JULY 1989 £1.30

ISSN 0141-0857

Practical Wireless

The Radio Magazine

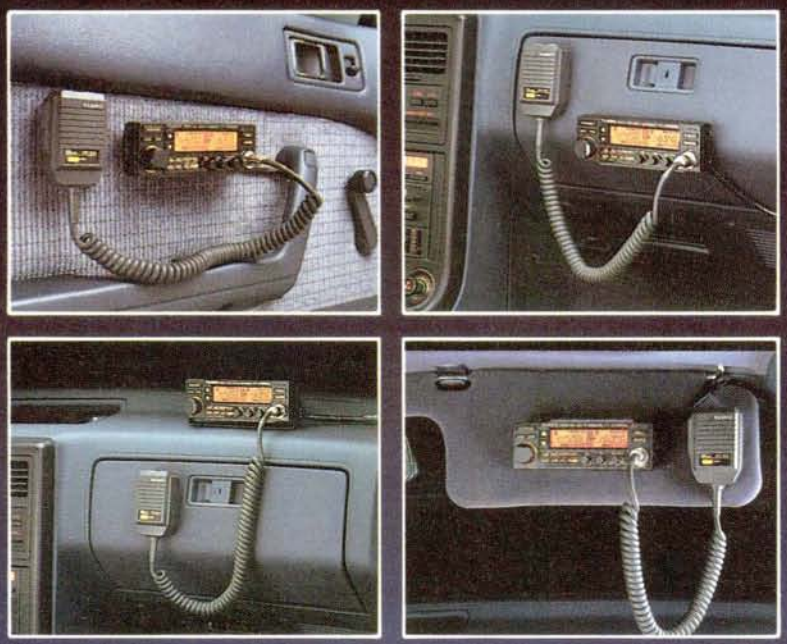
A SMALL YAGI FOR 50MHz

On Line to Cairo-
Transceiver Interfacing

Mobile Transmitter Control

Re-creating the ST-300

YAESU'S DUAL BANDER GOES PLACES OTHER MOBILES DON'T.



Introducing Yaesu's FT-4700RH dual-band mobile. Choose Yaesu's FT-4700RH, and you open the door to a lot of tight spaces.

While other dual banders just won't fit in today's small cars, the FT-4700RH utilizes a versatile "remote head" design. So you can mount the "brains" on your dash, visor, or door, and hide the "muscle" under your seat. Optional YSK4700 required for remote operation.

High-performance package. Packing a solid 50-watt punch on 2 meters (40 watts on 70cm), the FT-4700RH includes Dual-Band Watch for simultaneous monitoring of both bands, with independent squelch settings on the main and secondary bands. When you transmit, opposite band monitoring goes on in a full-duplex mode.

You can adjust the relative volume of the two receive channels with the balance control, too. And with Yaesu's bright LCD display, transceiver status is clearly visible in sunlight or shade.

Convenience on the road. Human engineering, long a Yaesu speciality, is an important aspect of the FT-4700RH design. The ten-button front panel keypad includes a "do-re-mi" audible command verification, and all important controls are backlit for night operation.

Frequency range 144-146MHz on 2m and 430-440MHz on 70cm. Nine memory channels on each band. High/low power selection (low power five watts). One-touch reverse repeater shift button. Optional CTCSS module. And 16-key DTMF microphone.

Optional accessories. FTS-8 CTCSS unit. MH-15D8 DTMF microphone with 10-telephone number memory. SP-3 or SP-4 External Speakers. And YH-1 Headset/Boom Mic or MF-1A3B Flex-arm Boom Mic, both with SB-10 PTT Switch Unit. YSK4700 Remote Kit.

Discover Yaesu's FT-4700RH today. And see what "high performance" really means. For dual-band mobile operation Yaesu's FT-4700RH really fits!
Call us today for details of your nearest authorised Yaesu dealer.

FT-4700RH control head
(1 15/16" x 5 7/8" x 1")

South Midlands Communications Ltd.
S M House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hampshire, SO5 3BY. Telephone (0703) 255111, Fax (0703) 263507, Telex 477351 SMCOMMG.

YAESU

Practical Wireless
The Radio Magazine

JULY 1989 (ON SALE JUNE 8) VOL. 65 NO. 7 ISSUE 988

THIS MONTH

Regular Features

Editor
Geoff Arnold I.Eng FSERT G3GSR
Assistant Editor
Dick Ganderton C.Eng MIERE G8VFH
Art Editor
Steve Hunt
Technical Features Editor
Elaine Richards G4LFM
Technical Projects Sub-Editor
Richard Ayley G6AKG
Editorial Assistant
Sharon George

Technical Artist
Rob Mackie
Administration Manager
Kathy Moore
Accounts
Alan Burgess
Clerical Assistant
Rachel Parkes

Editorial and Advertisement Offices:
Practical Wireless
Enefco House
The Quay
Poole, Dorset BH15 1PP
☎ Poole (0202) 678558
(Out-of-hours service by answering machine)
FAX Poole (0202) 666244
Prestel 202671191

Advertisement Manager
Roger Hall G4TNT
PO Box 948
London SW6 2DS
☎ 01-731 6222
Cellphone 0860 511382
FAX 01-384 1031

Advert Copy and Make-up
Marcia Brogan
☎ Poole (0202) 678558

WSE — HAM RADIO STORE

ALINCO DJ500E Dual Bander

£375

FREE DELIVERY

***2M & 70CMS**
***Full Duplex**
***Extended receive coverage**
***No Extras to Buy**

The new ALINCO DJ500E has at last arrived! Covering both 2m and 70cms, it is the ideal handheld for those who demand the ultimate. Full duplex operation means telephone style crossband contacts. Receive coverage can be extended to cover 130-170MHz, 340-380MHz, 420-470MHz, and 870-900MHz. No extras to buy; price includes nicad pack, AC charger, wideband helical, carry strap and belt clip and built-in DC/DC converter for 13.8V supply. Quite a specification, and a lovely rig. Size, with standard pack and DC/DC converter, measure: 7.5" × 2.5" × 1.25" approx. Available now from stock, send for colour brochure.

AZDEN PCS-6000 2M FM + AIRBAND!

This rig is unique. It provides 25 watts of FM on 144-146MHz plus full receive coverage from 108-180MHz AM/FM. 20 memories any duplex split in any memory, auto tone-burst, listen on input etc. etc. The airband section has been purpose designed for the job. Send today for colour brochure.

£329

FREE DELIVERY

ALINCO DJ-100E 2M FM

DJ-100E 2M FM

NEW

IN STOCK

Latest rig from the ALINCO stable, this handheld has been developed from the successful ALX-2E. Now incorporating LCD display and 10 memory channels it will fit into even small pockets! The extended receive range cover 140-170MHz and there are no extras to buy. Chris Lorek says in Ham Radio Today, "a lovely little transceiver with a very impressive technical performance.

£219

FREE DELIVERY

ALINCO ALD-24E Dual Bander

If you thought that dual band rigs were expensive, then look again at this one. It gives true duplex operation with a single antenna output. Basically 2 rigs in one box, it has a superb specification covering 2m & 70cms FM. Extended receive coverage is possible upon request. Probably the most cost effective rig on the market. Send for full details today.

£449

FREE DELIVERY

MIZUHO QRP TRANSCEIVERS

HF SSB/CW

£189

Post £2.00

The new Mizuho QRP rigs are proving very popular. Ideal for holidays, hotels, caravans etc. Beautifully designed, they incorporate high quality 9MHz IF filter with 2.4kHz selectivity, VXO xtal for high stability, noise blanker, IRT; rx attenuator; CW/SSB modes; built-in microphone, speaker and Morse key; nicad charger circuit (from 12V); external key socket/mic socket; and S-meter/RF-meter. Can be powered from internal batteries or external source and the size measures: 2.5" × 1.5" × 6" approx! Output power is 2 Watts and one plug in xtal is supplied giving 25kHz coverage on 80 or 40m models and 50kHz on 20m model. There is room for one further xtal. Also available are the telescopic whips for ultra portable work. We have so far worked 10 countries on 40m using a 4ft whip!

MX-3.5	SSB/CW transceiver fitted 2.525-3.550kHz	£189.00
MX-7	SSB/CW transceiver fitted 7.075-7.100kHz	£189.00
MX-14	SSB/CW transceiver fitted 14.200-14.250kHz	£189.00
AN-Whips	Base loaded telescopic single band 20, 40 or 80m	£29.00
PM1	12v to 9.6v converter	£19.95
MS1	Speaker/microphone	£29.00
XTALS	VXO cut xtals for above rigs	£8.00

SHORT WAVE CONFIDENTIAL FREQUENCY LIST

£7.95 + £1 p&p

This brand new publication replaces the previous edition of UK Listeners Confidential Frequency List. Completely updated as of April 1989 with many new entries, this is now the foremost guide for short wave listeners who need a realisticly priced frequency guide prepared for listeners within Europe. Smartly bound and laid out, this manual will take you quickly to the right frequency. Covers Marine, Military, Naval, Aeronautical, Press, Broadcast, Fixed etc., and includes SSB, CW, FAX, RTTY, SITOR. Entries are numerical with station details, modes, callsigns, and time schedules. Don't be left in the dark, order your copy today!

Other titles:

CGTVHF	Complete Guide to VHF/UHF Frequencies	£5.95
VHF/UHF	VHF/UHF Airband Frequency Guide 1989	Phone
OCEANIC	HF Oceanic Airband Communications	£3.50
MORSE	The Secret of Learning Morse Code	£4.95
RTTY	Pocket Guide to RTTY & FAX Stations	£2.95
MARINE	Marine Radio Frequency Guide (HF & VHF)	£4.95
ATC	Air Traffic Control by D. Adair	£6.99

Post on above items: £1.00 (2 or more £2.00 total)

SAGANT "ZEPP" ANTENNAS

The new "ZEPP" antennas from Sagant are superbly efficient designs, that have all the advantages of end feeding without the problems! Simply connect a short length of 50 Ohm cable between aerial and transceiver. Uses half-wave element and special matching circuit. Can be used in various configurations. Ideal for portable or temporary locations. No hanging coax, no ATU, and "better than dipole" performance. Suitable for all current 100 Watt rigs. Recent report: "worked VK on 20m with antenna 15ft high."

Post & P. £2.50

ZA3.5	80m Zepp with all wire and hardware	£55.00
ZA7	40m Zepp with all wire and hardware	£49.00
ZA14	20m Zepp with all wire and hardware	£55.00

MAIL ORDER ON ALL MAJOR BRANDS

Our mail order service has been sending goods all over the World for longer than many dealers have been in business. We can supply most products advertised in this magazine at the same or often better prices. Fully computerised, your order will normally be despatched same day, fully insured, carefully packed and guaranteed by us. Have you got a copy of our famous price list and our own product catalogue? Just send an SAE and we will send you all the latest information.

WATERS & STANTON

RETAIL & MAIL ORDER:- 18-20, Main Road, Hockley, Essex SS5 4QS.
Tel: (0702) 206835, 204965
RETAIL ONLY:- 12, North Street, Hornchurch, Essex RM11 1QX.
Tel: (04024) 44765
Visa and Access by telephone. 24hr. Answerphone.

ICOM

VHF/UHF FM Handhelds

If you want a handheld with exceptional features, quality built to last, and a wide variety of interchangeable accessories, take a look at the ICOM range of FM transceivers.

All ICOM Amateur handhelds are supplied with a flexible antenna, rechargeable nicad battery pack and an AC wall charger.

IC-2E 2 Metre Thumbwheel Handheld

This popular transceiver from ICOM is still available after eight years of production. If you're looking for a straightforward but effective handheld the IC-2E takes some beating. Frequency selection is by means of thumbwheel switches (with 5KHz up switch), with simplex and repeater operation possible. Power output is 1.5 watts or LOW 150 milliwatts (2.5 watts possible with BP5A battery pack).

MICRO 2E/4E

These micro sized 2 metre and 70 centimetre handhelds give the performance and reliability you expect from ICOM. Measuring only 148 x 50 x 30 the micro fits in your pocket as easily as a cassette tape. The micro features up/down tuning switches for quick frequency changing, 10 programmable memories, LCD readout and 1.5 watts output (2.5 watts possible with BP24 battery pack).

IC-02E/04E Keypad Handheld

These direct frequency entry handhelds utilise a 16 button keypad allowing easy access to frequencies, memories and scan functions. Ten memories store frequency and offset, a front panel LCD readout indicates frequency, signal strength and transmitter output. Power output is 2.5 watts or LOW 0.5 watt. (5 watt is possible with the BP7 battery pack or external 13.8v D.C.)

IC-2GE/4GE

The 'G' series of handhelds fulfills the most important criteria for a handheld transceiver, it is small, rugged and easy to operate. The 20 memory channels can store simplex and repeater frequencies and with the several scan functions there is no need to manually search for activity. The 3 watt output and power saver circuit ensures low battery drain. (7 watts is possible with the BP7 battery pack or external 13.8v D.C.)

IC-12E 23 Centimetres

Similar in style to the 02E/04E this 1296MHz handheld utilizes ICOM's experience in GHz technology, gained by the excellent IC-1271E base station. With the growing number of repeaters on 23cm the IC-12E makes it an ideal band for rag chew contacts. Power output is 1 watt from the standard BP3 battery.

IC-32E Dual Bander

This exciting new handheld offers 2 metres and 70 centimetres in one compact unit. Tough and splash resistant it offers many features including crossband duplex operation, 20 dual band memories and power saver circuit. The IC-32E utilises most existing ICOM accessories, ideal if you are upgrading from an existing ICOM handheld.

Also available for ICOM handhelds are a large range of optional extras including rechargeable nicad battery packs, dry cell battery cases, desk chargers, headset and boom microphones, leatherette cases and mobile mounting brackets. New products just released:- HM46 miniature speaker/microphone and HS51 lightweight headset/microphone complete with PTT and Vox unit.

ICOM (UK) Ltd.
Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

ommunications ltd.

YAESU

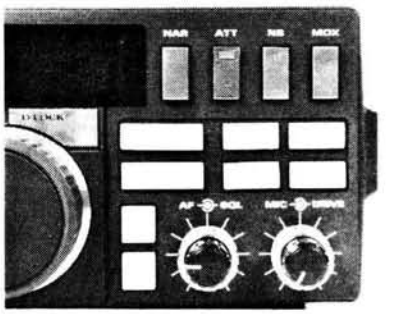
NTS. SO5 3BY TEL: 0703 255111 FAX: 0703 263507 TLX: 477351

*FREE FINANCE — BUY NOW SAVE MONEY SUBJECT TO STATUS

FANTASTIC PERFORMANCE, REALISTIC PRICE

- ★ 160-10M HF TRANSCEIVER
- ★ GENERAL COVERAGE RECEIVER
- ★ ALL MODE (FM OPTIONAL)
- ★ 0-100W OUTPUT (25W AM CARR.)
- ★ CW NARROW (500Hz) STANDARD
- ★ LARGE CLEAR LCD DISPLAY
- ★ SIMPLE OPERATION (see pic below)

The FT-747GX is a compact SSB/CW/Am and (optionally) FM transceiver providing 100 watts of PEP output on all hf amateur bands, and general coverage reception continuously from 100kHz to 30MHz. A front panel mounted loudspeaker and clear, unobstructed display and control layout make this set a real joy to use. Convenient features include operator selectable coarse and fine tuning steps optimized for each mode, dual (A/B) vfos, along with twenty memory channels which store mode and skip-scan status for auto resume scanning of selectable memories. Eighteen of the memories can also store independent transmit and receive frequencies for easy recall of split-frequency operations. Wideband (6kHz) AM and narrowband (500Hz) CW IF filters are included as standard, along with a clarifier, switchable 20dB receiver attenuator and noise blanker. User programming for more advanced control by an external computer is possible through the CAT (Computer Aided Transceiver) System. The transmitter power amplifier is enclosed in its own diecast aluminum heat-sink chamber inside the transceiver, with forced-air cooling by an internal fan allowing full power FM and packet, RTTY, SSTV and AMTOR operation when used with a heavy duty power supply.



All major controls are grouped together for convenience and ease of operation.

MD-1B8 Base Mic	£79.00	MH-1B8 Hand Mic	£21.00	FRB757 Relay Box	£10.50
MMB38 Mobile Mount	£22.00	FIF232C Interface	£75.00	FP757HD Heavy Duty P.S.U.	£239.00
D3000568 FM unit	£39.99	FC757AT Automatic ATU	£349.00	FL7000 500W P.E.P. Linear	£1600.00
FP700 Standard P.S.U.	£219.00	FAS14R Remote Ant. SW	£80.00	SP767 Ext. Spkr	£69.95
		TXCO 747	£46.00		

WARNING: If you buy FT747GX not designed for the U.K. market, these will not be fitted with AM/CW filters which you will not be able to obtain.

FT747GX TRANSCEIVER RRP £659.00 inc VAT

LET THE RADIO DO THE TALKING!

ON 2m OR 70cms

We are pleased to announce a new series of FM VHF and UHF mobile transceivers for the amateur. The 45/5W FT-212RH and the 35/4W FT-712RH. Smaller than their predecessors these models utilize a new cpu with greatly expanded features, most notable of which are 19 memories and support for the DVS-1 Digital Voice System, which can digitally record and playback from the microphone or the receiver.

FT212RH	£349.00.
FT712RH	£375.00.
DVS1 Voice Memory Unit	£79.00
FTS12 CTCSS Unit	£60.38

FT212RH & FT712RH

SMC NORTHERN (LEEDS) CLOSED SATURDAY AFTERNOONS

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

Free interlink delivery on major equipment
Small items, Plugs, Sockets, etc by post £1.75. Antennas, cables, Wires & larger items. Lynx up to £5. Interlink delivery available, upon request for items other than radios from £7.30 depending on weight. Same day despatch whenever possible.

YAESU DISTRIBUTOR WARRANTY
Importer warranty on Yaesu Musen products. Ably staffed and equipped Service Department. Daily contact with the Yaesu, Musen-factory. Tens of thousands of spares and test equipment.

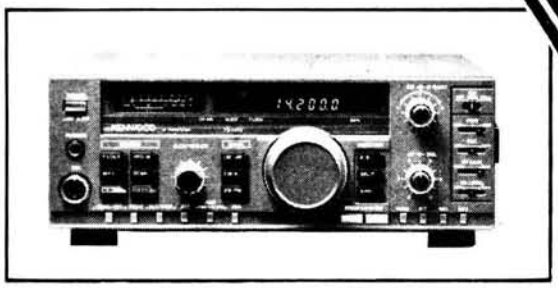
PRICES & AVAILABILITY SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

DEWSBURY ELECTRONICS

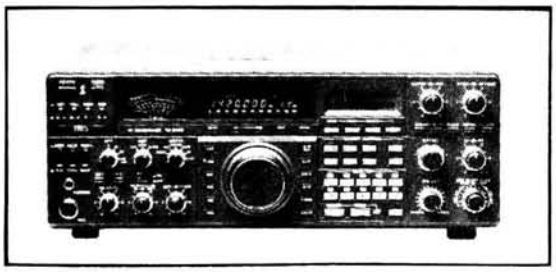
G4CLX

IF IT'S **KENWOOD** IT MUST BE **DEWSBURY**

A FULL RANGE AVAILABLE

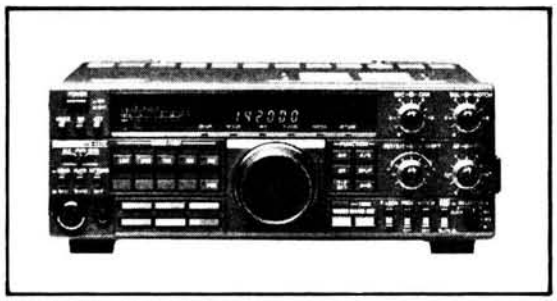


TS-140S £862.00



TS-940S £1995.00

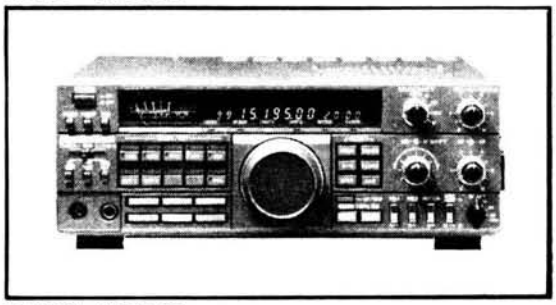
APPROVED KENWOOD DEALER



TS-440S £1138.00

APPROVED KENWOOD DEALER

R2000 £595.00



R5000 £875.00

POCOMOTOR AFR2000
RTTY ALL MODE DECODER

PRICES FROM £385.00

STAR MASTER – KEYER £54.70

REPAIRS

PROFESSIONAL
INDUSTRIAL
AMATEUR
PMR

Repairs and Service

- ★ 7 Working days guaranteed turnaround (subject to availability of parts)
- ★ 24 hour industrial service available
- ★ Collection and delivery of equipment, fully insured, arranged on request
- ★ Repairs to Kenwood, Yaesu, Icom, Ten Tec and all types of marine communications equipment

Stockists of DAIWA — WAVECOM — JRC — BENCHERS — VIBROPLEX — MICROWAVE MODULES — TENTEC — YAESU — ICOM

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands DY8 1TG.
Telephone: Stourbridge (0384) 390063/371228. Fax: (0384) 371228
Telex: 336712 SHELTN G. Ref. D2850

Access

VISA

Instant finance available subject to status. Written details on request.

WRITE ON...*the page where you have your say*

STAR LETTER
£10 TOKEN WINNER

Initiative

Your Comment in May's *PW* was indeed thought-provoking. I have felt for some considerable time that there is a disturbing shortage of really interesting constructional articles right across the whole spectrum of radio hobbyist magazines - the occasional exceptions being your goodselves and *RadCom*.

And yet, you know, a lot of good construction goes on, but little if any of it reaches the pages of any magazine. So, where does the root of this problem lie, with the constructor or with the magazine editor?

Time was, not so long ago, that on opening the pages of a radio magazine, including the ones from abroad, some circuit or other would whet the reader's appetite. Nine times out of ten it would be impossible for him to exactly duplicate the circuit and the listed components, but our builder automatically made substitutes from components near to hand, adjusted the circuit to suit, and most often finished up with a product that performed better than the original.

This then widespread ability to adapt someone's circuit ideas seemed to die a natural death some time in the early 1970s - about the same time that I overheard a bloke at a Leicester Rally state that he never built circuits from *The ARRL Handbook* because all their designs used 115V a.c. primary transformers. Think about that one!

In my own case, construction has always taken up about 80 per cent of my "radio time" - the past two years resulting in the design and construction of (1) an s.s.b. transmitter for 160/80m, (2) a servo driven automatic antenna matcher for 20/15/10m,(3) a v.h.f. tunable receiver covering 2m and the aircraft band, and (4) a customised "Codar" transmitter with all the trimmings!

Enough there, you would think, to interest any magazine editor, and yet not one of them, with the exception of the "Codar", which was rejected as being "too complex for today's radio enthusiasts", was ever put forward for possible publication.

And the reason for that? Quite simple. In these days where the editor requires not only the type and value of each component in a circuit, but also the cost, the supplier, and almost the number of the bus to take the would-be builder to the shop, a design which uses not easily obtained and duplicatable components doesn't stand a cat-in-hell's chance of being published.

My automatic a.t.u., for example, uses servo motors and gearboxes culled from ex-service gear. The s.s.b. uses filters and phase shift components that need making (horrors!), and the v.h.f. job, component-wise, was similarly "complicated". In short, no editor would touch them with a barge-pole!

But why this attitude against experimental construction - is it a fear of failure? It could be said that the "radio enthusiasts" of the '80s lack the basic curiosity and the desire to experiment, which are the

Playing the Game

I would like to register my total disgust at the attitude of certain stations, the number of which is growing, to the licensing conditions for 50MHz. Has anyone heard of e.r.p. or p.e.p.? During the 50MHz contest stations were quite openly flaunting the power restrictions for this band.

I heard stations saying they were using 100W into 8-element beams. Do these people work out their e.r.p. or do they simply not care about it? 100W into an 8-element beam surely does not give 100W e.r.p. unless the loss in the coaxial feeder is approaching 10dB, which is just a little unlikely, isn't it?

To the powers that be I simply say, act now before it's too late! Am I the only one who actually reduced his power to conform to the power restrictions on 50MHz? It's got me to the stage of closing my 6m station down in disgust.

D. B. Glover G1VJP, Merseyside

PW COMMENT

QTHR?

IN HIS HF BANDS COLUMN in last month's *PW*, Paul Essery GW3KFE raised an interesting point regarding the use of regional identifiers (G, GW or GM) by stations located near the borders of England with Wales and Scotland.

Apparently, the computer at the Radio Amateur Licensing Unit (RALU) at Chesterfield places stations according to their post-codes, and issues licences with regional identifiers appropriate to whichever country the Post Office says those post-codes apply to. In fact, post-code areas quite often cross county boundaries, and sometimes country boundaries too.

Checking the new UK Amateur Radio Licence conditions (Sub-clause 7(5) in Booklet BR68), I found that it says "When away from the Main Station Address, the Licensee shall use the appropriate Regional Secondary Locator specified in note (w) to this booklet". Surely it would be right and proper (and logical) that if, for example, your Main Station Address is in Wales but with an English post-code, you should use a GW prefix when operating at home. Not according to Booklet BR68! If you look back at the conditions on the previous Amateur Radio Licence (Sub-clause 9(a)), you will find that although the wording was different, the meaning of the rule was the same.

Now you may well think, as I did when I first read GW3KFE's comments, that all this is a bit of a storm in a Welsh teacup. But border regions often have a history of centuries of dispute over land ownership, and as like as not cross-border raids and skirmishes too. Many people who live in those regions feel very strongly about their national loyalty, and I think that it is a little unfair of RALU to transport them summarily into another country, even if it is still a part of the United Kingdom. Why cannot the licence conditions simply say that the callsign should always be prefixed with the regional identifier appropriate to the country that the station is being operated in at the time.

Incidentally, there still seems to be confusion among some radio amateurs regarding the date when the new licence conditions apply and when they will be receiving a revised licence. For existing licence-holders, new licences are not being issued until the normal annual renewal is done. The new conditions came into effect on 1 January 1989, and you should be operating according to those conditions even if you still have an old format licence which is due for renewal later this year. The new licence conditions appeared in full in the issue of *Practical Wireless* dated September 1988, and are also reproduced in the 1989 RSGB *Amateur Radio Call Book*.

Geoff Arnold

building blocks for the continuation of amateur radio. Or could it be that the over-cautious attitudes of a series of latter day magazine editors, in a misguided attempt to help their readers to a maxima, have in fact inhibited the initiative of the would-be constructor?

I favour the latter suggestion, Mr Editor, and wish so very much that you would publish something really interesting which uses components which are NOT readily available from the high street emporium. True, it would put a lot of readers off the project, but the ones who were not put off are the sort of people we need to take REAL amateur radio into the '90s. Why not try it, you could be surprised!

Nev Kirk G3JDK
Rotherham

So far as PW *is concerned, nothing would please me more than to publish the sort of articles Nev Kirk describes. However, we know from bitter experience that we would be inundated by telephone calls and letters from readers saying something like: "I know you said in the article that you couldn't tell us where we could find the bits and pieces, and we'd have to search them out at rallies and so on, but can you just tell me where I can find so-and-so".*

We do our best, but by the time you've had half a dozen calls like that, each taking perhaps ten or fifteen minutes, plus several letters posing similar problems, that's an awfully big chunk out of a working day. As G3JDK says, and I've said before in these pages too, initiative seems to be a commodity that is sadly lacking in too many of today's radio hobbyists. - Ed.

First Stuff Your Horn

Reading the excellent article on an "Acoustically Tuned CW Loudspeaker" in March *PW*, brought to mind a similar idea which I have used in the past.

There are still a few old horn type loudspeakers in readers' shacks, and if one of these is stuffed liberally with cotton-wool, it makes an excellent acoustic filter for reading c.w. through the QRM! The cotton-wool should be teased out, and the actual amount used judged by trial and error, but it certainly works.

How do you connect an old horn speaker, with an impedance of 2000 ohms, to the output of a modern set? Well, the simple answer is to use an output transformer, wired "back-to-back" - that is with the low impedance winding coupled to the receiver output. Any type of fairly high step-up ratio seems OK, as a little distortion only adds personality to the Morse code note.

Douglas Byrne G3KPO
Ryde, Isle of Wight

VFM?

It seems to me that Mr Arnold is trying to have it both ways in his "Talking Point" article in the May issue of *PW*. He states that "having two competing societies could very rapidly degenerate into total chaos" and in the next paragraph says "It would be interesting to know how many *PW* readers would support an alternative society".

I also feel that in reprinting the letter from Trevor Preece to Ken Willis, *PW's* integrity has suffered.

I know nothing of the internal politics of the RSGB, but I make this simple comparison. For £15.60 I get twelve issues of *PW*. For £20.50 I get twelve issues of *RadCom*, plus help with my planning application, plus help with my EMC problems, plus a QSL bureau, plus membership of a society which represents at the highest level my interest as a radio ham.

Jeff Cook G0AFQ
Wigan

Send your letters to the Editorial Offices in Poole, the address is on our contents page. Writer of the Star Letter each month will receive a voucher worth £10 to spend on items from our PCB or Book Services, or on *PW* back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.

Letters must be original, and not duplicated to any other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.

RSGB

I should like to take up just two points from David Evans' letter (*PW* May 1989).

First, to compare prices now and twenty years ago is largely an exercise in futility. Nevertheless, since he has done so, he might ponder on why electronic goods of all types from pocket calculators to computers, and including domestic radios, have come down in absolute terms. Meanwhile, as we know, the prices of our equipment continue to rise. For a man in his position, his acceptance seemingly without demur is a little odd.

However, my second point bears on a problem equally vital to the future. In May 1983, in another publication, he stated:

> "We are very aware that we do too little for the newcomer to the hobby."

and later, in the same article:

> "One of the consequences of the move of headquarters is that we can now implement the decision made by Council two years ago, namely, the employment of a full-time technical officer whose main function would be to ensure the generation of 'beginners' technical material."

So, it seems that back in 1981 the Council recognised their duty to new entrants, and by implication, to obtain them in the first place. Unfortunately, it appears little, if any progress has been achieved. Was the technical officer appointed, and if so what were the results?

K. Gardiner
Doncaster

Super Dipole?

The committee and members of the UKFM Group (Northern),and users of GB3NA repeater, were fascinated to read P. L. Crosland's letter in your April issue.

If Mr Crosland would care to publish details of his Magic Dipole that can hear the West Yorkshire repeater in Worcester, we feel sure that amateurs around the world would be delighted.

What Mr Crosland has probably heard is his local repeater in Birmingham, which regretfully has been plagued of late by half-wits.

Ivor Shaw G3KWT
Leeds

Gilding the Lily

Having built the *PW* "Itchen" *LCR* Bridge designed by GW3JGA (*PW* April 1987), I wish to congratulate him on its excellent performance.

There is a feature, however, which I have added which may be of interest to your readers who wish to "gild the lily". Across pins 11 and 12 of IC4d, I've connected a 100-0-100 microammeter with a 47kΩ resistor in each lead, which gives a more precise null than the l.e.d.s.

This is very effective on all ranges, particularly the low capacitance range, where it now possible to define quite clearly small picofarad values.

As an inveterate dabbler who has built and adapted many of your designs over the years since 1947, I wish your magazine every success for the future.

R. V. Privett G0CUU
Croydon, Surrey

Newsdesk...Compiled by G4LFM

Rallies

***June 11:** The Royal Naval Amateur Radio Society's annual rally is scheduled to be held at HMS Mercury again this year.

June 11: The Mid Lanark Amateur Radio Society are having their open day at the Community Education Centre, Newarthill, by Motherwell. This is on the A723, 2.4km south of the Newhouse interchange on the M8. There will be trade stands, bring & buy, demonstrations of packet, RTTY and QRP together with lectures and the award of the Society's annual EHI Trophy. Talk-in is on S22 and refreshments will be available.

June 11: The Elvaston Castle Radio Rally will be held in the showground of the Elvaston Castle Country Park. This is 5 miles south east of Derby.

June 18: The Newbury & District ARS will be holding a Radio Boot Sale and Rally at Acland Hall and Recreation Fields, Cold Ash, Newbury. The sale is on between 10am and 3pm and admission if free. There are both indoor and outdoor stands and talk-in will be given by GB4NBS. Details and bookings from: Mike G3VOW. Tel: (0635) 43048.

***June 25:** The 32nd Longleat Amateur Radio Rally will be held as usual in the grounds of Longleat House, Warminster, Wiltshire. This rally is always popular as it offers something for the whole family. More details from: Shaun O'Sullivan G8VPG, 15 Witney Close, Saltford, Bristol BS18 3DX.

June 30 - July 2: The Popular Flying Association Rally is again being held at Cranfield Aerodrome, Bedfordshire. The rally covers the whole spectrum of sporting aviation from light aircraft through powered gliders and microlights to airband radio. For more details, contact: Popular Flying Association. Tel: (0273) 461616.

July 2: The Newport Amateur Radio Society will be holding their 2nd Grand Surplus Equipment and Junk Sale at Brynglas House, Newport. The event opens at 11am (10.30am for disabled visitors) and it finishes at 4pm. There will be surplus/second-hand equipment and junk stands. From 12 noon to 3pm there will be an auction held in the main hall of the building. Light snacks and refreshments will be available. Talk-in will be provided by GW1NRS on S22. The money raised will go towards training young people in line with Project YEAR.

July 9: The 1989 Droitwich Strawberry Rally will take place at the High School, Droitwich. There will be trade stands, a Bring & Buy, family entertainment and strawberry fields (weather permitting). There is both free entrance and car parking. Details from: Derek Batchelor G4RBD. Tel: Worcester 641733.

***July 15:** The Cornish Radio Amateur Club rally will be held at Richard Lander School, Truro. There will be the usual trade stands, a Bring & Buy, computer displays/demos and refreshments. There is plenty of free parking as well as attractions for all the family. More details from: Rolf Little. Tel: (0872) 72554.

***July 16:** The Sussex Amateur Radio & Computer Fair will be held at Brighton Racecourse from 10.30am to 4.30pm. Free shuttle to Brighton sea-front for the family, trade stands, bring & buy, refreshments and car park.

July 16: The Pontefract & District ARS are holding their rally at the Pontefract Racecourse & Park. Doors are open from 11am to 5pm. There will be traders, RSGB bookstall, bring & buy, refreshments and bar, boating, putting, etc., for the family. Large free car park with admission 50p per prize programme. Talk-in on S22. Details from: C.A. Mills G0AAO. Tel: (0977) 43101.

July 23: The Burnham Beeches and Maidenhead & District ARCs are staging the sixth McMichael Rally at the Haymill Centre, Burnham, near Slough. Doors open at 10.30am (10.15 for disabled visitors). The CAMRA bar will again be attending. Tea, coffee and food will also be available. There's ample car-parking on site and the car boot sale will be staged again this year. Attractions include radio controlled cars, ATV groups, packet station and the h.f. station GB4MR. Entrance fee is £1 and the car boot area will be £5 per car and driver for the day. Contact: Bob Hearn G0BTY on (0494) 29868.

July 23: The first North Cheshire Radio Club Mini-Rally and Car Boot Sale will be held at the Morley Green Social Club, Mobberley Road, Morley Green, Nr Wilmslow. Car boot pitches are £5 in advance or £6 on the day. There will also be some local trade stands as well as refreshments and a licensed bar. Talk-in on S22 from G1NCR. Peter G4WCE. Tel: Lymm 5959 or via packet at GB7NWP-2.

July 22/23: The 934 Club (Essex Group) will be holding their 5th Annual Mobile Rally at Thorndon Park, Brentwood, Essex. The rally site will be open from 2pm on the 22nd for campers/vans, etc. An overnight charge of £2 will be required. Entrance on the Sunday (from 10am) will be free. The Southend & District Radio Society will be attending, working h.f., packet and 144MHz using GB0NTF. There will also be the annual "fun quiz" (on air) for mobile stations with 934MHz equipment on Sunday afternoon. Also a free-of-charge car boot sale. Tel: (0702) 712595 or (0702) 420918.

July 28-31: Dataspace '89 (incorporating the RSGB Data Symposium and the AMSAT-UK Colloquium) will be held at the University of Surrey. Full details and booking forms for tickets and accommodation can be obtained from: Ron Broadbent G3AAJ, AMSAT-UK, London E12 5EQ or RSGB HQ, Lambda House, Cranborne Road, Potters Bar EN6 3JW.

July 30: The Hilderstone Radio Society are holding their rally at Hilderstone College, St Peters Road, Broadstairs, Kent. There will be trade stands, a Bring & Buy, a talk-in station, raffle, refreshments, a licensed bar, etc. Contacts are: Alan on (0832) 593072 or Ron (0304) 812723.

***July 30:** Scarborough ARS are holding their annual rally at the Spa, on the South Shore

Catalogues

BDL Electronic Components and Equipment have a catalogue of their components available. It will be sent on request if you send a 19p stamp and your address. It contains details of the components from light-weight stereo headphones to i.c.s, diodes and filters. There is also a page of special offer i.c. packs, all at £1 per pack (you could get as many as 10 i.c.s in a pack depending upon the type).

BDL
88 Bewick Road,
Gateshead,
Tyne & Wear
NE8 1RS
Tel: 091-490 1975

New Marine Channels

The DTI has assigned additional v.h.f. radio frequencies for use by marinas, yacht clubs and pleasure craft to reduce congestion on the existing communications channels in coastal waters.

The boom in yachting has resulted in the current 158.85MHz frequency, called Channel M, becoming over-used. The frequency 161.425MHz, provisionally called Channel M2, has been made available to yacht clubs whose need is mainly for a simplex channel on which to pass messages, for instance to a group of yachts in a race.

Marinas, which often need to be contacted by foreign vessels, may apply for a transmitting frequency of 161.625MHz and a receiving frequency of 157.025MHz which are together known as Channel 80. This is in the international band available to the UK and foreign yachtsmen. The new channels will require a licence or, in the case of current Channel M licences, an amendment to this licence will be needed.

Fireworks at Your Rally?

Some organisers make their rallies events to remember in many ways. An ever more popular way is with a firework display. One company that supplies these fireworks to radio rallies is AES Pyrotechnics. Their brochure contains all kinds of details of the packages they have available.

The display package includes the setting-up, fusing and firing of the display and because they use re-usable launch stands no holes have to be dug in the ground. The travel expenses to the site are charged at cost.

Aerial displays mentioned in the brochure range from £150 to £3000 plus VAT and Ground and Aerial displays range from £180 to £475 plus VAT. Other options are things like daylight specials (one of those available is a shell burst that breaks at great height releasing a paper hat and flowers or flags) and these range from £10.

AES Pyrotechnics.
Main Street,
Alrewas,
Burton-on-Trent,
Staffs. Tel: (0283)790819.

Seafront, Scarborough. This is close to the beach and all the entertainment, so there will be something for all the family. Doors open at 11am. There will be trade stands, bring & buy, refreshments and bar, with talk-in on S22. Details from: G4UQP on (0723) 376847.

July 30: The Rugby Amateur Transmitting Society are holding their Amateur Radio Car Boot Sale at Lodge Farm, Walcote, Nr Lutterworth. Apparently, that's less than 2 miles east from junction 20 of the M1. Talk-in will be on S22. Pitches are available for £5 and entrance to buyers is 50p per car. The event opens at 10am. More details can be obtained from: Kevin G8TWH. Tel: (0203) 441590 or David G4DDW. Tel: (0455) 52599.

***August 13:** Hamfest '89 will be held at the Flight Refuelling Sports Ground, Wimborne, Dorset. Gates open at 10am and there's free car parking as well as overnight camping facilities. The day will feature radio and electronics trade stands, field displays and a craft and gift fair. More details from: Rob G6DUN. Tel: (0202) 479038.

• Practical Wireless & Short Wave Magazine in attendance. If you are organising a rally and would like it mentioned in Practical Wireless, then drop us a line, preferably as soon as you have fixed the date but no later than 6 weeks in advance (marking your envelope Rally Calendar) and we'll do the rest. Please make sure that you include all the details including such essential information as the venue, starting time, special features and a contact for further information.

HT Connectors

A new high tension 2mm touch-proof connector is now available from Multi-Contact (UK) Ltd. It has a test voltage of 5kV and is rated at 15A. The recommended operating temperature range is between 70° and -10°C. The socket, manufactured from brass, machined and gold-plated has a deep insulating shroud giving a breakdown voltage to VDE standards of 9.5kV. The connectors are available in either red or black (the socket is additionally available in blue).

Multi-Contact (UK) Ltd.
ICG House,
Station Approach,
Oldfield Lane North,
Greenford,
Middlesex UB6 0AL.
Tel: 01-575 7070.

RAE Courses

Harrow, Middlesex: Wednesday evenings, nine month course for the licence begins at Weald College, Brookshill, Harrow at 7pm September 27. For enrolment call Weald College on 01-954 9571. Tutor is John Brown G4UBB.

Ratchet Screwdriver

A three-position ratchet screwdriver from Freetrade (TEP) Ltd., has a tilting head that can be set at 0°, 45° and 90° angles for access to most screw heads. The angled head allows the handle to act as a lever for applying more power when loosening stubborn screws. The screwdriver (part No. 321390) has a ratchet control with tightening, untightening and locked positions. It takes standard hex shaft bits and is supplied with four bits - two slotted and two cross-head, which are stored safely inside the handle. The cost of the screwdriver is £4.62 (exc VAT).

Freetrade (TEP) Ltd.
Unit 15C
Avery Industrial Park,
Garrison Lane,
Bordersley Green,
Birmingham B9 4QE.
Tel: 021-766 6142.

DXpedition

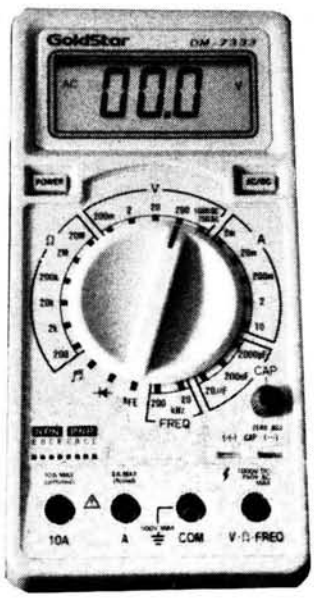
Once again the Isle of Man ARS are setting up a station of the Calf of Man. This is a small island 0.5km in diameter and it is a nature reserve and bird sanctuary. During the summer months, the population is only five....until the GDs arrive!

The party of amateurs will be going out to the Calf on Friday July 7 and returning (weather permitting) on Sunday July 9. The callsigns in use will be GD0IOM and GD3FLH on h.f. with GD4IOM on v.h.f. The frequencies to listen on are: 14.250MHz s.s.b., 21.250MHz s.s.b., 28.525± QRM, 144MHz, 430MHz and possibly 50, 70 and 1296MHz. Contacts made during the Calf DXpedition will count towards the Golf Delta award.

Multifunctional DMM

The GoldStar 7333 is a hand-held d.m.m. which features a single, easy to use, 25-position rotary switch for both function and range. With a large 31/2 digit, 1999 count, liquid crystal display, this instrument offers high accuracy and input impedance, auto zeroing, low battery and over-range indication, measured units annunciation and full overload protection. Functions are a.c. and d.c. voltage and current, resistance, frequency, capacitance, *npn* and *pnp* transistor gain, diode test and audible continuity. The DM7333 measures d.c. volts to 1000V with a basic 0.3% accuracy, a.c. volts to 750V and alternating and direct current to 10A. Resistance is to 20MΩ with a separate 200Ω range. Capacitance is measured to 20μF and frequency to 200kHz. Powered by a single 9V battery, the units weighs 425g and measures just 185 x 90 x 45mm. The unit comes ready for use with test leads, spare fuse, battery and operator's manual. It costs £59.95 (exc VAT).

Alpha Electronics Ltd.
Unit 5,
Linstock Trading Estate,
Wigan Road,
Atherton,
Manchester M29 0QA.
Tel: (0942) 873434.



muTek Products

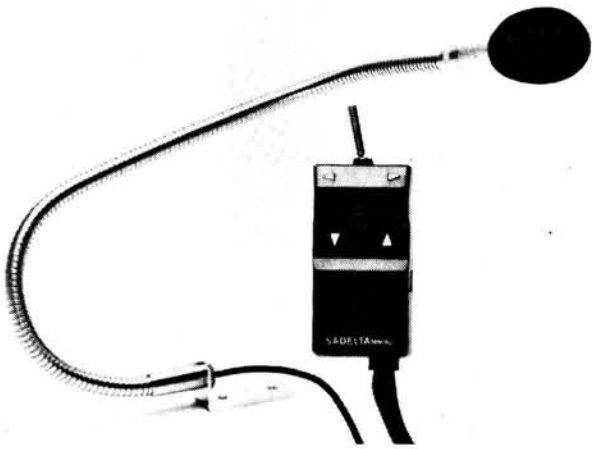
muTek ceased to use the BF981 in new products from April 1989. All production from this date will use a new device, the BF988, which is a pin-compatible replacement offering the following advantages:

- lower noise figure
- higher frequency response
- more gain
- better linearity

These devices are available from muTek priced £1.25 plus 50p P&P (1 off).

muTek Ltd.
PO Box 24,
Long Eaton,
Nottingham NG10 4NQ.

Newsdesk...*Compiled by G4LFM*



Nevada Communications have introduced a new Sadelta mobile microphone, the model MM90. They say it is suitable for use with all existing brands of amateur transceiver and CB radio, and has been designed to give hands-free operation in the car. The MM90 uses an electret uni-directional mic insert and comes complete with a control box that allows up/down control of appropriate radios. The MM90 may be powered directly from the transceiver or from the vehicle battery.

The output impedance is 1.5kΩ, output level is adjustable 0-2V p-p and the frequency response is 150-8500Hz. The MM90 costs £39.95.

Nevada Communications.
189 London Road,
North End,
Portsmouth,
Hampshire
PO2 9AE.
Tel: (0705)662145.

Communications Museum

The Museum of Communication will be displaying some of the interesting items from the museum's collection in the Upper Library, Bo'ness on the weekend of September 16/18. Amongst the things on show will be examples of early spark transmission, telegraph and telephone mechanisms, a cylinder recorder and horn gramophone, crystal receivers, horn loudspeakers, early single and multi-valve receivers to name but a few. Bo'ness is also the home of the Kinneil and Bo'ness Steam Railway. The steam trains will be operating on the 11km return journey to the Birkhill Clay Mine which has been opened to the public this year.

Bo'ness Heritage Trust.
Museum of Communication
22 Kinglass Avenue
Bo'ness
West Lothian

Special Event Stations

GB2NTS, GB2NTU, GB2NTW and **GB2NTE**: On July 29/30 four stations will be on the air from different National Trust properties, one each in Scotland, Ulster, England and Wales. Hopefully Ireland will make up a fifth country (EI). If you live overseas and can contact two of these stations, or if you live in the UK/Ireland and contact three stations there is a Commemoration Certificate available. Overseas the cost is $1 or equivalent return postage by Air Mail, UK/Ireland it requires a 19p s.a.e. You need to send QSL cards or log extracts to: Scottish Tourist Board (Radio Amateur) Expedition Group, PO Box 59, Hamilton, Scotland ML3 6QB.

GB2WW & **GB4BOB**: During 1989, the Bedford & District Amateur Radio Club plan to commemorate the outbreak of the Second World War by operating several Special Event Stations. The locations will include a number of former RAF and USAAF stations in and around the Bedford areas which were in use during the hostilities.

GB2WW: This station will be on the air on August 19 from Kimbolton Airfield for the Remembrance Service of 379 Bomb Gp USAAF. Then, on September 3, it will be on the air from RAF Cardington for the 50th anniversary of the start of WWII.

Further details can be obtained from the Special Events Manager: Ray G0EYM. 30 Cotswold Close, Putnoe, Bedford MK41 9LR. Tel: 0234 244506.

GB?ATC: This station will be on the air from Cardington Airfield to celebrate the 50th Anniversary of 157 Sqdn (Bedford) ATC on July 15.

GB2RBC: Located at Royal Balmoral Castle, Crathie, Aberdeenshire on June 24/25.

GB0DOB: This is the provisional callsign for the special event station to be set up in July this year. The purpose is to link church members and school children in the Diocese of Bradford with others from the USA and elsewhere. They should be using s.s.b. on the 7, 14, 21 and 28MHz bands (WACRAL frequencies). More information from G4YRH. QTHR.

GB0RAF: The Scarborough Special Events Group will be on the air from the Scarborough Air Show on July 1 to celebrate the 50th Anniversary of RAF Staxton Wold Radar Base. The RAF Red Arrows display team will also be present and a special QSL card will be issued to commemorate the celebrations. Operation will be around 3.725 and 7.055MHz in the h.f. band and also on 144MHz. Further details can be obtained from: Roy Clayton G4SSH. QTHR.

GB4ATG: This is the talk-in station for the BARTG Rally on August 27 from Sandown Park Racecourse, Esher, Surrey.

GB4VMR: This is the talk-in station for the Vange ARS 10th Annual Mobile Rally from Basildon on September 10.

GB0KCF: This event will take place on June 24 in the recreation ground of the village of Kingston Bagpuize, which is situated 15km south-west of Oxford. They hope to be active on 3.5, 7, 14, 21, 28 and 144MHz with s.s.b. and f.m. where appropriate.

Five Bells DXpedition

The Five Bells Group have obtained permission to visit the island of North Rona, which is located 72km north-west of Cape Wrath in QRA XT71b (WAB HW83). The island is completely uninhabited (apart from sea birds, seals and sheep!) and landing by sea is difficult as most of the island's coastline consists of cliff faces. The group are aiming to land on the island on July 11 and to be operational from July 12 to 19.

Final details have still to be confirmed, but operation is planned on 50MHz, 144MHz (144.028MHz c.w. and 144.215MHz s.s.b.) and possibly 430MHz (432.215MHz). The callsign GB4XT has been applied for.

In view of the reliance upon sea conditions for landing, no prior skeds can be taken, but please listen on 14.345MHz and their nominated 144MHz band frequencies for m.s. as well as tropo contacts. The confirmed operators, to date, are: Chris G8JIC, John G4NPH, Julian G4YHF and Keith G4ODA. All QSLs should go via the bureau to G4NPH or G4ODA.

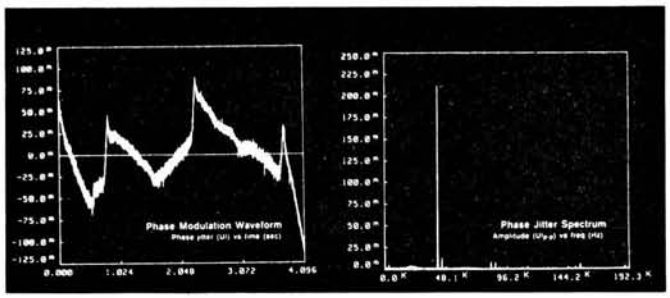
Can You Help?

Andy Henderson is searching for any KW 1000 linear amplifier owners to help him solve a couple of problems. A. Henderson, 3 Helmsley Lawn, Redcar, Cleveland TS10 2LL.

Analyser Software

Protek now have available the DP280 Phase Noise and Jitter Analyser software which runs on an HP 9000 Series 300 workstation or PC compatible with associated hardware.
It will control an HP 5371A Frequency and Time Interval Analyser to gather phase samples of the signal of interest and computes and displays jitter and phase modulation spectra from digital communications and other serial data systems such as from a "noisy" crystal oscillator module. The system can make measurements at sample rates as high as 10MHz allowing spectral energy below 5MHz to be accurately characterised and the jitter bandwidth to be examined can be greater than 2MHz.
The software is easy to use with menus to enable quick set-up, calculation, display and selection of units of the results to be easily changed. The HP5371A is also set up from the software menus using simple field entry.
Extensive help screens provide a view of the way the system operates and cover the signal processing steps taken as phase sample data proceeds through the system.

Protek.
10 Grosvenor Place,
London SW1X 7HH.
Tel: 01-245 6844.



Theatre Radio Mics

An extra 22 radio frequency channels have been made available to theatres and concert halls which use radio microphones, in a bid to overcome outside interference.
The extra channels will also remove the likelihood of interference from the high powered services, such as new p.m.r. services which are to be introduced in the early 1990s on frequencies now used, without authority, by some theatre radio microphones. Such services are likely to make those radio microphones unusable.
Unauthorised theatre radio microphones tend to suffer serious interference from the more powerful equipment used by legitimate users of these frequencies such as mobile operators. The new channels will be shared with existing users but potential interference will be avoided by giving geographical allocations to theatrical use.
Manufacturers, retailers, suppliers of equipment and theatre managers will need to switch to the new approved frequencies and equipment as soon as possible. An annual licence, costing £100, will be needed to operate on the additional frequencies. The Department will carry out checks on illegal use of equipment later in the year, meanwhile complaints about individual cases of interference will be investigated as usual.
An information sheet giving details of the new and existing arrangements for authorised use of such radio microphones is available free of charge from:

The DTI.
Radiocommunications Division Library,
Room 605,
Waterloo Bridge House,
Waterloo Road,
London SE1 8UA.

