel knob with a deep moulded indent at S0. You can set this vertical by touch alone and can then count up the channels without even seeing the channel display. Great when mobile and you need your eyes on the road.

Finally the TR7500 with all its potent performance is packaged in a case not much bigger than a TR2200GX!

Accessories

The TR7500 is supplied complete and ready to use with TRIO quick release mobile mount, microphone, power leads, comprehensive manual etc. etc. Nothing more to buy to own the best mobile/fixed station FM rig on the market.

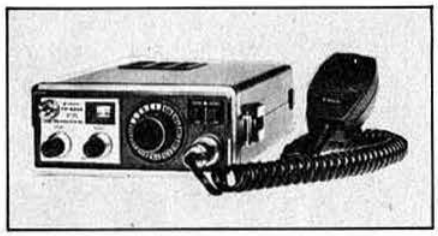
TR-7500 £225 inc. VAT
DON'T SETTLE FOR ANYTHING LESS

TRIO

LOWE ELECTRONICS LTD

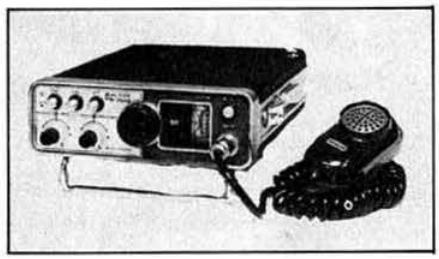
TS700G £426 inc. VAT (also including the matching VOX-3)

Say what you will, the TS700G set the standard for all other 2 metre all mode transceivers. A very high standard which has yet to be surpassed. Full 2 metre coverage, VFO or 22 crystal channels, all mode operation AM, FM, USB, LSB and CW. Mains or battery supply. Normal and reverse repeater facilities at the turn of a switch. Trio exclusive tuning fork access tone generator with fully auto tone burst. Best quality signal on the band thanks to TRIO design excellence in low intermod amplifiers. It's simply the best rig that you can buy, and it's backed by the combined reputations of TRIO and Lowe Electronics.
15 Watts output; 0·25 microvolt sensitivity; first class strong signal handling receiver; European standard selectivity. If you haven't yet handled the TS700G, rush to one of our branches and be prepared to be impressed. Send for full details now.



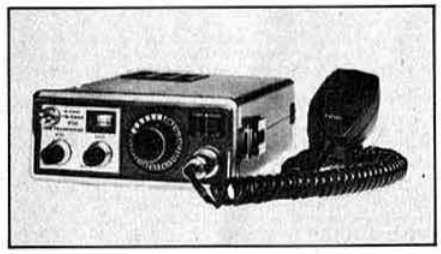
TR2200GX £139 (3 ch.) £169 (12 ch.) inc. VAT

This is the definitive 2 metre FM portable rig which has won praise from all over the world. Over 2W transmitter output with switched reduction to 400mW for local contacts. High gain receiver with double IF filtering at 10·7MHz and 455kHz for razor sharp selectivity.
The TR2200GX is supplied with all accessories including the battery charger for the optional Nicad battery pack, the removable telescopic antenna, the carrying case, the shoulder strap, external power lead, microphone and handbook. Fitted with 12 channels, the price is only **£160** inc. VAT. If you wish to start out at a lower price, we can supply the rig fitted 3 channels for only **£130**. With all its performance, the TR2200GX is a must for the portable operator. At the price, it has to be the best around. Just look around at the next rally and see how many operators are carrying them. Also available are a mobile mounting bracket at **£9.70**, a matching 10 Watt amplifier for **£45** and a flexible antenna. Send for full details now.



TR7010 £189 inc. VAT

Work real DX with ease on 2 metre SSB and CW. The TR7010 combines a high performance receiver with a 10 Watt transmitter and provides mobile or fixed station capability at low cost. Supplied ready to operate from 144·1–144·34MHz, the TR7010 covers all CW, SSB and beacon activity. 48 channels with 5kHz spacing plus VXO and RIT provide continuous coverage. Operation in any other part of the 2 metre band can be carried out by a simple crystal change and no re-alignment is required.
Single conversion using an IF of 10·7MHz with a first class crystal filter gives outstanding selectivity. Wide range amplified AGC and newly developed FET devices in the RF and mixer stages allow maximum sensitivity to be used with freedom from overload due to adjacent signals. The single conversion transmitter using fully balanced mixers generates a beautifully clean signal with crisp audio quality.
Join the SSB gang and work real DX for **£189**. Send for full details now.



TR3200 £182 inc. VAT

The newest FM handy transceiver from the ever expanding TRIO range. Superb performance for the 70cm operator with all the advantages of portability and TRIO reliability. 12 channel capability in the range 432–436MHz with three channels fitted (SU8, 18, 20). Transmitter output switched 2W/400mW and incorporating the exclusive TRIO 1750Hz tuning fork access tone generator (does that mean you can ring for credit?) High gain 5/8 wave antenna for enhanced performance on transmit and receive. Supplied complete with all accessories as for the TR2200GX and including the all important battery charger.
We have just received the first shipment of the VB3200 10W amplifier for the TR3200. Rather more complex than the VB2200, the VB3200 also includes a switchable receive preamplifier. Price . . . **£95** inc. VAT. Send for details now.

TRIO PRICES—ALL OUR PRICES INCLUDE VAT (12½%) WE DO NOT SEEK TO DECEIVE

TS820	£645.00			TR2200GX (12CH)				**OTHER THINGS**
VFO820	£112.00	TS700S	£542.00		£169.00	T599S	£383.00	Complete ranges of
DG1	£127.00	VFO700S	£83.00	RA1	£6.30	S599	£18.00	J-Beam . Microwave
SP820	£36.00	TR7010	£189.00	MB1a	£9.70	TL922	£697.50	Modules . G Whip .
TS520S	£489.00	PS5	£58.00	VB2200GX	£45.00	HC2	£14.88	Hy Gain . Rotators.
DS1a	£40.00	TR7200G	£189.00	PS1200	£29.50	MC10	£9.00	Too much to mention.
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SP520	£19.00	TR7400A	£329.00	TR3200	£182.00	LF30A	£17.00	50p in stamps and
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TS700G	£426.00	TR2200GX (3CH)		R300	£184.50	PS6	£57.00	catalogue and antenna
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◀IC-202

IC202 The 2m SSB/CW portable which is clean enough to use as a prime mover to drive a linear. The VXO gives continuous coverage over the ranges 144·0-144·2 and 144·2–144·4. The coverage can be extended with extra crystals switchable from the front panel. This is the ideal set to buy if you are thinking of sampling the delights and advantages of SSB on 2m as it gives full coverage of the SSB and CW portions of the band with easy, continuous tuning.
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IC-215 By far the best 2m FM portable on the market—with more power (3W) than most and batteries some 4 times as big thus giving a reasonable period of operating use. Add to this the superb, clear modulation for which ICOM are so famous and a good receiver, plus a solid, reliable construction and you have really good value for money.
Total channel capacity = 15
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2·3"

◀IC-240

IC-240 Think of the features you would instal in a mobile to provide a combination of optimum usefulness AND SAFETY. You will probably come up with the following requirements:

1 Easy channel selection with minimum knob twiddling—yet with all the normal FM channels available.
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3 Instant reverse repeat at the flick of a switch without any re-tuning or memory programming.
4 A very sensitive receiver with a spurious response performance far better than the average and a very clean transmitter with excellent clear, crisp modulation. (We measured a sensitivity of 0·1µv pd for 10dB sinad).
5 A reasonable price—but (more important) a quick, reliable after sales service.

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IC-211E ▼ £529 inc VAT

Giving you FM/CW/USB/LSB, all produced from the amazing ICOM synthesizer and patent LSI chip. Frequency read out is to the nearest 100Hz and it is amazingly stable and accurate. You can use the two frequency stores as separate VFOs or for any repeater shift required. The tone burst is automatic, of course, and reverse repeat is available at the flick of a switch. Add a keypad (we will give you the circuit to make your own or you will be able to buy one shortly) and find a new facility which is quite impossible with old-fashioned rigs. The original waiting list has now been dealt with and you can now have one from stock.

IC-245E £396 inc VAT ▲

This truly amazing little box gets you mobile on FM, USB or (if you really think it a good idea) CW! The synthesizer is the same as the IC-211E and can be tuned to the nearest 100Hz, again with amazing accuracy. Of course such a versatile little box will often be used as a base station and facilities such as keypad operation can be added. They are now ex-stock—but only just!

IC-701 £999 inc VAT

◄ The popular "SLIM JIM" SJ2

144–146MHz—High efficiency 2 metre omni-directional vertical

An omni-directional 2 metre aerial developed by T & T from a design by F. C. Judd (G2BCX). Derived from the "J" the SJ2 is a free space aerial with *better than 50% greater efficiency than conventional ground plane types due to the very low angle radiation field.* The aerial is slim and compact (58 inches long) and as there are no radials it is unobtrusive and has low wind resistance. Supplied complete with mast clamp. **£15.50** inc. VAT (carriage £1.00).

The HF rig to beat them all, **HERE THIS MONTH.** ★ All solid state including the finals ★ 100W RF output Continuous Duty on All Bands. All Modes ★ All bands 1·8–30MHz ★ USB, LSB, CW, CW (narrow), RTTY ★ Double balanced Schottky Diode mixer used in both Tx and Rx ★ Fully synthesized with Digital readout to 100Hz and two stores to enable split frequency operation ★ ICOM's unique bandpass tune ★ VOX, Semi-break-in CW, RIT, AGC, Noise Blanker ★ Built-in RF speech processor ★ Extremely compact ★ All filters built in ★ 12V or mains operation ★ Electret desk mic due in at the end of April. NO EXTRAS TO BUY.

INTRODUCING A NEW RANGE OF MICROPHONES BY LESON. For the time being available only from Herne Bay.
All these are suitable for ICOM transceivers and have a PTT switch and a frequency response 300–2500Hz. They are NOT fitted with a plug.

MODEL	TYPE	BUILT-IN AMPLIFIER	IMPEDANCE	PRICE (inc VAT)
TW232	Ceramic Desk mic with PTT, Lock sw and gain cont. Silver grey finish	Compression amp 0–30dB var.	<4·5K	£25.00
DH-218	Moving coil dynamic. Hand held	NONE	500Ω	£4.99
DH-233	Moving coil dynamic. Hand held	Pre-amp 0–15dB var.	<3·5K	£9.00
CH-229	Ceramic noise cancelling. Hand held	Compression amp 0–35dB var.	<5K	£15.00

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1N914	100v	10mA	.05
1N4005	600v	1A	.08
1N4007	1000v	1A	.15
1N4148	75v	10mA	.05
1N753A	6.2v	z	.25
1N758A	10v	z	.25
1N759A	12v	z	.25
1N4733	5.1v	z	.25
1N5243	13v	z	.25
1N5244B	14v	z	.25
1N5245B	15v	z	.25

SOCKETS/BRIDGES

8-pin	pcb	.25	ww	.45
14-pin	pcb	.25	ww	.40
16-pin	pcb	.25	ww	.40
18-pin	pcb	.25	ww	.75
22-pin	pcb	.45	ww	1.25
24-pin	pcb	.35	ww	1.10
28-pin	pcb	.35	ww	1.45
40-pin	pcb	.50	ww	1.25
Molex pins .01		To-3 Sockets		.45
2 Amp Bridge		100-prv		1.20
25 Amp Bridge		200-prv		1.95

TRANSISTORS, LEDS, etc.

2N2222A	NPN (2N2222 Plastic .10)	.15
2N2907A	PNP	.15
2N3906	PNP (Plastic)	.10
2N3904	NPN (Plastic)	.10
2N3054	NPN	.35
2N3055	NPN 15A 60v	.50
T1P125	PNP Darlington	.35
LED Green, Red, Clear, Yellow		.15
D.L.747	7 seg 5/8" High com-anode	1.95
XAN72	7 seg com-anode (Red)	1.25
MAN71	7 seg com-anode (Red)	1.25
MAN3610	7 seg com-anode (Orange)	1.25
MAN82A	7 seg com-anode (Yellow)	1.25
MAN74A	7 seg com-cathode (Red)	1.50
FND359	7 seg com-cathode (Red)	1.25

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4000	.15
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4007	.35
4008	.95
4009	.45
4010	.45
4011	.20
4012	.20
4013	.40
4014	.95
4015	.90
4016	.35
4017	1.10
4018	1.10
4019	.50
4020	.85
4021	1.00
4022	.85
4023	.25
4024	.75
4025	.30
4026	1.95
4027	.50
4028	.95
4030	.35
4033	1.50
4034	2.45
4035	1.25
4040	1.35
4041	.69
4042	.95
4043	.95
4044	.95
4046	1.75
4049	.45
4050	.45
4066	.95
4069	.40
4071	.35
4081	.70
4082	.45
MC14409	14.50
MC14419	4.85

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7400	.15	7473	.25	74176	1.25	74H72	.45
7401	.15	7474	.30	74180	.75	74H101	.75
7402	.20	7475	.35	74181	2.25	74H103	.75
7403	.20	7476	.40	74182	.95	74H106	.95
7404	.15	7480	.55	74190	1.75		
7405	.25	7481	.75	74191	1.05	74L00	.25
7406	.35	7483	.95	74192	.75	74L02	.25
7407	.55	7485	.75	74193	.85	74L03	.30
7408	.25	7486	.25	74194	1.25	74L04	.30
7409	.15	7489	1.35	74195	.95	74L10	.30
7410	.10	7490	.55	74196	1.25	74L20	.35
7411	.25	7491	.95	74197	1.25	74L30	.45
7412	.30	7492	.95	74198	2.35	74L47	1.95
7413	.35	7493	.35	74221	1.00	74L51	.45
7414	1.10	7494	.75	74367	.85	74L55	.65
7416	.25	7495	.60			74L72	.45
7417	.40	7496	.80	75108A	.35	74L73	.40
7420	.15	74100	1.15	75110	.35	74L74	.45
7426	.30	74107	.35	75491	.50	74L75	.55
7427	.45	74121	.35	75492	.50	74L93	.55
7430	.15	74122	.55			74L123	.85
7432	.30	74123	.55	74H00	.15		
7437	.30	74125	.45	74H01	.25	74S00	.35
7438	.35	74126	.35	74H04	.20	74S02	.35
7440	.25	74132	1.35	74H05	.20	74S03	.30
7441	1.15	74141	.90	74H08	.35	74S04	.30
7442	.45	74150	.85	74H10	.35	74S05	.35
7443	.65	74151	.65	74H11	.35	74S08	.35
7444	.45	74153	.75	74H15	.45	74S10	.35
7445	.65	74154	.95	74H20	.30	74S11	.35
7446	.95	74156	.95	74H21	.25	74S20	.35
7447	.95	74157	.65	74H22	.40	74S40	.20
7448	.65	74161	.85	74H30	.20	74S50	.20
7450	.25	74163	.85	74H40	.25	74S51	.25
7451	.25	74164	.60	74H50	.25	74S64	.20
7453	.20	74165	1.50	74H51	.25	74S74	.35
7454	.25	74166	1.35	74H52	.15	74S112	.60
7460	.40	74175	.80	74H53J	.25	74S114	.65
7470	.45			74H55	.20		
7472	.40						

74S133	.40
74S140	.55
74S151	.30
74S153	.35
74S157	.75
74S158	.30
74S194	1.05
74S257 (8123)	1.05
74LS00	.25
74LS01	.35
74LS02	.35
74LS04	.30
74LS05	.45
74LS08	.25
74LS09	.35
74LS10	.35
74LS11	.35
74LS20	.25
74LS21	.25
74LS22	.25
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74LS37	.35
74LS40	.45
74LS42	1.10
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LM309K (340K-5)	.85	LM340T12	1.00	78M05	.75	LM1458	.95
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LM320K12	1.65					NE565	.95
						NE566	1.75
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The FRG7 is a general coverage solid state receiver with specifications unparalleled in its price range. It uses a Barlow Wadley Triple-mix, drift cancelling loop for continuous, spin-tuned inclusive coverage of 0·5 to 30MHz.
The receiver is sensitive (0·5μV for 10dB, S+N/N(SSB) and stable with AM, SSB and CW modes catered for. A three position audio filter, RF attenuator, dial lamp conservation switch, recorder and phone sockets are fitted. It is mains powered, but should the supply fail, or portable operation be required, eight dry cells are automatically switched in.

FRG-7 Analogue Readout £154+VAT **SMC COUNTER £50+VAT**
FRG-7 Digital Readout £207+VAT **YH55 Headphones £8.50+VAT**

The SMC, full specification, internally mounted counter (easily installed in existing receivers) provides: a 100Hz readout (100 fold improvement), flashing ± digit (to indicate VFO over-range) and adjustable gate time.

YAESU for HF from SMC

FT901DM

THE FT901 – SIMPLY UNBELIEVABLE PERFORMANCE

160–10m. (+WWV Rx). 12 and 234v. (PSU Built-in). SSB, AM, CW, FSK and FM (TX & RX). 180W. PIP, 80W. FI. Analogue 1kHz and Digital to 100Hz. Sensitive, ½μV with AGC controlled Mosfet RF to push pull FET RF, Balance active mixer, push pull IF amp. to crystal filter then noise blanker. Overlapping filters give continuously variable selectivity 300Hz to 2·4kHz and fixed 600Hz, 2·4kHz, 6kHz and 12kHz (at 6dB). 80dB cross mod. rejection, 90dB desensitisation immunity (at 20kHz off at 14MHz). Audio Peak and separate notch tuning. Negative RF feedback on 6146B toroidal tuned output stage (–31dB 3rd order). RF processor, VOX, Curtis electronic keyer, tune button (10sec. on full power). PLL VFO with memory for any TX, RX or T/RX frequency. Modular plug-in construction, permability tuning (for possible new band allocations) 25kHz calibrator, 20dB switchable attenuator, sidetone, clarifier, advance noise blanker are all features of the FT901—The 1980's Transceiver available from SMC next month. Coming are the Matching transvertors and phase lock loop synthesised external VFO with scanning facility.

THE FT101E-COMPLETE HF STATION
THE MOST POPULAR RIG IN THE WORLD

The FT101E a complete mains or 12v DC station contained in a compact 30lb package, 260W. P.I.P. of SSB (with in-built RF speech processor) 180W, CW and 80W of AM 10 to 160m (incl) 10MHz RX). The sensitive and selective (permeability tuned RF stages and eight-pole crystal filter, receiver offers: threshold adjustable noise blanker, switchable 25 and 100kHz calibrator, ±5k clarifier (with separate on/of switch), etc, etc.
The VFO is stable and linear (readout to 1kHz) external VFO or crystal control can be selected with LED indicators illuminated accordingly. Carrier level is adjustable for: tune up, AM and for CW operation, whose performance with the semi break in keying, with side tone, and the optional filter installed in a high order. Linear and transverter provisions are made with sockets for: relay contacts, ALC output, an internal HT supplies, low level RF heater links and switches, etc, etc.

FT101E

FR101DD

The FR101 series of de-luxe Communications Receivers

The FR101D (de luxe) wide coverage (23 [from 1·5MHz] 500kHz bands + 4 and 2 metres) receiver. Analysis of the signal path shows: 0–20dB switchable attenuator, two section permeability tuned input filter, Mosfet R.F. stage and mixer (crystal controlled), three section top coupled bandpass filter, no gain at first IF, IC balance mixer, 20kHz wide crystal filter, shunt diode noise blanker, single FET buffer stage. AM, CW or SSB (RTTY) filter, appropriate detector and audio stage. Add to this, two excellent VHF converters, squelch, FM detector, 1kHz readout, excellent stability, TX monitor control, crystal control facility, switchable AGC transceive capability (FT or FL101) and that digital readout options are available of this (de-luxe) or the standard (less the plug-in optionals of converters, broadcast band crystals, filters etc) version truly an "apparatus communications sine fils" extraordinary.

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FT221R

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THF FT221R MULTI MODE FROM YAESU

The FT221R. The multimode USB, LSB, AM, FM, CW (with semi-break in and side tone), 2m transceiver offering the choice of phase locked VFO or 44 crystal channels, simplex or repeater (600Hz up and down shifts), with unique "double push" auto tone burst, mains or 12v (3A) operation, excellent selectivity SSB 2·4kHz (1·7:SF) or FM 12kHz. Front panel adjustable VOX and mic gain, a calibrator (1MHz – 10), 1kHz readout and linearity, sensitive squelch, clarifier with IRT and IRT with ITT (makes FSK easy), switchable "S" and centre zero tuning meter, noise blanker, serviceable plug in boards all contained in 11½" (14") × 5" × 11½", 22lb rigid package. 600kHz and 1·6MHz shifts over 4MHz.

FT221R £357 + VAT YC221 £72.50 + VAT MANUAL £9.00

SCANNING DIGITAL II from KYOKUTO

DIGITAL II £235 SCANNER £49.50 (+ VAT 12½%)

The Digital II offers complete 5kHz step coverage across two metres and now with the Scanner 33, 25kHz channels from 145MHz upwards covered in around 10 seconds. It offers full lock and lockout on all channels. The scanner stops on a required channel for 10 seconds, then unless locked moves on. The bright digital readout comes from six seven-segment LEDs.

Selectable 10 or 1W output for simplex or duplex (up and down shifts), across 144–146 (RX to 149MHz) from a tiny 6½" × 2" × 7½". Easily underdash mounted with the supplied mounting bracket, or slipped in place of the broadcast wireless.

For strong handling, and low noise the RF mixer, first IF (16·9MHz) second mixer (and LO) are all FET's. The front end is tuned by varicaps by the DC output of the PLL with superb selectivity provided by a 15-pole (±8kHz at −6dB ±15kHz at −70dB). Ceramic filter. LED lamps indicate if the PLL in unlocked or the squelch open. The VCO is directly modulated (for exceedingly linear deviation). Unitary 6 circuit block construction (for serviceability and screening). Selective calling socket.

FOR VHF MOBILE THE FT227R FROM YAESU Ex STOCK £179 + VAT

The new FT227R uses a "single knob" tuned digital synthesizer employing a photoelectric sensor or an optical coupled system which eliminates both noisy, unreliable rotary switches, and crystal banks.

Full coverage of 2 metres in 5kHz divisions with a ±600kHz shift plus a memory feature which permits recall of any entered frequency or particular offset.

Bright large, digital readout gives unequivocable readout of the frequency in use. The receiver offers 0·3μV (for 20dB S + N/N) sensitivity into a ±6kHz (at 6dB) bandwidth whilst maintaining a remarkable immunity to overload and image problems. The 20W DC input transmitter features Hi/Low power outputs, AFP tone burst on repeaters and an out of band inhibition trip, etc.


FT227R

KYOKUTO DENSHI SCANNING FM2015R

The 2015 transceives across 144–146 (RX to 149) MHz in 5kHz steps tuned by coaxial switch stopped at 0 and 9.

A major feature is the four-channel RAM memory (with an internal Ni Cad back up) which may be programmed direct from the front panel by simply dialling in a frequency, no screw drivers, no soldering irons, no fuss. Frequencies can be recalled from the memory instantly or they may be scanned in either of two modes:—searching for a vacant or an occupied channel, five split (including + and −600kHz) for repeater or transvertor (even triplevertor) use. Multipurpose tone burst, RIT (centre off with "click"), modular constructions, centre zero meter, accessory socket, mounting bracket, microphone etc., are all provided. The sensitive receiver is varicap tuned by the DC level of the PLL. IFs of 16·9MHz and 455kHz provide high image rejection and good shape factor 2:1 at 70dB (12kHz BW). In the transmitter, modulation is applied directly to the VCO (for the ultimate in fidelity), auto power control and varicap tuning keeps power output constant at band edges and spurii way down. **Ex-STOCK. £245** + VAT (12½%).

VHF HANDHELD

KEN KP202 TRANSCEIVER (+VAT Price)
144MHz, FM, 2W of RF and ½W of audio. Immunity to breakthrough.
Performance to rival all walkie-talkies and many a mobile set.
C/w F plug, leather handle/whip case and telescopic whip.
Fitted six channels S20 and S21 plus choice from S (21, 23, 24, 0)

R (3, 4, 5, 6, 7)	£114.50
R channel only crystal tone burst	£10.00
Flexible stubby antenna	£5.95
Case	£4.95
F to UHF adaptor	£1.65
Nicads	£9.00
Base charger KCP2	£12.75

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VHF Monitor Receiver

SEIWA MR2 AND MS2 (+VAT prices)
Ideal for the SWL, the YL or even the XYL as the monitor receiver to keep you in touch. Tiny (2½" × 1½" × 4½") and light (8oz) slip into your pocket or onto your belt with the optional case. Sensitive double conversion superhet with 12kHz band width, auto squelch, and generous audio output c/w Nicads, Mains Charger, Earpiece, Antenna.

MR2(4) 70MHz 12 switched channels	£70.00
MRS 144MHz 12 switched channels	£62.00
MS2 144MHz 4 scanning channels	£75.00
Leather Case £1.90	Crystals each £2.20

NEW UHF FM AND VHF AM MODELS NOW AVAILABLE. SAE FOR DETAILS.


MS2

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NEC NEC

CQ110E DIGITAL READOUT TRANSCEIVER

Frequency Range	10M to 160M
Modes	LSB USB CW AM FSK FAX/SSTV
Power Requirements	100/234V AC or 13·5V DC
Input Power	280W PEP (240W on 28MHz)

CQ 201 EXTERNAL DIGITAL READOUT VFO

Three Outputs	5·0-5·5MHz 8·2-8·7MHz 8·9-9·4MHz
Frequency Counter	10Hz to 30MHz
Output Voltage 2V (p-p)	Impedance 50-100ohms
Counter unit input Level	0·1V (p-p) 100Hz >
	1V (p-p) 100Hz >
Power Requirements	100/234V AC

CQ 301 LINEAR AMPLIFIER

Frequency Range	10M to 160M
Mode	LSB USB CW AM
Power Requirements	100/234V AC
Max Input	2KW SSB 1KW AM
Drive Power	100-200W
Circuit	2 × 3-500Z in Grounded Grid A1

M110 DESK MICROPHONE

Dynamic Unidirectional—Impedance 50K—Frequency Range 200-10,000Hz Flexible Shaft with diecast base for stability and two position Switch.

SP110 EXTERNAL SPEAKER UNIT/DIGITAL CLOCK

High Quality Speaker Unit 4W 8ohm range 180-8000Hz. Digital Clock with 7-segment display, with 59 minute sleep timer, and 24 hour alarm setting with two AC outlets one unswitched and one switched controlled by clock. Power Fail Indication. Power Requirements for Clock 100-234V AC and 50/60Hz switch Selection.

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WESTERN TRIBANDER

4 MODELS NOW AVAILABLE!

DX31

Element length	7·84m
Turning circle dia.	7·84m
Wind load at 120km/h (75mph)	10kg
Wind load at 160km/h (100mph)	17kg
Weight	4·1kg

PRICE £43.31

DX32

Gain (rel. free space ½-wave dipole)	up to 6dB
Front/back Ratio	up to 13dB
Boom length	2·15m
Longest element length	7·85m
Turning circle dia.	8·20m
Wind load at 120km/h (75mph)	19kg
Wind load at 160km/h (100mph)	34kg
Weight	9·7kg

PRICE £67.50

DX33

Gain (rel. free space ½-wave dipole)	up to 8dB
Front/back Ratio	up to 25dB
Boom length	4·00m
Longest element length	7·87m
Turning circle dia.	11·20m
Wind load at 120km/h (75mph)	28kg
Wind load at 160km/h (100mph)	50kg
Weight	15kg

PRICE £92.81

DX34

Gain (rel. free space ½-wave dipole)	up to 9dB
Front/back Ratio	up to 25dB
Boom length	6·45m
Longest element length	7·84m
Turning circle dia.	9·72m
Wind load at 120km/h (75mph)	35kg
Wind load at 160km/h (100mph)	62kg
Weight	20kg

PRICE £121.50

ALSO AVAILABLE

Conversion kits to up-date from one to the next . . .
DX-31/32 . . . £27.56 **DX-32/33 . . . £28.68** **DX-33/34 . . . £32.06**
All Prices include VAT — carriage free

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"May I compliment you on the excellent conversion kit DX-33 to DX-34 . . . The log entries have certainly never looked so DX'y before. Must say I'm very satisfied."
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"I have just recently installed a DX-33 beam and I would like to advise you that I am extremely satisfied with it. It certainly outperforms the TH3 Jr. which I previously used and also the VSWR is lower . . . Any time there are a lot of VK stations calling the rare DX stations, they usually come back to me"
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YAESU

proudly announces a new synthesised 2m FM transceiver FT-227R

The world-famous Yaesu state-of-the-art technique has brought computer theory into VHF communications.

What are the frequency splits for repeaters? Don't worry! Yaesu has computerized it. In addition to a conventional ±600kHz split, any transmitter offset frequency is memorised with a touch of a push-button.

What was my last frequency channel? Don't check! A touch of a push-button will bring you back to the memorized channel instantly.

Why only one knob to select a channel out of 800 channels? Yaesu utilises a "OPTICAL COUPLING" system to select each channel in 10kHz steps and the channel may be offset 5kHz higher with a touch of a push-button. Thus 800 fully synthesized channels are provided with one knob and no rotary switches to get oxidized and noisy.

Why wait? the FT-227R is on your dealer's shelf now.

Many, many other features such as automatic encoder-decoder for tone guarded squelch (TGS) (optional). Tone burst accessed repeater operation, automatic final protection, busy channel indicator, high-low output selection, diecast front panel, and famous Yaesu quality throughout!

And all at a most attractive price. See your dealer today for an informative catalogue.

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

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

YAESU
proudly announces
1980's RADIO TODAY:
The FT-901DM HF Transceiver

The Ham's dream—to have the best—is now reality.

Advanced receiver features include rejection tuning, dual-filter variable-bandwidth IF passband tuning, and audio peak frequency tuning for sharp CW reception. Unparalleled receiver selectivity is yours.

Built-in Curtis 8043 IC Keyer! Provides reliable operation and superb immunity from RF interference.

Famous Yaesu quality workmanship throughout. Toroidal output circuitry and RF negative feedback for maximum reliability and purity of emissions. Rugged GE 6146B final tubes.

Memory circuitry allows you to store a frequency, then recall it with the push of a button for control of transmit, receive, or transceive frequency. Digital plus analog frequency readout. PLL frequency derivation.

VOX, calibrator, noise blanker, RF speech processor, and 20dB attenuator are all built in, not expensive accessories.

Modern computer-type plug-in circuit boards for quick servicing and clean layout.

The FT-901DM will be available soon. See your dealer for a colour brochure on the FT-901DM and other Yaesu products.

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

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AMATEUR ELECTRONICS UK

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Hours: 9.30-5.30 Continuous including Saturdays—Early closing Wednesday, 1 p.m.

HOW TO REACH US (EASY PRIVATE PARKING ON OUR 70ft. FORECOURT)

FROM SOUTH AND EAST. We are located approximately two miles from Junction 5 of the M6 from which follow signposts to Birmingham. Within ¼ mile turn right at Clock Garage and proceed towards city. After one mile look for traffic lights at Fox & Goose and immediately over the lights take minor left fork into Alum Rock Road. We are located one mile from this point.
FROM NORTH. Leave M6 at Junction 6 (Spaghetti) and follow left fork down to traffic island beneath motorway complex. Take third turning off to Lichfield. One mile further on follow A4040 to the right and within 100 yds. vere again to the right, approximately one mile further on brings you to the Fox & Goose. Turn right and see preceding directions.
FROM THE WEST AND SOUTH/WEST. Follow M5 then M6 to Spaghetti Junction (see above). Alternatively, leave M5 at junction 4 or 3 and proceed to inner ring road. Turn South on ring road and leave on A47 (East). We are located three miles from this point.

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YAESU

AS FACTORY APPOINTED DISTRIBUTORS WE OFFER YOU—WIDEST CHOICE, LARGEST STOCKS, PROMPTEST DEAL AND FAST, SURE SERVICE RIGHT THROUGH.

It's long been acknowledged that the name YAESU is synonymous with the finest in amateur radio techniques and when it comes to choice of models the story is the same—this month we feature some of Yaesu's top sellers but please remember only the catalogue can give the full story so don't delay send for one today—see our offer below.

A FT-227R Provides new standards of convenience in 2 metre FM communications. A Phase Lock Loop Synthesiser generates 800 channels in 5kHz steps between 144 and 148MHz using an "optical coupling" system for channel selection instead of a rotary switch that could wear out. A memory circuit allows you to memorize any of these 800 channels with return to the memorized frequency at the flip of a switch. The standard repeater shift or any other offset frequency can be utilized. Automatic tone burst and advanced circuitry to protect PA transistors from high SWR or reversed supply polarity.
See Catalogue Page 19

B FT-7 The all-solid state FT-7 mobile transceiver provides high performance on the 80 through 10 metre bands. The operator may select upper or lower sideband or CW operation and the compact package provides many features engineered for convenience while mobile. A single knob provides all transceiver tuning and the state-of-the-art noise blanker minimizes impulse-type noise such as that found in mobile applications. The FT-7 is designed for operation directly from your car's 12 volt battery. Can also be used as a base station with the matching FP-4 AC PSU.
See Catalogue Page 18

C FT-901DM Unparalleled receiver performance plus advanced transmitter features make the FT-901DM the ham's dream come true. The receiver features rejection tuning, dual-filter variable band width tuning and audio peak frequency tuning for maximum rejection of unwanted signals. Transmitter includes built-in Curtis keyer and RF Speech Processor and features a 10 second "TUNE" timer to safeguard your finals. Includes memory for both transmit and receive frequencies, an advanced noise blanker and off-set tuning on both transmit and receive. All modes, USB, LSB, CW, FSK, AM and FM, 160 thru 10.
See Catalogue Page 3

D FT-221R Here is a compact all-mode transceiver designed for the maximum enjoyment of the 2 metre band. The FT-221R provides SSB, FM, CW, AM, operation with repeater off-set capability. Advanced Phase Lock Loop circuitry offers unsurpassed stability and clean spurious-free signals. Modular, computor type construction offers maximum reliability and ease of service. Pre-set pass band tuning provides optimum selectivity and performance needed for easiest operation on today's busy 2 metre band.
See Catalogue Page 21

E FRG-7 The model FRG-7 is a precision built, high performance Communications receiver designed to cover the bands from 0·5MHz-29·9MHz without gap. The advanced technology employed in its circuitry includes the famous Wadley Loop System drift cancelling technique. This coupled with a triple conversion super heterodyne system guarantees extremely high sensitivity and exceptional stability. Careful design has minimised unwanted spurious signals so often encountered in cheaper imitations. Features include RF attenuator, selectable audio filter and automatic noise supression circuit.
See Catalogue page 13

F FT-101E This is the world's No. 1 160 thru 10 metre transceiver and sets standards that no other manufacturer has been able to achieve. It outshines its competitors on 10 and 15 metre sensitivity where so many receiver sections fall down and the reliability of the FT-101E is a by-word. Noted for its distinctive quality on the air, the switchable Speech Processor gives that extra punch when the going is tough. Advanced computer type modular construction and complete portability are further features of this definitive transceiver.
See Catalogue Page 10

SPECIAL VOUCHER OFFER

Here's a 10-1 winning offer if you'd like the latest Yaesu catalogue. Just send us 4 - 9p stamps (36p) and we'll send you Yaesu's latest fully illustrated brochure together with our Credit Voucher for £3.60 against your eventual purchase. A couple of stamps will bring you the latest Atlas or Swan leaflets or our current used equipment list.

BRANCH: AMATEUR ELECTRONICS, UK—COASTAL, CLIFTONVILLE, KENT, KEN McINNES, G3FTE, THANET (0843) 291297. 9 a.m.-10.30 p.m.
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DenTron MLA 2500 160–10m 2kW PEP £695 inc. VAT and delivery

Send 25p for complete DenTron HF Catalogue

- ★ 1kW DC continuous
- ★ ALC circuit
- ★ 3 speed cooling
- ★ Military specifications
- ★ 234v/117v AC
- ★ 2 of EIMAC 8875 tubes
- ★ R.F. Wattmeter (incl. p&p)
- ★ Size 5½" × 14" × 14"
- ★ Weight 47lb
- ★ Ideal for SSTV/RTTY
- ★ 3rd order down 30dB +
- ★ 40 watts drive for 1kW

160–10m ATU's also in stock

NAGAI 2200LINEAR £399 inc. VAT (Securicor £4.50)

Sae for colour brochure

- ★ 230v AC
- ★ 4CX-350F tube
- ★ Receiver pre-amp
- ★ 10–13 watts drive
- ★ SWR meter built-in
- ★ 500W. PEP input
- ★ 400W. FM/CW input
- ★ Fan cooled
- ★ 12v DC output
- ★ Covers 144–146mHz

FAST DELIVERY ANYWHERE IN UK Barclaycard or Access orders accepted over the 'phone

NAIGAI LINEARS

2200 500W 230V AC Linear 2M **£399.00** (£4.50)

4CX350F replacement tubes .. **p.o.a.** (cost)

ADONIS COMMUNICATIONS MICROPHONES

MM202G Mobile boom 500-50K **£19.95** (50p)

AM502G Compressor "studio" base station **£32.50** (£1.00)

AM802G Deluxe "studio" base station **£45.00** (£1.00)

KATSUMI

EK 151 Electronic Keyer .. **£29.95** (£1.00)

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444 50K base station ..	**£25.50**	(£1.00)
526T 500–50K base station	**£32.50**	(£1.00)
201 50K hand-held ..	**£11.25**	(£1.00)

MICROWAVE MODULES

MMT 432/28S Transverter ..	**£133.88**	(n/c)
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MMC 70/28 LO converter ..	**£22.50**	(n/c)
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MT2500A 160–10 2kw linear ..	**£699.00**	(n/c)
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SW-2 160-10 2kw SWR meter	**£69.95**	(n/c)
Doubler 160-10m 2kw Dipole	**£22.00**	(n/c)
HF Transceiver DTR-1	**T.B.A.**	

HF ANTENNAS (EX-STOCK)

Mosely TA33 (high power) 10–15–20m 3 el.	**£110.80**	(£2.50)
Mosely TA33 JR 400W PEP 10–15–20m 3 el.	**£95.60**	(£2.50)
Mosely TA32 JR 400W PEP 10–15–20m 2 el.	**£65.80**	(£2.50)
Hygain 12AVQ Vertical 2kw 10–15–20m	**£39.95**	(£2.00)
Hygain 14AVQ Vertical 2kw 10–40m	**£56.20**	(£2.00)
Hygain 18AVT Vertical 2kw 10–80m	**£81.45**	(£2.00)
HQ-1 "Mini-beam" 10–20m	**£94.00**	(£2.00)
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YAESU MUSEN

FRG7 Gen coverage receiver 5–30Mhz AC/DC	**£173.00**	(£4.50)
FRG7D As above but digital readout	**£208.00**	(£4.50)
FR101D 160-2m+broadcast rx AC/DC	**£489.00**	(£4.50)
FT101E Transceiver 160-10m AC/DC	**£509.00**	(£4.50)
FT101EE As above less processor	**£492.00**	(£4.50)
FT101E Extra-narrow CW filter	**£23.00**	(25p)
FV101B External vfo for FT101	**£77.00**	(£4.00)
S.P.101B External speaker for FT, FR Series	**£18.50**	(£1.50)

FT200 Transceiver 80-10m 260 watts	**£320.00**	(£4.50)
FP200 Matching AC PSU for above	**£67.00**	(n/c)
YO100 Monitor scope	**£156.37**	(£4.50)
FT221R 2m all mode transceiver AC/DC	**£401.60**	(£4.50)
YC221 Matching digital readout	**£81.55**	(75p)
FT227R 400 channel FM transceiver 12V DC	**£201.00**	(£2.50)
YP150 150 watt dummy load	**£47.50**	(£2.50)
FT901DM Digital 160-10m transceiver	**£842.00**	(n/c)
QTR24 Amateur Radio World clock	**£16.30**	(75p)
YH55 Communication headphones	**£9.00**	(75p)
YD844 Desk microphone	**£20.25**	(75p)
YD846 Hand microphone	**£8.40**	(75p)
FT901D 160-10 transceiver	**£727.00**	(n/c)
FT7 GRP 10-80 transceiver	**£313.00**	(£2.00)

FDK

TM 56B VHF MONITOR

The TM56 is one of our most popular models, combining great performance with modest price. The TM56B has the basic receiver design of our mobiles and includes its own 230 volt AC supply, plus external 12v DC input. 12 fixed channel positions are included, plus 4 autoscan positions. Any one of the Autoscan channels can be cancelled. Price includes 10 channels, R3, R4, R5, R6, R7, S0, S20, S21, S22 and S23, necessary leads etc, and 12 month guarantee. At **£85** it is unbeatable! 10 channel marine version **£98** inc. VAT.

FDK

70cms MULTI-UII

- ★ Fitted 6 repeaters and 4 simplex
- ★ Automatic tone-burst
- ★ 12 watts output
- ★ Receiver RF pre-amp
- ★ Receiver IRT control
- ★ 4 channel autoscan

IN STOCK

Fitted 6 repeaters + 4 simplex £249

Fitted choice of 2 channels £219

ELECTRONICS

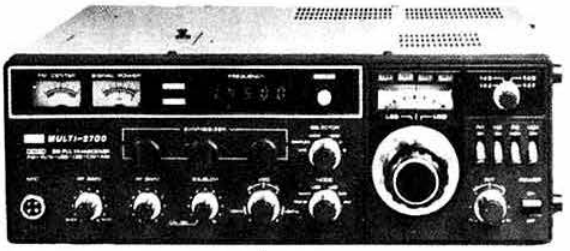
TELEX 897406

FAST MAIL ORDER SERVICE

FDK

FDK MULTI-2700 MkII

THE ULTIMATE 2m ALL-MODE!



The Multi-2700 is the ultimate in 2m all-mode transceivers. Established now for 2 years, the sales of this model increase every month! Proof indeed of its popularity and value for money. Unfortunately, within the limited space of this advertisement, it is just not possible to list all its many features. The manufacturers brochure runs to 4 pages! However, a S.A.E. will bring you a copy of this free of charge. What we can do is list for you some of its main features, then perhaps you will begin to see why more and more people are trading up to the Multi-2700.

IN STOCK NOW £489 inc. VAT COMPARE IT'S PRICE!

HP Deposit £98.00 + 12 months @ £37.15; 18 months @ £26.29 or 24 months @ £20.85.

FEATURES:-
2 VFO's for instant QSY (one analogue the other synthesised) both useable on all-modes with VXO for fine tuning on SSB; FM, SSB, AM, CW; 16 watts output; 143-149mHz reception (Tx 144-146mHz), 230v AC and 12v DC; WBFM/NBFM; OSCAR downlink receive converter; speech processor; VOX; IRT; 100kHz calibrator; noise blanker; automatic tone-burst; + or − 600kHz shift; + 1·6mHz shift (for 70cms); RF gain; RF pre-amp; squelch; separate FM/SSB mic gain controls; variable AGC; Antivox; variable compression; CW semi-breakin; accessory sockets at rear; supplied complete with mic, cables, handbook and even log book! Don't buy any other model until you have compared it with the Multi-2700 Mark II. S.A.E. For Full Details

FDK

QUARTZ-16

AT £149.75 inc. VAT. . . YOU CAN'T BEAT IT!

HP Deposit £30

2m FM MODULE

FEATURES
23 channels + 2 priority.
True "S" channel readout.
12 watts output.
7 channels fitted R3–R7, S0, S20.
SPECIAL OFFER S21, S22, S23 **£7.50** inc.
Quick release mobile mount.
Mic and D.C. leads.
Automatic tone-burst.
S.A.E. for full details.

FDK

M800D 25 WATTS FM

The Multi-800D is a 25 watt FM transceiver with 800 synthesised channels 144–148mHz. Tuning is manual or automatic with 3 speeds from 10kHz second to 500kHz second. Tone-burst is automatic and power is infinitely variable from 1 to 25 watts. A remote digital display is available and reverse repeater is obtainable at the flick of a switch (no need for re-tuning). There is a memory for two programmable frequencies, both are retained even after switch-off. The memory facility also enables other shifts to be programmed in (1·6mHz for 70cms) and the LED readout always reads true transmit and receive frequencies.

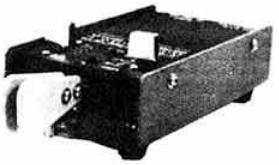
PRICE £239 inc. VAT **SECOND BATCH SOLD OUT–**
REMOTE DIGITAL DISPLAY £15 inc. VAT **NEXT DELIVERY MAY**

HERE'S OUR TIP FOR THE TOP. . . IN ROTATORS!

JAYBEAM KR400 supports ½ ton costs **£95** incl. VAT **(£2.00)**

ALL JAYBEAM AERIALS IN STOCK

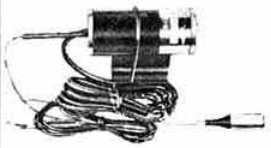
JAYBEAM 9502 ideal for VHF. **£45** (only needs 3-core cable **(£1.50)**



E121 KEYER

- ★ Built-in paddle
- ★ 6–35 wpm
- ★ Internal batt or ext. DC
- ★ DC150V/1A Max.
- ★ Plug-in board
- ★ Space-Dash ratio adjust

PRICE £29.95 inc. VAT



MM202G MICROPHONE

- ★ High quality condenser mic.
- ★ Boom weighs 5 grams
- ★ Tx/Rx switch clips on gear lever
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The national society representing all UK radio amateurs

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

GENERAL MANAGER AND SECRETARY
D. A. Evans, G3OUF

EDITOR
A. W. Hutchinson

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Zone E:	Regions 10 and 11
Zone F:	Region 15
Zone G:	Regions 12, 13 and 14

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Region 1	Cheshire, Cumbria, Greater Manchester, Isle of Man, Lancashire, Merseyside.
Region 2	All that part of Humberside north of River Humber, North Yorkshire, South Yorkshire, West Yorkshire.
Region 3	Hereford and Worcester, Salop, Staffordshire, Warwickshire, West Midlands.
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CURRENT COMMENT

Citizens' band

The RSGB is aware of the numerous items that continue to appear on this subject in various publications, both as correspondence and as feature articles. It is apparent that much of this material has been generated by those who will profit financially from the introduction of the facility rather than by potential users.

The Society is often asked to state its policy on a citizens' band. It is somewhat difficult to offer an informed opinion on a matter concerning which nothing definite is known. Understandably, no guidelines are available from the administration regarding the various possibilities, and it is in this context that the following statement is made.

This statement was first published in Radio Communication *in November 1976, and since that time nothing has been published in this journal to warrant any changes to it.*

The matter of a citizens' band is under continual consideration by the Society's Telecommunications Liaison Committee, and the Council approves its present views which are:

1. The RSGB exists to safeguard the interests of its members and of the amateur service in the UK. The amateur service is a defined service in the Radio Regulations (Geneva 1976) and is accorded worldwide status in the same way as the professional services. A citizens' band facility exists only where a national administration is prepared to set aside spectrum space for this use.
2. While the RSGB may have no direct interest in a citizens' band facility by its present articles of association, it must, in the interests of its members, take heed of developments likely to affect the amateur service.
3. The major consideration affecting the introduction of any new facility is the ability of the administration to exercise complete and effective control. Anything less is not acceptable.
4. The RSGB is not opposed to the introduction of a short-range personal communications facility provided that its location in the spectrum and the equipment used are suitable. The 27MHz band as used in the USA and some European countries is probably one of the most unsuitable frequency bands that could be envisaged. There are three main reasons:
   (a) its proximity to the amateur 28MHz band and the consequent availability of high-power equipment together with the ease of illegal operation in this band;
   (b) the existence of long-distance propagation during part of the sunspot cycle, and
   (c) the interference to television receivers, particularly those operating in Band I.

   Having regard to equipment now available it would appear that a vhf or uhf fm service with power limitation, crystal control and type-approved apparatus could be suitable.
5. Location of a citizens' band within an existing amateur service allocation is not acceptable to the RSGB. Further, if this facility is eventually allowed it ought to be located in a part of the spectrum remote from any amateur allocation to prevent illegal operation in an amateur band such as is now experienced in the USA.

QTC
amateur radio news

Licensing

Following representations from the RSGB, the Home Office will now grant a UK licence to a British national who holds a current amateur licence issued by any administration with which the UK has a reciprocal agreement. Formerly a British national was required to pass the UK RAE and cw test.

QSL Bureau

The RSGB QSL Bureau will be closed from 17 June until 9 July, and no cards should be posted to arrive during this period.

Quote your callsign

When writing to RSGB HQ, ordering books, or renewing subscriptions unaccompanied by the renewal notice, members should ALWAYS quote their callsign or BRS number. If the callsign or BRS number has recently been changed, please quote the one used on the most recent *Radio Communication* address label.

Delays may occur if callsigns are not quoted.

Management appointment

Attention is drawn to the management appointment vacancy at RSGB HQ which is advertised on page 458 of this issue.

10th World Telecommunication Day 17 May 1978

This year the theme of World Telecommunications Day is "Radiocommunications", chosen to mark the 50th anniversary of the International Radio Consultative Committee (CCIR) of the International Telecommunication Union. The CCIR is responsible for establishing international standards in radio communications.

World Telecommunication Day is celebrated every year on 17 May, as it was on that date in 1865 that the first International Telegraphic Convention was signed in Paris.

BARTG Convention, 15 July

The convention will be held at Harpenden Public Hall, Harpenden, Herts, from 11am until 5pm.