Bookshelf

NOVICE ANTENNA NOTEBOOK
By Doug DeMaw W1FB
Published by the American Radio Relay League
Available from the Practical Wireless Book Service
206 x 276mm, 130 pages. Price £5.95 plus 75p P&P
ISBN 0 87259 207 3

Another winner from Doug DeMaw, who has a magic touch when it comes to explaining theory and practice in a way that can be easily understood by a newcomer to the radio hobby, and who boldly tackles the nagging questions that other experts tend to gloss over. The eight chapters deal with antenna materials and placement, dipoles, feed lines, verticals, loops and straight wires, beams, support structures and antenna hints and kinks. Each chapter ends with a summary and glossary of terms.
A mine of information, to be thoroughly recommended to anyone interested in experimenting with antennas. GCA

THE RADAR WAR
Germany's Pioneering Achievement 1904-45
by David Pritchard
Published by Patrick Stephens Ltd
Available from good book shops
159 x 240mm (hardcover), 240 pages. Price £14.95
ISBN 1 85260 246 5

David Pritchard's name will be familiar to *PW* readers as the author of the series "Battle of the Beams". In this book, the culmination of many years of research and interviews with leading engineers of the time, he examines in some detail the history of radar in Germany, from its first experimental demonstration in 1904 through to its development and use before and during WWII.
He looks not only at the technical side, but also at the political and inter-service rivalries which, as so often happens, did much to shape the course of events. A fascinating book, though I would have liked to see more details of the engineering techniques used. GCA

PW REVIEW

The Ten-Tec Paragon Model 585 All-band HF Transceiver

Upon unpacking the Ten-Tec Paragon 585 for review, Ken Michaelson G3RDG felt an immediate liking for it. Here he reports on his impressions gained from a deeper acquaintance with the rig.

The Paragon Model 585 is made by Ten-Tec of Sevierville, USA. It has a rigid aluminium chassis with an extruded aluminium front panel, hinged to provide access to all sections of the chassis. The top and bottom covers are of steel finished in pale grey. A snap-up stainless steel bail is provided to raise the height of the front of the rig.

Although when the top cover is removed, the rig has the usual appearance (and a very smart and business-like appearance it is) of the p.c.b.s interconnected with each other by various leads, when the bottom cover is removed the p.c.b.s are not exposed immediately. There is a steel screening plate covering the whole area with outlines naming which board is which and, in addition, having holes for all the trimmer adjustments, every one of which is named. The Final Amplifier subassembly even takes it further, actually having arrows pointing clockwise around the holes with the word "increase" on them showing which way to turn! I really did think that this was an excellent design point .

The Owner's Manual is a manual in the true sense of the word, having 83 pages of A4 size with 88 illustrations and 26 circuit descriptions contained in a very smart blue loose-leaf folder.

I imagine that Ten-Tec are providing for the repair of possible faults worldwide, because all potential information is given, as for example "Theory of operation", "Circuit trace" and "Component layout" of all the p.c.b.s in the rig. All the circuit boards, of which there are 14 double-sided and 9 single-sided, are glass epoxy of G10 standard, and all can be removed without desoldering.

The appearance of the front panel is uncluttered and spacious, making the operation of critical controls very simple. It is divided into two, with the right-hand half having a dark grey panel proud of the actual front. The tuning knob is in this assembly and has a rubber ring around its circumference giving a pleasant feel when tuning. There is not, however, any means of adjusting the "drag" of the knob as is incorporated in many Japanese rigs. This, I thought, was a pity, as the "freeness" of the rotation was not to my liking. In the same area of the front panel are 32 push-button switches and a keypad.

The column of six push-buttons to the left of the tuning knob includes the TUNE button and emission mode selectors. Above the tuning knob are five further buttons which select the various bandwidth filters, marked "6.0", "2.4", "1.8", ".50" and ".25". On the review rig, only the two widest filters were fitted, the other three are optional extras.

To the right of the tuning knob is a further set of buttons associated with tuning of the dual v.f.o.s and transmit and receive incremental tune, a keypad for direct frequency entry, and buttons controlling the memory and scanning functions. The left-hand half of the front panel contains the usual quota of rotary controls for transmitter and receiver levels, plus i.f. passband tuning and notch, squelch, audio bandpass filter and tone, metering, speech processor level and noise blanker width. There are also switches for fast/slow a.g.c., r.f. attenuator, break-in speed and noise blanker on/off.

On the rear panel are large heatsinks for the two final transistors, plus connectors for power, antennas, transverter (0dBm TX drive level), linear amplifier, key and RTTY key, auxiliary audio input and output suitable for driving modems, etc., and external loudspeaker. Two rows of preset potentiometers control c.w. sidetone pitch and level, s.s.b. monitor level and "beep" voice level, and the usual VOX functions.

On the Control board, situated under a cover beneath the transceiver, there is an adjustable c.w. keying drop-out delay control.

There are 62 memory channels which store frequency, mode, filter selected, channel number and a 7-digit alpha-numeric "tag" which can be used to record other information such as a station name. The "Paragon" automatically selects the next available memory channel when a new frequency is entered.

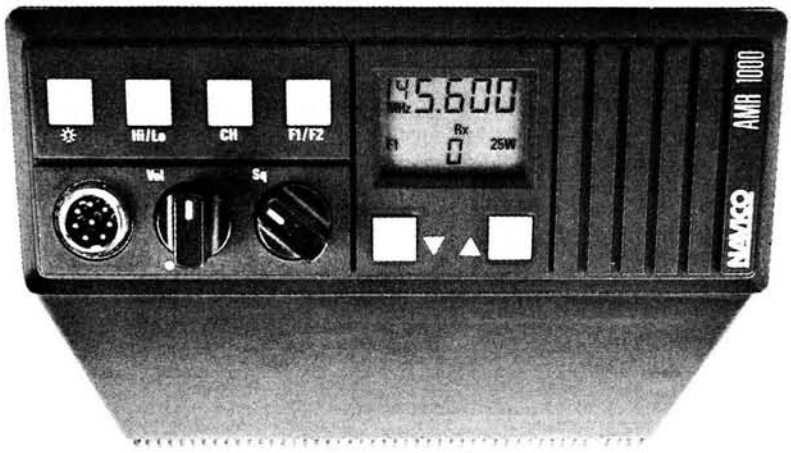
The memories can be scanned at a variable rate, with the option of locking out unwanted channels. Channels can be unlocked on a selected or global basis. It is also possible to tune through the memories using the main tuning knob. An additional "scratch-pad" memory can store a single frequency without affecting the main memory locations.

The front panel of the Ten-Tec Paragon 585

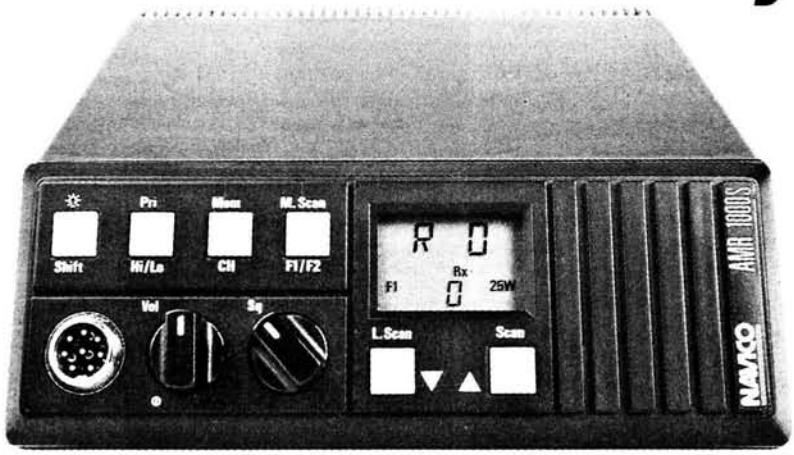
In Use

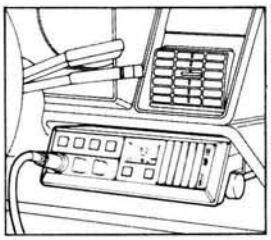
Allowing for the usual familiarisation period to get used to the many controls, the rig worked very well. A frequency can be selected in two ways, either by using the main tuning knob or by keying in the frequency on the keypad. Frequency is normally displayed on the blue fluorescent readout to the nearest 100Hz, but this can be changed to 10Hz if desired.

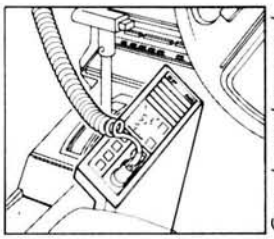
The 2.4kHz filter coped reasonably well with s.s.b. reception, aided if necessary by the the use of the passband tuning control, which was very efficient in getting rid of

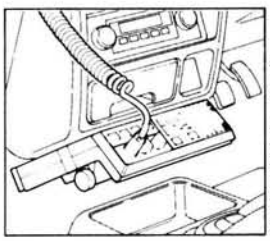


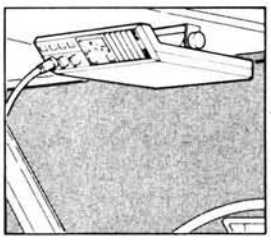
The new AMR1000/S
It checks out from every angle




Under dash mounted (side)


Central console mounted


Under dash (central)


Roof mounted

Whichever way you look at it, the Navico AMR1000/S sets new standards in 2m mobile transceivers.

The angled, reversible control panel, together with a range of inexpensive optional mounting brackets enables installation in any vehicle, whether under or on top of the dash, either side of a central console or even from the roof.

This means the display will always face you giving total access to the controls which are spaced to allow simple, safe, mobile operation. The front mounted loudspeaker will also face you, projecting the sound toward you and not at your feet or into the dashboard.

Combine this with the most sensitive and selective receiver, an audio response tailored for today's busy band and the unique, fully automatic repeater/simplex operating facilities and you have a truly remarkable mobile radio.

There is also a choice of models to suit your exact needs. In the words of Chris Lorek of HRT about the Navico AMR1000/S "Not only does it out-perform its competition on technical grounds but it offers many very useful operating features not found on other rigs, and sells at what appears to be a very competitive price".

Check it out for yourself, prices start at just £247.25 (incl. VAT). For more details and to arrange a personal demonstration clip the coupon today.

PRIORITY INFORMATION REQUEST
For full details send to:
Navico, Star Lane, Margate, Kent CT9 4NP,
United Kingdom. Telephone: 0843 290007.

Name _____

Address _____

_____

_____ Tel _____

PW **The professionals in amateur radio**

NAVICO®

unwanted s.s.b. stations close by. The sharp notch filter was also useful. The BPF/FADE controls would fade the normally flat receiver audio response to a bandpass filter variable from 220 to 1700Hz. There is no doubt that a sharper i.f. filter would have been a great advantage for RTTY. The attenuator switch, which removes the front-end r.f. amplifier from circuit, was used very often with great success on the 7MHz band. The RX OFF and TX OFF controls give up to 99.9kHz offset of receive and transmit frequencies.

I used the rig for some AMTOR contacts, and it was my feeling that the receiver recovery time could be decreased to some advantage. The contacts which I had, although they were relatively local, did prove that the system worked, however.

The date, time and memory contents are saved so long as the power supply is left on. I lost them all on the first day because I automatically turned off the mains when I left the shack. Because of this I installed a backup battery, which can be a 9V alkaline or NiCad type. The life of an alkaline battery, according to the manual, is only some 150 hours. A NiCad battery, on the other hand, would require the mains to be turned on (not necessarily the rig) for only 3 to 4 hours per week to keep the battery trickle charged.

Using the general coverage receive facility and my ICS FAX-1, I copied a number of FAX stations sending weather maps, particularly Offenbach DCF54 on a frequency of 134.2kHz. I actually got to this frequency by using a Datong v.l.f. converter giving an output in the 28MHz band. There was no discernible drift in the Paragon and the maps were printed out with the rig remaining absolutely stable.

The same satisfactory operation took place when receiving figure groups associated with weather reports, but again I felt that a narrower filter would have been of very great help. On 14MHz several satisfactory s.s.b. QSOs were carried out, using the p.t.t. method as against VOX. I have never liked VOX myself, although after adjusting the three controls on the rear panel, the system would work perfectly for those who like it.

When transmitting, the method of operation is to press the TUNE key, adjust the a.t.u. for minimum s.w.r., then turn the power control up to the desired output. On s.s.b., it is also necessary to advance the MIC GAIN until the ALC l.e.d. lights on voice peaks.

The tuning knob provides two tuning step rates, 10Hz or 20Hz, and similarly the UP and DOWN buttons can change frequency in either 100kHz or 1MHz steps.

Conclusions

As I have already remarked, I liked the Paragon at first sight and the more I used it and became familiar with its operation, the more I appreciated its design. In particular the facility for transverter working, an option often neglected on other rigs, gave it the edge over other transceivers. I would thoroughly recommend it to anyone, though if I were the owner of the rig, the purchase of one or more of the optional filters would be my first object.

A microphone was not provided with the rig, and the one which I used was the Ten-Tec Model 700C electret hand-held, priced at £32.00. A separate 13.5V 22A d.c. power supply would also be required, and the Ten-Tec item was the Model 961 at £215.00. The cost of the Ten-Tec Paragon Model 585 transceiver itself at the time of going to press was £1839.00, all prices inclusive of VAT. ***PW***

Thanks to **Amcomm Services Limited, 373 Uxbridge Road, Acton, London W3 9RH, telephone 01-992 5765/6**, for the loan of the rig for this review.

★ MAKER'S SPECIFICATIONS

TRANSMITTER

Frequency coverage:	Amateur bands from 1.8MHz (160m) to 28MHz (10m)
Offset tuning range:	±99.9kHz
RF power output:	25 - 100W into 50Ω
Carrier suppression:	More than 60dB
Unwanted sideband:	Better than -60dB with 1.5kHz a.f. input
Spurious emissions:	Harmonic: better than -45dB Non-harmonic: better than -50dB
Microphone:	Low impedance, electret bias provided
3rd Order intermodulation distortion:	Better than -30dB (@ 100W p.e.p.)

RECEIVER

Frequency coverage:	100kHz - 29.9999MHz
Intermediate frequencies:	75MHz, 9.0MHz,6.3MHz 455kHz(f.m. only*)

Sensitivity: Input for 10dB S+N/N (except f.m.)

	0.1 - 1.6MHz	>1.6MHz
s.s.b./c.w./RTTY (2.4kHz)	0.5µV	0.15µV
a.m.: (6kHz)	3.5µV	1.0µV
f.m.*:(12dB SINAD)	1.0µV	0.3µV

Attenuator:	10dB <1.6MHz, 20dB >1.6MHz
Image rejection:	Better than 80dB
I.F. rejection:	Better than 70dB

*OPTIONAL

Selectivity: (-6/-60dB)

Standard a.m.	6.0/11.25kHz
Standard s.s.b.	2.4/3.36kHz
1.8kHz s.s.b.*	1.8/2.9kHz
500Hz c.w.*	0.5/1.4kHz
250Hz c.w.*	0.25/0.85kHz
Standard f.m.*	15/30kHz

Offset tuning range:	±99.9kHz
Dynamic range:	100dB
Blocking dynamic range:	+16dBm for 1dB compression of an S9 signal at 50kHz offset, -2dBm for 1dB compression of an S3 signal at 50kHz offset
Third order intercept:	+18dBm
Noise floor:	-132dBm at 2.4kHz bandwidth
Squelch sensitivity:	Less than 0.6µV
Receiver recovery time:	Less than 27ms
Max. Audio output:	At least 1.5W into 8Ω
PBT i.f. shift:	±1.2kHz
Notch filter:	0.25 to 2.2kHz, greater than 50dB

GENERAL

Tuning steps (selectable):	See text
Frequency stability:	Worst case 1 p.p.m./°C at 29.999MHz
Frequency accuracy:	±100Hz at 25°C
Antenna impedance:	50Ω unbalanced
Power requirements:	12 - 14V d.c. 1.5A receive; 20A transmit
Dimensions:	W273 X H146 X D432mm
Weight:	7.25kg (16lb)

FOR THE BEST IN AMATEUR RADIO - SAVE MONEY AND CALL US NOW FOR OUR UNBEATABLE EXCLUSIVE PACKAGE DEALS

ICOM IC-761

100W, 1.8-30MHz Ham band TX, GCRX, 32 mems, Internal ATU & PSU, DFM mixer, 105db dynamic range
IC-761 ..... ~~£2450.00~~

ICOM IC-751A

100W, 1.8-30MHz Ham band TX, GCRX, 32 mems, SSB/CW/AM/FM/RTTY, 12v operation, 40 wpm QSK keyer
IC-751A ..... ~~£1500.00~~

ICOM IC-735

100W, 1.8-30MHz Ham band TX, GCRX, an ideal contest or mobile rig, 12v operation, 12 mems, AM/SSB/CW/FM
IC-735 ..... ~~£979.00~~

ICOM IC-725

BIG OF THE MONTH! 100W, 1.8-30MHz Ham band TX, GCRX, SSB/CW, AM/FM option, DDS system - **package deal available!**
IC-725 ..... ~~£750.00~~

ICOM R7000

25-1000MHz + 1.025-2GHz, keypad entry, 99 mems, AM/FM/SSB, comprehensive scanning system - **package deal available!**
IC-R7000 ..... ~~£999.00~~

ICOM IC-R71E

0.1-30MHz RX, 32 mems, keypad entry, SSB/AM/RTTY/CW (FM option), DFM system, a classic receiver
IC-R71E ..... ~~£856.00~~

ICOM IC-3210E

Dual band mobile, 144-146MHz and 430-440MHz. 20 double memories, 25/5W on both bands, duplex capability
IC-3210E ..... ~~£499.00~~

ICOM IC-32E

Dual band HT, 144-146MHz and 430-440MHz. 20 mems, 5W on 2 and 70, duplex capacity, keypad entry
IC-32E ..... ~~£399.00~~

YAESU FT-23R/FT-73R

Yaesu's classic compact HT's, 144-146MHz or 430-440MHz, 10 mems, 5W on 2/70, 0.25uV for 12db SINAD, many options
FT-23R/FT73R from ..... ~~£209.00~~

YAESU FT-727R

Dual band HT, 144-146MHz and 430-440MHz. 10 mems, 5W on 2/70, cross band capability, CAT I/F, PSS power system
FT-727 ..... ~~£425.00~~

FRG-8800

General coverage receiver, 0.15-30MHz all mode, 118-174MHz option, 12 mems, CAT system, keypad entry, 0.4uV sensitivity
FRG-8800 ..... ~~£649.00~~

FT-767GX

HF/VHF/UHF all mode 100W transceiver, 0.1-30MHz ham band TX, GCRX, 50/144/432 MHz option, built in ATU, digital SWR & power meter
FT-767GX ..... ~~£1599.00~~

FT-736R

VHF/UHF all-mode transceiver, 144-146MHz and 430-440MHz (50MHz and 1.2GHz options), 115 mems, 60 watts, TV option
FT-736R ..... ~~£1359.00~~

FT-747GX

HF all mode 100W transceiver, 0.1-30MHz, **RAYCOM** starter pack with our MKII RX improvement mod, free 20A PSU. ***UNBEATABLE!***
FT-747GX from ..... ~~£659.00~~

FRG-9600

VU/HF all mode RX, call for info on our exclusive mods, MK2 60-950MHz, MK5 100KHz-950MHz inc. free **ROYAL** discone and PSU
FRG-9600 from ..... ~~£499.00~~

TEN-TEC PARAGON

All mode 100W ham band TX, GCRX, dual VFO, RIT/XIT, 62 mems, alpha display, QSK, five IF filters, PBT, speech proc, RF control
TEN-TEC PARAGON ..... ~~£1839.00~~

NAVICO AMR1000/S

VHF 25W mobile, 144-146 MHz, 12.5/25 KHz steps, IARU channels, R0-R7, S8-S23, auto repeater shift/tone burst, digital S-meter
NAVICO AMR1000/S from ..... ~~£247.25~~

CHALLENGER BJ200

AM/FM scanning receiver, 26-520 MHz (with gaps) includes civil and most military bands, 16 mems, with **free** RAYCOM air band antenna
CHALLENGER BJ200 ..... ~~£229.00~~

CTE 1600

VHF HT, (same as IC-2E), 144-148 MHz, 2.5W RF, nicad charger, complete with **free** 2m mag-mount antenna, while stocks last
CTE 1600 ..... ~~£189.00~~

AEA PK-232

Multi-mode HF/VHF TNC, CW, RTTY, ASCII, AMTOR, Packet, FAX, Navtex, great software for PC/CBM/BBC, come and try it now
PK-232 ..... ~~£279.95~~

M O B I L E S

YAESU

FT-211RH 2m/45W	~~£309.00~~
FT-212RH 2m/45W	~~£349.00~~
FT-711RH 70cm/35W	~~£349.00~~
FT-712RH 70cm/35W	~~£375.00~~
FT-2311R 23cm/10W	~~£479.00~~
FT-4700RH dual band 50/40W	~~£675.00~~

ICOM

IC-228H 2m/45W	~~£385.00~~
IC-448E 70cm/25W	~~£429.00~~
IC-1200E 23cm/10W	~~£449.00~~
IC-900 multi-band txvr	~~£499.00~~
IC-UX19 10m band unit/10W	~~£219.00~~
IC-UX59 6m band unit/10W	~~£249.00~~
IC-UX29 2m band unit/25W	~~£229.00~~
IC-UX29H 2m band unit/45W	~~£259.00~~
IC-UX49 70cm band unit/25W	~~£269.00~~
IC-UX129 23cm band unit/10W	~~£399.00~~
IC-3210E 2m/70cm/25W	~~£499.00~~
IC-3200E 2m/70cm/25W SPECIAL	~~£399.00~~

CTE

CTE-1600 2m/2.5w plus free mag	~~£189.00~~

H A N D H E L D S

ICOM

IC-2SE miniature HT	~~£275.00~~
IC-MICRO 2 2m/1W	~~£249.00~~
IC-02E 2m/2.5W	~~£279.00~~
IC-2GE 2m/7W	~~£265.00~~
IC-A20 airband txvr/VOR beacon	~~£499.00~~
IC-A2 airband txvr	~~£429.00~~
IC-04E 70cm/2.5W	~~£319.00~~
IC-4GE 70cm/6W	~~£299.00~~
IC-32E 70cm/2m/3-5W	~~£399.00~~

YAESU

FT-23R 2m/W	~~£209.00~~
FT-73R 70cm/5W	~~£229.00~~
FT-727 2m/70cm/5W	~~£429.00~~
FT-411 2m/5W/keypad	~~£269.00~~
FT-811 70cm/5W/keypad	~~£299.00~~
FT-470 70cm/12m/5W/keypad	~~£389.00~~

NAVICO

AMR1000 2m/25W	~~£247.25~~
AMR1000 S 2m/25W	~~£299.00~~

CALL NOW FOR OUR FAMOUS USED LIST!

ICOM IC-2SE

The new ICOM IC-2SE is a veritable jewel. It's tiny size contains all the features you could want in a handheld. Two modes of operation (SIMPLE and PRIVATE) mean that with just 9 controls you can operate 48 memories, frequency and memory scanning, offsets, programmed scan, channel skip and much more. Exchangeable battery packs mean up to 5 watts of RF and four selectable power levels mean good battery life. SAE for further details, or order yours now!
ICOM IC-2SE ..... ~~£275.00~~

STOP PRESS

Just in at RAYCOM is ICOM's new baby, the IC-2SE. In a package just 12x5x3cms they have managed to get full 2m coverage, 48 memories, 4 power levels and much more. Send an SAE for a free info sheet on this little jewel! At the other end of the spectrum is the ICR-9000 complete with spectrum scope, 1000 (yes, 1000) memories and 100KHz to 2GHz continuous coverage. SAE for free info sheet. This month we introduce a new scanner starter kit, exclusive to RAYCOM! See the box below for details, SAE for info! 73!

SCANNERS

Bearcat 200XLT	~~£259.99~~
Bearcat 100XLT	~~£229.99~~
Bearcat 100XL	~~£189.99~~
Bearcat 70XLT	~~£169.99~~
Bearcat 55XLT	~~£99.95~~
Challenger BJ-200	~~£229.00~~
Sony AIR-7	~~£229.95~~
Sony PRO-80	~~£299.95~~
Sony SW1S short wave kit	~~£249.95~~
Sony 2001D HF/Air Band	~~£299.95~~
Sony ICF-7600DS	~~£159.95~~
MARCII 0.15-950MHz	~~£395.00~~
AOR AR2002	~~£489.00~~

YAESU

FRG9600 Standard Pack	~~£499.00~~
FRG9600 Mk2 60-950MHz	~~£569.00~~
FRG9600 Mk5 0.1-950MHz	~~£729.00~~

* all the FRG9600 packs include a free **ROYAL 1300 discone** worth £59.95 and a free mains PSU.

ICOM ICR-7000E 25-1300MHz .. ~~£989.00~~
* including **free ROYAL 1300 discone!**

ICOM AT RAYCOM
ICOM ICR-9000

This magnificent scanner could only have been built by ICOM! A whole page would not do it justice - 100KHz-2Gigahertz continuous coverage, 1000 memories, multi-function CRT display and spectrum scope, send SAE for a fact sheet about this super new receiver.
ICOM ICR-9000 ..... ~~£1995.00~~

Bearcat BC200XLT

THE BEST HANDHELD VHF/UHF SCANNER

COVERS 29 TO 956 MHz (with some gaps). Covers all popular VHF/UHF/PMR Amateur/Air Band/Marine/Cellular and many other interesting frequencies. Features include:
✘ 200 memory channels ✘ helical antenna ✘ nicad pack and charger ✘ green backlight for display ✘ super fast search mode - 25 ch./sec ✘ selective delay ✘ auto lockout ✘ priority channel ✘ track tuning

only **£229.99** (save £30)

plus £10.00 post/packing/insurance

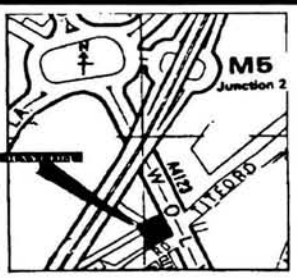
SCANNER SPECIAL! EXCLUSIVE TO RAYCOM - COBRA SR925!

16 channel programmable search, the COBRA scanner covers 29-54MHz for 10m & 6m Amateur bands, 118-136MHz Airband, 136-148MHz for 2m Amateur band, 162-174MHz for Land Mobile Radio and 406-512MHz for 70cm Amateur band and UHF 'T' band. With 16 memory channels, 2-speed search, high sensitivity (0.3 µV) and 1 watt of audio this scanner is ideal for beginner and enthusiast alike!

RAYCOM SPECIAL PACKAGE! includes the following:
COBRA SR925 scanner including mains adapter £179.99
FREE - RAYCOM scanner antenna worth £14.95 covering 60-90MHz, 108-136MHz, 138-174MHz and 380-525MHz
FREE - antenna adapter, 10 metres of coax and PL259 sockets worth £15 - a ready-to-go special at only (plus £10.00 post/packing) **£179.99**

RAYCOM COMMUNICATIONS SYSTEMS LIMITED, INTERNATIONAL HOUSE, 963 WOLVERHAMPTON RD, OLDBURY, WEST MIDLANDS B69 4RJ. TEL 021-544-6767, Fax 021-544-7124, Telex 336483 IDENTI G.

RAYCOM
COMMUNICATIONS SYSTEMS LIMITED



RAYCOM gives you more BUYING POWER

ALL MAJOR CREDIT CARDS ACCEPTED. BC, ACCESS, DINERS. INSTANT CREDIT UP TO £1000 (SUBJECT TO STATUS) WITH RAYCOM CREDIT CARD (APR 29.5%). FREE CREDIT ON CERTAIN ITEMS AT MRP. CALL NOW FOR MORE DETAILS.

ORDERING INFORMATION

WE STOCK ICOM, YAESU, BEARCAT, MFJ, BUTTERNUT, CUSHCRAFT, AEA, TONNA, NAVICO, TEN-TEC AND WELZ AMONG MANY OTHERS. CALL FOR FULL LIST.

TEL: 021-544-6767

PHONE BEFORE 4PM FOR NEXT DAY DELIVERY BY COURIER (£15.00) - OR 2PM FOR DELIVERY BY POST (£10.00 P&P). PLEASE ALLOW TIME FOR CHEQUES TO CLEAR. MANY OTHER ITEMS IN STOCK. PLEASE CALL FOR MORE INFO AND FOR **EXTRA SPECIAL DEALS!**

INFOLINE 0836-771500 5-9pm (weekdays)

OPENING HOURS 9-5.30 MON TO SAT, LATE NIGHT FRIDAY 'TIL 7 PM. 73 DE RAY G4KZH, JIM G8ZMP AND RON G6ZJN.

A Small Yagi for 50MHz

Ken Willis G8VR recounts his experiences with a small 3-element Yagi antenna for the 6m band.

The antenna is probably the most important part of any amateur radio station, yet most of us are precluded by space considerations or planning regulations from erecting the sort of system which we would like. In this crowded island, even a 17-element Yagi for 144MHz is often regarded as an eyesore, frowned upon by neighbours and a sure-fire object of attention when TVI is experienced in the neighbourhood! Over the past 50 years, while everything else in radio has become very much smaller and compact, nature decrees that antenna sizes continue to be determined by element lengths and spacing related to wavelength, setting a limit to the minimum size of an array with useful gain.

The release of the 50MHz band to UK amateurs posed a problem to many of us wishing to take advantage of F2 propagation in the current solar cycle and to share in the world-wide DX which this band is expected to provide as the peak of the cycle approaches. Because of the large dimensions of a 50MHz antenna compared with those used on other v.h.f. bands, many operators have resorted to indoor dipoles. While these have proved to be very useful antennas, the low-angle radiation from a well-matched Yagi is much to be preferred, and will greatly increase the probability of making regular DX contacts. Additionally, the directional properties of this type of antenna not only yield an increase in effective radiated power (e.r.p.) but also can be very useful in reducing man-made noise which can be troublesome on this band.

A year or so ago I started to study the literature in an attempt to find a compact antenna for 50MHz which would not look too out of place mounted at the rear of my house. At my QTH, a mast, camouflaged as a square drain-pipe, is fixed to the rear wall. From its top, a tubular aluminium pipe emerges, carrying a rotator, and this section can be cranked up to give a total antenna height of about 9.75m (32ft). When not operating, the mast is usually kept below the height of the roof ridge. The installation has its drawbacks however, since with no guying employed, there are limits on the size and wind resistance of antennas used. Thus any 50MHz antenna had to be as small as possible and it would need to share the mast with several other antennas which are changed from time to time.

Boom Length

The boom length for a 5-element Yagi with elements spaced 0.25 wavelength would be 6 metres, or almost 20 feet, definitely a non-starter in my case. Even if

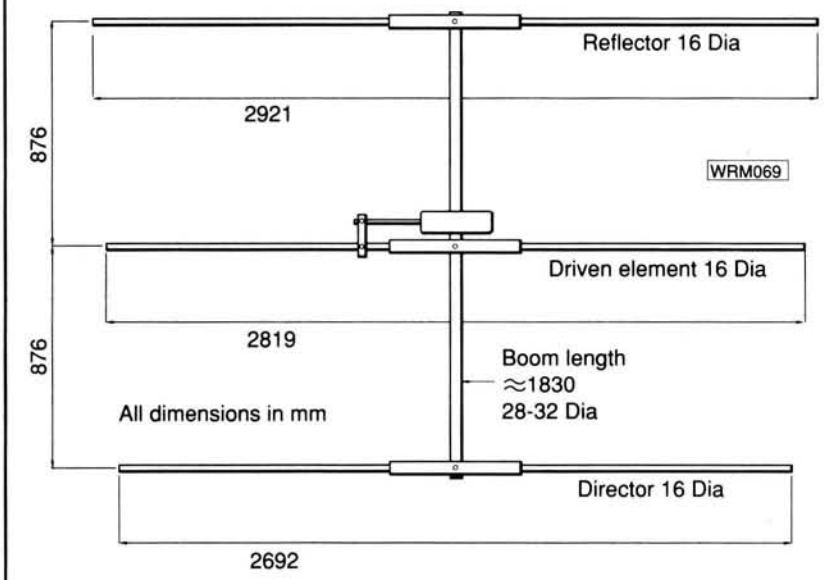


Fig. 1

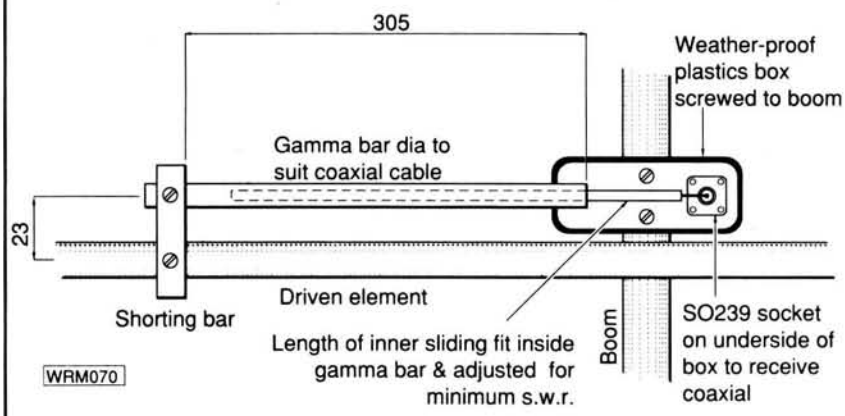


Fig. 2

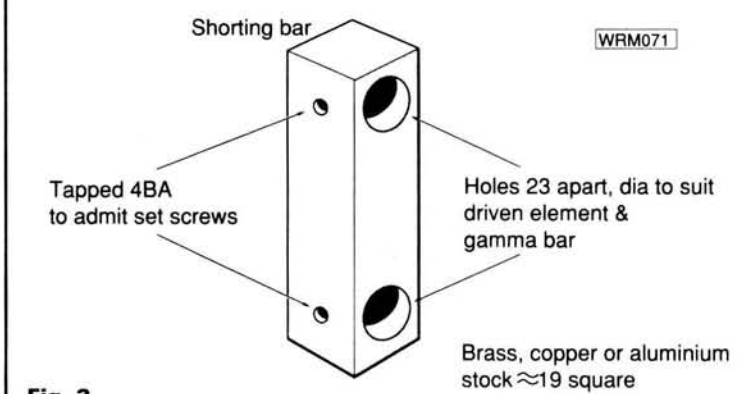


Fig. 3

the spacings are reduced to 0.2 wavelength, the boom will still be 4.9m long, which, with elements themselves some 2.7 to 3m in length, is altogether too reminiscent of Jodrell Bank for my location.

Most information on Yagi design advocates element spacings of not less than 0.2 wavelength (about 1.2m), but eventually I found a reference to a small 50MHz 3-element Yagi designed, I believe, for portable operation by ARRL VHF Editor W1HDQ in the 1960s. This has a boom length of around 1.8m which suggests a compromise in performance in the interests of small size. Undeterred, I built one to specification and the results have been most satisfactory with, at the time of writing, more than my share of DX contacts to North and South America, Africa and Europe. Many DX stations have returned to my first call in pile-ups, and the only criticism I could possibly make is that with so small an antenna there is the penalty of the loss of a few dB on receive, though in practice this has proved of little consequence when the band is open.

The photographs show the antenna mounted above a 9-element Tonna for 144MHz, and from several angles, especially when viewed from a distance, the 2m Tonna looks very much the larger antenna because its boom is longer than any element in the 50MHz Yagi. The relevant dimensions are given in Fig. 1. It is important to use tubing for the elements of the diameter quoted, or very close to it, or the antenna will not resonate in the correct part of the band. As designed, it should peak around 50.100MHz. Since it has a high Q, on tuning across the band the fall-off of noise on either side of the peak should be quite marked, and a sure way of checking that the driven element is resonant in the part of the band you want it to be.

Gamma Match

Matching the antenna to a coaxial feeder is, of course, very important for efficient operation. The gamma match illustrated in Figs. 2 and 3 is easy to construct and set up, and can be made quite weather-proof. The capacitor is a length of heavy-duty coaxial cable with the outer copper conductor braid stripped off, leaving the insulated inner conductor to be inserted into an aluminium tube which forms the gamma-match bar. By adjusting the length slid into the tube, the capacitance can be adjusted over quite a wide range. In my case the length required was just under 300mm. Since I am fortunate in that I can very easily crank my mast down to ground height, I was able to adjust the gamma match very accurately. Eventually I reached the point where no indication of reflected power at all was noticeable, even though I use a high-quality, foam-filled feeder (RG8/U) which has a very low loss at 50MHz.

To fix the elements to the boom, clips with U-bolts were used. These are sold by car accessory shops for fixing the exhaust systems on cars. Short lengths of mild-steel tubing, into which the elements are a sliding fit, were welded to the clips by my local garage. A self-tapping screw inserted in a hole through the centre of each of the mild-steel tubes and biting into the element beneath was the simple method used to prevent any sideways movement of an element in its tubular mounting (see Fig. 4). The use of the gamma match does not require the driven element to be cut in the centre, resulting in a very rigid structure, known in the old days as the "Plumber's Delight" form of construction. The boom diameter is not too critical, but the element clips should be a reasonably close fit to the boom, and rotate easily on it, to permit the alignment of the elements in the horizontal plane. If the mast is a metal one and earthed, with everything tightened up, all parts of the antenna will be grounded.

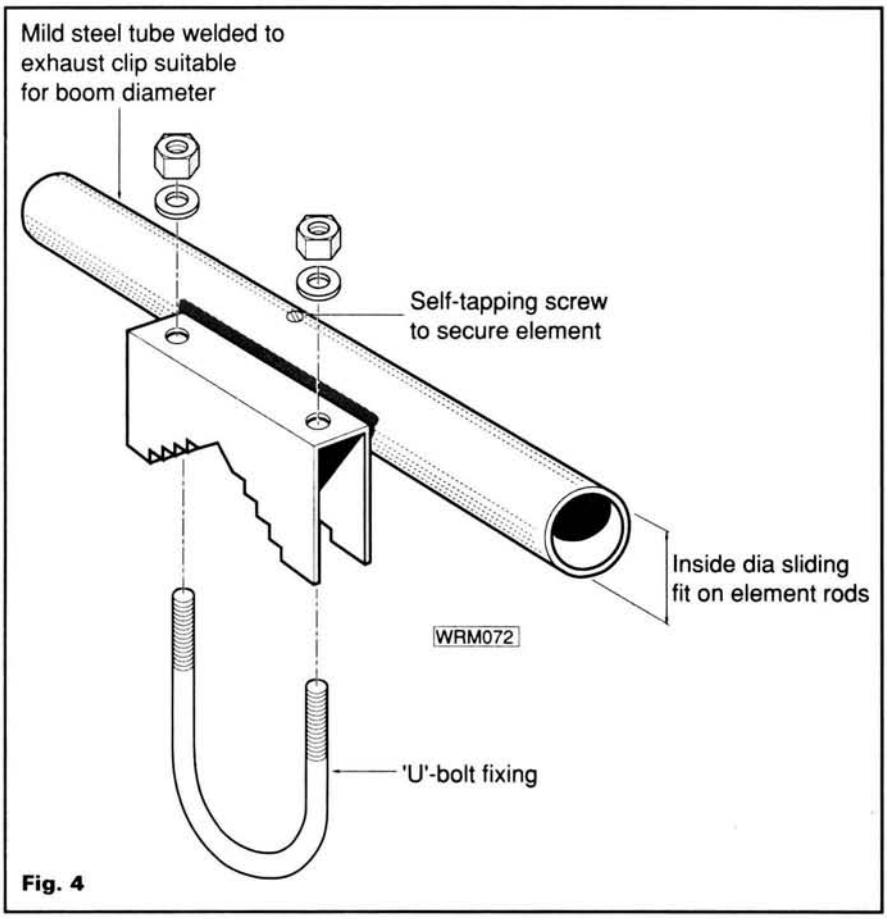
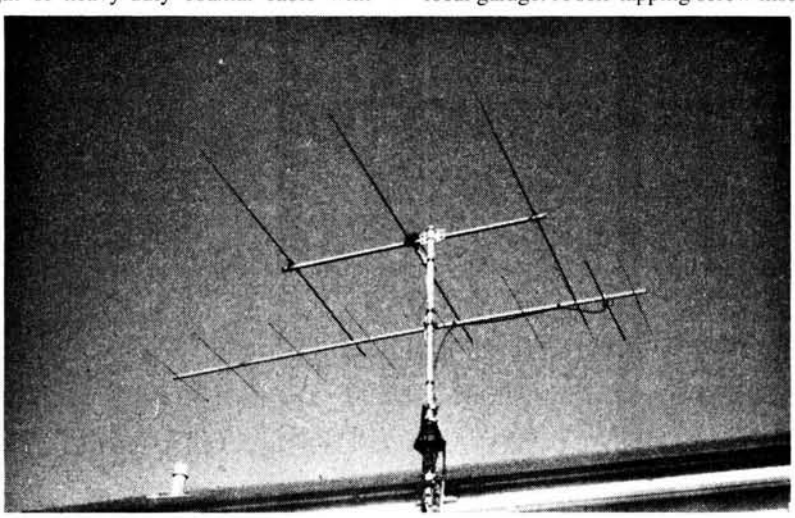


Fig. 4

Results

The result is a compact, very rugged antenna which performs well. I have not made any accurate gain measurements, but I would guess that the forward gain is 6 - 7dB, which makes it very suitable for use with a small linear amplifier without exceeding the e.r.p. permitted under the terms of the UK licence. The front to back ratio is noticeably high, which in my location greatly reduces continental TV interference which can be a problem when sporadic E is present. There is nothing magical about this antenna. For me, it provides an acceptable solution to a problem at minimum cost, and it works well. If the specification fits your location, too, I don't think you will regret building one. If you have a large loft or attic space, it can be mounted indoors since the turning radius is much less than many 144MHz antennas. **PW**



A Transmit Control For Mobile Operation

When using a "hands free" type microphone, mobile operators are still left with the problem of easy p.t.t. control. With this in mind James M. Bryant G4CLF has come up with a circuit which should ease some of the difficulties of mobile transmitter control.

Recent editions of the *Highway Code* recommend that drivers do not use handheld microphones while at the wheel of a car, and many amateurs and CB operators now use boom microphones attached to headbands, the seat-back or even the sunvisor. These microphones leave both hands free for driving.

The driver/radio operator still has the problem of switching his transceiver between receive and transmit. A common solution is VOX or voice operated transmission - a circuit which switches from receive to transmit whenever the operator speaks. While useful, this has several disadvantages in a motor vehicle:

1. While a well-designed VOX will reject noise from the receiver of the rig that it is being used with, it will however, still respond to loud external noises, which are quite common in a motor vehicle.

2. A VOX causes the transmitter to transmit anything the operator says, even if it is addressed to another person in the vehicle, (or another driver!). This function makes the VOX operation rather inconvenient.

3. It may also respond to speech from a broadcast receiver; many operators listen not only to their CB or amateur transceiver, but also the domestic car radio!

4. The circuitry of the VOX needs careful adjustment if it is to respond properly, particularly over a wide range of ambient temperatures.

The circuit to be described is a substitute for VOX. It requires the driver to operate a push-button switch to start and finish a transmission, which only requires the use of his hand for about as long as any of the other vehicle controls. (A foot switch, like an old-fashioned headlamp dip-switch, might also be used). The circuit also has other useful features.

Operating Features

The control consists of a single push-button switch. If it is pushed briefly the transceiver starts to transmit and continues to do so until either the button is pushed for a second time and released, or a preset interval is exceeded (this causes the transmitter to time out before the repeater does). If the button is pushed and held down for more than a second the transceiver will transmit only until the button is released. This combination is very useful. To make a short call (but longer than a second) the button is used like a conventional push-to-talk (p.t.t.) switch, for longer overs it need only be touched once at the start of a transmission and again at the end, and if transmission exceeds a preset time it is automatically ended. The last feature has three benefits:

1. It prevents garrulous individuals like the author from talking interminably.

2. When operating through a repeater with a time-out it prevents one from wasting breath talking and not being relayed.

3. If the button is touched accidentally it limits the length of the unintended transmission. This last feature is quite useful, as it is by no means uncommon to have repeaters blocked out for a considerable time, by a mobile station who has accidentally gone to transmit with a locking p.t.t. device.

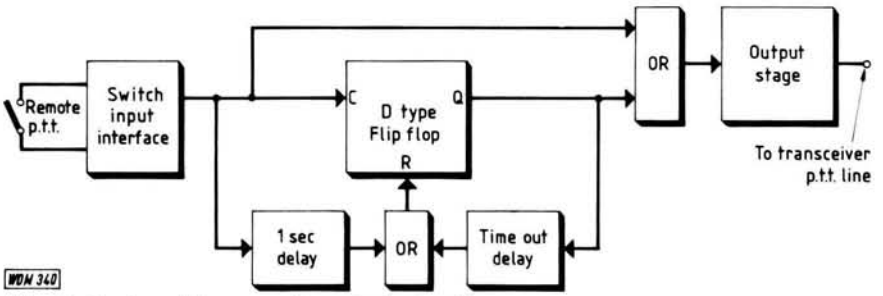


Fig. 1: System diagram of control circuit

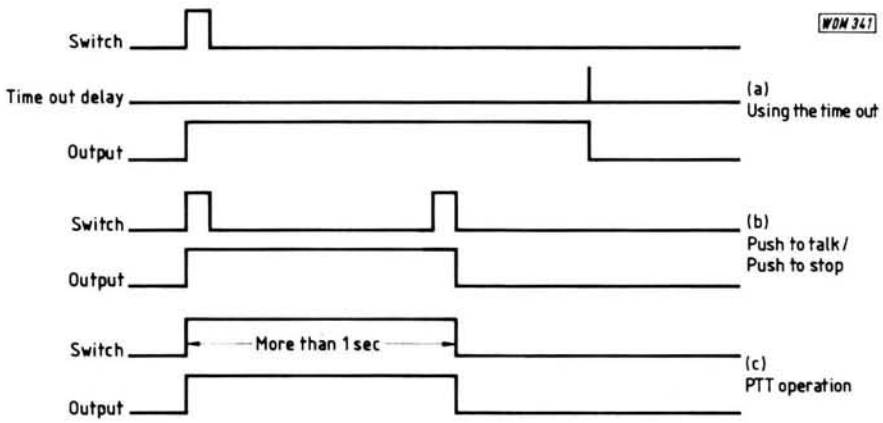


Fig. 2: Waveforms of different modes of operation

System Description

A functional diagram of the control is shown in Fig. 1. It consists of a flip-flop, two time-delay networks (one of 1 second and one of whatever time-out delay is required), two gates and a switch to operate the p.t.t. line of the transceiver being used.

The various modes of operation are shown by waveforms in Fig. 2. In every case the flip-flop changes state when button switch S1 is first operated and both time delays start. The output of the switch and the Q output of the flip-flop go to an OR gate which drives the output switch.

If the switch is released at once, the short time delay is reset and so the Q output of the flip-flop holds the output switch closed until the long time delay is complete. The flip-flop is then reset (Fig. 2a).

If the switch is pressed again during the delay (Fig. 2b) the flip-flop changes state again and the long time delay is reset, but the output switch is held closed by the signal directly from the switch until the button switch S1 is released.

If, when S1 is first pressed, it is held down for longer than the first time delay (Fig. 2c) then the flip-flop is reset when the first time delay is complete but the output switch is held closed (as in case Fig. 2b) until S1 is released.

Circuit Description

The system is built around two c.m.o.s. devices, IC1 a 4013 dual D-type flip-flop and IC2 a 4093 quad dual-input NAND Schmitt trigger, plus two v.m.o.s. transistors and associated passive devices. The circuit diagram of the controller is shown in Fig. 3.

The circuit works because of the use of the 4093. A normal c.m.o.s. gate circuit has a linear region where small changes in input produce small changes in output; in other words it acts as an amplifier. A Schmitt trigger, on the other hand, is a "snap-action" device. If the input is changed the output remains steady until a threshold is passed, when the output switches to its new value. However, if the input is then moved backwards it must move some distance back (called the "hysteresis") before the output snaps back to its original state. The characteristics of a normal c.m.o.s. gate and a Schmitt trigger gate are shown in Fig. 4a and Fig. 4b respectively.

One characteristic of c.m.o.s. Schmitt triggers is they have a very high input impedance so, if they are driven via a resistor/capacitor timing circuit (Fig. 5a), there will be a delay between the input changing state and the output. The delay is a product of the *CR* network connected between the input and the gate. If there is a diode in parallel with the resistor, the delay when the diode is conducting will be minimal but the delay when the diode is not conducting will be defined by the *CR* network (Fig. 5b). We can thus use c.m.o.s. Schmitt triggers to make time delay circuits which reset very quickly. Of course NAND c.m.o.s. Schmitt triggers can still be used as simple NAND gates.

The operation of the circuit in Fig. 3 is quite simple. The input to gate 1 of the 4093 is held high by a 100kΩ resistor (R1) to the positive supply rail. The push-button S1 grounds the input to the gate, which causes its output to go high. Capacitor C1 (0.1µF) debounces the switch and also prevents r.f. from the transmitter from affecting it. If S1 is sited a long way from the controller then a ferrite bead should be slipped over the wire near to the gate to minimise r.f. pickup.

When the output of IC2a goes high it drives the clock of flip-flop 1 (the other half of IC1 is not used and all its inputs should be grounded) and is outputs change state, this is because the $\overline{Q}$ output is fed back to the D input. The output of IC2a turns on transistor Tr1 and the Q output of IC1 turns on Tr2; either Tr1 or Tr2 will switch the p.t.t. line of the transceiver.

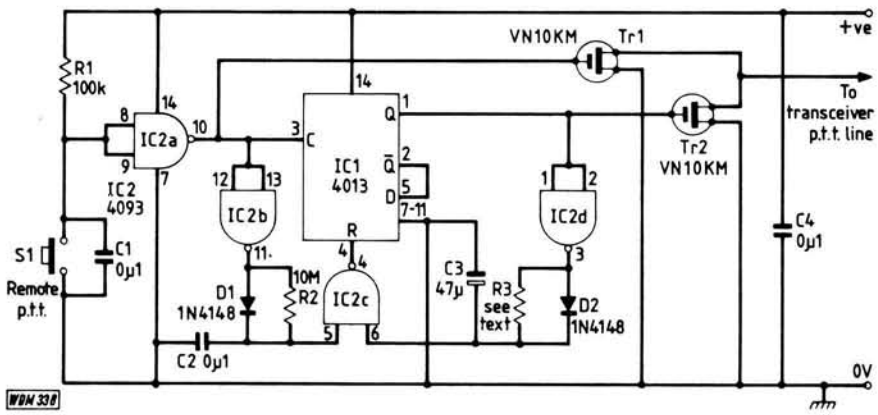
As well as driving IC1 flip-flop, the output of IC2a is inverted by IC2b and applied, via a time delay of about one second formed by R2 and C2, to one input of IC2c which drives the reset input of IC1. As long as both inputs to IC2c are high its output will go low, but if either goes low its output will go high and IC1 will be reset. The other input of IC2c is driven, via a time delay formed by R3 and C3, from IC2d which inverts the signal at Q. Resistor R3 and capacitor C3 could be driven directly from $\overline{Q}$, without an inverter, but since IC2d is otherwise unused it is better to buffer C3, which is relatively large. The two diodes, D1 and D2, ensure that when the outputs of IC2b and IC2d go high the capacitors C2 and C3 will recharge quickly.

There are two subtleties of design in the time delays. One is that the timing resistors R2 and R3 are driven by the gates as shown in Fig. 6a; the circuit would also work if they were grounded as in Fig. 6b but the standby current would be several microamps instead of a few nanoamps. The other subtlety is that the timing capacitors C2 and C3 are fully charged in their standby state. This is unimportant so far as C2 (a ceramic capacitor) is concerned but being biased continuously will reduce the leakage current of C3, which is a tantalum bead electrolytic.

The circuit will operate from any supply voltage between five and fifteen volts positive, but its timing is affected by major supply voltage changes. It has negligible current consumption in its standby state and therefore does not require an ON/OFF switch. An alkaline 6-F22 (PP3) battery makes an ideal power source, which should last for several years. During timing periods its consumption may rise to about 50µA and while S1 is depressed it will draw nearly a milliamp!

The output switch uses two v.m.o.s. transistors with their drains paralleled to give an OR function. They could be replaced by one v.m.o.s. device, two diodes and a resistor, as shown in Fig. 7a, but this circuit increases the current consumption during switching by about 80µA. If v.m.o.s. transistors are hard to obtain they may be replaced altogether by an *npn* transistor (almost any small-signal type will do), two diodes, and two resistors (Fig. 7b) but this will increase the current consumption during switching to about 200µA.

The controller described in this article will only work with p.t.t. lines that are grounded to operate. The v.m.o.s. devices recommended (Siliconix VN10) will work with positive voltages up to +50V and are capable of sinking 100mA. If an *npn* transistor is used the limit is about 80 per cent of its Vceo rating. Press-to-talk line currents are generally less than a milliamp.