Attractions will include trade stalls, bring and buy, picture tape factory, demonstrations and lectures (including one on "Microprocessors" by G3PLX, which should attract particular attention) and refreshments. Easy access provided by rail and motorway network, with car parking facilities. BARTG members and non-members welcome.

Philipp Lessig, DK3LP, the president of DARC, was the guest of the Society on 5/6 April. The visit came at a particularly appropriate time during the final preparations for the Region 1 IARU conference in Hungary, held in late April. DK3LP (l), seen here with RSGB President Dain Evans, G3RPE, at RSGB HQ, had most useful discussions with several of the RSGB delegates

New callsigns

In accordance with the Radio Regulations, the ITU has provisionally allocated the following callsign series:
J4A–J4Z to Greece;
J5A–J5Z to the Republic of Guiñea-Bissau.

Radio receivers and associated systems

A three-day conference on the above subjects is being held at Southampton University on 11–14 July 1978, organized by the Institution of Electronic and Radio Engineers. The RSGB is one of the three associated sponsoring organizations, together with the IEE and IERE. Society members' contributions to this conference are as follows.

Lecturer's papers

"Preliminary results of a six-year study of the lower troposphere over southern England of the radio refractive index and potential refractive index", by R. G. Flavell, G3LTP.
"Performance and operational requirements of modern amateur radio receivers", by T. G. Giles, G4CDY.
"Keep it simple: direct-conversion hf receivers", by J. P. Hawker, G3VA.

Talk, demonstration and discussion

"Slow scan tv", by T. Grant-Dixon, G8CGK.

Demonstration amateur station

An operational demonstration amateur station will be put on by the Southampton RSGB group (L. N. G. Hawkyard, G5HD) with a special event callsign of GB3RRC.

The closing date for reservations is *22 May 1978*, and further details can be obtained from the Conference Secretariat (Mr P. Elliott), IERE, 99 Gower Street, London WC1E 6AZ.

NEW EDITIONS

Amateur Radio Techniques

(6th edition)
by Pat Hawker, G3VA

"Experiment or die" might well be the rallying call of the radio amateur. No matter how much equipment he or she possesses, no matter how well it performs, there always has to be a better way of doing things just around the corner.

And that is why this new edition of *Amateur Radio Techniques* is so useful. It brings together a very large selection of stimulating ideas and circuits, together with many constructional and fault-finding tips, gathered in by the author during 20 years of writing the "Technical Topics" feature in *Radio Communication*. In this edition some 45 new or revised pages cover the most recent techniques, and affect all sections of the book.

Chapter titles are: *Semiconductors; Components and construction; Receiver topics; Oscillator topics; Transmitter topics; Audio and modulation; Power supplies; Aerial topics; Fault-finding and test units.*

336 pages **£3.95 incl p&p**

A Guide to Amateur Radio

(17th edition)
by Pat Hawker, G3VA

This book is intended to assist the newcomer to learn more about the hobby, and to help him or her to obtain a transmitting licence. It also contains technical information and operating data of interest to all radio amateurs and listeners.

The type for this edition has been reset, making possible a completely fresh look at the many aspects of the hobby that have changed since the last resetting of the complete book in 1958. The opportunity has been taken to bring editorial presentation in line with other current RSGB publications and to increase the number of pages. Much new information has been added, and the antenna information has been separated from that on transmitters to form two chapters and reflect current practice. A subject index now completes the book.

The new conditions for the UK amateur licences and the revised syllabus for the new form of Radio Amateurs' Examination are incorporated, and in the technical chapters the increased importance of vhf/uhf, ssb, nbfm and solid-state devices has resulted in many changes. Both newcomers and those seeking information on the very large range of equipment that has been produced for amateurs will find the enlarged chapter on factory-built receivers, transmitters and transceivers particularly valuable.

Chapter titles are as follows: *This is amateur radio; Getting started; Communication receivers; Transmitters; The antenna; Amateur radio equipment; Workshop practice; The licence examinations; Operating an amateur radio station; The RSGB and the radio amateur; International amateur radio organizations; Index.*

118+ii pages **£1.71 incl p&p**

TECHNICAL ARTICLES

Technical articles on subjects of amateur interest are always welcome and should be submitted 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 will be made for all articles published.

The editor will be pleased to send prospective authors a cipy of the *RSGB Style Guide* and to give any other advice and assistance requested.

A channelized 144MHz fm transmitter-receiver

by N. G. HYDE, CEng, MRAeS, MIERE, G2AIH*

AFTER operating exclusively on 70MHz for many years, the author recently decided to make a return to the 144MHz band. In view of the change in principal mode from a.m. to fm since his last appearance on the band (1963), existing equipment was obsolete and it was considered that the most useful replacement would be a channelized fm transmitter-receiver. This equipment operates at present on one repeater channel (with input channel reception facility) and four simplex channels, although provision has been made in the channel switching for two repeater channels in addition to the four simplex channels.

The receiver is a single-conversion superhet with an i.f. of 10·7MHz. Phase modulation is employed in the transmitter, which has a maximum input to the pa stage of 20W. Operation is from a 12V dc supply, with the maximum current consumption (on transmit) being of the order of 2A. Modular construction on printed circuit boards has been adopted for both receiver and transmitter.

During development of the receiver, strong interference on channel R5 was experienced from a local business radio transmitter. This was eliminated by the addition of a helical filter at the antenna input, constructed in accordance with the information given in [1]. This filter was found to be so effective that it has been incorporated permanently in the antenna feeder subsequent to the changeover relay; for this reason a harmonic filter has not been included in the transmitter pa stage.

* 114 Tattenham Grove, Epsom Downs, Surrey

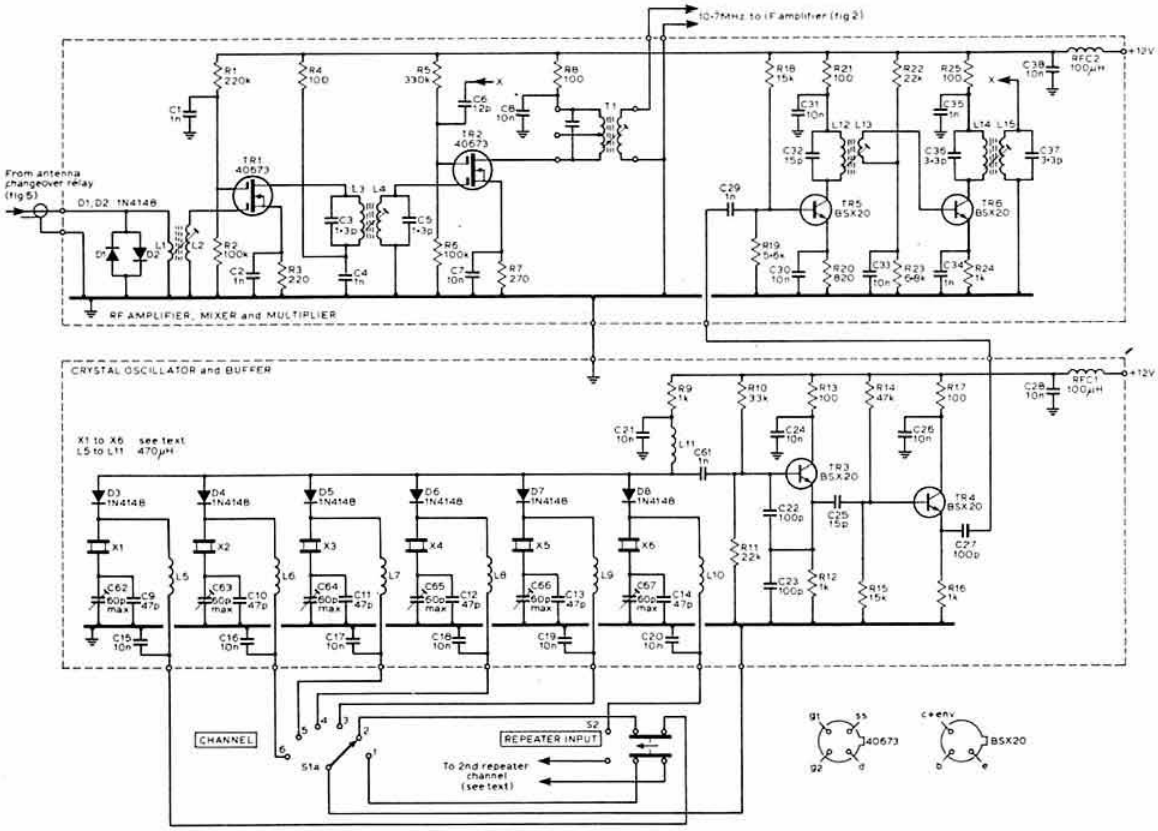

Fig 1. Receiver converter circuit diagram

Circuit description

Receiver (Figs 1 and 2)

The converter (Fig 1) consists of two circuit boards, one for the crystal oscillator and buffer, while the second carries the rf amplifier, mixer and frequency multiplier circuitry.

The receiver front-end is conventional and employs dual-gate mosfets TR1 and TR2 as rf amplifier and mixer respectively, with the input to TR1 protected by back-to-back shunt diodes D1 and D2. The two stages are coupled through a bandpass circuit L3,C3 and L4,C5.

Fundamental frequency parallel-resonance crystals in the 14 to 15MHz range are employed in the local oscillator. Six crystals in the base circuit of TR3 are connected through series diodes D3 to D8, and 12V dc is applied via R9 and L11 to their commoned anodes. Any one crystal is selected by S1a (CHANNEL) which earths the cathode of the particular diode through a series inductor (L5 to L10). This diode then conducts and presents a very low resistance in series with the crystal; all other crystals are isolated from the circuit by the high series resistance of the five non-conducting diodes. The series inductors have no adverse effect on the operation of the oscillator circuit.

Positions 1 and 2 of S1 are allocated to repeater channels with the four simplex channels occupying positions 3 to 6. With S1 set to position 1 or 2, operation of the slide switch S2 changes the crystal in circuit from the repeater output channel to the input channel, to permit monitoring on the input frequency. To allow working on the two repeater channels provided for in the circuit switching, it will be necessary to replace the existing oscillator board with one having eight crystal positions; this may require the use of switching diodes having a lower self-capacitance (eg Type 1N916) than those at present employed, and may also require these diodes to be reverse-biased to further reduce the effective capacitance in the base circuit of TR3†.

Crystal frequencies are set to the exact sub-multiple of the oscillator injection frequency by the film-dielectric trimmers C62-67 in series with the crystals. The maximum capacitance of these trimmers (60pF) could be reduced advantageously to 25pF, with an increase in the capacitance of C9 to C14, to facilitate adjustment. The 60pF

† A modification to incorporate the two repeater channels will be the subject of a later article.

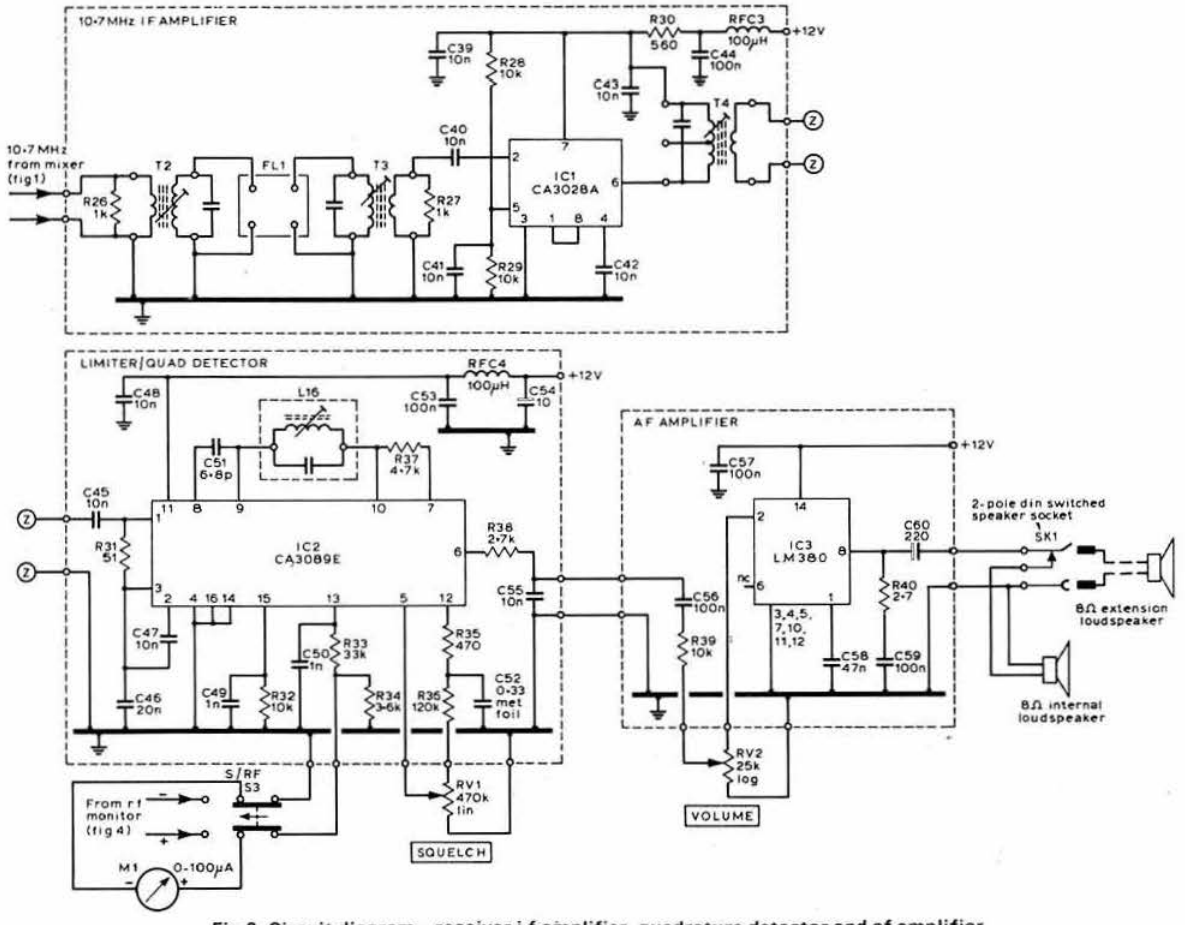

Fig 2. Circuit diagram – receiver i.f. amplifier, quadrature detector and af amplifier

Receiver components list

R1	220kΩ	R19	5·6kΩ
R2, 6	100kΩ	R20	820Ω
R3	220Ω	R23	6·8kΩ
R4, 8, 13, 17, 21, 25	100Ω	R28, 29, 32, 39	10kΩ
R7	270Ω	R30	560Ω
R9, 12, 16, 24, 26, 27	1kΩ	R31	51Ω
R10, 33	33kΩ	R34	3·6kΩ
R11, 22	22kΩ	R35	470Ω
R14	47kΩ	R36	120kΩ
R15, 18	15kΩ	R37	4·7kΩ
		R38	2·7kΩ
		R40	2·7Ω

All fixed resistors are ⅛W carbon film

RV1	470kΩ linear	RV2	25kΩ log
C1, 2, 4, 29, 34, 35, 49, 50, 61	1nF	C22, 23, 27	100pF
C3, 5	1·3pF	C25, 32	15pF
C6	12pF	C36, 37	3·3pF
C7, 8, 15, 16, 17, 18, 19, 20, 21, 24, 26, 28, 30, 31, 33, 38, 39, 40, 41 42, 43, 45, 47, 48, 55	10nF	C44, 53, 56, 57, 59	100nF
		C46	20nF
		C51	6·8pF
		C52	0·33F met foil
		C54	10μF elect
		C58	47nF
		C60	220μF elect
		C62, 63, 64, 65, 66, 67	60pF max preset
C9, 10, 11, 12, 13, 14	47pF		

All capacitors except electrolytics are miniature 50V ceramics.

D1, 2, 3, 4, 5, 6, 7, 8	1N4148	IC1	CA3028A
TR1, 2	40673	IC2	CA3089E
TR3, 4, 5, 6	BSX20	IC3	LM380

L1	2t 22swg enam	Wound on 4mm diam formers, with dust-iron cores
L2, 3, 14	4½t 22swg enam	
L4, 15	5t 22swg enam	
L12	15t 26swg enam	
L13	2t 24swg enam	

L5 to L11	Toko Type 7BA*
L16	Toko K586 10·7MHz quad detector coil*
RFC1, 2, 3, 4	Toko Type 7BA*
T1, 4	Toko KALS 1506 10·7MHz i.f. transformer*
T2, 3	Toyocom 10B-10 filter matching transformer†
FL1	Toyocom 10M-5B-1 10·7MHz crystal filter†
X1 to X6	14/15MHz range fundamental frequency parallel resonance, 30pF capacitance, HC25U holder (PM Electronic Services)
SK1	2-pin DIN switched speaker socket
S1	3-pole 6-way wafer switch
S2, 3	DPCO slide switch
M1	100μA fsd Ernest Turner edgewise meter†

* Ambit International. † A. J. H. Electronics

trimmers were used because only this value was available at the time of development.

Output from the emitter-follower buffer TR4 is coupled to the frequency tripler stages TR5 and TR6 on the mixer board. The local oscillator injection frequency, in the 134MHz range (fs–10·7) is applied via a bandpass circuit L14C36, L15C37 to gate 2 of the mixer TR2.

Fig 2 shows the circuitry of the i.f. amplifier, quadrature detector and audio-frequency amplifier. Intermediate frequency output at 10·7MHz from T1 on the mixer board is applied to the crystal filter FL1; T2 and T3 are the filter input and output matching transformers, terminated by R26 and R27 respectively. IC1, a CA3028A connected in cascode configuration, functions as a 10·7MHz i.f. amplifier; the output of this ic is coupled via T4 to IC2, a CA3089E which combines the functions of limiter, quadrature detector and low-level af amplifier. Circuitry associated with this ic follows the recommendations given by RCA Ltd in their application note. L16, with its associated parallel capacitance, forms the quadrature detector tuned circuit.

The CA3089E also incorporates a squelch facility, controlled by RV1 (SQUELCH). It also provides a voltage for operating an external tuning meter (M1) which is connected into circuit through a double-pole slide switch S3, allowing the meter to be used to monitor the rf output of the transmitter. The meter employed in this application is a 0-100 microammeter shunted by R34 to give an fsd of 150μA; if the meter used has an internal resistance different from the one specified, it will be necessary to change the value of R34.

Recovered audio from the CA3089E is applied via RV2 (VOLUME) to IC3, an LM380 af amplifier which drives an internal 8Ω 1¾in diameter monitor speaker, or an external speaker plugged into the 2-pole DIN switched socket SK1. The LM380 has a rated af output of approximately 1·5W; this is adequate for fixed station use, but in situations having a high ambient noise level, eg mobile operations, it would no doubt be necessary to include a single transistor amplifier stage after the CA3089E, and to substitute an ic having a higher audio rating, eg a TBA810AS, for the LM380.

Transmitter (Figs 3 and 4)

The circuit and method of channel switching used in the transmitter crystal oscillator are similar to that employed in the receiver local oscillator with the exception that the supply voltage to the oscillator (TR1) is stabilized at 10V by ZD1. As only five crystals are required in the transmitter for the present application, X6 position (Slb channel l) is vacant; this will eventually be used for the second repeater channel. Crystals are in the 12MHz range, the transmitter having a multiplication factor of 12 to reach the final radiated frequency.

The 12MHz output from the emitter of TR1 is applied to the phase modulator, which consists basically of the capacitance-coupled inductors L8 and L9, and the two biased variable-capacitance diodes D7 and D8[2]. L8 and L9 are individually screened, and coupling between the tuned circuits is by C22 only. Bias voltage for D7 and D8 is stabilized by ZD2.

The speech amplifier TR4, TR5 and TR6, is suitable for use with a crystal microphone. TR5 is followed by a speech clipper consisting of D9 and D10 connected back-to-back across the output circuit of the transistor. Input to the clipper is adjusted by a preset control RV1, while R29 and C41 form a filter to minimize harmonics of the speech waveform generated by the clipping action. Clipped audio is amplified by TR6 and applied to the phase modulator diodes via a potential divider R6, R7 and R8. The preset control RV2 sets the deviation level.

The 1,750Hz access tone generator employs a dual NAND Schmitt trigger SN7413 (IC1). Frequency of oscillation is determined by RV3 in conjunction with R35 and R36, the function of the two fixed resistors being to provide a fine adjustment by the preset control RV3. Duration of the toneburst is dependent on the values of C45 and R34; increasing the value of capacitance and decreasing the resistance results in an increased length of toneburst. Power supply to the generator is stabilized at

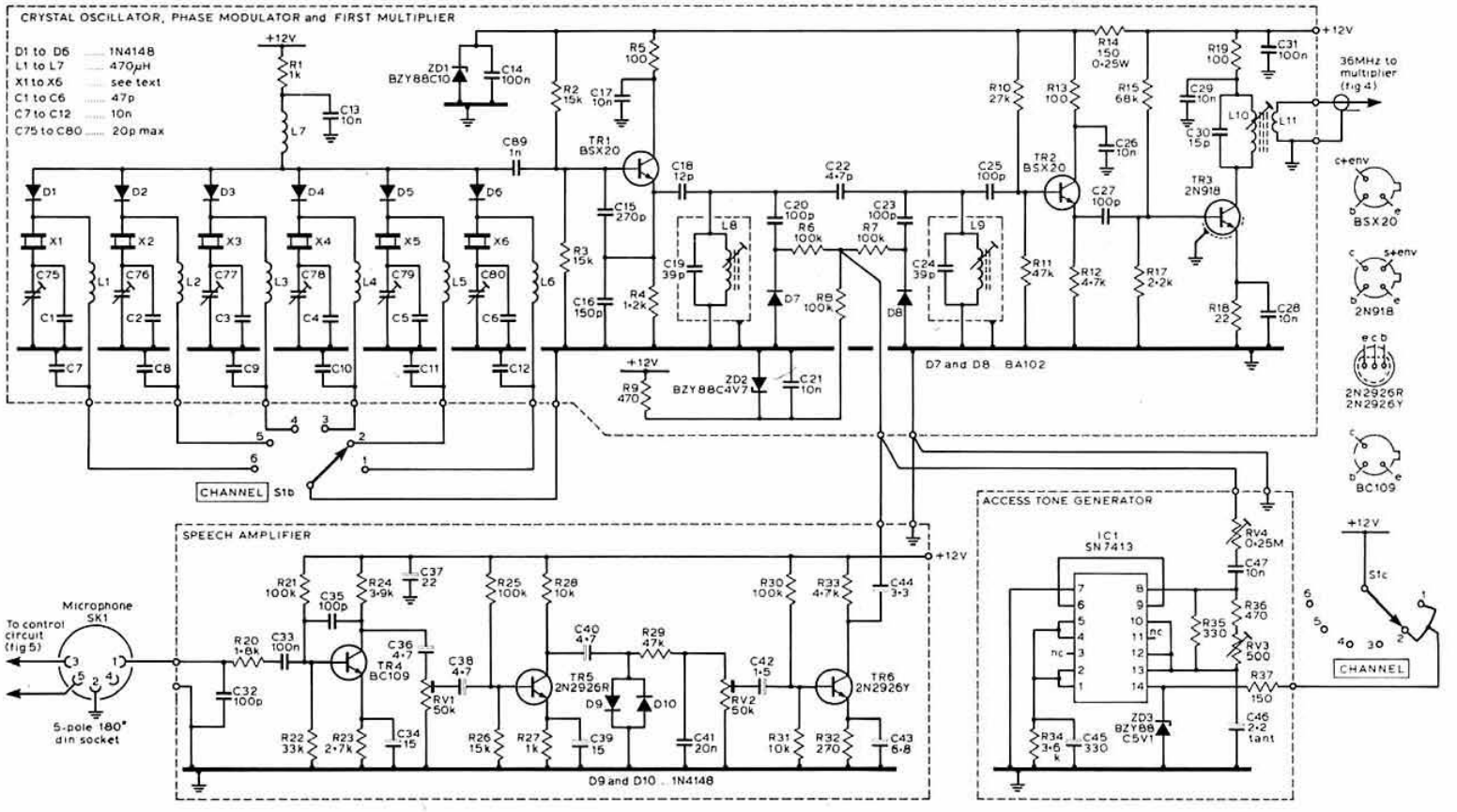

Fig 3. Circuit diagram transmitter oscillator and phase modulator, speech amplifier and access tone generator

Table 1. Typical current readings (12V supply)

Receiver (no signal)		65mA
Access tone generator		50mA
Transmitter oscillator phase modulator		50mA
Transmitter multiplier	TR7	21mA
	TR8	65mA
Transmitter amplifier	TR9	150-200mA
	TR10	1·3-1·6A

Transmitter components list

R1, 27	1kΩ		
R2, 3, 26	15kΩ	R20	1·8kΩ
R4	1·2kΩ	R22	33kΩ
R5, 13, 19	100Ω	R23	2·7kΩ
R6, 7, 8, 21, 25, 30	100kΩ	R24	3·9kΩ
R9, 36	470Ω	R28, 31	10kΩ
R10	27kΩ	R32	270Ω
R11, 29	47kΩ	R34	3·6kΩ
R12, 33	4·7kΩ	R35	330Ω
R14	150Ω 0·25W	R37	150Ω
R15	68kΩ	R38, 40	560Ω
R16	330kΩ	R39	39Ω
R17	2·2kΩ	R41	10Ω 0·25W
R18	22Ω	R42	12Ω 0·25W
		R43	1·2kΩ

All fixed resistors are ⅛W carbon film except where specified

RV1, 2	50kΩ pre-set		
RV3	500Ω pre-set		
RV4	0·25MΩ pre-set		
C1, 2, 3, 4, 5, 6	47pF	C44	3·3µF elect
C7, 8, 9, 10, 11, 12, 13, 17, 21, 26, 28, 29, 47, 51, 63, 66, 71	10nF	C45	330µF elect
		C46	2·2µF tant
		C48, 61	18pF
		C50	3·3nF
C14, 31, 33, 68	100nF	C52, 53	1·5nF
C15	270pF	C55, 73	1·8pF
C16	150pF	C56	33pF
C18	12pF	C57	68pF
C19, 24, 49	39pF	C58, 62, 65, 67, 70, 74, 89	1nF
C20, 23, 25, 27, 32, 35,	100pF	C59	56pF
		C60	8·2pF
C22	4·7pF	C64	0·75µF tant
C30, 54	15pF	C69	1·75µF tant
C34, 39	15µF elect	C72	27pF
C36, 38, 40	4·7µF elect	C75, 76, 77, 78, 79, 80	20pF max preset
C37	22µF elect		
C41	20nF	C81, 82, 83, 85, 87,	30pF preset
C42	1·5µF elect	C84, 86, 88	50pF preset
C43	6·8µF elect		

All fixed capacitors, except for electrolytics, are miniature 50V ceramics.

D1, 2, 3, 4, 5, 6, 9, 10, 11	1N4148	TR1, 2	BSX20
		TR3, 7	2N918
D7, 8	BA102	TR4	BC109
		TR5	2N2926R
ZD1	BZY88C10	TR6	2N2926Y
ZD2	BZY88C4V7	TR8	2N4427
ZD3	BZY88C5V1	TR9	2N5913
		TR10	2N5590
IC1	SN7413		

L1 to L7	Toko Type 7BA
L8, 9	17½t 28swg enam, 4mm former, ferrite core
L10	12½t 28swg enam, 4mm former, ferrite core
L11	4½t 28swg enam
L12	3½t 28swg enam
L13	12½t 28swg enam, 4mm former, dust-iron core
L14	6½t 26swg enam, 4mm former, dust-iron core
L15	4½t 26swg enam, 4mm former, dust-iron core
L16	2½t 20swg enam, 4mm former, dust-iron core
L17	3t 20swg enam, 6·4mm i.d.
L18, 20	3t 20swg enam, 5mm i.d.
L19	4t 20swg enam, 5mm i.d.
L21	2t 20swg enam, 5mm i.d.
L22	3t 18swg enam, 5mm i.d.
RFC1, 2	2½t 28swg enam on FX1898 ferrite bead
RFC3, 5	2½t 26swg enam on FX1115 ferrite bead
RFC4, 6	2½t 26swg enam on FX1898 ferrite bead
X1 to X6	12MHz range fundamental frequency parallel resonance, 40pF capacitance, HC25U holder (PM Electronic Services)
SK1	5-pin 180° DIN socket

Power and control unit components

RLA	Keyswitch Type SMP dpco relay, 12V coil
RLB	Magnetic Devices coaxial relay 50Ω, 12V coil (Modular Electronics)

5·1V by ZD3, and this is applied only when Slc is set to positions 1 and 2, to give automatic toneburst on repeater channels. Output is taken through C47 and the preset variable resistor RV4, which controls the deviation level, to the phase modulator.

Phase-modulated rf at 12MHz is applied to the emitter-follower buffer TR2. The next stage, TR3, is a frequency trebler with L10, C30 tuned to the third harmonic (36MHz).

Fig 4 shows the circuit of the frequency multiplier and amplifier boards. The 36MHz output from the first multiplier is fed through a 50Ω coaxial link and capacitive tap on the input tuned circuit to the doubler stage TR7. Both TR7 and TR8 are frequency doublers. Interstage and output coupling is by loosely-coupled tuned circuits with capacitive dividers for impedance matching, the 50Ω output line being matched to TR8 by preset air-spaced trimmers C81 and C82. Test points TP1 and TP2 allow the collector current of the doubler stages to be monitored during alignment.

The 145MHz amplifier consists of two zero-biased Class C stages, of which TR9 is a driver and TR10 is the final power amplifier. Interstage matching circuits are employed at the input to TR9 and between the two stages, the base circuits of the transistors being slightly damped by R41 and R42. Matching between the collector tuned circuit of TR10 and the 50Ω output line is achieved by C87 and C88. All variable capacitors in the amplifier are preset air-dielectric types; if a 50pF preset is substituted for the 30pF capacitor at C87, the parallel-connected silver-mica capacitor C72 need not be fitted.

To achieve stability in transistor rf amplifiers it is essential that the collector circuits are decoupled to all frequencies, which accounts for the several different values of decoupling capacitor shown in the circuit diagram. Leads to these capacitors must be as short as possible, and the two tantalum electrolytics should be of the metal-cased type.

An rf monitor voltmeter is connected via a small capacitor (C73) across the 50Ω output of the pa transistor. The dc voltage from the monitor is connected to M1 when switch S3 (Fig 2) is set to the rf position. It should be noted that this form of monitor does not provide an absolute measurement of rf output insofar as it takes no account of any vswr that may be present on the antenna feeder.

Power and control circuit (Fig 5)

Protection against accidental connection of reverse voltage is provided by FS1 and a high-current stud-mounted diode D12; should a reversed voltage be applied, the diode presents a very low resistance across the supply and the fuse blows. This system of protection is in use in certain commercial equipment, but its effectiveness has not been put to test in the present application.

12V positive is applied directly to the transmitter frequency multiplier and amplifier stages on closure of S4 (POWER), and to all receiver modules via the normally-closed contact of RLA. Operation of the RECEIVE-TRANSMIT switch S5 causes RLA and the coaxial antenna change-over relay RLB to operate; RLA switches the 12V supply from the receiver to the transmitter oscillator/modulator, access tone generator and speech amplifier, and RLB

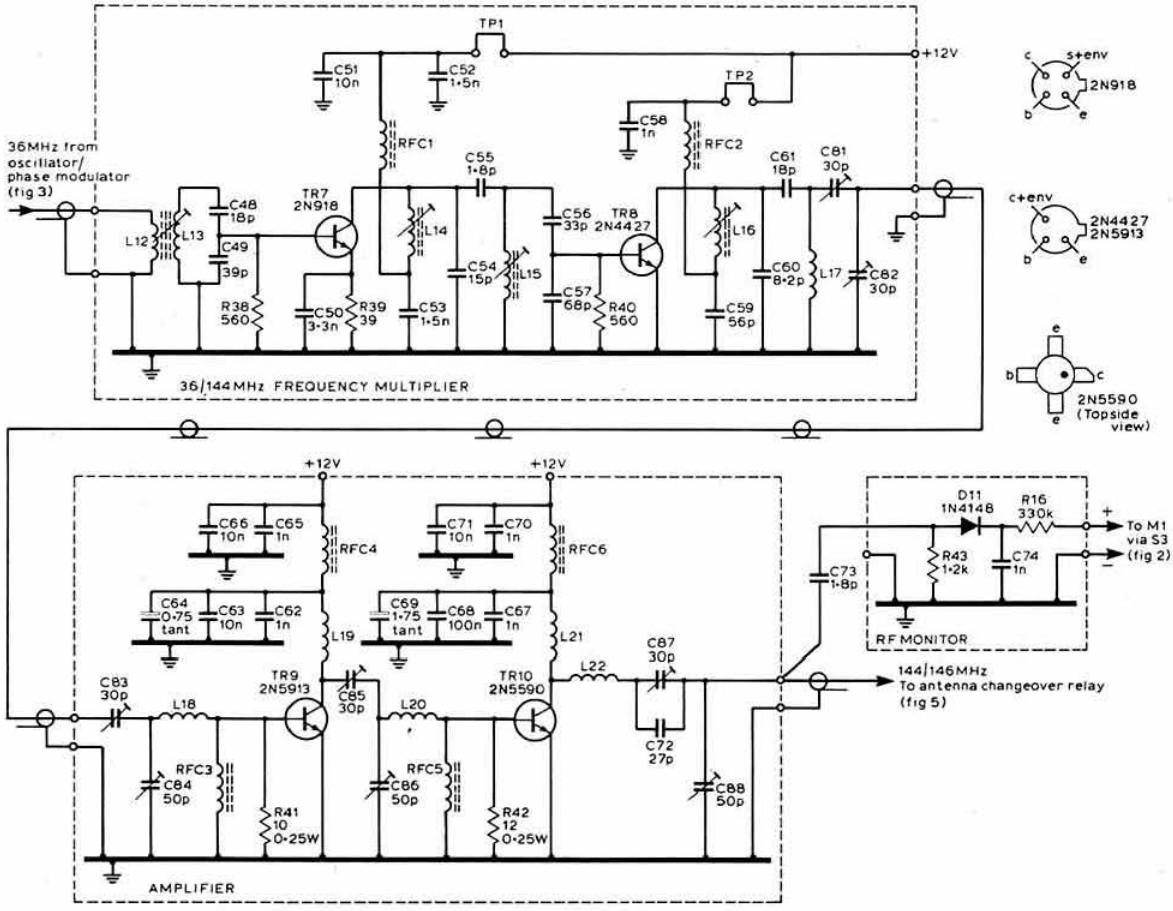

Fig 4. Circuit diagram – transmitter frequency multiplier and power amplifier

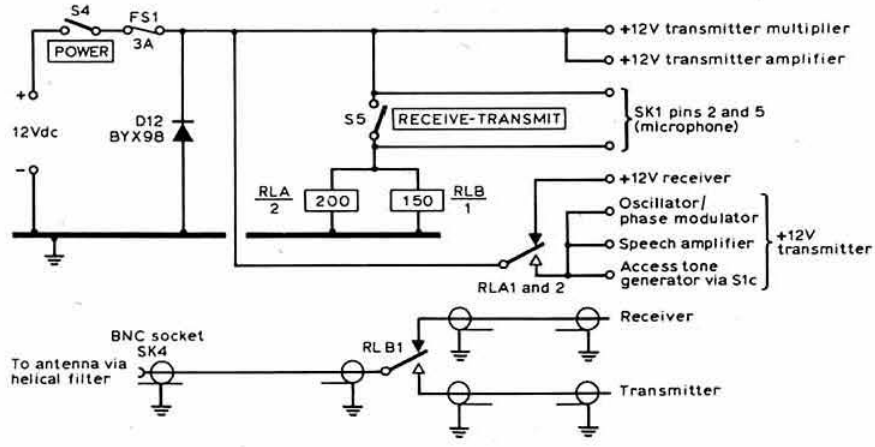

Fig 5. Power and control circuit

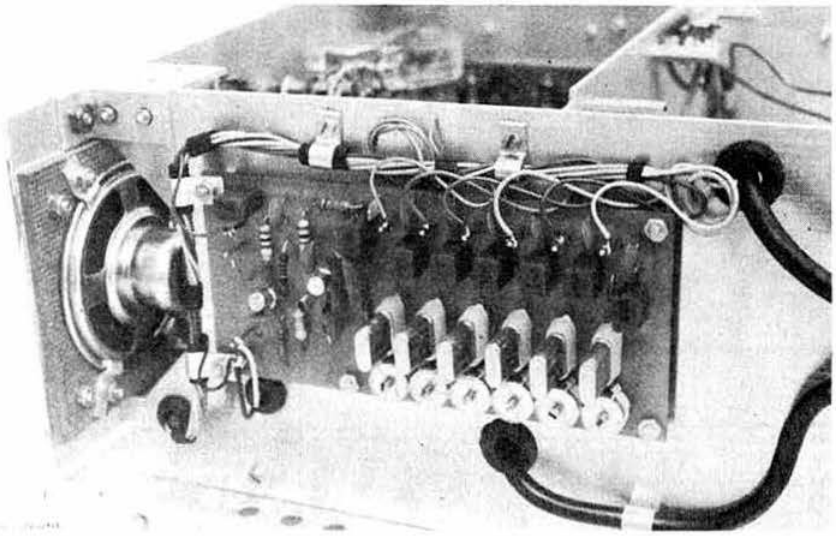

Photo 1. Receiver local oscillator

switches the antenna from receiver input to transmitter output.

Provision is also made for receive-to-transmit changeover by a press-to-talk switch on the microphone through pins 3 and 5 of the microphone socket SK1 (Fig 3), these pins being connected in parallel with S5.

The power control relay RLA is a double-pole changeover type, with the two contact sets connected in parallel. As the contacts of the relay specified are rated to carry 1A, and in this equipment are only required to pass 100mA, the second contact set could be used to switch the monitor meter M1 in lieu of the manual changeover switch S3.

Constructional notes

The complete equipment is housed in a case measuring 10in wide by 4⅝in high by 11in deep; this is larger than necessary for the present application, but increased depth has been allowed to incorporate a higher power pa stage, eg 50W, which would be mounted towards the rear with an external heatsink. Space has also been allowed for inclusion of a low-noise rf preamplifier to improve the receiver performance. Top and side dust covers are detachable, and the front and rear panels are hinged to allow easy access for alignment and servicing.

Single-sided printed circuit board is used for sub-assemblies, except for the receiver converter and transmitter multiplier which are constructed on double-sided board. The receiver af amplifier and access tone generator boards are srbp laminate, all other boards are glassfibre laminate.* The few components in the power control unit are mounted on a flat aluminium chassis plate.

Photos 1 and 2 show the location of the receiver: the local oscillator is mounted on a vertical partition towards the right of the case. Converter, i.f amplifier and

*Information about the circuit boards is obtainable on application to the author

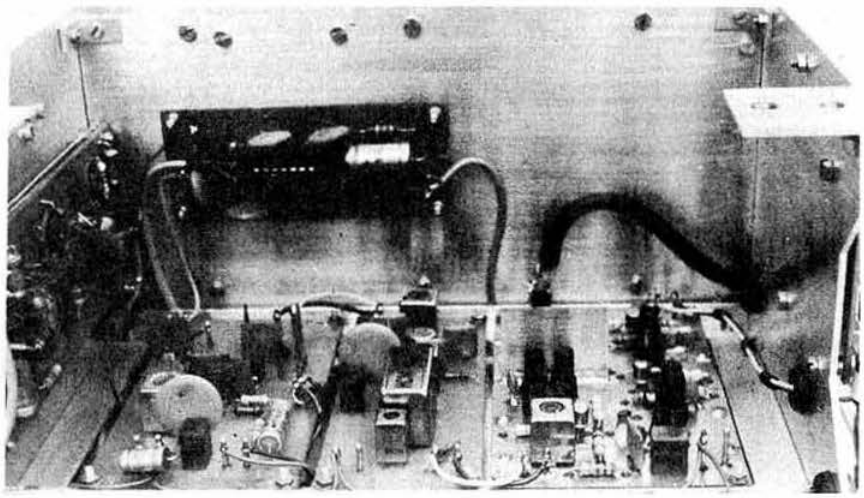

Photo 2. Receiver (r to l): mixer, i.f. amplifier and quadrature detector, with af amplifier at rear

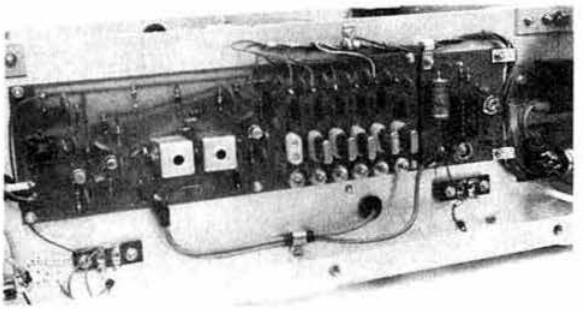

Photo 3. Transmitter oscillator, phase modulator and first multiplier, with access tone generator on right

quadrature detector boards are mounted horizontally in front of a transverse bulkhead, the front side of which carries the receiver af amplifier.

Transmitter oscillator and phase modulator board (Photo 3) is mounted on a vertical partition at the left, with the access tone generator immediately to the front. On the other side of this partition the speech amplifier is mounted, adjacent to the receiver. The multiplier board is situated towards the rear immediately behind the oscillator/phase modulator, and the transmitter amplifier is mounted vertically on the rear of the transverse bulkhead.

With the exception of the transmitter amplifier, all boards are of normal etched pcb construction. For the amplifier, however, the copper-clad laminate serves as a ground plane only; interconnections between circuit elements, input and output terminations are made through small pads of $\frac{1}{16}$in copper-clad laminate secured to the ground plane by an epoxy resin adhesive. The ground plane is backed by $\frac{3}{32}$in aluminium sheet which forms part of the pa heatsink, and to which the pa transistor is fixed through a clearance hole in the ground plane. Emitter connections to this transistor are made through small $\frac{3}{32}$in thick copper pads soldered to the ground plane as close to the transistor as possible; considerable heat is required to solder the emitter leads to the copper pads, and this operation must be carried out with some care. An additional heatsink of $\frac{1}{4}$in aluminium plate, painted matt black, is bolted to the first heatsink immediately behind the pa transistor. Silicon heatsink grease (Thermaflow) is applied to the transistor mounting stud and between both parts of the heatsink before assembly.

Alignment

Alignment of both receiver and transmitter is straightforward and follows normal procedure. The only critical adjustment in receiver alignment is to the quadrature detector coil L16; the core of this inductor should first be tuned for maximum af output and then re-adjusted slightly to obtain the best speech quality. These two conditions may not be co-incident.

The two inductors L8 and L9 associated with the phase modulator should be adjusted for maximum rf output. Tuning of these circuits interacts to a certain extent, and adjustments to the cores should be made repetitively until the optimum condition is obtained.

A frequency counter is essential to set the transmitter

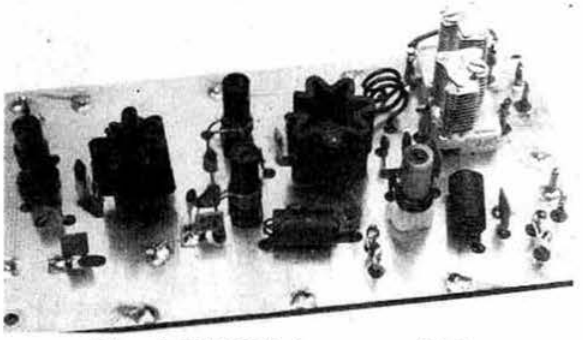

Photo 4. 36/144MHz frequency multiplier

crystals to the correct frequency, and is highly desirable for the receiver local oscillator.

When the transmitter is correctly aligned, input to the pa stage is approximately 20W. For the present application this has been reduced to about 15W to give a greater life expectancy for TR9 and TR10, resulting from a lower operating temperature. Input can conveniently be reduced by operating the multiplier transistors TR7 and TR8 at a slightly lower voltage through a series resistor from the 12V supply; a more elegant method, however, would be to insert an attenuator pad between the final multiplier and the pa driver transistor.

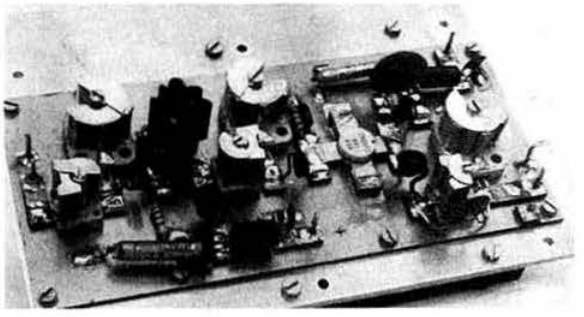

Photo 5. Transmitter driver and power amplifier

Acknowledgements

The author wishes to acknowledge assistance given by the following amateurs during development of this project: G3OQC for information on the access tone generator, and information on the phase modulator additional to that contained in [2]; G3ZMF for providing a 7413 access tone generator board used in initial tests; G3GVM for information on installation and operating temperature conditions of rf power transistors; and the many amateurs who have co-operated in on-the-air tests. Finally, thanks are due to the author's sister, Miss M. B. Hyde, MSc, for providing photographs of the equipment.

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[1] "A compact band-pass filter for 144MHz", G. R. Jessop, CEng, MIERE, G6JP, *Radio Communication* June 1971.

[2] "Obtaining deviation", B. D. A. Armstrong, G3EDD, *Radio Communication* December 1970. □

The development, theory and use of nickel-cadmium batteries

by P. N. BUTTERFIELD, BTech, PGDip, G4AAQ†

OVER the past five years, nickel-cadmium (nicad) batteries have become of ever-increasing importance to the amateur, especially with the increase in commercially available portable equipment. With this in mind, the author felt an article outlining the history and development of the nickel-cadmium battery, its theory of operation, and its performance and uses, would be of interest to the amateur. It may also clear up one or two misconceptions about nickel-cadmium batteries which have crept into conversations on the air.

History and development

The basic development of alkaline cells dates from 1881 when Lalande and Chaperon patented a cell which used a copper-oxide positive electrode and a zinc negative electrode in a potassium or sodium hydroxide electrolyte. Much work was done on this system, and in 1889 Thomas Edison patented a modified version of the Lalande-Chaperon cell. He later experimented with cadmium as a substitute for the zinc electrode but then turned his attention to nickel oxide and iron as electrode materials.

In Sweden, around the same period, Waldemar Jungner was working on alkaline electrolytes, experimenting with many combinations of metals and metal compounds. One of the major difficulties with the development of alkaline cells was that the electrolyte appeared to attack most metals by oxidation of the anode. Jungner undertook an investigation to find a metal which was not affected in this way: he came up with nickel and made this the support for active materials in his future experiments.

Jungner also carried out successful experiments on silver-cadmium cells, but the materials turned out to be either too expensive or too rare for exploiting on a large production basis. However, in 1901 Jungner patented a nickel-cadmium cell system.

The independent work done by Edison and Jungner formed the basis from which the successful manufacture of nickel-cadmium batteries began. These batteries were made by a similar process to the already common Planté lead-acid batteries, and the main application was as replacements for such batteries.

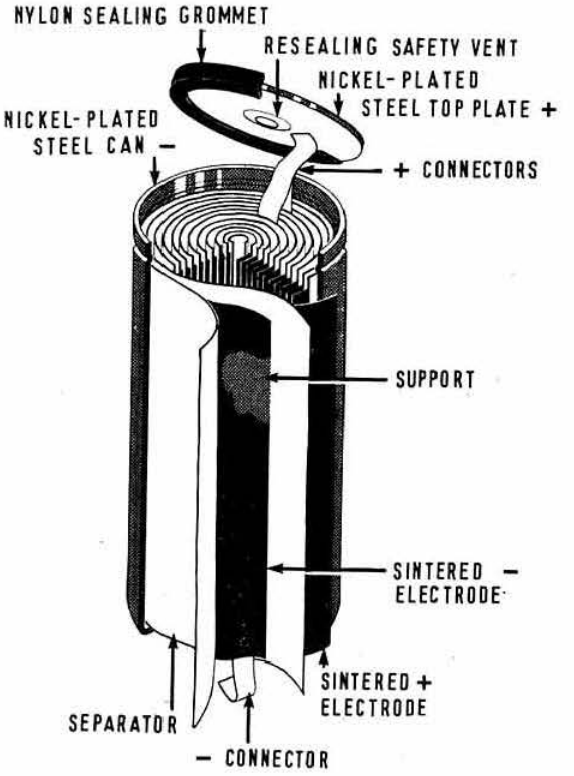

Fig 1. Exploded view of construction of typical nickel-cadmium cell

The next major step was made in the 'thirties in Germany, where the electrodes were developed, with the active materials deposited in the pores of sintered* nickel supports. Little use was made of this knowledge until the second world war, when sintered cells were manufactured in Germany and used in aircraft and rockets. These batteries had both mechanical and electrical shortcomings and it was not until after the war that these were resolved and the manufacture of sintered nickel-cadmium batteries was begun in several countries.

Development of a sealed system was considered by Edison in 1912. No practical system was evolved, however, until the early 'fifties, when intense research into nickel-cadmium batteries led to the discovery of the principle of oxygen re-combination. With the advent of suitable separator materials the sealed cell system was developed, and this resulted in a new era of nickel-cadmium technology and the manufacture and use of small, completely sealed rechargeable batteries.