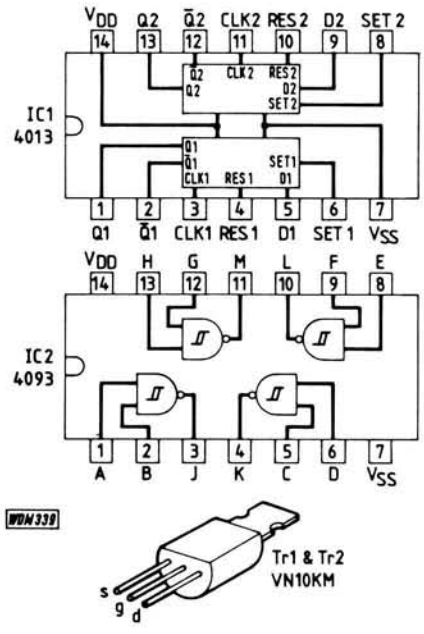


Fig. 3: Circuit diagram of the controller plus additional information on IC1, 2 and Tr1, 2

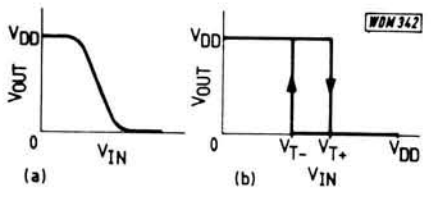


Fig. 4: Comparison of transfer characteristics between normal c.m.o.s. gates (a) and Schmitt input c.m.o.s. logic (b)

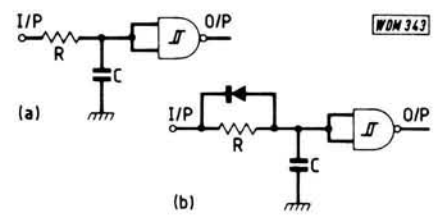


Fig. 5: Delay circuits; c.m.o.s. Schmitt trigger in delay configuration (a), configuration of delay with fast reset (reacts slowly to a rising edge and quickly to a falling edge - or vice versa if the diode is reversed

Timing

The threshold voltages of the 4093 Schmitt triggers vary from device to device. It is not, therefore, possible to give values for R3 for particular delays, so an experiment is necessary. Using the same 4093 and 47µF tantalum bead capacitor that you are going to use in your finished equipment, build the circuit in Fig 8. Connect a p.s.u. or battery of the same voltage as the finished project and check that when the switch is closed the l.e.d. lights after a delay of a few minutes. Open the switch and leave the circuit powered for several hours for the leakage current in the capacitor to drop (leakage in electrolytic capacitors is always greatest just after they are powered up). Close the switch and time the delay until the l.e.d. lights.

If this time delay is T seconds then the value of timing resistor that you must use for a delay of t seconds is t/T megohms. When you have calculated this, replace the 1MΩ resistor with the new value and check that it is correct. It is reasonable to find an error of up to 10 per cent due to leakage in the capacitor and you may wish to adjust the calculated value to get a more accurate performance (increasing the resistor increases the time delay and vice versa). When you have finished these tests you can build the circuit using the components you have tested.

If you want several different delays you can switch in other values of R3 . It is important that the switch is placed at the end of the resistors nearest output IC2d and on no account the end connected to the input of IC2c (Fig. 9).

Construction and Connection

The circuit is very simple and may be built using almost any construction technique. A circuit board layout and placement diagram are shown in Fig. 10 but this is by no means necessary. The only important feature of the construction is that leakage currents at the positive terminal of C3 must be avoided.

The circuit and its battery are so small,

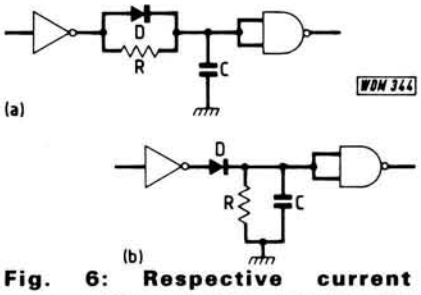


Fig. 6: Respective current consumption of delay circuits; (a) low standby current, (b) current flows in R during standby

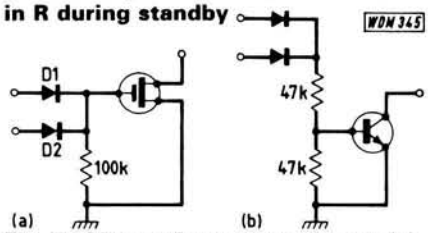


Fig. 7: Alternative output stages; (a) output stage using only one v.m.o.s. device, (b) output stage using one *npn* transistor

and need attention so rarely, that it may be mounted almost anywhere. With the addition of a 78L05 regulator to prevent supply variations, it could be mounted inside the rig itself. The power is taken from the unswitched side of the incoming +12V d.c., the circuit timing in this case should be tested at +5V (Fig. 11).

Much more important than the mounting of the circuit is the mounting of the push-button switch S1. The author has his mounted on the transmission tunnel just behind the gear lever, the possibility of a foot-operated switch (to the left of the clutch) has already been mentioned, and many operators have switches on the gear lever itself. Other possibilities include

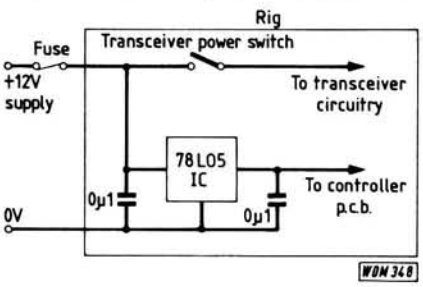


Fig. 11: Possible installation for controller within transceiver

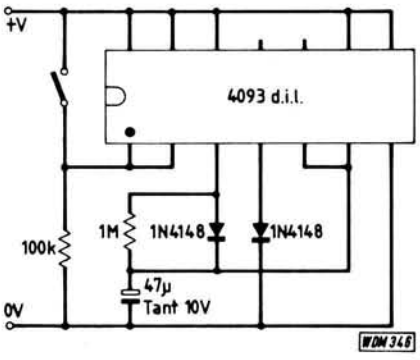


Fig. 8: Resistor R3 timing test circuit

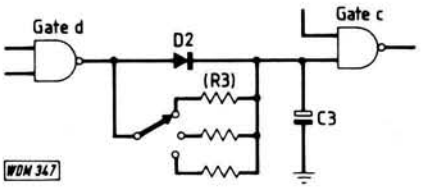


Fig. 9: Variable delay option, see text

steering column mounted switches, or even a push-button switch on the steering wheel itself, although considerable problems arise from making connections which are not affected by rotation of the wheel.

Conclusion

The author has been using this controller for over a year now and finds it far more convenient than a VOX. It has proved very reliable in service and a major asset in preventing inadvertent repeater time-outs. ***PW***

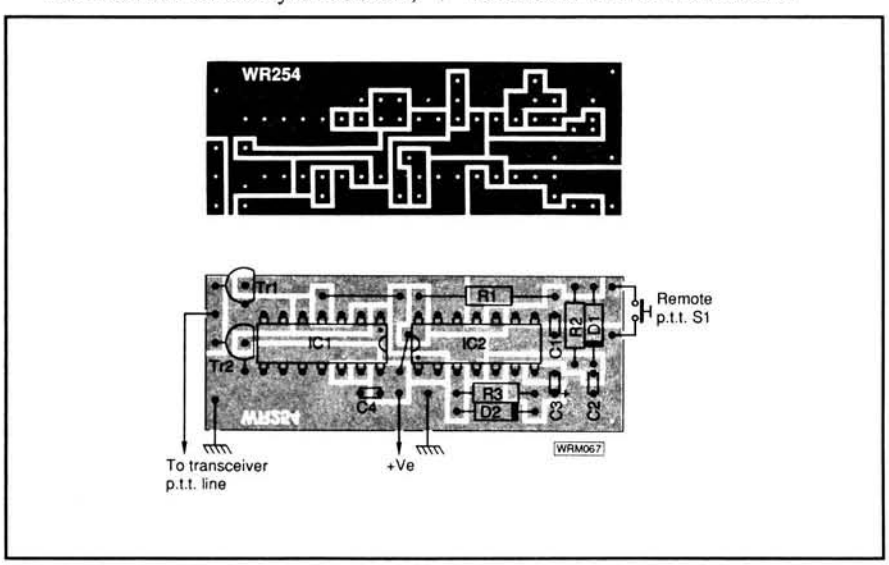


Fig. 10: Full-size single-sided track pattern and component placement diagram of controller

Shopping List

Resistors
0.25W 5% carbon film

100kΩ	1	R1
10MΩ	1	R2

R3 Several megohms - see text

Capacitors
Monolithic ceramics 50V

0.1µF	3	C1,2,4

Tantalum bead 10V (if a supply voltage of more than 9V is used select 16V working type)

47µF	1	C3

Semiconductors
Diodes

1N4148	2	D1,2

Transistors

VN10KM	2	Tr1,2

Integrated circuits

4013	1	IC1
4093	1	IC2

Please note 4000 series c.m.o.s. devices are available from many manufacturers with different lettering e.g. CD4013 or MC14013, etc.

Miscellaneous
S1 push-to-make non-locking; p.c.b.; connecting wire; double-sided adhesive pads; small enclosure.

HOW MUCH ?
£ 9.79
HOW DIFFICULT
Intermediate

On the Line to CAIRO

In this first part of an extended article, Dr Peter Best MSc CEng MIEE MBCS MBES G8CQH presents the practical case for a standard connection between rigs and accessories. Has he put the "wire" back into Practical Wireless?

Imagine a strange world in which the mains plugs and sockets are different in every household. Each time a friend or neighbour borrows an electrical item from you, or lends you one of his, your first action has to be to change the plug or dive into a large box of adaptors. How very frustrating! Thankfully, for the last twenty years and more, we have taken for granted the existence of a *Standard* connector for our mains.

Now apply a similar check to amateur radio transceivers and, in particular, consider the microphone, speaker or headphone connectors. It is highly unlikely that two dissimilar rigs use the same connector, and even those which do frequently differ in their signals-to-pins assignment. Consequently, if you have a favourite microphone, or some other form of *Accessory* which particularly suits your normal style of operating, it is unlikely that you can plug it directly into all your own rigs, let alone all the rigs belonging to your close friends, your club, contest group or other associates sharing a special interest with you. The wide variety of connectors used for this *Interface* between transceivers and communications audio accessories means that, all too often, the latter are specific to the former when, electrically and functionally, they need not be.

Such general incompatibility can be frustrating particularly in those aspects of amateur radio where two or more people share the operation of a station. Ideally, it should be possible for every operator to provide his or her preferred accessory, whether it is a "fist"-mic., a desk-mic. or one of the various kinds of headset, and use it as a truly personal item. Not only will you operate with more confidence when the accessory is familiar to you, but you can also be sure that hygiene is never compromised if you use the intimately-worn accessories like headsets. Equally, individual operators may consider that the desk-mic. or "fist"-mic. which suits their "shack" operating may be less than ideal when driving a car or being half-way up a mountain in cagoul and rucksack, in the pouring rain. Here again, a standard connector should let you select the accessory which best suits the circumstance.

Thus, in amateur radio, as elsewhere, we too need horses for courses in our optional selection of accessories as well as our choice of rigs. But, with so many rigs from so many stables these days, none of them is in the running for a connector which wins outright in the standardisation stakes. And some manufacturers, it must be said, overload their accessories with functions which should have their rightful place on the rig itself, so ensuring that their accessories become essential rather than optional.

The CAIRO scheme

As a member of RAYNET (Radio Amateur's Emergency Network) I was persuaded, as early as 1983, that a standardisation of connectors would lead to the rapid and efficient assembly of a station in a wide variety of circumstances, many of which would be unforseen. In principle, Smith could provide the rig, Jones the antenna and mast, MacWilliams the power supply and within a few minutes, they could gather round a table as a team of operators at a working station. The major prerequisite for the success of this would be an agreed Interface to allow them to use personal accessories which would be compatible with the rig regardless of its type, manufacture or ownership. After many months of very careful deliberation with fellow amateurs in the West Midlands, **CAIRO** emerged and has since been widely adopted in RAYNET circles.

CAIRO is an acronym for "Communications Audio Interface for Remote Operations"; a lengthy but accurate title for the scheme. First, it embodies the essential electrical signals which must pass between any rig and the wide range of audio accessories which could be used to operate it. Secondly, it declares that the organisation of a station may be distributed, perhaps over greater distances than one normally encounters in "shack" operating. Let me put the cart before the horse and first elaborate briefly on the idea of Remote Operations.

Once a particular transceiver (or separated pair of receiver and transmitter items) has been connected to an appropriate antenna and adjusted for the desired mode and frequency of operation, the mainstay of the ensuing voice communication - the 'phone QSO -

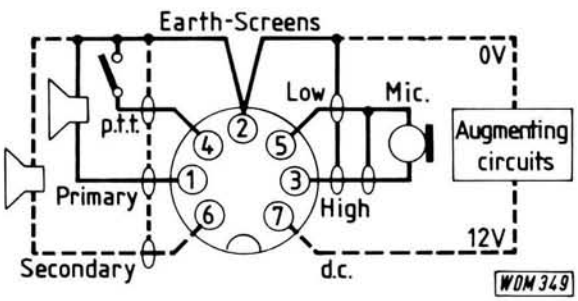


Fig. 1.1: Pin Assignment (pin numbers are DIN designated throughout)

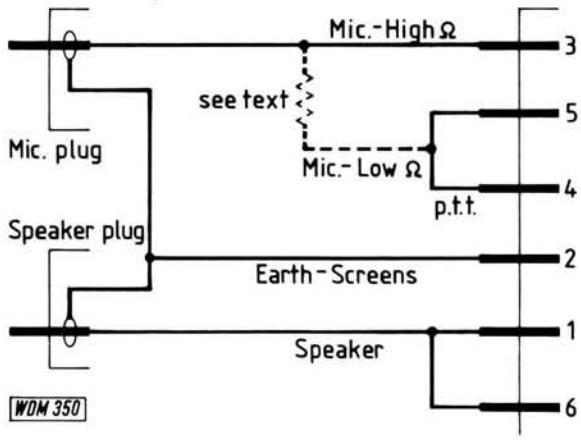


Fig. 1.2: Adaptor for series mic-p.t.t. transceivers

happens with just three signals. These are; (i) received audio delivered to a loudspeaker (or headphones), (ii) microphone for speech input and (iii) p.t.t. switching to engage the transmitter (and disable the receiver). In many transceivers, a built-in speaker satisfies the first requirement so we usually encounter the "fist"-mic., with its p.t.t. lever, as a common form of accessory having just two of these three essential elements in a single housing. Nevertheless, all three are base-band signals capable of passing, without noticeable degradation, over much longer distances than the metre or so of cable on the typical "fist"-mic. Extraordinary though it may seem at first, we may operate a typical f.m. rig remotely from distances in excess of 200m, providing that a cable is chosen to be fully compatible with the signals, and we advance the receiver-volume a little further than normal to overcome the slight increase in line losses. Few of us would want to be that far away from a rig, but if the specifications are correct for that sort of distance, they should be ideal for the more realistic remote distances which we might encounter.

Remote Operations

As examples of this, you may wish to operate a rig from the comfort of a chair anywhere in your shack or while wandering freely to consult your library shelf or wall maps and charts, or from elsewhere in the house. When outside the house installing or adjusting antennas, it is useful to be able to work the rig as the "acid test" that the adjustments are satisfactory.

In mobile operation, you will certainly wish to consider routing these signals around the vehicle to accessories which achieve some form of "hands-off" operating or, when static, perhaps continue working from a picnic table, or inside a caravan or tent. The rig remains in the vehicle on a lasting and rechargeable power-supply into an existing antenna and stays within the protection of appropriate insurance.

In -/P locations you may be able to site your antenna on the top of a building but not necessarily operate from the room immediately below it. Of course you can link the rig to its antenna with low-loss coaxial cable but Remote Operations allows the feasible alternative of installing the rig near to its antenna, to minimise r.f. losses. Then you simply pay out a length of the slender, easy-to-route remote signals cable to the room where operating is to take place. In short, Remote Operations means the provision of an optional flexibility in the configuration of a station.

Meanwhile, at the remote end of the link, all three signals become essential as we begin to use a variety of accessories to suit the circumstances. Accessories like the communications telephone handset - the classic "dog-bone" format with p.t.t. or "pressel" bar - or the speaker-mic. as a

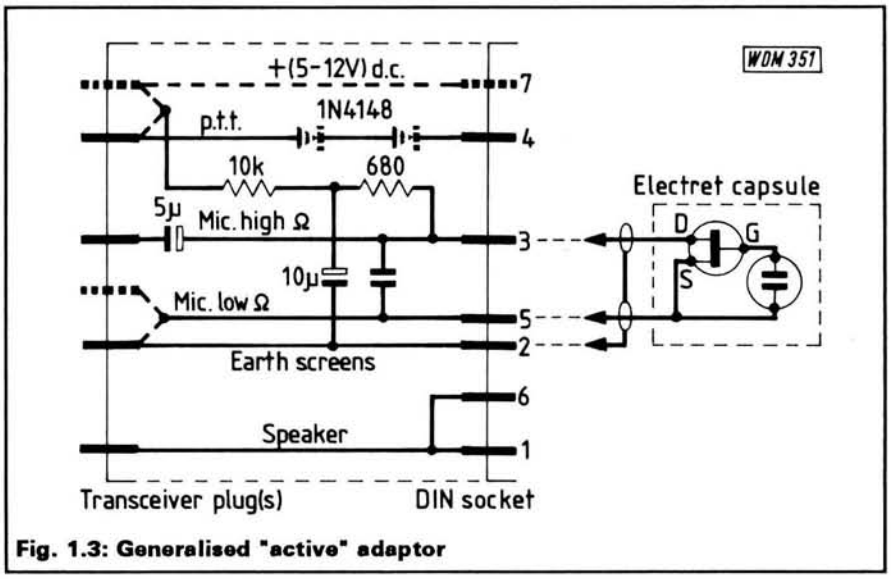


Fig. 1.3: Generalised "active" adaptor

modern compact variation on this theme, may both be described as *Complete* because all three elements are conveniently housed in a single item, suitable for occasional working. Conversely, the *Partial* accessories incorporate only one or two of the essential elements and would be used together, as combinations. The headset, being an earpiece (or two) with a boom microphone attached, does not usually incorporate a p.t.t. element so we might meet this requirement with, say, a separate footswitch - the Trample-to-Talk (t.t.t.) - to leave our hands free for clerical activities. Together, such a pair of accessories would be more suited to intense operating where high levels of concentration are called for, over lengthy periods.

Taken overall then, Remote Operations concerns the provision of a suitable cable with a standard signal format, capable of supporting sometimes quite lengthy runs, together with a standard connector which will allow multiple terminations of the line, when required. This should be achieved without specific reference to particular rigs or particular accessories to achieve maximum interchangeability; seemingly quite a "tall order"?

CAIRO Signals

Reassuringly, the overwhelming majority of transceivers in the amateur domain, and beyond, all operate with very similar accessory signals. Received audio is delivered as a single-ended signal for a matching loudspeaker of 8Ω, 2W "handling", whilst the p.t.t. action is engaged by a switch-closure to system earth. Microphone input circuits are invariably designed for an electrodynamic transducer of about 600Ω impedance and -65dBV sensitivity. Taking these as the basis of a specification, we note that the microphone delivers a low-level, medium impedance signal in comparison to the relatively high-level, low-impedance signals for the other two. Because remote operations may involve considerable lengths of cable in which all three signals will be harnessed together, we should apply good engineering practice to minimise the unwanted effects of fields which may be induced into the microphone circuit. This is particularly acute if the speaker circuit is not de-powered during transmission as in any "Intercom" mode like cross-band duplex working. Cross-talk elimination is achieved by presenting all microphone elements as isolated, two-terminal devices on two conductors which are individually screened throughout the link, being a *balanced* or *quasi-balanced* circuit. Then, in the same harness, we may incorporate single conductors for the speaker and for the p.t.t., outside those screens while letting them act as the system earth return. The light-weight (4mm dia) flexible 4-core, individually screened cable; e.g. RS Components [367-577] or equivalent, meets this requirement. This is the CAIRO Line (Please note that multi-core, overall screened cables do NOT meet our requirements.)

CAIRO Connectors

Next, we should adopt a suitable connector for this Line and all "terminating" accessories. For this, we must look at two more aspects of Remote Operation. If all forms of accessory are to be compatible with the scheme, this must include the many forms of headset, some of which will be dual-earpiece items, wired for "binaural" listening. For these, it is highly desirable to retain the electrical separation of the earpieces so that we may supply differing audio feeds. Although the CAIRO line will only transport a single or *Primary* feed, we may wish to include volume controls as a means of balancing the earphone levels or, perhaps, muting one ear altogether. Hence the standard connector should have pins both for primary and *Secondary* audio feeds, which we then usually assign to the Left and Right earpieces respectively.

Also, at the remote end of a Line, we are no longer in the vicinity of the rig and its power supply, but we can envisage using items which need a d.c. supply. For example, we can no longer see the rig, so

we may wish to include mimic lights which show the operation of the p.t.t. line being either in its "Stand-By" or "On-Air" status. Likewise, we might include *active* circuits to accompany some accessories and enhance their characteristics or operating features. If so, we must include a pin for 12V d.c. for these *Augmenting Circuits*.

This has now increased our requirement to a 7-pin connection which could be satisfied with many types of audio connector. However the most widely available range, which is also relatively inexpensive, is the DIN series. Adopting these for CAIRO, we specify that **all** sockets should be of the 7-pin format; either the chassis-type with mounting lugs [478-302] or the single-nut, "professional" chassis socket [478-661], or the in-line socket [476-261]. The CAIRO signals are universally assigned to the pins shown in Fig.1. 1, both to minimise cross-talk between microphone and speaker connections and also to exploit the mating compatability of three alternative DIN plugs; a hierarchy which accounts for the pin numbering sequence.

With all CAIRO sockets wired as shown (Fig. 1), the 5-pin (180°) DIN plug [477-876] becomes the standard required for all complete accessories and as the terminating connector for Lines and extension leads. The 3-pin DIN plug [477-854] is used for extension loudspeakers or single-ear (monophone) accessories (pin-3 left unused), whilst the 7-pin DIN plug [478-307] is used on binaural (stereo) headsets or "active" items needing a d.c. feed. It is useful to note that DIN plugs used in CAIRO will undergo many more insertions/removals than in other audio applications and so the robust nickel-plated diecast versions are recommended in preference to the pvc-insulated types.

CAIRO Distribution

The CAIRO scheme (like mains distribution) is essentially a plug-to-sockets connection with every plug "looking" towards the rig, as the "source", which feeds several sockets presenting the signals for onward connection towards the operator and his chosen accessories. A length of line cable takes a 5-pin plug at one end and perhaps several, parallel-wired sockets at the other end so that combinations of accessories may be connected. A convenient Line can be made by scramble-winding about 40m of CAIRO signal cable onto a blank drum (e.g. [488-688]) and setting two (or three) parallel-wired sockets into one side-plate blank. This item has already been widely adopted and has been dubbed the "Orange Reel". Shorter extension leads (say 5 to 10 metres) may be made up as well or instead. A suggested colour assignment for the cable cores is:

Pin-1 (Spkr) Blue
Pin-3 (Mic-Hi) White
Pin-4 (p.t.t.) Red
Pin-5 (Mic-Lo) Yellow
Pin-2 Screens

The speaker line is taken to pins 1 and 6 of all DIN sockets, and the pin-7s of grouped sockets are connected together as a voltage inter-link. All exposed metal chassis or plates should be earth bonded (to the screens) at one point only. Some users advocate the inclusion of a small speaker behind the remaining blank plate of the Orange Reel so that, even when paying out the line, incoming radio traffic can be monitored.

Transceiver Adaptors

Few users who adopt CAIRO wish to perform modifications "inside" a rig to achieve compatibility with the scheme, particularly if warranty agreements become jeopardised by such actions. In practice, internal modifications are unnecessary because simply-constructed external adaptors can be employed.

Series Adaptors

First, we consider the modern "hand-helds", many of which use a *Series* mic.-p.t.t. connection, often through a single sub-miniature (2.5mm) jack socket, with a separate speaker connection at a miniature (3.5mm) jack, nearby. Operationally, the hand-held may seem the least likely contender for CAIRO because it is almost a complete hand accessory in its own right. However, there will be times, like the aforementioned hike in wet weather, when it is preferable to use an accessory, in this case to allow the rig to stay protected in the rucksack. A suitable interface adaptor is shown in Fig. 1.2, where it can be seen that the two-conductor isolation of the microphone is exploited to achieve the required series connection "back" through the p.t.t. Of even greater significance, and the reason for discussing this type of rig first, is that the series mic.-p.t.t. connection completes a d.c. path (during transmission) which puts a *bias* voltage on the microphone circuit. This is purposely sufficient to energise the f.e.t. of an electret microphone element. Consequently we may use accessories having either a dynamic transducer or the more versatile electret capsule as their microphone element. The compactness of the electret capsule and the excellent audio quality which it delivers, partially accounts for the wide availability of speaker-mics and lightweight headsets these days.

Some transceivers will require a shunt resistance (typically 20kΩ), when electrets are used, so this is included as a permanent provision "behind" the DIN socket, being of no detriment to dynamics when they are used instead. A short length of cable is required between rig-plugs and the CAIRO socket for this adaptor. A neat version can be made from the lead of certain "cheap" tape-recorder microphones which have a play/pause control. Their leads split into short moulded miniature and sub-miniature jack-plug tails. By cutting this cable above the split, to the desired length 250mm and discarding the microphone, a DIN socket is fitted to achieve an adaptor with a "professional" appearance. Personally, I make mine "in situ" on a hand-held by passing the cable through the spare hand-strap eye, before soldering the DIN socket, so that it is permanently with that rig and cannot be mislaid.

Active Adaptors

In discussing hand-helds first, we have added a subtle extra specification to the general microphone circuit of CAIRO. If accessories are to have either a dynamic, or more generally a *passive* microphone, or else exploit the electret - an *active* device, the microphone circuit should carry a suitable biasing voltage for it. In the majority of base-station, mobile or "hand-bag" rigs, the microphone and p.t.t. circuits are presented separately, though usually on one connector, and then the speaker outlet is separate again from this. In almost all cases, the microphone input is a.c.-coupled and there is no bias for the electret. Hence we need an adaptor which achieves two objectives; (i) to bring these signals together to our standard format and (ii) to condition any signal which may not meet our emerging specification. In doing this we can now superimpose a bias voltage onto the CAIRO microphone circuit, but not the rig's, to enable the use of modern electret-based accessories when required. Fig. 1.3 depicts a generalised adaptor and, for clarity, shows the equivalent circuit of an electret.

A suitable bias voltage, between 1.5V and 10V (4.5V is optimum), may be

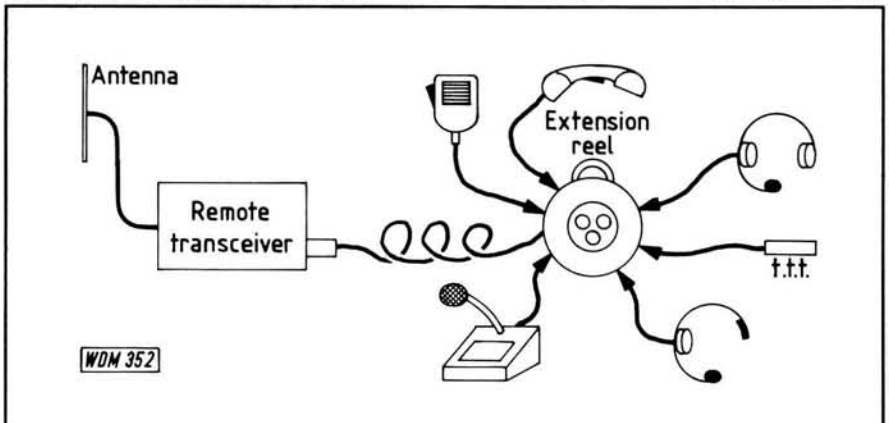


Fig. 1.4: Summary of matching CAIRO accessories

The G2BX

Antenna Clinic

Session 7

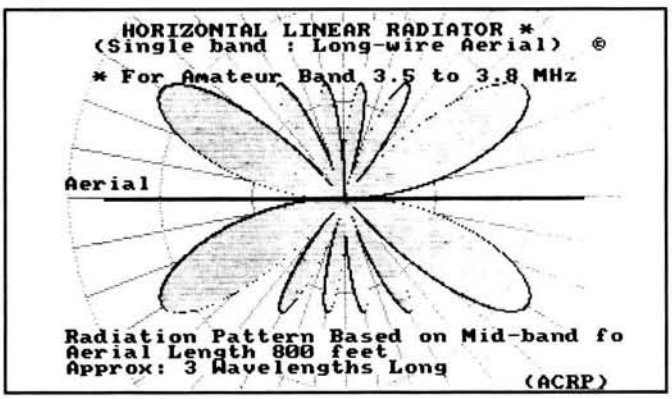
In the course of a year, antenna specialist F. C. Judd G2BCX receives many queries from radio enthusiasts, both about his own designs and about antennas in general. These come not only from various parts of the British Isles, but also from as far afield as Australia, New Zealand, Indonesia, Sri Lanka and several European countries. Often, several people will ask a very similar question, highlighting a point that be widely misunderstood. This series aims to explain some of these.

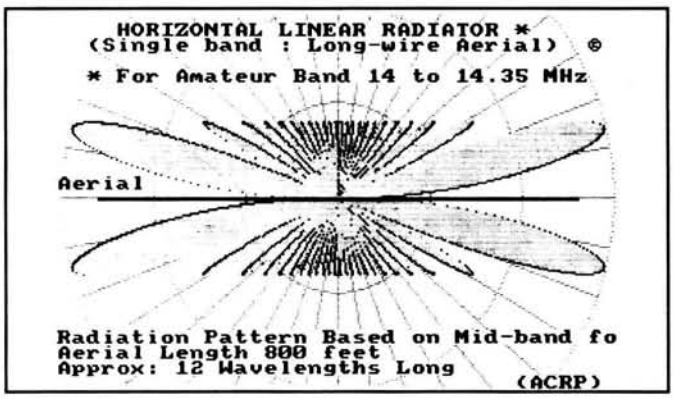
Q "Having been given permission to run a wire antenna approximately 245m (800ft) long and about 10m high over property adjacent to mine, can you give me some idea as to what the radiation pattern will be when the antenna is tuned for either the 3.5MHz (80m) or 14MHz (20m) bands?"

A For both bands the wire becomes a "linear antenna". It is not exactly resonant for either band, although for 80m it is a little over 3 wavelengths long and for 20m a little over 12 wavelengths long. An antenna this length, and in fact any random length of wire that can accommodate an odd or even number of half-waves plus a part half-wave, is best "end fed" from a suitable a.t.u.

For a 245m long wire, the radiation patterns for the 80m and 20m bands will be as illustrated here, although the vertical radiation will at a high angle for 80m and at a fairly low angle for 20m. For either band the main lobes are fairly close to the wire and each has considerable directivity gain over a dipole. A wire of this length would obviously need support along its length to prevent a high degree of sag at the middle.

Incidentally, the longest wire antenna known to the writer, and at one time used by a radio amateur in Norfolk for operation on Top Band, was an unused and disconnected railway telephone line about 11km (7 miles) long!





on the Line to CAIRO continued

derived from the transceiver's microphone socket. Some rigs provide an uncommitted "voltage" pin (typically between 5V - 8V) but, if not, a satisfactory bias may be taken from, say, a scanning function pin - but check that this voltage holds during the transmit condition. Failing that, a pair of general-purpose silicon diodes in series with the p.t.t. "pin-4" line will drop 2 x 0.7 = 1.4V as a sufficient bias - but test this thoroughly to be sure the p.t.t. will still operate. (Rigs having tied-high c.m.o.s. logic gates for the p.t.t. must be "bottomed" and the diode pedestal voltage may prevent this happening). Otherwise a tail may be passed to the rear of the transceiver to pick up 12V, or a battery can be included in the final adaptor. Whatever alternative source is used, the bias is applied via a 10kΩ resistor, decoupled (10μF) to system earth, to a resistor which then acts as an external drain load on the mic.-high line, whenever an electret, with its integral f.e.t., is used. The value of this load resistor should be about 10 per cent higher than the transceiver's stated input impedance; often "600Ω" so 680Ω is typical and seldom critical. At this point only, in the CAIRO chain, the mic.-low line may be grounded if the rig is designed for quasi-balanced input. For some transceivers it may be necessary to include a capacitor (e.g. 1nF) across the mic. pair to cut the topmost audio frequencies delivered by electrets. Unfortunately, there are no hard and fast rules for this so I have to refer you to your rig's handbook for final clarification.

Clearly, the construction of an adaptor for a particular rig is a one-off activity, to be performed with careful experiment, after which that adaptor becomes specific to that rig only. Unlike the series-adaptor the extra components may not be installed "behind" a DIN socket. Instead, a neat housing can be made from a small module (e.g. RS [456-201]) which is modified to have a DIN professional chassis socket fixed into one end, and the case of the transceiver's microphone plug soldered firmly to the other end so that the whole item becomes a rigid protrusion at the rig's mic. socket, like an oscilloscope-probe adaptor. If the speaker outlet is elsewhere on the rig, a tail may emerge neatly from the side of this module. Alternatively this adaptor may be prepared as an in-line module with tail(s) passing to microphone (and speaker) plugs as required. All components are mounted inside the module which, with care, still has sufficient space either for a miniature speaker isolation transformer, for rigs whose speaker output is not earth-referred, or a relay for rigs whose p.t.t. input is not earth-switched.

However, if you wish to incorporate a CAIRO adaptation inside a rig, be reassured that a DIN "pro" socket will fit the hole previously occupied by most circular multi-pin microphone sockets. If the rig had a separate speaker jack, it is expedient to replace it with a switch (e.g. RS [316-973]) wired to control the rig's internal speaker. ***PW***

Summary

In this part, we have seen that the essential audio signals for operating a radio transceiver may be prepared, conditioned and presented on a standard connector from the DIN range. A "generous" length of cable may be used to convey those signals to the operating point where multiple sockets allow a variety of accessories to be used, interchangeably and in combinations, to increase the versatility of radio operation. In the next part, we will examine in detail the wide range of accessories which can be used and, because they are no longer specific to a particular rig, they can be tailored to meet the exact needs of a variety of operating circumstances.

REVISED SERVICE!
LOWER PRICES!

Practical Wireless 0202 678558

PCB SERVICE

Printed circuit boards for *Practical Wireless* constructional projects are available from the PW PCB SERVICE. The boards are made in 1.5mm glass-fibre, and are fully tinned and drilled. All prices include postage, packing and VAT for UK orders. Please add £2.00 per order for despatch to overseas addresses.

Orders and remittances should be sent to: **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP,** marking your envelope **PCB SERVICE.** Cheques should be crossed and made payable to PW Publishing Ltd.

When ordering, please state the Article Title and Issue Date as well as the Board Number. Please print your name and address clearly in block letters, and do not send any other correspondence with your order. You may telephone your order using Access or Visa. A telephone answering machine will accept your order outside office hours.

Please allow 28 days for delivery. Always check the latest issue of *PW* for the current details of price and availability. Please enquire for p.c.b.s not listed here.

Board Number	Title of Article	Issue Dated	Price (£)
WR068	AF Speech Processor	Jan 80	5.20
WR095	Transceiver Power Supply	Sep 80	3.85
WR126	"Exe" 10GHz Transceiver	Aug 81	7.70
WR144	Iambic Keyer	Mar 82	6.50
WR143	ATV Converter	Apr 82	7.10
WR156	Repeater Time-out Alarm	Nov 82	5.20
WR160	LMS Regenerative Receiver	Feb 83	5.20
WR167	RTTY Terminal Unit for ZX81	June 83	7.80
WR165	"Severn" (VFO)	June 83	5.20
WR166	"Severn" (Receiver/Audio)	Jun 83	6.50
WR168	"Severn" (Ch.over/Sidetone)	Jul 83	6.50
WR169	"Severn" (Transmitter)	Jul 83	6.50
WR165 etc set	"Severn" 7MHz QRP TX/RX	—	14.90
WR161	"Marchwood" 12V 30A PSU	Jul 83	2.40
WR179	Transceiver VOX Unit	Mar 84	6.50
WR183	Top-band DF Receiver	Apr 84	6.50
WR184	Simple Top-band Receiver	Jun 84	6.50
WR185	Auto-notch Filter	Jun 84	6.50
WR187	Morse Sending Trainer	Jul 84	4.50
WR190	Mod FRG-7 (Switching)	Oct 84	4.50
WR189/192 pr	Bug Key with 528-bit memory	Oct 84	8.50
WR194	Mod FRG-7 (FM/squelch)	Nov 84	4.50
WR195	Stable Toneburst	Nov 84	2.60
WR196	"Teme" 7/14MHz QRP(TX)	Nov 84	3.70
WAD246	"Dart" Follow-up	Dec 84	4.00
WA001	"Teme" (VFO/Doubler)	Dec 84	2.80
WA002	"Teme" (Receiver)	Jan 85	4.30
WAD280**	Triambic Keyer	Feb 85	7.10
WAD249	Mod FRG-7 (BFO)	Feb 85	3.00
A004	"Colne" 3.5/14MHz RX (RF Amp)	Apr 85	3.10
A005	"Colne" (VFO)	Apr 85	3.10

Board Number	Title of Article	Issue Dated	Price (£)
WR198	"Colne" (Product Det/Audio)	May 85	3.90
WR197	"Colne" (Oscill/Converter)	Jun 85	3.90
WAD302	Battery Charger Controller	Jun 85	3.00
WR200	Low-cost Crystal Tester	Jul 85	2.50
WR201	Add-on BFO	Aug 85	2.50
WR202	Economy UHF Pre-scaler	Sep 85	3.70
WR199	"Meon" 50MHz Transverter	Oct 85	6.70
WR203	Simple Capacitance Meter	Oct 85	2.80
WR204	WQ Medium Wave Loop	Nov 85	3.00
WR205	RTTY/Morse Modem	Jan 86	5.40
WR206	RTTY/Morse Modem (plug-in)	Jan 86	2.80
WR207	Crystal Calibrator	Jan 86	2.10
WR208	RF Speech Processor	Mar 86	4.10
WR209	Simple Audio Oscillator	Mar 86	4.30
WR211	"Meon" Filter	Apr 86	3.10
WR210	"Arun" Parametric Filter	May 86	8.10
WR213	Mod FRG-7 (Carrier Osc)	Jun 86	2.70
WR215	Simple 50MHz Converter	Sep 86	3.60
WR217	Automatic NiCad Charger	Oct 86	2.40
WR220	Get Started Low-cost Converter	Oct 86	2.40
WR216	LF Bands Active Antenna	Nov 86	2.40
WR222	"Taw" VLF Converter	Nov 86	2.80
WR223	High-imp MOSFET Voltmeter	Dec 86	2.90
WR214	Mod SRX-30D (Audio)	Dec 86	3.00
WR224	"Westbury" Basic Wobbulator	Jan 87	3.50
WR218	Masthead Pre-amp for 144MHz	Feb 87	4.20
WR219	Masthead Pre-amp PSU	Feb 87	2.50
WR225	"Woodstock" SW Converter	Mar 87	4.10
WR298	"Itchen" LCR Bridge	Apr 87	3.40
WR226–8 set	"Blandford" Rcve Converter	Apr 87	9.70
WR230–2 set	"Axe" Signal Tracer	May 87	9.20
WR233	"Downton" F-V Converter	Jun 87	3.90
WR234	Side-tone Oscillator	Jun 87	2.70
WR235	Mains on/off for Batt Radios	Sep 87	3.00
WR236	"Blenheim" VHF Converter	Sep 87	4.50
KANGA	High Stability VFO (see issue)	Oct 87	—
WR237	RTTY Tuning Indicator	Nov 87	5.20
WR238	"Otter" 50MHz Receiver	Jan 88	7.10
WR239–241 set	"Orwell" Medium Wave Recvr	Mar 88	9.10
WR242	"Orwell" Varicap Tune Option	Mar 88	2.90
WR243	VHF Monitor Receiver (Audio)	Apr 88	2.30
WR245	Stopband filter for PW Blenheim	Jun 88	2.90
WR244	Practice Morse Key	Jul 88	2.96
WR246	"Portland" RF Voltmeter	Jul 88	3.59
WR247	Zener Diode Tester	Aug 88	3.56
WR248	"Badger" 144MHz Receiver	Oct 88	9.10
WR249	"Marlborough" MF Converter	Dec 88	4.60
WR250	DC/AC Power Converter	Jan 89	3.22
WR251	RF Operated Relay	Feb 89	3.80
WR252	Two-Tone Oscillator	May 89	6.52
WR253	TS940S Modification	June 89	5.54
WR254	TX Control for Mobile Use	July 89	5.08

S.E.M.

UNIT P, UNION MILLS, ISLE OF MAN
Telephone: (0624) 851277

S.E.M. TRANZMATCH MKIII. The only Aerial Matcher with UNBALANCED and TRUE BALANCED OUTPUTS. 1 kW 1.8-30 MHz, £145. Built-in EZITUNE (see below), £44.50. Built-in Dummy Load, £9.90. Ex stock.

EZITUNE. Allows you to TUNE UP on receive instead of transmit. FANTASTIC CONVENIENCE. Stops QRM. Boxed unit, £49.50. P.C.B. and fitting intsructions to fit in any ATU, £44.50.

FREQUENCY CONVERTERS. V.H.F. to H.F. gives you 118 to 146 MHz on your H.F. receiver, Tune Rx. 2-30MHz, £65.00 ex stock.
H.F. to V.H.F. gives you 100 kHz to 60 MHz on your V.H.F. scanner, £55.00 ex stock. Plug in aerial lead of any receiver. Tuning from 100MHz up.

2 or 6-METRE TRANSMATCH. 1kW, will match anything, G2DYM or G5RV? on VHF. £39.50 ex stock.

DUMMY LOAD. 100 W. THROUGH/LOAD switch, £24.00 ex stock.

VERY WIDE BAND PRE-AMPLIFIERS. 3-500 MHz. Excellent performance. 1.5 dB Noise figure. Bomb proof overload figures. £37.00 or straight through when OFF, £42.00 ex stock.

R.F. NOISE BRIDGE. 1-.170 MHz. Very useful for aerial work measures resonant freq. and impedance. £49.50 ex stock.

IAMBIC MORSE KEYER. 8-50 w.p.m. auto squeeze keyer. Ex stock. Ours is the easiest to use. £45.00. First class twin paddle key, £27.00 ex stock.

TWO-METRE LINEAR/PRE-AMP. Sentinel 40: 14× power gain, e.g. 3 W – 40 W (ideal FT290 and Handhelds), £95.00. Sentinel 60: 6× power, e.g. 10 W in, 60 W out, £105.00. Sentinel 100: 10 W in, 100 W out, £135.00. All ex stock.

H.F. ABSORPTION WAVEMETER. 1.5-30 MHz, £39.50 ex stock.

MULTIFILTER. The most versatile audio filter. BANDPASS Hi Pass, Lo Pass and two notches. Frequency and Bandwidth adjustable 2.5 kHz-20 Hz, £75.00 ex stock.

HIGH PASS FILTER/BRAID BREAKER. Cures T.V.I., £7.50 ex stock.

CO-AX SWITCH. Three-way + earth position. D.C.-150 MHz, 1kW, £29.50 ex stock.

12 MONTHS COMPLETE GUARANTEE INCLUDING TRANSISTORS
Prices include VAT and delivery. C.W.O. or phone your CREDITCARD NO. Ring or write for further data or catalogue. Orders or information requests can be put on our Ansaphone at cheap rate times. Remember we are as near as your 'phone or post box.

PACKET RADIO FROM THE SPECIALISTS!

Siskin Electronics have a policy of supplying the best range of packet radio equipment available for the radio enthusiast. We have examined the products of many manufacturers and are pleased to be able to offer what must be the widest range of equipment available from just one UK supplier. All prices include VAT and are valid at time of publication.

PACCOMM

TINY 2 with PMS	£119.00
TNC-320 dual port.NEW	£179.00
MICROPOWER-2	£139.00
Real Time clock option	£27.95
Printer port option with cable	£34.95
9600 baud adaptor	£95.00

AEA

PK88 Budget TNC	£129.95
PK232 best selling multimode	£279.95

KANTRONICS

KPC2 HF/VHF with Wefax	£159.00
KPC4 HF/VHF dual port	£225.00
KAM all mode with Wefax	£265.00
"Smartsocket" battery backup	£17.95
"Smartwatch" real time clock	£27.95

UPDATES

PACCOMM PMS (fits TNC-200/220, MFJ 1270/74, G0BSX and AEA PK80)	£12.50
KAM/KPC4 2.85 UK	£15.00
KPC2/KPC2400 2.85 UK	£10.00
AEA PK88 (30th Dec 1988 UK)	£10.00
AEA PK232 (30th Dec 1988 UK)	£15.00

PACKET ACCESSORIES

32K (62256) static ram	£15.00
27256 32K eprom	£5.00
27512 64K eprom	£8.00
BBC MICRO RS423 lead	£7.95
PC RS232 lead	£9.95
ATARI ST RS232 lead	£9.95
Custom made RS232 leads from	£9.95
4 way RS232 switchbox	£24.95
SPECTRUM 48K TNC interface	£14.95
AMSTRAD 464/664/6128 or PCW 8256/8512/9512 RS232 i/f	£59.95
HF 125 AM/SSB/CW receiver	£375.00
G3RUH 9600 baud modem	£95.00

BOOKS/PUBLICATIONS

BARTG Beginners Guide	£0.95
ARRL AX.25 PROTOCOL	£8.50
UK Confidential freq. guide	£6.95
Master Packet Radio (208 pages)	£9.95
Digital Comms. with ham radio	£8.95

SOFTWARE (Packet & FAX only)
We supply suitable software for most computers FREE of charge with all TNC purchases. Phone for commercial s/w list.

NOTE: All our units have CW Ident to comply with UK regulations.
Plus a wide range of scanners, audio and computer connectors, and indusrial packet radio products. Large SAE for catalogue and price list.

Siskin Electronics Ltd
Southampton Road,
Hythe, Southampton.
SO4 5HU.
FAX: 0703-847754

Tel: 0703-849962

A WORLD OF OPPORTUNITY FOR

RADIO OFFICERS

We offer a secure and rewarding shore-based career in the forefont of modern telecommunications technology. Thirty weeks special training (plus 6 weeks for non-typists) will prepare you to undertake a wide range of specialist duties as a RADIO OFFICER covering the complete communication spectrum from DC to light.

To qualify **you need** to hold or hope to attain:
an MRGC or BTEC HNC in a Telecommunications subject with the ability to read morse at 20 wpm.
City and Guilds 7777 at advanced level, incorporating morse transcription skills, would be advantageous.
Anyone without the above qualifications who has 2 years radio operating experience will also be considered.
Age – preferably under 45 years.

We offer you:
Comprehensive Training; Good Career Prospects; Opportunities for transfers within UK and Overseas; Generous Leave Allowances and a Non-contributory Pension Scheme; Job Security; Attractive Salaries – and much more.
Salary (Reviewed Annually) – As a Radio Officer after training: £11,568 rising to £17,057 pa in 5 annual increments. (includes shift and weekend working allowance)
CIVIL SERVICE IS AN EQUAL OPPORTUNITY EMPLOYER.
For more information and application form write or telephone:

GCHQ THE RECRUITMENT OFFICE, GCHQ, ROOM A/1108
PRIORS ROAD, CHELTENHAM, GLOS GL52 5AJ
OR TELEPHONE (0242) 232912/3

S.E.M.

UNIT P, UNION MILLS, ISLE OF MAN
Telephone: (0624) 851277

S.E.M. QRM ELIMINATOR

Do you suffer from local interference? The answer is probably yes. If you moved your receiver into the country you would be amazed how quiet your reception would be. The noises you hear on the H.F. bands are produced by local electrical equipment.

This completely new idea, developed by S.E.M. can provide the complete removal of any of these problems. You don't even have to know what or where the source is. It can be your own computer next to your receiver or r.f. welding equipment in a factory several miles away.

The QRM Eliminator connects in your aerial lead (you can transmit through it) it requires an auxilary aerial (this can be ANY other aerial e.g. a 2 metre one, or a few metres of wire, because wide band amplifiers are used to boost the level of the QRM). Your unwelcome signal will arrive at the two aerials slightly out of phase and by adjusting the phase of the signal from the auxilary aerial with the Eliminator controls, you can completely remove it BEFORE IT ARRIVES AT YOUR RECEIVER. Forget all the inadequacies of noise blankers, this is a new, different, concept. Sceptical? As W4CXH in Florida says "The power line noise is S 7 and you are coming through 5 and 4." Practical Wireless review says "Does it work? Yes it does". Other comments "A remarkable achievement", "It works like magic", "It even eliminates rain static" and comments about being able to operate again after years of enforced inactivity because of some local problem not previously curable or even traced, are many.

Size: 6" × 2" × 3" deep. Sockets SO239s. Supply 12 V (10-14) 30 mA. Frequency range 500KHz - 60 MHz continuous. May be transmitted through.

Price: £79.50 including VAT and delivery.

They Said We Couldn't Do It . . . But We Did!

The story of GB2EC

It all started in 1985, with the remark from Mr Hywel Roberts GW4CNM: "Are you putting on a special-event station at the Royal Welsh National Eisteddfod, when it comes to Newport in 1988?" That question set the wheels in motion for many, many months of hard work for the 35 members of the Newport Amateur Radio Society*.

At this point in time, any special event we took part in had to revolve around a lot of borrowed equipment; it really was time to get our own. We started with the purchase of a long-forgotten, rusty, and a little less than straight, motorway lighting tower - complete with "clapped out" 3kVA diesel generator. All the parts of this piece of equipment were completely renovated by Dave GW1XYQ, with the option of "any colour you like, as long as it is green".

The club was very kindly given a 10-foot caravan by GW6VVR, which was soon sat in a yard, which by this time, we had acquired from Associated British Ports, in Newport. We also had the luxury of a two-storey building next to the yard - a workshop downstairs and, upstairs, a meeting place with the faithful old generator supplying the electricity for more than we had anticipated. After depriving the building of about twenty years of accumulated dust and debris it had so carefully stored, we set about decorating it to suit ourselves. Once again, the choice of colour could be anything so long as it was pale blue - it looks so good!

The second purchase was a 22-foot mobile site office, which was even worse than it looked. It was without any windows and looked a very sorry sight indeed. This beast arrived in the yard in January 1988. With the exception of one panel, all other external and internal panels were replaced. We all got stuck in with the refurbishing, some with more fervour than others - John GW8SVN was pulling up the old floor covering and fell back, his rear-end becoming quite firmly adhered to the floor by the glue from the old covering! We now have a splendid display area and radio-shack, complete with patio doors, canopy and steps - "Ideal unit to hire out to companies, details on request, floral display optional".

The year trundled on, contact was made with other groups who had attempted to put on stations at previous Eisteddfods. They were not too hopeful of us getting through the week unharmed, or even being allowed onto the Eisteddfod site. However, we carried on undaunted.

Back in July 1987, we applied to the RSGB for the callsigns GB2EC and GB1ECC. This took them somewhat by surprise, because we asked for 24 application forms - one for each 28-day period running up to the Eisteddfod. This had never been done before, but we did it.

Sir Richard Davies G2XM, RSGB Immediate Past-President, and John Case GW4HWR, RSGB Zone "E" Representative, operating GB2EC at the Eisteddfod

Fund Raising

The big caravan was ready by 15 May 1988, for the Newport Amateur Radio Society's "Surplus Equipment and Junk Sale". This sale was held in order to raise funds for our Eisteddfod effort, and proved to be very successful.

We had two further events before the "big day", one at a local hospital fete and the other at the local Tredegar House Country Park with a summer fete organised by the local branch of the Cancer Research Campaign. All went well at both events, with just a few minor alterations and adjustments found necessary.

It was decided that, when out at events, somewhere was needed to sit, which was well away from the main observation area in the big caravan. The 10-foot caravan was duly attacked. It was completely gutted and refitted with all "mod-cons", including a microwave cooker. This again was mostly carried out by Dave GW1XYQ, ably assisted by club members, and is now affectionately known as the "Chuck Wagon".

By now, the problems had started to mount for our Chairman, John GW8SVN - Welsh speakers, transportation, parking arrangements, operators and schedules, awards, QSL cards, advertising, design and layout of equipment - the list seemed endless; not forgetting the fund raising to get the money to do it all. For Margaret GW4SUE, scouring deepest Wales for Welsh-speaking hams willing to help, and arranging the operating/display schedule, was a nightmare - not to mention the transport and ticket arrangements. It was due to her dedication and hard work that not one single problem was experienced.

Design

The design of the stand, award certificates and QSL cards was aptly carried out by Roy GW4LPA. When the stand arrived, it looked tremendous - metalwork in black, panels in Royal Blue cloth, with light oak work surfaces that had electrical ducting running around the rear edges. Our thanks go to Tony GW0BRG and Alan GW0BIC of Span Products, Monmouth.

Central to this stand was a very graphical display of amateur radio. This was done in lights showing the earth, moon, a satellite and the ionosphere. The "bounce" of radio waves was portrayed by rows of lights flashing in sequence, controlled by a home-made box of motor-driven rotary switches. This display was designed and built by Roy GW4LPA. This central display will eventually be placed in the display area of the big caravan.

Our thanks go to EPCO for sponsorship of 10000 QSL cards, Nash College of Further Education for use of BBC microcomputers, and Technical Software of Caernarfon for computer software. Our

The "converted site-office", now a mobile shack and hospitality unit, at the Eisteddfod site. Antennas to the left mounted on mobile towers owned by Newport ARS

thanks also go to the three Bobs, GW4IED, GW0FJE and GW0FXC, for setting up the computer systems, fast-scan TV link between shack and display stand, a constructional project for the younger visitors to the stand, RTTY and Morse, and the weather satellite link.

Moving In

On Tuesday, July 26, we took the stand to the Science and Technology Pavilion on the Eisteddfod site. The assembly of the stand was like the construction of a huge jigsaw puzzle. With the problem of not having seen all the pieces, simply being told *how* it went together proved to be somewhat insufficient! However, after a lot of what was termed "discussion and direction" amongst ourselves, the puzzle came together.

On Thursday 28th, we took the two caravans, generator (now mounted on its own trailer), box trailer and, by this time, two mobile towers down to the Eisteddfod site. The caravans were sited, towers and beams for h.f., v.h.f. and u.h.f. erected, and the on-site electricity supply located. We arranged our own security to supplement that already on site; this proved to be absolutely necessary. Our thanks to Peter GW1NYO, our RSGB Regional Liaison Officer, who did not leave the site for over a week, and to the other members who assisted him on the "night watch".

Our aim throughout all of the preparation, had been to promote amateur radio in as many aspects as were possible. Whilst Newport Amateur Radio Society put on the station and display stand, there was only one leaflet indicating who we were. At this point we must also thank the RSGB staff for their help in many areas - caravan insurance, publicity material (which had to be ready early in order that Welsh translations could be done), and many other queries over a long period of time.

The Big Day

The big day came at last, the opening of the Eisteddfod. We all arrived early on site for final checks - h.f., v.h.f., u.h.f. all 100 per cent, all computers up and running. We knew that the FSTV link was certainly good when Dave GW1XYQ stepped into the shack-end of the caravan to change into some clean clothes, his progress being closely monitored on our stand in the Pavilion!

Our feelings of impending doom were quickly proved unfounded. The transportation of operators and assistants to and from the Eisteddfod site ran smoothly thanks to our chauffeur Bob GW4VNS.

The construction kits proved extremely popular, it was wonderful to see so many youngsters interested. Due to the demand, the availability of kits had to be limited each day, and the success of this project was due to Bob GW4IED.

The station worked well and the callsign GB2EC was reaching all around the country, as well as all four corners of the world. All of the operations were well supported by excellent catering from Ann GW0JBH and mother Mary, in between their operating and logging sessions.

The catalogue of gloom and doom so often outlined, was behind us. The weather was good and all the hard work put into our display was rewarded. To see the number of children and adults making enquiries, inspecting both the stand and the radio station, was very satisfying. We had available a list of clubs throughout Wales, and were able to pass on many club addresses and contacts so who knows, perhaps some of those who made enquiries may come your way.

The highlight of the Eisteddfod week was a visit by the RSGB President, Sir Richard Davies G2XM, along with Council Officer for Wales, John Case GW4HWR. It was a pleasure indeed to have them and their wives showing so much interest, and giving us so much encouragement. Our thanks to them for giving their time. Our grateful thanks also to the clubs in Gwent and surrounding areas, and all visiting operators who gave up their time to help out during the Eisteddfod; there were 54 operators in all for the week, without whose help we could not have managed. Finally, to all the amateurs, both in the UK and world-wide, who made contact with GB2EC, our thanks for your patience during the "pile-ups", and the interest shown in the station - thank you one and all.

We, as a club, took on a daunting task, not knowing if we would succeed or otherwise. We are not a big club, nor a wealthy club. We aimed high and achieved our aim: to promote amateur radio in the biggest and best possible way. To all of us, GB2EC will always be special; we did it against all odds.

Our work is now being put to use in local schools and colleges, by taking our display unit to them and using it as our flagship. We can recommend to all clubs and societies that this type of activity enriches, and will bond any club, and this in turn can only be a good thing for amateur radio. ***PW***

*Newport Amateur Radio Society
PO Box 33
Newport, Gwent.

Stuart Instone GW1ZAH assisting youngsters to build a Morse Oscillator project at the Newport ARS display inside the Science and Technology Pavilion at the Eisteddfod

Re-creating John Scott-Taggart's ST300 of 1932

It is now 57 years since Mr Scott-Taggart's three-valve receiver design, the ST300, came into being. Robert A. Wilson decided it might be nice to re-live those halcyon days and so, after obtaining a blueprint for this classic receiver, he set about building a modern replica.

For a long time I had wanted to own a baseboard-built set, but unfortunately such things are few and far between these days.

After reading the test reports and studying the plans of the ST300 I decided that a replica of the set could be made, although a certain amount of guesswork would be required on some components. My own early days in radio had led me to believe that not much in the way of performance could be expected from three valves and relatively few components. At best I had expected one or two stations at medium to loud headphone strength, but rather low for a speaker. When the set was completed I was not only surprised - I was astonished! The performance was far superior to what I had expected. A number of stations were picked up at such a volume that the set could be heard some seventy feet down the garden with the ST300 inside the house. After dark a number of Continental stations were picked up also at good loudspeaker volume.

Although the set has relatively few components, it has rather a lot of panel controls. It is therefore not a simple matter of switching on, tuning in and adjusting the volume. As can be seen in the circuit diagram Fig. 1, there are five variable capacitors, each to be tuned carefully. They control the aerial, the r.f. amplifier, the detector, the anode coupling and reaction. With careful use of all these controls, a station may be picked up faintly beneath interference - amplified and isolated until it is at full strength.

The tone is sharp, but clear, no doubt it could be deepened with the addition of a tone control circuit. Battery consumption is low, being about 300mA for the filaments, 15mA for the h.t. and nil for the grid bias.

Building such a receiver as the ST300 in 1980s may seem a backward step to some. It is not. Amongst other things it shows what can result from a few components in a carefully designed circuit.

The biggest problem any present day constructor of the ST300 will come up against will be with the components. Many of them may be found in attics or markets, but often have suffered through age. Capacitors (condensers) will often have developed short circuits, chokes and coils gone open circuit and other components may have suffered insulation failure. It is therefore very necessary to check thoroughly any original components which you may find.

Fortunately the most important components, which are no longer manufactured, do not appear to suffer unduly with age. I refer now to the valves. As long as the glass envelope is not broken the valve is protected by its vacuum. Do not purchase or use any valve which has a milky white look inside it, this indicates that air has somehow got inside. Even if the valve itself in undamaged it will not work if the glass has broken or air has leaked in. A mirror-like burn inside the glass envelope is normal and indicates that the vacuum has been maintained. All the valves quoted in this article are still available.

The following notes are to help the present day constructor assemble all the various components for the receiver. Where certain items are no longer available, instructions are given as to how to construct them, or to modify modern equivalents to look like their 50-year-old counterparts.

Components

The following description of each individual component tells how to either obtain originals or fabricate replicas from modern components.

The ST300 was built on a wooden base measuring 406 x 254 x 12mm (16 x 10 x 0.5in). This, of course, poses no problem at all. In my own version, rather than using a plain piece of timber I obtained a piece of particle board (chipboard) with a dark-wood veneer with a fine grained finish. The sides of the base were covered with matching strips of iron-on veneer to hide the rough internal texture of the particle board.

Originally the front panel was of either ebonite or Paxolin, as was the terminal strip along the back. Rather than go to the expense and trouble of finding the correct material and having it cut and drilled I settled for a thin sheet of three-ply painted black. Both the panel and the terminal strip were drilled before fitting the baseboard.

Batteries

Three batteries were used to power the ST300. These are known as the high tension (h.t.), the low tension (l.t.) and grid bias (g.b.). In the 1930s the l.t. was provided by a 2V accumulator, whilst the g.b. and h.t. supplies were dry cells made up into blocks. All three batteries used in the replica I made up myself using modern-day dry cells.

The ST300 requires a h.t battery of 120 volts with at least two lower voltage tappings. The home-made battery consisted of fourteen 9V batteries wired in series as shown in Fig. 2. Tappings were made at the 5th battery (45V), 7th (63V) and 10th (90V) with the maximum h.t. at 126V. The batteries were encased in a

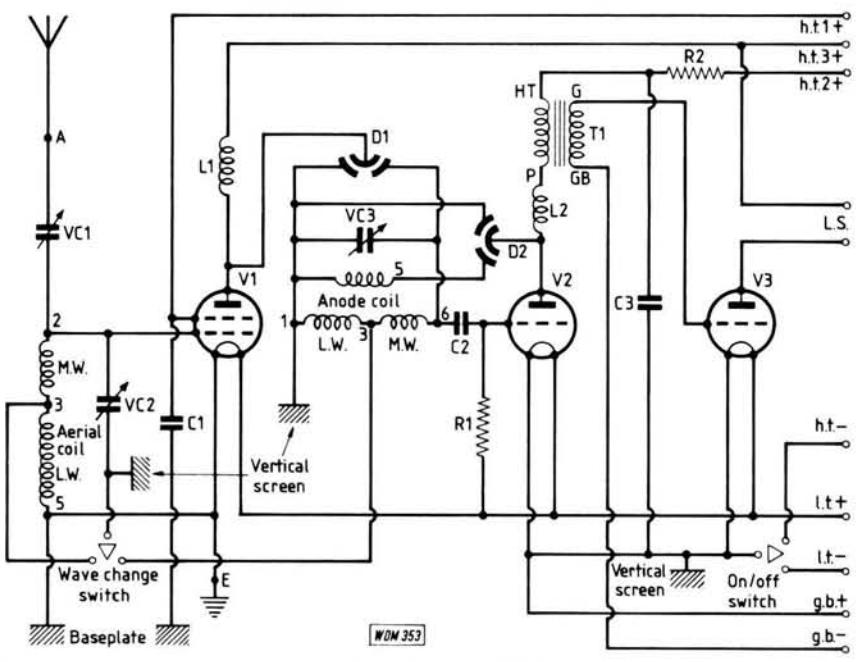


Fig. 1: ST300 Circuit Diagram. Note D1 and D2 denote differential capacitors and not diodes

small wooden box measuring 152 x 152 x 51mm (6 x 6 x 2in). The top was fitted with sockets labelled Negative, 45V+, 63V+, 90V+ and 126V+.

The l.t. requirement (valve filament supplies) is met by wiring two 1.5 volt batteries in series, giving 3 volts. Although this is one volt too much there is very little danger of damaging the valves. I have been using 2V valves on 3V supplies for years with no fatalities. These two cells should be the larger torch size as each valve takes about 0.1 amp for its filament, giving a total consumption of 0.3 amps.

The g.b. battery consists of four penlight cells wired as shown in Fig. 2 and enclosed in a small wooden box measuring 114 x 35.5 x 58mm (4.5 x 1.375 x 2.25in). This box has the positive terminal coming out of the back about 6mm (0.25in) above the bottom of the box. The other five terminals 0V, 1.5V-, 3V-, 4.5V- and 6V- are along the top of the box. The grid bias lead is connected to whichever terminal gives the best results.

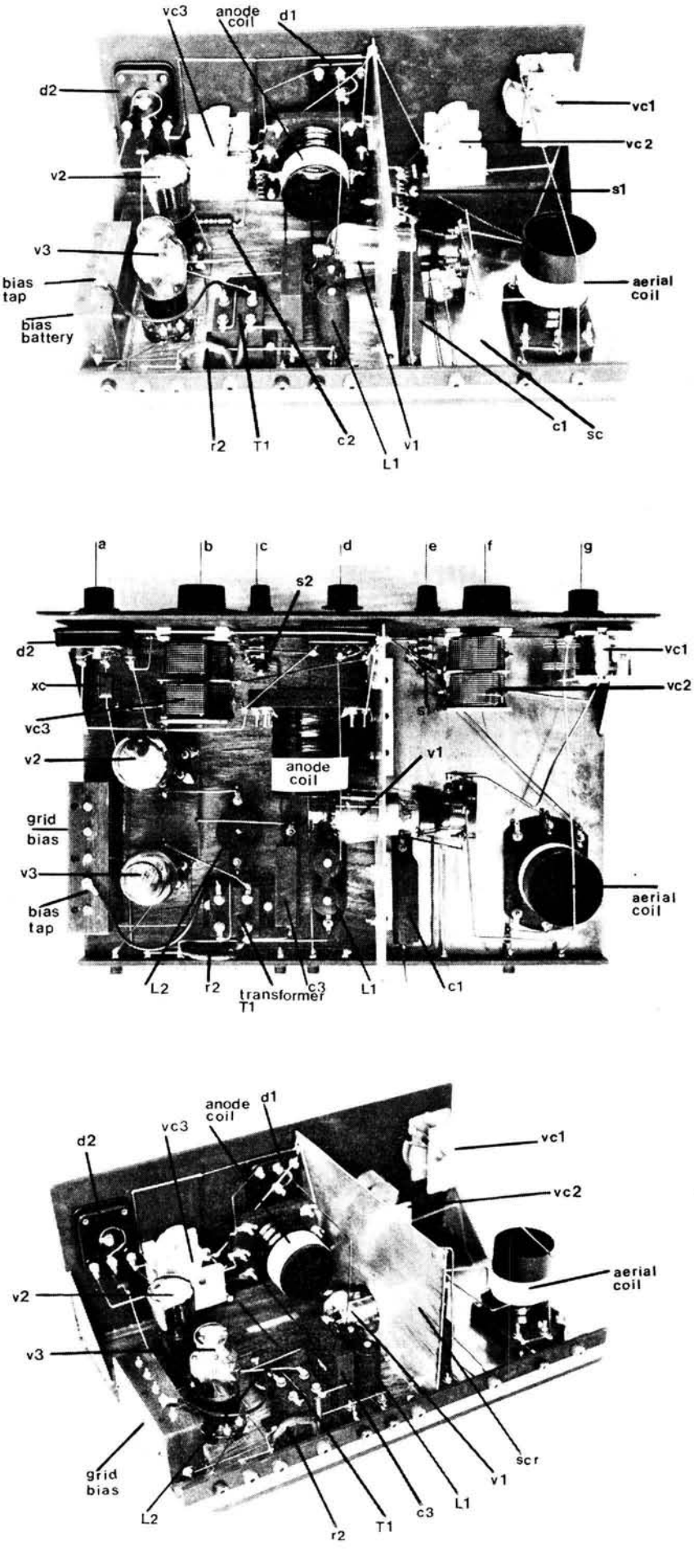
The g.b. battery may use miniature cells as there is virtually no current drawn from it. It merely supplies a negative potential to the grid of the output valve V3. This battery is not switched, but can be left safely in circuit all the time, hence its inclusion on the baseboard of the set.

Fixed Capacitors

Only three fixed capacitors (Fig. 3) were used in the design. Capacitors of this age are seldom in perfect condition so it is not recommended that they are used even if they are available. Fortunately the required values are still in common use, namely C2 0.0001mfd (100pF) and C1 and C3 both 1mfd (1µF). Capacitors C1 and C3 should have a working voltage of at least the h.t. voltage used, in our case 126 volts. Capacitor C2, being a grid capacitor, can be one of the small low voltage types.

Having obtained these three capacitors it is then necessary to change their modern appearance to what they would have looked like in 1932. This is not a difficult job as the two larger ones are identical. The drawing shows the dimensions of C1 and C3. The body of the replica capacitor is made from a solid block of wood. On the underside a space is cut out with a chisel and the modern capacitor inserted. The base consists of two identical sheets of wood as shown. The first one is glued to the base of the capacitor and the two terminal bolts put through it at the ends. The concealed capacitor is wired to these terminals. The second piece of wood has two "dimples" bored into the ends to accommodate the protruding heads of the terminal screws. The whole lot is glued together and painted either black or brown. I then added the value, "1MFD" to the outside in white dry rub-down lettering.

Capacitor C2 is much simpler, being a smaller component measuring approximately 38 x 15 x 6mm. Again it is a block of wood with a hollow cut underneath to house the modern



Three interior shots of the authors' replica receiver to assist with component placement

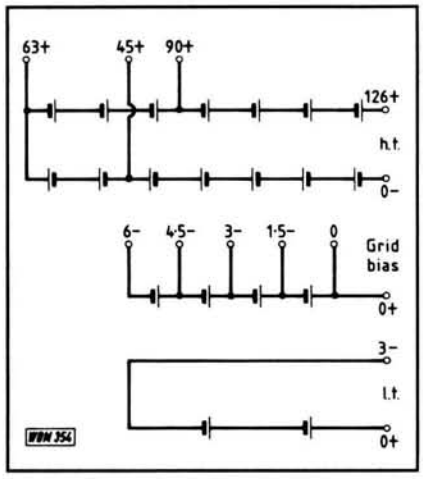


Fig. 2: Batteries

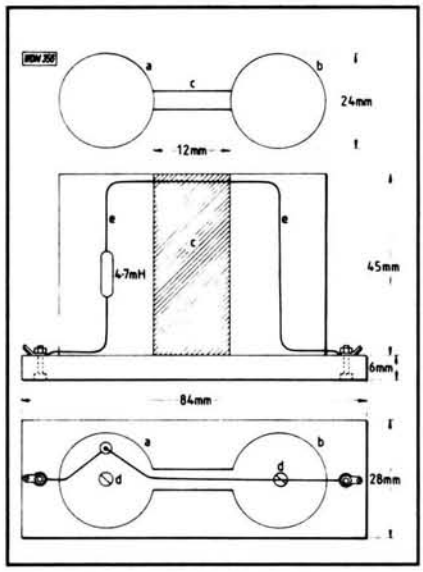


Fig. 4: Screen grid choke L1

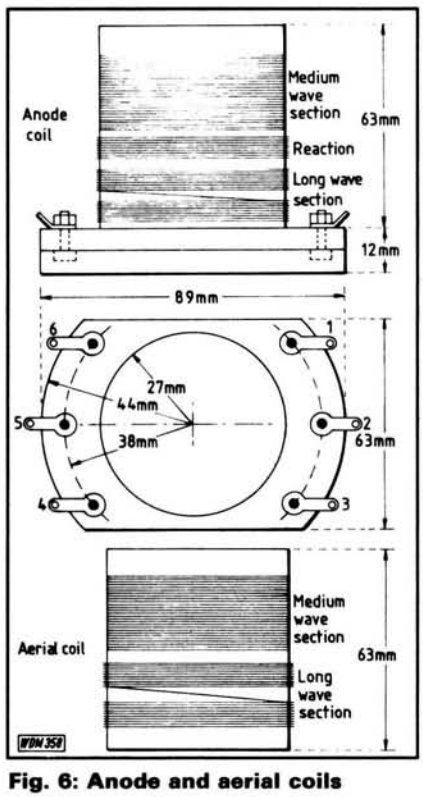


Fig. 6: Anode and aerial coils

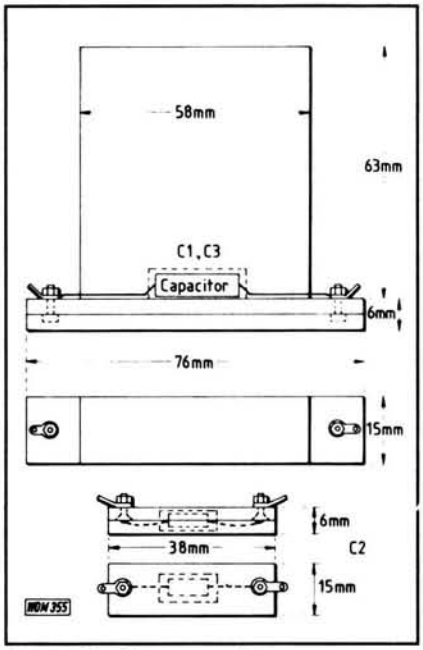


Fig. 3: Replica capacitors

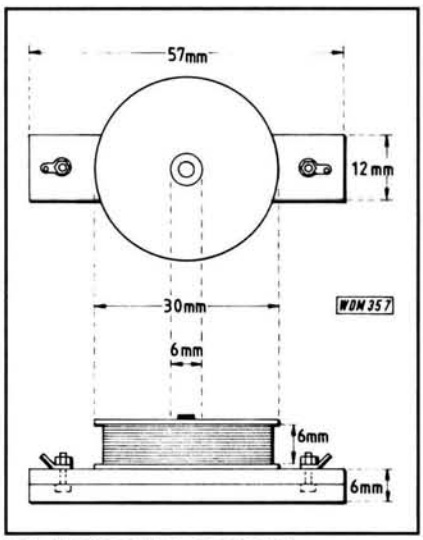


Fig. 5: Reaction choke L2

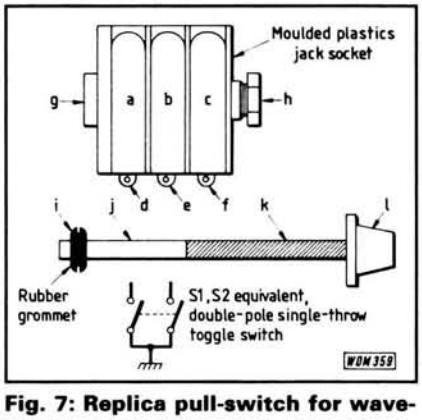


Fig. 7: Replica pull-switch for wave-change and power

components. Rather than have this wire-ended I fixed two solder tags in the ends of the block and soldered the leads to them. Again with rubdown lettering, the value 0.0001MFD was added to the completed capacitor.

Note that no fixing holes were provided in these components. When they were fitted they were held in position by contact adhesive.

Variable Capacitors

The ST300 uses five variable capacitors, three conventional ones and two differential. The aerial coupler is VC1 and has a value of 0.00004mfd (40pF). For this I used a standard modern capacitor of 174pF. Despite being of considerably higher value than the specification, this control is a very effective one.

The next two variable capacitors, VC2 and VC3, are 500pF. They form the tuning controls and at first I was tempted to use a modern ganged capacitor to take the place of two components. This would not have worked, however, as any adjustment of the anode coupler capacitor would have moved the set off tune, VC2 and VC3 must be kept separate. As I was unable to find two single 500pF capacitors I used two twin-ganged ones using only one set of blades of each. Ideally these capacitors should be identical, but again I was unable to find two matching ones and had to compromise, VC2 being slightly smaller than VC3. This does not affect performance.

The two remaining variable capacitors are of the differential type D1 and D2. That is to say they have two opposed sets of fixed blades. As the moving blades move out of one set of fixed ones they move into the opposing set. Their values are 100pF and 150pF. As far as I know such components are not manufactured today. Fortunately two components of the correct value were obtained from The Vintage Wireless Company of Bristol [1].

Chokes

In the anode circuit of V1 is a screen grid choke L1, mechanical details are shown in Fig. 4. The name screen grid choke may seem a rather an odd name for a device that is connected in the anode cicuit of a valve. However, the definition of this device is; a coil of wire connected in the anode lead of a screen-grid valve to offer high impedance to h.f. current.

Chokes of this type are still available, but can be rather expensive. A substitute can be made in a similar manner to the fixed capacitors. Screen grid choke L1 appears on the replica as two vertical tubes mounted on a base about half an inch apart. The windings are inside. The base of the simulated choke was made from a thin sheet of wood fitted with terminals at each end. The two tubes were cut from a length of plastics tubing obtained from a do-it-yourself store. The two 46mm (1.8in) lengths "a" and "b" were glued to the base with contact adhesive. A thin piece of wood "c" was glued between them. The

actual choke "L", a Siemens B78108S 4.7mH[2], was concealed inside one of the tubes. The lead "e" comes through of the top of the tube and out to the terminal. The open tops of the tubes were filled with resin filler and smoothed off after it had hardened. In the drawing two screw heads "d" can be seen on top of each tube of L1. These are only for effect. They have been sawn off and glued flat on top of the component.

The second choke, L2 is the reaction choke, the mechanical details of which are shown in Fig. 5. This component is still available, but again I decided to wind my own. First a bobbin was made from two 30mm (1.2in) diameter circles of Paxolin, with a hole in the centre and a 6mm (0.25in) length of 6mm (0.25in) dia. dowel glued in between. When the glue had set a hole was drilled through the centre of the bobbin.

The choke was formed by filling the bobbin to the edge with 34 s.w.g. enamelled copper wire. This was not as tedious as it may appear. A long nut and bolt was put through the centre hole, and the protruding end of the bolt was put in a wheel-brace chuck. The handle of the brace was then placed in a vice. The start of the winding was threaded through a hole in the centre of the bobbin and the wheel-brace was then turned by one hand while the other was used to guide the wire onto the choke. In this way the winding was completed in a few minutes. The d.c. resistance of the completed reaction choke was then found to be 300Ω. The wound bobbin was fixed to a strip of wood with a terminal in each end and painted black. The component was screwed to the baseboard through the central hole using a brass screw.

Coils

There are two main tuning coils in the ST300, the aerial coil and the anode coil, mechanical details of which are shown in Fig. 6. Neither is available, so they must both be made from scratch. Fortunately, both formers and bases are identical which makes things somewhat easier. The aerial coil consists of a medium and a long wave winding. The anode coil consists of two identical windings, but with an additional reaction winding in between. Each coil has six terminals, but in the aerial coil only three are used and in the anode coil only four are used. Both of my coils were fitted with the full six terminals purely for aesthetic reasons.

Each coil base consists of two 89 x 63 x 6mm (3.5 x 2.5 x 0.25in) sheets of obeche wood. This type of timber can be obtained from model shops in sheet form. The ends are curved to the radius shown in Fig. 6.

When the two halves of each base have been cut to size the nuts, bolts and solder tags can be fitted. Then the lower halves, with holes drilled to take the protruding screw heads, may be glued on. The bases should be painted either black or brown.

I thought the actual former might

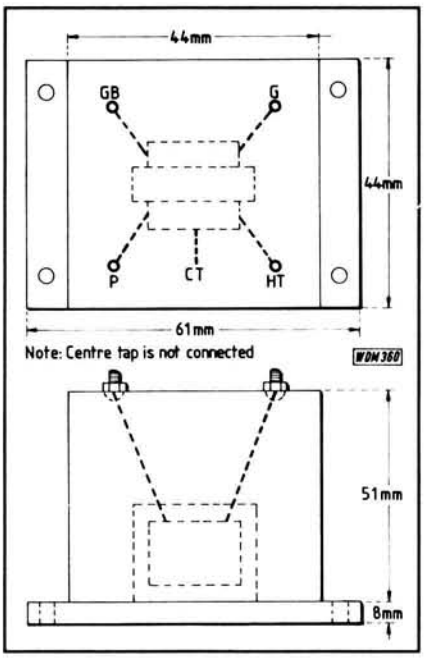


Fig. 8: Intervalve transformer. Note the centre tap of LT44 transformer is not used

prove a problem, but in the end it did not. A suitable plastics container was found in the form of a small tub containing dried parsley, available at most big grocers. The former of the anode coil must be cut down to a length of 63mm (2.5in) otherwise it will be in the way of the screen grid valve. Each former has eight vertical ribs.

These can be formed by sticking thin strips of wood up the sides of the formers. The positions can be marked on the tubs by holding them over the full sized blueprint[1]. When all the ribs are on, paint the formers the same colour as the bases. In the photographs it may be noticed that my coils do not have ribs. The first two coils I made did, but unfortunately the numbers of turns were way out and they were a long way off frequency. The coils shown are the second lot of experimental ones which were not ribbed in order to save time. Now that the correct number of turns have been sorted out I will be able to make the better looking ribbed variety.

Windings on both coils are wound from the bottom of the formers towards the top using 32 s.w.g. enamelled copper wire wound in the same direction.

Details of the anode coil are as follows; thread the end of the wire through a hole in the bottom of the former and label "1". Wind 60 turns of wire on to the former in a pile about 6mm (0.25in) wide. Without breaking the wire leave a small gap and then wind another 60 turns on the former in another pile. Thread the end through the former and label it "3". This is the long-wave winding.

About 6mm (0.25in) above this winding thread the wire through a hole and label it "1". Wind 50 turns of wire in a pile about 6mm (0.25in) wide and thread through a hole in the former labelling it "5". This is the reaction winding.

About 6mm (0.25in) above the reaction winding thread the wire through the former and label it "3". Then carefully wind 80 turns of wire on to the former with the windings touching but NOT piled on top of each other. Thread the end through a hole and label "6". This is the medium-wave winding.

Clean all the ends of the wires and solder them to their correct number tags shown on the drawing. Note that the lower end of the long-wave coil and the lower end of the reaction coil both go to terminal "1". The top end of the long-wave winding and the bottom end of the medium-wave winding both go to "3". The top end of the reaction coil goes to "5" and the top end of the medium-wave goes to "6". The former may now be glued to the base and the anode coil is complete.

Winding details of the aerial coil are as follows; thread the wire through a hole in the bottom of the former and label "5". Wind 60 turns on to the former in a band 6mm (0.25in) wide, leave a gap and wind another 60 turns on. Thread the end through a hole and label "3". This is the long-wave coil which is identical to the long-wave section of the anode coil apart from the numbering of its wires.

Thread the wire through a hole and label "3". Wind 80 turns on the former touching and NOT piled up. Thread the end through a hole and label "2". Again the medium-wave winding is identical to the one on the anode coil, apart from the wire numbering.

Clean the wire ends and solder to their appropriate tags. Note that the bottom end of the long-wave winding goes to "5". The top end of the long-wave and the bottom end of the medium-wave both go to "3" and the top end of the medium-wave winding goes to "2". Glue the former to the base and the aerial coil is now complete. Both coils should be checked for continuity on a meter in case a winding has a break or there is a bad soldered joint.

Control Knobs

Plain black modern knobs will look correct on all but the two main tuning controls. The two tuning knobs, however, were 3in diameter types calibrated from 0 to 180 degrees. Replicas of the original knobs are available from Vintage Wireless Company[1] and add a look of authenticity to the set.

Loudspeaker

A standard modern loudspeaker and matching transformer is quite adequate for the set. I removed a six inch speaker and its transformer from an old set and enclosed them in a wooden cabinet to the style shown in the constructional details.

Resistors

The circuit uses only two resistors, a 1MΩ grid leak and a 20kΩ spaghetti. Although both original types can be obtained it is just as easy to make your own. Conveniently the grid leak is the same diameter as a plastics ball-pen barrel.

Cut a piece from a ball-pen barrel 44mm (1.75in) long. Inside it insert a modern 1MΩ resistor and add a screw terminal at each end. The completed resistor may then be painted black.

A spaghetti resistance is one of the flexible type about 75mm (3in) long. It can be formed by threading a modern resistor into a piece of sleeving. As 20kΩ is not a common value these days I used two 10kΩ resistors in series.

Screens

The aerial circuit of the set is separated from the rest of receiver by a vertical screen "scr". This is a piece of thin aluminium with a right angled bracket along the bottom to screw it down. The horizontally mounted screen-grid valve V1 protrudes through a 44mm (1.75in) diameter hole. Only two wires pass through this screen. Suitable holes can be drilled and fitted with rubber grommets before fixing the screen in position.

The other screen is the plate "sc" which covers the base of the set containing the aerial coil. For this screen I used a blank piece of copper-clad printed circuit board, copper side up. The p.c.b. material was glued to the base with contact adhesive.

Switches

The on/off and wavechange switches are identical and are shown in Fig. 6. They have three connections which are all either made or broken. The originals were of the push-in, pull-out types. Although they are still available I found it a simple matter to make my own from two 0.25in moulded stereo jack sockets as shown in the drawing. Metal contact springs "a", "b", "c" are connected to the tags "d", "e" and "f" respectively. Fixing nut "h" is the point through which the stereo plug would normally pass. The only modification to the socket is to cut the end stop "g" off to give a hole right the way through the socket. The shaft of the switch is made from a length of 0.25in brass tubing "k" into which a length of wooden dowel "j" has been fitted. Push the shaft into the jack socket until the three tags "d", "e" and "f" are all shorted out by the brass rod. Cut the protruding end of the brass rod off so that the knob "i" is pressed right up to the fixing nut "h". Pull the knob out carefully until "d", "e" and "f" are electrically separate. Then glue a rubber grommet "i" on to the wooden dowel making sure that it is pressed up to the body of the socket.

This makes a very effective three-way switch.

Terminal Panel

The terminal strip was originally made of Paxolin or ebonite and measured 406 x 38mm (16 x 1.5in). In my own receiver I used plywood painted black.

The ten terminals were found to be available at most electronics shops for about 20p each.

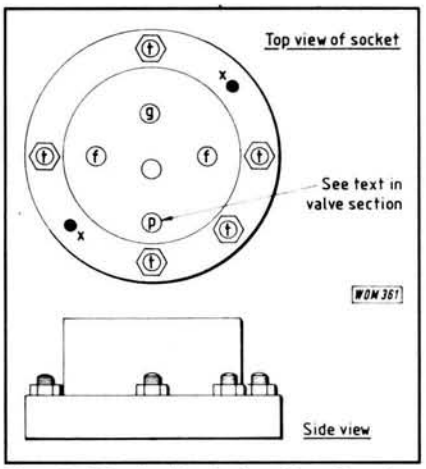


Fig. 9: Mechanical details of valve holders

Transformer

This component is just listed as an l.f. transformer in the parts list. Such transformers are still available, but can be expensive. I therefore decided to try a modern one concealed in a wooden mock-up of the original (Fig. 7). The drawing shows the dimensions of the box which was constructed out of thin sheet wood obtained from a model shop.

The transformer itself is an Eagle LT44[3] transistor driver transformer. It has a 20kΩ impedance primary winding and a 1kΩ impedance centre tapped secondary. For intervalve use, however, its connections were reversed. The centre-tapped secondary became the primary with the centre tap "CT" unused. The original primary then became the secondary. This component is only 19.5mm (0.75in) square and so it was supported inside its new case by its own leads as shown.

Valves

The ST300 uses three valves, a screen-grid tetrode, followed by two triodes. Valve types are not specified in the circuit details. The ones I chose were SG215(st) for the screen grid (V1), 210HL for the detector (V2) and HL2 for the output valve (V3). Triodes V2 and V3 are more or less interchangeable with each other depending on results. The "st" in brackets after SG215 refers only to the shape of the glass envelope, hence an SG215 is the same thing, but may be a different shape. All three valves are available along with baseboard mounting holders from The Vintage Wireless Company. Diagram Fig. 8 shows a typical baseboard type holder. The fixing holes are marked "x" whilst the connections are set around the base at points "t". These older type valve holders could usually take both four-or five-pin valves, hence the central hole and the extra terminal. In our case the fifth pin is unused and can be ignored. The four sockets "f", "g", "f", "p" stand for filament, grid, filament and plate. Plate is the old word for anode. These old valve holders can be made from wood, but it is easier to purchase them. The holder for the screen grid valve V1 should be a side mounting type. As mine were all vertical types I simply made an aluminium bracket for the S.G. valve holder.

Note: The S.G. valve holder connections are slightly different, "P" is the screen-grid terminal. The top cap of the valve is the anode or "P" connection.

Wiring

The leads used for connections between the terminal panel and batteries, etc., were normal flexible leads fitted with plugs at each end. The actual wiring of old-time sets such as the ST300 was usually of quite heavy gauge wire with all the angles bent neatly in the wire rather than going direct from component to component.

This is frowned upon today, but the ST300 was so well spaced out and screened that wiring in this manner does not have any adverse effect.

The wiring I used was bare copper wire of heavy gauge. Actually it was offcuts of modern house wiring cable. Before the wire can be used it should be straightened. To do this put one end in a vice, take the other end in a pair of pliers and pull it so that it stretches slightly. This stretching will make it perfectly straight. The angles can be bent in it with pliers and the wire cut to the correct length with clippers.

Panel Controls

Referring to the photograph, a is the Reaction control, b the anode tuning, c the on/off switch, d the anode coupler, e the wave change switch, f the aerial tuning and g the aerial coupler

When the set is switched on the required waveband should be selected first. It is best to make a start on medium wave until one is used to the operation. There are more stations available there.

The reaction control should be adjusted to minimum to begin with. If it is turned up too far the set will oscillate. When I first constructed my ST300 I found that the reaction was at minimum when the control was fully clockwise. The reaction condenser "D2" was therefore turned upside down so that the two sets of fixed blades became reversed (wires remained on same sides, but lower down). This put the minimum reaction at anti-clockwise.

Find a station by moving one or both tuning controls "b" and "f". Once a station is located it can be peaked with these two controls. Then an adjustment of the anode coupler "d" will improve it or remove interfering stations. The aerial coupler "g" may then be adjusted to increase volume. Once the station has been tuned in as well as possible with the two main tuning controls, plus anode coupler and aerial coupler, the reaction control can be turned slowly up. As reaction is increased, the signal strength will get louder until the set bursts into oscillation, the reaction should then be turned back again until oscillation ceases. Even then there is still scope for

improvement and this is where practice by trial and error comes in.

Notes

A small fixed capacitor "xc" is visible in the photograph connected to the moving blades of the reaction control. This is not shown in the circuit diagram. The reaction condenser "D2" is a differential with a value of 0.00015mfd (150pF). The condenser which I obtained although labelled correctly showed a capacitance of 0.00025mfd (250pF) on a capacitance meter. I had hoped that it would not make any difference, but it was so high that the set oscillated all the time. The introduction of "xc", a 0.0001mfd (100pF) capacitor cured this by lowering the effective capacitance of D2.

A low value aerial coupler VC1 could not be found. Several moving blades were pulled out of a normal one to reduce its capacitance. This is obvious in the photograph. If you have occasion to pull blades out do it one by one, they can't be put back again!

The medium wave sections of both coils were covered in white insulation tape simply to increase the general contrast. A more effective way is to use the brightly coloured enamelled copper wire for the windings. Also the inclusion of the vertical ribs on the coil formers improves looks.

The top cap of the screen grid valve V1 is a plain metal stud. Do not solder direct to this or you may burst the glass envelope. Make a push-on clip. Some older types of valves have a screw terminal for a top cap.

Be very careful when plugging the batteries in. If you connect the high tension battery to the low tension sockets on the terminal panel, all three valves will be destroyed immediately the set is switched on.

Trial and error will find what tappings to plug h.t.1, h.t.2 and h.t.3 into on the high tension battery. No harm will be done if either h.t.1, 2 or 3 share any particular tapping - it really depends on what type of valve you use.

The valves shown in the prototype are "bright emitters". This doesn't mean that they light up like lamps. They only have a dull glow which can be difficult to see in daylight. Valves V2 and V3, both being triodes can be changed round to see which performs best in which socket.

Experiments

As a number of component values were guessed at in my ST300, it is possible that improvements may be obtained by trying different values. The areas of experimentation are as follows:

Anode and Aerial Coils: The wavebands covered may be altered by using either greater or lesser number of turns. Whatever number you choose, both medium-wave windings and both long-wave windings should be the same on each coil.

Reaction and Screen Grid (S.G.) Choke: The number of turns and inductance of these two components was pure guesswork and perhaps modern r.f. chokes would be worth trying.

Valves: Different types of valves can be tried provided, of course, that the bases/anode cap are of the correct configuration.

Intervalve Transformer: Ratios of normal intervalve transformers of the 1930s seemed to vary between about 1:2 and 1:6. The transformer eventually used in the replica was way out of this range, but seemed to work well. Other transformers may be tried to advantage.

Once the ST300 is working it makes one wonder what could be achieved with modern components and valves. It would be interesting to construct a set based on this design, but modernised by thirty years or so.

One final point. Over the years, family and friends may have become rather bored with your obsession with radio construction. When you embark on an ST300 it is amazing how tolerant amusement can turn into amazement when the relic bursts into operation with a volume that certainly cannot be ignored. If nothing else, it is certainly a talking point for everyone. ***PW***

(1) The Vintage Wireless Company Ltd.
Tudor House
Cossham Street
Mangotsfield
Bristol BS17 3EN
Tel: 0272 565472

(2) Cirkit Distribution Ltd.
Park Lane
Broxbourne
Herts EN10 7NQ
Tel: 0992 444111

(3) Maplin Electronics plc
PO Box 3
Rayleigh
Essex SS6 8LR
Tel: 0702 552911

Theory

Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

In Part 15, R.F. Fautley G3ASG takes a looks at the type of h.f. oscillator you need for single sideband working.

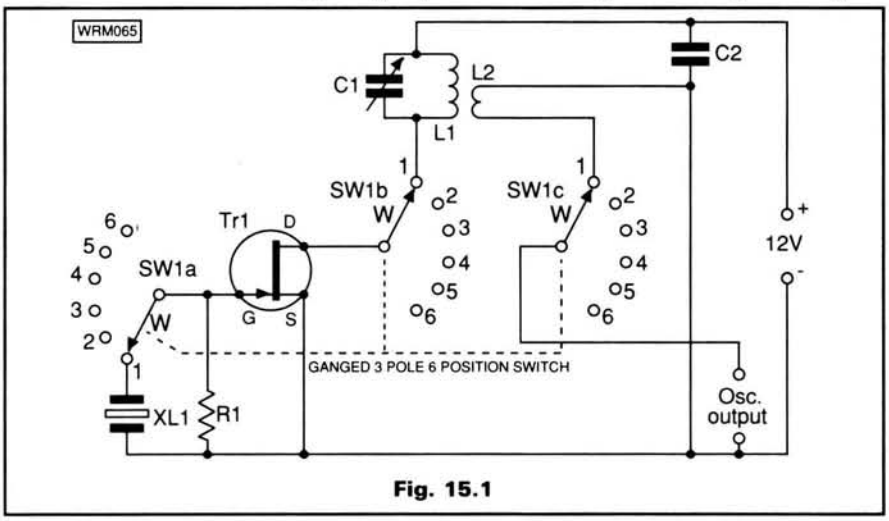


Fig. 15.1

Any type of high stability oscillator may be used, perhaps a crystal oscillator with several switched crystals. The disadvantage of such a system is that only **single** frequencies could be used for transmission such as, **one** in each of several bands, **all** in just one band or a mixture of the two. It is limited by the number of crystals and switch positions available. A possible circuit using a j-f.e.t. (junction field effect transistor) is shown in Fig. 15.1. Only one crystal with its associated tuned circuits is shown for clarity, but any number may be used, limited only by the number of positions to be found on one switch!

Switch section SW1a selects the crystal, SW1b the appropriate tuning in the drain circuit and SW1c the low impedance output link. All three sections are operated simultaneously by a common spindle and this is indicated by the dashed line joining them together. The sections are said to be "ganged" together.

Tuned circuit L1/C1 is usually tuned to the crystal frequency, but if tuned to an **odd** harmonic such as three, five, or up to about nine times, the circuit can be made to produce output **only** at the odd harmonic frequency. This is useful for v.h.f. equipment where much higher frequencies are needed. When used in this way, the circuit is referred to as an "overtone" oscillator.

Inductor L2 is just a low impedance output winding or link and C2 short-circuits the h.f. supply to r.f. signals.

Using such an oscillator limits the number of usable frequencies to the crystals and switch positions available. However, it is a simple way to get a stable signal on the air.

In the crowded bands of today though, it is really necessary to be able to move about the band to find clear frequencies. To do this a v.f.o. (variable frequency oscillator) is required. It **could** be used to replace the switched crystal oscillator directly, but then a v.f.o. for each band selected by a switch is necessary. A better method is to use a single v.f.o. operating at a low frequency, mix its output with the i.f. s.s.b. signal, filter out the wanted output, then mix again with a switched h.f. oscillator to produce the variable frequency s.s.b. signal translated to the required band.

The mixer, often operated around 3 to 5MHz, with a v.f.o. (like the circuit in Fig. 15.2) at a similar frequency, together with the sideband signals at i.f., provides variable frequency u.s.b. and l.s.b. signals, usually over a 500kHz band around 3.5 to 4MHz. Beating this band of signals with a switched oscillator like Fig. 15.1 in another mixer and then selecting the required operating frequency bands by using suitable filters at last provides what we wanted - u.s.b. or l.s.b. signals that may be tuned to any frequency in any of the permitted bands. Rather a complicated procedure which will not be elaborated in this series.

We'll have a look at the v.f.o. circuit of Fig. 15.2 though. The frequency determining components are primarily L1 and C1-4. All these capacitors are connected in parallel, C1 being the main variable tuning control and C2 an air-spaced pre-set trimmer (note the slightly different circuit symbol). It's usually used to adjust the oscillator when the main tuning control is set to the h.f. band edge frequency.

The other two, C3 and C4 would preferably be of the polystyrene type. Why four capacitors when one tuning control is really all that's needed? Any r.f. current flowing through L1 also has to flow through the capacitors, because together they are connected in series with the inductor. Remember that the four capacitors can be replaced by a single one of suitable value. The r.f. current is divided into four parallel paths resulting in less heating per capacitor and so also less change of component value due to internal temperature change. Thus better frequency stability.

When we discussed oscillators before (in Part 4), the circuits shown had parallel tuning, but Fig. 15.2 uses a series tuned circuit. An advantage is that a much larger inductor may be used resulting in stray circuit inductance having proportionately less influence on oscillator frequency. Of course, we have to make sure that the larger inductor itself is not a greater source of frequency drift! Another design problem.

Capacitor C5 is made small so as to isolate the main tuned circuit from any reactance at the gate of the f.e.t. Remember, a low capacitance value provides high reactance, which in turn gives high isolation. The junction of C6 and C7 provides the "tap" on the tuned circuit (mentioned in Part 4) to enable energy to be fed back from output to input, without which we wouldn't have an oscillator!

Diode D1 rectifies the r.f. signal and provides a d.c. charge on the capacitors. This charge acts as a bias on the f.e.t. preventing much of the distortion which would otherwise occur if the r.f. voltage was allowed to increase until it was rectified by the gate-source diode of the f.e.t. Resistor R1 provides a d.c. path for the diode.

The radio frequency choke RFC1 provides a d.c. path for the f.e.t. source whilst maintaining a high impedance for the r.f. output voltage. Capacitor C8, again as low a value as possible appropriate to the frequency of the oscillator, couples the output to the next stage. Preferably this next stage should be a "buffer" amplifier (see Part 3) to isolate the oscillator and prevent its output load circuit being influenced by succeeding stages.

Diode D2 (again note the different

symbol) is a Zener diode. It hasn't been **drawn** the wrong way round, it's **used** the other way round. When "reverse" current flows through the diode (the cathode being positive with respect to anode) the voltage across the diode remains almost constant even when the diode current changes considerably. This phenomenon is used to provide a constant voltage supply for the junction field effect transistor Tr1, as any change in supply voltage to the oscillator would result in a change in its output frequency. So, stabilising the supply voltage is another requirement for producing a stable oscillator frequency. Resistor R2 provides the voltage drop necessary from the 12V supply to the 9.1V across the Zener diode, as well as acting as a filter with C9 to minimise the level of oscillator signals on the voltage supply line. Capacitor C9 also provides an a.c. dead short for the drain to the common line, so that its operation is somewhat like a common collector circuit (see Part 3).

Another method of tuning control for transceivers is by means of a frequency synthesiser operating in a band about 45 to 75MHz. A receiver i.f. (intermediate frequency) above the highest operating frequency of about 30MHz is used to minimise receiver spurious responses. In particular, the image or second channel response will be very low.

Image? Second channel? These are two names for the same thing. In Part 7 we discussed "beats" and found that usually the difference frequency between the incoming signal and the local oscillator was retrieved from the mixer output to become the receiver i.f.

The receiver i.f. is the difference between f_{lo} and f_{ws}
Where

f_{lo} is the local oscillator frequency
and

f_{ws} is the wanted signal frequency

For example, say the i.f. is 465kHz which is the difference between 14.665 and 14.200MHz, where 14.665MHz is the local oscillator frequency and 14.200MHz is the required signal frequency. But, 465kHz is also the difference between 14.665 and 15.130MHz, isn't it? So, signals at the receiver input of **either** 14.200 or 15.130MHz when mixed with the **same** local oscillator signal of 14.665MHz will **both** produce a difference frequency of the i.f. How does the receiver know which is the one we want? It doesn't, is the answer! Do we get both signals at once then? Yes, indeed we do and the one not wanted is called the "image" or "second channel" frequency. The only way to discriminate between them is to attenuate the one we don't want whilst retaining the wanted signal. The answer is to use a filter of some sort **before** the signals reach the mixer. This is one reason for the r.f. amplifier stage in the superhet receiver, it not only amplifies but also provides **selectivity.** Remember about selectivity? If not, refer back to Part 6. When adjusted to resonate at the wanted signal frequency, the tuned circuits in the r.f. amplifier provide attenuation at the second channel frequency and provided that the discrimination is sufficient only

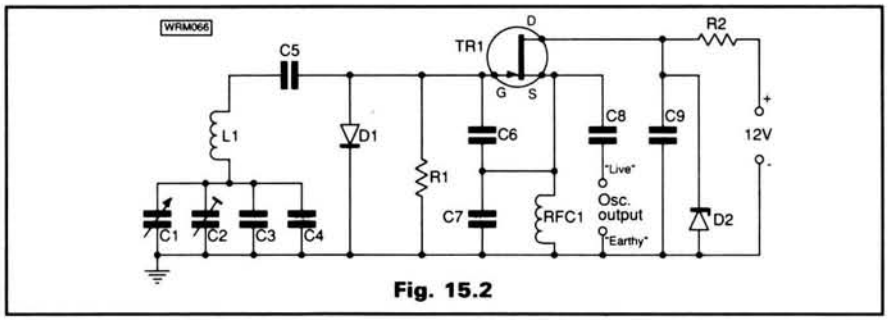


Fig. 15.2

the wanted signal will be passed to the mixer.

To determine the second channel frequency for any signal frequency:

If the local oscillator frequency is higher that the signal frequency (the more usual case):

$$f_{sc} = f_s + (2 \times \text{i.f.})$$

where

f_{sc} is the second channel frequency
and

f_s is the signal frequency

If we use our previous example:

$$f_{sc} = 14.200 + (2 \times 0.465)$$
$$= 14.200 + 0.930$$
$$= 15.130\text{MHz}$$

The wanted signal is 14.200MHz and the second channel is 15.130MHz. The ratio between them is 15.130/14.200 = 1.065. The larger the ratio, the greater is the possible attenuation of signals at the unwanted second channel frequency. If the local oscillator frequency is **lower** than the signal frequency then:

$$f_s = f_s - (2 \times \text{i.f.})$$

If the i.f. is put at a frequency **higher** than the highest operating frequency, the numerical difference between the wanted and the unwanted frequencies is very much greater, making for much greater attenuation of the second channel signal.

As an example, let's use the same wanted signal frequency as before of 14.200MHz, but now let's see what happens when the i.f. is set at 35MHz.

The i.f. is equal to the difference between the local oscillator frequency and wanted signal frequency. So the required local oscillator frequency is:

$$f_{lo} = f_s + \text{i.f.}$$
$$= 14.200 + 35.000$$
$$= 49.200\text{MHz}$$

With the local oscillator frequency at 49.2MHz and a wanted signal frequency of 14.200MHz, the unwanted second channel frequency will be:

$$f_{sc} = f_s + (2 \times \text{i.f.})$$
$$= 14.200 + (2 \times 35)$$
$$= 14.200 + 70$$
$$= 84.200\text{MHz}$$

The ratio between the signal and second channel frequencies is 84.2/14.2 = 5.93. A very much higher ratio than we obtained for the i.f. of 465kHz.

With the wanted s.s.b. signal finally at the required output frequency, the rest of the transmitter comprises linear amplifiers at low power, driver and r.f. power amplifier stages, **all** operating at the same frequency. Layout becomes important to limit possible feedback which could produce oscillation (as we discussed in Part 11) or perhaps increase the level of unwanted intermodulation products.

Fundamentally, all these amplifiers are of the same type, really only the power handling level is different, so the circuits look similar. Low level stages would probably use semiconductors, whilst driver and power amplifier stages may use valves. Again, it must be stressed that many transceivers use semiconductors throughout, but valves have been used for high power level stages in this series to provide circuit diagrams that weren't almost identical for each amplifier! On the other hand, valves can be used for all stages in a transmitter or a receiver, it's all a matter of choice coupled with cost.

There is very little difference between the circuit of a receiver r.f. amplifier and that of a transmitter linear low level stage, they both have tuned circuits at their inputs and outputs with an active device (transistor or valve) in the middle. Both perform similar functions, i.e. amplify the input signal, but the design for a receiver r.f. stage would have emphasis on low noise level as the input signal could be as low as 0.5µV, whereas the transmitter amplifier would concentrate on power handling without distortion as the input could be up to a volt or two.

In general, for s.s.b. telephony transmitters **all** the amplifiers **must** be linear, whereas for c.w. only or for anode modulated a.m. telephony transmitters, the r.f. amplifiers need not be of the linear type as only a single frequency is amplified. Thus Class C is used as its efficiency is greatest although it does produce a much higher r.f. harmonic content. Don't forget the high power audio amplifier necessary for anode modulated a.m., this must be of the linear type as the whole band of speech frequencies is amplified. Class B is favoured for this stage using the push-pull configuration described earlier in the part about amplitude modulation.