Continued developments in the search for smaller, higher performance, nickel-cadmium batteries have resulted in cells in which construction allows any oxygen

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*Sintering is the process which brings about the agglomeration of particles of a metal (or other substance) by heating, usually under pressure, to just below the melting point of the substance, or in the case of a mixture, to the melting point of the lowest melting constituent.

produced during charging to be recycled so that the cell may be sealed. This means there is no loss of electrolyte nor any significant build-up of gas pressure under normal use.

The most effective construction has been proved to be one where the active materials are chemically formed within the pores of the sintered nickel plates, and in which the cell is assembled with electrodes of different capacities and an accurately determined amount of electrolyte.

Nickel-cadmium cells are produced in both cylindrical and button type construction. Electrically and chemically both these types are identical and only differ in the physical construction. For amateur purposes the cylindrical sintered plate cell is the one most commonly used, and the remainder of this article is written with emphasis on this type of cell. The button type cell has many similarities but is generally designed for smaller capacities and lower current drains. If the reader wishes to use the button cells, he is advised to get the manufacturer's instructions for their use rather than directly apply the information given later in this article, which is applicable only to the sintered plate cell and, if used on button cells, could lead to reduced cell life due to overcharging or over-discharging.

Theory of operation

The sealed nickel-cadmium cell has a similar chemical reaction to the open nickel-cadmium cell. It is designed to be maintenance-free and under normal conditions it will not release gas, whereas an open cell is designed to release gases when necessary and may require topping up or a complete electrolyte change.

The elements of construction of the cylindrical sintered cell are shown in Fig 1. The key to the success of the system is the microporous pure nickel matrix which is formed about the perforated nickel or nickel-plated mesh making up the electrode support.

The interstices of this material are impregnated with the active electrode materials following high vacuum treatment to ensure that a high degree of utilization of space is achieved. Connections to the electrode packs are in all cases pure nickel strips welded to the plated steel outer casing. The electrode separators are formed from non-woven polyamide materials specially selected for long term chemical and physical stability.

Cell assembly is carried out under rigidly-controlled conditions, and the final hermetic closure is achieved by forming a pressure seal between the top of the can and a creep-resistant insulating nylon grommet or top plate. In addition, all the cylindrical type cells are fitted with a resealable safety vent, enabling the cell to release a little gas under conditions of extreme abuse, and then to reseal and function normally thereafter. Most nickel-cadmium cylindrical cells are designed to vent at between 10 and 20 atmospheres; however, it has been noted that several types of cells of oriental origin vent at a much lower level than 10 atmospheres, which in the long term leads to reduced life. Hence, with cells of this nature it is imperative that they are treated carefully and not abused.

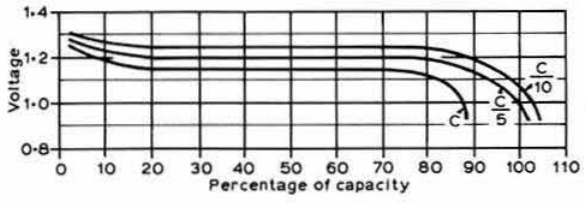

Fig 2. Typical capacity variation with discharge rate

The electro-chemical theory underlying this construction can now be considered. An approximation of the overall charge and discharge reactions of any nickel-cadmium cell may be represented by the following reversible reaction:

$$\underset{\text{Positive electrode}}{2Ni(OH)_2} + \underset{\text{negative electrode}}{Cd(OH)_2} \rightleftharpoons \underset{\text{positive electrode}}{2NiO(OH)} + \underset{\text{negative electrode}}{Cd + 2H_2O}$$

DISCHARGED STATE — CHARGED STATE

More detailed consideration of the individual electrode reactions during charge shows that the main negative electrode reaction, consisting of the reduction of cadmium hydroxide by absorbing electrons—$Cd(OH)_2 + 2e^- \longrightarrow Cd + 2OH^-$, is accompanied by a side reaction—$2H_2O + 2e^- \longrightarrow 2OH^- + H_2$.

However, the hydrogen evolution potential is not reached during charging at moderate rates and thus the hydrogen producing side reaction does not occur to any measurable extent.

Similarly, the positive electrode reaction—$2Ni(OH)_2 + 2OH^- \longrightarrow 2NiO(OH) + 2H_2O + 2e^-$, is accompanied by a side reaction—$4OH^- \longrightarrow 2H_2O + O_2 + 4e$.

By constructing the cell as shown earlier, the migration of oxygen evolved at the positive electrode is promoted to the vicinity of the negative electrode. Here, the oxygen is reduced on contact with the negative electrode by the reverse of the above reaction which absorbs electrons. Thus it can be seen that the electrons are not available for the reduction of the cadmium hydroxide. This no longer takes place and, therefore, the hydrogen evolution potential is not reached.

This state of affairs continues to exist as long as the rate of oxygen evolution at the positive electrode is no higher than the rate of its consumption at the negative electrode. Most cells have an additional built-in protection against overcharge which takes the form of a surplus amount of cadmium hydroxide incorporated into the structure of the negative plate. This surplus mass is called "charge reserve", and it ensures that the negative electrode is only partially charged when the positive electrode is fully charged.

Two practical points emerge from the above considerations. First, when the cell is fully charged all the current being passed will be used in the production of oxygen and its subsequent recombination, and the greater the current the more oxygen will be produced. If too high a charging current is used, more oxygen will be produced than can be recombined, gas pressure will build up and the safety vent will release oxygen from the sealed cell.

Second, it should be noted that the oxygen recombination reaction is exothermic and will cause the cell temperature to rise. (The resultant temperature rise is not caused by the cell's internal resistance.) Too great a temperature rise may damage the cell. It is therefore

necessary to limit charging current if there is any possibility of the cell being overcharged.

It will be noted that no mention of the electrolyte, potassium hydroxide (KOH), has been made and it does not appear in any of the formulas. However, water is produced when charging and is taken up when discharging. The purpose of the electrolyte is to reduce the effect of the water on the operation of the cell.

Performance and use

Capacity. The capacity of a battery is the total amount of electrical energy (expressed in ampere-hours) which can be obtained from it when fully charged. The available capacity is normally dependent on the rate of discharge, the temperature, the nominal and final discharge voltage and its recent history in terms of charge and discharge cycles.

The standard capacity of nickel-cadmium batteries (C) is the capacity which will be obtained when fully charged batteries are discharged at such a rate as will bring them to an end point of 1V in five hours. This end point is chosen because, at that voltage, the cell is effectively exhausted. This rate of discharge is known as the five-hour rate and is usually expressed as C/5.** Similarly, C/2 indicates a two-hour discharge rate and 2C indicates a complete discharge in 30min.

As mentioned earlier, the capacity varies with the discharge rate. Slightly higher capacities will be obtained if the discharge rate is reduced below C/5 (say C/10) and reduced capacities will result if the discharge rate is increased above C/5 (say C). This variation is shown in Fig 2.

For example, if a standard "AA" size, 450mAh battery at 25°C is discharged at a rate of 90mA, the full capacity of 450mAh will be obtained. If, however, it is discharged at 450mA, only 86 per cent of its full capacity, 390mAh will be obtained.

The capacity is also a function of temperature, and this is shown in Fig 3. If the cell is operated at any temperature other than 25°C, its capacity must be up-rated or de-rated. Using the previous example of a battery discharging at 450mA, if it was doing so at 0°C, only 61 per cent (0·71 × 0·86 × 100) of its full capacity, 275mAh, would be obtained.

**In certain literature, C may be denoted as I.

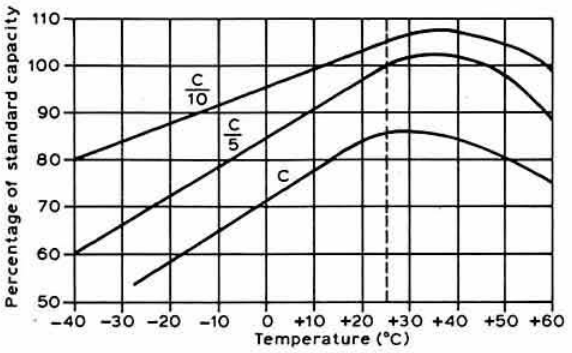

Fig 3. Typical capacity variation with temperature

Temperature. Nickel-cadmium cells will operate over a wide temperature range (−40°C to +60°C) and in a variety of unusual environments, eg in gravity free conditions or in a vacuum. The capacity of these batteries varies with temperature, as mentioned earlier, being greatest at about 30–40°C (Fig 3). At temperatures below 0°C, the battery's internal resistance increases and this can greatly affect the voltage characteristic at high discharge rates. Also, at low temperature, the battery's ability to recombine oxygen during overcharge is inhibited and, therefore, under normal circumstances, charging should not be attempted at low temperatures.

Nickel-cadmium batteries have a negative temperature coefficient of approximately 4mV/°C per battery. When selecting batteries for low temperature operation, both their reduced capacity and changed voltage characteristic should be taken into consideration.

Efficiency. Nickel-cadmium batteries with sintered electrodes have an ampere-hour efficiency of approximately 84 per cent. For this reason they have a charging factor of 1·2. Therefore, to completely charge a fully discharged battery, 20 per cent more energy must be put back into the battery than has been withdrawn.

The watt/hour efficiency is the ratio of the discharged energy to the necessary energy needed to charge a battery fully. Comparing the mean discharge voltage with the mean charge voltage gives approximately 73 per cent for a battery with sintered electrodes when discharged at the C/10 rate.

Storage. Sealed nickel-cadmium batteries can be stored indefinitely; ideally in a clean, dry atmosphere, in a discharged state—unlike lead-acid batteries which will sulphate if stored in a discharged state. Nickel-cadmium batteries can be stored in any state of charge without significant loss of life.

Maintenance charging is not required. However, after prolonged storage, up to three cycles of charge and discharge may be required to achieve the battery's rated capacity. It is recommended that the first charge in these circumstances should be for 24 hours at the C/10 rate.

During operation and storage it is possible that crystals may form in the area of the sealing gasket between the positive nickel-plated steel top plate and the negative nickel-plated steel can. These crystals form because of minute pores in the sealing ring which allow the electrolyte, potassium hydroxide, to combine with carbon dioxide from the atmosphere forming potassium carbonate. The crystals have no detrimental effect on the electrical properties or life expectancy of the battery and may be removed with a dry cloth. A smear of silicone grease round the edge of the sealing gasket will inhibit further growth.

Charge retention. Sealed nickel-cadmium batteries have a moderate self-discharge characteristic at normal temperatures. Fig 4 illustrates this and, as can be seen, the self-discharge is a function of the battery temperature. The loss is not harmful to the battery and the energy may be readily restored at any time by recharging.

Charging. An advantage of nickel-cadmium batteries is that they may be charged satisfactorily with very simple circuitry, but in all cases the current should be approximately constant or limited to a known safe value. Under

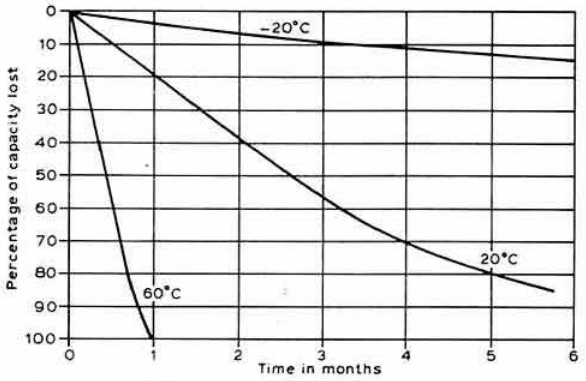

Fig 4. Typical charge retention characteristics with time

no circumstances should a constant potential charging system (such as a car battery) be used, since the very low internal resistance (approximately 20mΩ) of the nickel-cadmium battery may lead to very high currents being drawn and to the battery overheating. Also, since it is necessary to inhibit the evolution of gas within a sealed cell, the voltage rise caused by a cell gassing cannot be used to reduce the charge current to a safe trickle charge level. Many methods of determining the state of charge of a sealed nickel-cadmium battery have been tried but, due to the nature of the charge/discharge characteristics, no commercially viable system has yet been developed to give a sufficiently accurate indicator.

Discharged batteries (ie batteries below 1V) can be brought to the fully charged state after 12 to 14 hours if charged at the C/10 rate. If batteries are discharged much below 1V (ie overdischarged), reverse polarity may take place. In these circumstances it is recommended that an extended charge of 24 hours at the C/10 rate be given to ensure that the battery is charged to the correct level. Overcharge at rates in excess of C/10 should be avoided; however, 100 hours at the C/10 rate will have no detrimental effect.

There are many applications where it is necessary to maintain batteries in a fully charged condition at all times, eg emergency power supplies. In such cases, where deliberate indefinite overcharging has been planned for, the charge rate necessary to keep the battery fully charged is approximately the C/30 rate. This allows for normal self-discharge but the rate should be increased to C/10 if there is any major withdrawal of charge.

If the exact state of charge of a battery is known—and this is usually only when it is completely discharged—it is possible to charge very rapidly (at $10 \times C/10$ rate to approximately 80 per cent capacity). However, this must only be done under very carefully controlled conditions, and excessive temperatures must be avoided if the

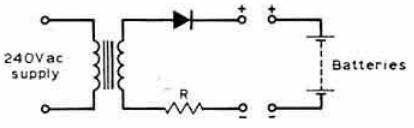

Fig 5. Simple mains charging circuit

expected life of the battery is to be attained. Any reduction in life may not become apparent until the battery has been in service for periods in excess of one year. It is not recommended that the reader attempts fast charging of nickel-cadmium batteries.

In applications where batteries are operated in a purely cyclic mode (ie charge/discharge cycle) at the C/10 rate, sintered electrode batteries should give 500 cycles to approximately 80 per cent capacity. Partial discharging will increase the number of cycles achieved quite significantly. Similarly, discharging at high rates, above C/5, will reduce the expected life of the battery.

Charging circuits

The coulombs stored by a battery during charge, or delivered during discharge, are a function only of mean current for short term cyclic variations. Consequently, it is an accepted practice to use unsmoothed rectified supplies, resulting in the battery current pulsing at harmonics of the supply frequency.

One of the simplest forms of charger circuit is shown in Fig 5 and consists of a transformer, half-wave rectifier and current limiting resistor. As a rule, the output voltage of the transformer should be about twice the on-charge battery voltage, which is about 1·45V per battery. The value of R is chosen to limit the current to the desired value. For greater efficiency it is possible to use full-wave rectification.

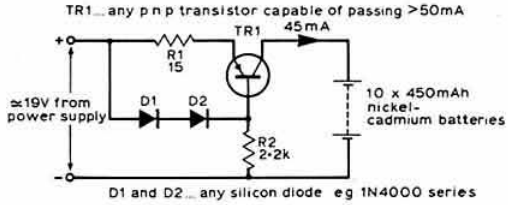

Fig 6. Constant current regulator

Such chargers are typical of the ones normally supplied with commercial portable equipment. However, one of the major disadvantages of such chargers is the absence of control over voltage variations and, in turn, the charging current. The problem of varying current can be overcome by using a constant current regulator. A suitable constant current regulator for charging nickel-cadmium batteries is shown in Fig 6, with component values to give a constant charge current of 45mA for a wide variation of input voltages. If the transistor TR1 is rated at 1W dissipation, the circuit will withstand a short-circuited output.

This still leaves two major problems. First, the need for a transformer which is a relatively bulky and costly item, and second, the fact that the charger cannot be used while the equipment is in the car. The difficulty is that the car battery voltage ($13V \pm 2V$) is insufficient to drive a constant current regulator under all conditions.

Many amateurs have a 12V source in their shack, and most have one in their car! The simple and inexpensive circuit shown in Fig 7 was developed for a local radio club project by G3WUI. It eliminates the need for a transformer, providing that a 12V supply is available. It provides

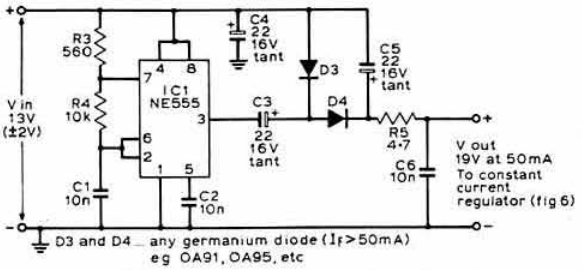

Fig 7. Simple 13V battery-source charging circuit

Table 1. Results of dc–dc converter charging circuit

V_{in} (V)	I_{in} (mA)	I_{out} (mA) without const current reg	I_{out} (mA) with const current reg
11	130	29	41
12	140	39	42
13	148	47	43
14	153	56	44
15	160	65	45

V_{in} = 13·0V ±2V (±15%)
I_{out} (without regulator) = 47mA ±18mA (±38%)
I_{out} (with regulator) = 43mA ± 2mA (±4·65%)

sufficient voltage and current to enable ten 450mAh nickel-cadmium batteries to be charged at the C/10 rate.

The heart of the system is a low current dc-dc converter using a Signetics NE555 integrated circuit. It operates as a multivibrator, at a frequency of about 8kHz, with a 1:1 mark-space ratio. A voltage doubler provides 19V at 50mA, and the overall efficiency is about 70 per cent. The current regulator is the same as that shown in Fig 6, and the results obtained with this configuration are shown in Table 1. The output current does not vary more than ±4·65 per cent for an input variation of ±15 per cent, which makes it suitable for use in a car whether mobile or stationary. The unit can be built on a piece of Veroboard about 1·2in square and, with some simple switching arrangement, could be mounted internally or externally, allowing the equipment to be used while mobile and to be charging the internal nickel-cadmium batteries at the same time. The advantages of such a system are obvious, especially where it is necessary to have the equipment operational at all times in fixed, mobile and portable conditions.

Conclusion

The characteristics of these small, compact power sources are such that the author expects they will find rapidly increasing applications in the field of amateur radio in the future. This article has briefly outlined the history, electrochemical and physical construction and typical operating characteristics of cylindrical sintered electrode nickel-cadmium batteries, together with some simple charging circuits. It is hoped that the reader now has a more optimistic view of nickel-cadmium batteries, and the author will be pleased to supply further information and advice to anyone requiring it. □

oscar news

Oscar 8 continues in a stable orbit, and daily reference figures can be obtained from GB2RS or one of the Oscar nets on Sundays. Severe fading has been noted on Mode A and this could be due to Faraday rotation or ionospheric effects during periods of high solar activity.

	OSCAR 7	OSCAR 8
145–29MHz transponder	Uplink: 145·85–145·95MHz Downlink: 29·4–29·5MHz (Mode A)	Uplink: 145·85–145·95MHz Downlink: 29·4–29·5MHz (Mode A)
432–145MHz transponder	Uplink: 432·125–432·175MHz Downlink: 145·975–145·925MHz (Mode B)	—
145–435MHz transponder	—	Uplink: 145·900–146·000MHz Downlink: 435·1–435·2MHz (Mode J)
Beacons	435·10MHz (Mode A) 145·972MHz (Mode B) 29·502MHz (Mode A)	435·095 (Mode J) 29·402 (Mode A)

A calendar of Oscar 8 orbits, similar to the Oscar 7 calendar produced by W6PAJ, will be available at the beginning of June from AMSAT-UK. The cost to AMSAT-UK members will be £1.40, and G3AAJ will be the source of supply.

Users should note that neither Oscars 7 nor 8 are available for use on Wednesdays, which are reserved for AMSAT-designated experimental use.

The table shows the main characteristics of the two spacecraft now in orbit. Certain of the Oscar 8 figures may change slightly during the ensuing month.

	OSCAR 7	OSCAR 8
Period	114·944834min	103·23162min
Longitude increment	28·736208°W per orbit	25·80868°W per orbit
Inclination	101·7010°	98·992°
Perigee	1,450km	898·259km
Apogee	1,461km	910·37km
Eccentricity	0·0010218	0·00070
NASA object No	74 89 B	78 026 B
Schedule	Not to be used on Wednesdays. Otherwise mode according to battery state.	Not to be used on Wednesdays. Usually—Mode A, Monday to Friday; Mode J, Saturday and Sunday.

Modifications for the W6MXV and other sstv monitors

by J. HOLMES, G3UEU, and

P. BURNETT, G4BLL*

THE following modifications have been incorporated in two home-built W6MXV design monitors. Both monitors have functioned perfectly with the component values given, and there is no reason why the basic ideas should not be incorporated in other monitors, whether commercial or home-built, although this has not been investigated by the authors.

50Hz/60Hz display switching

All slow-scan enthusiasts will know that when receiving video from countries with 60Hz mains frequency, on a monitor set up to British standards, a significant percentage of the picture is lost due to line and frame over-scan; the different count-down for derivation of the sync pulses allowing the spot to travel further across, and down, the screen before the next sync pulse is received. The effect can usually be tolerated when one is unaware of the exact pictorial information which should be present, eg a face or any picture where there are no "known" points of reference. However, when trying to identify a station calling on slow scan, when the callsign occupies the full width of the line, then the last letter can be almost completely hidden and undecipherable. Fig 1 shows how this situation is easily remedied by slowing down the spot, ie increasing the time constants in the line and frame scanning circuits by switching in additional 470kΩ pre-sets, which are adjusted until the picture again just fills the screen area. When receiving video from 50Hz countries the pre-sets are switched out, otherwise a black border will be present down the right-hand side and along the bottom of the picture.

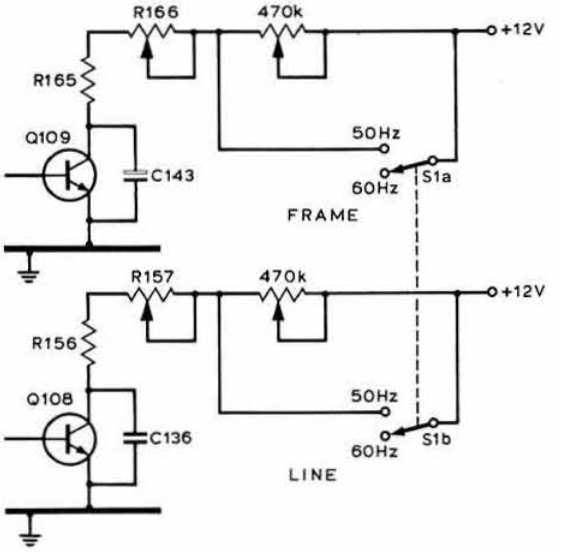

Fig 1. Circuit for 50Hz/60Hz picture size adjustment. (The abbreviation "Q" instead of "TR" is used for transistors to avoid confusion with the original circuit diagram)

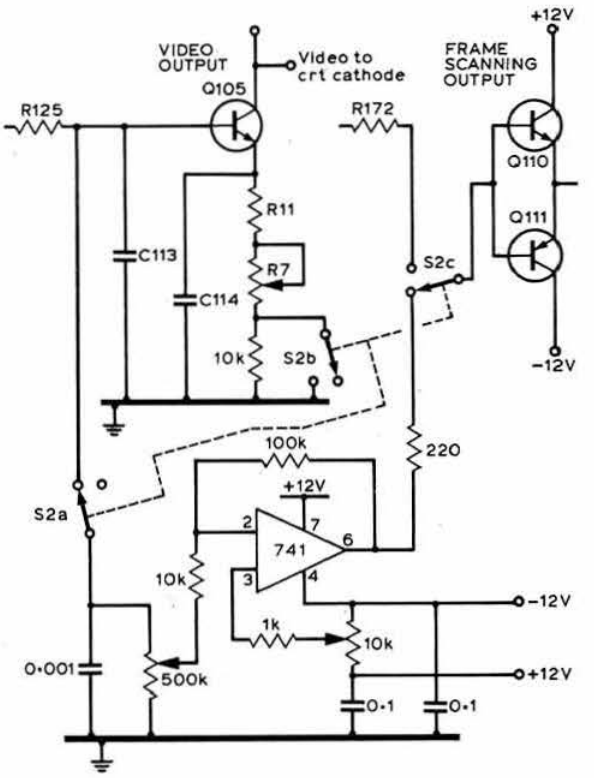

Fig 2. Circuit for video graph. (The abbreviation "Q" instead of "TR" is used for transistors to avoid confusion with the original circuit diagram)

Video graph

It is often helpful to be able to give an "accurate" assessment of the quality of received video signals, ie the video swing from black through grey to white and, of course, the sync pulse shape and width. So often, "informed" reports are given of insufficient black or white when "the fault" is due simply to a slight mistuning of the receiver—the receiver not being set to the centre of the pass band of the video.

The modification suggested here enables the video swing of the received signal to be viewed in an oscilloscope fashion; the photograph shows a typical trace. The

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sides of the tube mask may be calibrated to show the extent of the video swing for correctly modulated video and the line sync pulse height. Actually, what is being displayed is a line-by-line change in the video with the sync pulse shown negative-going at each end of the line (the sync pulse is split because at a certain point in the rise-time line, fly-back is triggered).

Fig 2 shows the switching and circuitry required. A 741 op-amp, with gain control and dc offset, is used to provide sufficient drive to the frame scanning output transistors. The gain control allows the height of the trace to be set, and the offset control, by adjusting the dc bias, allows the trace to be positioned in the centre of the screen. The 10kΩ resistor is switched in to bias the video output transistor to cut-off so that the brightness of the display is constant.

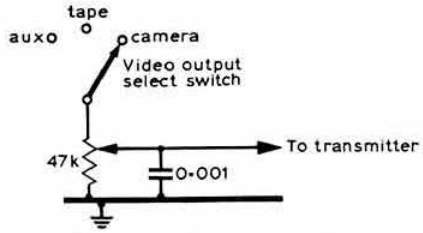


Fig 3. Circuit for video level output

Video level output

In most sstv stations the monitor also serves as the station control, routing the video from various sources—camera, keyboard, tape etc—to the transmitter. More often than not, the video output level varies from one source to another, or the audio drive required when switching from one band to another may vary.

Fig 3 shows a simple arrangement to control the audio drive to the transmitter. The potentiometer is most conveniently mounted on the front panel of the monitor to facilitate ease of use.

LED tuning indicator

The W6MXV monitor uses an EM84 or similar "magic-eye" as a very effective tuning indicator, but this type of

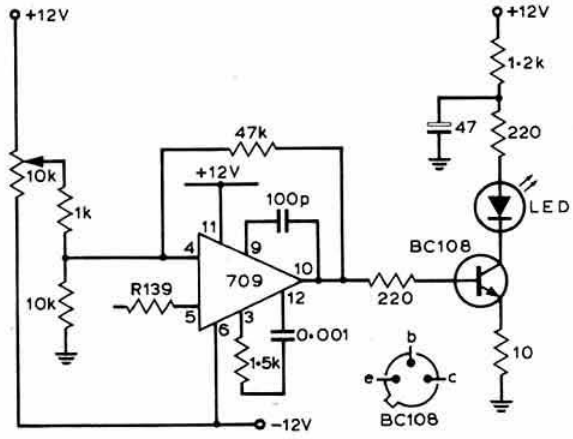
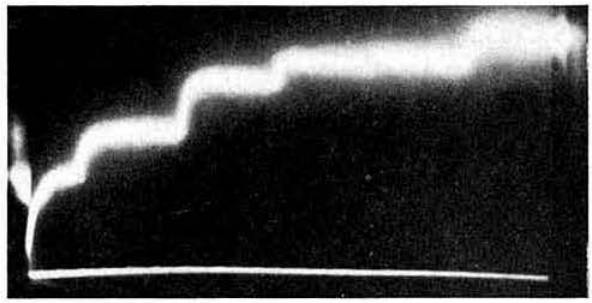


Fig 4. Circuit for led sync tuning indicator



Photograph of oscilloscope trace

indicator is no longer readily available. A drawback is that ht and a 6·3V ac heater supply are required, which have to be routed to the front panel, and therefore are further potential sources of hum. Fig 4 shows a simple circuit enabling an led to be used as the tuning indicator. The 10kΩ potentiometer is a dc offset control which allows the output of the 709 to be set so that the BC108 transistor is switched on only at the peak of the sync pulse.

Power supply

A further very worthwhile modification, applicable to all monitors incorporating a built-in power supply, is to replace the mains transformer with one of the toroid-wound types now beginning to appear on the market. They exhibit virtually no external hum-field, which eliminates any tendency to patterning (bending of the line due to 50Hz hum). A slight drawback is that usually there is no provision for a 6·3V winding for the tube heaters. However, this may be overcome by a circuit, Fig 5, which offers the added advantage of feeding a dc voltage to the heaters, eliminating another possible source of hum. The 6·8V zener across the output is included in case the pass-transistor goes short-circuit, which would otherwise result in the untimely demise of the tube heaters.

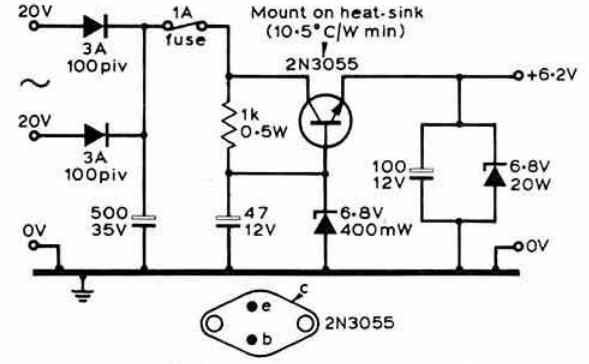


Fig 5. Circuit for tube heater supply

Conclusion

The W6MXV monitor is described in the *Slow Scan Television Handbook*, published by *73* magazine, and the circuits shown in Figs 1, 2, 3 and 5 should be read in conjunction with the original circuit to which the components and notation refer. □

Sunspot cycle 21—the peak, how much and when

by O. OKLESHEN, W9RX (Propagation editor, *HR Report*)

Of the many methods and authors of the "how much and when" of a solar cycle maximum, the most recent, and possibly the most accurate, method has been devised by A. I. Ohl, a Soviet scientist whose first publication was reported in *Solnechnaya Dannyye*, No 9 pp73–75. H. H. Sargent III, Space Environment Services Centre, Boulder, Colorado, modified the Ohl theory, thus enhancing the accuracy of the basic method developed by Ohl. The theory is based on the *regression of recurrent geomagnetic activity recorded from the prior cycle to predict the sunspot maximum of the forthcoming cycle.*

Mr Sargent modified the Ohl theory by taking into account finer time resolution and more accurate data than was available to Ohl. The Ohl theory, as modified, provided accuracies of maximum sunspot cycle peaks when tested against observed data within an accuracy of one per cent in some cases. While not so in every case, accuracies within five per cent of maximum sunspot level predictions appear to be common. Compared to any prior known methods, the Ohl/Sargent method would be, by far, a major breakthrough in the prediction of sunspot cycle maximum levels, when accuracy and other advantages are considered. The data used to establish and test the original Ohl theory was extracted from the last 110 years. The data before 1848 is dubious because of the information and techniques available. For that reason some of the other theories used at that time to predict sunspot maximum levels may be erroneous.

Many other methods have been used to achieve individual and combined success to determine maximum sunspot peak levels. The IGY peak of 1957 led to anticipation of a peak level, certainly of a magnitude that would stimulate IGY research. One often-used method is a "slope" technique that observes the rate of upward change at the beginning of a new cycle. This observed rate of change is then projected to a peak value. The Ohl method has two most important advantages over all other theories and methods of establishing the sunspot peak level. First, it appears to be superbly accurate, and second and probably most important, the Ohl method gives a year's earlier lead time. It is only necessary to use data from the prior decaying cycle.

The exact mechanism between the prior cycle recurrent geomagnetic behaviour and the succeeding cycle sunspot maximum is not clear. However, it is likely that one is directly related to the other in solar physics, whereby it is even possible that a new definition of a solar cycle may have to be established. Conjecture may place some possible validity in the theory that coronal holes that relate to recurrent geomagnetic disturbances may be the birthplaces of the succeeding cycle sunspot regions. This aspect of course would have to be studied and proved.

There is no doubt that the Ohl/Sargent method has great potential, as those needing accurate sunspot predictions are, and have always been, confronted with widely ranging opinions. We know that cycle 21 predicted maximums of 50 to 60 have already been exceeded; the February 1978 smoothed sunspot level has already reached at least 90 with the cycle peak approximately two years into the future!

As for specific figures of what may be in store for amateur radio, the following highlights and numbers have been extracted from the work of Mr Sargent.

Predicted smooth sunspot maximum for cycle 21 by Ohl/Sargent . . . . . 153·6

Approximate arrival date of the maximum . early 1980

Prediction of smooth sunspot level maximum by method of ratios . . . . . 158·0
(This method takes the averaged smoothed odd cycle peaks divided by the averaged smoothed even cycle peaks times the peak of cycle 20.)

Accuracy of the Ohl/Sargent method as tested with observed data from cycle 20 and compared to cycle 20 sunspot peak level . . . . . nearly 95 per cent

Twelve-hour periods with geomagnetic "A" indicies of 100 or more expected in the next 10 years 81
(an "A" index of over 50 indicates a major geomagnetic storm).

Monthly smoothed predicted sunspot numbers using the modified Ohl method for cycle 21

Jan 78 ..... 58·6	Jan 79 ..... 110·8	Jan 80 ..... 151·5	Jan 81 ..... 139·0
Feb 78 ..... 64·4	Feb 79 ..... 114·6	Feb 80 ..... 153·4	Feb 81 ..... 135·8
Mar 78 ..... 69·6	Mar 79 ..... 116·8	Mar 80 ..... 151·4	Mar 81 ..... 133.7
April 78 ..... 75·0	Apr 79 ..... 120·3	Apr 80 ..... 152·0	Apr 81 ..... 134·8
May 78 ..... 80·6	May 79 ..... 124·5	May 80 ..... 153·6	May 81 ..... 127·8
June 78 ..... 85·1	Jun 79 ..... 127·8	Jun 80 ..... 152·2	Jun 81 ..... 126·2
Jul 78 ..... 89·5	Jul 79 ..... 131·1	Jul 80 ..... 150·9	Jul 81 ..... 126·2
Aug 78 ..... 93·6	Aug 79 ..... 136·1	Aug 80 ..... 149·8	Aug 81 ..... 125·6
Sep 78 ..... 97·6	Sep 79 ..... 138·2	Sep 80 ..... 146·2	Sep 81 ..... 123·4
Oct 78 ..... 99·7	Oct 79 ..... 140·8	Oct 80 ..... 145·4	Oct 81 ..... 122·3
Nov 78 ..... 103·3	Nov 79 ..... 145·0	Nov 80 ..... 143·7	Nov 81 ..... 121·2
Dec 78 ..... 107·1	Dec 79 ..... 148·1	Dec 80 ..... 141·2	Dec 81 ..... 120·6

It is clear that if the predictions hold true, cycle 21 will be a whopper and will likely parallel cycle 18 and have an impact almost as severe as cycle 19. During periods of high solar activity, many services will be detrimentally affected. Satellite damage from solar radiation is one example. Communications and power will be interrupted. HF will probably be sheer havoc with skip interference. And now there is new evidence to support the theory that the weather is directly affected by solar sunspot behaviour and geomagnetic occurrences previously thought to be unrelated.

HR Report feels that the amateur community should be made aware of a highly accurate prediction that may well not only affect our use of the radio spectrum, but also our daily lives and our destiny.

Acknowledgement

This special report, reproduced from **HR Report**, *contains material from W9RX and extracts from a paper composed by H. H. Sargent III, Space Environment Services Centre, Boulder, Colorado.* □

technical topics

Pat Hawker, G3VA

THE recent mention of Murphy's Law ("if anything can go wrong—it will") has revealed that not all readers are cognisant of various profound scientific principles. The following are a few of those collected by J. Pinhey, ZL2LE (*Break-in* December 1977), all too applicable to amateur radio experimentation:

Cahn's axiom: When all else fails, read the instructions.

Horner's five-thumb postulate: Experience varies directly with equipment ruined.

Gumperson's law: The probability of a given event occurring is inversely proportional to its desirability.

Skinner's constant: The quantity which, when multiplied by, divided by, added to, or subtracted from your answer gives the answer you should have got (also known as Flannegan's Finangling Factor).

Rule of accuracy: When working towards the solution of a problem, it always helps if you know the answer (also known as Skinner's corollary).

Riddle's constant: There are co-existing elements in frustration phenomena which separate expected results from achieved results.

Chilsholm's law of human interaction: Any time that things appear to be going better, something has been overlooked.

HF solid-state converter

Some 16 years ago, Fred Johnson, ZL2AMJ, described a simple but effective crystal-controlled hf converter for the 7, 14 and 21MHz bands which provided its output on 3·5MHz, for which band it also acted as a pre-selector. It was intended for use with older hf receivers lacking either or both sensitivity/stability on the higher bands but still capable of good 3·5MHz performance. The converter offered the attraction of low cost, in that it required only one crystal which, if exactly 3,500kHz, provided direct readout of frequency from the 3·5MHz calibration of the main receiver, although in this case a strong internally generated signal is heard on 7,000kHz. This spurious signal can be shifted out of band by using a crystal of slightly lower frequency, but one then loses the advantage of consistent calibration. There is also a tendency to direct breakthrough of 3·5MHz signals unless a suitable filter is used ahead of it.

The original converter, known as the "hf gem", was described in *Break-in* September 1962, and used a 6U8 (ECF82) as untuned grounded-grid rf amplifier/pentode mixer, and a ·12AT7 (ECC81) as crystal-oscillator/cathode-follower. Despite its snags this always seemed an economical and practical approach to the extension of useful life of older hf receivers, and the design for many years has been featured in both *A Guide to Amateur Radio* and *Radio Communication Handbook*.

Now a New Zealand listener, Gary Moles, ZL2125, has taken the original design and adapted it, as simply and as directly as possible, for fet semiconductors, and has re-designated it as "The hf polished gem": Fig 1. He has

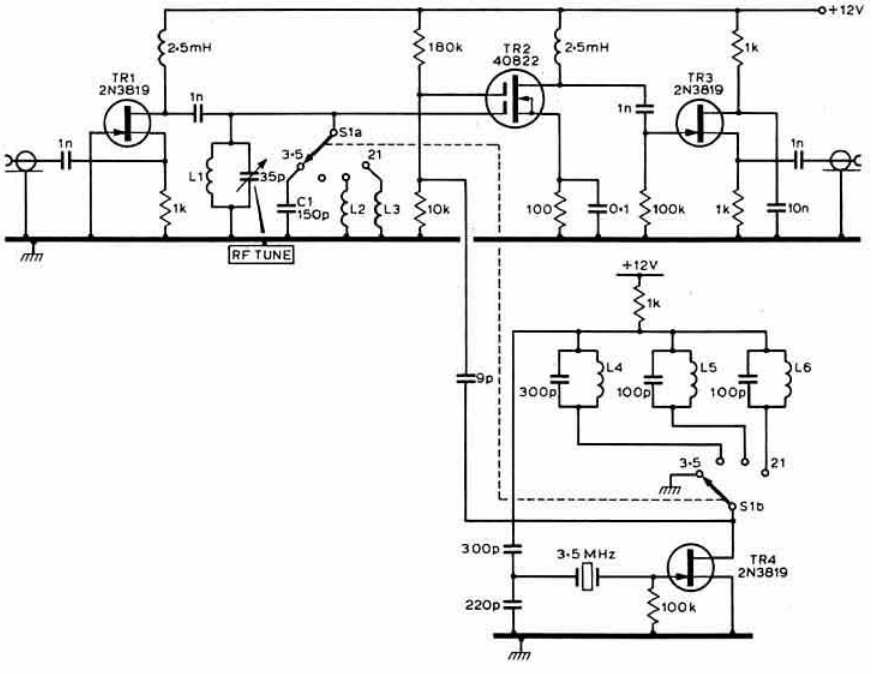


Fig 1. "The hf polished gem", a solid-state version of the ZL2AMJ "hf gem" converter first published in 1962. It acts as a crystal-controlled converter on 7, 14 and 21MHz, and as a preselector on 3·5MHz, providing output on 3·5–4MHz. If a 3,500kHz crystal is used, the calibration will be appropriate on all bands. All coils wound on ¼in diameter slug-tuned unshielded formers, using 30swg enamelled wire: L1, 42 turns; L2, 26 turns; L3, 17 turns; L4, 35 turns; L5, 13 turns; L6, 8 turns spaced over ⅜in

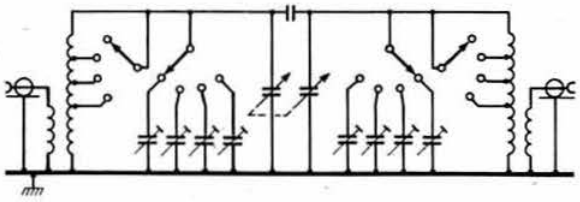


Fig 2. Bandpass preselector which can be put in front of the hf converter to eliminate direct breakthrough of 3·5MHz signals. A simpler highpass filter would probably suffice, and details of this particular filter were not given by Gary Moles

made no attempt to re-optimize component values and has followed the original arrangement, except for some rejigging of the mixer stage to change it from a pentode valve to a 40822 dual-gate mosfet. He notes that, like the original, there can be a problem of breakthrough of strong 3·5MHz signals, though this can be overcome by using a passive bandpass signal-frequency switched filter such as that outlined in Fig 2.

The original unit is housed in an old tea-tin with the crystal oscillator in its own semi-shielded compartment. Most of the components are mounted on Veroboard, and the coils mounted on the bandchange switch, but layout is not critical.

In setting up, the first task is to ensure that the crystal oscillator is functioning correctly on 3·5MHz (for 7MHz band), 10·5MHz (for 14MHz band) and 17·5MHz (for 21MHz band), and this can be done by using a gdo as an absorption meter while adjusting the slug cores. Having set the three oscillator cores, switch to 7MHz and adjust L1 for coverage of 7 to 7·5MHz with the "rf tune" control, this time using the gdo as a gdo. Next switch to 3·5MHz and, if necessary, alter the value of C1 by substitution or parallelling additional capacitance until 3·5 to 4MHz can be peaked by the rf tune control. Switch to 14MHz and adjust L2 for 14 to 14·5MHz coverage, and similarly adjust L3 for 21 to 21·5MHz coverage when switched to the 21MHz band.

Gary Moles found the pre-selector filter (Fig 2) necessary when using a good antenna, and his was built using a couple of toroids and a dual-gang capacitor. As this was originally developed for another application it may be that a rather simpler highpass filter would suffice.

Another point which might be worth investigation is whether the overtone oscillator could also be made to function on 24·5MHz (7th overtone) in order to add the 28MHz band.

It is perhaps worth noting that the combination of a high-stability converter and the mosfet ssb adaptor described below are together capable of effectively upgrading one of the older hf receivers, providing the sort of performance for which one has to pay a tidy sum these days for a new hf receiver. For greater dynamic range a diode-quad double-balanced mixer could be used.

Mosfet ssb adaptor

The March *TT* included an item from Lionel Sear, G3PPT, about a combined product detector/oscillator arrangement that he had found suitable for use in a direct-conversion receiver. He explained that this had stemmed from an item in *Elektor* (combined July/August 1977 issue, page 72) where a 455kHz version formed the basis of a mosfet ssb adaptor intended for use with any hf receivers not already fitted with a product detector or bfo. The original circuit is shown in Fig 3 although, of course, it could be adapted for use at other intermediate frequencies.

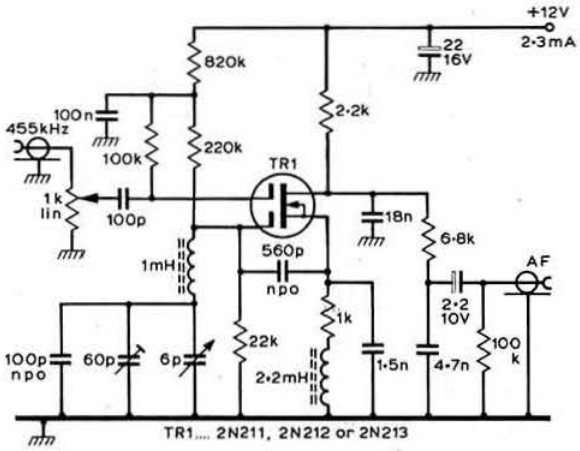


Fig 3. Mosfet ssb adaptor featuring combined product detector/oscillator circuit described in *Elektor*

It is noted in *Elektor* that self-oscillating product detectors tend to force the oscillator into resonance with the incoming signal but that the dual-gate mosfet appears to be reasonably free of this vice. However, by increasing the signal applied to the adaptor, this forced resonance effect can be used deliberately to achieve synchronous demodulation of a.m. signals over about a ± 1kHz range. The oscillator arrangement is based on the Clapp configuration.

Good netting with transceivers

In *Break-in* August 1977, Clive Lidell, ZL3ND notes that many ssb "nets" only go to prove the validity of that part of Murphy's Law that states "When two or more are gathered in a net there shall not be one common frequency among them".

Together with ZL3IC he carried out some experiments to determine why ssb nets inexorably result in a spread of frequencies. It soon emerged that a sizeable part of the problem stems from the fact that the vfo frequency of transceivers is often different on transmit and receive, although many of these equipments incorporate a pre-set adjustment to minimize such differences.

In the case of the popular FT101B series this difference can be reduced by carefully adjusting the trimpot labelled "zero set". It is the centre pot of three on the circuit board at the rear of the equipment; access is by lifting the top cover. Careful use of a small screwdriver is advised since "the trimpots are difficult to move smoothly; it will be found that the frequency will jump wildly at first but a little practice and patience will do the trick".

ZL3ND notes that when carrying out this adjustment

on transceivers a frequency counter makes the job easier but is *not* essential; a separate receiver can be used, coupled to the vfo and set to the vfo range of frequencies. Tune to zero beat and note whether any heterodyne appears when the transmit-receive switch is operated. After preliminary adjustment at zero beat, reset the vfo to give an audible beat note and then continue adjustment so that the note does not change when switching between transmit and receive. This will provide a more sensitive final adjustment than zero beat.

With almost all transceivers it should be possible to carry out such netting adjustments, if necessary without a manual, provided that it is known which control adjusts the vfo in this way.

Air-cells, lead-acid cells and nicads*

As a follow-up to the earlier notes on the use in South Africa of large, disposable Leclanché air-cells as a means of powering unattended repeaters in remote areas (*TT* December 1977), Ron Broadbent, G3AAJ, and R. A. Exley, G8HRE, have both mentioned that cells of this type are manufactured in the UK by Le Carbone GB Ltd (Ferguson Battery Co Ltd, Portslade, Sussex). They are used, for example, by British Rail. The type AD513A is about 7in square by 9in high, and each cell provides about 1·13V. These units are not suggested for *portable* operation because of their size, but the South African experience shows that they provide perhaps the most economical means of operating repeaters/beacons unless mains supplies at standard rates are available on site. They are most effective where the load is either intermittent or, if continuous, the drain is low. The idea of putting nicads in parallel to cope with high intermittent loads and trickle charging from the air-cells seems to have been pioneered in South Africa and could well extend the range of applications.

Improvements in lead-acid batteries also continue to be made. For example, the Chloride Cyclon range (Chloride Power Ltd, 15 Elizabeth Street, London SW1) is a rechargeable lead-acid cell with thin wound electrodes to increase energy density. Even a 2·5Ah size cell will permit instantaneous discharges to 100A and sustained discharges of 30A, and Chloride Power will soon introduce a 25Ah cell in this form. These cells are marketed in the USA as "Gates Energy Cells". It is claimed that the use of wound electrodes overcomes many of the usual limitations of the lead-acid system yet retains the "low cost, reliability, and ruggedness" associated with lead-acid systems.

There is also considerable current interest in various techniques for improving normal and fast recharging of lead-acid and nicad cells (*TT* September/November 1977). An interesting article on a nicad battery charger that it is claimed can achieve "a full charge everytime with no danger of overcharging" appears in *Practical Electronics*, March 1978 by E. A. Parr. Basically his technique is to discharge the battery *fully* before putting it on charge and then to use a Ferranti ZN1034 ic timer to define the charging time. It is pointed out that deliberately discharging completely a nicad cell does no harm (and prevents the cell from developing a "memory" that reduces its effectiveness).

This point is also taken up by Bob Eldridge, VE7BS, in commenting on the memory effect in nicads (*TT* November 1977). He writes:

"It is true that gradually giving nicads longer and longer use before recharging will gradually eliminate the "memory" and bring them back to full capacity, but this is a tedious method. A more straightforward and satisfying method is to discharge the cells completely by leaving a short-circuiting bar across the battery until it ceases to recover some voltage (it is necessary to leave the bar longer than one would think, because of the polarization produced by the discharging) then recharge it fully and go through the whole process again. When I first did this I was careful to limit the discharge current to not more than about the 1h rate, but now I do not bother. I just short-circuit the battery, and I think the polarization automatically limits the current flow to a safe value before the cell gets too hot. It seems to me that the whole Ni family thrives on hard treatment; I remember the recommended treatment for the NiFe cells we used in the Air Force was to short-circuit them, charge them in the opposite direction, short-circuit again, charge in the correct direction and put them back into service."

But remember, frequent *overcharging* does shorten the life of nicads.

Dual-purpose battery indicator

In a recent *Break-in*, T. M. Empson, ZL3TKI, notes that the conventional on-off pilot light on battery operated equipment tends to be expensive in current drain and provides little or no indication of the state of the battery. To overcome both deficiencies, he uses a led with a low duty cycle at a strobing rate that is normally concealed by persistence of vision and with current drain only about 10 per cent of normal: Fig 4. However, when battery voltage falls below a preset value the strobe rate drops sharply and the led flashes noticeably.