Of course, a.m. signals can be produced at a low power level, but then linear amplifiers **must** be used for all succeeding stages as for s.s.b. because the r.f. signals contains a **band** of frequencies and not just one.

Modern multi-mode transceivers usually generate the signal in the required mode at a low level and then use common linear amplifiers and linear mixers for all the following stages. This isn't the way to obtain maximum possible efficiency for a.m., c.w. or f.m. signals but it does provide all the different modes without using different amplifiers.

Having mentioned f.m., in the next part we'll take a look at how frequency modulation works.

GAREX THE SCANNER SPECIALISTS

POPULAR SCANNERS

AOR900UK inc UHF Airband	£235
BJ200 MkIII wide coverage	£199
Cobra 925 Economy Base	£149
Uniden 200XL inc 900MHz	£249
Uniden 50XL FM handy	£99

AOR 2002

* Covers: 25-550MHz, 800MHz-1.3GHz
* AM & NFM & WFM on all bands
* Computer interface socket
* 20 memories
* Compact size
* 12V dc operation
* Up/down step control knob

£487

REVCO RS-3000

THE COMPACT SCANNER

* Size only 6"×2"×8"
* Covers: 26-32MHz, 60-90MHz, 118-180MHz, 380-512MHz
* AM & FM all bands
* Liquid crystal display
* 50 memories
* Scan, search, priority

£225

AOR 800E

THE SMALLER HANDY-SCANNER

* Covers: 75-106MHz, 118-175MHz, 406-496MHz, 830-950MHz
* AM & NFM programmable on all bands
* Full scan & search functions are available
* 20 memories
* Measures only 2.5"×5.5"×2"
* Nicads, charger & BNC whip antenna included in the price

£199

JIL SX-200N

THE SUPERIOR SCANNER

* The choice of the professionals
* Proven reliability
* Covers: 26-88MHz, 108-180MHz, 380-514MHz
* AM & NFM on all bands
* Positive action keyboard
* 16 memories
* 12V dc & 240V ac

£325

NEW IMPROVED REVCONE

The British made REVCONE already renowned throughout the world has now been improved with a new exclusive feature. The addition of a vertical element to a discone has been shown to improve the performance on a selected band.

Now the REVCONE offers YOU the choice of band

All new REVCONES supplied by us now incorporate a mounting stud for an optional vertical whip for the band of YOUR choice. Whips may be chosen for any frequency from 27 to 950MHz from the standard REVCO range.

Basic REVCONE, excellent value at	£33.75
REVCONE with N-type socket	£35.95
Add-on whips from	£3.90 to £10.75

Remember this British product carries no overseas freight or Import Duty!

BROADBAND PREAMPLIFIERS

REVCO PA3 inline masthead model, with special mains psu. 20MHz-1GHz min. 13dB gain	£49.95
PA3I instrument or back-of-set version for 12v DC operation, BNC connectors (SO239 or N-type options)	£35.50

GAREX ELECTRONICS

HARROW HOUSE, AKEMAN STREET, TRING, HERTS HP23 6AA.
Phone 0296 668684 or 044 282 8580. Callers by appointment only.

MAIN DISTRIBUTOR OF REVCO PRODUCTS. PRICES INCLUDE UK P&P and 15% VAT. **Ask for details of our interest free credit.**

*Extensive range of **PYE** radiotelephone spares — S.A.E. for list.* *Ask for our secondhand scanner bargain list.*

RYEDALE SATELLITE SYSTEMS

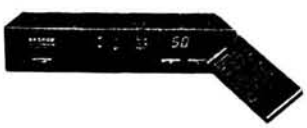
SUPERB QUALITY AT AN UNBEATABLE PRICE

THE MASPRO SRE 90R

FIXED SYSTEM

MASPRO SRE 90R 50 CHANNEL RECEIVER • TRAC 65cm DISH INCLUDING INTEGRAL FEEDHORN AND FERRITE POLARISER • MASPRO SCE 975 HEMT 1.6dB max HEMT L.N.B.

£292



ECHOSTAR SR4500 RECEIVER ANTENNA POSITIONER **£559**

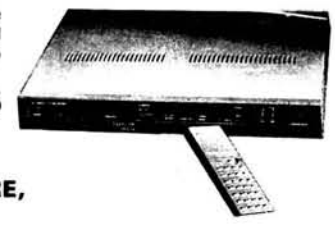
Motorised System comes complete with 90cm Offset Dish, Offset Feed with Magnetic Polariser, 1.3db L.N.B. Actuator Arm.

FREE — DIY INSTALLATION VIDEO SAVE ££!
ALL PRICES EXC VAT

SKYSCAN K1 MODIFIED

Motorised System comes complete with 90cm Offset Dish, Offset Feed with Magnetic Polariser, 1.3db L.N.B. Actuator Arm.

£445



245 CASTLEGATE, MALTON, N. YORKSHIRE, Y017 OEA.

MAIL/TELEPHONE ORDERS. CHEQUE/PO £10 P&P
Tel (0653) 697989. 48 HR DESPATCH

Books for radio amateurs

NAVICO

AERIAL ACCESSORIES AND MASTS

ELLIOTT ELECTRONICS

for the Radio Enthusiast

MICROWAVE MODULES

APPOINTED DISTRIBUTOR

JAYBEAM AMATEUR ANTENNAS

INSTANT HP AVAILABLE

OSY OLD MAN TO

RIGS, ANTENNAS, SWR BRIDGES, POWER SUPPLIES, TEST GEAR, COMPONENTS, MORSE KEYS, COAXIAL CABLES, ROTATORS, MICS, PLUGS AND SOCKETS, SWITCHES

Call us on (0533) 553293
OR COME AND LOOK AROUND AT
26/28 Braunstone Gate, Leicester

LOSING DX?

ANTENNA TUNER to **BOOST RECEPTION** and reduce interference, 100KHz-30MHz in 6 overlapping ranges, **IDEAL** for R1000 etc (or 10W tx) with outside or **INDOOR ANTENNAS,** end-fed LONG WIRES or dipoles, don't lose any more **RARE DX, only £31.30,** also easily converted to wavemeter or field strength meter.

V.L.F.? EXPLORE 10-150KHz, **Receiver £28.20.**

Each fun-to-build kit (ready-made to order) includes all parts, case, prewound coils, instructions, pcbs are fibre glass, instructions, by-return postage etc. and list of other kits.

CAMBRIDGE KITS

45 (PU) Old School Lane, Milton, Cambridge.

SWAP SPOT

Got a camera, want a receiver? Got a v.h.f. rig, want some h.f. gear to go with your new G-zero? In fact, have you got anything to trade radio-wise?

If so, why not advertise it FREE here. Send details, including what equipment you're looking for, to "SWAP SPOT", *Practical Wireless*, Enefco House, The Quay, Poole, Dorset BH15 1PP, for inclusion in the first available issue of the magazine.

A FEW SIMPLE RULES: Your ad. should follow the format of those appearing below, it must be typed or written in block letters; it must be not more than 40 words long including name and address/telephone number. Swaps only-no items for sale-and one of the items MUST be radio related. Adverts for ILLEGAL CB equipment will not be accepted.

The appropriate licence must be held by anyone installing or operating a radio transmitter.

Have Kenpro rotator plus 20m of 6-core cable, 32m Heliax with gold-plated N-type connectors, heavy duty 12V relay and heavy duty antenna switch. Cost £275. Would exchange for good quality receiver, Eddystone 940C, 888, EA12 or Racal RA17L, etc. E. Parks. 1 Silkstone View, Platts Common, Barnsley, South Yorkshire. *F615*

Have 29MHz f.m. rig, SMC Oscar 10 with repeater shift, mic and manual. Would exchange for any general coverage receiver, valved or solid-state or w.h.y? Frank. Tel: 041-954 0843. *F616*

Have Casio CZ-1000 MIDI synthesiser plus p.s.u. and RAM cartridge, boxed with manual, worth £250. Would exchange for FT290R or C58, etc., multi-mode 144MHz transceiver or w.h.y? Robert. Tel: Rhyl 0745 38197 *F626*

MM4001 RTTY transceiver, Kenwood T-599 s.s.b./c.w./a.m. TX, double-beam 35MHz Cossor 'scope, Data Precision 5740 counter. Would exchange for 1.3GHz, 50MHz transceiver, DX TV multi-standard set, Meteosat or new commercial satellite system. Tel: 0977 792817. *F682*

Have RCA AR88LF a bit tatty but complete and working plus some vintage Leica accessories and splendid old Gandolfi wooden studio tripod. Would exchange for Hallicrafters S27 or National HRO receiver and fittings. G3DUN. Smallfield, Surrey. Tel: 0242 843204. *F689*

Have Harvard 40-channel f.m. CB. Would exchange for working p.m.r. transceiver tuned to 144MHz. Jason G7BSK. Tel: 0427 2006 after 4.30pm. *F690*

Have Icom 720A all-band, all-mode transceiver with matching p.s.u. and speaker, both boxed in v.g.c. Would exchange for good condition Ford Transit 12 seater mini-bus, (new baby due soon). Ian. Tel: 0692 82075 daytime. *F692*

Have wavemeter, Admiralty type 15kHz-24MHz with circuit, needs NR51 triode or similar. Would exchange for *Harmsworth Wireless Encyclopedia*. Mann. Tel: Cambridge 860150. *F698*

Have Uniden Bearcat scanner BC-55XLT 29MHz-510MHz with gaps. Would exchange for Hallicrafters SX27 receiver 27MHz to 143MHz, cash adjustment. Tel: Cambs 241088. *F699*

Have Yaesu FRG-9600 Mk5 h.f./u.h.f. scanning receiver plus PA 4C p.s.u., also Amstrad PCW8512 computer system with twin disk drives, green screen monitor, 512K of memory, printer and 23 diskettes including programs. Would exchange for Icom ICR-7000 Scanning receiver. S. Clifton G4WBT. Tel: 0604 414498. *F753*

Have R1392, R220, R1355, crystal calibrator type 10, wavemeter type-D RX for A.1. MkVIII, AA predictor, oscilloscope type 11 and h.f. marine RX. Would exchange for WWII equipment. J. Roper. Vicarage Street, North Walsham, Norfolk NR28 9DQ. *F761*

Have Microflex T.L.R. camera, Hanimex slide projector, Rollei 6 x 7 enlarger, (no lens) takes 39mm Leica thread. Would exchange for decent scanner 25MHz upwards. K. Priestley. 15 William Street, Wath on Dearne, Rotherham, South Yorks. Tel: 0709 872810. *F790*

Have National HRO, with coils, and R1155 receivers. Would exchange for DST100, class D wavemeter or BC221, etc. Tel: 0508 20657. *F815*

Have Grundig Satellit 650. Would exchange for good domestic receiver with digital frequency readout, pre-sets, l.w./m.w./f.m. stereo through speaker, short wave bands would be a bonus. Will send by Securicor. RSGB 43503. Tel: 0472 358896. *F820*

Have Bruel and Kjaer 2301 level recorder plus Philips GM6020 microvoltmeter. Would exchange for w.h.y? Tel: 01-950 1428, 7-10pm. *F858*

Have Pye 4-valve suitcase radio circa 1954 with chrome interior in v.g.c. Also tuning capacitor assembly for National HRO receiver also in v.g.c. Would exchange for Codar CR-70A receiver, not working considered but must be complete. Borthwick, 49 Bleachfield Road, Selkirk, Selkirkshire TD7 5HR. *F879*

Have Commodore 64 computer with cassette and joysticks plus some software. Would exchange for h.f. or v.h.f. receiver. Tel: Brighton 0273 26945. *F881*

Have Apricot F1 PC with MS DOS, built-in disk drive and VDU, plus lots of software, Wordstar, GW Basic, DB2, Cobol, Turbo Pascal, etc. Would exchange for 125cc motor bike or an R2000 RX. Phill. Tel: 0978 352086. *F914*

Have good quality, British made, 40-channel f.m. CB in nearly new condition. Would exchange for working solid-state low-band f.m. p.m.r. suitable for 70MHz, or old but working general coverage RX, Lafayette, Heathkit, Realistic, Trio or similar, valved or transistor. Richard G6AKG. Tel: 0202 678558 office hours. *FH02*

Have Eddystone 750 double superhet general coverage receiver. Would exchange for Eddystone 888A amateur bands only receiver or KW707. G3NSW QTHR. (Callers only, no post). *F918*

Have 1930's loudspeaker, 18 inches in diameter, balanced armature type made in USA, has surprisingly good bass response. Would exchange for *Harmsworth Wireless Encyclopedia*. Mann. Tel: 0223 860150. *F943*

Have National Panasonic DR-28 and Realistic DX-302, total value about £350. Would exchange for good scanning receiver. Mr G Stokes, Flat 2A, Butler House, Chelsea Barracks, London SW1. *F985*

Have Mitsubishi stereo stack system, has great sound, includes tuner, amplifier, cassette and record decks all in one unit. Worth around £500. Would exchange for multimode TNC or good h.f. RX FRG-7700, etc. Phill. Tel: 0978 352086. *G005*

Have plenty of items to swop. Would exchange for *Practical Wireless* cassettes numbers 1 and 5. J. Brown, 45 Marlborough Avenue, Falmouth, Cornwall TR11 4HS. *G012*

Have Burgoyne late 1920's 1-V-2 "portable" receiver, built-in frame antenna and balanced armature loudspeaker, working well. Would exchange for modern h.f. transceiver. Mann. Tel: 0223 860150. *G155*

Have Casio 230S MIDI compatible music synthesiser. Would exchange for Yaesu FRG-7 receiver or w.h.y? Mr S. Smyth, "De Porres", 67 East Princes Street, Helensburgh G84 7DG. *G192.*

Have Gould Advance OS-4000 digital storage oscilloscope with Output Unit OS-4001 (digital and analogue output unit). Would exchange for amateur band transceiver or any ham gear. Don Ward. Tel: 0274 567570 evenings. *G205*

Have miniature ultrasonic thickness detector (type USK3), also 1934 1st edition of *The Book of Practical Radio* by J. Scott-Taggart. Would exchange for digital readout general coverage receiver (150kHz-30MHz). Tel: 0691 777868. *G281*

Have giant Solartron oscilloscope type C.D. 711S.Z (valved) condition unknown. Would exchange for w.h.y. of interest to short wave listener. Tel: 0258 72188 (Dorset). *G287*

Have SSTV/RTTY system to use with Spectrum computer. Built unit, interface and software, will TX and RX. Also have set of p.c.b.s, software and audio chip for above. Would exchange for computer bits. Mr J. Brown, 45 Marlborough Avenue, Falmouth, Cornwall TR11 4HS. *G294*

Have *Elektor* magazine English edition, No.1 Vol. 1, Dec. 74 through to No.34, Feb. 78 all bound, excellent condition. Would exchange for big straight Morse key or w.h.y? N.I. Briggs G3WGL. New QTH. Tel: Great Yarmouth 728267. *G302*

Have complete 934MHz station comprising Reftec Mk2, 7-element vertical antenna, masthead pre-amplifier and 10 metres of coaxial cable, plus mobile antenna. Would exchange for 144MHz or 432MHz hand-held transceiver. Tony. Tel: 0255 422843 (24 hours). *G303*

ERRORS & UPDATES

Front Panel Memory Bank Switching for the TS-940S. June 1989

Unfortunately, due to a printing error the price and constructional rating were left off the end of the article. The total cost of the project is £11.50 and the construction rating is ADVANCED.

VISA 0202 678558 0202 678558

PW BOOK SERVICE

The books listed have been selected as being of special interest to our readers. They are supplied from our editorial address direct to your door. Some titles are overseas in origin.

HOW TO ORDER

Add 75p per order postage (overseas readers add £1.50 for surface mail postage) and send a postal order, cheque or international money with your order (quoting book titles and quantities) to **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP.** Payment by Access, Mastercard, Eurocard or Visa also accepted on telephone orders to Poole (0202) 678558. Books are normally despatched by return of post but please allow 28 days for delivery.

* A recent addition to our Book Service. O/P = Out of print, O/S = Out of stock.

RADIO

AIR & METEO CODE MANUAL
10th Edition
Joerg Klingenfuss
Detailed descriptions of the World Meteorological Organisation Global Telecommunication System operating FAX and RTTY meteo stations, and its message format with decoding examples. Also detailed description of the Aeronautical Fixed Telecommunication Network amongst others. *289 pages* **£14.00**

BETTER RADIO/TV RECEPTION
A. Nallawalla, A. T. Cushen and B. D. Clark
An Australian book giving guidance and advice to listeners seeking reliable reception of distant radio stations, and to DX listening hobbyists. *134 pages.* **£9.95**

BETTER SHORTWAVE RECEPTION (USA)
W. S. Orr W6SAI and S. D. Cowan W2LX
Receivers, antennas, propagation, DX listening techniques for the short waves and v.h.f. *158 pages.* **£5.50**

PASSPORT TO WORLD BAND RADIO 1989
This book gives you the information to explore and enjoy the world of broadcast band listening. It includes features on different international radio stations, receiver reviews and advice as well as the hours and languages of broadcast stations by frequency. *398 pages.* **£12.95**

SCANNERS (updated)
Peter Rouse GU1DKD
A guide for users of scanning receivers, covering hardware, antennas, accessories, frequency allocations and operating prodedures. *177 pages.* **£7.95**

SCANNERS 2
Peter Rouse GU1DKD
The companion to Scanners, this provides even more information on the use of the v.h.f. and u.h.f. communications band and gives constructional details for accessories to improve the performance of scanning equipment. *216 pages.* **£9.95**

SHORT WAVE RADIO LISTENERS' HANDBOOK
Arthur Miller
In easy-to-read and non-technical language, the author guides the reader through the mysteries of amateur, broadcast and CB transmissions. *207 pages.* **£6.99**

RADIOTELETYPE CODE MANUAL
10th Edition
Joerg Klingenfuss
This book gives detailed descriptions of the characteristics of telegraph transmission on short waves, with all commercial modulation types including voice frequency telegraphy and comphrehensive information on all RTTY systems and c.w. alphabets. *96 pages.* **£8.00**

THE SATELLITE EXPERIMENTER'S HANDBOOK (USA)
A guide to understanding and using amateur radio, weather and TV broadcast satellites. *207 pages.* **£9.25**

1934 OFFICIAL SHORT WAVE RADIO MANUAL
Edited by Hugo Gernsback
A fascinating reprint from a bygone age with a directory of all 1934 s.w. receivers, servicing information, constructional projects, circuits and ideas on building vintage sets with modern parts. *260 pages.* **£9.00**

BEGINNERS

AN INTRODUCTION TO RADIO DXING (BP91)
R. A. Penfold
How to find a particular station, country or type of broadcast and to receive it as clearly as possible.
112 pages. **£1.95**

BEGINNER'S GUIDE TO RADIO
9th Edition
Gordon J. King
Radio signals, transmitters, receivers, antennas, components, valves and semiconductors, CB and amateur radio are all dealt with here. *266 pages.* **£6.95**

ELECTRONICS SIMPLIFIED - CRYSTAL SET CONSTRUCTION (BP92)
F. A. Wilson
Especially written for those who wish to take part in basic radio building. All the sets in the book are old designs updated with modern components. *72 pages.* **£1.75**

QUESTIONS & ANSWERS RADIO
Eugene Trundle
Basics of electrical theory, radio and semiconductors, receivers, amateur and CB radio, and test equipment.
110 pages. **£3.95**

THE SIMPLE ELECTRONICS CIRCUIT AND COMPONENTS Book One (BP62)
The aim of this book is to provide an in-expensive but comprehensive introduction to modern electronics.
209 pages. **£3.50**

TELEVISION

AN INTRODUCTION TO SATELLITE TELEVISION (BP195)
F. A. Wilson
Answers all kinds of questions about satellite television. For the beginner thinking about hiring or purchasing a satellite TV system there are details to help you along. For the engineer there are technical details including calculations, formulae and tables. *104 pages.* **£5.95**

A TV-DXERS HANDBOOK (BP176)
R. Bunney
Information on transmission standards, propagation, receivers including multi-standard, colour, satellites, antennas, photography, station identification, interference etc. Revised and updated 1986. *87 pages.* **£5.95**

THEORY

COMMUNICATION (BP89)
Elements of Electronics Book 5
F. A. Wilson
Fundamentals of line, microwave, submarine, satellite, digital multiplex, radio and telegraphy systems are covered, without the more complicated theory or mathematics. *256 pages.* **£2.95**

LEVEL II RADIO & ELECTRONICS THEORY
Ian Ridpath ZL1BCG
A sequel to Amateur Radio & Electronics Study Course, covers advanced theory to a level for most technician courses. The handwritten format aims to make the student feel these are his own notes. *169 pages.* **£6.70**

PRACTICAL ELECTRONICS CALCULATIONS AND FORMULAE (BP53)
F. A. Wilson
This has been written as a workshop manual for the electronics enthusiast. There is a strong practical bias and higher mathematics have been avoided where possible. *249 pages.* **£3.95**

SOLID STATE DESIGN FOR THE RADIO AMATEUR
Wes Hayward W7ZOI and Doug DeMaw W1FB
Back in print by popular demand! A revised and corrected edition of this useful reference book covering all aspects of solid-state design. *256 pages* **£10.95**

LISTENING GUIDES

AIR BAND RADIO HANDBOOK
David J. Smith
Listen to conversations between aircraft and ground control. The author, an air traffic controller, explains more about this listening hobby. *174 pages.* **£5.99**

AIR TRAFFIC CONTROL
David Adair
A guide to air traffic control with maps, drawings and photographs explaining how aircraft are guided through crowded airspace. *176 pages.* **£6.99**

DIAL SEARCH
5th Edition 1988/89
George Wilcox
The listener's check list and guide to European broadcasting. Covers m.w., l.w., v.h.f. and s.w., including two special maps. *46 pages.* **£3.25**

GUIDE TO BROADCASTING STATIONS
20th Edition 1989/90
Philip Darrington
Frequency and station data, receivers, antennas, Latin American DXing, reporting, computers in radio, etc.
240 pages. **£9.95**

GUIDE TO FORMER UTILITY TRANSMISSIONS
3rd Edition
Joerg Klingenfuss
Built on continuous monitoring of the radio spectrum from the sixties until the recent past. A useful summary of former activities of utility stations providing information in the classification and identification of radio signals.
126 pages. **£8.00**

GUIDE TO UTILITY STATIONS
7th Edition
Joerg Klingenfuss
This book covers the complete short wave range from 3 to 30MHz plus the adjacent frequency bands from 0 to 150kHz and from 1.6 to 3MHz. It includes details on all types of utility stations including FAX and RTTY. There are 15802 entries in the frequency list and 3123 in the alphabetical callsign list plus press services and meteorological stations. *494 pages.* **£19.00**

HF OCEANIC AIRBAND COMMUNICATIONS
3rd Edition
Bill Laver
Aircraft channels by frequency and band, main ground radio stations, European R/T networks, North Atlantic control frequencies. *29 pages.* **£3.50**

INTERNATIONAL RADIO STATIONS GUIDE (BP255)
Revised and updated in 1988, this book shows the site, country, frequency/wavelength and power of stations in Europe, the Near East and N. Africa, North and Latin America and the Caribbean, plus short wave stations worldwide. *128 pages.* **£4.95**

THE COMPLETE VHF/UHF FREQUENCY GUIDE
Updated 1988
This book gives details of frequencies from 26-2250MHz with no gaps and who uses what. Recently updated, there are chapters on equipment requirements as well as antennas, etc. *88 pages.* **£5.95**

THE INTERNATIONAL VHF FM GUIDE
7th Edition
Julian Baldwin G3UHK and Kris Partridge G8AUU
The latest edition of this useful book gives concise details of repeaters and beacons worldwide plus coverage maps and further information on UK repeaters. *70 pages.* **£2.85**

THE POCKET GUIDE TO RTTY AND FAX STATIONS
Bill Laver
A handy reference book listing RTTY and FAX stations, together with modes and other essential information. The listing is in ascending frequency order, from 1.6 to 27,1MHz. *46 pages* **£2.95**

SHORT WAVE LISTENERS CONFIDENTIAL FREQUENCY LIST
Bill Laver
Covering the services and transmission modes that can be heard on the bands between 1.635 and 29.7MHz.
£7.95

VHF/UHF AIRBAND FREQUENCY GUIDE (Updated)
A complete guide to the airband frequencies including how to receive the signals, the frequencies and services, VOLMET and much more about the interesting subject of airband radio. *74 pages.* **£5.95**

INTERFERENCE

INTERFERENCE HANDBOOK (USA)
William R. Nelson WA6FQG
How to locate and cure r.f.i. for radio amateurs, CBers and TV and stereo owners. *253 pages.* **£6.75**

RADIO FREQUENCY INTERFERENCE (USA)
What causes r.f.i? Are all r.f.i. problems difficult, expensive and time-consuming to cure? These questions and many more are answered in this book. *84 pages.* **£4.30**

TELEVISION INTERFERENCE MANUAL (RSGB)
B. Priestly
TV channels and systems, spurious-radiation TVI, strong-signal TVI, audio breakthrough, transmitter design.
78 pages. **£2.94**

AMATEUR RADIO

AMATEUR RADIO CALL BOOK (RSGB)
Winter 88/89 Edition
Now incorporates a 48-page section of useful information for amateur radio enthusiasts. *310 pages.* **£7.00**

AMATEUR RADIO LOGBOOK
Standard logbook for the transmitting amateur in horizontal A4 format. 25 lines per page. *96 pages.* **£2.30**

AMATEUR RADIO OPERATING MANUAL (RSGB)
A mine of information on just about every aspect of amateur operating. International callsign series holders, prefix lists, DXCC countries list, etc.
204 pages. **£6.16**

AMATEUR RADIO SATELLITES the first 25 years
Arthur C. Gee G2UK
This souvenir publication mainly a pictorial account of the pattern of developments which have occurred over the last 25 years. *34 pages.* **£2.25**

CARE AND FEEDING OF POWER GRID TUBES (USA)
This handbook analyses the operation of EIMAC power grid valves and provides design and application information to assist the user of these valves.
156 pages. **£6.75**

PASSPORT TO AMATEUR RADIO
Peprinted from *PW* 1981-1982
The famous series by GW3JGA, used by thousands of successful RAE candidates in their studies. Plus other useful articles for RAE students.
96 pages. **£1.50**

PRACTICAL IDEAS FOR RADIO AMATEURS
Ian Poole G3YWX
Offers a wealth of hints, tips and general practical advice for all transmitting amateurs and short wave listeners. *128 pages* **£5.95**

QUESTIONS & ANSWERS AMATEUR RADIO
F. C. Judd G2BCX
What is amateur radio? The Radio Amateurs' Exam and Licence. Technology, equipment, antennas, operating procedures and codes. *122 pages.* **£3.95**

RADIO AMATEUR'S GUIDE TO RADIO WAVE PROPAGATION
(HF Bands)
F. C. Judd G2BCX
The how and why of the mechanism and variations of propagation in the h.f. bands. *144 pages.* **£8.95**

RADIO AMATEUR'S MAP OF NORTH AMERICA (USA)
Shows radio amateur prefix boundaries, continental boundaries and zone boundaries. *760 x 636mm.* **£2.50**

RADIO AMATEUR'S PREFIX MAP OF THE WORLD (USA)
Showing prefixes and countries, plus listings by order of country and of prefix. *1014 x 711mm.* **£2.95**

RADIO AMATEUR'S WORLD ATLAS (USA)
Seventeen pages of maps, including the world-polar projection. Also includes the table of allocation of international callsign series. **£3.50**

THE 1989 ARRL HANDBOOK FOR THE RADIO AMATEUR
This is the 66th edition of this very useful hardback reference book. Updated throughout it has several new sections covering oscilloscopes, spectrum analysers, digital frequency synthesis, phase-noise measurement and new constructional projects.
1200 pages **£15.95**

***THE ARRL OPERATING MANUAL**
Another very useful book from the ARRL. Although writen for the American radio amateur, this book will also be of use and interest to the UK amateur.
684 pages **£12.95**

THE COMPLETE DX'ER
BobLocher W9KNI
Now back in print, this book covers equipment and operating techniques for the DX chaser, from beginner to advanced. *187 pages* **£7.95**

THE RAE MANUAL (RSGB)
G.L.Benbow G3HB
The latest edition of the standard aid to studying for the Radio Amateurs' Examination. Updated to cover the latest revisions to the syllabus.
132 pages **£5.00**

THE RADIO AMATEUR'S DX GUIDE (USA)
15th Edition
The guide contains information not easily obtained elsewhere and is intended as an aid and quick reference for all radio amateurs interested in DX.
38 pages. **£2.95**

THE RADIO AMATEUR'S QUESTIONS & ANSWER REFERENCE MANUAL
3rd Edition
R. E. G. Petri G8CCJ
This book has been compiled especially for students of the City and Guilds of London Institute RAE. It is structured with carefully selected multiple choice questions, to progress with any recognised course of instruction, although is is not intended as a text book.
258 pages. **£6.95**

VHF HANDBOOK FOR RADIO AMATEURS (USA)
H. S. Brier W9EGQ & W. I. Orr W6SAI
VHF/UHF propagation, including moonbounce and satellites, equipment and antennas.
335 pages. **£7.95.**

VHF/UHF MANUAL (RSGB)
G. R. Jessop G6JP
Theory and practice of amateur radio reception and transmission, between 30MHz and 24GHz.
520 pages. **£8.94**

DATA AND REFERENCE

DIGITAL IC EQUIVALENTS AND PIN CONNECTIONS (BP140)
A. Michaels
Equivalents and pin connections of a popular selection of European, American and Japanese digital i.c.s.
256 pages. **£5.95.**

INTERNATIONAL DIODE EQUIVALENTS GUIDE (BP108)
A. Michaels
Possible substitutes for a large selection of many different types of semiconductor diodes. *144 pages.* **£2.25.**

INTERNATIONAL TRANSISTOR EQUIVALENTS GUIDE (BP85)
A. Michaels
Possible substitutes for a popular selection of European, American and Japanese transistors. *320 pages.* **£3.50**

LINEAR IC EQUIVALENTS AND PIN CONNECTIONS (BP141)
A. Michaels
Equivalents and pin connections of a popular selection of European, American and Japenese linear i.c.s.
320 pages. **O/P**

NEWNES AUDIO & HI-FI ENGINEER'S POCKET BOOK
Vivian Capel
This is a concise collection of practical and relevant data for anyone working on sound systems. The topics covered include microphones, gramaphones, CDs to name a few.
190 pages. Hardback **£9.95**

NEWNES COMPUTER ENGINEER'S POCKET BOOK
This is an invaluable compendium of facts, figures, circuits and data and is indispensable to the designer, student, service engineer and all those interested in computer and microprocessor systems.
203 pages. Hardback **£8.95**

NEWNES ELECTRONICS POCKET BOOK
5th Edition
Presenting all aspects of electronics in a readable and largely non-mathematical form for both the enthusiast and the professional engineer.
315 pages. Hardback **£8.95**

NEWNES RADIO AMATEUR AND LISTENER'S POCKET BOOK
Steve Money G3FZX
This book is a collection of useful and intriguing data for the traditional and modern radio amateur as well as the short wave listener. Topics such as AMTOR, packet radio, SSTV, computer communications, airband and maritime communications are all covered.
160 pages. Hardback **£8.95**

NEWNES RADIO AND ELECTRONICS ENGINEER'S POCKET BOOK
17th Edition
Keith Brindley
Useful data covering math, abbreviations, codes, symbols, frequency bands/allocations, UK broadcasting stations, semi-conductors, components, etc.
201 pages. Hardback **£6.95**

NEWNES TELEVISION AND VIDEO ENGINEER'S POCKET BOOK
Eugene Trundle
This is a valuable reference source for practitioners in "entertainment" electronic equipment. It covers TV reception from v.h.f. to s.h.f. display tubes, colour camera technology, video recorder and video disc equipment, video text and hi-fi sound. *323 pages. Hardback* **£9.95**

POWER SELECTOR GUIDE (BP235)
J. C. J. Van de Ven
This guide has the information on all kinds of power devices in useful categories (other than the usual alpha numeric sort) such as voltage and power properties making selection of replacements easier.
160 pages. **£4.95**

RSGB RADIO DATA REFERENCE BOOK
G. R. Jessop G6JP
The 5th Edition of an essential book for the radio amateur's or experimenter's workbench.
244 pages. Hardback **£8.56**

TRANSISTOR SELECTOR GUIDE (BP234)
J. C. J. Van de Ven
This guide has the information on all kinds of transistors in useful categories (other than the usual alpha numeric sort) such as voltage and power properties making seletion of replacements easier. *192 pages.* **£4.95**

FAULT FINDING

ARE THE VOLTAGES CORRECT?
Reprinted from PW 1982-1983
How to use a multimeter to fault-find on electronic and radio equipment, from simple resistive dividers through circuits using diodes, transistors, i.c.s and valves.
44 pages. **£1.50**

GETTING THE MOST FROM YOUR MULTIMETER (BP239)
R. A. Penfold
This book is primarily aimed at beginners. It covers both analogue and digital multimeters and their respective limitations. All kinds of testing is explained too. No previous knowledge is required or assumed.
102 pages. **£2.95**

OSCILLOSCOPES, HOW TO USE THEM, HOW THEY WORK
Revised 2nd Edition
Ian Hickman
This book describes oscilloscopes ranging from basic to advanced models and the accessories to go with them.
133 pages. **£6.95**

PRACTICAL HANDBOOK OF VALVE RADIO REPAIR
Chas E. Miller
The definite work on repairing and restoring valved broadcast receivers dating from the 1930s to the 60s. Appendices giving intermediate frequencies, valve characteristic data and base connections.
230 pages. Hardback **£20.00**

SERVICING RADIO, HI-FI AND TV EQUIPMENT
Gordon J. King
A very practical book looking at semiconductor characteristics, d.c. and signal tests, fault-finding techniques for audio, video, r.f. and oscillator stages and their application to transistor radios and hi-fi.
205 pages. **£10.95**

TRANSISTOR RADIO FAULT FINDING CHART (BP70)
C. E. Miller
Used properly, should enable most common faults to be traced reasonably quickly. Selecting the appropriate fault description at the head of the chart, the reader is led through a sequence of suggested checks until the fault is cleared. *635 x 455mm (approx)* **£0.95**

PROJECT CONSTRUCTION

HOW TO DESIGN AND MAKE YOUR OWN P.C.B.s (BP121)
R. A. Penfold
Designing or copying printed circuit board designs from magazines, including photographic methods.
80 pages. **£2.50**

INTRODUCING QRP
Collected articles from PW 1983-1985
An introduction to low-power transmission, including constructional details of designs by Rev. George Dobbs G3RJV for transmitters and transceivers from Top Band to 14MHz, and test equipment by Tony Smith G4FAI.
64 pages. **£1.50**

MORE ADVANCED POWER SUPPLY PROJECTS (BP192)
R. A. Penfold
The practical and theoretical aspects of the circuits are covered in some detail. Topics include switched mode power supplies, precision regulators, dual tracking regulators and computer controlled power supplies, etc.
92 pages. **£2.95**

POWER SUPPLY PROJECTS (BP76)
R. A. Penfold
This book gives a number of power supply designs including simple unstabilised types, fixed voltage regulated types and variable voltage stabilised designs.
91 pages. **£2.50**

PRACTICAL POWER SUPPLIES
Collected articles from PW 1978-1985
Characteristics of batteries, transformers, rectifiers, fuses and heatsinks, plus designs for a variety of mainsdriven power supplies, including the PW "Marchwood" giving a fully stabilised and protected 12V 30A d.c.
48 pages. **£1.25**

PROJECTS IN AMATEUR RADIO AND SHORT WAVE LISTENING
F. G. Rayer G3OGR
Full constructional details are given for all projects including housing the units in a suitable case. All the projects are either on p.c.b. or matrix board.
90 pages. **O/P**

QRP NOTEBOOK
Doug DeMaw W1FB
This book deals with the building and operating of a successful QRP station. Lots of advice is given by the author who has spent years as an ardent QRPer. All the text is easy-to-read and the drawings large and clear.
77 pages. **£4.95**

AUDIO FREQUENCIES

AUDIO (BP111)
Elements of Electronics Book 6
F. A. Wilson
This book studies sound and hearing, and the operation of microphones, loudspeakers, amplifiers, oscillators and both disc and magnetic recording.
320 pages. **£3.50**

ANTENNAS (AERIALS)

AERIAL PROJECTS (BP105)
Practical designs including active, loop and ferrite aerials plus accessory units. *96 pages.* **£2.50**

ALL ABOUT CUBICAL QUAD ANTENNAS (USA)
W. I. Orr W6SAI & S. D. Cowan W2LX
Theory, design, construction, adjustment and operation of quads. Quads vs. Yagis. Gain figures.
109 pages. **£5.50**

ALL ABOUT VERTICAL ANTENNAS (USA)
W. I. Orr W6SAI & S. D. Cowan W2LX
Theory, design, construction, operation, the secrets of making vertical work.
191 pages. **£7.50**

AN INTRODUCTION TO ANTENNA THEORY (BP198)
H. C. Wright
This book deals with the basic concepts relevant to receiving and transmitting antennas. Lots of diagrams reduce the amount of mathematics involved.
86 pages. **£2.95**

BEAM ANTENNA HANDBOOK (USA)
W. I . Orr W6SAI & S. D. Cowan W2LX
Design, construction, adjustment and installation of h.f. beam antennas. *198 pages.* **£6.75**

HF ANTENNAS FOR ALL LOCATIONS (RSGB)
L. A. Moxon G6XN
Taking a new look at how h.f. antennas work, and putting theory into practice. *260 pages.* **£5.19**

•NOVICE ANTENNA NOTEBOOK
Doug DeMaw W1FB
Another book from the pen of W1FB, this time offering "new ideas for beginning hams". All the drawings are large and clear and each chapter ends with a glossary of terms. *130 pages* **£5.95**

OUT OF THIN AIR
Collected Antenna Articles from PW 1977-1980
Including such favourites as the ZL Special and '2BCX 16-element beams for 2m, and the famous "Slim Jim", designed by Fred Judd G2BCX. Also features systems for Top Band, medium wave/long wave loop designs and a v.h.f. direction finding loop. Plus items on propagation, accessories and antenna design. *80 pages.* **£1.80**

SIMPLE, LOW-COST WIRE ANTENNAS FOR RADIO AMATEURS (USA)
W. I. Orr W6SAI & S. D. Cowan W2LX
Efficient antennas for Top Band to 2m, including "invisible" antennas for difficult station locations.
191 pages. **£6.75**

THE ARRL ANTENNA BOOK (USA)
15th Edition
A station is only as effective as its antenna system. This book covers propagation, practical constructional details of almost every type of antenna, test equipment and formulas and programs for beam heading.calculations. **£14.95**

THE ARRL ANTENNA COMPENDIUM (USA)
Volume One
Fascinating and hitherto unpublished material. Among the topics discussed are quads and loops, log periodic arrays, beam and multi-band antennas, verticals and reduced size antennas. *175 pages.* **£9.25**

WIRES & WAVES
Collected Antenna Articles from PW 1980-1984
Antenna and propagation theory, including NBS Yagi design data. Practical designs for antennas from medium waves to microwaves, plus accessories such as a.t.u.s, s.w.r. and power meters and a noise bridge. Dealing with TVI. *160 pages.* **£3.00**

W1FB'S ANTENNA NOTEBOOK
Doug DeMaw W1FB
This book provides lots of designs, in simple and easy to read terms, for simple wire and tubing antennas. All drawings are large and clear making construction much easier. *124 pages.* **£5.95**

25 SIMPLE AMATEUR BAND AERIALS (BP125)
E. M. Noll
How to build 25 simple and inexpensive aerials, from a simple dipole through beam and triangle designs to a mini-rhombic. Dimensions for specific spot frequencies including the WARC bands. *80 pages.* **£1.95**

25 SIMPLE INDOOR AND WINDOW AERIALS (BP136)
E. M. Noll
Designs for people who live in flats or have no gardens, etc., giving surprisingly good results considering their limited dimensions.
64 pages. **£1.75**

25 SIMPLE SHORT WAVE BROADCAST BAND AERIALS (BP132)
E. M. Noll
Designs for 25 different aerials, from a simple dipole through helical designs to a multi-band umbrella.
80 pages. **£1.95**

25 SIMPLE TROPICAL AND MW BAND AERIALS (BP145)
E. M. Noll
Simple and inexpensive aerials for the broadcast bands from medium wave to 49m. *64 pages.* **£1.75**

THE RADIO AMATEUR ANTENNA HANDBOOK
William I. Orr W6SAI & Stuart. D. Cowan W2LX
Yagi, quad, quagi, l-p, vertical, horizontal and "sloper" antennas are all covered. Also towers, grounds and rotators. *190 pages.* **£6.75**

COMPUTING

AN INTRODUCTION TO COMPUTER COMMUNICATIONS (BP177)
R. A. Penfold
Details of various types of modem and their applications, plus how to interconnect computers, modems and the telephone system. Also networking systems and RTTY.
96 pages. **£2.95**

AN INTRODUCTION TO COMPUTER PERIPHERALS (BP170)
J. W. Penfold
Covers a wide range of computer peripherals such as monitors, printers, disk drives, cassette recorders, modems, etc., explaining what they are, how to use them and the various types of standards.
80 pages. **£2.50**

MICROPROCESSING SYSTEMS AND CIRCUITS (BP77)
Elements of Electronics Book 4
F. A. Wilson
A comprehensive guide to the elements of microprocessing systems, which are becoming ever more involved in radio systems and equipment.
256 pages. **£2.95**

MORSE

INTRODUCING MORSE
Collected Articles from PW 1982-1985
Ways of learning the Morse Code, followed by constructional details of a variety of keys including Iambic, Triambic, and an Electronic Bug with a 528-bit memory.
48 pages. **£1.25**

THE MORSE CODE FOR RADIO AMATEURS (RSGB)
Margaret Mills G3ACC
A guide to learning to send and receive Morse code signals up to the 12 w.p.m. required for the radio mateur aspiring to a Class A licence having passed the RAE.
19 pages. **£2.88**

THE SECRET OF LEARNING MORSE CODE
Mark Francis
Designed to make you proficient in Morse code in the shortest possible time, this book points out many of the pitfalls that beset the student. *87 pages.* **£4.95**

STOP PRESS

NEWNES SHORT WAVE LISTENING HAND BOOK
Joe Pritchard G1UQW
A technical guide for all short wave listeners. Covers construction and use of sets for the s.w.l. who wants to explore the bands up to 30MHz. *288pages.* **£12.95**

FLIGHT ROUTINGS 1989
T.T.Williams
Identifies the flights of airlines, schedule, charter, cargo and mail, to and from the UK and Eire and overflights between Europe and America. *104pages.* **£4.00**

50 (FET) FIELD EFFECT TRANSISTOR PROJECTS
F.G.Rayer
50 circuits for the s.w.l., radio amateur, experimenter or audio enthusiast using f.e.t.s. *104pages.* **£2.95**

FROM ATOMS TO AMPERES
F.A.Wilson
Explains in simple terms the absolute fundamentals behind electricity and electronics. *244pages.* **£3.50**

TEST EQUIPMENT CONSTRUCTION
R.A.Penfold
Describes, in detail, how to construct some simple and inexpensive, but extremely useful, pieces of test equipment. *104pages.* **£2.95**

HINTS AND KINKS FOR TRHE RADIO AMATEUR
Edited by Charles L. Hutchinson and David Newkirk
A collection of practical ideas gleaned from the pages of *QST* magazine. *152pages.* **£4.95**

The ARRL ELECTRONICS DATA BOOK
Doug DeMaw W1FB
Back by popular demand, completely revised and expanded, this is a handy reference book for the r.f. designer, technician, amateur and experimenter. *260pages.* **£8.95**

GUIDE TO WORLD-WIDE TELEVISION TEST CARDS
Edition 3
Keith Hamer & Garry Smith
Completely revised and expanded, this is a handy reference book for the DXTV enthusiast. Over 200 photographs of Test Cards, logos, etc., world wide.
60pages. **£4.95**

SUBSCRIPTIONS

Fill in the Order form below and post it to: PW Publishing Ltd., FREEPOST, Subscriptions Dept., Enefco House, The Quay, Poole, Dorset BH15 1PP (no stamp required). Credit Card Orders taken on (0202) 678558.
Overseas subscriptions outside Europe are now despatched by Accelerated Surface Post for faster delivery.
If you already have a subscription you can still take advantage of our offer, but you must quote your subscription number.

Please indicate the type of subscription required:

PRACTICAL WIRELESS 1 YEAR
❑ £15.50 (UK)
❑ £18.00 (Europe)
❑ £19.00 (Overseas)

PRACTICAL WIRELESS 3 YEAR
❑ £40.00 (UK)

SHORT WAVE MAGAZINE 1 YEAR
❑ £17.00 (UK)
❑ £19.00 (Overseas)

SPECIAL JOINT SUBSCRIPTION 1 YEAR ONLY
❑ £28.00 (UK)
❑ £32.00 (Overseas)

Prices current at MAY 1989
To commence with issue dated.....

To: PW Publishing Ltd., FREEPOST, Subscriptions Dept., Enefco House, The Quay, Poole, Dorset BH15 1PP

Name.....

Address.....

.....

.....

❑ I enclose cheque/PO (Payable to PW Publishing Ltd) £.....

❑ Charge to my Access/Visa Card the amount of £.....

Card No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Valid from ..... to .....

Signature.....

Reg Ward & Co. Ltd.

1 Western Parade, West Street, Axminster, Devon, EX13 5NY.
Telephone: Axminster (0297) 34918

Yaesu

FT767	HF Transceiver	1599.00	(—)
FEX767(2)	2m Module (767)	169.00	(3.00)
FEX767(70)	70cm Module (767)	215.00	(3.00)
FEX767(6)	6m Module (767)	169.00	(3.00)
SP767	Speaker	69.95	(2.50)
FT747GX	Budget HF Transceiver	659.00	(—)
FT757GX	MkII HF Transceiver	969.00	(—)
FP700	20A P.S.U.	219.00	(4.00)
FC700	Manual ATU	149.00	(3.00)
FP757HD	Heavy Duty 2m P.S.U.	258.75	(4.00)
FAS14R	Remote Aerial Switch	80.00	(3.00)
FT4700	New 2m/70cm Dual Band FM Mobile	675.00	(7.00)
FT290	MkII Super 290 2m Multimode 2.5W	429.00	(—)
FT690	MkII 6m M/Mode 2·5W	399.00	(2.00)
YHA15	2m Helical	7.50	(2.00)
YHA44D	70cm ½wave	12.50	(2.00)
YM49	Speaker Mike	23.00	(2.00)
MMB15	Mobile Bracket	14.55	(2.00)
FT411	New 2m H/H Keyboard	225.00	(3.00)
FT811	New 70cm H/H Keyboard	239.00	(3.00)
FT470	New 2m/70cm Dual Band H/H	389.00	(3.00)
FT23R	2m Mini H/H	209.00	(3.00)
FT73R	70cm Mini H/H	229.00	(3.00)
FNB9	Nicad Battery Pack (23/73)	34.50	(2.00)
FNB10	Nicad Battery Pack (23/73)	34.50	(2.00)
FNB11	Nicad Battery Pack (23/73)	67.85	(2.00)
NC.18C	Charger (23/73)	17.71	(2.00)
SMC28	Charger (23/73) 13A Plug	17.71	(2.00)
NC.28	Charger (23/73)	17.71	(2.00)
NC.29	Base Charger (23/73)	69.00	(3.00)
PA6	Car Adap/Charger (23/73)	24.15	(2.00)
MH12A2B	Speaker Mic	31.05	(2.00)
MH18A2B	Speaker Mic Miniature (23/73/727)	31.05	(2.00)
FNB3	Spare Battery Pack (FT209)	41.00	(2.00)
FNB4	Spare Battery Pack (FT709)	46.00	(2.00)
FNB5	Empty Cell Case (FT727)	10.00	(2.00)
FRG9600M	60-950MHz Scanning RX	509.00	(—)
PA4C	Power Supply for 9600	29.00	(2.00)
MMB10	Mobile Bracket	10.00	(2.00)
NC9C	Charger	11.50	(2.00)
PA3	Car Adaptor/Charger	21.85	(2.00)
YM24A	Speaker Mike	31.05	(2.00)
FRG8800	HF Receiver	649.00	(—)
FRV8800	Converter 118-175 for above	100.00	(2.50)
FRT7700	RX ATU	59.00	(2.50)
MH1B8	Hand 600 8pin mic	21.00	(2.00)
MD1B8	Desk 600 8pin mic	79.00	(2.00)
MF1A3B	Boom mobile mic	25.00	(2.00)
YH77	Lightweight phones	19.99	(2.00)
YH55	Padded phones	19.99	(2.00)
YH1	L/weight Mobile H/set-Boom mic	28.75	(2.00)
SB1	PTT Switch Box 208/708	22.00	(2.00)
SB2	PTT Switch Box 290/790	22.00	(2.00)
SB10	PTT Switch Box 270/2700	22.00	(2.00)
FT736 **NEW**	2/70cm 25W Base Stn	1,359.00	(—)
FT747GX	160-10 All mode TX Gen. Cov.	659.00	(—)
FT2311R	23cm FM Transceiver	475.00	(—)
FT211RH	2m 45W FM Mobile	309.00	(—)
FT212RH	New 2m 45W FM Mobile	349.00	(—)
FL2025	25W Linear	115.00	(3.00)
FL6020	6m 10W Linear	109.00	(3.00)
QTR24D	World Clock	39.00	(3.00)

— Antennas —

VLF	50-500MHz RX Discone	22.50	(3.00)
D120	26-1300MHz Discone	75.00	(3.00)
Jaybeam	TB3 MkIII 3e HF Tribander	348.45	(8.00)
Hygain	TH3JNR 3e HF Tribander	299.00	(8.00)
Creative	CD318 JR 4e HF Tribander	299.00	(8.00)
Creative	CD318 JR 4e HF Tribander	349.00	(8.00)
CA2X4KC	2/70cm Mobile	39.95	(3.00)
WX1	2m/70cm Base Fibre Glass	49.95	(4.00)
CA2X4Max	2m/70cm Base Fibre Glass	99.95	(4.00)

IC765 **NEW**	HF Transceiver	2499.00	(—)
IC751A	HF Transceiver	1465.00	(—)
IC735	New HF Transceiver	949.00	(—)
IC725	HF Base TRansceiver	759.00	(—)
AT100	100W ATU (751/745)	365.00	(3.50)
AT150	150W ATA (735)	315.00	(3.50)
PS55	Ext PSU (735)	185.00	(3.00)
IC505	50MHz multi-mode portable	499.00	(—)
IC290D	2m 25W M/Mode	542.00	(—)
IC228E	2m 25W FM Mobile	365.00	(—)
IC Micro	2E New Mini H/H	239.00	(3.00)
IC2GE	FM H/Held **NEW**	265.00	(3.00)
IC275E	New 2m 25W Base Stn	1039.00	(—)
IC4GE	70cm H/Held **NEW**	299.00	(3.00)
ICmicro4E	70cm H/Held	299.00	(3.00)
IC32E **NEW**	2m/70cm Dual Band H/Held	399.00	(3.00)
IC490	70cm 10W M/Mode	617.00	(—)
IC3210	2m/70cm FM Dual Band Mobile	499.00	(4.00)
IC12E	23cm H/H	428.00	(3.00)
ICR71	Gen Cov RX	825.00	(—)
IC7000	VHF/UHF Scanner	957.00	(—)
AH7000	25-1300MHz Discone	82.00	(3.00)
SP3	Ext Speaker	61.00	(2.50)
CK70	DC Cable (R70/R71)	7.00	(2.00)
EX257	FM Board (R70/R71)	41.00	(2.00)
GC5	World Clock	43.00	(2.50)
AQ2	Waterproof Bag all Icom H/H	14.38	(2.00)
BC35	Desk Charger	70.15	(2.50)
BP3	Battery Pack 8.4V (2/4E/02/04E)	29.90	(2.00)
BP4	Empty Battery Case (2/4E/02/04E)	9.20	(2.00)
BP5	Battery Pack 10.8V	60.95	(2.50)
BP7	Battery Pack 13.2V (02/04E only)	74.75	(2.50)
BP8	Battery Pack 8.4V	71.30	(2.50)
CP1	12V Charge Lead BP3/7/8	6.90	(2.00)
DC1	DC/DC converter operate from 12V	17.25	(2.00)
HM46	**NEW** Mini speaker mic	24.15	(2.00)
HM9	Speaker/Mic	21.85	(2.50)
HS51	Headset inc PTT/Vox unit	41.25	(2.00)
LC24	Micro + BP21	7.50	(2.00)
LC24	Micro + BP22/23	7.50	(2.00)
LC41	IC32 + BP3	9.20	(2.00)
LC42	IC32 + BP5	9.20	(2.00)
SS1	Shoulder Strap	10.35	(2.00)
SM6	600ohm 8P Base Mic	46.00	(2.50)
SM8	1.3kµ/600µ 8P Base Mic	82.00	(2.50)
SM10	Comp/Graphic Mike	116.00	(3.00)

— CW Keyers —

HI-MOUND			
HK702	Straight key (adjustable tension)	42.49	(2.00)
HK703	Straight key (adjustable tension)	38.45	(2.00)
HK704	Straight key (adjustable tension)	26.35	(2.00)
HK705	Straight key (adjustable tension)	22.49	(2.00)
HK706	Straight key (adjustable tension)	21.80	(2.00)
HK707	Straight key (adjustable tension)	20.15	(2.00)
HK802	Straight key (Deluxe-Brass)	109.00	(3.50)
HK803	Straight key (Brass)	104.50	(3.50)
MK703	Squeeze key	34.50	(2.00)
MK704	Squeeze key	30.00	(2.00)
MK705	Squeeze key	32.78	(2.00)
MK706	Squeeze key	30.48	(2.00)
STARMASTER			
Dewsbury	Electronic Keyer Unit (No Paddle)	54.70	(3.00)
Dewsbury	Electronic Memory Keyer (No Paddle)	95.00	(3.00)

— Rotators —

G250	Light Duty	78.00	(4.00)
AR200XL	Light Duty	38.50	(4.00)
G400	Medium Duty	139.00	(4.00)
G400RC	Medium Duty (Round Face)	169.00	(5.00)
G600RC	Medium/Heavy Duty	219.00	(5.00)
G200RC	Heavy Duty	445.00	(5.00)
G500	Elevating Rotator	149.00	(5.00)
GR5400	Azimuth/Elevating	279.00	(5.00)

KENWOOD

TS940S	9 Band TX General Cov RX	1995.00	(—)
AT940	Auto/ATU	244.88	(3.00)
SP940	Ext Speaker	87.55	(3.00)
TS140	HF 9 Band Gen. Cov. TX/RX	862.00	(—)
TS6805	HF/6m TX Gen. Cov. RX	985.00	(—)
TS440	9 Band TX General Cov RX	1138.81	(—)
AT440	Auto/ATU	144.82	(3.00)
PS50	H/Duty PSU	222.49	(3.00)
AT230	All Band ATU/Power Meter	208.67	(3.00)
SP230	External Speaker Unit	66.49	(3.00)
PS430	Matching Power Supply	173.78	(3.50)
SP430	Matching Speaker	40.81	(3.00)
SM220	Station Monitor	343.62	(3.50)
BS8	Band Scope Unit (830/940)	77.00	(2.50)
TL922	10/160 2kW Linear	1495.00	(7.00)
TH25	**NEW** 2m H/Held	238.00	(3.00)
TH45	**NEW** 70cm H/Held	269.00	(3.00)
TH205	2M H/H	215.26	(3.00)
TH215	2M H/H Keyboard	252.13	(3.00)
TR751	2M 25W M/M Mobile	599.00	(—)
TS790	VHF/UHF Transceiver	1495.00	(—)
R2000	Gen Coverage HF/RX	599.00	(—)
VC10	118-174MHz Converter (R2000)	161.94	(2.50)
R5000	General Coverage HF/RX	875.00	(—)
TM701	**NEW** 2m/70cm FM Mobile	469.00	(5.00)
TM721	2m/70cm FM Mobile	675.00	(5.00)
TM231E	**NEW** 2m FM Mobile 50/10/5W	289.00	(5.00)
TM431E	**NEW** 70cm FM Mobile 35/10/5W	318.00	(5.00)
SMC30	Speaker/Mic TH21/4/2600	28.31	(2.00)
MC50	4P Desk Mic	46.08	(3.00)
MC60A	8P Desk Mic	88.22	(3.00)
MC80	Electric Desk Mic	53.98	(3.00)
MC85	Desk Mic Audio Level Comp	99.00	(3.00)
MC43	8P Fist Mic	22.22	(2.00)
MC35	4P Fist Mic	21.72	(2.00)
MC55	Mobile Mic (6p.o. 8p)	52.67	(3.00)
LF30	HF Low Pass Filter	32.26	(2.50)
HS6	Lightweight H/phones	24.36	(2.50)
HS5	Deluxe H/phones	37.54	(2.50)
TW4100	2/70cm FM Dual band model **SPECIAL**	499.00	(5.00)
RZI	500Hz-950MHz AM/FM Scanner	465.00	(6.00)
VC20	118-174MHz Converter (R5000)	167.21	(2.50)

— SWR/PWR Meters —

HANSEN			
W720S	130/440MHz 20/200W	52.75	(2.50)
JD110	1.5-150MHz	12.50	(2.00)
YMIX	3.5-150MHz	31.50	(3.00)
Yaesu Y560	1.6-60MHz	93.15	(3.00)
Yaesu YS500	140-525MHz	81.65	(3.00)
Hanson FS500H	1.5-30MHz	53.40	(3.00)

— Miscellaneous —

SMCS 2U	2 Way SO239 Switch	18.95	(2.50)
SMCS 2N	2 way 'n' Skts Switch	23.50	(2.50)
Kenpro KP21N	2 way Switch 'n' Socket Deluxe	27.00	(2.50)
T30	30W Dummy Load	10.29	(2.50)
T100	100W Dummy load	45.00	(3.00)
T200	200W Dummy load	65.00	(3.00)
WAI	Wavemeter 120-450MHz	24.95	(2.00)
PK232	Packet/RTTY Terminal	269.95	(3.00)
Datong D70	Morse Tutor	56.35	(3.00)
Datong FL2	Audio Filter	89.70	(3.00)
Datong FL3	Audio Filter/Autonotch	129.37	(3.00)
Datong ASP	Processor 4pin	82.90	(3.00)
Datong ASP	Processor 8pin	89.70	(3.00)
Datong AD370	Active Antenna	69.00	(3.00)
Datong PCI	General Coverage Converter	137.40	(3.00)

VISA — Instant credit available. Mail/Telephone order by cheque or credit card. Cheques cleared before goods despatched. (E&OE)

OPEN TUES.-SAT. 9.00-5.30 (CLOSED MONDAYS)

STOCK ITEMS USUALLY DESPATCHED WITHIN 48 HRS.

DELIVERY/INSURANCE PRICES IN BRACKETS

ANTENNAS TONNA (F9FT)

THE VHF/UHF ANTENNA SPECIALIST

50MHz
5 element ..... £50.71(a)

144MHz
4 element ..... £29.39(a)
4 element crossed ..... £37.26(a)
9 element fixed ..... £33.12(a)
9 element portable ..... £35.19(a)
9 element crossed ..... £62.10(a)
13 element ..... £49.06(a)
17 element ..... £66.24(a)

435MHz
9 element ..... £30.43(a)
19 element ..... £36.64(a)
19 element crossed ..... £42.44(a)
21 element 432MHz ..... £47.61(a)
21 element ATV ..... £47.61(a)

144/435MHz
9 & 19 element Oscar ..... £61.07(a)

1250MHz
23 element ..... £61.07(b)
4 × 23ele – stacking frame – power splitter ..... £175.00(a)

1296MHz
23 element ..... £32.29(b)
4 × 23 ele – stacking frame – power splitter ..... £175.00(a)
55 element ..... £49.27(a)
4 × 55 ele – stacking frame – power splitter ..... £250.00(a)

2300MHz
25 element ..... £43.47(b)

POWER SPLITTERS
2 way 144MHz ..... £48.36(b)
4 way 144MHz ..... £57.53(b)
2 way 435MHz ..... £45.69(c)
4 way 435MHz ..... £55.76(c)
2 way 1250MHz ..... £38.35(c)
4 way 1250MHz ..... £43.36(c)
2 way 1296MHz ..... £38.35(c)
4 way 1296MHz ..... £43.36(c)
2 way 2300MHz ..... £38.35(c)
4 way 2300MHz ..... £43.36(c)

ANDREW HELIAX
LDF4-50A £4.70/m
'N' Connectors ..... £16.80(c)

TELESCOPIC MASTS – STACKING FRAMES – COAXIAL CABLE – ROTATORS ETC.

All prices include VAT. Please add carriage (a) £5.00 (b) £2.20 (c) £1.20. U.K. MAINLAND ONLY. ACCESS or VISA cardholders telephone your order for immediate dispatch. Callers welcome, but by telephone appointment only, please. Send 50p for our catalogue which contains the full specifications.

SOLE U.K. DISTRIBUTOR **RANDAM ELECTRONICS (P)**
FREEPOST, ABINDON, OXON, OX14 1BR.
Tel: (0235) 23080 (24hrs)

HAMGEAR ELECTRONICS

Introducing our VFO, covering 3 switched bands: 3.5/3580, 7.0/7050, 10.1/10150, designed especially with CW in mind and ideal for inclusion in that new TX/RX project. Ready made in a die cast box, overall sizes 4½" × 3¼" × 1¼". The design includes - three buffer stages, two stabilisers, four D.C. filters, offset, RIT plus a degree of temperature compensation. Output is sinewave and sufficient to drive three untuned transistors to 1.5/2W. Also our new QRP Wattmeter, a non-radiating 50 ohm load with five switched ranges from point one MW to 10 W. Also has a field strength position; an oscilloscope can also be connected. Covering HF to VHF. The PMX Preselector, an ATU and preamp combined covering HF, specially for the SWL and now in its 26th year.

VFO **£37.00**
Wattmeter **£36.00**
PMX unpowered **£69.00**
PMX mains powered **£78.00**

Prices include postage which is by first class mail (same day return)
Leaflets available on all products

125 Wroxham Road, Sprowston, Norwich NR7 8AD
Tel: Norwich (0603) 405611

ARROW ELECTRONICS LTD

HEAD OFFICE 5 The Street, Hatfield Peverel
(Nr Chelmsford) Essex
Tel: 0245 381626
0245 381673
0836 739577
FAX: Call
Hours: 9-5 Mon-Sat. Closed Thursday

GLASGOW SHOWROOMS
Ask for Jim GM0AAJ
Unit 17, Six Harmony Row,
Govan, Glasgow G51 3BA
Tel: 041 445 3060
8.30-5.30 Mon-Fri. Late night Thurs 7pm

New "AIRSHOP"

at ARROW, Glasgow and Chelmsford
– Terrific range of Scanners & Airband Radios with Books, Maps, Models, Civil Aviation Authority Publications.
Send S.A.E. for new Price List

THE BEST DEAL IN AMATEUR RADIO
ALL MAJOR BRANDS AT DISCOUNT PRICES
AVAILABLE NATIONWIDE — CALL ANY NUMBER FOR FAST EFFICIENT SERVICE
(Arrow are AUTHORISED dealers for Kenwood, Icom, Yaesu and all we sell)

NORTH WALES	WIGAN	LEICESTER
John Lewis, Tel: Anglesey 0248 714657	Jim Cook Tel: 0942 214969	Dave Foster Tel: 0533 608189 Latest calls: 8.30pm please!

LATEST CALLS 8.30pm PLEASE

"COMPUTARIG" SERVICE TAKES OFF!!

We've been inundated with sellers/buyers of USED equipment taking advantage of our 10% commission on sale & picking up the bargains
– Why don't you send SAE for lists?
ARROW will also buy your unwanted gear.

ACCESS — VISA CREDIT SALES (HP) — PROMPT MAIL ORDER

On The Air
On The HF Bands

PLEASE NOTE
CORRECTED
POSTCODE
SY16 1RA

Reports to Paul Essery GW3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

Conditions

Not bad at all, by and large. Of course at this stage in the sunspot cycle the number of active spots is always enough to give good DX, given only that the negative factors indicated by the A and K indices are not bad. If you listen to WWV at 18 minutes past the hour for the solar report, you are looking for an A figure of twenty or lower, K of four or smaller. It might be an interesting exercise for someone to correlate the sunspot count, A and K figures with observed DX activity on each band for an interesting scientific study.

DX Activity

At the time of writing, I don't have any firm news on Jim's Chesterfield Reef proposal, save that the calls will be FK89DX and FK89CW; more details will be forthcoming when the landing permission has been received from the FK authorities.

Kirsti VK9NL and Leila WA4ZEL will be signing /JW from Svalbard, beginning on June 3 and for several weeks.

A three-month swing around the Pacific by VK2BCH, Bing Crosby, starts as ZK1XV, South Cooks; from there he hopes to do Samoa 5W, American Samoa KH8, Tokelau ZK3, and maybe Rotuma 3D2. Details not yet to hand.

If you are looking for a Seychelles S79 contact, S79MST will be at Mahe for the next 18 months; look, out for him at 28.5 and 14.215MHz.

Silent Keys

Herb Becker W6QD who has recently died, was elected to the DX Hall of Fame for his pioneering activities; back in the thirties and forties he wrote the first DX column, beginning in 1935. In addition, Herb was the the original definer of a "country" for DXCC purposes, and the WAZ idea, dividing the world into 40 Zones, some of which even now, fifty years later are still incredibly difficult to raise. Were all that not enough, Herb thought up the CQ WW format as a shorter alternative to the ARRL DX Tests which in those days ran an incredible nine days for each leg!

Another prominent amateur in DX circles has passed away; Jostino Ramiro Santod CT1UA, at the early age of 47, from complications after major surgery.

Top Band

Naturally enough, with the rising sunspot level, one expects to find Top Band activity and reports are down.

I hear that TZ6VV is back home in Bamako on July 28 after his vacation in the States, for a further four year tour. Larry now has a permit for the band 1.810-1.850MHz, and promises an improved antenna system. QSLs go as before to N0BLD.

G3HZL says he didn't expect too much from Top Band, but did connect with LA2UA, OY3QN, OY7ML, and PA3CWG, all on c.w.

G2HKU (Sheppey) mentions having s.s.b. contact with ON7BW, while c.w. accounted for RQ2GFP and UQ2GQU.

The 3.5MHz Band

G0HGA (Stevenage) has rig problems again, alas, which has put her on to v.h.f. only for a while. However, on 3.5MHz (80m) QRP c.w., Angela managed F6ENO, DL6ZBA, G3JTG, G4RMV, G2BB and G3UDI.

A new reporter this time is **Glenn G0LCQ**. He uses a QRP rig - an HW9 - built from the kit. As for an antenna, Glenn has some 5.6 metres of wire out of the bedroom window, end-fed, and at height 3.8 metres at the home end, and 1.8 metres at the far end, where a convenient silver birch tree serves the office of a mast. No insulators are used, though the wire is itself insulated; but Glenn hasn't yet rumbled the thought that the nylon monofilament line used by fishermen can be regarded as an elongated piece of insulator for our purposes. So far three continents and 20 countries have been worked in the first month of activity; on 3.5MHz F9LX, PA0CMP and SM7KWE were booked in.

Turning from a complete newcomer to a real old-timer with 300 countries confirmed, we find that G3HZL raised DF0FX/CT3, EA8AB, K4TX and W9AND all on the key for his contribution.

The 7MHz Band

There is good DX to be found and worked on this band if only you can hear it.

G3GDL (Stoke-on-Trent) - welcome, Arthur - uses 50 watts of c.w., and this netted him contacts with W2FXM, K1ZZI, W1RPW, DL7APE, DL9ZBP, OK3CNS, OK3KSQ, F6BWF, YU3ABC, EC6NW, F6BHP, UA1HM, UZ6AWP, UQ1GWW, UA9WBA, YU4AVW, IK2DHR, IS0LKX, CM6TL, 4Z4DX and 4N0R.

Now to G3HZL, who keyed with DF0FX/CT3, CM8TB, CO2VG, CO5HL, C56/G3TXF, K0GVB/C6A, EA8AB, EA8BTO, EA8BDX, J80A, K4LTA/J8, WE5P/J8, KL7Y, NL7J, PU1AAS, PY2UFO, PY7GQ, PY1IRL, TE5T, UA9FAL, UA9XHT, UA9FAN, UA9FGJ, UA9CDC, UA9DC, UA9ADG, UW9CP, UW9CKU, UV9DZ, RV9WZ, UI9ACP, UJ8JW, UL7JW, UL7PHT, RL7AB, VE2MRM, VE2GFE, VE7CC, VK2AYD, VP2VI, VP2V/DF2PI, NU1W, KU2D, W4NPX, W7EJ. W7RK, NQ8O, W7WA, K0YR, KO0U, ZL2JK, ZL3GQ, ZL4HB, ZD8JP, WD8A, UB/6Y5 and 6Y5HN.

Turning to G2HKU, Ted offers his c.w. contacts with W1WA and V29OA.

QRP operation by G0LCQ gave him contacts with EA1MV, EI8FH, F5WB and various G stations.

Let us now take a look at the list from G0HGA; she has UV3HD, IN3NB, OK1OFM, IN4BGM, LA9HFA, HB9RV, YT3GP, lots of two-way QRP inter-G contacts and the usual crop of DL/ON/PA/Y stuff, all with maximum input at ten watts.

WARC Bands

Funny how the reports on these bands taken month by month seem to vary from almost none to lots!

This time our first reporter is G3GDL (Stoke-on-Trent) who stuck to 10MHz for K3CJ W3LQD, K3ZQI, KV2E, W2HXG, NB3Q, K5KV, N1CES, KV8H, W4JEV, W5TZC, W8EGB, W2DG, N8IYV, N4JQP, HB9BCF, HB9BX, HB9DIJ, HB9LO, HB9ACP, HB9IIF, PA3DNZ, PA0GMZ, HA8QF, F6BAZ, FE1JBM, DF4ZU, LX1BK/A, OH6NIO, OZ1A, LA0EP, VE3CES, SV0AA/5, ZL4HB, VK5FE and VK7RY.

All three WARC bands were used by G3HZL; Don mentions on 10MHz EA8AB, TF3SZ, VK3AUC, NU1W, WA2MYL, ZL4AHB - the latter a daily sked at 0545 plus other RNARS stations. Turning to 18MHz, G3HZL notes EA8AB, HB9LO, I1UST, I4YTE, OY3QN, SM7BDB, SP5YQ, VK4XA, VP5/W4NPX, ZL1AH and ZL4HB, while 24MHz yielded EA8AB, ZL2ANT and ZL4HB.

On to G2HKU, who offers 10MHz with VQ9QM for a new one (this was W4QM on holiday); on 18MHz KJ4GK, AB4CA, KB5AA, W1PXA, W6OV, LU3HAN; and on 24MHz EA8BTO and K4II.

The QRP of G0LCQ managed on 10MHz, DL1KBO, PA3AFF, F9KP, DL9FC, F6GUR, and Gs, while 18MHz yielded DJ4AZ, SM2PDW, WA1EVJ, W3FM, leaving W4ABI to be netted on 24MHz.

The 14MHz Band

This one is not only where most of the world's DX business is transacted, but to a large extent it is the home of Slim, and his odd manifestations, not to mention all the resident and inexplicable funny noises.

The s.s.b. business of raking them all in was done with his usual efficiency by **G3NOF**. This month, Don noted that the band opened up as early as 0600Z, and stayed open to all sorts of hours. Don made s.s.b. contacts with C31LHK, D68CY, EK0AH (Arctic Expedition), FO0EXV/Austral, HL9EP, JW0A, KA6V/7, KH6IJ, N6KLQ/5N0, P29VMS, S01A, TE89R, T5MF, T5YD, TF6MM, TG9GI, TG9GI, UA0FAA, UA0KK, US0SU (Ayon Is, and Zone 19), V85NR, VKs, W6/G4LJF, ZL2VS, ZL7TZ, ZS8MI, XE1VIC, XF4L, YE0AX, ZD8JP, 3B9FR, 3D2AG, 4Z1A, 7J1ADJ and 7J6CAO (Okinawa). However, Don was not able to hook 3D2CR on Conway Reef; they were often audible on 21MHz but while they did work a few Europeans they seem to have concentrated on the JAs.

For a change, G2HKU had a couple of s.s.b. contacts on this band, with KB8RO/KP4 and ZL3FV. his main mode was c.w., and this came up with ZS5WT, HK3RQ, N4GYX, RB5LVV/RB8J, 4S7EA, FY/F3OA, CT3CU (W2ZZ on holiday), VP8BFM (Falklands), N2OO/SV5, CO5DM, HC5AI and YN3CC.

G3HZL's idea of fun is c.w. all the way, and it included EA8AB, CN8ST, VEs, VK3RAN, VK3BPV, VK2DUY, VK4CU, VK4RAN, VK4EBV, VK4CY, VK6LW, VK6DZF, VK6HB, VQ9DM, VS6UO, EY9FWW, UA0BY, UA0AMV, UA9HTT, UZ9OWE, UM8MCF, K7GE, ZD8JP, ZL3GQ, ZL3QW, ZL2JK, ZL2RN, 4Z4DX, 6W6JX and 6Y5HN.

Now to G0LCQ who offers 4X6VH, DL1, DL7, FE1LJH, HA5, HA8, HB9, IK1, IK7, OE6, OH1OH/6, OK1, OK2, OK3, OZ1, OZ3, RB5, RC2, RQ2, SM6, SM7, SP4, SP8, U5, UA2, UA9SDB, UB5, UC1, UC2, UP2, UQ2, UT5, UZ1, UZ6, Y32, Y67.

Finally, G0HGA who again stuck to the c.w. and a maximum of fifteen watts, which was enough to raise OK1OFM, EA3FYQ, UY5XP and SJ9WL.

The 21MHz Band

G2HKU mentions a Spring antenna overhaul, during which he has replaced the open-wire feeder on his G5RV with the slotted ribbon stuff and the old TV type coaxial cable with transmitting stuff. Not a bad idea, an overhaul, and I have to admit to wondering just how these people who buy dipoles ready-made ever get on! However, to return to our muttons, Ted again stuck to c.w., and raised LU4FFG, UI8IAY/UI1T in the rare Oblast 052 and K4II.

Turning to G3HZL, Don mentions that he raised EA8AB to make a seven-band job of it, plus C56/T3TXF, C56/G3SZW, DF0FX/CT3, G3OOK/MM (Near HS PA/G4BUV/MM in the Gulf of California, JA4HBP, UA9TA, UA9UOI, UA9XBH, UA0QGL, UA0OD, UA0YM (Zone 23), EY9FAR (Soviet Winter Games and a fast QSLer), UL7CAC, UD7DWQ, VK2DUY, VK2FYM, VK3RAN, VK4CJB, VK6LW, VQ9QM, VS6WB, VS6WU, ZL2JK, ZL2VS, ZL2RN, ZL3GQ, 4Z4OX, 4Z5Y, 9J2BO plus a solitary ZC4KM on s.s.b.

Now G0LCQ; Glenn used his HW9 to good effect to key with IV3, OH6, RA3, SP7GV and SM3PVM for the very first two contacts to go in the log, UB4 and YO5.

The long path to the Antipodes has opened as early as 0600-0800Z, says G3NOF, followed as ever by the change to short path until around noon. The band has often been noted open to South America after midnight. Don clocked up s.s.b. contacts with CE3DKZ, D68CY, HI3JH, HK3MAE, JAs, JT1BO/3, JT1KAA, JT1T, KC6VW (Belau), PJ6/KV4AD, S79MST, S01A, T30BC, T5YD, TE89R, TU2QQ, RA0AD/JT, UA9YJQ/UA9, UA0FF, UA0WZ, UZ0QXU, UZ0WWA, V85IR, VKs, including VK3ID/M, XF4L, YB0FS, YI7EDZ, ZL1BQD, ZL3RK, ZS8MI, 4Z1A, 4Z2B and 5W1HP.

The 28MHz Band

By the time of writing it had passed the equinoctial peak, but nonetheless there is plenty doing. G3NOF notes that the band usually opens up with the short path to VK/ZL/JA/Asia from 0700-1200Z, while the long path has been noted on occasion between 2100-2300. North Americans appeared as early as 1100 and stayed in till as late as 2300 on occasion. South Americans were heard during the evenings up to midnight with the LUs the last to disappear; and around 1800-1900Z the path over the North Pole opened up to FO and KH6. It was s.s.b. of course, all the way, for G3NOF, with contacts out to CE7BIY, CE0DFL, CE0MTY, CT3EU, D68JL, D68MG, FO0EXV (Marquesas Is), FR4FA, HC8GR, J28CW, JAs, PY0FF, S01A, S79MC, TE89R (Jasper Is), VKs, VK9LA, VP2EXX, VP8BUB (S. Georgia), VU2DK, VU7APR/URX, XF3RK, XF4L, XX9KA, YB0BAQ, YC0DB, YF0CAI, ZC4AB, ZD8JP, ZL2APW, ZL3DX, ZL4OD, ZS8MI, 3B9FR, 3DA0BK, 4Z1A, 4Z2B, 4Z3C and 7P8DP.

Now from the OT to the New Chum in his first month; the QRP of G0LCQ made it over to N2IF, N3CEU, NE3P, UA3LEY and WD4LGE.

G0HGA mentions just two contacts on 28MHz (10m), both at the ten-watt level, with UA9HGE and W3LPL.

Turning to G2HKU, Ted says he found c.w. the preferred mode, and this way raised W6DU, HK3RQ, VE3EAF and ZC4RF.

Finally on this band comes G3HZL who shamefacedly admits to a couple of s.s.b. contacts with ZS6BIG and ZC4KM; after that came the c.w. ones, to C56/G3SXW, C56/G3TXF, CU2BU, EA8AB, JA6PA, JR8QMO, N2OO/SV5, UH3H/UV9WN, UL7TAQ, VP2MT, VK6LW, YV6AZC, ZL2JK, ZL4HB, 5N0BRJ, 9J2BO, 4Z2B and 4Z4OX.

Finale

Here, of course, is where we put in the usual plea for more reports... but at the same time may we please remind everyone that this is not a column reserved for the Big Guns. Every person's idea of DX is their own, and what is memorable is also their own. This column exists for you to share your pleasure with others, whether raising OK on half a watt and a wire antenna, cracking the XF4L pile-up with full power and beam at 20m, or getting into the DX with an all home-brew station - all these are parts of our scenario.

The next three deadlines are June 28, July 26 & August 23

VHF Up

David Butler G4ASR
Yew Tree Cottage,
Lower Maescoed, Herefordshire HR2 0HP

When Geoff Arnold, the Editor of *Practical Wireless* ,invited me to be the "VHF Up" columnist, I was very pleased. I have always enjoyed reading the material that Norman G3FPK wrote and feel that a well written and informative column can really enhance one's knowledge and enjoyment of the v.h.f. bands.

No doubt there will be one or two changes to the column to suit my style of reporting, but please be patient as I experiment to find out what the best format is. One immediate change I will be making concerns locator squares. It is now something like six years since the majority of IARU Region 1 member societies voted in favour of a world-wide locator system. With the introduction of the 50MHz band into Europe and the widespread use of satellite communications there can only be one system. As far as I am concerned the QRA system only suits those people who are unable to work the same square twice! Changes to the various tables will also be made. I propose including 50MHz and 70MHz within the locator squares table. Can you therefore sent me details of your six and four metre squares totals. When sufficient details have been amassed they will be integrated within the QRA table. Another type of table that has always interested me is one that details furthest distances (QRB) worked via different propagations modes on 144MHz. I would be most interested to know from you all as to the furthest distances worked via the following modes, tropo, Sporadic-E, Aurora and meteor scatter. Not much interest has been shown in the annual c.w. ladder and therefore I will be dropping this one at the end of the year.

By now some of you may be wondering "Who is this ASR chap anyway?" Licensed in 1967 as G8ASR, I was originally active on 432MHz. Since that time I have operated on just about every band between Top Band and 23cm. These days I concentrate on 50, 70, 144 and 430MHz bands from my 185m high location in the foothills of the Black Mountains. As a firm believer that you should put a little bit back into the hobby, I am a member of the RSGB VHF Committee and co-editor, with G4VXE, of the RSGB *Six Metre and Up Dx'er*. I was also a member of the Training and Education Advisory Working Group who were tasked with writing the proposals for the Student licence. Enough of me!

Finale to the March Aurora

Reports are still trickling in regarding the major auroral event of March 13/14. Most interesting was news from **Keith G4FUF** of a one-way contact with HG2RD (JN87WB) on 1296MHz. Keith received a report of 55A from the Hungarian but could not make it a two-way as HG2RD was only running 2 watts. Keith bemoans the fact that virtually no-one was willing to try for a 1296MHz contact. Perhaps when the next big one occurs a few more will be willing to try the next band up. It is worth recording that the Doppler shift on 1296MHz was running at around 12kHz and that future auroral contacts on this band will probably require the use of dual v.f.o.s if a successful QSO is to be made.

Szigy YO2IS (KN05PS) writes to say that he had great fun in the aurora. On 432MHz Szigy worked G3LQR for a 1st G-YO on the band. This was followed by contacts with G3XDY (JO02) and G4RGK (IO91). On 144MHz, GW4FRX (IO82) and G4ASR (IO81) were contacted, both at around 1900km. So, 12 countries and 36 squares were worked bringing Szigy's squares total to 379 on 144MHz

At the QTH of **G4ASR** (IO81), operation concentrated on 144MHz. A total of 186 c.w. QSOs were made in 74 squares and 18 countries. Contacts with UK5KY (KO31) at 2029km and RB5PA (KO21) gave two new locator squares. Other contacts included 10 x YU, 12 x HG, 17 x SP and 27 x OK. Six Italian stations were worked showing how far south the auroral propagation was reaching.

Down at the l.f. end of the spectrum, many stations mentioned the Finnish stations worked on 50MHz via auroral Es. This rare propagation mode normally occurs after the main auroral event has finished. Unlike signals propagated via the auroral curtain, which exhibit very rough T1 or tone A pitch, auroral Es sounds T9 and are similar to Sporadic-E propaga-

tion. This event lasted for about 40 minutes and co-existed with the normal auroral opening.

The first authenticated 50MHz transatlantic contact by auroral Es was recorded during the opening. **Dave Newman G4GLT** spent most of the time looking westward for stateside contacts and was rewarded by hearing VE1BPY at 559 between 2153 and 2157UTC. Bob VE1YX was heard briefly on s.s.b. at 53 a few minutes later. Finally at 2234UTC, G4GLT contacted KA1MFA for a two-way with reports of 579 559.

Olaf SM6PU writes with details of the 100 stations he worked in G, GD, GI, GM, GW, PA and LA. Stations operating on 50MHz in Sweden are not allowed to transmit during TV hours (0630 - 2230UTC) which meant that Olaf could not come on the band until 2243Z.

Sporadic-E

By the time you read this the Sporadic-E season should be well and truly under way. Although by its very nature Sporadic-E is unpredictable in the long term, it is possible to make some general predictions. The propagation "experts" are going to disagree with me on this one but I reckon that if you can accept that Es generally occurs in June and July then you can refine it a little and say that statistically the first week of June and the second week of July show enhanced possibilities. I have always said that the Monday and Tuesday after the first weekend in June usually gives some sort of Es activity on 144MHz. I am not so confident about openings in July but the period 7-13 will provide some excitement, I am sure. Try it - you might be pleasantly surprised!

Beacon & Repeater News

A new type of beacon intended for propagation research has been installed near Buxton, Derbyshire (IO93BF). The beacon GB3BUX, on 50.000MHz is intended for use by researchers investigating propagation path lengths. By accurately transmitting frequency and timing information it is possible to measure the time delay taken for a signal to reach the measuring station and hence calculate the total path distance. The beacon is sourced from a high stability temperature controlled 5MHz crystal oscillator phase-locked to the MSF 60kHz standard transmitted from the BT Radio Station at Rugby. When not keying location information the beacon sends pulses with a 100ms break in carrier every second.

A note from the Mid Cornwall Beacon and Repeater Group indicates that the two new beacons for 50.0425MHz and 1296.86MHz are now ready and waiting to go on the air but require the go-ahead from the owners of the new mast. Geoffrey Holland G3GHS is handing the job of beacon keeper over to Maurice Richards G3WKF who can answer any queries concerning these two new beacons and the repeaters GB3HB and GB3NC.

The Gibraltar 50MHz beacon ZB2VHF on 50.035MHz was re-activated on April 16. It is now located on top of the rock at 52m a.s.l. Reception reports should go to ZB0D who, incidentally is now himself active on the 50MHz band. Within 4 hours of being switched back on the beacon was heard in New Zealand by ZL2KT.

A new 430MHz repeater, GB3EH, commenced operation earlier this year on channel RB8 from a site on Edge Hill, Banbury. Coverage is provided for the Banbury and Stratford-upon-Avon area and is expected to include a good stretch of the forthcoming M40 Oxford to Birmingham motorway extension. The repeater uses a Pye 412 base station, two Pye AE450 cavities in notch mode, and a pair of end-fed dipoles. The logic, built by Steve Powell G8PYT, provides a signalling frequency of 875Hz (one octave below timeburst) and callsign and timeout intervals of 256 seconds. A reply "pip" is awarded to any input transmission of over 4 seconds duration. Reports and contributions would be welcome by G4OHB or G8CQH, both QTHR.

12.5kHz FM Channel Spacing Survey

To help gauge what interest there might be in a change from 25kHz to 12.5kHz channel spacing on the 144MHz band a survey form has been produced by **Steve White G3ZVW**. If you want one, maybe for your club newsletter, send me an s.a.e. and I'll make sure you get one.

The 50MHz Band

Dave Brown GD4XTT writes that conditions recently have not been very good. The only "new one" was GW8YUJ (GDD) but as Dave is still only running 400mW he is quite happy with the results so far.

Ela Martyr G6HKM (ESX) managed to work G3GJQ/5N0 (JJ16) for a new square on March 29 but mentions that she seems to have missed what little DX there was on the band. The contest on April 9 gave Ela a terrific boost to her county score with twenty new ones being bagged. A contact with G1SDX/P (IO70) in Cornwall also gave Ela a new square.

Another station to find the band disappointing of late is **Dave Glover G1VJP** but thinks that maybe he is listening at the wrong times. Dave is using an FT-290 driving an R.N. Electronics transverter and a 5-element beam. He has found that the use of a speech processor has meant getting contacts which he would otherwise have missed.

A contact with LU8MBL on March 20 has prompted **G7CFK** to write in for the first time. G7CFK (sorry, no name given) has been licensed for 6 months and only operates on 50MHz. He uses an FT-690 running 10 watts into an HB9CV antenna. So far contacts have been made with LU, J52, W, VE, OH, PA, EI, GM and G. Other countries heard but not worked have included P43, FY, HC, ZS3, ZS6, CT, SM, F, GI, GJ and GU. Not bad at all for a newcomer.

From the station of G4ASR (HWR) a considerable difference was noticed in conditions during the months of March and April. Auroras in March were observed on nine separate occasions whereas only three were observed during April. Stations worked via aurora included LA3EQ, SM6PU (JO67), PA0HIP (JO21), EI5FK (IO51), GM3POI/P (OKE), GM4IPK (SLD). Similarly, 20 stations were worked in Southern Africa on nine occasions throughout March but only one opening was heard in April and that only produced 1 contact. An opening on March 25 gave contacts into the ZS5 call area, best DX being ZS5AV (KF59) at 9750 kilometres. Propagation swung around to South America during April with LU3EX being worked on the 12th and CX4HS being heard on the 21st.

Meanwhile, on a completely different planet are the lads situated on the south coast. It is very apparent that for every move of 100km to the south, the number of 50MHz openings increases by a factor of 10 or more.

Mike Walters G3JVL, favourably located on Hayling Island (IO90), recorded no less than 15 days of openings to Southern Africa since the aurora of the 14th! The band was open to ZS virtually every day throughout March. On March 19, Mike worked TU2MA (Ivory Coast) for a new

	Band (MHz)			
Station	1296	430	144	Total
G3IMV	48	124	412	584
G4KUX	—	120	372	492
G3UVR	82	135	246	463
G4RGK	50	124	284	458
G0DAZ	27	128	277	432
G3XDY	89	147	196	432
GJ4ICD	59	119	254	432
G3JXN	87	134	179	400
G1EZF	—	93	263	388
G4XEN	—	111	274	385
G6DER	78	110	183	371
G6HKM	45	107	197	349
G4RRA	—	80	255	335
G3COJ	44	103	186	333
G4DEZ	48	37	248	333
G4SSO	—	93	229	322
G4FRE	72	146	102	320
G4TIF	—	110	200	310
G1KDF	37	98	174	309
G4DHF	—	—	307	307
G1EGC	23	80	198	302
G8HHI	38	110	148	296
G6MGL	59	89	141	289
G8PNN	63	98	128	289
G4NBS	63	105	119	287
G1LSB	—	133	150	283
DL8FBD	—	—	280	280
G8ATK	45	91	143	279
G4MUT	28	90	149	267
G4PCS	—	3	258	261
G1GEY	11	77	168	256
G3NAQ	—	80	175	255
G8LHT	6	83	156	245
G6DZH	—	87	154	241
G0EVT	—	56	184	240
G4IGO	—	—	238	238
ON1CAK	—	33	204	237
G3FPK	—	—	236	236
G0EHV	—	75	154	229
EI5FK	—	56	172	228
G6STI	24	69	130	223
ON1CDQ	—	32	182	214
G4MEJ	—	—	213	213
G8LFB	—	—	209	209
GW4FRX	—	—	204	204
G8MKD	—	49	150	199
GJ6TMM	—	48	151	199
G4YCD	—	—	197	197
G4DOL	—	—	186	186
GI1JUS	—	—	181	181
G1SWH	—	49	118	167
G6MXL	16	45	91	152
G4AGQ	1	41	104	146
GW6VZW	—	6	128	134
G4ZTR	30	45	53	128
G1WPF	—	29	97	126
G0FEH	—	24	101	125
G1IMM	—	17	98	115
G8XTJ	—	—	110	110
G0FYD	—	—	108	108
GM0HBK	—	—	107	107
GI4OWA	—	—	103	103
G1SMD	—	—	93	93
GM0GDL	—	20	73	93
G8PYP	—	15	77	92
GW1MVL	—	20	72	92
GW1MVL	—	5	86	91
G1TCH	—	6	84	90
G4WHZ	7	—	76	83
G0HEE	—	—	73	73
GU4HUY	—	—	73	73
G1DOX	2	10	58	70
G1CEI	—	—	68	68
G0HDZ	—	—	64	64
G1NVB	—	—	58	58
G2DHV	2	7	33	42
GM0JOL	—	—	37	37
G7AHQ	—	—	34	34
G7CLY	—	—	31	31
GM1ZVJ	—	—	24	24

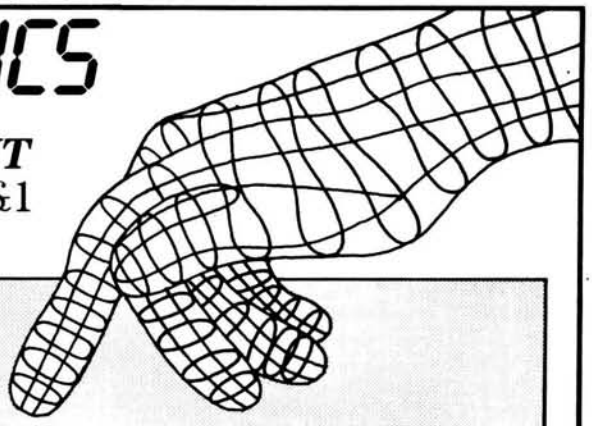
Starting date January 1 1975.
No satellite or repeater QSOs.

CRICKLEWOOD ELECTRONICS

OUT NOW!

1989 100 PAGE COMPONENT CATALOGUE PRICE £1

SEND OFF FOR YOUR COPY TODAY...



- WE STOCK AN UNRIVALLED RANGE
- ALL OUR COMPONENTS ARE FIRST CLASS BRANDED ITEMS
- WE OFFER A SAME DAY SERVICE ON ALL STOCK ITEMS
- NO MINIMUM ORDER—IF YOU NEED **ONE** COMPONENT WE CAN SUPPLY **ONE** COMPONENT
- WE HAVE ADOPTED A NEW LOWER PRICING POLICY + QUANTITY DISCOUNTS
- FREE VOUCHERS WITH YOUR CATALOGUE—ORDER ONE NOW!...

JUST FILL IN THE COUPON OPPOSITE AND POST IT WITH YOUR £1 PAYMENT TO THE ADDRESS BELOW. YOU WILL RECEIVE NOT ONLY OUR SUPERB 100 PAGE CATALOGUE, BUT ALSO FREE VOUCHERS WHICH YOU CAN USE ON YOUR NEXT COMPONENTS ORDER.

CRICKLEWOOD ELECTRONICS LTD 40 CRICKLEWOOD BROADWAY LONDON NW2 3ET TEL: 01-450 0995/452 0161 FAX: 01-208 1441 TELEX: 914977

FREE VOUCHERS!

SEND OFF FOR YOUR CATALOGUE AND VOUCHERS TODAY.

I WOULD LIKE TO RECEIVE..... COPY(COPIES) OF THE 1989 CRICKLEWOOD ELECTRONICS COMPONENT CATALOGUE. I ENCLOSE £..... PLEASE ENCLOSE MY FREE VOUCHERS.

Tape your £1 coin here, or send a cheque or postal order for £1.00 for every catalogue you require.

NAME.....

ADDRESS.....

.....

.....

---

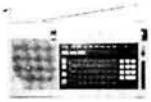
dressler
COMMUNICATIONS LTD.

191 FRANCIS ROAD
LEYTON · E10 6NQ · LONDON
TELEX 8953609 LEXTON G
PHONE 01-558 0854 01-556 1415
FAX 01-558 1298

SONY

SONY ICF 2001D
76-108 MHz
116-136 AIRBAND
153kHz-29.995MHz
FM - AM - SSB 32 MEMORIES
INC PSU, CARRY STRAP & EARPHONE

£299

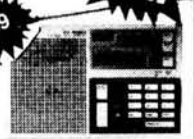


Sony ICF 7600DS FM/AM/SSB	£159
Sony SW1 150-30M C/S + FM Stereo-249	AM/FM
Sony Pro 80-150KC-108MHz, 115MHz-224MHz, AM-FM-SSB	£299
Sony Air 7	£229
Sony AN1 Active Antenna	£55
Sony Accessories Available	

SONY ICF 7600DS
76-108MHz
76-108MHz
153kHz-29.995MHz
Complete with case, mains power supply, earphone and frequency list.

NEW

£159



KENWOOD & SCANNERS

Kenwood R5000 + ARA 30	£899
Kenwood R5000	£799
VC20 Converter	£160
TS680 HF + 6 Mtr inc. Microphone	£895
TS440 inc Auto ATU inc. Microphone	£1,170
Bearcat 200XLT	£239
Black Jaguar	£199

DRESSLER ACTIVE ANTENNAS

ARA 900 ACTIVE ANTENNA

NEW

50MHz to 1300MHz
Gain 17dB Typical

TECHNICAL SPECIFICATIONS

Noise Figure
1dB at 50-180MHz
1.5dB below 300MHz
2.0dB below 350MHz
2.7dB below 400MHz
3.0dB below 500MHz
3.8dB below 650MHz
4-6dB below 1300MHz

£139.00 *(PL259 Connectors)*
£149.00 *(N-Type Connectors)*

Intercept Point 3rd Order: +18dbm at Input
Post £3.00 or Securicor £7.00 extra

ARA 30 ACTIVE ANTENNA
50 kHz . . . 40 MHz WITH LIMITED PERFORMANCE UP TO 100MHz

Professional electronic circuitry with very wide dynamic range. Meets professional demands both in electronics and mechanical ruggedness. 1.2m long glass fibre rod. Circuit is built into waterproof 2.5 mm thick aluminium tube. Ideal for commercial and swl-receiving systems. £129. See Review in August 1985 Issue p.35 Both antennas come complete with 7 metres of cable, interface, power supply and brackets. Dressler preamps available.

£129

OPEN MON – SAT 9AM – 5.30PM
INTEREST FREE HP FACILITIES AVAILABLE ON MANY ITEMS
PROMPT MAIL ORDER

Access VISA AMERICAN EXPRESS

Prices correct at time of going to press. Please phone for latest quote.

ICOM

ICOM R71
General Coverage Receiver £855

FIRST CLASS SHORT WAVE RECEIVER. BUY THIS FOR **£855** AND RECEIVE AN ARA 30 **FREE.** WORTH **£129.**

Also R7000 complete with ARA900 **£999.** (ASK ABOUT THE NEW TV CONVERTER)
PHONE FOR BEST PRICE

ICOM IC32G	ICOM IC3210
ICOM IC2GE	ICOM IC761
ICOM IC228	ICOM IC781
ALL IN STOCK	ICOM IC735

+ All ICOM models available. + YAESU Accessories.

YAESU

FRG9600	£475	FT747GX	£599
FRG9600M	£500	FT757 MkII	£875
FRG8800	£585	FT23, 411, 4700, 767	
FRV8800	£100	+ All Yaesu available	

country. The next day started with the normal midday opening to ZS3/ZS6 but with the added attraction of an opening to South America. LU8MBL was heard briefly at 1257UTC followed by a contact with PZ1AP in Surinam at 1411UTC. At around the same time the FY7THF beacon was heard peaking S6. During another opening to ZS3/4/5/6 on March 27, Mike heard the ZS5VHF beacon on 50.320MHz. On the 28th a contact with Z23JO in Zimbabwe gave Mike another new country. Conditions on the 29th were still good and gave indications of a classic pre-auroral enhancement to the band. Propagation started with the usual African opening followed by yet another opening to South America. Stations heard included ZS3E, ZS6WB, G3GJQ/5N0, J52US, LU9AEA, LU8MBL, FY7THF, HC5K, KP2A, 9H1BT and PA0HIP. An aurora was detected at 1600UTC and continued through to 2200UTC giving Mike contacts into northern England and Scotland. Similar openings continued into April with no less than 12 days producing propagation to Southern Africa within the first 2 weeks.

Another station favoured by southern climes is **Ted Collins G4UPS** (DVN). Apart from the almost daily openings to ZS3 & ZS6, Ted also heard or worked the following gems, CT1DTQ, 9H1CG, TR8CA, J52US, G3GJQ/5N0, TU2MA, 5Z4RT (crossband), ZD8VHF, LU8MBL, LU9AEA, FY7THF, 8R1AH, PZ1AP and KP2A. With contacts also being made, via aurora, to EI, PA, SM, LA, G, GD, GI, GJ, GM & GM it seems that the band wasn't in such a bad shape after all.

Interesting openings into the UK have occurred on the following dates; LU8MBL, LU9AEA working G & GW about 1200UTC, CX4HS working GI & GM at 1300UTC, CE3OK, CE6ABK working GM at 1330UTC on March 29; LU3EX, LU7DZ, LU8DIO working G from 1305UTC on April 1; ZD8MB working G, GI, GM & GW between 2150 to 2215UTC on April 11; LW1EKH, LU3EX, LU8DIO, LU9AEA working G & GW on April 12; LU8MBL working G at 1520UTC and CX4HS also working G from 1715UTC on April 21.

Conditions may have been relatively dull in the rest of the UK but over on Aruba **P43AS** recently worked 46 Australians in call areas VK2/3/4/5/8, in an opening lasting 2 hours. Our turn will come!

The following 25 Swedish stations have a one year permit allowing 50MHz operation.

SK2BF (KP05), SM2BYA (KP07), SM2CEW (KP15)

SM2LTA (JP94), SK3SN (JP81), SM3MXR (JP81)

SM5DRV (JO77), SM6AEK (JO66), SM6ASD (JO57)

SM6CKU (JO67), SM6CMU (JO57), SM6CVL (JO57)

SM6DWF (JO57), SM6ESG (JO67), SM6PU (JO67)

SM7AED (JO65), SM7BAE (JO65), SM7BKH (JO65)

SM7FJE (JO65), SM7FWZ (JO77), SK0UX (JO99)

SM0CHH (JO89), SM0DRV (JO89), SM0HP (JO89)

SM0MXR (JO89).

The 70MHz Band

From *QSB The Newsletter for Four Metres* by G4WND comes news of activity on the Island of Jersey between Mar 3 - 5. Graeme Castleton G6CSY operated as GJ6CSY/P, with 10 watts and a 5-element Yagi, from a location situated on the north coast of the island at a height of 90m a.s.l. Best DX were G4SEU and G4ZTR at 386km. Graeme is looking for a solid state p.a. before his next visit to the island.

Gerry Schoof G1SWH (IO83) mentions a number of stations worked recently on 70MHz. One of the more difficult counties to work, Cleveland, was added to the list thanks to a contact with G4VCJ. Gerry made sure that this station didn't slip away by working him on all bands from 50 to 432MHz. A QSO on March12 with EI9FK/P in County Wicklow gave Gerry country number four on the band.

Stations wishing to work **Nick Perrott**, operating as **GJ4TAW/P**, can arrange 70MHz schedules with him via GB7GUR-2 on packet radio.

Geoff Grayer G3NAQ is looking for anyone interested in SSTV schedules on four metres. Geoff is QTHR.

Martyn Vincent G3UKV is planning an expedition from a Scottish Island this year. If you have any suggestions as to which Island you would like activated on 70MHz, contact Martyn on 0952 255416.

Don't forget that Tuesday nights are activity nights on 70MHz.

Station	50MHz Counties	50MHz Countries	70MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Total Points
G1SWH	36	13	27	4	72	5	35	6	--	--	208
G6HKM	47	16	--	--	62	22	34	12	5	5	203
G4XEN	21	9	13	2	63	21	33	9	--	--	171
G0IMG	44	13	24	4	39	7	13	3	--	--	147
G1DOX	26	3	30	5	50	12	16	2	--	--	144
G6NB	44	20	--	--	43	7	16	2	--	--	132
G8LHT	10	8	19	4	33	18	29	7	2	1	131
GW6VZW	35	8	--	--	49	13	--	--	--	--	105
G4LDR	27	2	--	--	28	5	27	8	--	--	97
GW1MVL	--	--	--	--	62	20	3	4	--	--	89
GM1SZF	16	9	--	--	49	14	--	--	--	--	88
GD4XTT	33	5	--	--	35	7	5	2	--	--	87
G4ZTR	8	6	31	6	20	11	--	--	--	--	82
G8PYP	7	6	--	--	30	13	18	6	--	--	80
G0EHV	--	--	20	4	39	11	--	--	--	--	74
G0FYD	--	--	--	--	52	19	--	--	--	--	71
G3FPK	--	--	--	--	51	19	--	--	--	--	70
G4VOZ	--	--	41	6	--	--	17	4	--	--	68
G7CLY	--	--	--	--	48	12	4	1	--	--	65
G8XTJ	21	5	--	--	34	5	--	--	--	--	65
GW4HBK	--	--	44	6	--	--	6	2	--	--	58
G1TCH	7	7	--	--	29	10	--	--	--	--	53
G1GEY	4	2	--	--	--	--	34	8	2	2	52
G1VJP	8	4	--	--	31	7	--	--	--	--	50
G0EVT	--	--	--	--	13	17	1	4	--	--	35
G6MXL	2	1	4	1	7	4	8	5	--	--	33
G0HOZ	--	--	--	--	25	4	--	--	--	--	29
G3EKP	4	3	11	2	3	1	1	1	--	--	26
G1CEI	--	--	--	--	14	4	--	--	--	--	18
G4AGQ	--	--	8	1	1	3	--	--	--	--	13

The 144MHz Band

John Lincoln GM0JOL complains that the 144MHz band is very quiet at his location in northern Scotland. A week can easily go by without any signals being heard at all. When you consider that John is located as far away from SE England as London is from Austria then the enormity of the problem is realised. Consequentally most contacts have to be made via aurora. Unfortunately the event on March 13 was too far south and only 9 QSOs were made. An aurora on April 7 was more conveniently placed with 24 contacts being made in 6 countries. Best DX was DJ4UF (JO30) at 1090km, also worked were OZ1LPR (JO44), DJ9CZ (JO31) and LA3BO (JO59).

The Isle of Man has also had a bleak time of it recently. GD4XTT worked 5 new counties since last month by contacting G3GRJ (NOR), G4YRY (DOR), G8DTQ (SRY), G1EJU/P (WLT) and GW4ZQV (GWT).

Ela Martyr G6HKM fared a bit better than most by working Andy GW0KZG/MM in the North Sea. Ela picked up JO04 on April 4 and JO12 on April 19. The EI contest on Mar 27 provided G1SWH with a number of useful counties. Contacts included EI9FY/P (Cavan), EI4DQ (Cork), EI4AEB (Meath), EI8CXB (Carlow), EI8EQ (Kildare) and EI9FE (Tipperary).

Don Field G3XTT writes under the guise of the HF Committee Publicity Officer. He has been charged to heighten the awareness of 144.525MHz as the HF DX alerting frequency. While h.f. DXers lay no "exclusive" claim to the frequency, many people benefit from its use and, even when the channel appears quiet, there are often many people monitoring in case any interesting DX should be announced. The use of 144.525MHz is analogous to the use of 14.345MHz or 28.885MHz as alerting frequencies for v.h.f. enthusiasts.

The 430MHz Band

Jac PA3DZL is very interested in making c.w. meteor scatter schedules on the 430MHz band. Despite the difficulty of working stations via this mode, Jac has completed 4 contacts to date. If you have a good system and wish to try something a little more interesting then send your sked proposals to Jac de Bruyn, Dorpsstraat 11-13, NL- 4711 ND Sint-Willesbrord, Holland.

Those of you interested in picking up new squares should note that **Charles EI5FK** is now active from IO51 with 50 watts and a 21-element Yagi.