The led is driven by the LM3909 ic and the strobing rate is altered by the collector resistor of the BC208 transistor. The ZD1 zener diode is selected to provide 1V *less* than the required threshold voltage (eg for a threshold of 7·2V

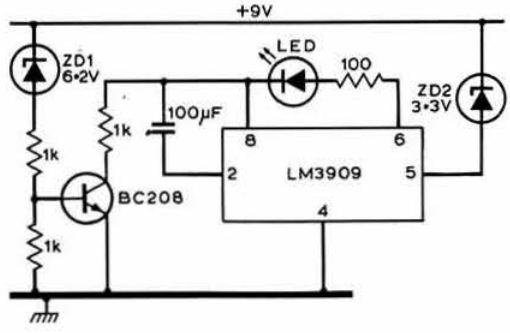


Fig 4. Combined panel light and battery indicator circuit using low duty cycle to reduce battery drain, and with noticeable flashing when voltage drops below a pre-determined figure

*Also see "The development, theory and use of nickel-cadmium batteries" by P.N. Butterfield, G4AAQ, in this issue.

a 6·2V zener diode should be used). ZD2 is selected to provide about 6V on pin 5 of the ic (eg about 3·3V diode for a 9V battery). The normal strobe rate is about 80Hz but this reduces to about 1Hz when battery voltage falls below the selected threshold.

Helipot substitute

In these days of electronic tuning diodes and voltage-controlled oscillators etc, there is increasingly a need for potentiometers providing both a broad voltage-span and yet capable of fine adjustment. This can be achieved with the modern multi-turn "helipot" but these are quite costly components and not always readily available. An interesting alternative—almost an exact analogue of the classic two-capacitor technique of electrical band-spreading—is suggested by O. Ormrod of Auckland, New Zealand, in *Practical Electronics* (April 1978, page 574): see Fig 5.

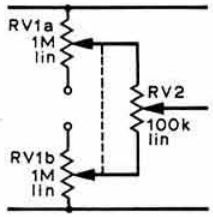


Fig 5. Two-knob "helipot" substitute to provide fine adjustment of potentiometer settings for voltage-controlled tuning etc

This achieves the "sensitivity" of a 10-turn helipot for the price of a common two-gang potentiometer plus a conventional single unit. In practice RV2 is left at mid-travel while adjusting the coarse setting of RV1, and then carrying out final adjustment using RV2. For some applications RV1 could be "preset", so reducing the system to single-knob operation. The system can, of course, be applied to any application requiring accurate setting of a linear potentiometer, and the ratio between potentiometer values need not necessarily be 10:1, although this is a useful ratio.

Sporadic-E—cleaning up nature

Recently, as a result of some notes I wrote for *World of Amateur Radio* on the intriguing "sweeper" atmospherics (see also *TT*, January 1978), Dr E. B. Dorling of the Mullard Space Science Laboratory (University College, London) wrote a letter to *Wireless World* (April 1978, page 85) setting out briefly but very clearly the current views of the radio physicists on how sporadic-E layers are formed—and a very curious story it proves to be. Although some elements have been known for some time—for instance the suspected link between E*s* and high-altitude winds is mentioned in *Radio Communication Handbook*—it is clear that many of the ideas have hardened up only in recent years but are already well beyond the stage of speculation. Indeed, the discoveries in the past decade form a remarkable example of modern scientific detective work in an area that is too low for space satellites and totally inaccessible to regular on-the-spot measurements, and have had to be built up from occasional high-altitude rockets plus ground-based observers.

In 1958 a British Skylark rocket launched from Woomera, Australia, showed that sporadic-E is a thin intense layer of ionization. Over the next eight years it began to be suspected that there was a link between such layers and sharp reversals in wind directions, and by then it was recognized that there are indeed tenuous winds constantly blowing at these high rarified altitudes. Wind measurements at heights up to about 150km above earth revealed that a surprising pattern of wind reversals occurs with height, and that there is a tendency for such patterns to descend slowly over a period of several hours. These sharp wind reversals or shears may appear initially about 150km high, moving downwards to below 100km before fading out. Dr Dorling continues:

"The cause of this rather unexpected wind structure appears to be the propagation of atmospheric waves horizontally over great distances.

"The sharp wind shears are at the root of the sporadic-E layers, though in rather complicated a way. The winds, tenuous though they are at such heights, act to move the ions and electrons in the atmosphere across the earth's magnetic field, but interactions then occur in such a way as to displace the plasma vertically. Where strong wind shears of the appropriate sense exist, the plasma is squeezed into a thin concentrated layer, being moved downwards from above, upwards from below. As the wind pattern descends, the layer descends too into an ever denser atmosphere, until finally at a height of about 100km it is brought to a halt.

"In a very productive experiment at Woomera in 1971, a Skylark rocket was launched with a ground-based ionsonde showing a strong layer overhead. Instruments on the rocket measured the exact position of the layer and, something of a novelty, the ambient electric field as well; the wind structure was also charted, in better than usual detail. A very strong wind shear was found but the layer was not quite where theory required, until a correction was applied for the additional constraint imposed on the electrical charges by the electric field.

"Sporadic-E, then, owes its transient character to interactions between atmospheric waves, the ionospheric E layer and magnetic and electric fields. All but the magnetic field are constantly changing so that the right conditions for layer formation occur—well sporadically."

There is yet another surprise for those of us who have thought of ionized layers as ionized gas. For it seems that in the case of sporadic-E these very sharp intense layers are composed of ionized *metallic atoms*. These are mainly magnesium, silicon and iron, and Dr Dorling suggests that these are probably the remains of burned-up meteorites. These ions are caught up in the descending wind shears and swept downwards until atmospheric turbulence "churns them away into oblivion". Thus, as Dr Dorling puts it: "Sporadic-E layers seem to be the product of nature's vacuum cleaning."

For the amateur, it seems to me, this account of sporadic-E both answers and yet raises many questions. With so many variables affecting the formation of layers it is clearly going to be extremely difficult to predict them in advance, at least until the time that these conditions begin to develop. But why is there such a clearly defined E*s* season in the UK but not in some tropical countries, where the winds would seem to blow more constantly

throughout the year? Is there a link between these high altitude winds and the almost daily "Spread F" phenomenon, which in turn appears to be linked with transequatorial (te) mode F-layer propagation? And then, why has te mode propagation so suddenly begun appearing on 144MHz and possibly on 432MHz, as indicated by recent openings in South America and between Japan and Australia?

From a practical communications point of view, the descending wind shears could be followed by noting the maximum distances of stations heard via Es, and again this would indicate that the vhf operator needs to begin using the layer in its early period since maximum distances can be expected to reduce as the layer sweeps lower.

3·5MHz low-power Franklin transmitter

Recently, Gus Taylor, G8PG/GW8PG, took me to task for having suggested that most British QRP operation appears to be on 3·5MHz. He believes that the keen low-power hf enthusiasts are increasingly equipped for multi-band operation. Low-power cw can be particularly effective on 21/28MHz where, even with fixed wire antennas, there need be no shortage of dx contacts, and with a lot more room to breath than on 14MHz. However, it is still probably true that many, if not most, home-built low-power rigs start off as 3·5MHz units, such as the one included this month.

This is a solid-state transmitter (Fig 6) for 3·5MHz cw which uses available components and is based on a bipolar Franklin vfo. It has been described by Siegfried Hari, DK9FN (*CQ-DL* No 9/77, and *Old Man*, No 3, 1978). With a power source of 12V at about 150mA it runs at some 1·5—2W input; even with oscillator keying it is claimed to be chirp and click free.

When used over the range 3,500—3,600kHz the only tuning control is the vfo, which uses a low-value variable capacitor connected to points 1, 2 of the main board. This can typically be 25pF or 50pF variable, with 10 to 20pF series capacitor arranged to give the required frequency span. The key is connected across points 3, 4. Output of TR4 is about 100mW, and the working point of the final stage (TR5) is adjusted by the 500Ω variable resistor between base and chassis.

Gain of Yagi antennas—continued

Among the more revealing forms of amateur radio contests are those devoted to measuring the gain of the competitors' vhf antennas. Such contests involve a good deal of preparation, a suitable site, and trusted equipment and measuring techniques, but nevertheless are held occasionally in the USA and in New Zealand. Over the years the results suggest a steady improvement in antennas, but they still show that, in practice, forward gain often bears little relationship to the number of elements or theoretical considerations.

For example, a recent 144MHz contest of the Christchurch branch of NZART, held in an almost ideal location, showed that one 8-element log-Yagi had only 1dB forward gain (reference dipole) compared with 7dB for a 4-element Yagi (while another 4-element Yagi was only 1·5dB up on the dipole); in fact 4-element Yagis varied from 1·5 to 7dB; one 5-element Yagi registered −10·5dB; the highest recorded gain was 10dB for a 13-element Yagi; 3·5dB gains were registered by a 6-element log-Yagi and a 3-element Yagi. Beamwidth of most of the antennas exceeded 40° although front:side ratios commonly exceeded 30dB. Height gain is significant between 10 and 27ft, and all antennas were measured at 18 ft. It is noted that "the majority of antennas had gain over the reference dipole, although some antennas, considering their size, gave very poor results, which in some cases could be put down to poor matching". In a few instances the antennas included a length of coaxial feeder which in effect reduced the measured gain.

By comparison, collinear verticals produced some unexpectedly large gains (from 6 to 9dB reference λ/4 whip) suggesting that high-gain omni-directional antennas might prove as effective and far less expensive than rotary beams in applications where vertical polarization is acceptable. ZL3ABJ concludes the report by commenting: "Perhaps the moral of the story is, for dx work, use a whip antenna instead of a beam."

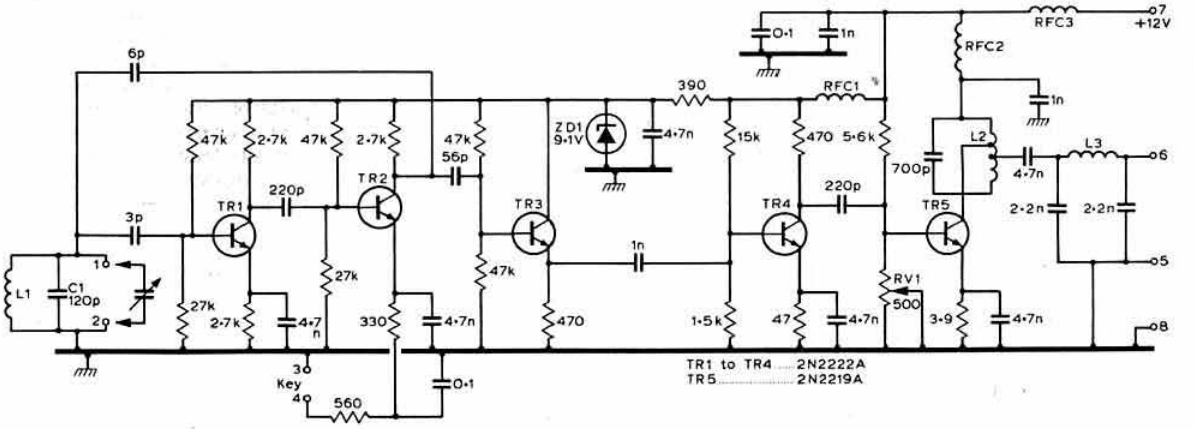


Fig 6. Low-power 3·5MHz cw transmitter with Franklin vfo. L1 is 14μH wound with 0·2mm enam copper. For 5mm diameter former use 100 turns; 6mm, 80 turns; 7mm, 60 turns; 8mm, 50 turns; 9mm, 42 turns. L3 is 1·6μH, 0·6mm enam copper. For 5mm former use 30 turns; 6mm, 21 turns; 7mm, 17 turns; 8mm, 13 turns; 9mm, 11 turns. L2 is 2·7μH, typically 0·8mm wire 18 turns on 16mm diameter former, spaced 1·5mm. Collector tap 3-4 turns from cold end. Output tap 9 turns. RFC1, 2, 3 Ferroxcube type "green"

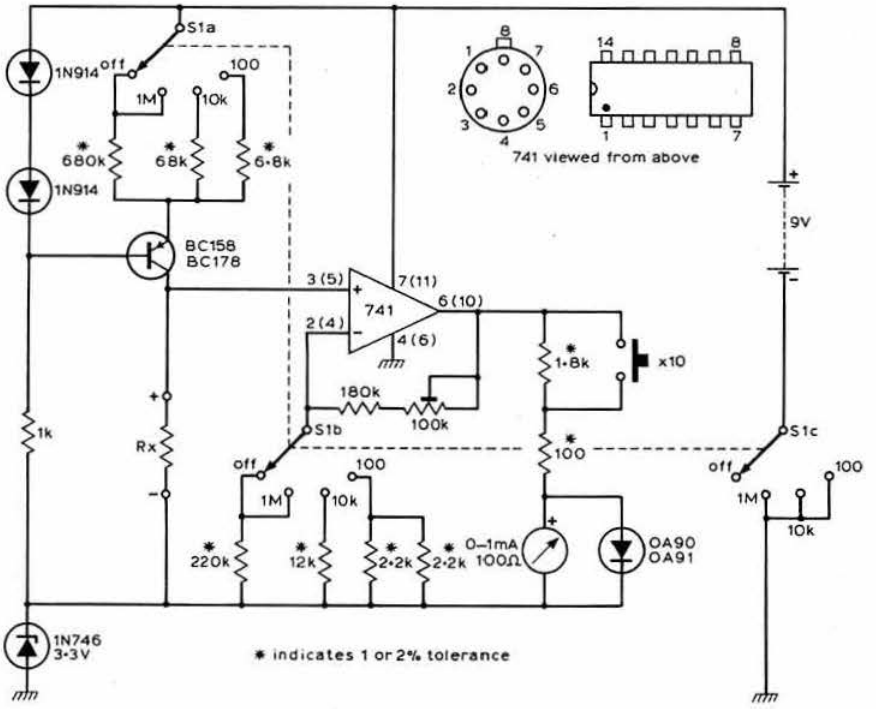


Fig 7. Linear ohmmeter with reduced current flowing through the "unknown" resistor. Pin numbers for 741 op-amp are for the TO-5 type of package, but figures in brackets refer to dual-in-line package

Sunspot cycle 21

Few hf operators will need reminding that we are now well into cycle 21 and that the February/April band conditions have given ample reason to believe that cycle 21 may prove to have a really high maximum. This is in line with a number of recent forecasts, including those resulting from G8KG's analysis (*Radio Communication* July 1976) and that of G. Ramaswamy (*TT* April 1977), although it represents a major reversal of the ideas being promulgated a few years ago when it was sometimes suggested that cycle 21 would have a very low peak—even that we might slip back into the virtual absence of peaks that occurred in the mini-ice-age of the 18th century.

Theories of sunspot cycle forecasting seem to fall into two main categories; those such as the tidal synchronization ideas discussed by G8KG that link solar activity with possible causal phenomena, and those which depend on statistical study of the rise and decay of past cycles, without attempting to explain why the cycles vary so remarkably.

An article by O. Okleshen, W9RX*, in a recent special *HR Report* deals with a theory on a basis which seems to put it firmly into the second category along with the Ramaswamy technique of forecasting. High degrees of accuracy are claimed when applied to past cycles, and maybe this theory is as good as W9RX suggests, maybe not. But there is a consensus of opinion now that we are in for a high peak—and while not to be welcomed without qualification, this certainly puts a smile on the face of the 14, 21, 28 and even 50MHz operators!

*Reprinted on page 405—*Ed*

Low-consumption linear ohmmeter

In *TT* (January 1977) details were given of a simple, direct-reading ohmmeter with a linear scale originally described by V. Ramprakash in *Electronics*. Since then a number of variations on this basic idea have appeared: for example the discrete-component unit by G3YRN in *TT* March 1977, and one by David Edwards in *Electronics Australia* February 1977 using the original op-amp approach. Recently a reader of *EA*, D. L. Craig, has suggested (*Electronics Australia* January 1978) some improvements to the earlier design to eliminate heavy battery current drain on the 100Ω range: Fig 7. In this latest circuit, a fixed current is passed through the unknown resistor by using a pnp transistor as a constant current source. This is switched to provide 100μA on the 100Ω range; 10μA on the 10kΩ range and 1μA on the 1MΩ range. It is pointed out that 1μA is about the lowest current that should be used since, below this value, errors due to the input bias current of the 741 op-amp will become significant. Total circuit current on all ranges is about 5mA from a small 9V battery, so the unit should be switched off when not in use.

Operation is as follows: the voltage produced across Rx is amplified by the op-amp to drive the meter movement. The op-amp is used in the non-inverting mode, and because of the high input impedance it does not load the measurement circuit. The output voltage of the op-amp, and hence the meter current, is directly proportional to Rx. The gain of the op-amp is switched to provide the correct output voltage on each range. Gain is 200 on the 100Ω range down to two on the 1MΩ range. Calibration is adjusted on the 10kΩ range using a 10kΩ resistor of known precision. □

microwaves

Charles Suckling, G3WDG *

Microwaves at Munich

G3RPE was a visitor to the second Bayern-Süd (South Bavaria) VHF Convention held in Munich on 11–12 March. About 400 amateurs attended the meeting for lectures, demonstrations, and a very popular equipment test facility for each of the bands from 144MHz to 2·3GHz which used very sophisticated test equipment loaned by Rhode and Schwarz.

This year there was a single lecture stream only. The Saturday afternoon consisted of five lectures, one of which was mainly concerned with matching problems in transistorized 1·3GHz transceivers (DJ7WI), and the second with preamplifier/mixer noise considerations in 1·3GHz receivers (DJ7WA). The Sunday morning programme (which was well supported even at 9am!) had formal lectures on the design of a Gunn oscillator (DK1PN), and DK2ZG described and demonstrated an amateur version of the Microwave Associates digital afc system. An excellent feature of the convention is that all the lectures are preprinted, which makes them considerably more valuable.

In a less formal lecture, G3RPE described some recent UK developments on 10GHz. This included the design of a simple but efficient receiver†, checking receiver performance using sky/earth noise measurements (*Radio Communication* July 1977), and the virtues of the flyswatter antenna (*Radio Communication* August 1977). The remainder of the lecture was concerned with emphasizing that while small, simple, and not particularly efficient, equipment was all that was required to work over line-of-sight paths and via ducts, the size of equipment required to overcome obstructed paths was very much larger, eg 1m diameter dishes, 100mW–1W transmitters and i.f. bandwidths of 10kHz. It was emphasized that there was little point in building more sophisticated intermediate size equipment, which would be too good for line-of-sight paths, but would have a disappointing performance over an obstructed path.

In attempting to answer the question of how amateurs could build equipment of the size and stability required, it was suggested that higher power Gunn or impatt oscillators, combined perhaps in a magic-T, could be frequency stabilized by cavity or injection locking, or by an afc loop, as described recently by G8DEK at our own VHF Convention.

Activity on 10GHz in Germany has increased dramatically since G3RPE was last there two years ago—an increase from 2 up to 200 stations was suggested! The current dx record is 240km, from the Zugspitze to Großer Arber by DK2VF and DJ1CR.

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

†To be published later—Ed.

2·3GHz news

A new world record for this band was established on 17 February 1978 between VK6WG and VK5QR (the current holders of the 1·3GHz world record) over a path 1,885km long. This outstanding contact was made during enhanced propagation conditions over the near all-water path between Albany (SW Australia) and Adelaide. Signals ranged from S1 to 7. VK5QR used ssb, which was processed in a divide-by-six circuit at 28MHz, transverted to 384MHz and multiplied to 2,304MHz. VK6WG used an SCR522 (!) providing drive at 128MHz, which was multiplied up to 2,304MHz via 384 and 1,152MHz, the final doubler employing a 2C29A.

On a slightly less exotic note, a successful one-way test was carried out on 5 March over the 180km path between G3LQR (Suffolk) and G3WDG (Oxford). The signals from G3LQR were received in Oxford at approximately 5–15dB over noise in a 2·5kHz bandwidth. An interesting feature of the signals, was that they exhibited a considerable amount of rapid flutter, suggesting that they were being received by tropospheric scatter. If this was the case, the path should be repeatable regularly, and it is hoped to do further tests in the near future to check this. G3LQR was running 11W output from a 2C39A pa into a 5ft dish. A 4ft dish was used by G3WDG, feeding an NEC57835 preamplifier at the dish feed, giving a system noise figure of 4dB. An attempt to try the path in the opposite direction was unsuccessful, probably on account of the low-power transmitter (1W) in use at G3WDG.

News has just come in that for some months a linear repeater has been successfully operating in Germany on 2·3GHz. This is sited at Feldberg (EK36h), and has an output of 5W. The input is on 2,339·5MHz, with the output on 2,348MHz, the bandwidth being 60kHz.

Skeds wanted

The Edinburgh & D ARC will be active from GI and EI on 1·3GHz from 4 to 28 August. Anyone interested in skeds should write to Tom Melvin, GM8MJV, 17 Dundas Cres, Eskbank, Dalkeith, Midlothian, Scotland.

From GM3DXJ comes the information that DJ3KM will be holidaying in Cuxhaven from 20 July to 2 August. He will be glad to arrange schedules for 10GHz to the east coasts of GM and G, and requests stations to be prepared to transmit on 10,320MHz, and receive on 10,350MHz. His QTH directly overlooks the North Sea, and appears to be ideal for super-refraction. For schedules, write to Adalbert Kaufmann DJ3KM, Martin-Luther Straße 29, D-6507 Ingelheim/Rhein.

Another request from abroad for 10GHz schedules comes from Carl Blom, SM6HYG, Badhusberget 10b, S-45300 Lysekil, Sweden. In a recent letter he described his 10GHz equipment, which consists of a circulator-based transceiver using separate Gunn oscillators for transmitter and receiver local oscillator. This has been carefully optimized by the use of a remote signal source, and appears to be working well. His QTH is only 100m from the sea with a clear take-off towards the UK, and so would be useful for super-refraction work. Anyone interested in making the first G (or GM) to SM contact is advised to write to SM6HYG before the super-refraction season starts!

10GHz news from France

Providing a focus for current 10GHz activity in France is William Benson, F6DLA/G5BTN, who visited us at the round table at Winchester last November. He is concentrating his efforts on 10GHz and is producing a two-monthly 10GHz bulletin. This has a current circulation of 150, and is sent free on receipt of an sae at his address at C3, La Garenne a Brefaut, 78190 Trappes, France.

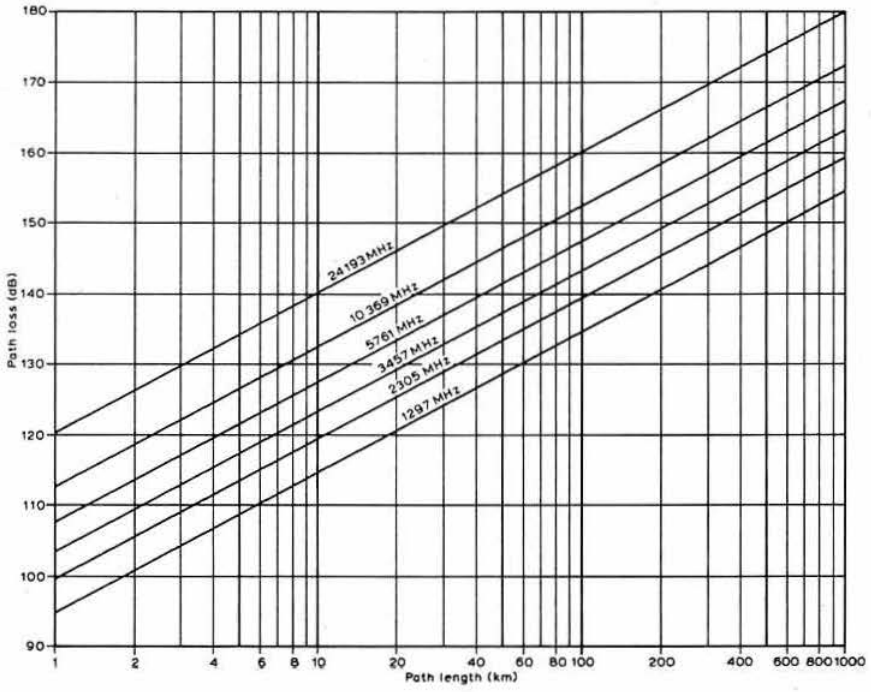


Fig 1. Free-space path loss as a function of distance for the bands 1·3-24GHz

Calculation of equipment performance over line-of-sight paths

In the March *Microwaves*, a short series of items on the subject of calculating equipment performance was begun. The first article covered the calculation of receiver and transmitter performance in terms of two simple parameters, the effective receiver sensitivity (ers) and the effective isotropic radiated power (eirp). To obtain the signal-to-noise ratio in any given situation, the ers and eirp are added together, and the path loss subtracted.

This month, propagation over line-of-sight paths is discussed. Propagation over obstructed paths by knife-edge diffraction, tropospheric scatter and moonbounce will be described at a later date.

Line-of-sight path losses are very easily calculated by considerations of the inverse-square law. It is not intended to derive the equation here, but simply to present the result, which may be expressed as:

free space path loss = 93 + 20log d + 20log f

where d is the path length in kilometres, and f is the operating frequency in gigahertz. Fig 1 shows the free-space path loss as a function of distance for the bands 1·3–24GHz.

Another equation which is useful in these calculations is that of dish gain, which may be expressed as:

gain over isotropic (dB) = 18·6 + 20log D + 20log f

where D is the diameter in metres and f is the frequency in gigahertz. If D is expressed in feet, the equation is then:

gain over isotropic (dB) = 8·3 + 20log D + 20log f.

A graph showing the gain of a dish as a function of its diameter for the bands 1·3–24GHz is shown in the *VHF/UHF Manual*, p8.52. Incidentally, on the same page is shown a graph of path losses on 24GHz, which includes not only the free-space loss, but also the extra losses to be expected under various conditions of rainy weather, which has a far greater effect at this frequency than on the lower bands.

As an example of the ease with which equipment performance can be calculated over line-of-sight paths, let us consider the following example:

Operating frequency	3,456MHz
Receiver bandwidth	30kHz
Receiver noise figure	10dB
Receiving antenna	2ft dish (25dB gain)
Transmitter power output	0·5W(−3dBW, ie 10log 0·5)
Transmitting antenna	4ft dish (31dB gain)

Following the definitions and graphs in *Microwaves* (March 1978) the transmitting eirp is:

−3 + 31 = 28dBW,

and the effective receiver sensitivity is

150 + 25 = 175dBW.

Thus the path loss capability of the equipment as a whole is 175 + 28 = 203dB. To obtain the received carrier-to-noise ratio over a particular path, the path loss is subtracted from this figure. For example, over 1,000km the carrier to noise ratio would be 203 − 163 = 40dB. The actual signal to noise ratio would depend on the mode in use, as discussed previously.

It is hoped that this short series of items will encourage readers to calculate, on a regular basis, the signal levels which they expect to achieve over line-of-sight paths. Even if all the equipment parameters are not known accurately, reasonable estimates can still be made, and useful predictions obtained. Indeed, line-of-sight paths can be used as a means of checking equipment performance, and the estimates revised accordingly! □

4-2-70

Graham Knight, GM8FFX*

Moonbounce

Chris Lancaster, G8HDR, and Charles Suckling, G3WDG, continue with their 432MHz moonbounce reception experiments. Signals have recently been received at Oxford University from LX1DB, I5MSH, W1XP, WA2WVL, K2UYH, K3NSS, WB5LUA and ZE5JJ. The receive set-up consists of an NES7835 pre-amplifier (1·1dB noise figure), a Microwave Modules 432/144MHz converter and a Trio JRS599 receiver fitted with a Datong FL1 active filter. K3NSS was the strongest signal heard—being 20dB above noise.

The second half of the ARRL-sponsored International Earth-Moon-Earth Competition takes place between 0001gmt on 20 May and 2359gmt on 21 May. Moonbounce amateurs throughout the world will be taking part in this "real dx" event which covers all bands above 50MHz. The ARRL has said that it will especially welcome any listener reports for this contest.

Interest in moonbounce is growing in Europe, and members contemplating extra-terrestrial propagation may wish to write to the Eimac Division of Varian at 301 Industrial Way, San Carlos, California 94070, to obtain their free data package entitled "Everything you wanted to know about moonbounce".

New pre-amplifiers

Polar Electronic Developments are now selling the American made "Lunar" range of pre-amplifiers. These low-noise, narrow-bandwidth devices were designed by W6CA and were used extensively in America by NASA before being released on the amateur market. Separate models are available for the 28, 50, 144 and 432MHz bands. One of the 144MHz units has been in use in conjunction with an IC211E at GM8FFX for the last three months, and the performance has been superior to that of the previous SD306 pre-amplifier. The units, which utilize grounded gate fets, are very small and are fitted with bnc sockets.

Microprocessor data

Reference was made in *4 – 2 – 70* (December 1977) to the fact that Jack Pennell, G3EFP, and Peter Martinez, G3PLX, had been exchanging programmes over 144MHz for their microprocessor systems. G3EFP started more than a year ago with an sc/mp system but added a 6800 later to experiment with exchanging programmes "on air". G8INP, G8MYV, G4FRJ and G3PXQ are also experimenting with microprocessors, mainly for vhf rtty. In Spain EA4SG has a complex system with his entire log details in the memory—no need to look up a card index to find out details of a previous QSO!

G3EFP has been using vdus on rtty for many years now and he feels that the use of microprocessors is a valuable addition to the system. Jack uses the sc/mp processor for rtty having made up programmes for keyboards to convert ASCII to Murray Code, automatic case change, automatic line length etc. Another programme converts Murray on rtty to ASCII for vdu display containing automatic case shift, unshift on space, all space rejection and speed conversion. A programme for Selcal automatically tells G3EFP if someone has called him on 144MHz rtty. Jack has also sent 1,200 baud data transmissions on 144MHz which have been successfully recorded by G3PLX and used for demonstrations at Alexandra Palace and at the BARTG convention. G3EFP and *4 – 2 – 70* would be pleased to hear from other amateurs using microprocessors as part of their vhf stations.

Spain worked on 432MHz

A spectacular opening occurred on 11 March when Geoff Brown, GJ8ORH, in Jersey, worked EA1CR in Gijon, Spain. Geoff used a Liner 432 and a 12XY antenna from a sea level site at St Saviour; 5 and 9 reports were exchanged and this is believed to be the first contact between Spain and the Channel Islands on 432MHz. EA1CR was also contacted on 432MHz by Paul Widger, G8AGU, in Devon, and by a number of stations in the London area. Paul Johnson, GJ8KMV, at Grouville, Jersey, later worked EA1CR on both 144 and 432MHz.

Tuning the band—the easy way

The Icom IC211E and IC245E 144MHz transceivers, which feature digital frequency display, have been available in this country for some time. Some operators have taken advantage of the lsi synthesizer circuitry to construct keypads which allow the frequency to be selected by simply pressing the buttons on a keyboard similar to that on a calculator.

Julian Broadhurst, G8LIC, has taken this one step further by making a unit which quickly scans the entire band continuously, slowing down when signals are received. This is achieved by using both a fast-scan and a slow-scan oscillator to pulse the lsi chip. A 1,500Hz oscillator gives a tuning rate of 150kHz/s; at this speed the receiver led lights as the receiver scans through a signal. This information from the receiver led is used to switch to an lf oscillator which tunes very slowly through the signal until the receiver led goes out and the faster scanning circuitry resumes. It is also possible to stop the scanning on a signal by utilizing the voltage present on a transistor when the centre meter is at zero.

The net result is that Julian is continuously monitoring the whole band for auroras or any other openings. The whole band is scanned five times every minute and the unit can also be programmed to avoid stopping at local beacon and repeater frequencies. G8LIC is still experimenting with different circuits and would be interested to hear from other operators who have constructed frequency control keypads and scanners.

Coaxial gain

A recently-licensed amateur wrote to *4 – 2 – 70* to say he had spent £50 on an in-line power meter and yet "noticed no gain on either transmission or reception", and went on to ask "what should I buy next that would improve my

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range?" Further correspondence revealed that the operator was using a well-known commercial 432MHz fm transceiver connected via standard 75Ω television coaxial cable to a Yagi antenna designed for 50Ω impedance. It was gently pointed out that an in-line wattmeter measures the forward and reflected power—it does not act as a pre-amplifier on receive or as a linear on transmit.

Although it is always better to know the exact power output and match to the antenna, our correspondent's £50 would have been better spent buying some good coaxial cable. Standard television coaxial cable has a loss of more than 9dB per 100ft at 432MHz; this loss could be almost halved by upgrading to UR67 cable.

Many vhf amateurs are spending considerable sums on high-quality cable believing the advantages of lower cable loss on both reception and transmission outweigh the high cost of purchase. Angus McKenzie, G3OSS, attributes much of his dx success to the care taken in installing all the antennas with high-quality coaxial cable. Douglas Parker, G4DZU, is using Andrews LDF4–50 cable to feed his large 56-element array—this cable has a loss of 1·6dB per 100ft at 432MHz. GM8FFX has recently purchased RG318, a $\frac{7}{8}$in diameter air dielectric heliax cable which requires special N-type connectors having inlet valves for connection to the dry air pump required to pressurize the cable and, incidentally, which cost £28 per plug. The inner core of this cable is itself larger than the diameter of many other coaxial cables.

Until recently it has been difficult to obtain high-quality cable without buying a whole 100m drum. Now a firm called UHF Developments, at Bedford, is willing to supply specified lengths of many different types of low-loss cables and will also give discounts to RSGB repeater and beacon groups.

The grapevine

The Manchester Institute of Science and Technology club station G3CXX is now louder than ever on 144MHz thanks to the new 14-element Parabeam which is 165ft above ground level . . . Possible QRM in June when two groups will be on expeditions to the Faeroe Islands. . . The Edinburgh & D RC braved 70mph winds while operating portable at the Cairn O'Mount for the RSGB 70MHz Contest . . . G3NSM, the loudest signal from the south in the recent auroras, is now building up a high power amplifier for 432MHz. Bob purchased the Arcos kit for $500 during a visit to America . . . G3LEQ's Auchtermuchty repeater continues to be a subject of much discussion on GB3MP . . . EI6AS worked 20 countries on 144MHz last year. Arthur hopes to repeat his 432MHz tropo contact with SK6AB again in 1978, but this time via aurora . . . The Glenrothes Group has applied for a 500W licence for their expedition to Iceland, and they will be taking GM8NCM's Nag 144 linear . . . Jim Martin, GU3YIZ, has now worked DL, DM, SM, SP and Italy by meteor scatter . . . Neils Johannesen, OY2NS, or PO Box 29, Torshaven, has been sending out QSL cards for his 144MHz tropo contacts from the rare QTH locator of WW77f.

Awards

An unusual claim for a 144MHz Senior Award reached the vhf awards manager, G5UM, from Bo Nilsson of Malmo, Sweden, whose station SM7FJE has given many UK operators their first SM on the vhf bands. Although Bo had worked the required total of 60 UK counties, his countries score was nearly as high, as he had worked no fewer than 39 different countries on 144MHz including the various permutations of the USSR and UK callsign blocks. He has now been sent Senior Certificate No 122. At much the same time Seniors Nos 120 and 121 went to G4AWU and G8APZ. 144MHz Standard Awards have gone to G4ERX and G3SPJ. In the 432MHz category, G8IL of Salisbury was the first claimant for a Senior in 1978; No 44 is now on his radio-room wall.

Many vhf operators who have gained the Supreme Award think that the 70MHz Awards are the hardest to obtain, but some stations gain their awards fairly quickly by really concentrating on the band. A single-minded approach to the band has brought success to Colin Wooff, G3SPJ, of South London. Within two weeks of going on 70MHz last year, and with the help of a contest, he had worked the requisite three countries plus 30 counties for the Standard Award. By sending QSL cards direct, Colin has been able to claim Standard No 129 in a very short time but he thinks the Senior Award will take the rest of 1978 to achieve.

On 12 March G3OSS in North London was elated to hear G3LDR come back to him on 70MHz to give Angus his 60th county towards his Senior Award. All claims for RSGB vhf awards should be made direct to Jack Hum, G5UM, QTHR.

Believed UK vhf "firsts"

70MHz		
GI to G:	G13HXV to G3OHH	28 Oct 1961
GI to GM:	GI3HXV to GM3EGW	5 Nov 1961
GI to EI:	GI3HXV to EI2W	10 Feb 1962
GI to GD:	GI3HXV to GD3CUW	26 Mar 1963
GI to GW:	GI3HXV to GW3RUF/P	1 May 1965
GI to GC:	GI3PGG to GC3POI/P	4 Sep 1966
G to ZB:	G3RIK to ZB2VHF	2 June 1967
G to PX:	G3NKL to PX1RI	24 June 1968
GI to PX:	GI3HCG to PX1RI	24 June 1968
EI to PX:	EI9AD to PX1RI	24 June 1968
144MHz		
GI to ON:	GI3GXP to ON4BZ	4 Jan 1956
GI to DL:	GI3GXP to DL1SEA	5 Jan 1956
GI to GC:	GI3GXP to GC3EBK	13 Sep 1956
GI to F:	GI3GXP to F8MX	30 July 1957
GI to PA:	GI3GXP to PA0NO	4 Aug 1957
GI to OK:	GI3GXP to OK1VR/P	28 Oct 1958
G to I:	G5NF to I1KDB	14 Jun 1959
GI to HB:	GI3GXP to HB9RG	7 Oct 1960
GI to LX:	GI3GXP to LX1CW	3 Feb 1965
G to UP:	G3CHN to UP2BBC	26 Mar 1976
GI to I:	GI8KIA to I7EMG	14 June 1976
GW to 9H1:	GW4CXM to 9H1CD	23 June 1976
G to IC:	G8BQX to IC8FHF	21 July 1976
G to CT:	G4DGU to CT1WW	6 June 1977
432MHz		
GI to EI:	GI3KYP to EI2W	24 Oct 1964
GI to HB:	GI8HXY to HB9AMH/P	26 Oct 1975
GD to HB:	GD2HDZ to HB9AMH/P	26 Oct 1975
GI to GD:	GI8HXY to GD2HDZ	14 Jun 1976
GI to ON:	GI3VPK/P to ON5UN/P	3 Jul 1976
GI to D:	GI8HXY to DB4EX	16 Jun 1977
G to EA:	G3AUS to EA1AM	11 Sep 1977

The above list is by no means final, if you claim any "first" please send details to G5UM, who is compiling a list of all the UK records for forwarding to SM5AGM, the European IARU records co-ordinator.

Free Plessey ic offer

Pat Hawker, G3VA, wrote about the new Plessey SL660 ic in the November 1977 issue of *Radio Communication*. The SL660 fm detector has one property which is particularly useful in a repeater—its use of a pll detector which enables it to reject co-channel interference even when the interfering signal is as little as 4dB below the wanted signal.

To encourage the amateur use of the SL660, Plessey Semiconductors will supply one free of charge to any repeater group that asks for one for incorporation into a repeater. Plessey ask only that the use of the circuit be acknowledged in the repeater specification as published and in any repeater group report. The offer applies worldwide (except the USA) and requests for free ics should be sent to: The Applications Manager, Plessey Semiconductors, Chesney Manor, Swindon, Wiltshire SN2 2QW.

Auroral reports

There were 30 auroral events in the first 88 days of 1978, thus keeping up the previously-mentioned average of an aurora every three days since the end of August. This year's events took place on 3, 4, 6, 9, 13, 16, 17, 18, 20, 23, 24, 29, 31 January; 1, 2, 6, 16, 21, 26, 27, 28 February, and on 1, 2, 8, 9, 16, 17, 18, 26, 27 March.

Now that the British Astronomical Association auroral observer system is linked with the RSGB system, there is a race to see which organization notices the aurora first. This link-up has been working well, with alerts being made to all observers by both groups. For example the BAA were advised during sunlight of a radio aurora on 26 March, with the result that they were prepared for the visual aurora which occurred in the evening.

G3NSM at Oxford was a 5/9 plus signal at Aberdeen within 5min of the RSGB auroral warning system being activated. G3FPK at Purley worked SM and LA stations on cw, the best dx being in QTH locator GU. GI8EWM and LA2PT were outstanding signals during the last two events in March. Members keeping auroral calendars have been rewarded with many repeat events. The aurora on 4 January has already repeated strongly three times, and many of the other events have recurred.

Faeroes expedition and beacons

A group consisting of OZ7IS, OZ3TZ and six others is going in relays on an expedition to the Faeroe Islands. The first section of the group leaves Denmark on 20 June, with a second contingent following on 12 July. Operation from OY will be from late June until 26 July, with 500W on 144 and 432MHz. It is hoped to send two beacons to the Faeroes three weeks before the expedition starts, and these will be on 144·885MHz and 432·885MHz. It is also the intention to leave these beacons behind when the expedition leaves, as they would be most useful propagation indicators. The Glenrothes trip to the Faeroes will coincide with a few days of the Danish group's expedition, and then the Scottish group goes on to Iceland.

Paul Widger, G8AGU, and Ian McHardy, GM3JFG, will be operating from the Island of Barra in June, but plan to be on 144MHz only. Further information about the Edinburgh & DRC expedition to EI can be obtained from GM8MJV, QTHR.

Unrest below 145MHz—ssb repeater opposed

The publication in the March *4 – 2 – 70* pages of the details of a proposed ssb repeater for the Sheffield area has certainly caused plenty of excitement among the normally docile operators who use the lower megahertz of the 144 to 146MHz band. More than 60 letters and telephone calls were received by GM8FFX in the first 10 days following the publication of the March issue. With the exception of a letter from the proposer, G3RKL, all the letters have been unanimously against the proposed ssb repeater having either an input or an output below 145MHz. The proposal to give channel numbers to the frequencies below 145MHz also meets with an emphatic negative response. Copies of the letters received have been forwarded to the VHF Committee and its Repeater Working Group. The following are extracts from some of the comments made:

Writing as an ssb/fm/cw operator and not with my AMSAT-UK hat on, I would like to ask the proposer four questions:
1. Are we therefore to have channelized ssb and cw?
2. What will happen to the already serious group of amateurs who are conducting moonbounce and meteor scatter contacts in this segment?
3. What about the IARU bandplan? Is this a case of what the minority want, the majority will get?
4. Will the idiot minority also be allowed to control ssb as they do on GB3LO with its disgusting prattle on fm?

"With regard to question 1, my licence calls the spectrum 'frequency' and does not mention channels. There are the idiots who will have us all on 800 channels and a Big Brother on every one?"—Ron Broadbent, G3AAJ, RR Region 19.

"While I have every admiration for the huge technical successes that have been achieved in the field of vhf repeaters, due in no small way to the enthusiasm and expertise of G3RKL, I view with horror the prospect of an ssb repeater with its output frequency in such a popular simplex operating portion of the band as 144·175MHz.

"Tony's proposed repeater is, it seems, intended to explore the possibilities of 5kHz ssb channelling for commercial users. This is in itself a good idea, since a demonstration of the feasibility of such a changeover might reduce the pressure on our frequency allocations. But surely a commercial changeover to ssb would be gradual, involving a long period of ssb and fm alongside each other. Why not, therefore, make the experiment more realistic by interleaving its frequencies between existing fm repeater channels? This would show whether interleaving was practical under operating conditions encountered in practice. I suggest 'R3½', between GB3NA and GB3HH, both of which are audible at the proposed site of the ssb repeater.

"I consider that this policy would go a long way towards meeting the objections of those who regard black box repeaters as a technical success but a social disaster, and who will, I anticipate, fight tooth and nail to keep repeaters out of the best portion of the band, the ssb segment."—Christopher Eley (home QTH Sheffield) G4FTF.

"The suggestion that ssb repeaters would bring benefits to the existing ssb operator is incomprehensible. The result would be as on fm—lots of people running 5 or 10W into dipoles, unable to hear one another, except through bleeping machines. I suppose the logical step would be to scrap the RAE and rename 144MHz a citizens band."—Brian Clowes, GW8BXT.

"I have been operating on 144MHz since 1956 and have been appalled at the way the standard of operating has diminished since the introduction of repeaters. Amateurs with families cannot tune the whole of the band because of the language through GB3LO. There comes a time when we can retreat no further, 144·0 to 144·150MHz should continue to be reserved for cw, and 144·150 to 144·500MHz should be reserved for ssb with no interlopers. The others should be kept above 145MHz so that the proper amateurs do not get mixed up with the cb-type operators and all the maniacs on repeaters."—Bill Martin, G3FVG (just two miles from GB3LO).

"There is no justification for constraining ssb operation to a number of fixed channels. Indeed it makes worse use of the bandspace available than current practices. Do we call CQ SS10 on cw? Should we as amateurs do cheap research for organizations which have a stated interest in several of our frequency allocations?"—Chris Bartram, G4DGU.

"I thought the write-up on a sideband repeater was the result of a dirty trick by an anti-repeater group but it does seem to be meant seriously. I am not sure whether the ssb operators were asked whether they wanted the benefits of 'fm machines'—like obscenities, jamming, sacred channels, lack of incentive to develop equipment beyond that necessary to work into the repeater etc. If the question is to be asked, my answer is a definite NO! There are 25kHz between the present fm repeaters, surely a few ssb channels could be fitted in between."—Peter Burden, G3UBX.

"As ssb mobile operation has an easy range of 50 miles and is far superior to fm mobile operation, there is no need for an ssb repeater with the same coverage. Why not make all the existing repeaters multi-mode, ie linear, then everyone can have the use of all modes without any more of the frequency spectrum being allocated for a minority interest. Does G3RKL also propose a microprocessor-controlled frequency counter with a vdu to tell you what SS(Silly Simpleton) channel you are operating on."—Douglas Parker, G4DZU.

"You only have to listen, even at my poor QTH, during an opening to realize that with ssb stations operating as close as 2kHz apart that channelizing is totally impractical. Let us hope that those among us who still know how to use a vfo are able to continue to utilize all frequencies for a long time to come."—Brian Naylor, G4GNJ.

"Under the IARU Region 1 bandplan for 2m, to which the RSGB is a signatory, the bottom half of 144MHz is designated for dx use, so a network of local ssb repeaters is in contravention of this plan. Having listened occasionally to the disgraceful rubbish relayed by GB3LO, surely we can well do without G3RKL's proposal which could lead to similar interference in the only sane part of the 144MHz band.

"If all G3RKL wants to do is prove to the commercial folk that vhf ssb relays at a 5kHz channel spacing are feasible, then let him apply for a G9 licence to experiment in a private mobile radio band. Obviously there must be frequencies available for such trials, but not in an amateur band, thank you."—Norman Fitch, G3FPK.

"We are totally opposed to any channelization of the lower half of the 144MHz band. We rarely use repeaters because QSOs through these devices are generally unrewarding in the amateur radio sense. Channelized fm requires neither effort nor knowledge to tune and listen to—you do not even need to know your frequency, also any weak dx calling in will be unreadable."— G8LEF, G8EOP, G3LRP, G3ZIV, G4FXW.

"Who needs a repeater for ssb when we can work to Scotland on every day of the year."—G4FKF and G4EGC, Sheffield.

"Marconi didn't use a repeater."—Dave Storrs, G8GXP.

"Up to now I have taken the view that there is plenty of room on 144MHz for all, and I have been prepared to leave the top megahertz to the 'citizen banders' with their propensities for 'communication' with inefficient natter boxes and minimal antennas. But now they want the lower megs as well. If we must have an ssb repeater let us put it in the top megs where it will be in good company with the other yatter machines. Plenty of channels up there, and ssb can be interleaved with existing fm repeaters. We might even see some narrowband fm then. I would add that my anti-repeater status is legitimate and I have no connection with any so called anti-repeater group which wishes to force its policies down other people's throats. I do not use repeaters, I do not like them, but I leave them alone and do not want to see any encroachment onto the lower end of 144MHz. Those repeaters which do exist do so by democratic decision and must remain until democratic decision comes to its senses and removes them."—John Ridd, G8BQX.

"GB3SF would not be a linear repeater in the accepted sense; in concept it is identical to the present fm machine, except that its mode is 5kHz channelling ssb instead of 25kHz channelling fm. As such, it is just a single-channel repeater and therefore brings to the ssb area all the general arguments for and against. These have already had an adequate airing for fm and to a lesser extent a.m., rtty and fast-scan television, for which there are also repeater proposals. GB3SF and its successors would give an 'in addition to' not an 'instead of' ssb service, benefiting particularly the mobile and poorly-located station—yes, there are still some who cannot get out, even on ssb.

"Using standard 600kHz spacing between input and output, the frequency slot which best fits into the present bandplan is 144·150–144·200MHz/144·750–144·800MHz. For ease of reference, especially with the ever-increasing use of synthesized equipment, if the 5kHz channels from 144·0 to 144·995MHz were called SS0 to SS199, ie the calling channel 144·3MHz is SS60, the repeater channels would be RS30 to RS40. Disregarding RS30 and RS40, since these are otherwise occupied at present, this would leave nine repeater channels, which should prove adequate for a countrywide network. To have the output high or low is open to debate, but having it low would have the advantage of having the strong repeater signal in the region most used and listened to, while keeping the input in a relatively quiet part of the band, this arrangement is the case for fm on both 144MHz and 432MHz. Frequency stability/accuracy would be of paramount importance, short term values in the region of one part in 10^7 or better being required for stations working through. The channel requested for GB3SF is RS35, with an aimed-for minimum frequency stability of one part in 10^8, increasing to around one part in 10^{11} when locked to a standard such as Droitwich.

Finally, it ought to be emphasized that, to date, GB3SF is only a proposal, it has not got the approval of the RSGB or a licence from the Home Office. It is very much an experimental project, both for the builder and the users, and as such could merit a licence for say a trial period, similar to GB3PI in the early days of fm."—Tony Whitaker, G3RKL, Department of Electronic and Electrical Engineering, Sheffield University.

REAL DX 1978

70MHz aurora	GM3YOR-G3SPJ	560km
70MHz tropo	GM3WOJ-GU3HFN	590km
144MHz tropo	GM8MBP-DF5GX/P	1,300km
144MHz aurora	G3ZIG-UR2RQT	1,800km
144MHz ms	GM8NCM-SM3BIU	1,340km
144MHz te	LU5DJZ-KP4EOR	6,120km
432MHz tropo	VK6KZ-VK3ZBJ	2,460km
432MHz eme	G3LTF-JA6CZD	13,600km

Opposition to this proposal has also been expressed by the following: G3CCH, G3CHN, G3GNR, G3NNG, G3POI, G3WCS, G3XVY, G3XXS, G3YRU, G3YUV, G3ZEM, G3ZSS, G4CBW, G4CVI, G4DCV, G4DEZ, G4EXX, G4FNF, G4GNJ, G4GRF, G8FQO, G8FUF, G8JHL, G8HCB, G8LGX, G8MCY, GD3UMW, GD4BEG, GI8EWM, GM3WOJ, GM3ZBE, GM4BWT, GM4DSZ, GM8EYB, GM8JYZ, GM8MBP, GM8GHV, GM8MJV, GM8NCM, GM8NSU, GW4CQT and GW4GSS. It is regretted that space does not permit publication of all the letters and comments this proposal has generated. The VHF Committee invited comments on this ssb repeater proposal and they certainly now have plenty to consider. The result of their deliberations will be detailed in next month's *4 – 2 – 70*.

Late news

Letters and calls continue to pour in about the sideband repeater, by 7 April the numbers were 121 against and one for the proposal. Pilot G3KWI noticed a sporadic-E opening on 4 April when his aircraft was on the ground at Bucharest and he called the local control tower on a frequency near to 144MHz only to be answered by Palma, Majorca—any other Es that day? Further auroras on 31 March and on 3, 4 and 5 April, best dx on 144MHz being UR2RD and UR2RQT with very strong signals from G4BWG in London. GM4COK worked OH0AA and many Scandinavian stations whose contest coincided with the event. On 70MHz GM3ZBE worked ar to GI3RXV, and G3SPJ worked GM3YOR.

Finally, thanks for all the mail and telephone calls. Send your news and views to PO Box 49, Aberdeen AB9 8JA, or record them on the *4–2–70* telephone answering machine by ringing 0224 780347. □

swl news

Bob Treacher, BRS32525 *

QSL matters

Dave Borne, G4CYW, our QSL sub-manager, has written suggesting that those swls who prefer to QSL direct only may find it worth their while to send several envelopes to him in case the dx station returns the QSL to the RSGB Bureau. Dave points out that he has one or two QSLs for many A and BRS stations who do not supply him with envelopes. It may be that the rare one you QSLd direct has replied and his card is waiting for you at Dave's QTH. For those who decide to follow this tip—on the top left-hand corner of the envelope to be returned write "Wait 1 only". By doing this you get the card returned promptly.

Clipperton and WPX

The big talking point in March was the fact that Clipperton Is was activated. A number of listeners mention logging the expedition, and one at least, Dave Whitaker, BRS 25429, reports hearing it on all five bands. The expedition decided to use frequencies which to many are not immediately linked as dxpedition frequencies. Everyone looks for expeditions on 14·195MHz but the FO0s were using 14,105 QSX up. This may have foxed a number of people—but in this business it pays to keep your ears open over the whole band. It seems that the YV0 expedition had to be postponed, but there seems to be another expedition to H5 scheduled for late April/early May.

Also in March we had the annual prefix contest—WPX. This year's assortment of callsigns was certainly as good as anything heard in the past. Some examples—the Canadians were using CG, CZ, VB, VC and XK; the Mexicans joined in using 4A1, 4B1 and 6F8, while 4T8V emanated from Peru, HD1A from Ecuador and 4M5s were from Venezuela. Nearer home, the Finns were heard using a variety of prefixes which included OG, OC and OF. Coupled with the now-familiar AA, N and PP prefixes, a fine time must have been had by all, especially as conditions were excellent for most of the event.

The mailbag is full

Several new contributors this time. BRS36106 is Ray Maslen, who lives among the mountains near Grantown-on-Spey. Ray uses a Trio 599D and a JR310 with a 70ft wire into an atu. Reception is good but Ray misses not being able to travel to the "local" club 30 miles away in wintry conditions, and looks forward to this magazine and Geoff Watts' excellent *News Sheet* arriving.

Graham Matthews, BRS34570, is another first-timer. He uses an FRG7 into a length of wire, but is unfortunately plagued with tv timebase noise. However, he manages to listen at regular intervals and has been lucky enough to hear some good dx—mainly in the mornings when the tv is off!

*392 Rochester Way, Eltham, London SE9 6LH.

1978 HF Countries Table

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS17567	140	141	172	28	76	5	562	ssb
BRS25429	126	82	122	56	100	13	499	ssb
BRS35454	98	101	139	46	66	6	456	ssb
A8841	56	91	162	51	75	0	435	ssb/cw
BRS34740	56	62	90	42	45	7	302	ssb
BRS32286	75	56	75	19	43	0	268	ssb
A9191	67	45	70	23	32	0	237	ssb
BRS20185	44	34	60	16	41	2	197	ssb
ARS39720	24	46	65	14	19	0	168	ssb
BRS37782	23	23	38	6	30	2	122	ssb
A9107	23	20	43	26	4	5	121	ssb
ARS39018	5	39	17	15	32	1	109	ssb

Note: Scores for the all-time table have been held over.

Ray McLoughlin, BRS39273, writes from Portadown, and submits a list of dx heard for the table. Please let me refer everyone to the simple rules given on p37 of January's issue which said "Let your scribe have the totals for each band". Your scribe enjoys looking at lists of stations that he has probably missed but he does not relish the chore of computing everyone's table scores. Going back to Ray's letter, he too uses an FRG7 with a multiband dipole at 28MHz, and has heard PY0FN on Fernando de Norohna for what is probably the best of the dx he has listed.

Denis Taylor, BRS34740, also writes for the first time. He has been an swl for four and a half years. His shack is an old converted coalhouse where he uses an FR101D into an 18AVT, and he is at present considering purchasing a 30ft Hilomast.

The regulars

Som comments have been received regarding the G/PA0 event. Basically it is felt that the event is a good idea—so we will try and work something out.

Of our regulars, many comment on the superb 28MHz conditions. David Hawes, A9191, mentions 5H3BP, 3B8CV and ST0RK (Southern Sudan—QSL via DL7FT) as his best dx, and all were additions to his all-time score. Neville Spry, BRS17567, mentions KL7HDS, KC4AAC, FH8CJ and CE0AE. Stephen Casey, A9107, has logged 47 USA states plus VP8PM and FR7BE. Last, but not least, is Robert Small, A8841, who was pleased to log S79MC, RH8EAA and AP2KS, all for new countries.

Conditions on the other hf bands have also been good. Ken Sketheway, BRS20185, reports D6AD from Grand Comoro on 21MHz and VP2KT on 14MHz. Bob Roney, ARS39720, comments on the YM prefix in use by several TA stations, and that there seem to be ample stations on from Grenada using their new J3 prefix. The 3·5 and 7MHz bands seem to be entering their decline period, but some interesting dx was heard during March, including CO5GV, PJ8CO, FP8DX and TI9DX (Cocos Is) on 7MHz. Robert Small comments on the good conditions and notes that, at the time of writing, 14MHz was open well after 2300. Some even report hearing KL7, W6/7 and VE6/7 on the band after this time. Robert has caught up with Kerguelen Is—FB8XS, and ZL4LR/A on Campbell Is. QSL returns during the period include 3C1X, FK8CC, P29AC and VK9RH. This means that Robert now has three cards from different stations on Norfolk Island!

Bernard Hughes, BRS25901, has now received the ADXA Award from Japan for 30 Asian countries confirmed, and the DXCC SWL Award for 300 countries confirmed on 14MHz.

John Holmes, BRS38934, reports that he has permission to erect a mast at his QTH. He is now looking for the right accessory to place on top of it. John also mentions the many Russians on 28MHz, using their vhf callsigns, eg RB5ITS.

Crosbie Rodgers, BRS32286, has had some problems with his health of late, and his activity has suffered, but after convalescing he hopes to be at the rig a great deal more. The Dumfries club now holds the callsign GM4HAA.

We have got to the end of the pile of correspondence, and look forward to an equally large contribution next time. Until then, best of luck with the hobby. Deadline for next time is **20 May.** □

Orbital predictions for Oscar 8

by P. T. GREED, G3MQD*

The following "look-up" table for Oscar 8 is based on the orbital parameters:

Orbital period	103·228min
Angle of inclination	98·989°
†Track separation	+25·807°West

(†Including correction for the rotation and orbit of the earth and the precession of the satellite's orbits)

Column 1 Longitude of the ascending node.
Column 2 Time for acquisition of signal (aos).
Column 3 Time for loss of signal (los).
Column 4 Beam heading at aos.
Column 5 Beam heading at los.
Column 6 Max elevation (ie altitude) at time of closest approach (tca).
Column 7 Compass sector at tca.

Time is given in minutes after ascending node.
Azimuth is based on a ground station at 52°N 2°W.
Beam headings are true bearings.

Long West	Time aos	Time los	Bearing aos	Bearing los	Elevation	Sector
000	7	22	187	337	39	WSW
002	7	22	190	337	35	WSW
004	7	22	193	336	30	W
006	7	22	197	335	26	W
008	7	22	202	333	23	W
010	8	22	206	332	20	W
012	8	21	211	331	16	W
014	8	21	216	329	14	W
016	8	21	222	327	12	W
018	9	20	228	325	10	W
020	10	20	234	322	8	W
022	10	20	240	319	7	W
024	11	19	248	315	5	W
026	12	18	258	309	Horizon	WNW
028	13	15	270	300	Horizon	WNW
			(Out of range)			
146	33	40	052	099	Horizon	E
148	33	40	046	110	Horizon	E
150	32	41	042	117	6	E
152	32	42	039	126	8	E
154	31	42	036	131	9	E
156	31	43	034	137	11	E
158	30	43	032	143	13	E
160	30	44	031	147	15	E
162	30	44	029	153	19	E
164	30	44	028	157	21	E
166	30	44	027	161	24	E
168	30	44	025	166	28	E
170	30	44	024	171	33	ESE
172	30	44	023	173	35	ESE
174	29	45	021	178	45	ESE
176	29	45	020	182	53	ESE
178	29	45	019	187	60	ESE
180	29	45	018	190	66	ESE
182	28	44	017	193	78	ESE
184	28	44	016	197	86	O'head
186	28	44	015	199	Overhead	
188	28	44	015	202	78	WNW
190	28	44	014	207	66	WNW
192	28	44	013	211	56	WNW
194	28	44	013	216	48	WNW
196	28	43	012	219	43	WNW
198	28	43	011	223	39	WNW
200	28	42	011	227	35	WNW
202	28	42	010	231	31	WNW
204	28	42	010	235	27	NW
206	28	42	009	238	24	NW
208	28	41	008	242	22	NW
210	28	41	008	247	20	NW
212	28	40	007	251	18	NW
214	28	40	005	255	16	NW
216	28	39	005	260	14	NW
218	28	39	004	266	13	NW
220	28	38	003	270	11	NW
222	28	38	003	273	10	NW
224	28	37	002	277	9	NW
226	28	37	001	282	8	NNW
228	28	36	001	287	7	NNW
230	28	36	000	291	6	NNW
232	27	35	359	296	5	NNW
234	27	34	359	301	Horizon	NNW
236	27	34	358	305	Horizon	NNW
238	27	33	357	310	Horizon	NNW
240	27	33	356	314	Horizon	NNW
242	28	32	355	317	Horizon	NNW
244	28	31	354	325	Horizon	NNW
246	27	30	353	328	Horizon	NNW
			(Out of range)			
288	20	23	038	005	Horizon	NNE
290	20	24	042	005	Horizon	NNE
292	19	24	046	002	Horizon	NNE
294	18	24	050	001	Horizon	NNE
296	18	24	056	000	Horizon	NNE
298	17	24	060	000	Horizon	NNE
300	16	24	065	000	Horizon	NNE
302	16	24	070	359	6	NNE
304	15	24	074	358	6	NE
306	15	24	079	357	7	NE
308	14	24	083	356	9	NE
310	14	24	087	355	10	NE
312	13	24	091	355	11	NE
314	13	24	095	354	12	NE
316	12	24	101	353	14	NE
318	12	24	105	353	17	NE
320	11	24	110	352	18	NE
322	11	24	114	352	20	NE
324	10	24	119	351	23	NE
326	10	24	122	351	26	ENE
328	10	24	126	350	28	ENE
330	9	24	130	349	31	ENE
332	9	24	133	349	35	ENE
334	9	24	137	348	39	ENE
336	8	23	141	347	43	ENE
338	8	23	145	347	51	ENE
340	8	23	149	346	56	ENE
342	8	23	152	346	66	ENE
344	8	23	156	345	74	ENE
346	7	23	160	344	86	O'head
348	7	23	164	343	86	O'head
350	7	23	168	342	74	WSW
352	7	23	171	341	66	WSW
354	7	23	174	341	60	WSW
356	7	23	179	339	48	WSW
358	7	22	183	338	43	WSW
360	7	22	187	337	39	WSW

*18 Nursteed Park, Devizes, Wilts SN10 3AN.

the month on the air

John Allaway, G3FKM *

THE very well-produced and informative brochure circulated by the organizers of the recent most successful expedition to Clipperton Is mentions the fact that "after discovery by Magellan, the atoll was named Passion Is...." How little did the first visitors to the island realize how appropriate this name would be hundreds of years later! This was the first really large and well-publicized operation from the area since the advent of ssb, and the writer estimates that not far short of 30,000 contacts must have resulted. What a pity then that such success should be accompanied by the worst display of on-the-air manners ever heard on the hf bands. The operators were mostly European, and it is sad to record that many of the special attempts to work into Europe were thwarted by stations in the western hemisphere, and that likewise many contacts were ruined by crosstalk and rudeness by European stations on the expedition's frequencies. Congratulations are certainly due to the French and Swiss amateurs who made the whole episode so successful in spite of all this.

DX news

F8US wishes to point out that he no longer acts as QSL manager for anyone.

In a letter from the club secretary of YU1BCD, the current position on activity from Iraq is explained. It seems that a group of Iraqis from the Baghdad Technics organization recently spent a month in Belgrade. Two of them were for the "radio amateur section", and received instruction from YU1NZV. They returned home accompanied by an Atlas 350XL—a present from the society. The radio club in Baghdad hopes to have the callsign YI1BGD and has been given 1,500 QSLs. YU1NZV was due to go to Iraq at the end of March to give further instruction and to assemble the equipment.

W6YO, who recently arrived home after his long trip aboard the *Yankee Trader*, now has some permanent QSL cards and will replace the temporary ones already sent out—please send sae and irc with your request.

FG7AN and VP2MJC were killed in an air crash recently.

FB8ZM now has a quad and operates on 14,224kHz at about 1300 each day. He will be there for the rest of 1978 and says that more activity from Crozet Is is to be expected soon.

In spite of rumours to the contrary, DF7GF/5H3 is genuine and located at Arusha, Tanzania. He has an FT277E and triband beam antenna. A new amateur in the Republic of Comoro is D68AD, who runs 100W into a vertical antenna and may be reached at the address given in "QTH Corner". The only amateur in Niger, 5U7AG, keeps a schedule with K1VSK on 14,270kHz at 2230 on Wednesday and 2000 on Sunday.

K4YT is in Africa and hopes to be able to get on the air; during his stay he will visit Somalia where he will try to obtain permission. He is also thinking of visiting FH, D6, FR and 3B and, if he is successful, QSLs should be sent to him via "Dxpedition of the Month", W2GHK.

VR1AG has returned to the UK from Ocean Is (now called Barnaby Is), and YJ8GH is also due for leave. VP8PM is G3NUF, and also held the callsign VQ1GDW some years ago.

At the time of writing, there was still speculation as to the possible DXCC status of Desecheo Is (near KP4). The island is under the control of the US Dept of the Interior. A group of Puerto Rican amateurs is ready to mount an expedition should separate status be granted.

According to *Ham Radio Report* the whole USA amateur callsign structure has been changed. One of the first results will be the appearance of calls in the N plus three-letter series. Call areas will remain but it is understood that original calls may be retained even if the holder moves to another call area. Callsigns are divided into four groups—A for Extra class, B for Advanced class, C for General and Technician, and D for Novices. As a amateur progresses upwards his callsign may be changed each time. New prefixes will be used by the Pacific and Caribbean islands and will be as follows: KH1—Canton Is, KH2—Guam, KH3—Johnston, KH4—Midway, KH5K—Kingham Reef, KH6—Hawaii, KH7—Kure, KH8—US Samoa, KH9—Wake, KP1—Navassa Is, KP2—US Virgin Is, KP3—Serrana Bank, and KP4—Puerto Rico. Certain other call areas (KX6 and KG4) are said to be not administered by the FCC.

News from overseas

Jack Hollingworth, formerly 6Y5HJ, ceased operations from Jamaica last December, but all QSLs sent to his address there or via the 6Y5 bureau will reach him eventually. Jack is now in Grand Cayman and has the callsign ZF1HJ, and he mentions that he has a good supply of 6Y5HJ cards left should anyone require one more urgently (see "QTH Corner").

Ron Roden, VP9IR (G4GKO), who was also ZD8RR, VP8OA and ZB2DN, has been alarmed by the news that his old VP8OA call has been re-issued to G4FIY. ZD8RR has also received the same treatment, and Ron would like to make clear the fact that he can only QSL contacts made with ZD8RR between July 1971 and September 1973, and with VP8OA between September 1974 and January 1976. His current address is to be found in "QTH Corner".

Tony Mills, G3TRR, is in Mombasa and using his 5Z4QP call most evenings on 14 and 21MHz cw. He returns to the UK in June or July and suggests that QSLs are sent preferably to his G call via the RSGB QSL Bureau. His direct address is in "QTH Corner".

*10 Knightlow Road, Birmingham B17 8QB.

Rosti, OK2PGU, runs this largely home-built station on 1·8MHz. He uses a 125ft vertical transmitting antenna and a Beverage for receiving. *(Photo: W1BB)*

Dxpeditions

Jim Smith, P29JS, hopes to visit the Cocos Keeling Is late in May and to be there for two weeks. He has been allocated the callsign VK9YS and should be using his TS820 and linear mainly on 14,005–14,010, 14,125, 14,195, 14,220, 14,265, 21,255 and 28, 600kHz. Operation on 7 and 3·5MHz seems unlikely.

West Coast DX Bulletin notes information received from LA1H concerning possible activity from Bouvet Is next winter. The callsign 3Y1VC has already been issued, and it is hoped that it will be heard in use during the period January–February 1979 when a meteorological survey is due to be carried out in the area.

The Mellish Reef trip being talked about by some Australian amateurs is still being planned, and VK2BJL is mentioned as a likely member of the party. P29JS is also being mentioned in this connection, and August would seem to be a likely time for the action. In the same area is Frederick Reef, which is located in the Coral Sea some 270 miles off the Queensland coast, and rumours are circulating that VK4LX is considering making it a target later in the year when its DXCC status is established.

G2MI has forwarded a letter received from N0TG. This says that a group of USA amateurs is going to Navassa Is early this autumn and that they will operate on all bands 3·5 to 28MHz, cw and ssb. Each operator will pay for his own personal expenses, but the boat hire will cost about $3,500. Those due to be on the KC4 expedition include N0WL, W0RJU, W0ZH, WB0RSL, N0TG, K2KA, W2PAU and W6OIG. Financial support is not solicited at this stage—but promises of assistance on return from the trip would be appreciated. Please contact Randy Rowe, N0TG, 3237 Connecticut Drive, St Charles, Mo, 63301, USA.

RAF Cosford open day

RAF Cosford is situated eight miles NW of Wolverhampton on the A41. It will be celebrating its 40th anniversary this year and will be holding an open day on 3 June. The amateur radio station will operate two talk-in stations—G4CES near 3,710kHz, and G3PWI on 145·425MHz, from 1000. There will be static and mobile displays, the Cosford Aerospace Museum will be open, and a comprehensive flying display will take place during the afternoon. It is hoped to run both amateur stations during the day. Cosford is mainly concerned with teaching the intricacies of airborne radio and radar, but also houses the RAF School of PT and the Joint Services School of Photography. The museum houses a unique collection of second world war aircraft, British and German, a wide range of German rocketry, plus research aircraft (including a TSR2).

Dxpeditions to Guernsey

During the 1977 CQ WW DX Contest the Channel Contest Group operated GU4DAA from a guest house in Guernsey. The owner, although not licensed himself, expressed interest in providing facilities for visiting amateurs and since then has obtained planning consent for a 60ft crank-up tower and TH6 beam. He intends to instal these this year and to fit out a room with operating tables, power points, etc.

Before making a final decision to proceed, he would like some idea of the amount of interest that there might be. The QTH is on the west coast of the island, remote from any built-up area. The take-off is particularly good from NE through W to SW, with the land sloping away to the sea about a mile away. There would be no objection to additional antennas being put on the tower, and there is plenty of room for lower frequency antennas. The facilities would be available at all times of the year for contests or for casual bookings. Obviously bookings for the main holiday periods would need to be made well in advance. Anyone who is interested, please contact G3FXB, QTHR, for details.

Odds and ends

G3KPO points out that there are many special-interest nets on the 3·5MHz band. One of these is the "Organgrinder's Net", which is specially for those interested in electronic and pipe organs. It meets around 3,700kHz at 3pm on Wednesdays, and anyone interested is invited to join in.

G3RWH is receiving QSL cards intended for VP9IF—particularly from Japan. If any reader could supply him with the address of VP9IF, or his correct QSL manager, he would be grateful.

Dick Allisette, GU4CHY, with his very neat station which gives many a first contact with Guernsey

G4CKL reports that his callsign has been pirated on 3·5MHz. The pirate was using a.m., whereas the real owner of the call uses ssb and cw only. G3CCD is receiving QSL cards for cw contacts which he has not made—he rarely operates on cw.

Contests

Apologies for the late publication of the results of the **1977 ARRL DX Contests**. British scores were as follows:

CW SECTION

Single-operator scores

All band		High band		Low band	
G3FXB	1,782,600	G3UJE	611,226	G2RO	94,392
G3MXJ	1,574,166	G3SSO (G4BEZ)	175,392	G4AMT	36,567
GM3CFS	703,671	G4EHF	130,152	GM6RV	13,563
GI3JEX	531,864	G3UFY	92,016		
G3ESF	326,742	G3YBH	65,520		
G3KSH	104,535	GI3KDR	43,569		
G3APN	77,847	G6NK	39,780		
G4BUQ	55,902	G3IQF	4,692		
G4FDC	37,248	G3CWL	1,224		
G2AJB	11,817				

Multi-operator, single transmitter

GI6YM 175,560 **GM3ZRC** 42,336

PHONE SECTION

Single-operator scores

All band		High band		Low band	
GW4BNJ	29,400	**G3TZH**	942,390	**G3TJW**	253,062
G5CP	11,160	**GW4BLE**	887,040	G4AMT	151,452
		G3SSO (G4BEZ)	461,475	**GI6YM** (GI3IVJ)	24,948
		GI3KDR	262,650		
		G3TTJ	187,137		
		GI5BVN	93,024		
		G3NT	52,290		
		G3IRM/M	3,828		

Multi-operator, single-transmitter

G4ANT	1,771,026	G3OUR/A	587,190
G5YC	1,207,410	G3KMI	22,608

Certificate winners are listed in bold type

The rules of the **IARU Region I International Gagarin Cup Competition,** which was to take place on 9 April, were regrettably received from the Radio Sports Federation of the USSR too late for publication. This is a three-yearly event and it is hoped that in 1981 this situation will be improved.

In the **1977 CQ WW WPX Contest,** UK scores were as follows:

G4DMN	(All band)	193,930			
G4ETK	..	166,859	**GW5BI**	(21MHz)	**35,090**
GM3CFS	..	158,067	G4AHO	..	10,570
G3NFV	..	94,944	**G4DKT**	(14MHz)	101,775
GW3SLA	..	84,747	G4CVZ	..	86,900
G2AJB	..	46,168	G3VOF	..	78,814
G4DBW	..	19,836	G4ALG	(7MHz)	72,192
G3IRM/A	..	3,741	**GU3YIZ**	(3·5MHz)	37,050
G3RMF	(28MHz)	1,000	**G4BBA**	..	12,804
GW4FVT	..	924	**GM5AXY**	..	2,940
G3SSO	(21MHz)	70,468	**G4BXT**	(1·8MHz)	3,036

Results of the **1977 IARU Radiosport Championship** were as follows: (Mixed modes) **G3FXB**—497,340 points, G4BWP—26,910. (CW) **GM3CFS**—175,824, **GI3JEX**—85,489, **G3ESF**—67,166, G3TXF—38,304, G2AJB—12,180. (Phone) **G4DMN**—261,177, G4CVZ—41,075, **GW3SLA**—21,886, **GM5AXY**—2,784. (Multi-operator) **G3XBN/A**—534,828, G4FDC/P—4,550. Congratulations to **G3FXB** who was world fourth (outside the USA) in the single-operator mixed section, and to **G4DMN** who was similarly placed in the phone section.

Francophones Countries Contest

0000 to 2400 27 May (cw).
0000 to 2400 28 May (phone).

The object is to contact Francophone countries – (a) the 17 French provinces, (b) four overseas French departments and 11 French territories, (c) the 22 other countries listed for the DUF Award, and (d) the 11 other French-speaking countries—ON, LX, HB, 4U, HH, VE2, OD, 3B8, 9U, 9X and 9Q.

There are multi- and single-operator entries—the latter may only operate for 18 hours. Exchanges consist of RS/T plus QSO serial number (from 001). Two points are gained by contacting stations in one's own continent, four with those outside. The multipliers (per band) are those listed in (a), (b), (c) and (d). Final score is total QSO points multiplied by the sum of multipliers from each band added together. Send logs and summary sheets to: Francophone Test, REF, Square Trudaine 2, 75009 Paris, France.

The Channel Contest Group, G4DAA, with visitors: (Back row, l to r) K3RV, G5WP, G3MXJ, G4EHF, W4WJ, G4BUE, VE1CD, G3XBN, G3ZQW. (Front row, l to r) G3ABJ, K4II, W4ZMQ, 5Z4LW, G3FXB and G3GFG

Awards

The Worked All Zones Award

Please note that applications for this certificate must now be sent to W4KA (L. Haijsman, 1044 SE 43rd St, Cape Coral, Fla. 33904, USA). Application blanks may be obtained from G3FKM (sase please), who also acts as a checkpoint for QSLs. Completed forms, plus QSL cards, should be sent to G3FKM for certification; it is then only necessary to send the list plus eight ircs,to W4KA. The same procedure is followed by applicants for the **CQ DX Award**, but in this case completed forms should be forwarded to Rod Linkous, W7YBX, 5632 47th Avenue, SE Seattle, Wash. 98136, USA. QSL cards for the **WPX** and **VPX Awards** do not need to be checked, and completed application forms should be sent direct to Bob Huntington, W6TCQ, 5014 Mindora, Torrance, Cal. 90505, USA.

Worked All Birmingham Postal Zone Award

Sponsored by the S Birmingham RS (G3OHM/G8OHM), and available to all listeners and licensed amateurs. Three classes—Bronze (25 points), Silver (50 points) and Gold (75 points). G3OHM or G8OHM must have been contacted (not both) and five points gained thereby. Contacts with SBRC members count two points, and those made with non-members in Birmingham postal districts one point. A special activity weekend is planned for the Spring Bank Holiday (27–29 May). Full rules and list of members may be obtained (sase or irc please) from the award manager, John Harvey, G8KLO, 38 Bodenham Road, Birmingham B31 5DS.

Greenland Award

Issued in three classes: (1) for contacts with five different locations and 15 different stations, (2) for four and 10 respectively, and (3) for three and five. It is issued for cw, phone or mixed modes, and is also available to listeners. Contacts must have been with OX3 stations only, and must have been made since 1 January 1978. All bands 3·5 to 1,296MHz may be used, and minimum reports must be RS33 or RST338. A list giving full details (and certified by the Awards Manager of a national society) plus $2 or Dkr12 should be sent to: Award Manager, OZ1WL, PO Box 213, 5100 Odense C, Denmark.

Marconi 75th Anniversary Certificate

The Cornish Radio Amateur Club is awarding a certificate to amateurs submitting log extracts recording details of contracts with both GB3MSA and KM1CC during the week of special celebrations in January 1978. Applications should be sent to: A W Hammett, G3VWK, Rosehill, Ladock, Truro, Cornwall. Please enclose 25p or four ircs.

Band reports

Excellent conditions on the hf bands during the past month have meant that the lower frequencies have been somewhat neglected. The 28MHz band has been open for interesting contacts most days, and BRS25429 has noted from his records that by the end of March some 173 countries had been worked or heard from the UK during 1978.

Many thanks to the following for sending in information from which this section has been compiled: G3HB, G3PH, G5JL, G6GH, G2AMV, G2HKU; G3KSH, G3JZG, G3LPS, G3RCA, G4EAN, G4EHQ, G4ETN, SP3ACE, BRSs 17567, 25429, 31301, 33915, 36928, 38934 and 39756, and A8961.

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

3·5MHz. 0100 J3AAG. **0500** *VO1, VE2/3, ZL1/2/3/4.* **0600** ZL. **0800** *GD5BLG/P* (QSL to DJ0UP). **2300** OE5CA/YK.

7MHz. 0000 PJ2AAX, UK0AAB, *VU2GW, ZD7PV,* 9K2EX. **0100** FM7WS, HK, PY0FN, *VE5RA, 8R1J.* **0200** *CO, TI, VE6/7.* **0300** W6/7. **0600** *FO0XD, K7CTQ* (Mont), *PY0MAG, ZL.* **0700** *KH6AKX, TF5TP, VK2/3/7.* **0800** FO0XD. **1700** *UL7.* **2200** *FMOCOO, 4K1GM* (Soviet Antarctica).

QTH CORNER

A35AA	Amateur Radio Station, Vava'u, Tonga.
D68AD	Robin Francis, PO Box 15, Moroni, Rep of Comoros.
FH0OM	via DJ1TC, O.Blankenhorn, Sophienstr 178, 7500 Karlsruhe, W Germany.
FO0XA to **FO0XH**	all via HB9MX, K. Bindschdler, Strahleggweg 28, CH-8400, Winterthur, Switzerland.
K4II/KC6	W. G. Baird Jr, 1018 Woodburn Rd, Spartanburg, SC, 29302, USA.
PY0FN	via WA3HUP, Mary Crider, RFD-2 Box 5-A, York Haven, Pa, 17370, USA.
PY0MAG	PY1MAG, P. Rabelo, Albino Pereira 355, San Francisco, 24000 Niteroi, Brazil.
ST2HF	via G4GFI, M. Broadway, 32 Stock Hill, Biggin Hill, Westerham, Kent.
SV1JH	Box 73, Rhodes, Greece.
TI9CW **TI9DX**	via TI2CF, Carlos Fonesca, PO Box 4300, San Jose, Costa Rica.
VP8PM	G. D. Wilson, PO Box 179, Port Stanley, Falkland Is.
VP8PP	V. Redsull, 1 Maxtow Rd, Dover, Kent.
VP9IR	R. Roden, Cable & Wireless Ltd, PO Box 151, Hamilton 5, Bermuda.
VR1AF **VR1AG**	Via W7OK, W. Don Brickey, Box 95, Las Vegas, Nev. 89101, USA.
ZD7SD **ZD7SS**	via WA2DWE, M. D. Selby, 120 Esplanade Drive, Rochester, NY, 14610, USA.
ZF1HJ	J. Hollingworth, PO Box 1215, George Town, Grand Cayman, BWI.
ZL4LR/A	via ZL3FE, 8 Middle Park Road, Christchurch 4, New Zealand.
5Z4QP	A. M. Mills, PO Box 95221, Mombasa, Kenya.

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

Last year, Mr D. P. Tipper, G3JBR, was invited to visit Florence for the 50th anniversary celebrations of ARI. He had a most interesting visit and was overwhelmed by the kindness and hospitality of his hosts. He is seen here with I52WD operating the special station IK50ARI

14MHz. 0000 *FO0XH,* OE5CA/YK. **0100** TI9DX. **0500** YS1RVE (QSL to WA0JYJ). **0700** *BV2A,* FO0XC, KC4USV, 5W1AU/AX. **0800** A35AA, CE0AE, HC8GI, KX6BU, VK2AGT/LH, VR1AF/AG, W6/7, XE3AK (QSL Box 47, Oaxaca), YJ8GH, *ZK1DR,* ZL4LR/A. **0900** FB8YF, *JA,* KC6CG/CV, *PY0MAG,* 3D2BM/WR. **1000** JT1AN, ST0RK, VK, ZL. **1100** KC4AAA, KL7, VR4BF. **1300** YJ8KW. **1600** HS1WR, W6/7. **1700** FB8XS, FH8CJ, *KH6CC,* VE6/7, ZL2/3. **1800** FR7BV (BP 75, St Louis), *P29JS, VS6CZ, ZD7PV.* **1900** FH0OM, *ZL,* 5H3FW. **2000** FK8CR, TJ2P, ZD9GG. **2100** FY7BC (QSL to F9LM), *KL7HCC,* VP8PU/PM, ZD7MG. **2200** JA6AA, *VP1,* VP2, W7. **2300** *CX5RV, J28AG, JA, PY0,* TI9DX, VK6, VP8PM, WA6OXZ/VQ9, W7.

21MHz. 0000 CE. **0600** JA. **0700** JA, ZL. **0800** JA, VR4BF, ZL1/3. **0900** JA, *KL7HCC, LU, PY,* VK. **1000** D4CBS, FH8CJ, JA, KL7JET. **1100** *KG6,* VR4DJ. **1200** *PY0MAG,* VR4DJ, 9N1MM. **1300** *CO, JA,* KG6FAE, P29JS, VS6FE. **1400** FO0XB, ZC4AJ. **1500** *VP8PL, ZD7PV.* **1600** *PY0MAG,* W6/7. **1700** CE0AE, WA6OXZ/VQ9, *G3LGP/W0.* **1800** D68AD, HC8GI, *KH6,* S79MC. **1900** C5AAL, *FO0XE, KH6AQ, KL7,* W6/7, *VP9PL.* **2100** *CX5RV,* PJ8CO (QSL to W8AEB). **2200** *CE, HK0,* KH6OR, VP8MV. **2300** *CE, HI, LU, PY, W7GS* (Wyo), *ZP.*

28MHz. 0700 JA, VK3/4, *UA0.* **0800** K0AX/DU2, HZ1HZ, P29MO, YB0ACT. **0900** JA, *KA6DX,* TU2FH, UA0, YM1ZB, 6W8EX. **1000** TR8MM, UH8, VU, YC1WS, *ZB2, ZD7PV.* **1100** *A9,* CE, *VK6/8, VU,* OE6DK/YK. **1200** C5AL, S79DF, VS6FX, VP5WW, W1/2/3/4, 5N2NAS, 9M2BY. **1300** CT3/OH2BC, OK2BFP/D2A, *PY0FN/MAG,* VE7CQX/SU, YB0ACT, *9K2.* **1400** FP8DX, HS1WR, KC4AAC, W1-W5, *3B8MS,* 5T5ZA. **1500** D4CBC, FO0XG, FR7BE, XE, ZS3AK. **1600** C5, FH8CJ, PY0FN, VP5WW, VP8PU, W6/7, 5H3BP. **1700** A9XBD, FO0XG, OA, W6/7, VP8HA, XE. **1800** *HH,* HC1BU, W6/7. **1900** CE, FY7AG, KL7IRJ, *LU,* OA, OX, VP8TM, W6/7, 9L1CA. **2000** CE0AE, HH2MC, KG4. **2100** CE, KH6IDA, KP4, HI, HK, TI, VP2MT, W1-0. **2200** W7EJ.

Thanks to all correspondents, and especially to the authors of the following for information extracted: *Long Skip* **(VE1AL/3),** the *West Coast DX Bulletin* **(WA6AUD),** *DX'press* **(PAλTO),** *CQ Magazine* **(W1WY),** the *Ex-G Radio Club Magazine* **(W3HQO),** *DX News Sheet* **(Geoff Watts),** and *RSZ Newsletter* **(9J2KL).**

Please send all items for **July** issue **to reach G3FKM** by **3 June,** and for **August** by **28 June.** □

HF propagation study

Predicted hpfs (MHz × 10) for May 1978

GMT =	00	02	04	06	08	10	12	14	16	18	20	22	24
ADEN	200	192	221	282	293	300	319	335	340	295	260	218	200
ASCENSION	224	213	201	168	293	296	315	346	366	361	310	255	224
BAHRAIN	187	182	228	270	284	286	299	307	317	291	247	213	187
BANGKOK	177	172	220	247	255	261	257	266	275	270	238	195	177
BARBADOS	224	185	164	172	194	257	263	265	270	288	300	268	224
BERMUDA	214	168	143	147	180	230	242	247	251	256	268	257	214
BOGOTA	223	177	159	163	204	243	258	258	265	275	289	267	223
BUENOS AIRES	224	204	191	186	148	255	290	301	319	322	324	267	224
CAPE TOWN	206	176	136	285	295	309	327	359	378	336	293	214	206
COLOMBO	183	176	235	267	271	280	289	294	305	265	249	205	183
CYPRUS	176	169	190	251	261	267	279	280	294	284	248	205	176
DAKAR	216	213	201	200	293	296	315	346	366	361	310	244	216
DENVER	180	157	133	129	135	139	177	196	209	209	213	215	180
FAIRBANKS	169	147	150	172	186	178	174	169	172	172	176	176	169
FALKLANDS	169	150	143	138	178	233	295	315	329	336	319	211	169
GIBRALTAR	138	126	116	148	180	183	194	194	199	208	197	168	138
HONG KONG	172	172	210	229	238	237	243	243	255	241	218	187	172
HONOLULU	169	147	147	172	194	200	188	167	205	205	202	191	169
ICELAND	122	102	103	136	157	161	167	166	167	169	173	153	122
JAMAICA	214	169	144	153	180	218	244	248	251	258	268	258	214
LAGOS	221	213	197	258	294	303	323	357	373	365	300	216	221
LAS PALMAS	200	180	167	187	247	257	268	277	288	291	280	237	200
LIMA	225	190	174	177	204	185	270	276	284	295	307	270	225
LOS ANGELES	172	154	134	144	128	125	161	197	211	215	218	202	172
MALTA	153	145	138	200	214	221	230	233	235	242	219	187	153
MAURITIUS	211	174	211	286	295	304	323	350	352	324	277	216	211
MEXICO	200	163	126	149	174	159	225	233	235	238	251	235	200
MOSCOW	143	136	163	194	206	204	211	211	220	223	206	174	143
NAIROBI	204	202	201	288	295	307	324	355	361	332	255	215	204
NEW DELHI	178	171	227	253	262	266	266	271	286	243	229	196	178
NEW YORK	200	163	126	124	155	202	214	219	228	229	241	238	200
OSAKA	168	168	190	209	218	220	224	224	220	199	192	187	168
PERTH	182	176	235	266	271	277	252	215	192	178	161	148	182
RIO DE JANEIRO	223	205	195	183	168	282	295	313	329	335	326	266	223
SALISBURY	218	200	177	289	295	310	331	356	366	347	288	210	218
SEYCHELLES	206	186	221	281	295	305	323	338	345	301	268	215	206
SINGAPORE	178	171	227	253	262	266	266	272	286	265	239	196	178
SUVA (s)	169	162	172	190	200	206	208	208	200	208	202	191	169
SUVA (l)	225	214	200	260	209	191	206	159	149	139	307	237	225
SYDNEY (s)	172	172	210	229	238	234	199	197	177	158	157	187	172
SYDNEY (l)	223	191	176	186	191	159	139	140	128	116	202	266	223
TEHERAN	183	176	235	267	271	280	286	294	305	289	239	201	183
VANCOUVER	166	147	147	168	161	161	162	172	183	183	200	194	166
WELLINGTON (s)	167	167	186	205	215	215	190	167	157	154	215	187	167
WELLINGTON (l)	220	208	197	210	166	147	133	136	126	139	235	265	220

Bands recommended are those between hpf and half hpf.

Propagation predictions

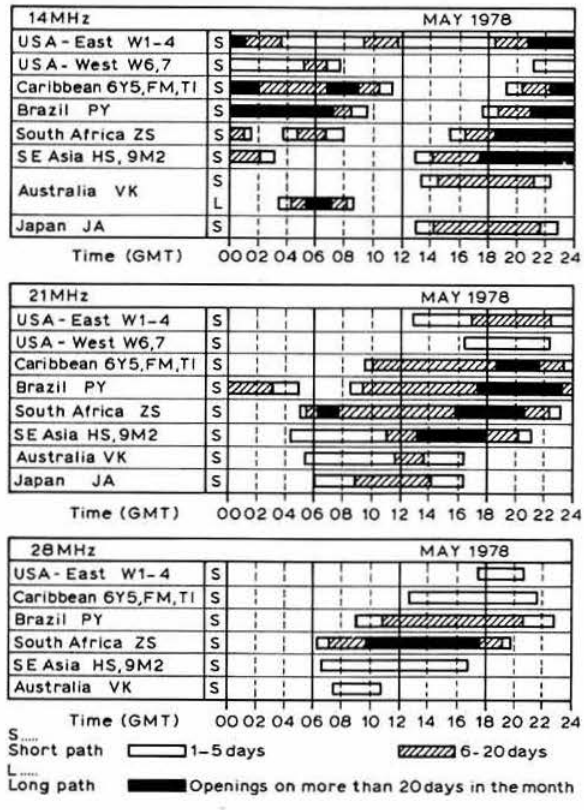
In the ionosphere, May is a typical summer month. In the northern hemisphere the daytime frequencies are already relatively low, and because of the short nights, night time frequencies do not fall as low as during the winter. The low daytime frequencies will be noticed most on **28MHz** where traffic with North America and Japan will suffer; from now until the end of summer both regions will be heard only under exceptional circumstances on this band. There may be a possibility of traffic with Africa and parts of South America. A small compensation for the bad dx conditions on this band, which will remain so until September, will be sporadic short skip over distances of about 500–2,000km.

The **21MHz** band will also be influenced by the summertime worsening of dx conditions. As the days lengthen, the band will remain open longer at night, but western North America will only be heard under exceptional circumstances. The best time for dx on this band will be during late afternoon and early evening.

Because of rising F2 mufs, **14MHz** will remain open all night, especially for traffic with South America, and partly also with Central and North America. Short skip conditions, which could mostly occur during late afternoon and early evening, may lead to increasing QRM from Europe. QRM-free traffic will be possible at night and during the early hours of the morning. Traffic with western North America, South America and Japan will be possible under very favourable conditions via the indirect path. Traffic with Australia will also be possible in the early hours of the morning via the indirect path.

The rise of summertime QRM will lead to a worsening of dx conditions on **7MHz,** and, compared to last month, conditions on **3·5MHz** will be much worse. DX will only be possible when the greater part of the path lies in darkness; this is most important for **3·5MHz.** There will be no interruption of local traffic by the dead zone.

The provisional sunspot number from the Swiss Federal Observatory for February 1978 was 89·8 with the numbers for the first seven days of the month rising as high as 138. The predicted smoothed numbers for June, July and August are 64, 68 and 72 respectively.



council proceedings

A brief report of the Council meeting held on 21 January 1978

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

The President welcomed the new honorary treasurer and other new members of Council and extended his thanks to retiring Council members J. O. Brown, D. Pratt and D. Thomas, and general manager G. R. Jessop, for their past services.

Zone 6 vacancy

Mr Parsons proposed Mr D. H. Adams, GW3VBP, be appointed Council member for Zone 6 and Mr Scarr seconded the proposal, which was approved unanimously. Mr Adams then joined the meeting and was welcomed by the President.

Election of executive vice-president

The President called for nominations to fill this post, and Messrs Balestrini and Bazley were proposed. A ballot was held and the President declared Mr Bazley elected as executive vice-president for 1978.

Mr P. A. Nicholson, G8LMD

The general manager reported that G8LMD's membership had lapsed in September and he was technically, therefore, no longer a member; a three-months' grace period having also expired at the end of November 1977.

After much discussion it was agreed that it should be recorded that expulsion proceedings had been considered but because the person concerned was no longer a member of the Society, no further action could be taken.

It was also agreed that if G8LMD re-applied for membership he would have to appear before Council.

Financial report

The President briefly outlined the issue raised at the AGM resulting in the possibility of a poll. Objections had been raised to the acceptance of the accounts as some members held a number of proxies, and it had been agreed to proceed with a poll.

Mr Cornish said that there was no legal significance in the objection to the acceptance of the accounts. The only requirement was that the accounts and certificate of the auditors be produced and signed, which was all in order.

Mr Parsons commented on the excellent financial results and said it was the accounting techniques not the accounts which were questionable.

Dr Evans agreed that it was a pity the good financial results had been somewhat overshadowed at the AGM.

Mr Cornish reported on the auditors comments based on their examination of the Society's accounts and records of the 12 months to 30 June 1977. He said that in all cases valid criticisms by the auditors had been or were being met by improved routines adopted since 1 July 1977. He thought the problems had arisen mainly from the changeover of systems and staff difficulties.

Headquarters report

The general manager explained the new system for dealing with general membership/subscription queries and reporteduiat the 3741 data station was now operational. Problems regarding the HQ telephone system were being tackled, and there was a proposal to convert the front basement into a book packing area as the present packing facilities were not adequate to cope with the growing number of book orders.

Appointment of committees

The membership of committees of Council for 1978 was discussed and the appointment of members of committees was agreed. (Published in the April issue of *Radio Communication).* Draft terms of reference for the new HF Committee were tabled and the appointment of its first members approved.

Membership and representation

The question of waived subscriptions was discussed and referred to the Membership & Representation Committee. Waived subscriptions in respect of four members were approved.

It was also agreed that a more practical system should be devised for the consideration of reduced subscriptions. Reduced subscriptions in respect of five members were approved.

It was agreed to grant affiliation to:

Cheltenham Amateur Radio Association; Dudley Amateur Radio Club, Dudley, West Midlands; Electrical School Society, Kingston Polytechnic, Surrey; Ericsson Group Radio Amateurs, Stockholm, Sweden; G5LK Memorial, Hethersett Centre for Blind Adolescents, Reigate, Surrey; Helensburgh Amateur Radio Club, Dumbartonshire; Old Swinford Hospital School Radio Society, Stourbridge, West Midlands; Royal Air Force Henlow Amateur Radio & Electronics Club; South Central Amateur Radio Society, London SE1; University of Keele Amateur Radio Society.

The following nominations for area representatives were accepted: J. H. Grassby, G4CPY, Leicester; L. E. Light, G3KDL, Harrow.

Appointment of honorary officers

The following honorary officers for 1978 were appointed:

Telecommunications liaison officer	R. F. Stevens, G2BVN.
Awards manager, hf	C. R. Emary, G5GH.
Awards manager, vhf	J. Hum, G5UM.
Intruder Watch organizer	S. A. G. Cook, G5XB.
Slow morse transmissions organizer	M. A. C. MacBrayne, G3KGU.
Taped lecture library curator	S. W. Coursey, G3JJC.
Trophies manager	P. A. Miles, G3KDB.
VHF manager	Dr I. F. White, G3SEK.
Emergency communications manager	P. Balestrini, G3BPT.
Microwave manager	Dr D. S. Evans, G3RPE.

The appointment of an hf manager would be referred to the HF Committee.

Representatives on outside bodies

The following were approved:

A. H. B. Bower, G3COJ,	CCIR Study Group 2.
R. G. Flavell, G3LTP,	CCIR Study Groups 5 & 6.
R. F. Stevens, G2BVN,	CCIR UK General Purposes. BSI TLE 25/1 and /2. Frequency Advisory Committee.
D. A. S. Dryborough, G8HEV,	CCIR Study Group 8. BSI TLE 23/1, 25/3, 25/6.
R. S. Roberts, G6NR,	BSI TLE 1/5, 1/30, 24/4, 25/6.
R. J. Hughes, G3GVV, L. E. Newnham, G6NZ, W. A. Scarr, G2WS,	RAE Advisory Committee

Mr Andrews stated that Mr I. Jackson, G3OHX, wished to relinquish his position on the BREMA Interference sub-committee, and Mr J. Anthony said that he was willing to fill the vacancy.

Committee minutes

Council received the minutes of the following committee meetings: Mobile & Exhibition (18.10.77, 15.11.77), Membership & Representation (20.10.77, 10.12.77), Repeater Working Group (24.9.77, 29.10.77, 3.12.77), Technical & Publications (2.11.77), Education (5.11.77), Finance & Staff (17.11.77, 15.12.77), Interference (18.11.77), VHF Contests (24.11.77), VHF (12.11.77, 10.12.77), Telecommunications Liaison (8.12.77).