Gerry G1SWH must obviously have a good take-off to Ireland, for in addition to his EI contacts on 70 and 144MHz, he also managed to work EI4AEB (Meath) and EI9GO (Waterford) on the 430MHz band.

Bernard F5DE writes with details of future activity. During contests both he and FC1HGO will be active from JN05AI with 1kW and four 17-element Yagis.

The Microwave Bands

After nearly thirteen years, since the first UHF Worked All Continents award was achieved on 432MHz, the WAC barrier has been broken on 1296MHz. All continents, except for South America, have had enthusiasts capable of running 1296MHz e.m.e. Recently YV5ZZ has become active on the band with a 6m dish and 150 watts. One of his first contacts

was with OE9XXI who has now claimed the 1st 1296MHz WAC.

The latest issue of *CQ-TV* (BATC) contains constructional details for an ATV transmitter on the 2.45GHz band. Definitely not for the faint hearted it involves modifying a 450 watt microwave oven magnetron enabling it to produce about 250 watts of r.f. at 2400MHz. At least the article included a paragraph on the safety precautions that must be adopted when running this sort of power.

Which is more than I can say for a recently received microwave newsletter from California. One article actually suggested that you should place your hand across the transmit output waveguide. It continued..."if your hand warms up after a few minutes then you probably have over 10mW output!"

All microwave operators must be aware of the very real dangers of microwave radiation. Never put your hand in front of waveguide that contains appreciable r.f. energy and certainly NEVER look down the open end of waveguide unless you are absolutely certain that no r.f. is present.

F8WN and **F6DPH** both hope to be active during the 10GHz contest on July 16 from Le Mont Pincon (IO98). Look for them on 10368MHz (n.b.f.m.) and 10100MHz (c.w.).

Phil G4EFT plans to operate in the contest from a site near Ventnor on the Isle of Wight.

News has reached me of what is almost certainly the first GM to GI contact on the 24GHz band. On the afternoon of 11 March 1989, GM3WIL/P at Portpatrick worked GI4SQL/P near Belfast over a path length of 52km. Despite the use of simple GDHM32 wideband transceivers, signals built up to S9 as the clouds lifted and visibility improved.

The next microwave band up also requires the weather conditions to be just right. In a recent ARRL contest WA3RMX/7 and K7AUO running just 4 milliwatts output made a world record contact over a 105km path on the 47GHz band.

VHF News

Nick Perrott is now active as GJ4TAW/P on 70, 144, 430, 1296MHz and 2.45GHz from IN89WF. Nick is especially interested in 1296MHz/2.45GHz QSOs back to the UK.

Gordon Curry GI6ATZ is looking for a high speed c.w. program for the BBC computer. Can anyone help?

If you run a packet system and want to know what's happening on 50MHz in South America try connecting to HC5K's packet mailbox on 28.105MHz.

Following on from last month's WAB news, **G1EUU** has now worked 1400 3rd series WAB bookholders on 144MHz s.s.b.

The French national society REF has arranged for an organisation of 18 correspondents, each representing an area of France, to pass on v.h.f. information. Although the volunteers are active on 144, 430, 1296MHz and 2.45GHz they feel isolated from v.h.f. developments in northern Europe. Their Spanish cousins feel much the same and thus the first F/EA meeting was held recently to discuss activities. As a direct result of the meeting **Pierre Redon FC1ADT** is looking for a competent person in the UK with whom he can exchange v.h.f./u.h.f. information. If you feel you can help please write to Pierre Redon FC1ADT Casseuil, 33190, La Reole, France.

Meteor Showers

The period June - August always provides very good reflections from sporadic meteors. In addition there are many minor shower streams throughout this period and of course a number of major showers as well. The following showers should provide the real dxer with much fun. Day of maximum activity is shown in brackets.

June Lyrids	June 10-21 (June 15)
Ophiuchids	June 17-26 (June 19)
54 Perseids	June 22-30 (June 25)
Beta Taurids	June 5-July 17 (June 26)
Alpha Orionids	July 9-15 (July 12)
Nu Geminids	July 9-18 (July 12)
L Geminids	July 4-29 (July 12)
Capricornids	July 10-Aug 15 (July 25)
Delta Aquarids	July 12-Aug 18 (July 27)

Expeditions

OZ1DJJ will operate from Greenland on 50MHz with the callsign OX3LX from June 9 to July 1. He will be in locator GP44CD.

The Five Bells Expedition Group have obtained permission to visit the Island of North Rona located some 70km north west of Cape Wrath in locator IO9 (WAB HW83). The island is completely uninhabited apart from sea birds, seals and sheep! Landing by sea is difficult as most of the island's coastline consists of cliff faces. The group hope to be operational from the island from July 12-19. Frequencies to monitor are 50.350MHz and 144.028MHz for meteor scatter contacts, 144.215MHz and 432.215MHz for tropo contacts and 14.345MHz for liaison. The callsign to watch out for is GB4XT. QSL address is via G4NPH or G4ODA.

Two expeditions groups have set their sights on Corsica this year. First up will be F6CIS, F6HKA and F1EHN between July 20-27. The group will run QRO amplifiers and antennas on 144, 432, 1296 and 2320MHz. Listen on spot frequencies .020, .220 & .420 on each band. The second group will consist of FD1FHI, FD1FLN and FC1DEC who will concentrate on 144MHz m.s. between July 27 and Aug 12.

Johannes LA6HL will be making his annual trip to Iceland from July 20 to Aug 10. Using the callsign LA6HL/TF he will be active on 50.183MHz running 10 watts and a 5-element Yagi. This was sufficient last year to enable him to work 59 UK stations via Sporadic-E. The frequency to watch on 144MHz is 144.183MHz where Johannes will be running c.w. meteor scatter. Despite only working G0CUZ via this mode last year, Iceland to central England, at about 1700 kilometres is an optimum distance for meteor scatter. A few years ago I worked LA6HL/TF in 3 different squares and signals were very strong via sporadic meteors in the late evening.

HB9CYY and HB9SLU have at last found a good portable site in JN46 that very much favours the UK. They promise to activate this square during periods of good tropo. Meteor scatter operation is also likely following their operation from this site during the Quadrantids in January.

QRZ Contest

June 18 50MHz RSGB Trophy 0900-1700UTC

June 24 AGCW-DL 144MHz c.w. 1900-2300UTC

June 24/25 10GHz cumulative 2000-2000UTC

July 1/2 VHF NFD 50-2320MHz 1400-1400UTC

July 3 Scandinavian microwave activity

July 4 Scandinavian 144MHz activity

July 6 Scandinavian 432MHz activity

July 16 10GHz cumulative 0900-2100UTC

July TBA CQ WW VHF WPX 0000-2400UTC.

	Band (MHz)				
Station	**50**	**70**	**144**	**430**	**Points**
G4XEN	7	—	144	9	160
G4OUT	—	10	85	—	95
G4ASR	46	—	TBA	—	46
G3FPK	—	—	32	—	32
G0FYD	—	—	31	—	31
G4VOZ	—	27	—	4	31
GD0ELY	1	—	14	—	15
GW4HBK	—	15	—	—	15
G4AGQ	—	6	4	—	10
GW4VVX	—	—	9	—	9

Station	Counties	Countries	Squares	Points
G6DER	34	10	36	80
G3JXN	29	11	39	79
G8TFI	26	7	32	65
G3XDY	19	8	26	53
G8PNN	17	7	26	50
G6YLO	8	4	8	20
G8GRT	3	3	5	11
G6OYL	1	1	1	3

The next three deadlines are June 28, July 26 & August 23

Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS

This month sees the start of a new feature in the column, so I think I'd better start with an explanation of why the change. It has become apparent to me that the popularity of packet combined with the effective mailbox system, makes it impossible to produce up-to-date packet news reports in a monthly magazine. On the other hand there is one area where I think more coverage is required and that is data equipment reviews. So, this month I am including a review of the Siskin Tiny-2 Packet TNC.

I will be trying to hit a compromise between reviews and general information, i.e. contests, etc. If you have any views on the change to the column or would like a particular item reviewed please drop me a line.

Siskin Tiny-2 Packet TNC

This TNC is one of the latest breed of small single port units featuring full AX-25 version 2 commands and a range of interesting enhancements. I was fortunate enough to get my hands on a review model so read on for my reaction.

Documentation

With a complex piece of equipment such as a TNC, it is very important to have good documentation and the Tiny-2 meets this requirement well. The main manual consists of a 115-page A5 booklet which is spiral bound and split into two sections - operating manual and hardware reference manual.

The operational section started off with a good description of all the basic commands necessary to get you on the air quickly. For those who like a quick insight into how AX-25 works there was a very good eight page section covering just that.

This was followed by a complete description and examples of usage of the full command set. As with previous Pac Comm TNCs, the default values for all the commands was also given which can be very useful.

The hardware reference manual section gave detailed instructions regarding the radio and computer interfacing. In addition, there was also a circuit description and some trouble shooting guidelines. The final section of the manual comprised examples of interfacing leads for a variety of popular computers and transceivers. Despite the American slant of this section most of the equipment covered is popular in the UK.

As packet radio is constantly evolving you will not be surprised to hear that there was some additional literature supplied giving details of the latest release software. This consisted of a simple 8-page A5 leaflet listing the new commands and their meaning.

The final item was a command reference card which gave a list of all the commands (except the latest additions) the default value and a brief description. Once you have learnt the basics of packet this card is a very useful guide for use in the shack.

Interfacing

One area that often causes confusion for the newcomer is the interconnection of the TNC with the radio and computer, the RS-232 "standard" being one of the main reasons for this confusion. Pac-Comm, who incidentally make the Tiny-2, have gone to great lengths to make this operation as simple as possible.

Starting with the radio connections, the audio output from the Tiny 2 can be connected directly to the microphone input of the transceiver. The adjustment of the modulation level is achieved via an internal trim-pot. This trim-pot was placed close to the t.t.l. port and could be reached via a gap in the rear panel which was quite handy. The adjustment range of this pot on the review model was 0 to 1.6V p-p, though above 0.9V p-p the distortion was rather high. This distortion is not likely to be a limitation as most transceivers will need a level below 0.1V p-p. At these lower levels the output waveform consisted of a very clean sinewave, ideal for transmission.

Looking at the other direction, the Tiny-2 can accept audio signals in the range 20mV to 700mV, which I'm sure will be fine for the vast majority of v.h.f./u.h.f. transceivers. The best connection point on your transceiver is a "fixed" audio output. If this is not available, as is the case with a lot of portables, the external speaker jack can be used instead.

Having dealt with the audio connections, we now need to connect-up the p.t.t. line. The standard used here is pretty universal, with this line being grounded for transmit.

The final connection, which is optional, is the radio squelch. This facility is not very often used as it requires a d.c. output from the transceiver to indicate when the squelch is lifted.

Moving on to the computer interfacing, Siskin and Pac-Comm have again made things as easy as possible. The first good point was that the computer interface can accept both t.t.l. and RS-232 levels. Early implementations of this facility on some TNCs used an internal switch to select between RS-232 or t.t.l. There was a problem with this system as it was possible to damage the interface if it was set to t.t.l. and an RS-232 signal was connected.

The Tiny-2, however, overcomes that problem by supplying two computer ports with totally different connectors. The RS-232 port uses a nine pin "D" connector, which is rapidly becoming yet another "standard" for RS-232. In contrast the t.t.l. output uses an eight way i.d.c. connector. As to which pin you connect to what, there is plenty of advice both in the manual supplied with the Tiny-2 and the Siskin catalogue. For my set-up I was using the Tiny-2 with my BBC B and Tandy 100 computers, so the RS-232 option was chosen.

When trying to sort out the connections, most people are ok on transmit and receive data, but get very confused with RTS, CTS, CD, DSR and DTR. All these terms are used to describe the handshaking between the computer and the TNC. If you imagine that the TNC is sending data to the computer and the computer needs to stop receiving data and do something else, it needs a way of telling the TNC to stop sending. If you use all these hardware connections the break in transmission is achieved by changing the state of the appropriate line. This is known as hardware flow control.

There is an alternative to this hardware control system which is software flow control. In this system the computer and TNC use a special character to let the other know that sending must stop. Of course, you need another character to start the process off again. The standard system for software control is called Xon/Xoff and the special characters are ctl S to stop and ctl Q to continue. I must admit that my personal favourite for ASCII data transfers is software control as it keeps the connections to a minimum, i.e. trans and receive data plus ground, and is implemented on most computers.

The Tiny-2 incorporates some extra flexibility with the software flow control, as the start and stop characters can be set to any value by the user.

With all the interfacing complete, it was time to set-up the transceiver modulation level. This proved to be very simple, but does require the use of a dummy load and another radio tuned to the same frequency as yours.

To help with this process the Tiny-2, like previous Pac-Comm TNCs, has a command CAL. Typing this command followed by K, keys the transceiver ready for the setting-up process to start. All you need do then is adjust the trim-pot in the rear of the Tiny-2 for maximum output from the monitoring receiver. Next you back off the trim-pot until the level just drops. As you can see the process is very simple.

Before I leave the interfacing I ought to mention that the Tiny-2 is fitted with a standard modem disconnect header so that more sophisticated high speed radio modems can be used if required.

Commands

Moving on to the command set, this follows the current AX-25 version 2 standard and in the review model was TAPR release 1.1.6.

The meaning and use of all these standard commands is covered both in the supplied manual and in many packet guides such as the publications from BARTG. Because of this I won't go into detail here, but cover the enhancements and special features of the version 1.1.6 software used in the Tiny-2.

The first and most import addition is the inclusion of a c.w. ident to meet the regulatory requirements. As with most of the commands in the Tiny-2 the user is given the option to change various parameters as required. With the c.w. option there are three variables to be set. The first and most obvious is the text to send, i.e. your callsign. This variable is called CWIDTEXT and can accept up to 32 characters, though the length is effectively limited by the p.t.t. watchdog timer. This limitation means that with a c.w. speed of 20 w.p.m. the text can be up to 13 characters long. Despite the capability to send all these characters I would strongly recommend that just the callsign is sent.

The next variable is the c.w. speed which is called CWLEN and comprises a number between 1 and 7 which governs the length of the dot. In the case of the review model 20 w.p.m. required this variable to be set to 6.

The final setting determines when the c.w. ident will be sent and works much the same as the standard beacon system. There are two basic options - either to send ident after packet activity on the channel or to send at regular intervals. In either case there is a variable to set, which determines either how long after activity it is sent or the period between idents.

The c.w. ident feature in the review model suffered a few bugs in that it would send the beacon text as well as the c.w. text, but I understand that this has now been fixed.

Incidentally the resultant c.w. was quite good quality, but of the two-tone f.s.k. type which is not a favourite of mine.

Moving on to some of the more general command enhancements, there was one that I personally liked and that was the option to show the month in numeric or alphabetic form, i.e., Jan, Feb, etc,. Although hardly a technical breakthrough, its nice to see a few friendly messages as opposed to all clinical numbers!

There are some minor changes to the PERSIST command which is a variable set to help avoid collisions and PIDCHECK which determines whether to receive only level 3 protocol frames or all frames.

Another requirement for a modern TNC is the inclusion of the KISS code to support several of the specialist computer programs like TCP/IP and STATS. The Tiny-2 supports this code which is enabled by the command KISS ON which is simple enough!

The final command mod which struck me as a useful addition was the ability to stop unproto frames being sent. This often happens when a connection fails, so should be particularly useful for buletin board operators.

Personal Mailbox

One of the most interesting features included in the review model was the Personal Message System, known as PMS. The facilities provided within this system are very good and I found them to be very useful indeed. In order to keep things as simple as possible Pac Comm have aligned the PMS commands with the standard Packet bulletin board system commands, so users of your PMS won't have to learn new commands. The PMS software is included in the main ROM and can actually be included in many other TNCs that use TAPR software, although the RAM requirement is 32K.

When it came to testing out the PMS, I decided to connect the Tiny-2 back to back with my TNC-220. By using this technique I could freely try all the facilities without causing pollution of the air waves!

The first job before the PMS can be used is to store your callsign and a suffix number between 1 and 15. Incidentally this suffix is required so that the TNC can differentiate between a call for the message system and one for you. Once this is done the PMS can be enabled simply by typing PMS ON. Any connects to your PMS callsign will receive the message:

"Logged on to .....'s Personal Message System", which is quite a friendly response. The user is then offered the following set of commands:

CMD(K/L/M/R/S/B/H/?)>

As these are standard commands I won't go through them in detail here.

Having organised my two TNCs back to back, I set about testing the PMS software to see how well it performed. Sending messages proved to be very straightforward and these could be terminated either with ctl Z, .CR or /ex. Once the message had been saved it could only be read or deleted by either the originator or recipient. I tried various techniques to read other people's mail and failed, which is a good point for the Tiny-2. Another question is what about third party traffic, which is not allowed at present. This is handled by another command 3RDPARTY which, when set to off, prohibits messages being left to any call other than the operators. If anyone tries to leave a third party message they are greeted with: NO THIRD PARTY MAIL ALLOWED.

Moving now to the operator's view of things, if a message has been left on the PMS, the operator's attention is drawn by the STA l.e.d. flashing about once per second. For retrieving messages there is an extra command MINE which lists all messages addressed to the operator.

Data Rates

Whilst I had the two TNCs setup back to back I thought I would try some data transfers to see what the effective data rate was over an error free link. To do this I sent an ASCII file containing 6141 characters over the link and timed the transfer, which turned out to be 135 seconds. The code used between the computers and the TNCs was 7-bit even parity with one stop bit making a total data word length of 10 bits. Some simple maths gives the total number of bits transferred as 6141 x 10 = 61410.

So to find the baud rate in bits/sec, you simply divide 61410 by 135 seconds giving 454 baud. Now considering that the data rate over the link is 1200 baud this means that the redundancy of the packet link and asynchronus data is 62.2per cent. This test was only done as a matter of interest and is not meant as a criticsm of the Tiny-2, just a comment on the protocol.

Summary

I have had the Tiny-2 on review for quite a while now and I must admit it has performed very well indeed. The various command enhancements with release 1.1.6 are all useful and I was particularly pleased with the PMS facility which also worked well.

So with the main packet activity these days concentrated on v.h.f. and u.h.f., the Tiny-2 slots nicely into the market in terms of size, performance and price.

The Tiny-2 is available from Siskin Electronics, Southampton Road, Hythe, Southampton SO4 5HU price £109.00. My thanks are also due to Siskin for the loan of the review model.

The next three deadlines are June 28, July 26 & August 23

Amateur Satellites

Reports to Pat Gowen G3IOR
17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD

Satellite Update

OSCAR-9 continues to give all users an excellent service and a strong signal to boot, but is continuing to fall back to earth, with the current calculations showing a re-entry towards the end of September or early October. The orbital period measured by consecutive Doppler TCAs on Sunday April 16 was 92 minutes and 49.9 seconds, and falling.

For those who wish to enter the numerous open contests for fall-out day and time, now also being run by AMSAT in USA, note that the later you leave your entry estimate, the more accurate you will be likely to be - but don't leave it too late, as all entries have to be received at least one clear month before the burn-out time given to in order to qualify for a prize. AMSAT-UK are allowing up to six different attempts per person for their UoSAT-1 fall-out contest. Entries for both the University of Surrey and the AMSAT-UK contest must be sent to G3AAJ, QTHR, but the single entry AMSAT (US) event has to go to AMSAT at PO Box 27, Washington, D.C. 20044, USA. For the G3IOR contest, the space book prize, send a single time and date of re-entry to the address given in this column, plus a short write up and a picture on your satellite activities and interests.

OSCAR-11 is in no such re-entry danger and is with us for a long time to come yet. A number of users report considerable variation of signal strength from both minute to minute and day to day. Whilst UoSAT-2 is further out than OSCAR-9, and thus for the same effective radiated power should be weaker in any case, this does not account for the variables which seem mainly absent on its predecessor.

Stan G4LWM, a keen satellite fan, has been noting the inconsistency of the downlink signal. He reports, "Whilst I have been getting a few problems in resolving complete passes, on Saturday April 22 OSCAR-11 was a splendid signal, with a perfectly solid signal". This date was an excellent day for h.f. propagation, with JA signals coming in from early morning to late afternoon on both 21 and 28MHz, and ZLs as strong as I have ever heard them. Theory would normally dictate the opposite, as dense ionisation and a high m.u.f. normally attenuate inversely to the elevation angle. An interesting research study of the level of UoSAT attenuation, relating this to the solar flux, dark or light path, satellite attitude from the telemetry, etc., is awaiting the attention of an interested enthusiast.

OSCAR-10 is "out of bounds" at the time of writing, but should be back with us again by the time you read this column, with a renewed lease of life and a well charged battery. Soon after last month's column was out, a request not to use the transponder came in from command supervising station Graham Radcliffe VK5AGR, unfortunately too late for inclusion. As it was, OSCAR-10 use was quite impossible, as stations attempting to employ the satellite's mode B transponder found that the frequency pulling of both c.w. and s.s.b. signals rendered the resulting 145MHz downlink totally unreadable, even when modestly powered uplinks were employed.

OSCAR-13 seems to be taking the brunt of the DX satellite communications and is steadily improving its communications support as the high point of the orbit moves north, with opposite hemisphere apogees now increasingly being "seen" from the UK.

Rod Clewes G3CDK, has been watching the OSCAR-13 telemetry frames whilst he also observes occupancy of the transponder passband. He reported that he has noted a.g.c. attenuation of up to 17dB on the transponder receiver input at times when the satellite use appeared to be minimal. "On one occasion," said Rod, "I could only hear a single Italian station who was S7 and two slightly weaker DLs, yet the a.l.c. was recorded at this steady minus 17dB, an enormous level of attenuation without apparent rhyme or reason".

One possible cause may be earth QRO radar in the amateur uplink band. This would not normally be heard by ear as Karl Meinzer DJ4ZC designed and incorporated a highly efficient radar blanker to counter this potential problem. It may well, however, show up as an input to the receiver and hence activate the a.g.c. system.

Vin G4ULS, is a very active OSCAR-13 user, who has been operating on over two thirds of the satellites in-range active times since its post-launch switch-on. His log of stations worked shows an interesting alignment of those countries and parts of the world most active. Vin said, "I have had QSOs with some 45 JA stations, about the same number of Ws in all districts,

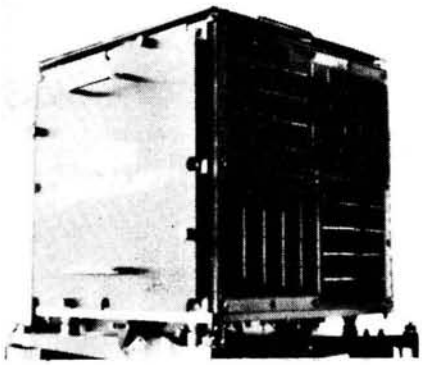


Fig.1

contacted 50 west Europeans, of whom 25 were DL stations and the other 25 generally distributed in the rest of west Europe. Additionally, I have made QSOs with some 25 stations in eastern Europe and the USSR". In view of the earlier pre-launch claims made of "a new amateur DX band" with such heralded ease of access even by mobile stations, this would not appear to be the evidence of the high level of activity that one might have expected. Undoubtedly the current excellent h.f. communication prospects and the poorer than forecast performance of OSCAR-13 have both limited the employment of the satellite, but a log of only 165 active stations from the whole world's possible access (except ZL) for such a keen and active user as Vin hardly shows symptoms of overcrowding.

Mode S is on again both as beacon and transponder activity now that good earth pointing is possible at close parts of the OSCAR-13 orbit, from mean anomaly 210 to 222. The current mode switching schedule will hold until May 3, after which until June 14 it will activate transponders according the the following regime:

Mode B from mean anomaly 003 to mean anomaly 160.

Mode JL from mean anomaly 160 to mean anomaly 200.

Mode S from mean anomaly 210 to mean anomaly 220*.

Mode B from mean anomaly 220 to mean anomaly 240.

All transponders off between mean anomalies 240 to 003.

* Mode S is on when the satellite is at a squint angle of less than 10 degrees, and the range is greater than 25000km.

Dave Rowan G4CUO, of Newark reports this month on the Japanese **Fuji**, which has been rather silent between our UK horizons due to insufficient charge of its batteries to maintain transponder operations. Dave works mode JA, mainly s.s.b., and finds that the transatlantic paths give him the most enjoyable QSOs. "George VE2LI is on most orbits," writes Dave, "as is Jim W8VXH in Ohio. WA4TGB in Tennessee and W9ODI are good DX, and are found on when passes emanate from equator crossing after 80 degrees west. New calls on OSCAR-12 include W1WYZ in Massachusetts and W9LCA in Illinois."

The operational schedule for JO-12 for June and July has, at last, been planned well ahead and reads as follows, where JD is digital (packet) mode, D is transponder off, and JA is analogue (s.s.b. and c.w.) mode.

Mode	Date	Time start (UTC)
JD	June 3	0546
D	June 4	0044 (e.g. JD is switched off).
JA	June 9	0425
D	June 9	2120 (e.g. JA is switched off).
JA	June 21	0143
D	June 21	1838
JA	June 24	0103
D	June 24	1758
JA	June 29	0035
D	June 29	1529
JD	July 01	1543
D	July 01	2355
JD	July 04	2113
D	July 05	1408
JD	July 07	1422
D	July 07	2234
JD	July 09	2046
D	July 10	1342

It is to be hoped that this plan can be maintained, and that we see an increase in use of this excellent satellite's DX transponders as a result of the awareness of the now publicised long term planned operation.

The forthcoming new **JAS-1-B** satellite is now due for launch with the Japanese MOS-1-B Maritime Observation Satellite on a H-1 rocket from Tenegashima in February 1990. The main payload will be placed into a sun-synchronous 99 degree inclination 103 minute period 900km altitude orbit so that it passes over a given longitude at a similar daily time, with a repeat pass every 17th day. Such an orbit has its limitations, as the satellite will be in cell charging solar illumination for only 66 per cent of each orbit, thus requiring good storage batteries and an adequate covering of solar cells with which to charge them.

JAS-1-B, like its predecessor JAS-1, now OSCAR-12, is very small, thus space for solar cells is very limited, the result of which power restrictions can be evidenced by the intermittent operations of OSCAR-12 itself. It is hoped that the utilisation of additional thrust from residual second stage fuel may be available to place the amateur satellite, launched after the separation of MOS-1-B, into a more elliptical higher apogee orbit. This will mean a far higher percentage solar illumination period per average orbit, and indeed extensive periods of series of orbits when no eclipse whatsoever is seen by the satellite, so permitting long periods of continuous operation of the transponders.

In addition, JAS-1-B will carry a total of 1520 solar cells, 900 of these measuring 10 x 20mm, and 620 of 20 x 20mm, requiring a slightly greater 40mm spacecraft diameter of JAS-1-B over Fuji. Fuji (JAS-1) carried 979 20 x 20mm silicon solar cells on a 400mm diameter. The cells will be the new gallium arsenide type which, being dual layer formations sensitive to both blue and red light, will give an additional improved energy conversion, providing some 11 watts of power at peak initial efficiency. Compared with the earlier model, which gave only 6.5 watts of peak power availability, the new satellite demonstrates a significant improvement in small area power production, which should keep the new bird

operative for most of the time except under prolonged eclipse conditions.

The antenna receive system, which was merely a slanted monopole aboard the first Japanese amateur radio satellite, gave periods of signal loss due to null lobes. JAS-1-B will carry a ring turnstile, to provide more isotropic behaviour, thus avoiding signal drop-out. The transmitter antenna will be shared by both the analogue and digital systems, using a circulator and phase shift network instead of the previous power divider.

The JARL have provided the following frequency and mode table for the forthcoming satellite:

Mode JA (analogue) (c.w. and s.s.b. inverting transponder):
Uplink passband:
145.900-146.000MHz.
Downlink passband:
435.900-435.800MHz.
Morse Beacon:
435.795MHz.
Mode JD (Digital):
Uplink frequencies:
145.850, .870, .890, .910MHz.
Downlink Frequency:
435.910MHz.
System:
AX.25 (level 2) protocol
(as OSCAR-12).

The microsats are fast approaching completion and the aim is to have them completed, tested and ready to go by May 15. One of the prototypes, complete with protective shielding for the solar panel, is shown in Fig. 2. The SPOT-II launch which will carry them aloft is still set for the middle of June, although in practical terms this would appear to be a little optimistic.

The LU-SAT is now known to be also carrying a half watt 70cm c.w. telemetry beacon, but this will not be activated on a continuous basis.

More information on the UoSAT-D and E spacecraft should be available in the next issue, just as soon as the current enormous workload in preparation for the July deadline is complete, and the specifications and parameters have been checked out.

"Radio" Satellites

I took time off one day, added a few contacts to the Robot logbook, and worked DL1NN, HG5AGZ, DJ5XO, OK1ANG, UA4FP, RS1A and UL7CA. No Ws were heard, let alone worked. Dave G4CUO, was pleased to work VE8NN for a new one and also noted the absence of W stations. Stan G4LWM, reported that the downlink signal was very weak at times, and that many f.m. terrestrial stations were transmitting in the downlink passband.

Andy Mironov RS3A, writes to say that no additional information is yet to hand on the Soviet RS-12/13 pair now ready for space. No firm launch date has been given, but it is generally accepted that this will take place in the summer of this year, soon now.

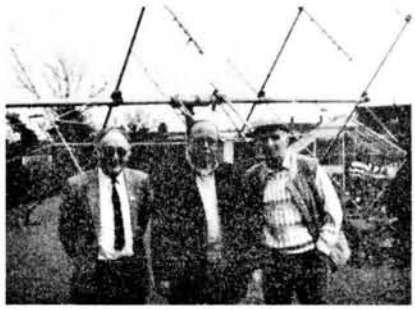


Fig.2

MIR

Sadly, it has to be told that whilst many stations including G4LUA and G0AHO have reported successful QSOs with U4 and U5MIR in the past month, no more amateur radio activity is expected until at least August. This is unfortunate, as a comprehensive schedule of training and split frequency operation had been planned in detail for what would have been the current mission. The story behind the curtailment of operations is told in full in the current "Info in Orbit" column of *Short Wave Magazine*.

Space Invaders?

John Branegan GM4IHJ, who from his QTH at Saline in Fife, Scotland keeps a very close and expert eye and ear on all space activities, reports that we have at least two presumably non-amateur satellites radiating a downlink in the amateur 430MHz band. "They are sending continuous unmodulated carriers Doppler-ing from approximately 435.980 down to 435.968MHz, centring at 435.974MHz," writes John. "One has a 103 minute period, and may be in a high inclination polar orbit at 900km altitude. The period brings one of them round to roughly the same AOS daily, e.g. 0707, 1653, 1838 and 2023UTC. The other is less predictable. One is on all the time, the other is switched off and on".

John does not think that he has missed an obvious AMSAT source, and considers them to be interlopers, possibly Soviet ELINT (Electronic Intelligence gathering satellites). "I would suggest that whoever they belong to, it is rather silly for them to use exactly the same frequency as several established amateur radio satellites," writes John. "However, they do offer amateurs excellent Polar experimental facilities, which we have missed since the demise of OSCAR-8 and the P-76 satellite, which also had a 435MHz continuous carrier downlink".

Lunar Beacon

It has recently been learned that it is the intention of the USSR to launch a Lunar Orbiter in 1992, and that it is part of the plan to land a vehicle in order to obtain some samples of "moonrock" for research purposes. Earlier muses amidst the US launch agencies also suggested that certainly interests, if not finances, lean toward a further lunar landing, possibly a joint venture with the USSR. In the light of this knowledge of an intended mission to the moon, it has been proposed to both sources the interest in an inexpensive yet valuable experiment that could form a part of the mission, which could involve non-commercial international co-operation to yield valuable and needed data. If there was a radio beacon on the surface of the moon, it would be an invaluable research tool. A further step would be to provide the lunar module with a radio transponder that would not only be used to indicate the two-way path effects. Financial income permitting, the entire package could be financed, built and tested under the auspices of the international AMSAT organisation. Facilities for this already exist within the USSR, Hungary, Japan, USA and at the University of Surrey in England, where numerous complex orbiting satellites and/or their modules have been successfully constructed. The question comes that if this should be brought to fruition, how could we help fund it, and how should we best use it? The thoughts of a "repeater" covering half the world at any one time, literally providing total world-wide propagation anomaly free amateur radio communications at v.h.f., u.h.f. and even s.h.f. (yes .. even antipodal such as G/ZL!) would certainly need some firm joint IARU planning and abidance to the ground rules laid down.

Dataspace '89

This highly popular event will take place at the University of Surrey from July 27 - 31 this year. Space does not allow enough room to publish all of the events, one of which will be an international meeting. Whether a novice learner or a highly experienced expert, there will be many topics, lectures, meetings, talks and demonstrations to fascinate you. Dataspace '89 may grab you too! Drop a s.a.s.e. to Ron Broadbent G3AAJ, Secretary of AMSAT-UK, at 94 Herongate Road, Wanstead Park, London E12 5EQ and you will get all the required details on the event and registration.

The next three deadlines are June 28, July 26 & August 23

Propagation

Reports to Ron Ham
Faraday, Greyfriars, Storrington, West Sussex R20 4HE

Using the Radio Telescope

1983 was a relatively "quiet" year for my solar telescope at 143MHz. Although continuous noise storms were recorded on February 3-6, March 7, 9 and 22, April 17, May 12, 13, 22 and 23, June 8-10, July 24, 29 and 31 to August 3, September 28/29 and October 9 and 15, the number of individual bursts, received between 1130 to 1430, was well down. While the February storm was in progress, **Cmdr Henry Hatfield** (Sevenoaks) often recorded solar noise at 197MHz in addition to his normal working frequency of 136MHz. It was no surprise to learn that aurorae manifested at 1915 on the 4th, 1407 on the 6th and 1500 on the 12th. For some years, several of us had an arrangement that as soon as aurora was sighted, or radio signals developed a "raspy" tone we telephoned our nearest colleague and so the "grapevine" began. There is little doubt that this storm was caused by the 6 sun-

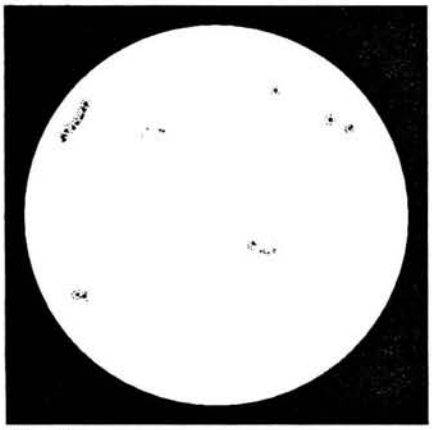


Fig. 1

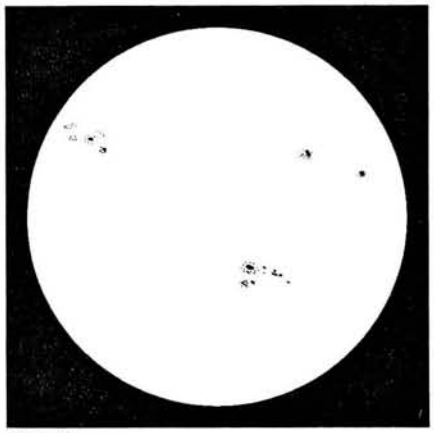


Fig. 2

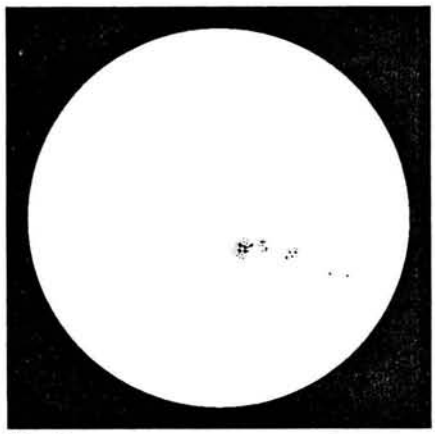


Fig. 3

WRM075

spot groups, 1 with about 20 spots, seen by Henry with his spectrohelioscope on the 2nd.

The activity from the 2 small groups with a long chain of about 20 spots and an eruptive prominence, which Henry observed on March 5, was responsible for the noise storm on the 7th and 9th and the aurora on the 12th. Solar bursts were heard on 28 and 50MHz on May 16, 22 and 28 and an ionospheric disturbance was reported by the BBC World Service at 1330 on the 12th. This was not unexpected because during the previous day Henry logged 3 sunspot groups and 2 flares. The longest individual bursts that I recorded in 1983 occurred at midday on October 9 which lasted 4 minutes, and 7 minutes on the 17th and December 4.

Solar

Back to 1989. From his observatory in Selsey, **Patrick Moore** drew the shape of the giant sunspot group as it neared the limb at 1200 on March 17, Fig. 1, plus others that he projected at 0810 on the 25th, Fig. 2 and another large group at 0700 on April 3, Fig. 3.

Ted Waring (Bristol) counted 29 sunspots on April 3, and 37 and 40 on the 14th and 20th respectively. Henry Hatfield, using his spectrohelioscope located the groups, filaments and quiescent prominences shown in Fig. 9.

During a contact on the 7MHz band with a station in Belfast on March 16, **Doug Smillie GM4DJS** (Wilshaw) noted that the incoming signal gradually fell from S9 to zero in about 60 seconds. He scanned both the 3.5 and 7MHz bands and found that almost all signals had gone indicating that a sudden ionospheric disturbance (s.i.d.), resulting from a solar flare had taken place. A most interesting observation and report Doug. **Ern Warwick** (Plymouth) heard a very strong "rushing noise (frying eggs sound)" on 14MHz from 1233 to 1240 on March 30 and from Storrington, **Fred Pallant G3RNM** reports hearing "nothing but solar noise" on 28MHz early on April 17 and "very high" bursts of noise at 0915 on April 22 and during the morning of the 24th.

Although there was plenty of solar activity with flares on most days, **Neil Clarke G0CAS** (Ferrybridge) reports that, "The monthly mean for March was 209 s.f.u. and like the sunspot numbers, the lowest for four months." Neil's computer print-out, Fig. 8, shows the daily variations of solar flux units through the month.

Henry Hatfield recorded a variety of individual bursts of solar noise at 136MHz on April 2, 4, 5, 15, 16, 18 and 19 and

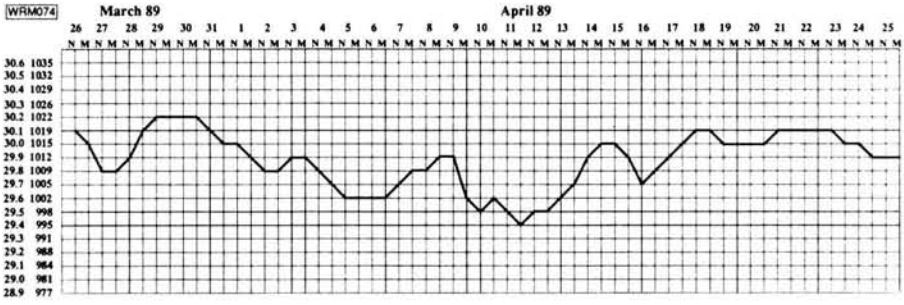


Fig. 4

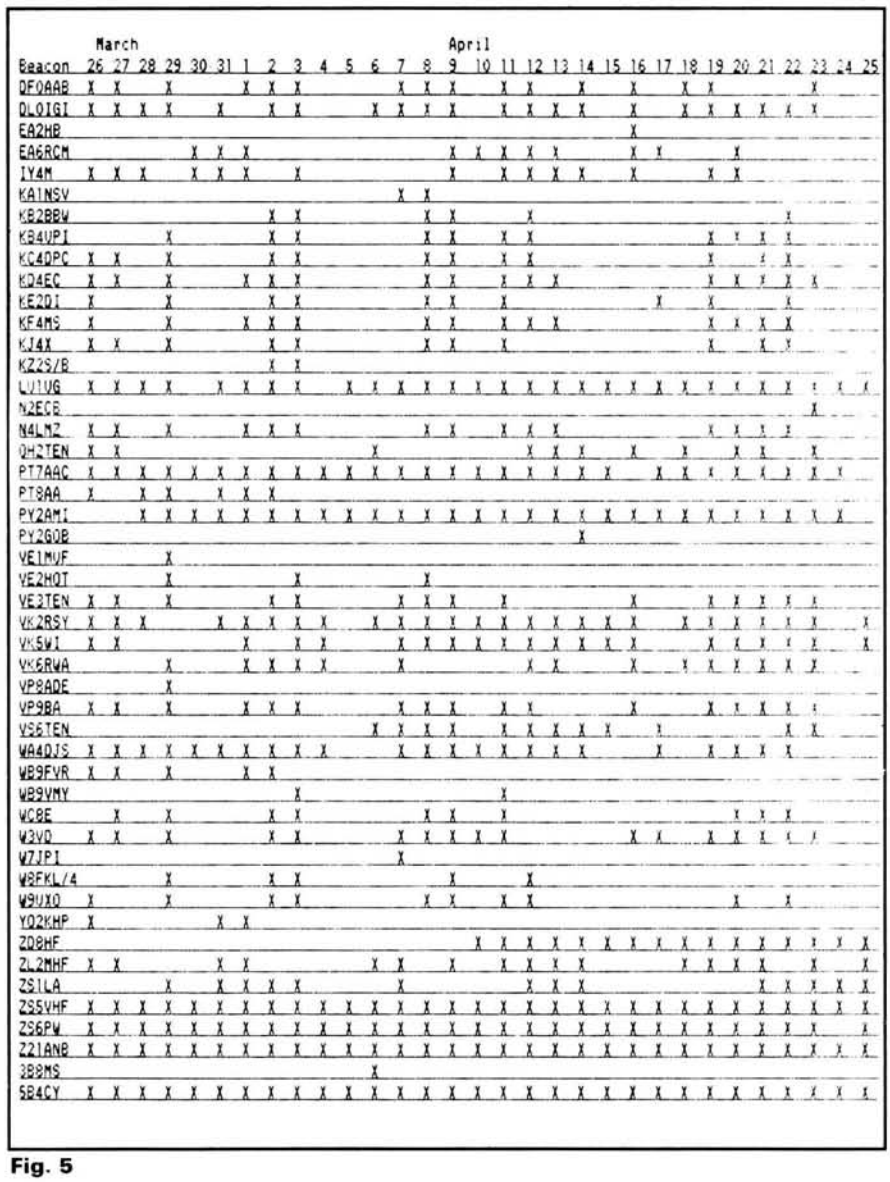


Fig. 5

SPECIAL NOTICE TO READERS

Although the proprietors and staff of *PRACTICAL WIRELESS* take reasonable precautions to protect the interests of readers by ensuring as far as practicable that advertisements in *PRACTICAL WIRELESS* are *bona fide*, the magazine and its Publishers cannot give any undertakings in respect of claims made by advertisers, whether these advertisements are printed as part of the magazine, or are in the form of inserts.

While the Publishers will give whatever assistance they can to readers having complaints, under no circumstances will the magazine accept liability for non-receipt of goods ordered, or for late delivery, or for faults in manufacture. Legal remedies are available in respect of some of these circumstances, and readers who have complaints should address them to the advertiser or should consult a local Tradings Standards Office, or a Citizen's Advice Bureau, or their own solicitor.

periods of more continuous noise at varying strengths on days 1, 3, 4, 5, 6, 15, 16, 17, 19, 20 and 21. His recorders also showed radio emissions from the sun at 1297MHz on the 5th, 16th and 17th. The communications receivers, used as tunable i.f. amplifiers and associated items in Fig. 6 and the home-brew chart-recorders in Fig. 7, form the "eye-piece" of Henry's radio telescopes which operate together at 136 and 1297MHz. One of the receivers is also used for checking the 28MHz beacon band.

Magnetic

"March was very active or stormy for most of the month with no quiet days," wrote Neil Clarke, whose chart of the Ap Index, Fig. 4, shows that giant spike around the time of that massive sunspot and intense aurora. "On the 13th it took off and reached 169," said Neil.

Ron Livesey (Edinburgh) the auroral coordinator for the British Astronomical Association received reports from Karl Lewis (Saltash) and Doug Smillie that their magnetometers had recorded storm conditions on days 3, 4, 7, 12-17, 19-23, 26-31. Ron himself, with his "jam-jar" magnetometer, recorded such conditions on most of the days mentioned.

Aurora

"The Royal Observatory Belgium reported aurora on March 13/14 over France, Belgium and the Netherlands," wrote Ron in his preliminary report for March to the BAA. He received reports of "Corona, all forms and colour", from 81 observers about the great event, "glows", "rayed arcs" and "coronas" seen from North Scotland and the weathership *Cumulus* at station Lima on 14/15, "rays" from Edinburgh on 16/17, "glows and arcs", "active rays" and "rayed arc" from Shetland on 24/25, 25/26 and 26/27 respectively, "active rays" from Edinburgh and Shetland on 28/29, "glow rays" from Edinburgh and Helsinki on 29/30 and "active rays" from Edinburgh on 30/31. In addition, Ron learnt that Doug Smillie heard tone-A signals (very raspy) from 133 stations in 14 countries on 13/14 and logged radio aurorae on days 3, 19, 23 and 31. **Vaclav Dosoudil OK2PXJ** (Kvasice) tells me that during the great aurora on March 13, OK2BZN and OK2PFN made tone-A contacts on 144MHz with stations in Belgium, England, France, East and West Germany, Holland, Northern Ireland, Poland, Scotland, Sweden and parts of the USSR.

Dave Coggins (Knutsford) heard auroral signals on some TV channels in Band I at 2000 on March 29, 1845 and 2100 on the 31st, 1845 on April 4 and 1625 on the 7th. He also noted auroral-type fluttering on the signals from the RWM time signal station in Moscow, on 15MHz around 2140 on the 3rd.

The 28MHz Band

"The 28MHz band does not seem to be very active. Doesn't seem to open till about 1600," wrote Ern Warwick on April 8. However, he found the 3rd "quite like old times" when it suddenly came to life at noon. Ern's beacon log has the remarks "very dead" on the 4th and 5th and "dead" on the 6th.

Dave Coggins found the 21 and 28MHz bands "dead" and 14MHz "very flat" at

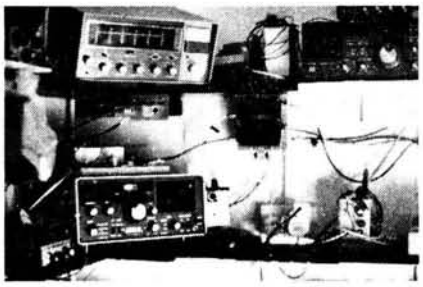


Fig. 6

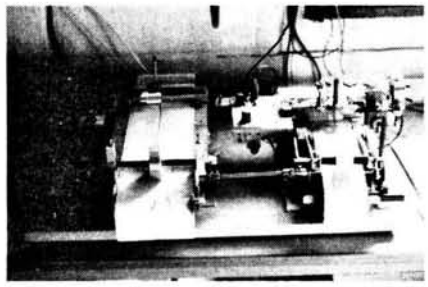


Fig. 7

2042 on March 29 and at 0630 on April 4, 28MHz was "dead" and 21MHz "almost dead". Dave could only find a few stations at 1200 and his check at 1830 showed that the band was almost closed. Dave's log also records "very few stations on 14MHz at 0630," on the 5th, "28MHz devoid of all signals at 0730," on the 15th and "28MHz practically dead all day," on the 24th. **Ted Owen's** (Maldon) beacon log was scribed "band dead" and "almost dead band" on April 5 and 17th respectively.

Fred Pallant thinks a "big blackout" occurred between 0800 and 1200 on April 17 because the only signal he could find on 28MHz at 0815 was the beacon GB3RAL and that was very "watery".

While stuck in a traffic jam on April 10, John Levesley G0HJL (Bransgore) heard an S9+ signal from Antigua on his mobile, but when he arrived home, twenty minutes later, 28MHz was dead. He also logged stations from Asia, Africa and north and South America on March 26 and 27 and April 8, 21 and 23 and Asia and Africa on April 2, 9, 12, 13 and 22 and Australia on the 8th and the USA on days 2, 13 and 22. After hearing the New Zealand beacon, ZL2MUF, several times, Don Hodgkinson G0EZL (Hanworth) added to his report for the month prior to April 24, "I managed to work into 'ZL' a few times myself, including ZL4OD in my home town, Invercargill, via the long path on the evening of the 12th."

Propagation Beacons

First, my thanks are due to Mark Appleby G4XII (Scarborough), Chris van den Berg (The Hague), Dave Coggins, John Coulter (Winchester), Vaclav Dosoudil, Henry Hatfield, Don Hodgkinson, Ken Lander (Harlow), John Levesley, Ted Owen, Fred Pallant, Ted Waring and Ern Warwick (Plymouth) for their excellent 28MHz beacon logs from which I compiled, Fig. 5. Owing to a spell in hospital Greg Lovelock's usual detailed report is missing this time, however, from us all "Get well soon Greg and we will be pleased to include your logs as soon as you are ready".

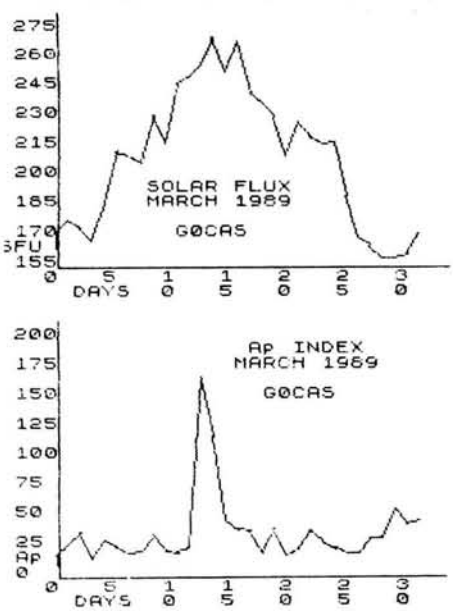


Fig. 8

"Not quite so lively this month," wrote Ted Owen on his log and Don Hodgkinson said, "The beacon report seems to be a bit thinner this time, with noticeably less being heard from North America and more from South America." Even so, he heard two new ones KZ2S/B in New Jersey and KA1NSV/B on 28.259MHz from Cape Cod and the new beacons for Ken Lander this period are KZ2S/B around 28.225MHz on April 3 and ZL2MHF on the 6th. Dave Coggins received the Australian beacon VK2RSY via the long-path at 2140 on April 11 and 12 and heard EA2HB on the 16th. Mark Appleby copied signals from a recent stranger, the Mauritius beacon 3B8MS, for a short while at 0735 on the 6th and a new one WB9VMY/B (Calumet) on appoximately 28.218MHz at 1645 on the 11th.

During this period Ken lander heard signals from the beacons IK6BAK on 24.915MHz on March 26, 31 and and April 1 and often logged CT3B, OH2B and 4X6TU/B and occasionally JA2IGY, KH60/B, LU4AA, W6WX/B and 4U1UN/B on 14.100MHz. At 1925 on April 6, Ken added HB9AR/P on 7.075MHz to the score.

Tropospheric

The slightly rounded atmospheric pressure readings for the period March 26 to April 25 were taken at noon and midnight from the barograph installed at my home in Sussex, Fig.4. Increases in the range of v.h.f. radio and television signals coincided with the movement of high pressure systems. For instance on March 29, Simon Hamer (New Radnor) received many European and Scandinavian stations in Band II and pictures from Belgium, Czechoslovakia, Denmark, Germany, Holland, Luxembourg and Norway in Band III (175-230MHz).

I heard Dutch and French stations in Band II (88-108MHz) at 1100 on the 30th, mainly French at 1800 on the 31st and found French and German broadcast stations respectively were predominant in the band during short duration openings on April 21 and 24. In Maldon, the readings on Ted Owen's barometer were similar to mine showing a peak of 1025mb (30.25in) on March 29 and a low of 992mb (29.3in) on April 11.

934MHz

From his holiday home in Deal, using a collinear antenna, Les Jenkins GB-37 worked stations in Basildon, Eastwood

and Hadleigh on March 24, Aylesham, Dettling, Southend and Sturry on the 25th and a couple in Leigh-on-Sea on the 26th.

John Levesley (UK-627) worked GY-186, in Guernsey at 161km, on March 27 and heard him again on April 2. While en-route to south Devon on the 31st he listened to a net which included stations from Bournemouth, Guernsey, New Forest, The Purbecks, Shepton Mallet, Torbay and Yeovil. Most signals were over 97km and the longest was around 240km.

Date	Groups	Filaments	Quiescent Prominences	Notes
30.3.89	1	19	6	
31.3.89	1	22	8	
01.4.89	1	17	11	
04.4.89	1			viewed despite cloud at 1013
07.4.89	3	24	12	
08.4.89	3	23	12	+small bright patch almost flaring on east limb
14.4.89	2	26	13	
15.4.89	2	28	12	
18.5.89	4	16	11	probably more as hampered by cloud
19.4.89	5	19	12	

Fig. 9

The next three deadlines are June 28, July 26 & August 23

Broadcast Round-up

Peter Shore

Expansion of output seems to be high in the news at present. Radio France International has announced increases to its broadcasts to Eastern Europe, without a cut in its French output. Languages to receive additional air time will be Russian, Polish, Romanian and Serbo-Croat. It will represent a 45 per cent increase of broadcast time to the Soviet Union, Poland, Romania and Yugoslavia. In an interview broadcast during March, the RFI Director-General. M. Montcel, stated that RFI's mission "is to teach democracy...we have not the mission to be a propaganda mission". Eight new staff members are being recruited to RFI and it is hoped that further additional staff may be employed in the near future. A full schedule will be published in this column in the next couple of months.