A recommendation that Mr L. N. G. Hawkyard, G5HD, be appointed exhibition organizer for the RSGB Amateur Radio Exhibition at Alexandra Palace this year was approved.

Morse tests in GI

Mr McGonigle expressed concern over the lack of facilities for taking the morse test in Northern Ireland. Mr Stevens replied that this matter had been in the hands of the Home Office for six months.

IARU Region 1 conference, Hungary 1978

Mr Stevens raised the question of representation at this year's conference. He stated that Mr P. Gowen, G3IOR, who was an Oscar specialist, had offered to pay half his expenses, and it was agreed that this offer be accepted.

WARC 79

Mr Stevens reported on a recent visit to the Home Office by the President, the general manager and himself regarding the final UK proposals for WARC 79.

Dates of 1978 Council meetings

The following dates were agreed: 18 March, 4 May, 22 July, 22 September, 11 November and 16 December.

obituaries

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

Mr D. J. Barrow, G3YLQ
David Barrow died on 3 December 1977, aged 26. Unmarried, his life centred around radio, rtty and electronics, and he had made many friends in the RSGB.

Mr H. Beaumont, G5YV
Harold Beaumont died on 13 March. His work on 144MHz made him almost a legend, and he was also well known for his early work on meteor scatter.

Mr F. Bradley, G3EQR
Frank Bradley, who died on 21 March, aged 78, was licensed just after the war, and had been a member of the RSGB since 1950. He was mainly active on 3·5MHz and 14MHz.

Mr P. Brockhurst, A9149
Phil Brockhurst died in an accident on 8 March, aged 18. He was in the RAF as an air communications fitter, and recently showed a keen interest in the 144MHz and 432MHz bands. He had also planned to take the RAE.

Mr F. George, G5FG
Fred George died on 13 March, aged 79. He had held a licence since 1927 and was active on cw and phone. He had been a member of Edgware RS for many years, taking part in field days and contests, and was one of the operators when Edgware won the NFD.

Mr L. W. C. Hagger, G6BO
"Bo" Hagger, who died on 20 March aged 79, was a "lifelong" amateur and was still operating on 2 March.

Mr J. S. K. Hitchins, G4FGN
John Hitchins died on 26 March, after an illness which he faced with courage over a period of nine months. He had been a member of the Grafton Radio Society for nine years, and was its president, having previously served as a chairman from 1974 to 1977. His main activity was on the 3·5, 14 and 144MHz bands.

A strong supporter of the RSGB, John worked at RSGB HQ during 1976 and 1977, and the success of the RSGB exhibitions at Alexandra Palace in those years was a tribute to his organizing ability and care for detail. The onset of his final illness deprived the Society of a loyal member and a popular member of its HQ staff.

Mr E. Ingleton, G5IL
Ernie Ingleton died on 26 March, in Cornwall. Originally from Gravesend, Kent, he was best known in pre-war days for his fine fist and ever-cheerful manner.

Mr J. E. Johnson, G2HR
Eric Johnson, who died on 7 March, had been active on 144MHz almost to the end, working the Silverthorn RC net with a hand-held rig on the Sunday before he died. He was first licensed in 1929, and was a founder member of the Silverthorn club. He had been the club's RAE instructor until 1976 and, at the time of his death, was the club's president.

Mr R. MacIntosh, G3XKM
Roy MacIntosh, who died on 12 March, was involved with all the activities of the Stourbridge & D ARS, and by his enthusiastic persuasion introduced many members, of all ages, to amateur radio.

Mr L. H. Pearson, G6LP
Laurie Pearson died early in March, aged 78. He was among the first holders of a transmitting licence in the city of Nottingham, and, as an enthusiast in the early days, took part in trial broadcasts from the Hague to Nottingham.

Mr W. G. Pitfield, G3EDG
Bill Pitfield, who died on 23 February, was a keen cw man. He made many friends throughout the world, and was a stalwart supporter of Brighton radio societies through all their ups and downs over the past 30 years.

Mr D. Rains, G6IC
Don Rains, who died on 15 January, aged 64, had been an amateur for over 40 years. Before the war he was VE1BM and VE2JB.

Mr A. A. W. Tetstall, G8LD
Arthur Tetstall died on 4 March, aged 64. First licensed in 1938, he was active in post-war years but allowed his licence to lapse in the late 'fifties. He renewed his licence in 1973, on his retirement, and was active on the hf bands and 144MHz. Latterly he operated mainly on 3·5MHz, where he maintained regular skeds with other stations.

We have also been advised of the death of:
Mr C. Edmundson, G4DLL, on 8 March.

your opinion

ANTENNA POLARIZATION

The Editor
Radio Communication

Sir—Newcomers to 144MHz often suggest that all stations should use the same antenna polarization, preferably vertical. Naturally, they are unaware of the controversy about this subject, especially in America, in the early days of the 144MHz band. This has recently been revived in *QST* with several guest editorials on the subject in the "World Above 50MHz" column of the magazine.

One of these (August 1977) was by Ed Tilton, W1HDQ, who devoted several months in the early days (1949) to attempting to sort out the merits of horizontal and vertical. Space does not permit his comments to be quoted in full, but he makes the following points:

"Like many important questions, this one had no pat answer, but there were important differences over the long run. In the presence of man-made noise, horizontal gave better signal-to-noise ratio than vertical.

"Horizontal was substantially better than vertical on some obstructed paths, a result that was never reversed except during periods of marked tropospheric bending, and then only at random times, which were in the minority.

"The biggest advantages of horizontal were turned up on short obstructed paths—just the kind of operating that makes up so much of the fm communicating today.

"One early repeater, where polarization tests were conducted carefully, in hilly terrain, had a much larger service area with horizontal antennas."

Evidently, vertical has nothing in its favour—except one very important fact—the simplicity of antennas providing omnidirectional coverage. No horizontally-polarized omni can compete in simplicity with a mobile whip or a base station vertical dipole or ground-plane. So much so, that, in spite of its inferiority, vertical polarization is in universal use for mobile communication, both amateur and commercial, and likely to remain so.

I am afraid that the requirements of dx work in ssb and cw are incompatible with those of local fm mobile operation. One compromise, suggested by K4MSG in the October 1977 *QST*, is to use circular polarization. This is very effective but the increase in complexity is almost as great as with two separate antennas. The only real answer is for some genius to invent a horizontally-polarized omnidirectional antenna which is as simple and inconspicuous as a vertical whip. Any offers?

A. H. B. Bower, G3COJ

"'Antenna Polarization on 144MHz", Tilton, *QST* January 1950, p15.

MAY RAE

The Editor
Radio Communication

Sir—May I, through your correspondence column, publicly thank the City & Guilds of London Institute for their courtesy and consideration in allowing Davies's College to become an emergency examination centre for the May RAE.

Due to the late distribution of the February *Radio Communication*, there were many students who were unaware of the official closing date. When this position was explained to the City & Guilds of London Institute, they made speedy arrangements to authorize this college to accept late entrants, and, thanks to the RSGB News Bulletin, several candidates were able to enter who would otherwise have had to wait until December.

On behalf of these candidates, and the Brighton & DRS in particular,

I should like to say how delighted we all were to see that rules can be bent, even in this age of ever-increasing bureaucracy.

R. Bellerby, G3ZYE
"Davies's", Hove

CB

The Editor
Radio Communication

Sir—At the RSGB VHF Convention I was handed a document—a copy of the winter 77–8 issue of *Talkthrough*, the news-sheet of the UK FM Group (Western). This makes several startling suggestions, which include the allocation of part of one of our existing bands to a citizens' radio service.

I have no fundamental argument with the cb lobby; believing that a service of that kind could, if properly managed, be of positive social benefit. I am extremely concerned, however, that there are those within our ranks who are unable to differentiate between the "technical self-training and investigation" aspects of amateur radio, and the low cost communication service that is cb. Any blurring of the distinction is likely to be very damaging to amateur radio.

C. Bartram, G4DGU

(See also, "Current Comment" in this issue—*Ed*)

SSB REPEATER PROPOSAL

Editor's note

Letters on this subject have been received from G8ART, G8BQX, G8GMC, G8GOV, G8ILO, all of them expressing opposition to the proposal. No letter in support has been received. In view of the wide cover given to letters on this subject in *4–2–70* this month, it is regretted that no further space can be allocated for it in "Your Opinion".

Mobile rallies calendar

14 May—East Suffolk Wireless Revival, The Hollies Sportsground, Bucklesham, near Ipswich (follow "ESWR" signposts from outskirts of Ipswich). Start 11am. Talk-in on R3, RB4 and S22 using GB3SWR (also on hf). Attractions include traders, transceiver performance tests (bring rigs for a thorough check), Viewdata/Ceefax/Oracle displays, constructors' competition, vhf/uhf antenna gain competition, bring and buy, plus events for all the family including childrens' entertainment. Refreshments available, including licensed bar, and plenty of parking space. Details from G8LBS.

21 May—Northern Mobile Rally, Victoria Park Hall, Keighley. Details from G8DFZ.

21 May—Welsh Amateur Mobile Rally, Barry Rugby Football Club, Cemetery Lane, Barry, South Glam. Details from GW3WBU, tel Penarth 702877.

28 May—Hull & DARS Mobile Rally, University of Hull, Cottingham Road. All the usual attractions. Details from sec G3WYW.

10 June—Scottish Amateur Radio Mobile Rally, The Palace of Art, Bellahouston Park, Glasgow. Details from GM4FDM.

11 June—Elvaston Castle Mobile rally, Elvaston Castle Country Park (five miles SE of Derby on the B5010), from 10am. Talk-in on 144MHz and 432MHz. All the usual attractions for the whole family including full catering facilities. Rally free, but local authority car parking fee of 25p. Further details from G4CTZ, QTHR.

18 June—Plymouth RC Mobile Rally, TAVR Centre, Lambhay Hill, The Hoe, Plymouth, Devon (near the Citadel). Details from G4EWZ.

18 June—RNARS Mobile Rally, HMS Mercury, Petersfield, Hants. Details from G4DIU, tel Havant 79464.

25 June—Longleat Mobile Rally, Longleat Park, Warminster, Wilts. Rally starts at 10am, and Dain Evans, PhD, BSc, FIM, G3RPE, RSGB President, will be in attendance. 144 and 3·5MHz talk-in stations will be operating. Prizes worth £150 to be won, plus a star prize of an HW202 144MHz transceiver kit, kindly donated by Heath (Glos) Ltd. All facilities of Longleat Park available to the family, with trade stands, and RSGB books available at rendezvous tent bookstall. Plenty of parking space adjacent to the new rally site, which is only a short walking distance from Longleat House. Details from G4FRG.

9 July—Upton Radio Rally. Details from M. Monro, G8DLL, 127 Monarch Drive, Worcester, tel Worcester 423276.

16 July—Hornsea ARS Mobile Rally, Hornsea School, Hornsea, North Humberside. Details from G8KFK.

23 July—Cornish Mobile Rally, Truro. Details from G3NKE, tel Camborne 712419.

23 July—Anglia Mobile Rally, Stanway School, Winstree Road, Colchester, 10am. Details from G4DKI, QTHR, tel Colchester (0206) 67512.

30 July—Scarborough RS Mobile Rally, Scarborough Technical College. Details from G3RTN.

6 August—RSGB National Mobile Rally, Woburn Abbey.

13 August—Derby Mobile Rally.

20 August—Preston ARS Mobile Rally, Walton-le-Dale County High School, Bamber Bridge, Preston (one mile from M6, junction 29). Talk-in on S22. Usual attractions including bring and buy stand. Plenty of free parking. Doors open at 11am. Details from G8KTM, QTHR.

27 August—Torbay Mobile Rally, venue to be arranged. Details from G3UIQ, tel Newton Abbot 3025.

10 September—Stalybridge Festival Mobile Rally, Cheetham Park, Stalybridge, Cheshire. To be held in conjunction with the Stalybridge 1978 Festival. Details from G8KQP, QTHR.

10 September—Telford Mobile Rally, Town Centre Malls, Telford, Salop (approached via A5 exit off M6, A442 from N and S, or M54 from W). Free admission and free parking for 5,000 cars. Jointly organized by Telford & D ARS and Salop ARS, the rally attractions will include trade stands, exhibitions, "flea market" for private sales, licensed bar, refreshments and toilets, club stands; and a free coach ride to Ironbridge Open Air Museum, the largest of its kind in Europe. Further details from G8DIR, tel Shrewsbury 64273, or G3UKV, QTHR.

17 September—Peterborough R&ES Mobile Rally, Walton School, Mountsteven Avenue, Peterborough. Details from G3EEL, QTHR, tel 65423/62881.

24 September—Harlow & DARS Mobile Rally, Netteswell Comprehensive School, Harlow. Details from G8FRG, 232 Pennymead, Harlow, tel 0279 32486.

1 October—Great Lumley Mobile Rally, Community Centre, Great Lumley, Tyne & Wear. Trade stands, etc. Details from G8JLQ, QTHR.

Special event stations

GB2FES, 20 May

Balshaw's High School Spring Fair, Church Road, Leyland. Operation will be mainly 3·5 and 14MHz ssb. QSL cards will be sent via the QSL Bureau, and swl reports will be QSLd in the same manner unless accompanied by an sae. Further information from G4BEE, QTHR.

Grimsthorpe Country Sports Fair, 28–29 May

Operating from Grimsthorpe Castle, Bourne, Lincs, on hf and vhf. A GB call has been applied for, and further details can be obtained from Bill Felton, G3XZF.

GB2BWS 30 May–3 June

Organized by Yeovil ARC and other RSGB groups in Region 20, the station will be operated from Stand 508, Road J, at the Royal Bath & West Show, Shepton Mallet, Somerset. Operation on all bands 3·5–28MHz, A1, A3J; 144MHz, A1, A3J, F3. Talk-in on S21 if required. Special QSL cards will be issued; QSL to G4GHI.

GB2FES, 3 June

From the Leyland Festival, Worden Lane, Leyland. Operational from approximately 9am until 9pm, on 3·5–28MHz, 144MHz a.m./cw/ssb/fm. Further information, and details of the festival, can be obtained from G4BEE, QTHR.

G2NM, 24–25 June

Chichester & DARC has organized a station to celebrate the 50th anniversary of Empire Broadcasting.

Looking ahead

11–14 July—Radio Receivers and Associated Systems Conference, Southampton University. Details from Peter Elliott, IERE, 99 Gower Street, London WC1E 6AZ.

15 July—BARTG Convention, Harpenden Public Hall, Harpenden, Herts.

17 September—IOW "get-together", Alverstone Manor. Details from G3KPO.

24 September—Welsh Amateur Radio Convention, Oakdale Community College, Blackwood, Gwent. Details from GW3KYA.

2–4 November—ARRA Exhibition, Granby Halls, Leicester.

contest news

21/28MHz Telephony Contest 1978 rules

Licensed amateurs and swls throughout the world are invited to take part in this contest for single-operator stations. As in previous years the contest is for a total of 12 hours and the scoring system is based on multipliers. Due to the improvement in conditions on the 21/28MHz bands, the committee has decided to increase the time available to British Isles entrants for submission of their logs. See Rule 7 below.

General.
A station whether fixed, portable, mobile or alternative address may be logged only once per band for the purpose of scoring.

Transmitting section.
1. The general rules for RSGB hf contests, published in the January 1978 issue of *Radio Communication*, will apply.
2. When. 0700 to 1900 on Sunday 15 October 1978.
3. Eligible entrants. Single-operator stations only, in two sections.
(a) British Isles section: RSGB members resident in the British Isles.
(b) Overseas section: Licensed amateurs in all parts of the world except the British Isles.
4. Contacts may be made using any telephony system for which the entrant is licensed on the 21 and 28MHz amateur bands. Stations may be contacted once on each band. Contacts between stations in the British Isles are not allowed. A contact shall consist of the RS report plus a progressive QSO number starting with 001.
5. Scoring: British Isles stations. Each completed contact shall score three points. The final score is the number of countries worked on 21MHz added to those worked on 28MHz and then multiplied by the total number of points. A country worked on both bands therefore scores two multipliers. For the purpose of scoring, the RSGB countries list will apply, with the exception that VE, VK, W/K/N, ZL and ZS call areas will count as separate countries.
Note. Different USA prefixes for the same district may not be counted more than once, eg W1, WA1, K1, N1 etc is a single-call area for the purpose of scoring.
6. Scoring: Overseas section. Each completed contact with a British Isles station will score three points. The final score is the number of British Isles prefixes worked on 21MHz added to those worked on 28MHz and multiplied by the total number of points. British Isles prefixes are: G2, G3, G4, G5, G6, G8, GD2, GD3, GD4, GD5, GD6, GD8, GI2, GI3, GI4, GI5, GI6, GI8, GJ2, GJ3, GJ4, GJ5, GJ6, GJ8, GM2, GM3, GM4, GM5, GM6, GM8, GU2, GU3, GU4, GU5, GU6, GU8, GW2, GW3, GW4, GW5, GW6, GW8. Contacts with GB stations do not score points or count as multipliers.
7. Entries should be sent to P. A. Miles, G3KDB, 28 Scotch Orchard, Lichfield, Staffs WS13 6DE, England. Entries must arrive no later than 4 December 1978 from overseas entrants, who are advised to submit their entries by air mail. British Isles entrants' logs must be received not later than 30 days following the date of the contest.
8. Logs. Separate logs for each band and a summary sheet for each band showing number of QSOs and list of multipliers claimed for that band.
9. Awards. The Whitworth Trophy will be awarded to the leading British Isles entrant overall, and for the first time the Powditch Trophy will be awarded to the leading British Isles entrant on 28MHz. Certificates will be awarded to the leading entrant in the Overseas section and to second and third stations in both sections.

Receiving section
1. The general rules for RSGB hf contests will apply, with special reference to Rule 6.
2. When. 0700 until 1900 on Sunday 15 October 1978.
3. Eligible entrants. The contest is open to all swls throughout the world.
4. Scoring. British Isles listeners may only log overseas stations working British Isles stations in the contest. Overseas listeners may only log British Isles stations in contact with overseas stations in the contest. For the purpose of scoring, the following applies:
(a). British Isles listeners. Each completed log entry will score three points. The final score is the number of countries heard on 21MHz added to those heard on 28MHz and multiplied by the total number of points. For the purpose of scoring, the RSGB countries list will apply, except that VE, VK, W/K/N, ZL and ZS call areas will count as separate countries (see note re USA in Rule 5 above).
(b). Overseas listeners. Each complete log entry will score three points. The final score is the number of British Isles prefixes heard on 21MHz added to those heard on 28MHz and multiplied by the total number of points.
5. Entries. As Rule 7 of the Transmitting section.
6. Logs. As Rule 8 of the Transmitting section.
7. Awards. The Metcalfe Trophy will be awarded to the leading British Isles entrant overall, and the Powditch Receiving Trophy will be awarded to the leading British Isles entrant on 28MHz. Certificates will be awarded to the leading overseas listener and to the runners-up in each section.

Summer 1·8MHz Contest rules

1. The general rules for RSGB hf contests, published in the January 1978 issue of *Radio Communication*, will apply.
2. When. 2000gmt Saturday 24 June to 0100gmt Sunday 25 June.
3. Eligible entrants. All radio amateurs licensed to use 1·8MHz. Multi-operator or single-operator entries will be accepted. There will be two sections.
(a) British Isles stations (single or multi-operator).
(b) Overseas stations (single or multi-operator).
4. Contacts. CW (A1) only in the 1·8-2MHz band. County code (three letters), as published in the January 1978 issue of *Radio Communication*, must be sent by all British Isles entrants after the report/serial number. Overseas entrants will only send report/serial number.
5. Scoring.
(a) British Isles stations. Three points for each contact, with a bonus of five points for the first contact with each new British Isles county, and for the first contact with each new country outside the British Isles.
(b) Overseas stations. Three points for each contact with a station in the British Isles (not EI), with a bonus of five points for the first contact with each new county.
6. Logs. Column 5 to be headed "Code received". The county code as sent must be shown on the top of each log sheet. Entries must be addressed to the RSGB HF Contests Committee, c/o C. A. P. Henderson, 76c The Avenue, Beckenham, Kent BR3 2ES.
7. Awards. The winner, second and third placed entrants in each section will receive a certificate of merit.

144MHz QRP Contest rules

0900 – 1700gmt, 30 July 1978

All entries and checklogs to: VHF Contests Committee, c/o Mr F. Mathews, G8ACJ, Easedale, Woodway, Merrow, Guildford, Surrey GU1 2TF.

The transmitter output power shall not exceed 1W cw or p.e.p. If transmitter power reduction is required, then brief details of how this was achieved must be given.

The following general rules, published in the January 1978 issue of *Radio Communication*, will apply: 1,2,3,4a,5a,6a,7a,8,9a,10a,11-2 2.

10GHz Cumulative Contest rules

0900-2000gmt 21 May, 25 June, 23 July, 27 August, 24 September.

All entries, checklogs and information sheets to: VHF Contests Committee, c/o Dr C. W. Suckling, G3WDG, Physical Chemistry Laboratory, South Parks Road, Oxford OX1 3QZ.

This contest will be a cumulative event, with three activity periods to count towards the final score. Entrants unable to be active for three periods are strongly encouraged to send in logs; these will be included in the table of results, but will not be eligible for an award.

During each activity period a station may change location once (see General Rule 5b). For the purposes of this contest, the "location" will be defined as any point within 5km of any fixed point, instead of the usual 1km, to allow stations to move around one site to avoid local obstructions. Contestants may start from a new location for each activity period.

The contest exchange shall be as defined in Rule 11, except that the location information shall be the QTH and an eight-character ngr, as defined on the OS 1:50,000 map; for international contacts the QTH locator may be given instead of the ngr. The ngr of each site used must be given on the contest cover sheet.

The information to be logged shall be as defined in Rule 12 (with ngr instead of QTH locator). In addition ALL UNSUCCESSFUL CONTACTS must also be logged.

Awards will be made to the winner, the runner-up, the leading fixed

station operating from his home QTH, and to the highest-placed station who has never won a certificate before in this contest.

Entrants are recommended to send details of their equipment (both microwave and talkback), including frequencies and modes in use, to the above address to arrive no later than the Friday nine days before each particular activity period. These details will be put together to form an information sheet, which will be sent before each event to those people who had included saes with their information.

Except where modified above, the following general rules for vhf/uhf/shf contests, published in the January 1978 issue of *Radio Communication*, will apply: 1.2,3,4b,5b,6a,7b,8,9b,10b,11-22.

Microwave Contest rules

1600-1600gmt 17-18 June

All entries, checklogs and information sheets to: VHF Contests Committee, c/o Dr C. W. Suckling, G3WDG, Physical Chemistry Laboratory, South Parks Road, Oxford OX1 3QZ.

This contest will encompass all the amateur bands 2·3-24GHz. Awards will be made to each band leader, and to the overall winner. Scoring will be at the rate of one point/km, with no band multipliers.

The contest exchange shall be as defined in Rule 11, except that the location information shall be the QTH and an eight-character ngr, as defined on the OS 1:50,000 map; for international contacts the QTH locator may be given instead of the ngr. If more than one site is used, the ngr of each must be given on the contest cover sheet.

The information to be logged shall be as defined in Rule 12 (with ngr instead of QTH locator). In addition, ALL UNSUCCESSFUL CONTACTS must also be logged.

Entrants are recommended to send details of their equipment (both microwave and talkback), including frequencies and modes in use, to the above address to arrive no later than 9 June. These details will be put together to form an information sheet which will be sent before the event to those people who had included saes with their information.

Except where modified above, the following general rules for vhf/uhf/shf contests, published in the January 1978 issue of *Radio Communication*, will apply: 1,2,3,4b,5b,6a,7b,8,9b,10a,11-22.

January 1978 70MHz CW Contest results

Despite the late publication of the rules, activity seems to have been fairly good during this event. Propagation conditions were generally reported as being poor, but did not prevent some long-distance contacts from being made, including the current "Real dx 1978" contact.

Congratulations to the winner, GU3HFN, and to the runner up, GM3WOJ/P, both of whom will receive certificates.

G3WDG

Posn	Callsign	Points	QSOs	Best dx	Km
1	GU3HFN	313	27	GM3WOJ/P	590
2	GM3WOJ/P	292	21	GU3HFN	590
3	G3UKV	249	35	GU3HFN	370
4	G3SPJ	141	37	GM3WOJ/P	485
5	G4ENB	130	32	GM3WOJ/P	401
6	G3BTO	121	33	GU3HFN	220
7	G3TCU	104	31	G3WCS	285
8	G5HD	102	20	G3JYP	410
9	G4BOX/P	97	17	GM3WOJ/P	370
10	G3LVP	91	21	GU3HFN	320
11	G3TWG	82	26	G3WCS	260
12	G3RDQ	77	19	GM3WOJ/P	454
13	G3UES	69	29	GU3HFN	262
14	G5UM	48	14	G3WCS	145
15	G4AGQ	25	13	G3LXP	70
16	GM3YOR	14	6	G3JYP	195
17	G3RYN	9	5	G3OHH	82

Erratum

In the results of the 432MHz-2·3GHz Contest, published in the January issue, the runner-up in the 1,296MHz Portable section was G4BRK, not G3BRK as listed.

1977 Verulam ARC Contest results

This contest showed a considerable increase in 144MHz activity, unfortunately the opposite was true of top-band. Perhaps the advice of one or two contestants to shift 1·8MHz to an evening contest will be considered.

The 144MHz transmitting entry was greater than that of 1976, but reports on the activity would suggest entries could have been even greater. Congratulations to the winner, G4FDX, for a tremendous effort. The 1·8MHz transmitting winner was G4AFS. In the receiving section, the winners were BRS15822 on 144MHz and S. D. Sharrard on 1·8MHz.

Contests calendar

21 May	DF Qualifying Event, Burton-on-Trent
21 May	Region Round-up SSB (Rules in March issue)
27-28 May	144MHz Portable (Rules in April issue)
3-4 June	HF NFD
17-18 June	Microwave (Rules in May issue)
18 June	DF Qualifying Event, Rugby
24-25 June	Summer 1·8MHz (Rules in May issue)
1-2 July	VHF NFD and SWL (Rules in April issue)
9 July	DF Qualifying Event, Coventry
16 July	3·5MHz FD
23 July	DF Qualifying Event, Dartford Heath
30 July	144MHz QRP (Rules in May issue)
6 August	DF Qualifying Event, South Manchester
13 August	70MHz Open and SWL
20 August	DF Qualifying Event, Slade
2-3 September	SSB FD
2-3 September	144MHz Open and SWL
10 September	RSGB Region 1 VHF
17 September	DF Final, Basingstoke
October-November	432MHz Cumulative
7-8 October	432/1,296/2,304MHz
14-15 October	21/28MHz SSB (Rules in May issue)
21-22 October	7MHz SSB
22 October	70MHz Fixed
4-5 November	7MHz CW
4-5 November	144MHz CW
11-12 November	2nd 1·8MHz
3 December	144MHz Fixed

Mr J. Bazley, G3HCT, executive vice-president, and chairman of the HF Contests Committee, (right) presenting the Founders Trophy to Mr Geoff Peck, BRS15402, at his home. Mr Peck, the former organizer of RSGB df contest, was unable to attend the 1977 AGM to receive the award because of ill-health

club news

RSGB affiliated societies and clubs, and RSGB groups, are invited to submit items for inclusion in "Club News" to their regional representatives (not direct to the editor).

Items of news and dates of forthcoming events should reach RRs by 19 May for the July issue.

Club secretaries are QTHR unless otherwise stated.

REGION 1—RR Wm. M. Furness, G3SMM, 16 Coniston Avenue, Sale, Cheshire M33 3GT.

Ainsdale (AARC)—Thursdays fortnightly, 18 May, 1, 15, 29 June Ainsdale Scout Headquarters. For details please contact G2CUZ.

Blackburn (East Lancs ARC)—First Thursday in each month. 7.30pm. YMCA. Blackburn. Sec G4DGR.

Blackpool (B&DARS)—First Monday in each month. Phone G5ND (Blackpool 64508) for details of venue.

Bolton (B&DARS)—Main meeting on first Wednesday in each month with informal meetings on third Wednesday, 8pm. Bolton Recreation Club, Kensington Place, Bolton. Sec G4FSN.

Bolton (Edbro Radio Club)—New club! Details from the sec c/o Edbro Ltd, Lever Street. Bolton.

Bury (BRS)—Main meeting on second Tuesday in each month. 9 May ("Microprocessor developments" by A. M. Lock Ltd), 13 June ("VHF df techniques" by G8BCG). Mosses Community Centre, Cecil Street, Bury. 28 June (Visit to police HQ radio room, and club supper). Club rig on the air, cw classes, construction projects, noggin and natter sessions. RAE course, in conjunction with Bury Technical College, starting in September. Hon sec E. Thirkell, G4FQE, tel Rochdale 32730.

Carlisle (C&DARS)—Mondays, 7.30pm. Currock House, Lediard Avenue, Currock, Carlisle. A very full programme of lectures and demonstrations has been arranged for the coming months. Full details from G8DVD.

Chester (C&DARS)—Tuesdays, 8pm, except for first Tuesday in the month. YMCA Chester. Further details from the ASR. G3PYU.

Douglas (IoMARS)—Mondays fortnightly. "Keppel Hotel". Cregny-Baa, Nr Onchan. Sec GD4FWQ, tel Douglas 22295.

Eccles (E&DARC)—Tuesdays, 8.30pm. "White Swan", Worsley Road, Swinton. Sec G4AEQ.

Lancaster University (UoLARS)—Wednesdays, 8pm. Furness College. Visitors are welcome, as are skeds on hf and 2m–club callsigns are G8DOU and G3ZBY. There are RAE and morse test classes. Enquiries to John Morris, G4ANB, Dept of Physics.

Leyland (LHARG)—Second Monday in each month, 7.30pm. "Rose & Crown", Ulnes Walton, Leyland. Details from G3XII.

Liverpool (L&DARS)—Tuesdays, 8pm. Conservative Association Rooms, Church Road, Wavertree. Sec G4EST.

Liverpool (North Liverpool RC)—For details of meetings please contact R. Porter, G3VXK, 11 Cranmore Avenue, Crosby, Liverpool L23 0QD; tel 051-928 1610.

Liverpool University (UoLARS)—Meetings each lunchtime. Visitors from the Polytechnic and other colleges most welcome. Club shack, Reilly Building. Club active on top to two, G3OUL/G8JUL. Sec Geoff Plucknett, G4FKA, UoL Guild of Undergraduates, 2 Bedford Street North, Liverpool L7 7BD.

Manchester (M&DARS)—Wednesdays, 7.30pm. 203 Droylsden Road, Newton Heath. Club call G3HOX is active on hf and vhf. Sec G8IYX.

Manchester (South Manchester RC)—12 May ("Getting started on 23cm" by Peter Taylor, G8BCG), 19 May (AGM), 26 May (Discussion evening, "What do members want in 1978-9?"), 2 June ("Sporadic E anomalous propagation" by Prof Martin Harrison, G3USF), 9 June (Talk by one of the winners of the homebrew competition), 16 June (Demonstration of receiver testing by Peter Torry, G3SMT), 23 June (Grand opening of new shack at the community centre), 30 June ("Notes on the design of a cathode ray oscillograph, and its use in an amateur station" by W. L. Seddon, G3VIW), 8pm, Sale Moor Community Centre, Norris Road, Sale. Further particulars of club activities from hon sec G3VIW, tel 061-973 3355. *Please note:* informal meetings are no longer held on Mondays at "Greeba", Baguley, due to the sale of the site.

Manchester University (MUARS)—Interested parties should contact G4AOS, QTHR.

Manchester (UMISTRS)—Every weekday, 12.15pm, and Wednesdays, 8pm. Morse classes held each lunchtime. The bar, UMIST Union. Prospective members please contact R. Napper, G4FXU, UMIST RS, c/o UMIST Union, PO Box 88, Sackville Street, Manchester. G3CXX/G8FOT is alive and active on all bands top to ten and two.

North Western Repeater Group—Informal meetings on the third Thursday in each month, 8pm, "Globe Club", Willows Lane, Accrington, Lancs. Details from sec G3RXH.

Ormskirk (OARC)—New club. Wednesdays at members' QTHs. For details contact G3SZV or sec G4GCB. Alternatively listen 145·000MHz fm/a.m. Wednesdays 1930–2030. Club interests: vhf/uhf, hf, rtty, contests, atv.

Preston (PARS)—Thursdays fortnightly commencing 12 January, 8pm. "Windsor Castle" (private room), St Paul's Square, Preston. Hon sec George Loades, G3PVD.

Salford (Dial House RS)—Wednesdays, 5.30–9.30pm. Dial House, 21 Chapel Street, Salford, Lancs. Net channel 145·25MHz fm–the club station G3WDH monitors this frequency every club night for any other station. Details from sec G8JCM, c/o M38 at above address.

Stockport (SRS)—Second and fourth Wednesdays in each month, 8pm. "Blossoms Hotel", Buxton Road, Stockport. 10 May ("Phase locked loops" by G3NUQ), 24 May (Natternight), 14 June ("Receiver test gear" by G3SMT). For details apply to hon sec G3FYE. New members and visitors always welcome.

Thornton Cleveleys (TCARS)—First and third Wednesdays in each month, 8pm; morse practise from 7.30pm. St John Ambulance Hall, Fleetwood Road North (next to "Gardner's Arms"), Thornton. Details from sec G8MKQ.

UK FM Group (Western)—Informal meetings first Thursday in each month, 8.30pm. "Legh Arms", Knutsford. Sec G3LEQ, tel Knutsford 4040.

Warrington (W&DARS)—Tuesdays, 7.45pm. Grappenhall Community Centre, Bellhouse Lane, Grappenhall, Warrington. Sec G3MMD, tel Lymm 3533.

Wigan (Douglas Valley ARS)—This recently formed club meets on the first and third Thursdays in each month. Shevington Conservative Club, Shevington, Wigan. Details from G8KKP, tel Wigan 56318.

Winsford (Mid-Cheshire ARC)—Wednesdays. Technical Activities Centre, rear of Verdin Building, Verdin Comprehensive School, Grange Lane, Winsford. RAE class 7pm to 8pm. Morse class every third Wednesday. Net nights 160m Mondays, 8pm; 2m (fm) Tuesdays, 8pm. Sec G8HAV.

Wirral (WARS)—First and third Wednesdays in each month, 7.45pm. Sports and Recreation Centre, Grange Road West, Claughton, Birkenhead. Sec G3DLF.

REGION 2—RR R. C. Andreang, G4CMT, 6 Beech Avenue, Bilton, Hull, Humberside.

Barnsley (B&DARS)—Fourth Friday in each month, 7.30pm. "King George Hotel", Peel Street, Barnsley. Sec G3LRP.

Bradford University (UBURS)—Thursdays, 7.30pm. N10, University Main Building, Richmond Road. Come and see the 2 metre station, G8IIW. Details from G8GOV.

Denby Dale (DD&DARS)—Wednesdays, 7.30pm. Pie Hall, Denby Dale. Sec G3FQH. Visitors always welcome.

Goole (G&DARS)—Fridays, 7.30pm (during school term only). Goole Grammar School. Details from chairman G3VBI.

Halifax (Northern Heights ARS)—7.45pm. "Peat Pitts Inn", Ogden, Halifax (four miles north of Halifax town hall). Sec G3MDW.

Harrogate (Harrogate & Knaresborough RS)—First Monday in each month, 7pm. College of Adult Education, Victoria Avenue, Harrogate. Sec J. Douglas, 15 Pannal Ash Drive, Harrogate HG2 0JA.

Hornsea (HARS)—Wednesdays, 8pm. Rear of "Victoria Hotel", Hornsea (facing Hornsea Mere). Sec G4CHH. Visitors always welcome.

Hull (H&DARS)—New venue. Fridays, 8pm. Community Centre, Fountain Road, Hull. Hon sec G3WYW.

Hull (HUR&ES)—Fridays, 1pm. Room 313B, Union Building. All amateurs invited. Enquiries to G4FVP.

Leeds (White Rose RR)—Wednesdays, 7.30pm. (Lectures start 8pm). Sec G4DZI.

Leeds (LUUARS)—Tuesdays, 8pm. Union Annexe (second floor), Woodhouse Lane. All new students welcome. Sec G4CNG, QTHR, or at "E" block, Lupton Flats, Alma Road, Leeds 6, during term.

Otley (OR&ES)—Tuesdays, 8pm. 14 Back of Court House Street, Otley. Sec G8DFZ.

Scarborough (SARS)—New night. Mondays, 7.30pm. Scarborough Technical College, Scalby Road, Scarborough. Sec G3RTN. Visitors always welcome.

Sheffield (ARS)—Third Monday in each month, 8pm. "Sheaf House Hotel".

Wakefield (W&DARS)—7.30pm. Ines Road School, Wakefield. Sec G3WWF.
York (YARS)—Fridays (except third in each month), 7.30pm. United Services Club Room, 61 Micklegate, York. All details from sec G3WVO. A visit to the Mansion House in York took place on 7 March. The club has been invited to put a "GB" station at the Great Yorkshire Show at Harrogate on 11, 12, 13 July, and the usual station at Tollerton Show in August. A Raynet group is in the process of being formed, and thoughts are being given to a 70cm repeater for York.

Note from RR2: If the above details are not correct, or your club/society has not been included, perhaps you might let me have details.

I would like to thank everyone in the region for their help during the last three years and, if required, I will serve for another period. It has been suggested that a regional meeting be held in September/October; perhaps secretaries will advise me of their views and suggestions for a possible venue?

REGION 3—RR H. S. Pinchin, G3VPE, 61 Cole Bank Road, Hall Green, Birmingham B28 8EZ.

Birmingham (Birmingham University RS)—Tuesdays during term, RAE classes fortnightly, 7pm. Students' Union. Sec G4CKK. Meetings followed by tour of real ale establishments. Club stations G3IUB and G8IUB.
Birmingham (Midland ARS)—23 May (Surplus sale), 20 June, 8pm. Room 110, University of Aston, Gosta Green, Birmingham. 6 June (Construction and club station), 7pm. Brasshouse Centre, off Broad Street, Birmingham. Sec G8BHE.
Birmingham (Slade RS)—Alternate Fridays, commencing 12 May, 8pm. The Committee Room, Church House, Erdington, Birmingham. Sec G4FGF.
Birmingham (South Birmingham RS)—Thursdays (HF night on the air), Fridays (Construction and morse classes), 7.30pm. 7 June ("GB3MH and GB3MS" by Alec Smith, G3MTI), 5 July (Surplus sale), 8pm. Hampstead House, Fairfax Road, West Heath, Birmingham B31 3QY. Sec G8KPA.
Bromsgrove (B&DARC)—12 May (HF NFD preparations), 27, 28, 29 May (On the air for "Birmingham postal zone award"), 3, 4 June (HF NFD, Signet Fields Farm), 9 June, 1, 2 July (VHF NFD), 1 July ("Sport for all" exhibition, Sanders Park), 8pm. Avoncraft Art Centre, Bromsgrove. Sec G4GBE.
Burton-on-Trent (BonT&DARS)—Wednesdays, 8pm. Stapenhill Institute, Main Street, Stapenhill, Burton-on-Trent. Sec G3ACR.
Cannock Chase (CCARS)—First Thursday in each month (Business meeting), other Thursdays (HF and vhf club stations, natternights, morse classes, talks etc), 9pm. Bridgtown Social Club, Walsall Road, Cannock. Sec G8MWE. Visitors welcome.
Coventry (CARS)—12 May (Night on the air), 19 May ("Radio in Japanese pow camps" by Tom Douglas, G3BA), 26 May (Natternight), 2 June (night on the air), 9 June (Treasure hunt), 16 June (VHF portable outing), 23 June (DF practice), 30 June (VHF NFD preparations), 7 July (Night on the air), 8pm. Baden Powell House, 121 St Nicholas Street, Radford, Coventry. Sec Dave Parker, G8OMB, 41 Brookdale Road, Nuneaton CV10 0BL.
Coventry Technical College (CTCARS)—Mondays and Thursdays, 7pm. Winfray Annexe of the college. Sec G8ISJ.
Coventry (University of Warwick ARS)—Wednesdays during term, 7pm. Cryfield Farm, University of Warwick. Talk-in on S20, or contact G4BXI or G4CDW, Hurst Flat 40, Cryfield Village, University of Warwick.
Dudley (DARC)—Second and fourth Tuesdays in each month, 7.45pm. Central Library, Dudley. Sec Norman Rock, 28 Conway Close, High Acres, Kingswinford, Brierley Hill DY6 8PT.
Hereford (HARS)—First and third Fridays in each month, 8pm. Civil Defence HQ, Gaol Street, Hereford. Sec G4CNY.
Lichfield (Chad RC)—Alternate Wednesdays, commencing 10 May, 8pm. The Naval Club, Burton Old Road, Lichfield. Sec G4ESK.
Mid-Warwickshire (MWARS)—First and third Mondays in each month, 8pm. 61 Emscote Road, Warwick. Sec G8CXL.
Redditch (RRC)—Second and fourth Thursdays in each month, 8pm. WRVS Centre, Salop Road, Redditch. Sec G3EVT.
Shrewsbury (Salop ARS)—Thursdays, 7.30pm. "Albert Hotel", Smithfield Road, Shrewsbury. Sec G3VZG. New members welcome.
Solihull (SARS)—16 May, 20 June, 7.30pm. The Manor House, High Street, Solihull. Sec G4AEJ.
Stoke-on-Trent (North Staffs ARS)—First and third Mondays in each month (Lectures, etc), other Mondays (Natternights, Raynet and club station G4BEM), 7.30pm. Harold Clowes Community Centre, off Dawlish Road, Bentilee, Stoke-on-Trent. Sec G8CMR. New members welcome.
Stoke-on-Trent (SonTARS)—Thursdays, 7.30pm. 2a Racecourse Road, Oakhill, Stoke-on-Trent. Sec G4CWN.
Stourbridge (StARS)—Informals on the first Tuesday in each month, 9pm. "Shrubbery Cottage" public house, Heath Lane, Oldswinford, Stourbridge. 15 May (Contest entry discussion and general chat), 5 June (Construction and morse evening), 19 June (Talk on digitals or integrated circuits), 3 July (Construction and morse evening), 7.45pm. Longlands School, Brook Street, Stourbridge. Sec G4CLX.
Stratford-upon-Avon (SuponA&DARC)—Every third Friday, commencing 12 May, 7.30pm. The Clubroom, Swimming Pool, Bridgefoot, Stratford. Sec G4EXR, tel Stratford 5638, weekends only. New members welcome.
Sutton Coldfield (SCRS)—Second and fourth Mondays in each month, 7.30pm. Central Youth HQ, Clifton Road, Sutton Coldfield. Sec G8KRW.
Tamworth (TARS)—Second and fourth Mondays in each month. Indoor Sports Centre, Corporation Street, Tamworth. Sec G4EUF. New members welcome.
Telford (T&DARS)—Wednesdays, 7.30pm. Phoenix Centre, Webb Crescent, Dawley. Sec G8MXS, tel Much Wenlock 357. Visitors welcome.
Walsall (WARC)—10 May (AGM), 17 May (Morse practice), 24 May ("Interference" by Alf Matthews, G3UNM), 31 May (Morse practice), 7 June (HF night on the air), 14 June (Morse practice), 21 June ("Early marine radio" by W. W. Humphries, G3IGK), 28 June (Morse practice), 5 July ("Modern power stations" by Lindsay Roberts, G8III), 8pm. Forest Community Centre, Forest School, Hawbush Road, Leamore, Walsall. Sec G8KML.
Willenhall (W&DARS)—Alternate Wednesdays. Morse classes available at the end of each meeting. "Three Crowns", Stafford Street, Willenhall. G3YHN xyl.
Wolverhampton (WARS)—15 May (Natternight), 22 May (HF night on the air), 29 May (No meeting), 5 June ("Digital logic" by Phil Cadman, G8HHK), 12 June (Natternight), 19 June ("Microwave ovens" by Dennis Rose, G3LUP), 3 July ("SSB above 432MHz" by Russ Steward, G8BHH), 10 July (Natternight), 8pm. "Neachells Cottage", Danscourt Road, Stockwell End, Tettenhall, Wolverhampton WV9 9PH. Sec G8EDG.
Worcester (W&DARC)—22 May (Open evening at the club shack, 224 Worcester Road, Droitwich); 29 May (Demonstration station at Kempsey carnival); 3, 4 June (HF NFD at Kempsey Common); 5 June ("World Administrative Radio Conference" by John Allaway, G3FKM, and John Bazley, G3HCT), 3 July (Magazine evening), 8pm. "Old Pheasant", New Street, Worcester. 9 July (Upton rally). Acting sec G3TQD.

REGION 4—RR T. Darn, G3FGY, 20 Mount Pleasant, Ripley, Derbys DE5 3HE.

Derby (D&DARS)—Wednesdays, 7.30pm. 119 Green Lane, Derby. Morse classes Tuesdays and Fridays, 7pm when arranged. The annual dinner on 4 March was attended by the RSGB President Dain Evans, G3RPE, past presidents G3FKM and G2CVV, and Council members G3BA and G3KQF.
Derby (NHARG)—Fridays, 7.30pm. Nunsfield House, Boulton Lane, Alvaston, Derby.
Grimsby (GARC)—First and third Thursdays in each month, 8pm. Alexandra Club, Cleethorpes.
Leicester (LRS)—Mondays, 7.30pm. Club House, Gilross Estate Cottage, off Groby Road, Leicester.
Mansfield (MARS)—First Friday in each month, 7.30pm. "New Inn", Westgate, Mansfield.
Matlock (Derwent Valley ARS)—First Monday in each month, 7.30pm. "The Royal Oak", Tansley, Nr Matlock. Guest speakers each month.
Melton Mowbray (MMARS)—19 May ("Oscar 7" by Pat Gowen, G3IOR, an RSGB tape/slide lecture), 7.30pm. 16 June (Visit to the computer control at Rutland Water, details later). St John Ambulance Hall, Ashfordby Hill, Melton Mowbray.
Nottingham (ARCON)—Thursdays, 7.30pm. Sherwood Community Centre, Mansfield Road, Nottingham.
Nottingham University (NURC)—Tuesdays. Contact R. Dixon, G4BVY, c/o Students' Union, Nottingham University.
Scunthorpe (SARC)—Tuesdays, 7.30pm. The Shack, Grange Farm Hobbies Centre, Franklin Crescent, Scunthorpe. It is regretted that, due to the lack of a suitable instructor, RAE classes have been discontinued. Visitors always welcome.

The Leicester Repeater is now in full operation. Meetings of the group are usually announced through GB3RS.

Leicestershire Raynet Group meets monthly at the County Hall, Glenfield. Further details from G8CAC.

Club visits: Zonal Manager, G3KQF, and Tom Darn, G3FGY, made several visits to clubs and groups in Region 4 during the winter months, and both are available for visits in the coming months. Write to G3FGY with a date for a proposed visit.

REGION 5—RR P. F. Chilcott, G4BBA, 258 Coneygree Road, Peterborough PE2 8LR.

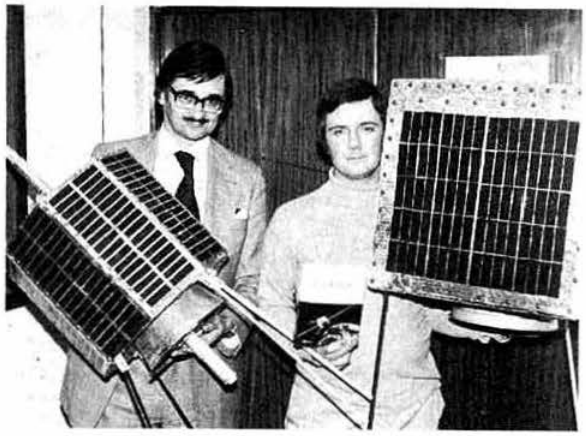
Bedford (B&DARC)—Wednesdays, 8pm. Ravensden. Sec G4FFC.
Cambridge (C&DARC)—Fridays, 7.30pm. Air Training HQ, Newmarket Road. Sec G4BAO.
Cambridge (CUWS)—Tuesdays fortnightly during full term. Details from sec G8KTJ, Queens' College.
Corby (CARG)—New name! New QTH! Fridays, 7.30pm. Hightrees Scout Centre, The Nook, Corby. Sec G8MLA.
Dunstable (DDRC)—Fridays, 8pm. Chews House, 77 High Street South. Sec G3HJF.
March (M&DRAS)—Tuesdays, 7.30pm. 2 Grays Lane. Sec G8GNE.
Northampton (NRC)—Thursdays, 8pm. Kingsthorpe Community Centre, Thornton Park, Kingsthorpe. Sec G8LHR.
Peterborough (GPARC)—25 May ("Telex and rtty" by Derek Close), 22 June (Homebrew rig night), 7.30pm. Southfields Junior School. Sec G4FDF. The AGM elected George Sewell chairman and Derek Hodge, G4FFS, treasurer.
Peterborough (PR&ES)—Third Friday in each month, 7.30pm. Scout Hut, Occupation Road. Sec G3EEL.
Shefford (S&DARS)—Thursdays, 8pm. Church Hall. Sec. G8HHO.

REGION 6—RR F. S. G. Rose, 84 Cock Lane, High Wycombe, Bucks HP13 7EA.

Banbury (BARS)—First Friday in each month, 7.30pm. The General Foods Sports and Social Club, Spriceball Park, Banbury. Sec S. L. Terry, G8OCT, tel Banbury 4769.
Bracknell (BARC)—Mondays, 8pm, Coopers Hill Centre (adjacent to station). For meeting details please contact sec D. Williams, G4CVN, tel Windsor 56096.
Burnham Beeches (BBRC)—First Monday in each month, 8pm. Hedgerly Scout HQ. Sec Peter Flynn, tel Farnham Common 2609.
High Wycombe (Chiltern ARC)—8pm. 42 Castle Street, High Wycombe. Sec G4FRL, tel Kingston Blount 52006.
Maidenhead (M&DARS)—7.30pm. Red Cross Hall, The Crescent, Maidenhead. Sec Mike Adams, G3ZLQ, tel Bourne End 21684 (work hours).
Milton Keynes (MKARS)—8 May (Film slides by G8GHZ: followed by a debate on repeaters), Lavat Hall, Silver Street, Newport Pagnell. For time details contact sec F. Walters, tel Shenley Church End 310.
Newbury (N&DARS)—Second Tuesday in each month. Newbury College of Further Education. Sec Merton Vaslet, G8LTD, tel Newbury 46078.
Oxford (O&DARS)—Second and fourth Wednesdays in each month, 7.30pm. Civil Service Sports Club, Marston Road, Oxford. Sec G4BHR.
Oxford University (OURS)—Please contact sec M. Evans, G8LTE, Worcester College, Oxford, for meeting details.
Reading (RARC)—Details from sec Chris Young, G4CCC.

REGION 7—RR N. A. Smith, G3HFO, 7 The Byeways, Surbiton, Surrey KT5 8HT.

Addiscombe (AARC)—Tuesdays, 9pm. "Spreadeagle", Portland Road, South Norwood. Sec G3SJX.
Ashford (Echelford ARS)—Second Monday and last Thursday in each month, 7.30 for 8pm. The Hall, St Martin's Court, Kingston Crescent, Ashford, Middx. Sec G3TDR, tel Staines 56513.
Bexley Heath (North Kent RS)—Second and fourth Thursdays in each month, 8pm, St Mary's Institute, 2 North Cray Road, Bexley. Sec G4ARQ.
Coulsdon (CATS)—First Thursday in each month, 7.30 for 8pm, 10th Purley Scout Hall, Chipstead Valley Road (opposite Rickman Hill). Third Monday in each month, 7.30 for 8pm. 1st Purley Scout Hall, Purley Park Road, Purley. Sec G8KDQ.
Cray Valley (CVRS)—First and third Thursdays in each month, 8pm. Christchurch Centre, High Street, Eltham, London SE9. Sec G4FUG.
Croydon (Surrey Radio Contact Club)—First and third Wednesdays in each month, 7.30 for 8pm. TS "Terra Nova", 34 The Waldrons, Croydon. Sec G3FWR, tel 01-657 3258.



Just two days after the launch of Oscar 8, Richard Limebear, G3RWL, the communications officer of AMSAT-UK, presented a lecture and practical demonstration at the March meeting of the Thames Valley ARS. He showed full-scale models of Oscars 6, 7 and 8, described the technical background, and gave practical instruction on the accessing of Oscar satellites. During the meeting, Oscar 8 passed overhead and a satisfactory demonstration of down-link was mounted. G3RWL is shown here, right, with Victor Brand, chairman of TVARS

Crystal Palace (CP&DRS)—Third Saturday in each month, 8pm. Emmanuel Church Hall, Barry Road, East Dulwich. Sec G3FZL, tel 699 6940.
Guildford (G&DRS)—Second and fourth Fridays in each month. Model Engineers HQ, Stoke Park, Guildford. Sec G4BHQ, tel Guildford 76375.
Guildford (University of Surrey E&ARS)—Informal meetings, lunchtimes during term. Lower Bar, Union House. G8AHK is active on vhf, and G3IGQ on hf. Skeds and QSOs always welcome. Sec G8MLO tel Guildford 71281.
Kingston (K&DARS)—Second Wednesday in each month, 8.15pm. Berrylands Scouts and Guides HQ, Stirling Walk, Raeburn Avenue, Surbiton. Sec G4APG, tel 399 8113.
New Cross (Clifton ARS)—Fridays, 8pm. 225 New Cross Road, London SE14. Details from R. A. Hinton, 42 Sutcliffe Road, Welling.
Reigate (RATS)—16 May ("Microwaves" by D. Hayter), 20 June ("Simple circuits" by J. Longhurst, G3VLH), 8pm. Constitutional Centre, Warwick Road, Redhill. First Tuesday in each month (Natternight), 8pm. "Marquis of Granby", Hooley Lane, Redhill. Sec G3XSZ.
Sutton and Cheam (S&CRS)—18 May (Inter-club quiz), 22 June. Sutton College of Liberal Arts. Sec G2DMR.
Thames Ditton (Thames Valley ARTS)—First Tuesday in each month. Giggs Hill Green Library, Giggs Hill Road, Thames Ditton. Sec G3ZNW.
Wimbledon (W&DRS)—Second and last Fridays in each month, 8pm. 12 May ("Starting with Oscar" by R. Broadbent, G3AAJ), 26 May (G3WIM activity night). St John Ambulance HQ, 124, Kingston Road, Wimbledon SW19. Sec G3XTC, tel 01-644 3698. Visitors welcome.

REGION 8—RR D. N. T. Williams, G3MDO, "Seletar", New House Lane, Thanington, Canterbury, Kent.

Brighton (B&DRS)—8pm, prompt. Catholic Church Hall, Bristol Road, Brighton. Details from N. Hewitt, G8JFT.
Burgess Hill (Mid-Sussex ARS)—7.45pm. Marle Place, Burgess Hill. Details of future events from G3PEQ.
Canterbury (East Kent RS)—Details of future events from sec G8GHH.
Chichester (C&DARC)—First Tuesday and third Thursday in each month. Lancastrian Boys School. Details from G4ETU, tel 0243 88069.
Crawley (CARC)—United Reform Church Hall, Ifield, Crawley. Details from G3MGL.

The St Dunstan's ARS held its AGM and luncheon at St Dunstan's Ian Fraser House, Ovingdean, Brighton, on 4 February, during which the first presentation was made of the G3MOW Memorial Trophy

Wally Wardrop, G3MOW, of Bromley, Kent, was a well-loved and respected radio amateur in the UK and overseas. Wally went silent key on 28 December 1976 after a long and gallant fight against ill health, and his many friends decided to sponsor a trophy in his memory. Two of the main sponsors were F6CYL and ZS6AKG, and the magnificent cup, made in South Africa, carries the inscription:

"'Gentle Man of the Air'. Floating Memorial Trophy In Memory of Silent Key Wally Wardrop, G3MOW. Presented by St Dunstan's Amateur Radio Society for outstanding service".

The trophy was given to St Dunstan's ARS, who decided to award it each year for outstanding service. The winner also receives a suitably engraved shield showing St Dunstan's badge. The trophy will remain on show at Ian Fraser House.

By secret ballot, the society awarded the trophy this year to Ted John, G3SEJ, founder secretary/treasurer of the society, who is here shown receiving the trophy and shield from Jack Dixon, G2HV, of the RNARS

A St Dunstan's photograph

Dartford (DHDFC)—Second Friday in each month. Scout House, Broomfield, Dartford. Details from Jeanette Maggs, 25 Leybridge Court, Eltham Road, Lee, London SE12.
Dover (South East Kent YMCA ARC)—Wednesdays. Details from G8KEN.
Eastbourne (Southdown ARS)—7 May (Annual junk sale), 13, 14 May (SARS members will entertain 32 members of the Radio Club de Normandie, the itinerary including a visit to Kings Standing Radio Station, BBC European Service). Further details of activities from sec G8CVV, or pro G3LFZ.
Hastings (HERC)/(ITT(H)S&AC)—Details of future events of both units from G8DNO.
Horsham (HARC)—First Wednesday in each month. Civil Defence HQ, Moons Lane, Brighton Road, Horsham. Details of future events from G3NPF.
Maidstone (MYMCAARS)—First and third Fridays in each month devoted to the beginner, RAE and morse tuition, 7.30pm. Alternate Fridays, a wide range of lectures and use of the club shack. Details from G8KMX, tel Maidstone 61792.
Medway (MARTS)—Details of events and venue from G4EVY.
Tunbridge Wells (West Kent ARS)—12 May ("The hissing phenomena" by Ron Ham), 26 May (HF and VHF NFD arrangements), 9 June ("PO communications" by G8DET), 23 June ("Using and understanding logic"). Adult Education Centre, Monson Road, Tunbridge Wells. Informal meetings alternate Tuesdays commencing 16 May, to include chat, morse practice and technical advice to beginners. Drill Hall, Victoria Road. Further details from G4DYF.
Worthing (W&DARC)—Tuesdays, 8pm. Adult Education Centre, Union Place, Worthing. Details from G8MSQ.
Kent Repeater Group—Details of membership from G3XDV, 5 Lambs Walk, Whitstable, Kent.
Sussex Repeater Group—Information from G8HVV.

REGION 9—RR H. W. Leonard, G4UZ, 4 Start Bay Park, Strete, Dartmouth TQ6 0RY.

Camborne (Cornish RAC)—1 June ("Some recent projects" by G3PPT), 6 July ("Mining" by Mike Cooper), 7.30pm. SWEB Clubroom, Pool, Camborne. Cornish net each weekday 10am on 3·715MHz, and on Sundays 11am on 3·692MHz. Details from H. Adcock, tel Cockwells 562. Visitors most welcome at club meetings.
Exeter (EARS)—Second Monday in each month, 7.30pm. Community Centre, St Davids Hill, Exeter. Details from G3HMY.
Newquay (N&DARS)—Alternate Wednesdays, 7.45pm. Treviglas School, Newquay. Details from G8GOR, tel Newquay 4168.

Members of the Exeter ARS set up a complete station, G4ARE/A, at the Exmouth Rotary Club Hobbies Exhibition at the Exmouth Pavillion from 13 to 16 March, and showed rtty, an hf all-bands station (TS520 into trap dipole), 144MHz ssb and fm, closed ciruit plus broadcast tv, and an swl station. Seen here (l to r) are Ted Conway, swl; Malcolm Richards, G4APF, EARS chairman; Gordon Wheatcroft, G3HMY, EARS hon sec; and Alec Jeffries, G8GON

At a recent very successful dinner/dance held by Torbay ARS, Geoff Pascoe, G4ELZ, (l) received the construction cup from the TARS president, G2CWR, for his home-built electronic keyer of special design

North Devon (NDRC)—10 May ("DX working" by G8HW), Barnstaple; 24 May ("Electricity distribution" by G2FKO), Bideford; 14 June (Ragchew); 25 June (Proposed trip to Longleat Rally; names to G4CG); 28 June (Junk sale), Bideford. Full details from G4CG.
Plymouth (PRC)—Alternate Mondays commencing 17 April, 7.30pm. TAVR Building, Lambhay Hill, The Hoe, Plymouth, (near the Citadel). Details from G4EJO. Visitors most welcome.
Saltash (S&DARC)—First and third Fridays in each month, 7.30pm. Burraton Toc-H Hall, Saltash. Sec G8LLR, tel Plymouth 771135.
Torbay (TARS)—Fridays, with special meeting on last Saturday in each month, 7.30pm. Rear of 94 Belgrave Road, Torquay. Torbay net weekdays 3·756-3·764MHz, Mondays to Fridays 10.30am, Saturdays 9.30am. Full details from G3UIQ, tel Newton Abbot 3025. Visitors to club meetings most welcome.

REGION 10—RR R. G. Barrett, GW8HEZ, 23 Carshalton Road, Beddau, Pontypridd, Glam.

Barry (BCoERS)—Thursdays, 8pm. Barry Rugby Football Club, Reservoir Road, Barry. Details from sec S. N. Lloyd Hughes, GW8NVN, 1 Min y Mor, Barry.
Blackwood (BARS)—Fridays, 7pm. 12 May ("Practical construction" by GW8LJJ), 19 May ("New transceivers" by GW3NWS), 26 May ("The electron rules the waves" film), 30 June ("RAEN" by GW3MMU). Oakdale Community Centre, Oakdale, Blackwood, Gwent. Details from GW4BLE, 10 Llanthewy Road, Newport, Gwent.
Bridgend (Glamorgan VHF/UHF Group)—Second Wednesday in each month, 7.30pm. NCB Social Club, Tondu, Bridgend. Details from sec GW4BDV.
Cardiff (CRSGB)—8 May ("Receiver Design" by GW3RWX), 12 June ("Teaching electronics at A level" by GW4CJC), 7.30pm. "Pantmawr Inn", Pantmawr Estate, Cardiff. Details from sec GW3VOW.
Merthyr (Hoover ARS)—Mondays, 7.30pm. Hoover Social Club, Pentrebach, Merthyr. Details from GW3RNC.
Newport (NARC)—Mondays, 7pm. Adult Educational Settlement, Brynglas Road, Newport. Details from sec GW8MER.
Pembroke (PRSGBG)—Last Friday in each month, 7.30pm. Defensible Barracks, Pembroke Dock, Dyfed. Details from sec GW3XJQ.
Pontypool (PRSGBG)—Tuesdays, 7pm. Education Settlement, Park Hill Road, Pontypool. Details from GW3JBH.
Port Talbot (British Steel Corporation ARS)—Thursdays, 7.30pm. BSC Sports and Social Club, Margam. Details from GW4ESV.
Rhondda (RARS)—Every other Thursday, 7.20pm. Transport Employees' Club, Porth. Details from GW3PHH.
Sully (S&DSWC)—Mondays, fortnightly, 7pm. Sully Bowls and Social Club, 58 South Road, Sully. Details from sec GW8JHF.
Swansea (SARC)—Tuesdays fortnightly, 8pm. "Commercial Inn", Killay. Details from sec GW8CMA.
Swansea (University College of Swansea RS)—Mondays, 7.30pm. Room 801, Applied Science Building. Details from sec J. Morris, 1 Hadland Terrace, West Cross, Swansea, tel 68675.

REGION 11—RR P. H. Hudson, GW3IEQ, "Silhill", Dinas Dinlle, Caernarvon LL54 5TW.

Rhyl (R&DARC)—It is regretted that this club has been closed until further notice.
Conway Valley (CVARC)—Second Thursday in each month, 7.45pm. The Quarry Offices, Llanddulas.
Bangor (UCNWARS)—Thursdays, 7.30pm. Small lecture theatre, School of Engineering Science, Dean Street, Bangor.

REGION 12—RR F. Hall, GM8BZX, 45 Priory Cottages, Lunanhead, Forfar, Angus DD8 3NR.

Aberdeen (ARS)—Fridays, 7.30pm. Now at new premises, 80 Guild Street, Aberdeen (next to "Station Hotel" and immediately adjacent to railway station). President, Findlay Baxter, GM3VEY; committee, Wm. Mitchell, GM3FRI, Gordon Smith, GM4DSZ, Alan Milne, GM8LHP, (also vice president), Brian Bowman, and James McKinnon, GM4EKC. Sec GM4BKV.
Dundee (Kingsway Technical College ARC)—Wednesdays, 6.30pm. Kingsway Technical College. Programme details from sec GM4FLP.

DD3ZN, DK7ZQ, HB9BNC and OK1AWW were welcome temporary members of Dundee Kingsway Technical College RC while attending computer courses early this year, and are seen here with members of the club. Back row (l to r): GM4FSB, DK7ZQ, GM4DGC, DD3ZN, GM2CPC, OK1AWW; front row: GM8BOW, GM8BZX, GM4AQM, GM3GUI, HB9BNC, GM4CUZ and GM3YVX

Grampian Repeater Group—President GM3DWX, project manager GM3HAT, committee GM8CBQ and GM5BQA. Further information from sec GM8HGD.
Inverness (Technical College ARC)—Every second Wednesday, 6.45pm. Room C30. Sec W. Lee, 36 Old Mill Road, Inverness.
Lerwick (ARC)—Wednesday evenings. Annsbrae House. Sec GM3HTH.
Moray Firth (MFARS)—Committee has put club into mothballs due to lack of members. Details from sec GM8LHE.
Perth (P&DARG)—Wednesdays, 7pm. Perth Technical College. A formal proposal has now been submitted to the RSGB for a vhf repeater to be located near Perth. Project committee is GM8KPH, GM8JZY, GM4BVD, GM4AWA and GM3YEW. Details from sec GM4DQJ.

Area Representative, Highlands: Nominations have been received **It is also believed** that clubs meet at St Andrews University and Ferranti (Edinburgh), but no details are available.

REGION 13—RR A. B. Givens, GM3YOR, 41 Veronica Crescent, Kirkcaldy, Fife KY1 2LH.

Berwick upon Tweed (Border ARS)—First and third Fridays in each month, 7.30pm. Roxburgh Hotel, Berwick upon Tweed. Details from sec GM8IIO.
Dunfermline (DARS)—Second Wednesday in each month, 7.30pm. CCTV Studio, Pittencreiff School, Maitland Street, Dunfermline. Details from sec GM3MGX, tel Limekilns 313.
Edinburgh (E&DARC)—Tuesdays, 7.30pm. City Observatory, Calton Hill, Edinburgh. Details from sec GM8MJV, tel 031-663 2033.
Edinburgh (Leith Nautical College ARC)—First and third Thursdays in each month, 7.30pm. Leith Nautical College, Milton Road East, Edinburgh 15.
Edinburgh (Lothians RS)—Second and fourth Thursdays in each month, 7.30pm. Adult Education Centre, Riddles Court, High Street, Edinburgh. Details from sec GM4BYF, tel 031-447 3201.
Edinburgh (Heriot Watt University ARC)—Wednesdays, 2pm. Aerial Laboratory, Top Floor, Mountbatten Building, 31-35 Grassmarket, Edinburgh.
Glenrothes (G&DARC)—Third Sunday and every Wednesday in each month, 7.30pm. Old Nursery School Building, Provosts Land, Douglas Road, Leslie, Fife. Details from GM4BRM, 31 Church Street, Glenrothes, or GM3YOR, tel Kirkcaldy 200335.
It is also believed that clubs meet at St Andrews University and Ferranti (Edinburgh), but no details are available.

REGION 14—RR I. L. McKechnie, 41 Westerlea Drive, Bridge of Allan.

Ayr (AARG)—Every second Sunday evening commencing 8 January. Community Centre, 24 Wellington Square, Ayr. Details from sec GM3THI.
Glasgow (West of Scotland ARC)—Details from sec GM4FDM.
Greenock (G&DARC)—Tuesdays and Fridays, 7.30pm. 22 Inverkip Street, Greenock. Details from sec GM3LYI.
Motherwell (Mid-Lanark ARS)—Wrangholm Hall, Community Centre, Jerviston Street, Motherwell. Details from sec GM8FHK, tel Motherwell 66581.

REGION 15—RR H. J. Campbell, 26 Kilcoole Park, Belfast BT14 8LB.

Ballymena (BRC)—Tuesdays, 8pm (RAE and morse classes). 86 Old Cullybackey Road, Ballymena. Fridays (club night); Sundays, 3pm. (special projects). Sec GI8LSF.
Bangor (B&DARS)—First Friday in each month, 8pm. Redcliffe Hotel, Seacliff Road, Bangor. Sec GI4AAM.
Belfast (QUoBRC)—Tuesdays, 8pm. Queen's University Radio Club, 37 Fitzwilliam Street, Belfast.
Belfast (CoBYMCARC)—Saturday mornings in new premises, 4th Floor, YMCA, 12 Wellington Place, Belfast. Sec GI8MQR. New members welcome.
Belfast (BRSGBG)—Third Wednesday in each month, 8pm. 90 Belmont Road, Belfast. Varied winter programme. Details from GI8FOK.
Carrickfergus (CYMCARC)—Second Thursday in each month, 8pm. Carrickfergus YMCA. Sec GI4FUE. New members welcome.
Mid-Ulster RSGB Group—First Sunday in each month at QTH of GI4BAC. Always something interesting. Sec GI3WWY.
North Ulster (NURSGBG)—For details, contact GI3UHL.

REGION 16—RR*(Post vacant)*
Following information is latest received.

Bury St Edmunds—Second Monday in each month, 7.30pm. Details from J. Munro, 29 Angel Hill, Bury St Edmunds.
Chelmsford (CARS)—First Tuesday in each month, 7.30pm. Marconi College, Arbour Lane, Chelmsford. Details from R. Brocks, 30 Rowan Drive, Heybridge, Maldon.
Colchester (CRA)—Wednesdays, 7.30pm. 114 Ipswich Road, Colchester (above Candor Motors). Details from G3YAI.
Great Yarmouth (GYRS)—Last Thursday in each month. 67 Southdown Road, Great Yarmouth. Details from G3NHU.
Harlow (H&DRS)—Tuesdays, 8pm. Mark Hall Barn, First Avenue, Harlow. Details from G3WUX.
Ipswich (IRC)—Wednesdays fortnightly. Ranelagh Road School, Ipswich.
Loughton (L&DRS)—Loughton Hall, Rectory Lane, Loughton. Details of meetings from G8DZH, tel 01-508 3434.
Lowestoft (L&DARC)—Fridays, 7.30pm. Morse class every Tuesday. YMCA, Park Road, Lowestoft.
Martlesham (MRS)—First Wednesday in each month, 7.30pm. Details from M. Appleby, PO Research Centre, Martlesham, Ipswich.
Norwich (Norfolk ARC)—Wednesdays.
Norwich (U of East Anglia R&EC)—Details from G3IOR.
Southend (S&DRS)—Fortnightly, 8pm. Church Hall, Sir Walter Rayleigh Drive, Rayleigh, Essex. Contact sec G3YOA.
Stowmarket (SDARS)—First Monday in each month. Red Cross Hall, Stowmarket Railway Station. For details contact sec G8MYE.
Vange (VARS)—Thursdays, 8pm. Youth Hall, Barstable Tenants' Community Association, Long Riding, Basildon. Details from Mrs D. Thompson, 10 Feering Row, Basildon SS14 1TE.

Members of the Martlesham Radio Society and Ipswich Radio Club who were presented with the Surrey Trophy at the VHF Convention for winning the 1977 VHF Field Day. They are (l to r): G3ZNU, G4GBA, G3YWM, G4FSG, G3XDY, G4FZZ and G3YGY
Photo: G8MUF

REGION 17—RR L. Hawkyard, G5HD, 100 Shirley High Street, Southampton, Hants.

Basingstoke (BARC)—First Saturday and third Wednesday in each month, 7.30pm. Chineham House, Popley, Basingstoke. Sec G3CBU.
Basingstoke (UK FM Group Southern)—First Wednesday in each month. Chineham House, Popley, Basingstoke. Details from sec Mrs J. Payne, tel Aldershot 26108.
Bournemouth (Wessex ARG)—First and third Fridays in each month, 7.30pm. 19 May, ("Early days of wireless" by W. K. Alford, G2DX, and "Extracting cw signals from noise" by F. J. Charman, G6CJ), 2 June ("RSGB QSL Bureau" by A. O. Milne, G2MI), 16 June ("TV and radio interference" by a Post Office official). The Dolphin Hotel, (Club Room), Holdenhurst Road, Bournemouth. Sec G. Cole, G4EMN, tel Bournemouth 20027.
Chippenham (C&DARC)—Tuesdays, 7.30pm. Sheldon School, Hardenhuish Lane, Chippenham. Sec G8BXG.
Fareham (F&DARC)—Wednesdays, 7.30pm. Porchester Community Centre, Room 9. Sec D. Thompson, tel Fareham 2799.
Farnborough (F&DRS)—Second and fourth Wednesdays in each month, 7.30pm. Railway Enthusiasts' Club, Access Road, off Hawley Lane, Farnborough. Sec G3TMQ, 103 Hawley Lane, Farnborough.
Guernsey (GARS)—Tuesdays and Fridays, 8pm. Details from sec GU8ITE, PO Box 100, St Peter Port, Guernsey.
Horndean (H&DARC)—Second Thursday in each month, 7.30pm. Merchiston Hall, Horndean. Net Sundays, 6.30pm. 21·40MHz. Sec G4CHQ.
Jersey (JARS)—Sundays, 10.30am, and Fridays, 8pm. Le Hocq Tower, St Clement, Jersey. Sec Mary McTaggart, 19 Parade Road, St Helier.
Poole (PRAS)—Last Friday in each month, 7.30pm. Poole Technical College. Sec Graham Tizzard, tel Poole 4641 ext 34.
Portsmouth (P&DRC)—Wednesdays, 7.30pm. Portsmouth Community Centre, Malins Road, Buckland, Portsmouth. Sec G3CNO.
Salisbury (SR&ES)—Tuesdays, 7.30pm. Salisbury Activity Centre, Wilton Road. Sec G3FIX.
Southampton University (SUARC)—Tuesday evenings. Also informal meetings every lunchtime in the clubroom, Old Union Building. Sec D. Price, Chemistry Dept.
Southampton (SRSGBG)—First Monday in each month, Lanchester Building, Southampton University; Wednesdays, the clubroom, Kent Road; both at 7.30pm. AR G4COM.
South Dorset (SDRS)—7.30pm. Lecture Hall, South Dorset Technical College, Newstead Road, Weymouth. Details from G3YWG.
Swindon (SD&ARC)—Alternate Wednesdays, 7.45pm. Clubroom above "Coldharbour" public house, Blunsdon, just north of Swindon. Sec G8KWC.
Winchester (WARC)—First Friday and third Thursday in each month, 7.30pm. "Crown Hotel". Sec Chris Jackson, BRS39944, 69 Buriton Road, Harestock, Winchester.

REGION 18—RR *(Post vacant)*

Durham (DUARS)—Alternate Wednesdays during term. Physics Dept, Durham University. All local amateurs are welcome to join. Talk-in by G4DUR on R5 or S20 before all meetings.
Easington (EAR&EC)—Tuesdays and Thursdays, 7.30pm. Easington Village Workmen's Club. RAE and morse tuition if required (the club has a good RAE pass record). ATV can be received on 625 lines. The club is now equipped with an hf transceiver as well as other gear. Sec G4COI.
Great Lumley (GLAR&EC)—Alternate Wednesdays, 7.30pm. Great Lumley Community Centre. Sec G8JLQ. Assistance with RAE and morse if required.
Hartlepool (HRC)—Mondays, 7.30pm. Methodist Church Hall, Grange Road. Sec G3NWU.
Middlesbrough (Post Office ARC)—All amateurs welcome, but first contact sec G8CDP.
Middlesbrough (Teesside Repeater Group)—Last Tuesday in each month, 7.30pm. 196 Marton Road, Middlesbrough, Cleveland. All amateurs and SWLs invited but first contact sec G8MBK.
Morpeth (Northumbria RC)—Now meets Thursdays. British Legion premises, Gambois, near Blyth. Sec G4AVO.
Newcastle upon Tyne (Tyne & Wear Repeater Group)—First Wednesday in each month. Arts Common Room, University of Newcastle. Open to all amateurs and SWLs. Sec G4DOB, tel Newcastle 744444.
South Shields (SS&DRS)—Fridays, 7.30pm. Trinity House. Old and new members welcome. Sec G8BQF, 67 Lauderdale Avenue.
Tyneside (TRS)—Mondays, 8pm. The Community Centre, Vine Street, Wallsend. Sec Alex Frazer, 35 Percy Street, Tynemouth.

REGION 19—RR R. J. C. Broadbent, G3AAJ, 94 Herongate Road, Wanstead Park, London E12.

Acton Brentford Chiswick (ABCRS)—16 May (Members problems), 20 June (RAE syllabus changes for 1979), 7.30pm. Chiswick Trades and Social Club, 66 High Road, Chiswick. Sec G3GEH, tel 01-992 3778.
Barking (BR&ES)—Mondays (Construction), Wednesdays (CCTV techniques), Thursdays (Informal). Morse classes Tuesdays, 7.30pm. Westbury Recreation Centre, Westbury School, Ripple Road, Barking, Essex. Sec N. Dowsett, 44 St Anne's, Barking.
Cheshunt (CDRC)—New premises—Church Room, Church Lane, Wormley, Herts. Wednesdays, 8pm.
Chingford (Silverthorn RC)—Fridays, 7.30pm. Friday Hill House, Simmonds Lane, Chingford E4. Sec G4AJA, tel 01-529-2282. All visitors welcome.
Ealing (EDARS)—Tuesdays, 8pm. Northfield Community Centre, Northcroft Road, London NW13. Sec G8KPN, tel 01-997 5947. Newcomers and old-timers very welcome.
East London RSGB Group—21 May (Linear amplifiers), next meeting 17 September, 3pm. Wanstead House, The Green, London E11 (200yds from Wanstead underground station). Sec G4CJQ, QTHR. For meetings after September, the committee would like lecture suggestions; send these to G4CJQ.
Edgware (E&DRS)—Second and fourth Thursdays in each month, 8pm. Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware. Sec D. L. Lisney G3MNO, QTHR, tel 01-907 1237.
Harrow (RSH)—Fridays, 8-10pm. Roxeth Community Centre, Scott Crescent, West Harrow, Middx. 12 May ("Solid-state receivers" by G3TDR). Sec G4AUF, tel 01-868 5002. All new and old members welcome.

Alma Hipkin, BRS38657, has been a very active member of the Stevenage & D ARS for the past two years, and last year she was elected as the club's first chairwoman. With her husband, Peter, G8KMG, she is interested in touring around Britain, and G8KMG may often be heard working mobile on 144MHz ssb and fm. The photograph shows Alma near a memorial stone on the Isle of Wight commemorating Marconi's first cross-Channel radio transmission. Alma is currently studying hard for her RAE which she hopes to take this month

Havering (H&DARC)—Wednesdays, 8pm. British Legion Club, Western Road, Romford.
Holloway (Grafton RS)—7.30pm. Holloway Institute, Archway Annexe, Highgate Hill, London N19. Sec G3ZKE.
Ilford (IRSGBG)—Thursdays, 8pm. 50 Mortlake Road, Ilford. Sec G3LRE, tel 01-500 7196.
Northolt (British Airways European Division ARS)—First Monday in each month. Trident Club, Western Avenue, Northolt, Middlesex. This club is open to non-BA employees by invitation. Contact G3TLG for details. Civil Aviation Sunday net 1100–1200gmt on 3·68MHz, listen for G3NAF or G3BEA.
Shelburne (SRC)—Wednesdays, 7pm–9pm (Electronics for beginners); Thursdays, 7pm–9pm (Club evenings). Shelburne Youth Centre, Hornsey Road, London N4.
Southgate (SRC)—Second Thursday in each month, 7.45pm. May ("Kites and kite antennas" by Ray Marden, G3MWF), June ("Basic Logic" by John Young, G8ODR). The Scout Hut, Wilson Street, Winchmore Hill Green, London N21. Sec G8EWG, QTHR, tel 01-440 7353, publicity officer I. R. Selby, G4DRI, QTHR.
South Kensington (Baden Powell House Scout ARG)—Third Tuesday in each month, 8pm. Baden Powell House, Queensgate, South Kensington.
Stevenage (S&DARS)—18 May ("GB3LO" by G8IVC), 1 June ("Electronics in medicine" by G3AGP), 15 June ("DF receivers" by G4DDX), 8pm. Morse code practice for 30min before each meeting starts, ie 1930-2000. Hawker Siddeley Dynamics Ltd, staff canteen. Sec G8KMV. Everybody welcome.
St Albans (Verulam ARC)—25 May ("Electronic aids in gliding" by G3RPA), 22 June (Trade show by Amcomm Services; this is a joint meeting with Edgware & DRS). Market Hall, St Albans. Also second Thursday in each summer month. Salisbury Hall, London Colney. Sec B. Pickford, G4DUS, tel Rickmansworth 77616. Everyone welcome.
West Drayton (LT District Line ARC)—Hon sec G8MXX, 6 Shawfield Court, Church Road, West Drayton, Middx.

RR19 wishes to send greetings to all in Region 19, and hopes that he can be of assistance to members and clubs within the region.

REGION 20—RR G. Mather, G3GKA, 8 Hills Close, Keynsham, Bristol.

Bath (B&DRG)—Tuesdays, 8.30pm. The Crypt, Ascension Church, 35a Claude Avenue, Oldfield Park, Bath. Sec N. S. Cridland, Flat 3, 30 Paragon, Bath BA1 5LY.
Bristol (BARC)—Tuesdays, 7.30pm. The University Settlement, Barton Hill, Bristol 5. Sec G8GFZ.
Bristol (Shirehampton ARC)—Fridays, 7pm. Twyford House, Shirehampton. Sec G8KUM. HF and vhf station all modes, occasional lectures and films. RAE and morse classes in progress. New members welcome.
Bristol (BRSGBG)—22 May ("Further Developments on ssb at vhf" by Prof W. Gosling), 26 June (W. Scarr, G2WS, MA, FBIS, Zone D, member of RSGB Council), 7-9.30pm. Small Lecture Theatre, Queens Building, University Walk, Clifton, Bristol 8. Hon sec G4FRG.
Bristol (North Bristol ARC)—Fridays, 7pm. RAE instruction Wednesdays, 7pm. Lockleaze Community Association, Romney Avenue, Lockleaze, Bristol BS7. Hon sec G2BSU.
Cheltenham (CARA)—The Cheltenham Amateur Radio Association is derived from two long established clubs who have amalgamated—the Cheltenham ARS and the Cheltenham &DRSGBG. First Thursday and third Friday in each month, 8pm. The Old Bakery, Chester Walk, Cheltenham. Sec G3JJG.
Gloucester (GARS)—First and third Thursdays in each month, 7.30pm. Chequers Bridge Centre, Painswick Road, Gloucester. Hon sec G3MA.
Weston-super-Mare (WsMARS)—Second Friday in each month, 7.30pm. Room Lewis M2, Worle School, New Bristol Road, Worle. Sec G3PQE.
Yate (Y&DARC)—First Saturday in each month, 8pm. G3RQN QTH. All welcome, including SWLs. Local chat channel S24, 145·6MHz, 2100 Wednesday and Saturday. Further info from G8LGC.
Yeovil (YARS)—11 May ("Transmission line transformers" by G3KSK), 18 May (RSGB tape lecture "My Golden Jubilee Year" by G6CL), 25 May ("Digital ic packages" by G3XFW), 1 June ("Amateur radio research projects" by G3MYM), 8 June (RSGB tape lecture "An anthology of radio signals" by G2MI), 15 June ("Direct conversion receivers" by G4DEP), 29 June (RSGB tape and slide lecture "A history of radio" by Mr Bruce). Hut 101 Houndstone Camp (three miles west of Yeovil off A3088). Hon sec G3NOF. Info at main gate, S20 fm talk-in, club net 10.30am Sundays, 3·660MHz.

raynet

S.W. Law, G3PAZ *

The Raynet Committee met for the second session of 1978 on the first Saturday in April under its new chairman, G8CAC. Ex-chairman G3BPT remains as a committee member, where his long experience and present position as RSGB emergency communications manager are invaluable to the conduct of Raynet affairs. Satisfaction was expressed at the new registration figure of 149 since the last meeting, but some concern was noted over the re-registration figures, which only amounted to 306, there being some disturbing gaps in the ranks of our controllers. It cannot be emphasized too strongly that unless a controller holds a valid registration card both he and his group cease to have any official existence with the Raynet Committee and the RSGB.

In order to jog the memories of the persons concerned and, we trust, to rectify this lax state of affairs, we list the relevant callsigns without naming the groups affected. They are: G4FRG, G8BFT, G3UKQ, G8MBB, GD3YEO, G3VIJ, G3PQH, G8CKN, G3XUU, G3IOW, G4BLH, G4CZP, G4FXY, G8IYK, G8HNM, G8MWE, G3JMU, G3OWF, G3GDU, G3NCX, G8LJE, G3VAP, GM3EXX and GW3LXI. There are two omissions in the foregoing list, for reasons which the members concerned will appreciate. We trust that the controllers concerned will take the hint and re-register as soon as possible in order that our lists may speedily be put in order. To those who may have already complied by the publication date we offer our thanks, and we would once again point out that the above list is as of the date of the Raynet Committee meeting.

Repeater or talkthrough?
The question of the use of portable repeaters for Raynet use has been raised often of late but the Home Office is still considering the matter. There is, however, an alternative under consideration, namely that of trying for a talkthrough system for use in difficult terrain. We understand that some groups have been looking into the viability of such a system already, and it has been suggested that two /M units on high ground might well be employed with an "interface" as such a facility.

Naturally the regulations with regard to callsigns would require careful consideration, but the Raynet Committee is of the opinion that there is much scope for the development of the idea. Should the scheme become valid, the advantages to certain groups would appear to fully justify the use of such units where communication would otherwise be difficult if not impracticable.

General comment
One point further to the matter of full registration. Until the lists are complete the full information cannot be offered for inclusion in the BBC and ITV teletext service (Ceefax and Oracle), so it is up to the individuals concerned to assist the Raynet Committee in this matter.

As to Raynet participation in the symposium at Leicester (15 April) and the RSGB Exhibition at Alexandra Palace (5–6 May), reports will be given in this column in a later issue. Lectures have been given to a number of interested bodies to date and lecture material is circulating well (although we would appreciate it if some users could return the material a little more promptly after use, please!).

In NW London, the appointment of G3IMI has been confirmed, as have G4DDM (Mid-Thames), G8KHI (N Herts), G3YWT (organizer, Wilts) and several others. Somerset is re-forming, as is SE Hants, and Bedford is budding into three groups to provide a wider coverage. An enquiry has come from Scandinavia for details of Raynet in the UK, and a letter from Lerwick requests assistance for a proposed group to cover the Shetland Isles.

Some snags have appeared in connection with the Raynet installation at Guys Hospital, but we are sure that G3IIR and his helpers will have matters well in hand in the near future.

Hon Registrations Secretary: Mrs L A Crane, "Greta Woods", Bromley Road, Ardleigh, Colchester, Essex.

*130 Alexandra Road, Croydon, Surrey CR0 6EW

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of the RSGB. They must be submitted on the Members' Ads order form printed in alternate issues of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 75p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

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

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

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

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

Do not post to RSGB HQ or Advertising Representative

FOR SALE

Trio TS500, psu, remote vfo, transverter, power and rf sockets fitted, £175 ono. G3LVP, 24 Sunnymede Close, Thundersley, Benfleet, Essex. Tel Rayleigh 773105.

Trio 9R59D rx, good cond, cw, spare valves,etc, £50 ono. G3RRA. Tel 0252 42958.

Trio 2200G, mint, S0, S20, S22, R6, R7, nicads, etc, £115. GW3VOW, QTHR. Tel Cardiff 762759, after 6pm.

Pye base tx, a.m., fm, '640 in final, xtals for 145·000, 145·150, 145·260, matching transistor vfo, mic, manual, smart homebrew cabinet, £50. Pye U450L 70cm tx, high quality antenna relay, mic, manual, £25. G8JAN, QTHR. Tel Downham Market (Norfolk) 2857.

FT2 auto 8ch scanner tx/rx, 12 and 230V, S20 fitted to priority ch, 4 simplex and 4 repeater chs, fitted preamp, leads and manual supplied, 10W out, £100. G3XGZ, QTHR. Tel Wantage 4004.

TS520, boxed, £380. Dig/readout SB650, £70. Prescaler, £25. Multi 2, boxed, auto tb, £160. HM102 HM2102 pwr meters, £25 ea. 2m rf amp 80W out mobile, £50. 813s, 8019s (DET12s), mobile ants, etc. All ono. Sig/tracer IT12, £20. G3BKL, QTHR. Tel Salisbury 5383 day, Winterslow 862489, evening..

Two Liner 2s, and Heathkit BA1 rx, £210 the lot; will separate. G4DBS, QTHR. Tel 0522 28968.

Hallicrafters SR150 tx/rx, psu/spkr, 80 thru' 10, cw/ssb, manual, spare valves, £225. IC22A, vgc, auto xtal toneburst, S0, S20-24, R3-7, £130. Hy-Gain 14AVQ trap vertical, LC80Q loading coil, covers 80 to 10m, £25. Pair Pye Pocketphones, nicads, in case, £25. Avo 8 Mk2 multimeter, in carrying case, £40. 6in Rigonda tv, £25. SSM Europa transverter, all leads for FT101, £45. G3LXX, QTHR. Tel 0625 48526.

KW201 rx, manual, perf cond, £85. BC221Q with charts, £15. Buyers collect. Clinch, 29 Forster House, Whitefoot Lane, Bromley BR1 5SD.

Drake R4B, clean, good cond, £200. Yaesu FTV250, mint cond, £100. MMC 144/28 lo, £15. MMC 432/28 lo, £15. Bacon, G3ZSS, "Brackenridge", Brocton Heights, Stafford. Tel 0785 62780.

FT200B, FP200B, YD846 mic, Drake lp filter TV3300, all as new, less than 30h use, £230 the lot for quick sale. G3ISP, QTHR. Tel 0632 836222, after 8pm.

FT2FB 2m tx/rx 12ch, auto toneburst, psu, £130 ono. Buyer must collect. G8LWE. Tel Medway (Kent) 723798.

HW-101, plus set spare valves, exc, £175. Trio 7010 2m ssb rig, £105. Electroniques s/m dial, new, £3. Jaybeam h-duty couplers, £2.50 ea. KW traps, £4. 2m amp (fm), 2W input 25W o/p, £4. G3ZYL, QTHR. Tel Bracknell 22169.

Trio 7010, mint cond, additional xtal fitted for ABCD chs, £120. G3WMU. Tel Brighton 688105 day, 65704 evening.

New oil-filled mains transformers, 1185V-0-1185V 360mA, £11.50; used, £9. New vacuum variable 1000pF capacitors, £8.50. Mains stabilized psu, meter, adjustable, 9-18V dc 3A, £15.50. 250MHz divided by 10 prescaler, £12. Transformer, 500V-0-500V 250mA, £4.50. Carr extra, sae enquiries. G4DFE.

HW12A, factory built, psu (hb), exc cond, two new extra pa valves, £85. Shack clearance test equip, mains xtrs, paper caps, resistors, transistors, hosts of electronic parts, mostly new. SAE please. G3OIS, QTHR. Tel Kelshall 378.

FLDX400, £150. Codar AT5, ac psu, £25. Microwave Modules 5W a.m. tx, fm vfo, £30. RSL 2m fm tx with xtals, £20. RSL 2m fm pa, £15. RSL psu, £6. GU4EON, QTHR. Tel 0481 21591.

Honda generator E800E, 240V ac or 12V dc, 10h use only, immac, boxed, £140. Tel 01-485 2231, 9am-5pm.

Cossor 1039M oscillograph, £10. Leyland Audio oscillator, 0-20kHz, £10. Valve millivoltmeter, six ranges, £8. BC221 with psu and instruction book, £13. Must collect as gone blind. G3WBT, 27 Banklands, Workington, Cumbria.

Welson organ, two manual, plus bass pedal and accompaniments, exch for hf 160-10 tx/rx or will sell, £300. G4EJD, 125 Armshead Road, Werrington, Stoke-on Trent. Tel Ash Bank 3458.

AR88D, Pye base tx, BC348, Admiralty G73 wavemeter, hi-band Vanguard, Pye Cambridge, offers. *Wanted*: AR88D output transformer, Pye base cabinet, lo-band Vanguard, good communications rx, multiband tx. G3HVI, 46 Golborn Avenue, Meir Heath, Stoke-on-Trent, Staffs.

TR7200, virtually as new, incl mic and fittings, xtalled 144·48, 144·60, 145·32, £130 collected, or carr extra. G6CY, QTHR. Tel 0548 57424.

Farfisa Leader electronic organ, £150; Farfisa Gala Deluxe, with int Leslie spkr, £250; both two manual and vgc. G4FBJ, QTHR. Tel Clitheroe 24820.

Yaesu FT2FB mobile, 10W, fitted R5, R7, S0, S20, S21 S22, S23, 144·60, 144·48, manual, mount, mic, etc, £150 ono. Chris, 72a Benhill Avenue, Sutton. Tel 01-643 5960, evenings.

Quantity new valves; new Murphy and Winthronic Radio cassettes; digital Wien clock radio, vgc; multiband Worlstar portable radio, as new; Prinz-Sound new portable vhf/mw/sw, fine tuning; all bargains, offers. L.D. Ireland, Carnhell Green, Camborne, Cornwall. Tel Praze 236.

IC22S 80ch synthesized 2m rig, £160 ono. G8NDL. Tel 01-555 8898.

AR88, not wkg, £15. Buyer collects. GM3NIO, QTHR. Tel 031-664 7932, evenings.

TC101 wavemeter, vgc, six months old, £25. Electronic ignition Sparkrite, new, retails at £32, sell at £22. Sentinel MF 2m converter, £10. G8ESK, QTHR. Tel Bradford 45611.

TA33 Jr, 3-el, £40. Also, what offers for Mohican rx and several 813s and bases. G3NAU, QTHR. Tel 021-550 1256.

LM14 (BC221), comp with psu, charts, spare xtal, valves, circuit, £25. Balcom fm tx/rx FS1007P, 10W, 16ch scanner, xtal for 12ch t/b, R5 and R7, folded ground plane antenna, £125. G3OUX, QTHR. Tel Crawley 23890, after 5.30pm.

FR50B, 160-10m, calibrator; FL50B with vox; both in exc cond, with cartons, handbooks and connecting leads, £150. B. Kelly. Tel 0454 778191, evenings.

Standard C146A 2m walkie-talkie, 2W output, helical antenna, whip, nicads, charger, xtals, PL259 converter, leather case, manual, highest offer above £75. B44 4m tx/rx, tunable rx, tx 70·26, £9 ono. Enquiries invited. Tel Bristol 0272 615809, 6-7pm weekdays.

Gardner transformer, 240 in, sec 125V 0·5A, 28V 4A, £3. Transformer 240 in, 18V 4A, 6·3V 3A, 350-0-350 80mA. Exch Standard C828M with vfo, for 2200GX, comp, xtals, nicads, charger. Buyers collect, Birmingham area. G8KLI. Tel 021-472 4678.

Trio 820, digital, mint, to spec all respects, £640. Icom IC225 80ch phase locked 2m rig, £135. Datong filter FL1, almost new, £37. Genuine reason for sale. GW3GRY, QTHR. Tel 0492 56135.

Free to collector: dc psu, variable 200-500V, plus LTs equipment cabinet 19in type, 17½in tall, 11½in deep. Variac 250V/1A, panel mount, £6, incl p and p. Belling Lee 15A mains filter, £6 incl p and p. 2N3055, 25p ea. AUY10, 20p ea. B5F valveholders (silver plated contacts) for hf QRO rig, £1.20 ea. G4GCJ, QTHR.

KW Vespa 1, £55. Trio JR500 rx, £50. Hamgear 160m converter, £10. G3EGS, QTHR. Tel 021-472 2525.

Trio TR7010, mint, boxed, stabilized 12V psu, homebrew vfo for above, 8-el Jaybeam, £150 ono. G5NV, QTHR. Tel Sheffield 334514.

IC22A, 10ch, £125. 2m 10-el beam, £10. 2m 6-el beam, £4. 2m ground plane, £4. 2m high-Q break, £5. Three 15yd lengths UR67 coaxial, £3 ea. DM17 mic, £5. Portable mast, £5. G8BPK. Tel Rayleigh (0268) 747178.

TR7500, £180. 150W 2m pa, 12V dc, switched fm/ssb, £55. Lowe monitor rx, S20, R6, ac/dc psu £20. 70cm 12XY, £15. 70cm ASP colinear, £10. 2m 10XY, £13. 2m $\lambda/2$, mag mount, ASP, £8. Cragg. Tel Dunstable 600358.

Collins KWM2A tx/rx, noise blanker, notch filter, DX Engineering rf clipper; 312B-5 vfo/wattmeter/stn control; 351D2 mobile mount, MP-1 12V psu; PM2 psu; 516F heavy-duty psu; 51s-2 gen cov rx; carrying case KWM2; mobile mic, headset; offers. G4CHP. Tel Swainsthorpe 470365.

Racal transistorized triple-mix rx, four xtal filters, 1-30MHz, needs attention, £40. Heathkit 6MHz oscilloscope, unused, manual, £40. Japanese lcr bridge, new, £25. Racal digital frequency meter, nixies, needs rebuilding, £4. Solartron oscilloscope, no crt, £3. GEC mini oscilloscope, needs attention, £4. Buyers inspect, collect, weekends only. Several 50μA edgewise meters $\frac{1}{2}$in by $1\frac{3}{4}$in, left centre right zero, £2 ea, post free. Hayward, 10 Spring Woods, Longdown Lodge Estate, Sandhurst, Camberley, Surrey.

IC211E, as new, £450. FDK TM56B monitor rx, unmarked, 10ch, £50. 2m linear 80W out amp, perfect, £85. Cole. Tel Hornchurch 55733, or (work) 01-501 0025.

Eddystone EA12, £120. Teletype 33ASR, £50. G3EMU 8MHz vfo, homebrew 2m conv, Microwave Modules 2m preamp, 8-over-8 Yagi, 42ft UR67, £20. AR30 rotator, two alignment bearings, £30. BC221, swr bridge, 70cm, 18-el, Pye base tx. G8IZT, QTHR. Tel Ashford 56935.

Katsumi EK108A elec keyer, £25. Moseley 10-40m trap vertical ant, £17.50. SSM Z-match, atu, £17.50. Jap bug key, £7.50. Carr extra. *Wanted:* 36-turn counter mechanism for roller coaster inductor. G4EVG, QTHR. Tel 073 525 3562.