In Scandinavia, Radio Sweden has added Latvian broadcasts to its service for the Baltic countries. Every day there is now a fifteen minute transmission consisting of Estonian and Latvian, heard at 1645UTC on 6.065 and 1.179MHz. There has been no additional budget allocations for these two languages, but should the service be expanded to a 30 minute duration, then a complete new editorial section would need to be established resulting in increased costs.

Speaking of increases in costs, the Swedish TV licence will rise on Jul 1 to 884Kr a year (about £80) - makes our £66 a year look like quite reasonable value...!

Listeners to Radio Sweden's *Sweden Calling DXers* will be pleased to know that presenter George Wood got married in the last weekend in April. Our congratulations go to him and Anki, his bride.

However, not everything is rosy in the world of international radio broadcasting. At the end of March, redundancy notices were sent to all but a handful of the 61 full-time employees of the Christian Science Monitor's Monitor Radio and HF World Service. The development of a daily TV news programme has proved rather costly for the Christian Science Monitor and, although a third new h.f. station is in operation (see The Americas news section), life is clearly hard. From May 1, all the WCSN's h.f. transmitters in Maine, South Carolina and Saipan will carry the same programme, fed by satellite from Boston.

Radio Veritas Asia in the Philippines has announced the start of a Siberian service using their 250kW transmitter outside Manila. The station is funded mainly by West German Catholics.

Broadcasts from the Central Asian Republics of the Soviet Union are now beamed to the Moscow area on a daily basis, probably as a result of the release of transmitters from the jamming stations. Details are given in the news section.

In early April, a team from Radio Austria International flew to the People's Republic of China for talks about a possible exchange of broadcasting hours and a relay co-operation agreement. The delegation visited transmitting and relay sites in Beijing, Xian and Shanghai. Radio Beijing already has relay agreements with Switzerland, Canada, Mali and Spain.

Band II f.m. DXers might be interested in the first North Bohemian (Czechoslovakia) v.h.f. Band II transmitter which carriers Radio Prague Interprogramme on 90.9MHz, with 50 watts

Radio Marti, the US government station beaming to Cuba from Florida, has recently gone to 24 hour operation. TV Marti will start in October, using an antenna suspended from a giant industrial balloon. The station has been allocated US$16 million for a two year trial period.

A new domestic station was introduced by Norddeutscher Rundfunk in April. NDR 4 broadcasts around the clock on 612, 630, 702, 828 and 972kHz medium wave. The station is modelled on the BBC's Radio Four, although 30 per cent of the broadcasts are aimed at immigrants in several languages.

Whilst satellite receviers seem to becoming ever more popular, pity the people in Singapore, where the government has banned the sale and installation of satellite dishes for the reception of TV broadcasts from overseas. The government fears that "commercial TV (in foreign countries) ... might transmit harmful values".

European Stations

All times UTC (=GMT).

Danmarks Radio has a five minute news broadcast in English, heard on the P1 network at 0610 on weekdays. This is audible on the long wave frequency of 245kHz. German news has now been dropped.

Radio Finland broadcasts in English during the summer:

0230-0300 on 15.185 & 11.755MHz
0630-0655 on 11.755, 9.56 & 6.12MHz
0800-0825 on 21.55 & 17.795MHz (not Sunday)
0830-0855 on 17.795 & 15.245MHz
1100-1125 on 21.55 & 15.4MHz (not weekends)
1200-1225 on 21.55 & 15.4MHz (not weekends)
1300-1325 on 21.55 & 15.4MHz (to 1400 at weekends)
1405-1430 on 17.8, 15.185 & 11.925MHz
1830-1845 on 15.185, 11.755, 9.55 & 6.12MHz
2100-2125 on 11.945, 11.755 & 6.12MHz

Voice of Greece Balkan service at 1600 is now heard on 11.645 and 9.425MHz. No English is carried at this time, but programmes are in Albanian, amongst other languages.

Radio Norway International now uses 21.705 at 1600 (with English on Sundays).

Radio Portugal has English beamed to the Indian sub-continent at 1800 until 1830 on 15.21MHz.

Swiss Radio International's schedule of English language programmes for the summer to Europe:

0630 on 3.985, 6.165 & 9.535MHz
1200 on 6.165, 9.535 & 12.03MHz
1730 on 3.985, 6.165 & 9.535MHz
2130 on 6.19MHz

Worldwide:

0200 on 6.095, 6.135, 9.725, 9.885 12.035 & 17.73MHz
0400 on 6.135, 9.725, 9.885 & 12.035MHz
0630 on 12.03, 17.57 & 15.43MHz
1000 on 9.56, 13.685. 17.67 & 21.695MHz
1100 on 13.635, 15.57, 17.83 & 21.55MHz
1330 on 9.62, 11.695, 13.635, 15.57, 17.83 & 21.695MHz
1530 on 13.685, 15.43, 17.83 & 21.63MHz
1830 on 9.885 & 11.955MHz
2100 on 9.885, 13.635 & 15.525MHz

We mentioned in the news section that following the release of jamming transmitters in the Soviet Union, programmes from regional stations are now broadcast to Moscow. Here are some frequencies and times to try.

Central Asian Republics

Uzbek SSR 0200-1330 on 9.595MHz
1335-1900 on 17.84MHz
Kazakh SSR 0000-1530 on 9.69MHz
1535-1700 on 17.73MHz
Kirghiz SSR 2300-1500 on 9.735MHz
1500-1700 on 17.785MHz

Tajik SSR 2315-1300 on 9.66MHz
1300-1750 on 17.865MHz
Turkman SSR 0415-1430 on
9.565MHz
1430-1800 on 17.635MHz
Tatar Radio 0200-1400 on
11.945MHz
1400-1800 on 17.81MHz

Several schedules for Radio Moscow's English language services arrived on the day this article was being finished, and it might prove interesting for listeners to check out just how accurate (or otherwise) they are!

First, frequencies for broadcasts to the UK and Ireland:

2000-2100 on 11.82, 11.73, 9.775, 7.37, 7.33 & 1.143

Programmes include a weekly *Glance at the British Scene* heard on Saturday at 2010, *Moscow Mailbag* on Saturday and Sunday at 2035, *Round about the Soviet Union* on Friday at 2040, and *New Market* on Sunday at 2015. In this last programme, you might well hear advertisements for goods produced in the Soviet Union.

The World Service broadcasts to Europe around the clock, but I've selected some peak times for you to try:

0700-0800 on 17.66, 15.135, 15.26, 15.52, 15.585, 13.71,11.735, 12.01, 12.03 & 9.765MHz
1700-1800 on 15.135, 15.585 & 11.82MHz
2100-2200 on 15.535, 11.675, 11.73, 11.775, 11.82, 9.665,9.775, 7.16, 7.37 & 1.143MHz

Twenty pages of frequencies are listed for the World Service, which just goes to show that Des Walsh's observations which we reported in last month's columns are very true.

The North American Service to the East Coast is quite audible here:

2200-2300 on 15.405, 15.425, 15.245, 15.29, 15.405, 15.425, 13.605, 11.71, 11.73 & 11.75, 12.03, 12.05, 9.53 (from 2230), 9.765, 7.215 (from 2230) & 7.31MHz

Vatican Radio's summer schedule includes English to Europe:

0500-0520 on 9.645, 6.185 & 1.53MHz
0600-0700 on 11.74, 9.645, 6.248 & 1.53MHz (includes French, Italian & Spanish).
1030-1100 on 11.74, 9.645, 6.248 & 1.53MHz
1345-1400 on 11.74, 9.645, 7.25, 6.248 & 1.53MHz
1500-1530 on 11.74, 9.645, 7.25, 6.248 & 1.53MHz (and French, Italian & Spanish).
1900-1910 on 15.12, 11.7, 9.645, 9.625, 7.25, 6.248, 6.19, & 1.53MHz
1950-2010 on 9.645, 7.25, 6.19 & 1.53MHz

Middle East & African Stations

It may be possible to hear Burundi on 3.3MHz in the early morning - the station signs on at 0300 until 0700 on this channel and again in the evening to closedown at 2100.

A new programme schedule from Islamic Republic of Iran Broadcasting lists English:

1130-1225 on 7.215, 9.67 & 11.79MHz
1930-2030 on 9.022 & 6.035MHz

There have been reports of irregular usage of 7.285 for some evening broadcasts. In all, the station broadcasts in seventeen languages, mainly to the Middle East and Indian sub-continent.

Israel's English programmes are now:

0500 on 17.63, 15.64, 12.077 & 11.585MHz
1100 on 21.76, 17.575, 15.65 & 11.585MHz
1800 on 11.585 & 11.655MHz
1900 on 17.68, 147.625 & 17.585MHz
2000 on 15.64, 15.095 & 12.077MHz
2230 on 17.575, 15.64 & 12.077MHz
0000 & 0100 on 15.64, 15.615 & 11.605MHz
0200 on 15.615MHz

Radio RSA seems to have a new transmission beamed towards Namibia, noted from fade-in around 1730 until close down at 2056, on 4.965MHz, in parallel with 6.13MHz, according to a new Radio RSA schedule. The language used for this broadcast is Ovambo, the main indigenous language of Namibia.

Radio Damascus now uses 17.71MHz and 15.095MHz for its European language transmissions between 1800 and 2100, including English at 2000.

Asian & Pacific Stations

Radio Bangladesh in English now uses 11.55 and 7.52 between 1600 and 2000, with English at 1815-1900.

Radio Japan's service to Europe via the Gabon facility is now on 21.690MHz (ex 15.235MHz). The General Service at 1400 uses 15.41 (ex 11.935MHz), at 1500 9.595 and 15.14MHz replace 5.99 and 15.23MHz, whilst at 1700 11.705MHz is used, and at 1900 11.705 and 11.85MHz are heard. Four new channels are used at 2100 - 11.815, 15.23, 15.27 and 17.89MHz.

Radio New Zealand returned to standard (winter) time on March 4, and thus now broadcasts as per:

1830-2105 on 11.78MHz
2345-0145 & 0330-0730 on 15.15 & 17.705MHz
1000-1205 on 9.85 & 11.78MHz
0145-0330 on 15.15 & 17.705MHz (weekends only)

Radio Pakistan has been heard with good reception in the UK on new frequencies of 21.74, 17.66 and 15.605 for the English broadcast at 1600.

The station has a new address: Box 1393, Islamabad, Pakistan.

The Americas

WCSN, the Christian Science Monitor, has announced the following schedules for Boston transmissions (via Maine):

0000-0400 on 9.85MHz
0400-0600 on 9.87MHz
0600-0800 on 9.84MHz
1400-1600 on 15.58MHz
1600-2000 on 21.64MHz
2000-2200 on 15.39MHz
2200-2400 on 15.3MHz

Broadcasts from the new site in Cypress creek, South Carolina:

0000-0200 on 11.98MHz
0200-0800 on 9.455MHz
0800-1000 on 17.855MHz
1000-1400 on 9.495MHz
1400-1600 on 13.76MHz
2000-2200 on 21.64MHz
2200-2400 on 15.205MHz

The 0800 broadcast is beamed to Australia, the rest to North America.

WHRI broadcasts in Serbo-Croat at 1600 on 21.84MHz.

The next three deadlines are June 28, July 26 & August 23

ATV

Reports to Andy Emmerson G8PTH
71 Falcutt Way, Northampton NN2 8PH.

MCL Exonerated

A few months back I mentioned interference on 10GHz, the suspected source being Mercury Communications Ltd (MCL). I am not sure why MCL was suspected as the culprit (perhaps because the RSGB warned us some years back that MCL was sharing the 10GHz band and we should avoid causing QRM). I decided to ask MCL about their operations on this band, but they said they did not use the band at all. So who else does use 10.0 - 10.5GHz? I wonder if we amateurs cause them interference. I suppose not, else there would have been complaints ...

Cosmetic Matters

No, not what you thought. But when you have finished a home-brew project, how do you finish it off? And how can you spruce up those battered second-hand bargains? A little work and loving care can turn all of these into something quite smart.

Unpainted diecast boxes and aluminium project cases tend to look rather scruffy to me, especially if they are finished off with non-matching knobs and switches plus Dymo tape lettering. It's amazing how much money people spend on a project, only to leave it looking unfinished. All these instrument cases will look better for a coat of paint and applying a coat of cellulose paint from an aerosol can doesn't take long. It is best to degrease and prime the surface first: a good scrub in the sink with Vim or similar cleaning powder does both. Paint doesn't stick very well to fresh, shiny aluminium, as you may have found, though a coat a spray varnish helps. Also, the smooth finish paints from Hammerite (known as Smoothrite) stick superbly to all kinds of awkward surfaces. For my part I am rather fond of the hammer finish, and you can get Hammerite in spray cans now and these are much easier to use than the brushing stuff (which tends to drip and run).

Before spraying, of course, you should either remove switches and knobs or cover them up with masking tape. Lettering is best done with Letraset or similar rub-down transfers (you can get a big pack of ready made 'electronicky' words as well as meter scales and A-Z and 0-9 characters at your local Tandy shop, far cheaper than a single sheet of Letraset).

For final badging of your projects you can get plastics "Traffolyte" labels engraved by the people who visit the rallies, prices start at under £2 and you should state that you don't want the callsign badge-type pin on the back. You can also have them by post from Newton Engraving, Newton St. Petrock, Torrington, Devon EX38 8LU; they will send you an order form and they can do larger sizes than the badges you see at rallies. Although these engaved labels are a little old-fashioned, I still think they give a well-built project the "professional" look. They are also good for covering potentiometer holes drilled in the wrong place, as are the self-adhesive BATC badges you can buy for 20 pence!

Smartening up equipment acquired second-hand is a matter of judgement: often a repaint would not be justified. But you can clean accumulated grubbiness from instrument panels very effectively with lighter fuel and a paper towel. A dab of paint can cover up scratches - the felt pens filled with enamel paint which you can buy in model shops are particularly handy for this. Textured finishes on plastic and the crackle finish on old radio equipment should be cleaned with a toothbrush and lighter fuel, then rubbed with baby oil (yes!) and given a final wipe with a paper towel. You'd be amazed how a scruffy old case can be restored and made to look like new again!

First ATV Repeater in France

Our old friend F3YX (also known as the Pope of ATV) reports in *Radio-REF* (December 1988) that France's first amateur television repeater has received authorisation to go on the air. To begin it will have a provisional licence, with a full licence expected after six months. The location is Montagne de Cormeilles (in Department 95) and its technical details are as follows.

Input frequency: 1255MHz f.m. Video deviation: 3.5MHz. Modulation sense: positive. Receiver passband: 10MHz to 6dB. Audio subcarrier: 5.5MHz. Subcarrier level: 12 per cent. Video pre-emphasis: 8dB at 4.4MHz. Audio pre-emphasis: CCIR 50 microseconds. Trigger: video with syncs, plus 1750Hz on audio. Output frequency: 438.5MHz. Modulation: a.m. positive. Audio subcarrier: 5.5MHz f.m., CCIR norm, re-injected at 12 per cent of video level. Output power: 30 watts peak video. RX antennas: 4 panels of 10dB gain, orientated N-S-E-W. TX antennas: 4 dihedrals of 6dB gain, same orientation.

These antennas give virtually omnidirectional coverage (within 6dB), using horizontal polarisation. The repeater was constructed by F1HKT, assisted by members of the Argenteuil radio club (FF6KAL), and it is confidently expected that ATV activity in the Cormeilles district will now increase.

ATV Bulletin Board Too

F3YX has established at his QTH in Limours, near Paris, a bulletin board system specialising in ATV matters. The contents list sounds fascinating: names of active ATVers, DX distance records, details of ATV get-togethers, contest news, hints and tips, etc. Operating under the callsign F3YX-1, the mini BBS has a memory of 15K, and can be reached either direct or via the packet radio network. It is powered by batteries charged by solar cells and puts out 100 watts on 144.675MHz into two 9-element beams. The BBS runs on a KAM controller and a PC-XT computer equipped with a 20 megabyte hard disk. Marc F3YX says he hopes in this way to rekindle the flame of French amateur television, which seems to have lost its vigour lately despite 650 to 700 ATVers known to exist.

Optics News

How do you get 35mm slides onto video? It ought to be a straightforward task - but is it? Projecting them on a screen and then pointing a video camera at the screen seldom works out. Usually the image is wider at the top than at the bottom (the so-called keystone effect) and the centre of the picture is brighter than the rest (the "hotspot"). Much better is a proper slide scanner or at least a diascope, an internally-illuminated optical device which replaces the camera lens and gets the slide image straight into the video camera. Unfortunately both of these gizmos cost loads of money and seldom if ever appear on the surplus market. But there is another way.

The solution is a slide copier, an attachment which fits onto the lens of your camera. Illumination is provided by natural light, then using the macro setting on your existing zoom lens and the optics in the slide copier you can frame up the slide image. In this way slides can be televised very satisfactorily, the only limiting factor being the resolution of your camera tube (or chip). Subjectively the results are very good.

So where do you get hold of a slide copier? Not a camera shop: they sell them but they seldom fit video cameras. A specialist dealer should have them, and a very good value offering (at £29.95) is that from SRB Film Service (286 Leagrave Road, Luton, Beds. LU3 1RB. Tel. 0582-572471). Adaptors are supplied to fit filter rings from 49mm to 58mm. SRB also have warming and cooling colour filters and a macro-zoom kit to enable you to enlarge specific areas of the slide image.

Another very useful service of SRB is making stepping rings to order: I had an ancient zoom lens with a filter thread which did not match any modern lens attachments. But at a modest cost SRB made an adapter ring so I can use a slide copier with this old lens on my 405-line cameras. Well recommended, and SRB sell many other video and normal camera accessories at discount prices - ask for their catalogue.

It Never Rains in California

... but they do have some interesting TV repeaters! , In fact southern California now has three repeaters with their output on 923.25MHz. These repeaters are 160km apart, so they cannot "see" each other but they are all in sight of one central repeater. This looks at each of the 900MHz outputs on a voting basis and relays the chosen input on 1253MHz. Fascinating! Repeater input is always on 434.0MHz, incidentally. Thanks Tom W6ORG for this interesting snippet.

Video Line Input

Final word this month is extracted from *P5*, the excellent newsletter of the Severnside Television Group. Pat Janes GW1SXU reports that the American model train firm Lionel is now advertising an on-board video camera to give you a "driver's eye" view of the track ahead. This should certainly make people see railway modelling in a new light.

The camera is monochrome only (not surprising) but that means c.c.d. cameras must be available in the USA at an affordable price. As I have mentioned before, they give a superb picture, even in low-light conditions, and as soon as the price comes down I shall procure one to put on the shack wall. With a wide-angle lens it should provide excellent pictures.

The next three deadlines are June 28, July 26 & August 23

COMPETITION

It's not too late to enter our competition to win a Mizuho MX-series QRP h.f. transceiver, worth £179 or £189 depending upon frequency band.

The entry form appeared in our June 1989 issue - If you haven't got a copy, you can still get one by post from PW Post Sales Department, Enefco House, The Quay, Poole, Dorset BH15 1PP price £1.40 including post and packing!

MIZUHO No. 2

Your entry must include the **two Mizuho corner flashes** cut from last month's issue and this one.

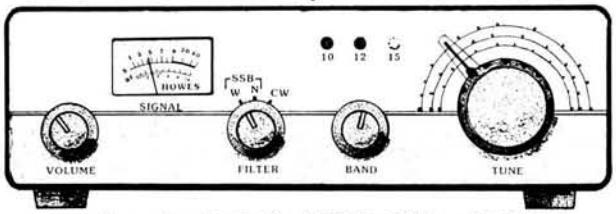
Hurry, hurry! The competition closes on Friday 14 July 1989.

C.M. HOWES COMMUNICATIONS

VISA Access

Mail order to: EYDON, DAVENTRY NORTHANTS NN11 6PT
Tel: 0327 60178

NEW RECEIVER
– Catch the DX on 10, 12 & 15 Meters!



concept receiver featuring DXR10, DCS2 and CSL4 Kits

Now that the sun's activity is high, propagation on the highest frequency shortwave bands is becoming excellent, with many DX stations, and much intercontinental working.

A brand new **HOWES** receiver, the **DXR10** has been developed to give the home constructor the opportunity to get in on the action. This is a three band receiver covering 10, 12 and 15 Meters. The prototype I have been using certainly pulls in the stations in a most impressive manner!

Like our very popular **DcRx** single band receivers, the **DXR10** is designed to be easy to build and within the scope of the beginner, whilst offering an amazingly good level of performance for a simple set. Technical features include a double balanced mixer, bandpass input filtering (which requires no tuning or set up adjustment), active AF filter, and plenty of audio output to drive a loudspeaker or headphones. Suitable for holiday, portable and home station use.

The price is still to be fixed at time of writing this advance information, but it should be **under £30 for the kit.** Ring or write for the exact figure, they should be in stock by the time this advert appears in print.

Some other HOWES KITS:–

ASL5 Dual Bandwidth Filter – worthwhile extra filtering and selectivity for virtually any receiver. Simply connects in line with external 'speaker or headphones.
Kit: £14.90 **Assembled PCB: £22.50**

CSL4 Dual Bandwidth Filter – the same excellent filtering as the ASL5, but designed for internal fitment with our receiver kits. Really sharp selectivity for CW or SSB.
Kit: £9.90 **Assembled PCB: £15.90**

CTU30 Antenna Matching Unit – an ATU for use on all **HF bands and 6M** for receiving or transmitting at up to 30W RF. High quality performance at a sensible price.
Kit: £27.90 **Assembled PCB: £33.90**

DCS2 Relative Signal Strength Indicator – or "S meter" in common parlance! Special **HOWES** custom made meter (see picture), with a two chip driver circuit for use with all our receiver kits. Adds a touch of "class"!
Kit: £7.90 **Assembled PCB + meter: £11.90**

There are over thirty different kits in our range. We have **receivers from £14.80,** and **QRP transmitters from £13.80.** HOWES KITS interlink, so that you can start with, say, a simple receiver and if you wish, expand it into a full transceiver at a later date. Most kits are suitable for the inexperienced constructor, as well as the "old hand"!

If you would like more information on any item, or a copy of our catalogue showing our whole range of kits, simply drop us a line enclosing an SAE. Technical advice and sales are normally available by 'phone during office hours.

All **HOWES KITS** come with full, clear instructions, good quality PCB (drilled, tinned and screen printed with the parts locations), and all board mounted components. Delivery is normally within 7 days.

PLEASE ADD £1.00 P&P to your total order value.

73 from Dave G4KQH, Technical Manager.

F.J.P. KITS & COMPONENTS. Tel: 05435-6487 for P.W. Kits

VISA

Transverters for 6m or 4m with 2m or 10m IF, 1.5 watts out on 6 or 4m ..... **£46.00 inc P/P**
P.W. Meon 0.5w out as above 10m IF **£40** or 2m IF **£44** inc extra PCB Attenuator
Linear 0.5-1.5 watts in for above also suits 2m mobile ..... **KIT £29.00 inc P/P**
P.W. Zenner Diode tester kit ..... **£12.50 inc P/P**
2 Tone Osc. May '89 ..... **£33.50 inc P/P**
P.W. 455-460 khz IF wobbulator inc box etc ..... **£16.25 inc P/P**
P.W. Woodstock Shortwave converter ..... **£26.50 inc P/P**
P.W. Simple 50 mhz converter to work cross band ..... **£22.00 inc P/P**
Full kit Sept 86

Frequency counter Prescaler for 600 mhz plus inc ICSP86 series, diecast box ..... **£24.00 inc P/P**
P.W. Diposc Oct 85 inc. diecast box ..... **£18.50 inc P/P**

Amateur kits. All boxed and complete with instructions.
Lists Free with 19p stamp

All kits use full spec. components with reprints if required, other P.W. kits available. Order to **F.J.P. KITS, 63 Princess Street, Chadsmoor, Cannock, Staffs. WS11 2JT.** P.O.s — Cheques. Credit Cards. 7-14 days delivery on Cheques. 48 hrs plastic.
Callers by appointment please.

PLEASE MENTION PRACTICAL WIRELESS WHEN REPLYING TO ADVERTISEMENTS

G4ZPY PADDLE KEYS

Britain's first Gold Plated Morse Keys. See them on display at Brighton, Woburn Abbey, Bolton.
Send for our Colour Illustrated Brochure.
4¼" × 6¼" SAE to: **41 Mill Dam Lane, Burscough, Ormskirk, Lancs L40 7TG. Phone No. 0704 894299.**

PW MEON Transverter kit

Complete Kits Available to Construct this very popular and well proven Transverter. Five versions available with 28MHz OR 144MHz I.F. 28MHz I.F. Available in 50MHz, 70MHz or 144MHz versions 144MHz I.F. Available in 50MHz or 70MHz Versions. Output approximately 0.5 Watt with provision for adding a PA in the same enclosure if required. The kit includes the specified Diecast Box, PCB, Relay, Connectors, Crystal, All Components, Hardware, Wire and Cable.

COMPLETE KIT £49.45 Including Postage and VAT

Cheque P.O. or Access to: CPL ELECTRONICS, 8 SOUTHDEAN CLOSE, HEMLINGTON, MIDDLESBROUGH, CLEVELAND TS8 9HE
Telephone 0642 591157

Many other kits available plus a wide range of components, hardware tools, test equipment etc. SAE for Free Price Lists. Access Mail or Telephone orders welcomed.

SPECTRUM COMMUNICATIONS
MANUFACTURERS OF RADIO EQUIPMENT AND KITS

New single board TRANSVERTER

For 2, 4 or 6 metres with 10 or 2 metres IF. 500mW output and repeater shift facility—phone for price and details.

MULTIMODE CB CONVERSION KITS — PHONE FOR DETAILS AND PRICES

CB TO 10 FM CONVERSION BOARDS, for rigs with LC7137 and TC9119 to give 29.31 to 29.70MHz. Built and aligned board SC29 **£18.50**. Or send your rig and we'll fit it **£31.50** inc P&P, **£35** inc P&P for base rigs. For rigs with MM55108 use SC29F board **£15**, or **£28** fitted.

FM CONVERSIONS FOR YAESU & KENWOOD, for rigs with AM **£64** boards or **£108** fitted, rigs without AM **£74** boards or **£118** fitted. Add **£16** for Valve only rigs. State rig type when ordering.

RECEIVE PREAMPS, 2, 4, 6, or 10 metres. RF switched and DC sensing. 100W power handling, gain panel adjustable 0-20dB, NF 1dB on 2m, 4m & 6m 3.5dB on 10m. 13.5V negative ground operation. Excellent performance at a reasonable price. Types RP2S, RP4S, RP6S, & RP10S. PCP kit **£14.75**. PCB built **£22.25**, Boxed kit **£25**, Built & tested **£35.50**.

TRANSVERTER, single board ½W out for 2m or 4m or 6m. 10m drive 25mW-500mW. Types TRC2-10, TRC4-10, or TRC6-10. PCB kit **£39**, PCB built **£54**. Boxed kit **£54**, Built & tested **£83.25**.

TRANSVERTER, receive converter and 2.5W transmit converter in single boxed unit. 10m drive 10-100mW unbuffered, types TRX4-10H & TRX6-10H. Boxed kit **£60**, Built & tested **£99.50**. Buffered types for use with 10m rigs giving – 6dBm drive, TRX4-10B & TRX6-10B, Boxed kit **£68**, Built & tested **£115**. With interface unit for use with 2m drive ½W-5W types TRX4-21 & TRX6-21, Boxed kit **£68**, Built & tested **£115**.

FREQUENCY MOD–DEMOD BOARD converts AM only synthesized rigs with 455 KHz IF to FM. Type FM455, PCB kit **£8.25**, PCB built **£12.25**.

NOISE SQUELCH, mutes rig when noise is too high. Allows reception of weak signals between noise bursts. PCB kit **£9.50**, PCB built **£14**.

TRANSMIT AMPLIFIERS, linear single stage, gain 10dB, 30W output, ideal for FT290, FT690, etc. RF switched and DC sensing. Types TA2S1, TA4S1, & TA6S1, PCB kit **£33**, PCB built **£40.25**, Boxed kit **£39**, Box built **£49.50**.

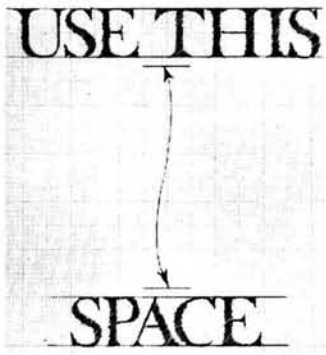
TRANSMIT AMPLIFIERS, linear two stage ½W in 20/30W out, unswitched, suitable for MEON. Types TA2U2, TA4U2, & TA6U2, PCB kit **£41.25**, PCB built **£52.50**, Boxed kit **£45**, Boxed built **£59.25**. Switched version for use with Spectrum transverter, types TA2S2, TA4S2, & TA6S2, PCB kit **£47**, PCB built **£60**, Boxed kit **£58.25**, Boxed built **£72.50**.

VAT & P&P INC PRICES
Delivery within 14 days if available
24 hr answering.

SHOP TIMES: 9am-1pm & 2pm-5pm TUES-FRI
9am-1pm & 2pm-4pm SAT
CLOSED SUNDAY & MONDAY

Access VISA

UNIT B6, MARABOUNT INDUSTRIAL ESTATE, DORCHESTER, DORSET. TEL: 0305·62250



SMALL ADS

The prepaid rate for classified advertisements is 42 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £13.90 per single column centimetre (minimum 2.5 cms). Please add 15% VAT to total. All cheques, postal orders etc., to be made payable to Practical Wireless. Treasury notes should always be sent registered post. Advertisements, together with remittance should be sent to the Classified Advertisement Dept., Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP. Telephone (0202) 676033.

Whilst prices of goods shown in advertisements are correct at the time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.

Receivers and Components

QUARTZ CRYSTALS and FILTERS

Large numbers of standard frequencies in stock for amateur, CB, professional and industrial applications.
Stock crystals **£5.50** each (inc. VAT and UK post). Any frequency or type made-to-order from **£6.50.**
Phone or SAE for lists.

GOLLEDGE ELECTRONICS
Merriott, Somerset, TA16 5NS.
Tel: (0460) 73718.

SCANNING? For a copy of our new catalogue of frequency listings and radio modifications, send a large s.a.e. to S.S.C. PO Box 71, Bournemouth, Dorset BH9 1DT.

AIR BAND RADIO – Steepletone FM/AIR/MW £9.95. Also B.F.O. kit, resolves single-side-band on almost any radio, £9.95. Corrigan Radiowatch, 7 York Street, Ayr KA8 8AR.

Kits

KANGA PRODUCTS

Kits for the Amateur, Budding Amateur and the Listener

Sudden DC Receiver	£17.95
Power Supply Kits	£14.95
A.F. Amplifier Kit	£12.95
Morse Practice Oscillator	£12.95
Iambic Keyer Kit	£16.95
100 Watt Dummy Load	£10.45
Crystal Marker Kit	£13.95
Frequency Counter/Dial	£21.95
'Oner' HF Transceiver	£27.50
Top Band Kit for the FT707 & FT77	£29.95
Dual Band Receiver (20m & 80m)	£36.95

(some kits are supplied semi-complete) Please add £1.00 P&P

SEND A LARGE SASE FOR FREE CATALOGUE
3, LIMES ROAD, FOLKESTONE CT19 4AU
Tel: 0303 276171

Wanted

WANTED, VALVES, Transistors, I.C.s, Plugs, Sockets, Shop clearance etc. esp. valve types PX4, PX25, KT66, KT88. If possible send written list for reply by return. BILLINGTON VALVES – see our ad Page 71.

SURPLUS ELECTRONIC COMPONENTS. Test gear, computers, amateur. Bought for cash. 0425 274274.

WANTED, instruction manual and plug-in's for Hewlett Packard 141A Oscilloscope. Ken. 0924 366152.

Educational

COURSE FOR CITY & GUILDS, Radio Amateurs Examination. Pass this important examination and obtain your licence, with an RRC Home Study Course. For details of this and other courses)GCE, GCSE, Career and professional examinations, etc.) write or phone: THE RAPID RESULTS COLLEGE, Dept. JX26, Tuition House, London SW19 4DS. Tel. 01-947 7272 (9am-5pm) or use our 24hr Recordacall Service: 01-946 1102 quoting Dept. JX26.

Antennas

TRAPS FOR D.I.Y. Tribander Beams & Anti-T.V.I. Trap-Dipoles. Aerial D.I.Y. Bits, Baluns, Data: 28p SAE. Aerial guide £1. G2DYM, Uplowman, Devon, EX16 7PH (03986) 215.

Service Sheets

ACCESS **MASTERCARD EUROCARD**

TECHNICAL INFO SERVICES (PW)

76 Church St., Larkhall, Lanarkshire ML9 1HE
Callers during business hours to 2 John Street, Larkhall ML9 2ET
Phone 0698 884585 Mon-Fri 9-5, 0698 883334 any other time FOR FAST QUOTES
IMMEDIATE DESPATCH OF ALL Phone Orders by ACCESS, etc. or to Listed Customers
WORLD'S LARGEST COLLECTION OF SERVICE MANUALS . . . from £3.50 to £50 . . . Most unobtainable elsewhere
Every issued FULL SIZE SERVICE SHEET in stock; CTV's or Combinations £3.50/Singles £2.50; Plus LSAE
LSAE for any Quotation, plus FREE large Catalogue, STREE Review, Pricelists, etc.
For £3 . . . Comprehensive Service Manuals & Sheets Catalogues PLUS 1988 Chassis Guide & £4 Vouchers
Spectrum Repair & Service Guide **£5.00** Kings CTV Servicing **£14.95** Video Recorders Service Guide 3rd Ed **£20.00**

TECHNICAL MANUALS, AR88, CR100, R210, HR0, £4 each. Circuits only 150 pence, plus LSAE, lists thousands. BENTLEY, 27 De Vere Gardens, Ilford, Essex IG1 3EB. Phone 01-554 6631.

WORKSHOP SERVICE MANUALS

Video Recorders – **£12.50**
Most Colour TV, Audio, Test, Vintage, Amateur etc. – **£6.00**
Please state Make/Model/Type with order.
FREE Catalogue Unique Repair and Data Guides with all orders or LSAE for your copy.
MAURITRON ELECTRONICS LTD (PW),
8 Cherry Tree Road, Chinnor, Oxon, OX9 4QY.
Telephone: (0844) 51694.

Veteran & Vintage

FOR VALVES, Service Data, Amplifiers and Radios, try the Vintage Wireless Co., first. Send for free information package. 1989 Catalogue available April £4.00. Cossham Street, Mangotsfield, Bristol BS17 3EN. Tel. 0272 565472.

Computer Software/Hardware

'A' LICENCE ASPIRANTS

Complete morse tutorial program AMSTRAD PCW 9512/8512 lessons VIDEO and AUDIO full curriculum, not a string of morse. Disc **£9.95** inclusive or sae.

Details:
LUCID PUBLICATIONS,
P.O. Box 82, Ramsgate, Kent CT12 6YZ.

Computer Software/Hardware Cont.

NOW YOU CAN
SEND FAX
USING YOUR
SPECTRUM

JOIN THE GROWING GROUP OF FAX USERS. SEND AND RECEIVE FAX, USING YOUR SPECTRUM.
ALL THE BENEFITS OF OUR VERY POPULAR RECEIVE ONLY PROGRAM, AND THE ABILITY TO TRANSMIT AS WELL!!
INTERFACE INCLUDES AUTO PTT, TONE GENERATOR AND DRUM SPEED GENERATOR!
SEND PREPARED DISPLAYS (SCREENS) OR JUST TYPE IN YOUR MESSAGE AND SEND IT.
COMPATIBLE WITH EXISTING FAX MACHINES.

PROGRAM ONLY £15
SUPPLIED ON TAPE. ADD £3 +3 DISC.
INTERFACE £48
A "TRADE IN" ALLOWANCE OF £18 IS OFFERED AGAINST YOUR RECEIVE ONLY SYSTEM.
SEND LARGE SAE FOR FULL DETAILS & PRODUCT LIST.

J.B.P. ELECTRONICS LTD.
Unit 45, Meadowmill Est, Dixon Street, Kidderminster DY10 1HH. Tel: (0562) 753893

COMPUTER REPAIRS & SALES. Fixed price repairs from £16 inclusive of p&p, VAT, and 3 month guarantee. We repair and sell Amstrad, Acorn, Atari, Commodore, Sinclair – Phone NOW for details. Advance Electronics (NE) Ltd, The Old Ropery, Deptford Terrace, Sunderland SR4 6DD, telephone (091) 5108040.

COMMODORE COMPUTERS (+4, C16, 64, 128). "MICROCOM" cw/rtty tx/rx with superb morse tutor. "TURBO LOG" ultimate high speed station log. "MICROCOM INTERFACE" ready built. S.A.E. to: Moray Micro Computing, Enzie Slackhead, Buckie, Moray, AB5 2BR. Tel. 0542 7384.

COMMODORE 64 converts from MHz to metres, calculates aerial length, testcard and colour bars, menu driven. Cassette £5. R. Measey, 8 College Crescent, Oakley, Nr Aylesbury, Bucks.

ORDER FORM PLEASE WRITE IN BLOCK CAPITALS

Please insert the advertisement below in the next available issue of Practical Wireless for ..... insertions. I enclose Cheque/P.O. for £ .....
CAT. heading .....
(Cheques and Postal Orders should be made payable to Practical Wireless)

NAME .....

ADDRESS .....

.....

PRACTICAL WIRELESS
Classified Advertisement Dept.,
Enefco House, The Quay,
Poole, Dorset. **Telephone (0202) 676033**
Rate **42p** per word, minimum 12 words.
Box No. **60p** extra.
PLEASE ADD 15% VAT TO TOTAL

Company registered in England. Registered No. 1980539. Registered Office: Towngate House, 2 Parkstone Road, Poole, Dorset, BH15 2PJ. 7/89

For Sale

SONY ICF7600DA World receiver, unused and boxed, normal price £129.00 for £80.00. Telephone 041 956 2811 after 5.30pm.

NEW REALISTIC SCANNER PR2005 25mHz-520mHz and 760mHz-1300mHz 400 channels. Full features £329.95. Free scanner book and free P&P. LINK ELECTRONICS, 228 Lincoln Road, Peterborough PE1 2NE. Tel. 0733 45731. Access or Visa cards accepted.

BARGAINS FOR CALLERS (check re. hols. first) 1989 ARRL Handbooks £11.99. Ant. Book £9.99. J. Beam, HF Beams less 12½% till end July. G3LLL see below.

G3LLL OFFERS Ten Tech Paragon & Corsair. CW filters FT101ZD, 902, 107, 707, & 102 £40 post paid. Black Star freq counters 600MHz £145pp 2.4 GHz £335pp. Full range Yaesu. Valves for Yaesu (be careful some batches give ½ power, we batch test). 6146B USA £33 matched pair. 6JS6C N.E.C. £38 matched pair. 12BY7A USA £7pp. 12BY7A N.E.C. £22pp. Improve your FT101E/B new band kits or double balanced receive mixer £20 each. S.A.E. for leaflet. Amtor RTTY packet? It's easy with PK232 call for DEM. 24AMP P.S.U.'s DRAE £150 + carriage. HOLDINGS AMATEUR ELECTRONICS, 45 Johnston St., Blackburn BB2 1EF. (0254) 59595 (15 mins. off Junct 31, M6, free parking at door). Phone before calling.

70MHz FULL SPEC CRYSTALS. Pye Westminster 70.26 AM/FM; 70.450, 70.425 and 70.475MHz FM. Ex stock at £10.50 per pair. C.A.R.E. (North West) Ltd., 12 Leeside Close, Liverpool L32 9QT. Tel. 051-426-2546.

POLYPROPYLENE GUYROPE – Don't waste money on small quantities – buy 220 metre coils! 4mm £12.50. 6mm £17.50 + £2.50 Postage. Cheques – 'ROPE-LINK', Cadence, Battle Road, Heathfield, Sussex TN21 9DR.

ANNOUNCING THE PC289. 160m. QRP four transistor phone/CW transmitter. Not a kit. £24. SAE for details. J C Electronics, 2 Mostyn Avenue, Prestatyn, N. Wales LL19 9NF.

FOR SALE, BETAMAX VCR plus 44 recorded tapes any reasonable offer considered. J H Kitchener, 101 Highfield Road, Tring, Herts. HP23 4DS.

Miscellaneous

WAVEGUIDE, FLANGES & DISHES. All standard sizes & alloys (new material only) from stock. Special sizes to order. Call: EARTH STATION 01-228 7876. 22 Howie Street, London SW11 4AR.

G2VF LOOP ANTENNAS COMPLETE WITH ATU FOR H.F. HAM BAND TRANSMISSION (SWR One to One 40, 15 and 10 and One Point Five to One 80 and 20) **AND SWL's, AND LONG AND MEDIUM WAVE BANDS FOR BCL's.** Loops 21 inches square or triangle. No special skills required. Circuits, Parts Lists with sources of supply assembly data. **HIGH FREQUENCY LOOP** 80 to 10 Metres **£5. LONG AND MEDIUM WAVE LOOP** for BCL's **£3. LONG WAVE MEDIUM WAVE AND SHORT WAVE LOOP** 1500 to 10 Metres **FOR THE BCL AND SWL £8. SHORT WAVE ATU FOR LOOP OR LONG WIRE ANTENNA £4. SHORT WAVE ATU BUILT IN PRE AMP FOR LOOP OR LONG WIRE £7.** Pre-amp LW, MW and SWave **£2. MW LOOP** with pre amp ATU **£3. PRE AMP FOR G2VF HF** Loop or ATU **£4.** SAE for details. All projects DIY. Photo Copy HRO Manual £4.

F. G. Rylands, 39 Parkside Avenue, Millbrook, Southampton SO1 9AF Tel. (0703) 775064

HEATHKIT U.K. Spares and Service Centre. CEDAR ELECTRONICS, Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel. (0684) 73127.

Valves

Rallies

INDEX TO ADVERTISERS

YOUR LOCAL DEALERS

SOUTH WALES

ELECTRO MART

Equipment, Components, Howes Kits, Eldy Kits, AR Gear and much more.

TAILLWYD ROAD
(off Main Road)
Neath Abbey, Neath
Tel: 0639 644111

IRELAND

Radcom Electronics

Icom, Yaesu and most Amateur Radio Accessories ex stock.

NEW PREMISES:-
Unit 4, Albert Quay, Cork City.
Tel: 021-632725 and 088 553947
(Mon-Fri 9-5 and Sat 9-3.45)

LONDON

Henry's

27MHz/934MHz Rigs & accessories in stock. Lists – S.A.E. (A4) – 26p Full catalogue (TG/P) – large S.A.E. £1.00

404 Edgware Road, London W2 1ED
Tel: 01-724 0323
(Open 6 days a week)

ESSEX

Selectronic

The UK's leading suppliers of 934MHz personal radio equipment

203 High Street, Canvey Island, Essex
Tel: 0268 691481
(Open Mon-Sat 9-5.30)
Amateur radio equipment also in stock

HERNE BAY

ICOM

ICOM (UK) LIMITED

The Official Icom Importer

Unit 8, Sea Street
Herne Bay, Kent CT6 8LD
Tel: 0227 369464
Fax: 0227 360 155
Open Mon-Sat 9-5.30,
(Lunch 1-2.00 pm)

SOUTHAMPTON

South Midlands Communications

Official Yaesu Importer

S.M. House, School Close, Chandlers Ford Industrial Estate, Eastleigh Hants SO5 3BY.
Tel: 0703 255111

PORTSMOUTH

Nevada Communications

Importers of the Nevada range of 934MHz equipment

189, London Road, North End, Portsmouth, Hants, PO2 9AE
Tel: 0705 662145

DEVON

Reg. Ward & Co. Ltd.

The South-West's largest amateur radio stockist. Approved dealer for Kenwood, Yaesu and Icom

1 Western Parade, West Street, Axminster, Devon, EX13 5NY
Tel: 0297 34918
(Closed 1.00-2.00 and all day Monday)

BUCKINGHAMSHIRE

Photo-Acoustics Ltd.

Approved Kenwood, Yaesu and Icom dealer (part exchange always welcome)

58 High Street, Newport Pagnell, Buckinghamshire MK16 8AQ
Tel: 0908 610625
(Tues-Fri 9:30-5:30, Sat 9:30-4:30)
Closed Mondays

TO FILL THIS SPACE CALL: 0202 678558

YORKSHIRE

YAESU ICOM

Alan Hooker Electronics

42, Nethernall Road, Doncaster.

Tel: 0302 25690
Open Mon-Sat 10-5pm
Closed Thursdays

MERSEYSIDE

MGR COMMUNICATIONS

ICOM — YAESU — Navico — Aerials — M.M. & Kits — Scanners — PMR — MARINE & BAND III

Part-ex welcome

48 Shrewsbury Rd., Oxton, Birkenhead L43 2HZ
051 653 3437

Unit 5, Miton St., Waterloo Ind. Est., Widnes, Cheshire
051 420 2559

SOUTH WALES MAIL ORDER RETAIL

A.C.S. SYSTEMS

PACKET RADIO: ST-PC-AMIGA COMPUTERS
AMATEUR SOFTWARE FOR MOST COMPUTERS
SATELLITE TELEVISION SYSTEMS

ICS DEALER FOR DATA COMMUNICATIONS

19, CILHAUL TERRACE, MOUNTAIN ASH, MID GLAMORGAN SOUTH WALES, CF45 3ND. TEL 0443 476040 SAE
CALLERS BY APPOINTMENT 9am-9pm Mon-Sat LIST

PLEASE MENTION PRACTICAL WIRELESS WHEN REPLYING TO ADVERTISEMENTS

WEST SUSSEX MAIL ORDER RETAIL

BREDHURST ELECTRONICS LTD.

High St., Handcross, West Sussex
Tel: (0444) 400786

Situated at the Southern end of M23. Easy access to M25 and South London.
Open Mon-Fri 9am-5pm except Wed 9am-12.30pm
Sat 10am-4pm

YAESU ICOM

SCANNERS – SCANNERS – SCANNERS

AT LAST!

THE NEW PRO-2005 400 CHANNEL 25-1300 MHZ £329.95

Free next day delivery by Interlink, phone through with your credit card numbers.

PRO-2021 200 Channel **£199.95**
PR-38 10 Channel **£99.95**
PRO-34 200 Channel HAND-HELD WITH FREE NICADS AND CHARGER **£249.95**

BEARCAT BC-200 FB

16 Channel Scanner with Search Facility, 66-88, 138-174 & 406-512 MHZ

£99.95

UNIDEN BEARCAT 200XLT

200 Channel HAND-HELD **£249.95**

FREE POSTAGE

Access

RADIO SHACK LTD

188 BROADHURST GARDENS, LONDON NW6 3AY

(Just around the corner from West Hampstead Station on the Jubilee Line)

Giro Account No. 588 7151 **Fax: 01-328 5066** Telephone: 01-624 7174

VISA

Published on the second Thursday of each month by PW Publishing Limited, Enefco House, The Quay, Poole, Dorset BH15 1PP. Printed in England by Blackmore Press, Shaftesbury, Dorset. Distributed by Seymour, Windsor House, 1270 London Road, Norbury, London SW16 4DH, telephone 01-679 1899, FAX 01-679 8907, Telex 8812945. Sole Agents for Australia and New Zealand – Gordon and Gotch (Asia) Ltd.; South Africa – Central News Agency Ltd. Subscriptions INLAND £15.50, EUROPE £18, OVERSEAS (by ASP) £19, payable to PRACTICAL WIRELESS, Subscription Department, PW Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP.

ICOM

Count on us!

IC-735 Compact HF.

As predicted the Icom IC-735 has rapidly gained the reputation it deserves. This compact transceiver is ideal for mobile, portable or base station operation. It has a general coverage receiver from 0.1Mhz to 30Mhz with superb sensitivity in all modes, SSB, CW, AM and FM. Spectacular specifications are also achieved on RF Intercept, Dynamic Range, Reciprocal Mixing and I.F. Blocking. As HF conditions improve over the next few years it is equipment like the IC-735 that will provide clear reception even under the worst pile-ups.

The IC-735 has a built-in receiver attenuator, preamp, noise blanker and RIT passband tuning and a sharp IF notch filter ensures clear reception. The twin VFO's and 12 memories can store mode and frequency. Scanning functions include program scan, memory scan and frequency scan. The HM12 scanning microphone is supplied.

RF output is approximately 100 watts and can be continuously adjusted down to 10 watts. The IC-735 is one of the first HF transceivers to use a liquid crystal display, which is easily visible under difficult conditions. Controls that require rare adjustment are situated behind the front cover but are immediately accessible.

Options include the PS-55 AC Power Supply, AT150 Automatic Antenna Tuner, AH2a Automatic Antenna Tuner, SM6 and SM8 Desk Mics, SP7 External Loudspeaker. Why not find out more about the IC-735 contact your local ICOM dealer or contact ICOM (UK) LIMITED.

Icom (UK) Ltd.

Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

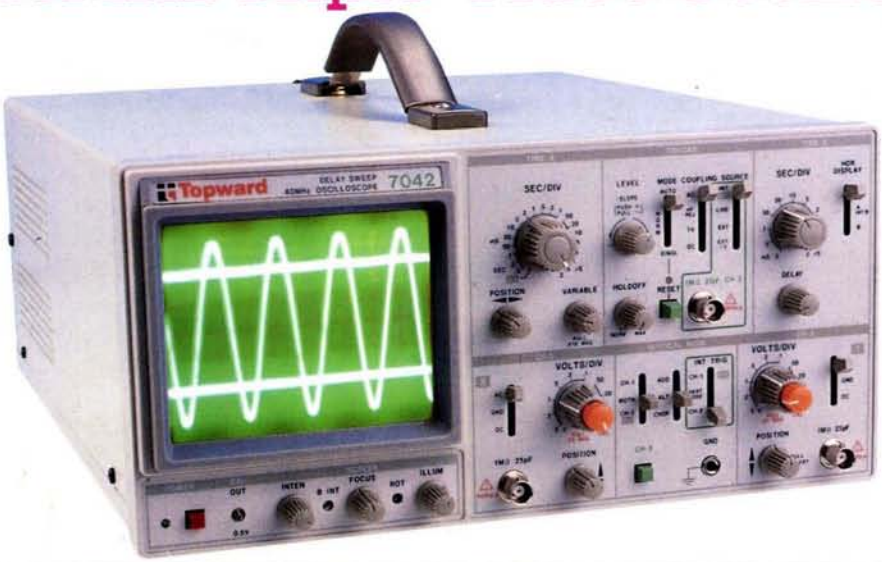
Helpline: Telephone us free-of-charge on 0800 521145, Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.
Datapost: Despatch on same day whenever possible.
Access & Barclaycard: Telephone orders taken by our mail order dept, instant credit & interest-free H.P.

Superb Triple-Trace 20MHz Oscilloscope

Precision laboratory oscilloscope.
3 Channels – 3 Trace.
Sensitive vertical amplifier 1mV/div allows very low level signals to be easily observed.
150mm rectangular CRT has internal graticule to eliminate parallax error.
X-Y mode allows Lissàjous patterns to be produced and phase shift measured.
TV sync separator allows measurement of video signals.
20ns/div sweep rate makes fast signals observable.
Algebraic operation allows sum or difference of Channel 1 and 2 to be displayed.
Stable triggering of both channels even with different frequencies is easy to achieve.
50mV/div output from Ch 1 available to drive external instrument e.g. frequency counter.
A hold-off function permits triggering of complex signals and aperiodic pulse waveforms.

ONLY
£287.49
XJ61R

40MHz Triple-Trace Oscilloscope



As above, but with 40MHz bandwidth and super bright 12kV tube even at the highest frequencies. This instrument also has a delayed sweep time base to provide magnified waveforms and accurate time interval measurement. Truly superb precision instrument.

Includes VAT & Carriage As Well!

ONLY
£499.95
XJ60Q

Order Coupon	Send to P.O. Box 3, Rayleigh, SS6 8LR		
Qty.	Description	Code	Price
		Add carriage	50p
		Total	

Name .....
Address .....
..... Post Code .....

I authorise you to debit my Credit Card account for the cost of goods despatched.

Card No.

Access, Amex, Visa ..... delete as required.
If ordering by Credit Card please sign .....
Expiry date of Credit Card .....

Maplin ELECTRONICS

P.O. Box 3, RAYLEIGH, ESSEX SS6 8LR.

VISA Access AMERICAN EXPRESS map

PHONE BEFORE 5PM FOR SAME DAY DESPATCH

0702 554161

ALL PRICES INCLUDE VAT.

All items subject to availability. Subject to availability both items will be on sale in our shops in Birmingham, Bristol, Leeds, London, Manchester, Nottingham, Southampton and Southend-on-Sea.