CT436 'scope, hb, vgc, recalibrated, £65. 80-10 hb 500W linear, 95 per cent comp, £25. *Wanted:* EC10. G3YGM, QTHR. Tel St Just (Cornwall) 788222.

Trio 2200GX, as new, nicads, helical, 8ch, R6, R7, rev R6, S0, S20, S21, S22, 144-48, £150. Free, GW8NPN, 15 Violet Grove, Rhyl, Clwyd, N Wales. Tel Rhyl 53201.

Transformers, mains i/p, sec 325V at 2·75A, 220V at 370mA, or 450V at 2·5A; unused b/w tubes type AW21-80 (8in); Pye Ranger, high band, boot mount, with cables, mic, spkr, etc; Gresham choke, 8H at 100mA, 3H at 550mA, 50Ω impedance; several 15MHz band xtals; write for further info on above items (sae), offers considered; would like a 2200GX or similar if possible. GW8MHL, 7 Trem Cymyran, Caergeiliog, Holyhead, Gwynedd.

Surveillance vhf rx, £40. RF tuner, £25. Tunable converter, 1GHz-2·6GHz, £25. 10 xtals 8·660MHz. 50p ea. Variable transformer 1kVA, £16.50. (BC221 tuning unit, calibration book, headphones, rf ammeter, B7G 500kHz xtals, £2.50 ea.) *Wanted:* SP-600, URR-35, rx. Wright. Tel Wigan 55948.

Storno CQL662 uhf fm mobile tx/rx, in vgc, with control box, harness, manual, antenna, toneburst, xtalled for RB4, RB6, SU8, RB10, RB14, 6W output, 12V operation, £105. G3KLF, QTHR. Tel Ipswich (0473) 310442, evenings or weekends.

IC240, latest, with hi/lo switch, comp with mic, mobile fittings, etc; plus Ringo Ranger ARX2 colinear antenna; £150 or will exch for modern hf rx or tx/rx. Fay, 5 Harland Way, Glebe, Washington, Tyne & Wear.

Component and equipment clearance: rxs, Marconi sig gen, vdu cases, ics, boards, etc, 70cm mobile tx/rx kit, ants, cassette deck, amplifier, instrument cabinets, components, old maps; sae for list. Time and space needed. G8IYK, 13 Hodge Bower, Ironbridge, Telford, Salop.

Icom IC202, vgc, with all accessories, £135. G3JHP, QTHR. Tel 01-684 2515, after 6pm.

KW109, £75; CDE rotator, £75; TA33 with Mustang driven element, £75; all under one year old. Spanish Linguaphone course records, guaranteed unused, £40. Prefer buyer inspects and collects, or carr at cost. GW3CBA, QTHR.

Mains transformer, with tapped secondary 170V to 200V at 180mA and 6·5V at 25A, vgc, £5. Buyer collects. GW8EQJ, QTHR.

5CP1 crt, unused, orig packing, £6. Two mains trans; one 350-0-350, 0-28-30-32V 0·5A, 5V 2A, 2x 6·3V 1A, 12·6V 6·4A; the other 350-0-350V 400mA, 12·6V ct 4A, 2V 0·5A; £2 ea. G3UYX. Tel Woodbridge 5284.

Heathkit audio a.m./fm tuner, model AFM1, 88-108MHz, 16-50, 200-550, 900-2,000m, £15; 9+9W stereo amp, 1ch needs attention, £15; or £25 for both. Buyer collects. G8GMI, QTHR.

KW2000E, immac cond, matching ac psu and spkr unit, little use since new July 1975, buyer collects, £275. Technical Associates audio compressor, £17. Technical Associates audio filter, 2·5kHz to 80Hz bandwidth, £18. G3UJK, QTHR. Tel 0494 25491.

Heathkit 0S2 'scope, manual, £14. Murphy Rover hi-band, £15. Multimitter tx, top-2-70, £12. Kleinschmidt rtty stn, comp with decoder reperf, needs attention, £40. 19in open 6ft rack, £5. Several mains txs, sae for list, yours for p and p. G8DKS, QTHR. Tel 0785 64366.

FRG7, perf, under guarantee, £140. Microwave Modules 144MHz converter to 28MHz, £15 ono. Brock. Tel Oxted 2141, evenings.

KW2000B, good cond, matching ac psu and spkr, manual, Shure 201 mic, spare valves, £205. Prefer buyer inspects and collects. GM4EBP, QTHR. Tel Kirkcudbright 30734.

Rig must shrink, selling: Eddystone 888A hf rx; KW Vespa hf ssb tx, 220W p.e.p., and spares; both exc cond, both have 160m; £80 ea ono. BC221, comp, £15 ono. *Wanted:* 2200G, nicads; or similar. P/exch preferred. Nick, G4FAL. Tel 01-946 9262 (Wimbledon).

Pye Bantam fm hand portable, wkg S20, S21, nicads, charger, manual, £65; possible exch for commercial hf tx/rx plus cash. Also compact homebrew solid-state 30W 2m fm tx, 10ch, vfo, toneburst, £35 ono. G8JSK. Tel 053-871 305.

Eight-pole ssb xtal filter 5·2MHz, 2·35kHz bw, QCI246AB, £6. RS 1mA panel meter with 5in mirror scale. Mark Spurgeon, 72 Kidbrooke Grove, London SE3 0LG. Tel 01-858 5831.

HR0 mx, five coils, bs, 160, 80, 40, 20, gc 14 to 30, £15; 1475 with psu, £12, seen wkg. Buyer collects or pays carr. G3YRB, QTHR. Tel 01-684 3974.

TR-7010 2m ssb and cw tx/rx, 8W output, spotless cond, electrically perfect, all accessories incl mobile mount, £140. G5NN, QTHR.

Yaesu FT2 auto 2m fm tx/rx, auto scan, ac/dc, 8ch, £120 ono. Telford TC9 tx, tb, £65. TW Two mobile tx/rx, 12V, a.m., £30. Pye Reporter rx, tunable tx on 2 (a.m.), £12. G8GAZ, c/o G8HEB, QTHR. Tel 021-357 1924.

Trio TS700, fitted mosfet preamp, auto toneburst, comp with manual, all leads, orig box, exc cond, can demonstrate, £310 ono. Adrian Green, G3UZF, QTHR. Tel Rickmansworth 71211 (work), Luton 424696 (home).

Cossor db 'scope, buyer collects (heavy), £10. Pye Cambridge, low band, £10. 14in reel, $\frac{1}{4}$in rcdg tape, £10. Telequipment db 'scope D53, £50. Valves; xtals; sae list; set FT243, £1 ea. Your frequency choice Marconi wave analyser, £20. APT stab psu, 0·5A 6-30V, £10. Tel 0908 313379, evenings.

Codar AT5, homebrew psu, vgc, £30 ono. David Craig. Tel 01-647 8539, evenings and weekends.

Solartron CD566 'scope, recently serviced, £25. Buyer collects. G3BJB, QTHR. Tel Malvern 3946.

Mullard crt (new) D14/121/GH, 50MHz, Y4·2, X15·5 V/cm Mu shield, matching new 'scope case (Bradley), eht transformer, doubler, rotation coil, plugs etc; replacement tube: Bradley 200, 0S3000, Solartron A100, ideal for high quality 'scope; many extras, £65. Tel 01-274 9511, after 6pm.

FDK Quartz 16, fitted R3 to R7, 145, S20 to S23, four months old, little used, boxed, all accessories, manual, reasonable offers over £130. G3FWU, QTHR. Tel 0634 35261, evenings.

Heathkit V7A valve voltmeter, 240V, 309 cu/rf probe, perfect, (same as SM5218 assembled at £80), £38. Cushcraft AR2 Ringo 2m $\lambda/2$ vertical antenna, little use, £10. G5FH, QTHR. Tel Highcliffe 5974, evenings.

Marconi TF867 sig gen, £60. Pair Pye Pocketfones, rx insensitive (10μV), xtalled RB10, spare nicads, £20. Xtals for PFI for SU20, £4. G8JBJ. Tel Chelmsford 440787.

FT221R, new October'77 (D suffix), SP120 matching spkr, £300. GM4DHJ, QTHR. Tel 041-889 9010.

HW101, psu, cw filter, spkr, mic, spare 6146Bs, other valves, handbook, £185. KW201 ssb a.m. rx, amateur bands only 160-10m, £85. Eagle swr meter, £10. G4EWG, QTHR. Tel Constantine 588.

Tower triangular lattice, 35ft in $3\frac{1}{2}$ 10ft sections, galvanized finish, strong construction, £50. Buyer collects or arranges transport. G4DCG, QTHR. Tel 0524 51000.

KW2000A, ac psu, plus KW107, £200. G-whip with coils, £15. SWR bridge, £10. All vgc. G4CKN, QTHR. Tel Dave, 01-790 3123, evenings.

Heathkit HW17 2m tx/rx, xtal tx, tunable rx, a.m. convertible fm, £35 ono. Pocketfones, two tx/rx pairs, xtalled 70cm, £14 ono per pair. Unica UR1A fet hf comms rx, 0·55-30MHz, useful rx/i.f., (tunable), £25 ono. Rew, G8GZZ. Tel Godalming 28739, evenings.

Redifon 500V 0·5A (stab) psu, £25. 24V psu for WSC11, £10. Avo sig gen CT378, h/book, £25. Marconi valve voltmeter CT208, h/book, £15. All ono, transit extra or by arrangement. G8GFB, QTHR. Tel 051-922 7374.

Microwave Associates 3cm tx/rx front end, £69. SAE details. G8APX, QTHR.

AR30 rotator and control unit, offers. GW3MZY, QTHR. Tel 0248 680034.

Collins TCS2 tx/rx, 1·5-12MHz, 50W, A1/A3, mains psu, atu, comp stn less antenna, first £25 can take away. G3AJT, QTHR. Tel Southampton 768986.

Shack clearance: Heathkit RG1 comms rx, 500kHz-30MHz, £30. SSM 2m conv, 4-6MHz, £10. Jaybeam 2m Skybeam, £6. Grundig TK40, 3-speed, 4-track, new mic, £18. Akai M8 stereo tape, £25. Reslo CR, £12; RV, £6; no ribbon. GM8CJW, QTHR. Tel Falkirk (0324) 26367.

Hammarlund HQ170, 160m-6m, vgc, with added clock, £95 ono. H/B comms rx, vgc, 550kHz-30MHz, £35. Telefunken compact hi-fi, loudspkrs 4Ω 15W, £35. Buyers collect or arrange carr. P. Pasquet, 37 Babsfield, Bentley, Farnham, Surrey. Tel Bentley (Hants) 3271.

25W amplifier for 200mW drive, 144-174MHz capability, 12-16V supply, only decoupling necessary, 70 by 20 by 10mm, £25. SAE data, expert advice on use. GW8JOJ, 12 Black Barn Lane, Usk, Gwent NP5 1BP.

Telequipment D43R 'scope, mounted in 19in rack cabinet, home-brew 0-40V 5A psu, 'scope comp with two C amps, one J amp, one K amp, one D amp, and one homebrew A amp, £80 ono. Heathkit multimeter, £20 ono. Resistance and capacitance substitution boxes, £15 ono. All items in good cond. W. J. Shadwell, 8 Appletrees, Bar Hill, Cambridge.

Yaesu FT221R, few hours use only, £300; or exch for quality hf or photographic equipment. GM4DNM, QTHR. Tel 0592 720224.

Microwave Modules 70cm/28MHz converter, £20. SEM 2m/28MHz converter, £10. Cushcraft Ringo uhf co-linear, £15. Creed 76, mains motor, £15. Storno CQF614 base stn, offers? *Wanted*: Microwave Modules 70cm/144MHz transverter. G3UGF, QTHR. Tel 0532 814218.

Selsyn transmitter receiver psu, £8. Muirhead Selsyn transmitter receiver, new, £6. Heath factory-built audio millivoltmeter AV3U, £18. Microwave Modules 70cm conv 24-27 i.f., unused, perfect, £17. *Wanted*: Transistor Electroniques Qoilpax, hamband or gc, or RA1 RG1. G3OXV, QTHR.

Storno 600F base stn, fitted S0, S20, S21, S22, R5, R7, mint cond, comp with stand, ptt mic, mains transformer, manual, 10W out, adjustable, £140 ono. Pete Dawson, G8MEN/A (Manchester address). Tel 01-733 8878, for details of QTH.

IC210, fully tunable fm tx/rx, 144-146, vgc, no mods, mains or 12V, fitted 145 xtal and toneburst, £175 ono. J. Cushing, 20 Kildowan Road, Goodmayes, Ilford, Essex. Tel 01-590 3116, anytime.

TS700, vgc, £300. KW77 rx, Vanguard 160-10m tx, £100; Telford TC10 Mk2 multimode tx, TC7 rx, bandsearcher, 4/2/70 convs, £150; will split tx/rx pairs. Buyer collects. G3VOS. QTHR. Tel Chorleywood 4185 (home), 01-534 5511 ext 250 (work).

Pye Cambridge inverter transformer, £3; mod transformer, £1. TX chassis incl relay, £6. U450 tx chassis, manual, £12. UHF c/o relay, 12V, cable entry, £5. Heavy-duty mains transformer, 440-0-440, £8. Ring for details. G8BWR. Tel 0926 48388.

2m linear amp, pair 4XC250Bs, all psus, relays, meters, etc, contained in base stn cabinet, £80. QQVO640 linear amp, psus, relays, meters, in cabinet, £35. 2BP1 screen base, £7. Two 9MHz filters, usb xtals, £9 ea. G3OXV, QTHR.

CZ457/5 component comparator, British Physical Laboratories, high quality, better than 0·05% accuracy, £50, or offers. Solartron CD711/S 30MHz dual beam 'scopes, one comp but minor fault, other for spares, £70. Buyers collect or arrange carr. Robinson. Tel Stocksfield (Northumberland) 3449.

Special fm Westminster/pa combination, 80W at 12·5V, rx improved, 31dB at 1μV emf, 130dB 12kHz filter, all cables, mic, etc, R5, R6, R7, S20, S22, S0, long boot box gives room for mods, tb incl, £190. Pye PF2FMB bodyworn portable tx/rx, 2W out, 15kHz filter, fitted R6/S20, mic, spkr, spares, leather case and shoulder strap antenna, xtal tb, with 50S led, service sheets, £85. Adrian Andrews G8AVR. Tel XFC Templecombe (Somerset) 587, evenings (not weekends).

RTTY Digitex D110 visual display system, (see p980 December *Rad Com*); ASCII with Waltham 12in mains battery tv rx, both as brand-new; £360. Prefer buyer inspects and collects, but can deliver at cost. G3RDG, QTHR. Tel 01-455 8831.

TR2200GX, immac, 10ch, PM2-25 amplifier, with mains psu; 8502A auto rotator Jaybeam 10XY; both brand-new, unused; 5/8λ antenna with mag mount; £200 the lot, might separate. GM3RUI, QTHR. Tel 0224 323808.

Heathkit, mint cond, factory assembled: IG-42 sig gen, £35; IM-28 vtvm, £35; GD-1U gdo, £25; MSP-1 high voltage psu, £25; GD-121 intercom, not wkg, £7; Megger ohmmeter, £10; CDR TR-44 rotator spares, two motors, housing etc, £8. G3UML, QTHR. Tel 01-550 0882.

Arowder 2m fm AS-1000-PI portable tx/rx, 11ch, £100 ono. GW4GQK. Tel Caernarvon (0286) 3272, 9am to 5pm.

FR50B, with 100kHz calibrator, full 10m as new, orig packing, manual, £75 ono. Carr by arrangement at cost. *Wanted:* FRG7, in good cond only. G8JAY, QTHR.

New, unused, BAY96 diodes, £2.50 ea, or £1.50 ea for 100 up. Racal RA117E, RA218, RA37, all as new, with manuals, best offer over £450. G3RNV, QTHR.

TS500, PS500, 80 to 10m tx/rx, ssb, a.m., cw, immac cond, plus KW E-Zee match, £140 ono. G3MJH, QTHR. Tel Windsor 60189.

Collins R390A/URR gen cov rx, mech dig readout, service manual, vgc, £325. Buyer collects. McAllister, 218 Eckington Road, Coal Aston, Nr Sheffield. Tel Dronfield 413413.

Liner 2, fitted preamp, incl mobile mount and handbook, vgc, £115. Also Trio JR500SE rx, £45. GI8IFP, QTHR. Tel Moy (086878) 329.

Solartron CD1015 oscilloscope, dc to 15MHz, spare cr tube and manual, £40. Prefer buyer collects, otherwise packing and despatch at cost. G3OFK, QTHR. Tel Eversley 733674.

Mosley RD5 swl antenna, plus 67ft lead in, £12. Graham, 67 Tregenna Avenue, South Harrow, Middx.

HW7 QRP tx/rx, immac, £35. Codar AT5, mains only with 250/S psu, vgc, £30. Metrovick universal meter type 214, incl valve voltmeter, vgc, offers? Army A510 tx, £10 ono. Granada hand tx/rxs, new, unused, 27·125MHz, £15. Steve, G4GTU. Tel Rustington 4123.

G3ZVC board less SL622, £30 ono. 4m boot Cambridge, with preamp and controls, £25. Bob Evans, G3ZFJ, 14 Gratwicke Road, Worthing, West Sussex. Tel Worthing 503041 (day), 206200 after 8pm.

FR50B, £60; DX100U, £40; Class D wavemeter, mains, £10; or exch for hf tx/rx. *Wanted:* FT221R, cash waiting. G4FYJ. Tel 01-733 7417.

Trio 2200GX, five months old, mint, 8ch, nicads, all extras, £140 ono. Tel Hereford 65092.

Belcom Liner 2, fitted preamp, very sensitive, good cond, mic, mobile bracket, checked on spectrum analyser, £110. G8MXX, QTHR. Tel Reading (0734) 83596 evenings, except Wednesday and Sunday.

Marconi 801 generator; TS413B/V 24GHz noise gen; CR150; HRO; Panda Cub; years of *Rad Com, QST, SWM, ED, Microwaves;* crts; jumbo 813; 4CX300A valveholders; slotted line; tx/rx valves; HP416B ratiometer; uhf plumbing; stamp for comp list. G2CPM, QTHR. Tel 0635 40464.

Lafayette HA800 amateur bands rx, 80 thru' 6m, solid-state, battery/mains, £55. Cash buyer to collect or pay carr. G4EOI, QTHR. Tel 01-648 6117.

Yaesu FT2F 2m tx/rx, chs fitted R7, R6, R3, S22 S21, S20, S8, S0, 144·8, 144·6, 144·48, R7 input additional a.m. detector, good cond, £80. Marconi wavemeter TF643A, 20MHz to 300MHz, incl charts, £8. G8FHN, QTHR. Tel Medway 63365.

"RSGB Bulletin", August '59 to December '67 incl; *Radio Communication* '68 to '74 incl; *Radio Constructor*, volumes 14, 15, 16, 18 and 24, bound. G3AY, 78 Linden Road, Birmingham 30. Tel 021-459 5040.

MMT 432/144 transverter, £120. 144MHz 70W SS linear, £50. KVG XF-9B sideband filter, £25. Joystick VFA, £15. PR-40 preselector, £7. Power swr meter, 3·5-150MHz, £7. 1975 *ARRL Handbook*, £1.50. *PW*, 1969-74, £1 per year. G8KMV, QTHR.

Trio 9R59DE comm rx, plus spkr, vgc, £40. Yaesu FT-2FB 2m fm tx/rx, fitted 144·25, ·48, ·60, S0, S20, S21, S22, R5, R6, R7, toneburst, £120. Buyer collects or arranges carr. M. Barson, 61 Plantation Road, Chestfield, Whitstable, Kent.

Resistors new ¼W high stability axial lead, five ea 30 well-spaced values 4·7Ω to 2·7MΩ (150 in packet), £1. *Wanted*: BC221 (non-wkg) needed for tuning assembly, dial, chassis and case. D. J. Thwaites, 15 Springhead Road, Kemsing, Sevenoaks, Kent. Tel Sevenoaks 62481.

Garex 2m tx/rx, 6ch, toneburst, fm/a.m., 12V or mains, £60. 4CX250B, new, boxed, £4.50. 3in 'scope, £5. Mullard Unilex stereo, preamp, psu, cabinet, £5. Pye vhf hi-fi tuner, £3. Buyer collects. G8HBO, QTHR. Tel 01-399 8196.

2m 10W tx, S20, S21, S22, R3, £15. 2m converter, 10–12MHz i.f., £5. Swiss-style Tri-ang model railway, £35. Philips electronic engr kit, £4. G8LMS, QTHR. Tel 0924 469288.

Trio TS520, cw filter, /MM fitted xtals, £385. HRO500, synthesized, 500kHz–30MHz, 35 bands, £365. Pye Cambridge, 6ch fm, rf preamp, toneburst, £48. Unmodified a.m. Cambridge/Vanguard, £25/£35 respect. G3SWC. Tel Horsham 0403 2742, evenings.

HW100, lp filter, mic, spare 6146s, homebuilt psu, £110; BC221 with charts and mains psu, £20; rf sig gen, £10; Solartron valve af mV-meter, £25; pen recorder, £35; or £180 the lot. Buyer collects. G3YAW, QTHR. Tel Aylesbury 83631.

Codar CR70A Mk2 gen cov rx, 0·5–30MHz, bfo, with Joymatch atu, spkr, manual, £25; Class D wavemeter Mk4, 1kHz accuracy, 1·2–19·2MHz, £15; both wkg. Buyer must collect. Chalmers. Tel Brentwood 225814.

AEC swr twin meter, £8. XF92A ssb filter with 9MHz carrier xtals, £20. G3SFV. QTHR. Tel Market Harborough 4827.

FT227P λ/2 mobile antenna and magnetic mount, AR2 Ringo base antenna, £190. G3VLQ, QTHR. Tel Reading 599591, after 6pm.

SSTV Robot 80 camera, £220; 70 monitor, £205; or £410 pair. Atlas 180, £250. FT75 plus ac/dc supplies, vfo, £180. Mint or near new cond, ono. GW3DZJ, QTHR. Tel 0745 583333.

FR50B, mint cond, £55. Thorens TD160, £40. G4CDJ, QTHR. Tel Kidmore End, (Reading) (073525) 3137.

TH3Jr and balun, good cond, ready dismantled, buyer collects, £45. *Wanted:* FT101E, preferably with cw filter, must be absolutely mint and under guarantee, cash waiting, will collect. G6XY, QTHR. Tel Kenilworth 52679.

Excellent dx/vhf QTH, 400ft asl, overlooking Bristol Channel, superior detached chalet bungalow, gas central heating, 2/3 beds, large lounge, sep shack, 40ft tower; woodlands, golf course, riding stables, M5 access nearby; £24,500. G5UG, QTHR. Tel Weston-super-Mare 25961.

IC240, six months old, perf cond, not used mobile, brand-new 5Y/2M, £156; or would exch engineer's 3in centre lathe, Drummond, Myford, why; no junk please; cash adjustment where necessary. HW12A 80m ssb fb rig, matching psu, £70. G3JJM, QTHR.

Hamtower, beams; immac 3/4 bed det dorm bungalow, 10 min resorts, 10s countryside, fishing, 2min bus, peaceful, edge beaut village, St Asaph, 6miles S Rhyl, superb family or retirement QTH, £19,500. GW3DZJ. Tel 0745 583333.

Grundig Satellit 210 amateur band rx, nicad, charger/mains unit, ssb unit, manuals, in maker's carton, all mint cond, snip at £90, carr extra. Tel Easton (North Shields) 70429, after 7pm.

Heath SW717 0·5-30MHz gen cov rx, bandspread, bfo, S-meter, as new, £35. Transverter, top band, 14MHz in 2MHz out, with rx section, all power supplies, relay, meter, etc, for use with hf tx/rx, £25. G3OXV, QTHR.

Bush CTV25 colour tv, spares and manual, requires some attention, fitted in a smaller cabinet, £50 ono, or swop for test gear, wkg or not. Tel Bob, Tonbridge (0732) 351361, after 1830.

IC22A, 12 xtals, £130; Liner 2, preamp, psu, £90; both with mic and mobile brackets. G8EMF, QTHR. Tel 021-373 0697, evenings only.

TS700G, t/burst, vgc, first £275 secures, carr extra. G8FR, QTHR. Tel Emsworth (Hants) 6177.

Disposal entire contents shack, ex late G3XOR: incl KW Atlanta, remote vfo, £200 ono. AR88D, £25. Test equipment, both professional and homebrew. Phone to view, or for list. Tel 021-354 1566, or 021-770 3467.

FT2FB 2m mobile rig, 10W/1W, fitted chs S0, S20, S21, S22, S23, R5, R6, R7, 144·48, comp with mobile mount, handbook, orig packing, £120. G8IZK/G8LYG, QTHR. Tel Minety (Wilts) (066 640) 508.

FT200, psu, few hours use only, £240. 14-el Parabeam, as new, £19. G3UAC, QTHR. Tel 01-688 2111.

Trio TR7200G tx/rx, vfo 30G, comp cov 2m, mic, power lead, mobile mount, manual, orig packing, first class cond, £160. G8KUE, QTHR (Sydenham). Tel 01-659 5269, after 6pm.

KW2000E, ac psu and inverter for mobile operation, Shure 201 mic, good cond, £260. G4CSG, QTHR.

Comp stn: KW Atlanta 80-10m tx/rx, ac psu, matching ext vfo, 400W p.e.p., spare valves, recently overhauled by Decca, exc order, worked 100 countries on ssb in only one year, £280 ono. Dr Morse. Tel Cirencester 5048.

Multi U11, sound box, £210; spare lead, £3. Shure SM10 561, offers. Processor pcb, £10. IT12 tracer, £20. 70cm mag/mount, 5/8 and collinear antennas. Hustler 80/40—6004/PG c/match gen, £45. Other items previous ad. All ono. G3BKL, QTHR. Tel Salisbury 5383, day.

CT381 indicator and power units, vgc, £32. GEC vhf/uhf Panoramic rx, just covers 70cm, gwo, £45. TS173 frequency meter, mains powered, 90-450MHz, gwo, with charts, £15. Buyers collect. G8LIU, QTHR. Tel Uxbridge 30006, evenings.

Liner 2, BAM preamp fitted, mobile mount, vgc, £90. G8FZR, QTHR. Tel 0227 61717.

Vertical antenna, 3-30MHz, base loaded with remote tuned coil, fibreglass sections, commercial mfr, buyer collects. £20. G2BVN, QTHR.

FT200, FP200, immac, £220. 12AVQ antenna, £25 ono. Storno-Southern 7ch 2m rig, 10W, £40. Tandburg 3541X reel-to-reel deck, £165. GL75P record deck, M75EJ cartridge, bargain £30 ono. G4GMH. Tel Basildon 413041, evenings, or 01-226 1262 ext 226, office hours.

Yaesu FT101E, £390. Icom IC22A, fitted 11ch, £110. Shure mic 201, £8. KF430 70cm trans, £175. ME2N swr/power meter, £8. GW4CBR, QTHR. Tel 06462 5534, evenings.

KW204, KW202, immac cond, £150 ea ono. ETM2 keyer, £15. KW600 linear amp, £125 ono. T144G sig gen, £7. VHF sig gen, £7. G3RJW, QTHR. Tel Burgh Heath 56158, after 6.30pm.

Trio QR-666 gen cov rx, no mods, exc cond, manual, boxed, £115, carr extra. *Wanted:* Hy-Gain C12 dipole or Q1 minibeam, or details of construction. G8DFZ, QTHR. Tel Otley (Yorks) 3083.

Audio generator, Philips PM5121, 1Hz to 100kHz 600Ω, manual, vgc, buyer collects, £30. Five nixi wired Vero base holder, £1.50. Five 88mH toroids, 30p ea. Pye Radiomobile mic DIN plug, £4. Post extra. G3XKA, QTHR. Tel Woking 73620.

MMT432/28, £80. 70cm Parabeam, £10. 2m 8-el Yagi, £5. Faulty CD1212 'scope, single beam 40MHz, double beam 24MHz, offers. G8FPT, QTHR. Tel Andy 01-504 4942.

2m a.m./cw 100W tx, QQVO640/A final, mod 2×807 Class B, Woden mod transformer, 8MHz xtals, transistorized vfo, in 19in rack, all psus built in, wkg order, £25 ovno. G3TIR, QTHR.

Trio 9R59DS rx, with spkr, £45. R. Looker, 91 Station Road, Amersham, Bucks. Tel 02403 7671.

TA33 Jr, exc cond, £45. AR22R rotor, £25. Trio JR310, needs attention, £40. EK9X keyer, £10. Will haggle. G4CLN, QTHR. Tel 05304 5735.

Uniden 2030 2m mobile tx/rx, five repeater and six simplex chs fitted, all solid-state, tx 10W or 1W output, automatic toneburst, comp with HBW mains psu, ⅝ whip, plus base, £125. GW4AEC, QTHR. Tel Portmadoc 2295.

SB101, cw filter, ext lmo, spare valves, £180. Vibroplex paddle, £9. Emsac 2m nuvistor converter, 28MHz i.f., £8. HW100 front panel, new, £2. 8-el 2m beam, new, £6. G3RUX, QTHR. Tel Exeter 69909.

Antennas, 2m Q6/2m quad, 70cm 14-el Yagi, £5 ea. Buyer collects please. G8ATA, QTHR.

Liner 2, good cond, mobile mount, spare dial, lights, PA3 preamp (unfitted), £110. Trio JR60, 550kHz-30MHz, 142MHz-148MHz, built-in Q-mult, xtal calibrator, amateur bands bandspread, £45. 14-el 2m Parabeam, £15. 2m preamp, £5. G8JAJ, QTHR. Tel 024-267 2965.

WANTED

Stolle 2010 or 2030 rotator. G3XDY, QTHR. Tel Ipswich (0473) 643484 day, or 44601 evening.

VHF gen cov rx, circuit essential, cond and price to Kelman, 61 The Fairway, Oadby, Leicester.

Semi-auto bug key or ordinary type; also two 6ER5 US valves. G4AKX, QTHR.

For the Wireless Museum: pre-war magazines, books, catalogues, valves, components, txs, rxs, spkrs, Voight corner horn; loan of 30-line Televisor; collection arranged. Details please to curator, Douglas Byrne, G3KPO, QTHR. Tel Shanklin (098 386) 2586.

Pair of new or vgc 4X150s. G3JQQ, 217 Bloomfield Road, Bath. Tel 0225 314331.

Eddystone rx, any model considered, in or out of order. GI3RSQ, QTHR. Tel 0232 666182.

Keyboard, or codebars for same, for a teletype 32ASR printer, must be Bourdot/CCIR2 code. G4CIN, QTHR. Tel Bilston 45862, after 6pm.

DX40 tx (USA); mains transformer, 240V primary; also manual, copy or purchase. Price and details to G4EFJ, QTHR. Tel 0293 21668.

R390A. G3GAD, QTHR. Tel Orpington 33408.

HQ170A rx, in good cond, for Port Talbot ARS; please write, all letters answered, stating cond and price, to hon sec, GW4ESV, 8 Cerise Close, Aberavon, Port Talbot, West Glam SA12 7AY.

Synchronous vibrator type 12SR7, as fitted in B44. G3RWH, QTHR. Tel Cowes 3323.

Manual for HW17, to buy or borrow; also spares for B46 rx or possibly scrap rx. Jackson, G8OIN, "Castle Lodge West", Halifax Road, Todmorden, Lancs OL14 5SQ.

HF mobile tx/rx, must have 20 and 160, size as for Atlas Cygnet, etc; price to suit pensioner. G3WNM, QTHR. Tel 01-959 4781.

Pye Bantam low band a.m. portables, for ATC squadron; also atu for A13. G8NUP, QTHR. Tel 01-530 2751.

Atlas tx/rx; also Vespa Mk2 tx; details and price to G3ART, QTHR. Tel 090 081 2030.

Telford TC7 Mk2, tunable i.f. 28-30MHz, details and price please to G3ZOG, QTHR. Tel Sunderland (0783) 280080, 6-8pm.

Xtals: HC6U 1175kHz, 8·08333MHz, 13·0166MHz, or other xtals to suit Pye Ranger. GM3SOM, QTHR.

Hammarlund enthusiast seeks HXL-1, HX-500, any other Hammarlund items considered (not SP600); prices to be commensurate with cond. Write details and price to G2WI, 115 Charterhouse Road, Orpington, Kent. Tel Orpington 29716, any evening (except Friday) 9-10pm.

Eddystone dial and drive, type 898, comp. Electroniques coilpack, type QP166, comp. W. T. Stephenson, 3 St Herbert Street, Keswick, Cumbria CA12 4DF.

Details of BC342, to copy and return, especially component values and alignment instructions. G3GUV, QTHR.

Facsimile machine, paper roll type, 120/240 revs/min, any cond. G3BIK, E. Chicken, 21 Townsend Crescent, Kirkhill, Morpeth, Northumberland. Tel Morpeth 3994.

KW2000, AR88, rotator, HW100, SB101. *For Sale:* steel masts, 20ft, 2in dia, unused, £8. Couplers 15in, £4. Carr at cost. GW3MHW, Glawyrafon, Bontnewydd, Nr Aberystwyth.

Hammarlund HQ170 noise blanker sub chassis circuit. Details G8BIH, QTHR. Tel 0420 82739.

Good quality Prismatic binoculars, 7 × 50 or similar. Also telescope, suitable simple astronomical observation. GM4MF, Holden, 3 Hodge Street, Falkirk FK1 5AA. Tel 0324 24832.

Trio remote vfo 5D for TS510, must be clean and unmodified. Details to G4IH, QTHR. Tel 0705 550954.

Lattice tower, tilt-over, telescopic. Why? Masts, guys rigging, etc. Jackson, G3LVZ, QTHR. Tel Leicester 50181 ext 2259, day; Sileby 2643, night.

KW2000B or FR50 FL50 combo, or other ssb tx/rx combo. G3KMH, QTHR.

Old pattern GEC valves, type 2759 or CV5060. Parker, 133 Station Road, Cropston, Leicester LE7 7HH.

"QST" May 1965, also comp years after 1970. Gen cov vhf rx, with circuit. Small pen recorder in wkg order. Kelman, 61 The Fairway, Oadby, Leicester.

VVM, no ancient junk. Details and price to G3OFK, QTHR. Tel Eversley 733674.

Pye Westminster or Motofone a.m. high band. G3XAC, QTHR. Tel 0282 38514, evenings and weekends.

Help, circuit diagram of the rx for a Hudson 145FM, will copy and return, or buy. C. Howett, 10 Bishops Close, Little Downham, Nr Ely, Cambs CB6 2TQ. Tel Pymore 341, evenings.

Aerocharge 3 or 5, or similar, can collect, reasonable distance. G4AYS, QTHR.

Pye F27 and/or remote controller service manual and/or circuit diagrams, to buy or copy at a fee and return promptly. Richard Brumpton, 182 Lowdham Lane, Woodborough, Nottingham. Tel Lowdham (060 745) 2501, evenings, reverse charges if desired.

"T & R Bulletin": 1934, Sept, November; 1935, May, June, November; 1938, February, June, August; 1939, June. *RSGB Bulletin:* 1947, November; 1957, June; all or any needed. Will buy or swop, many back numbers available. Write G4CCA, QTHR.

Aluminium tubing for mast (2in), plus sleeves/clamps, for local club, must be reasonable, will collect 100-mile radius. Clark, G3VCL, 21 Betony Walk, Haverhill, Suffolk.

TA33 or TA32 beam, also suitable antenna rotator. Will collect or pay delivery. G4EZC, QTHR.

Urgent: FT75B 10m tx/rx, in workable cond, please send details of cost and equipment; one pair Pocketfones with four xtals, one must be cw. M. Bulmer, G4FZS, Searchlight Workshops, Mount Pleasant, Newhaven, Sussex BN9 0NQ.

AR88 gen cov rx or similar; KW E-Zee match; atu; Trio 2200 hand portable or similar. *For sale:* FM10D Cambridge, usual chs, £50 ono. 14AVQ trap vertical, £15. Liner 2, mint, £115 ono. G4EVZ, QTHR. Tel Romford (Essex) 45733.

Racal RA117E rx, must be in mint cond with case, preferably with ssb unit and preselector (both cased), handbook, etc. Details to Taylor, G3UCT, 27 Glen Road, Fleet, Hants. Tel Fleet (02514) 6998, after 7pm.

18AVT/WB; Datong FL1; 10m rx; bound volumes of *Radio Com;* handbook or circuit for AR77. Mike Wright, 5 Woodview Park, The Donahies, Dublin 13. Tel 0001 316914.

Motorola fm tx, 30/40MHz, and matching rx, which were once available from supplier in Dorset. Alternatively, General Electric 4ET tx and matching rx, or 4ER would be acceptable. G3LYU, QTHR. Tel 0533 876459.

Valves, types 2C39A and Z759, or equiv; also manual or circuit for Solartron Solarscope, type CD614, to buy or borrow for copying. Details to G3NPF, QTHR. Tel Horsham 66290.

QTH: retired old-timer will buy or rent good QTH, prefer isolated cottage with land, southern half of England or Wales; if antennas already installed that is an advantage! G6ZY, QTHR.

Case/battery holder and lid for Bradley multimeter type CT471 or CT471C. G8EGT, QTHR.

250pF-per-section split stator capacitor, must have adequately spaced vanes to prevent flashover in tx atu. Price please incl delivery, all letters answered. D. M. Belding, G3NCF, 207 Stanley Street, Grimsby, South Humberside DN32 7LH.

Tx/rx covering hf bands, in really good cond, Yaesu, Trio, Heathkit, or other good type. G3WY, QTHR. Tel Evesham 45497.

SB300, SB301 or KW202, at reasonable price, in good cond, wanted by "white stick" swl. G. F. Napper, "Adams House", 2 Underhill Road, London SE22 0AH.

Westminster fm 1b. Pye Bantam fm 1b. Arac AR10, 28–30MHz tunable i.f. Jaybeam Q6 2m quad. *For sale:* HC6U xtals, 9–12MHz, for filter expts, 50p ea; sae for list. G3OOS, QTHR.

FT501 digital tx/rx; also HQ170A. Details and price to GW4NZ, QTHR. Tel Neath 4376.

2m linear amp, 100W out or plus, must be mint, pref with preamp. Details please, all letters answered. GW8HVK, "Glynteg", Llanfarian, Aberystwyth SY23 4ET. Tel Llanilar 281.

23cm equipment, transverter or what have you; required for local club; full details to G8MSQ, 46 Hillview Road, Worthing.

Good case for a Duvidal ITI-2 multitester, int cond immaterial; also a case in good cond for a 3-waveband Perdio battery Town & Country model, int cond immaterial. Please write, all letters answered. G3HRV, QTHR.

HQ1 minibeam; also transformer for Heathkit IO-12U 'scope. GM3VEY, 24 Hillview Crescent, Cults, Aberdeen. Tel 0224 48263.

Pye HP1AM Bantam and AM10D or AM10B Cambridge, any band considered; also a mid-band W15AM Westminster. G3ZDG, 40 Midsummer Meadow, Inkberrow, Worcs. Tel Inkberrow (0386) 792933, after 6pm.

Cabinet for a Hammerlund rx type SP-600-JX. H. H. Davey, "Rosemoor", Moor Lane, Maulden, Beds MK45 2DJ. Tel Ampthill 404165.

Trio type 5D vfo; morse course tape or records; 3-el multi-band trapped antennas, with fixed mast or tower. J. Siddon, 23 Hampden Road, Flitwick, Beds MK45 1HX.

Drake R4B and R4C; T4XC; Bird 43; pair 572Bs; Multimode 1600 tx/rx board, abandoned project. *For sale:* TS700, £280 ono. Day, G4DED, QTHR. Tel 075 86 2215.

TA33, Mustang, TH3, triband beam, why; can collect or pay carr. G4AFY (treasurer Kidderminster ARC), QTHR. Tel Kidderminster 63358.

Matching pair 4X150A/4X250B airflow sockets, uhf ptfe type preferred, must be good cond. G8AFA, 12 The Meads, Milborne Port, Sherborne, Dorset DT9 5BJ.

Manual for oscilloscope, Hartley (Solartron) CT436, to copy or buy. *For sale:* Taylor 31A oscilloscope, 6MHz bandwidth, single beam, 12in by 7·5in by 17in, £25 ono. P. Praeger, 60 Elmwood Road, London SE24. Tel 01-274 9511.

P.M. ELECTRONIC SERVICES

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144·030 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·4/433·2 ..	a	b	a	b	b	c	b	c	b	b	b	b	b	b
144·480 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·800 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·850 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·000/SO ..	a	a	a	a	a	a	a	a	a	a	a	a	a	b
145·050/R2T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·075/R3T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·100/R4T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·125/R5T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·150/R6T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·175/R7T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·200/R8T	a	a	a	b	b	a	a	a	b	a	a	b	a	b
145·300/S12	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·350/S14	b	b	c	b	b	c	c	c	b	c	c	b	b	b
145·400/S16	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·500/S20	a	a	a	a	a	a	a	a	b	a	a	b	a	b
145·525/S21	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·550/S22	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·575/S23	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·600/S24	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·650/R2R	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·675/R3R	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·700/R4R	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·725/R5R	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·750/R6R	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·775/R7R	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·800/R8R	a	a	a	a	a	a	a	a	b	a	a	b	a	b
145·95	a	b	a	a	b	b	b	b	b	a	b	b	b	b

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THURSDAY, FRIDAY AND SATURDAY, NOVEMBER 2nd, 3rd and 4th, 1978

10am to 6pm DAILY

ADMISSION 40 pence (Special concessionary prices for clubs, schools etc)

£500 IN VOUCHER PRIZES TO BE WON **£500**

ALL INFORMATION—Tom Darn G3FGY, 20 Mount Pleasant, Ripley, Derbys. DE5 3DX

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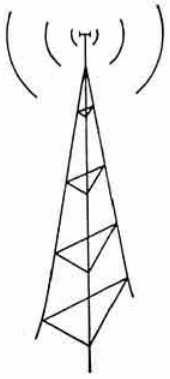

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Sensitivity – 4μV (EMF from a 50ohm source) for 20db quieting

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High sensitivity and selectivity
On board crystal filter buffering for ease of interface
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Squelch – noise operated, threshold adjustable over the range 0 to 20db s/n
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FEATURES

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PRICE £9.50 inc. VAT

NOTE TO ALL FT101 OWNERS:

FM IF AMPLIFIER for the world famous FT101 ready built into a small die cast box—just plug the leads into the back of your FT101 and remove one wire from the function switch. As the unit was not priced at time of going to press we will be pleased to forward same and data sheet on request.

Also next month a 2 meter convertor with matching 6 channel oscillator unit, these used in conjunction with our FM IF amp and audio board will make a first class monitor receiver with a sensitivity of better than 0·2 μV.

ALL MODELS FINISHED TO PROFESSIONAL STANDARDS AND FITTED WITH MOUNTING BUSHES

PROFESSIONAL GRADE CO-AX RELAY made by SIVERS LAB Sweden. We have no data on these but the following figures were obtained with tests at 1·2GHz. insertion loss = ½ db, isolation = 70 db, fitted with "N" type sockets and operates from 24 or 48 volts DC. contacts must be rated at well over over 500 watts @ 500MHz brand new for only **£15.00** few only so order now.

CO-AX CABLE type UR57 75 ohm 10mm dia only 2·2 db loss > 145MHz, 4·2 db loss @ 432MHz (both figures quoted per 100ft.). Due to large purchase we can offer at a very low price of **£12.00** + £2.00 carriage per 100 yard drum. Brand new and unused.

PYE FUNCTIONAL TEST SET type TS2 made for testing the COMPAC 8 HF SSB packset contains the following circuitary—audio oscillator, noise generator audio amplifier, battery load, RF dummy load, etc. Fitted with nice miniature 500 μA-meter by Sifam, multiway switch, mic. insert etc., built into die cast case size approx 9" × 6" × 2". These are brand new and boxed at only **£5.00** each (the meter must be worth this price) supplied with circuit.

TRANSIPACK STATIC INVERTOR type IV5350/24/240/250/50, input 24 volt DC output 240 volt AC 50 c/s. 250VA, these are brand new unused **£80.00**, (2 only). Buyer to collect by arrangement.

VALRADIO TRANSVERTOR type D241500S 24 volt DC input, output 115/230 volts AC 50Hz 500 watts new unused **£75.00** (two only). Buyer to collect by arrangement.

Leather cases for SF1 Starphone new unused **£2.75.**

PYE WESTMINSTER POWER LEADS W15 AM/FM etc, wired for positive earth, with in-line fuse holder new unused **£2.50.**

SIX-BANK PUSH BUTTON SWITCHES each bank 6 pco. Self cancelling **£1.00.**

HEWLETT PACKARD PIN DIODES type HP5082-3080 **50p** each or 4 for **£1.50.**

PYE COILS 5mm dia 10mm sq base OK for rewinding as used in all PYE R/Ts. **6p** each 10 for **50p.**

THREE-GANG TUNING CAPACITOR 365 pf per section direct drive **75p** each.

CATHODEON 1·4MHz CRYSTAL FILTER I.O. base, for lower side band SSB, with base connections new unused **£4·00** each, two for **£7·00.**

Disc ceramics 0·01 Mf 2·5Kv working 5p each. 1000 pf 500 vw 10 for **15p.**

WIMA MINIATURE POLYESTER CAPACITORS size only 6mm sq × 2mm thick. PC mount pin spacing 5mm. 100 vw in the following values 1000 pf, 2200 pf, 1500 pf, 10 for **20p** or **3p** each.

CO-AX PLUGS 50 ohm "N" type right angle for UR67 **£1.00**, PL259 right angle for UR57/67 etc. **£1.00**, SO239 sockets 4 hole fixing **50p.** 50 ohm BNC right-angle adaptors **50p.** SPECIAL OFFER 75 ohm BNC plugs and single hole sockets **35p** each.

MINIATURE NIXIE TUBES ITT—5853S with left and right hand decimal point size only ⅞" × 1⅜" nominal working voltage 170 volts DC, new unused 5 for **£2.50p** 10 for **£4.50p.**

DECADE COUNTER PCB made to suit the above nixie tube also takes SN7490, 7475, and 7400 ready drilled etc, **75p** each, set of 5 **£3.40.**

TRIMMER CAPACITORS 10mm dia. ceramic, 2-8pf, 3-10pf, 4-20pf, 10-40pf, all **10p** each.
7mm dia. ceramic, 3-9pf, 2·5-16pf, 7-35pf, all **10p** each. Tubular ceramic, 1-6pf solder in type, **8p** each; **60p** for 10.
Mullard tubular ceramic 0·8-6·8pf bolt in type, **15p** each. Ceramic miniature compression P.C. mount 10-40pf, **8p** each.
Plastic semi-airspaced 2-25pf 10mm dia. **6p** each; 10 for **50p.**
Oxley airspaced 9mm sq base 1-10pf and 1-15pf, **18p** each; 2-30pf **20p** each.
Erie teflon tubular trimmers "530 series" 0·25-1·5pf 4mm dia. × 11mm, **10p** each.

JACKSON TETFER TRIMMER Cat. No 5640 9mm sq base, **40p** each; also 8mm P.C. mount, **40p** each.

PLASTIC SEMI-AIRSPACED TRIMMER as used in PYE Westminsters P.A. stages 10-60pf, **15p** each.

JACKSON BUTTERFLY TRIMMERS 17+ 17PF 1·2mm air gap Cat. No C713, **50p** each; a few with ¼" spindle, **65p** each.

ELECTRONIQUES TUNING DIALS reduction 6-1 and 36-1, uses epicyclic drive, moulded clear plastic front, size 100mm × 160mm, supplied with two scales and two pointers, **£6.50.**

STEREO CAR CASSETTE player amplifier boards with two amp. ICs NEC-uPC 1001 H2, some models with uPC 1025H, requires 12V D.C. 3½W per channel, removed from new equipment by manufacturer, size 120mm × 45mm, supplied with circuit, **£2.25** each.

FM RADIO FRONT END TUNER Units 88-108MHz (remove three Cs and it tunes Air Band) and 2m very high quality and stable unit with exceptional sensitivity FET RF amp. NPN mixer and separate osc. AFC. and AGC inputs, works from 9-15V D.C., with circuit; new and unused BARGAIN @ **£3.30** each;

AM25T/S six channel PYE VANGUARDS 25KHz channel spacing with all control equipment in very good condition HIGH BAND 148-174MHz **£35.00** each postage £3.00.

COSSOR CC303 boot mout high band six channel mobiles 12½KHz channel spacing, 25W RF output with all control equipment ONLY **£25.00** postage £3.00.

HONDA PETROL GENERATOR type ED250 6V/12V/24V DC output used only 10 Hrs. mint condition **£108.00** buyer to collect by arrangement.

BC221-Q FREQUENCY METER with original calibration charts, mint condition **£28.00** buyer to collect by arrangement (one only).

470KHz AM IF AMPLIFIER BOARDS as used in Car Radio/Cassette players full of miniature Rs & Cs two double tuned IFTs, trimmers, coils, tantalum Cs, transistors, and LM382N low noise stereo pre-amp, size 1½" × 4½" new unused no info. **£1.00.**

CAR RADIO/CASSETTE STEREO AMPS contains two TA7205P Ics (5·8W @ 13·2V) per channel, plus Rs & Cs, Ex-equipment, manufacturers rejects **90p** each.

59 WAVERLEY ROAD, THE KENT, RUGBY, WARWICKSHIRE

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