"IN THE KNOW"...an 8 page feature to help you find components, materials & information

PW "MARLBOROUGH"...LF/MF to HF Converter

HEINRICH HERTZ...Father of radio?

"They said I couldn't work DX with just 100 watts. Especially with a radio that has less than 1000 switches on the front panel.

But the truth is, I'm working lots of DX, more than some of these blockbuster types, thanks to my Yaesu FT-747GX.

You see, my no-nonsense FT-747GX was designed with me in mind, so I can hop around the band fast to nail those DX stations. While the other hams are warming up their amplifiers, I'm working the new country!

My FT-747GX has a super receiver, with a directly-driven mixer for great overload protection. And, Yaesu included the CW filter in the purchase price (I used the money I saved on postage for the QSL cards!).

And my FT-747GX is loaded with other features. The receiver works from 100kHz straight through 30MHz, and it's a fantastic shortwave broadcast receiver. I can use all twenty memories for that alone! Plus it's got dual VFOs. A noise blanker. Split frequency operation for the pile-ups. And scanning up the band helps me check out openings as they happen.

I just put in the optional crystal oven, and next month I'm going to pick up the FM board.

And with the money I saved when I bought my FT-747GX, I got a second ten-metre antenna for satellite work on the high end of the band. I use my personal computer to tell me what satellites are going by, and the computer even sets the frequencies on the radio for me.

Now my friends are getting FT-747GX rigs, too. I knew they'd figure out my secret weapon sooner or later. But now I'm setting the pace!

Thanks, Yaesu. You've made a rig that makes sense, at a price I can afford."

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YAESU

"They laughed when they saw my radio. Then they saw my logbook."

Practical Wireless
The Radio Magazine

DECEMBER 1988 (ON SALE 10 NOVEMBER 1988) VOL. 64 NO. 12 ISSUE 981

THIS MONTH

Regular Features

NEXT MONTH

New series "Antenna Clinic" F. C. Judd G2BCX answers readers' questions

Build the "Fe-One" An Experimental Compact Transmitting Antenna

Amateur Radio in Spain

plus All the usual features

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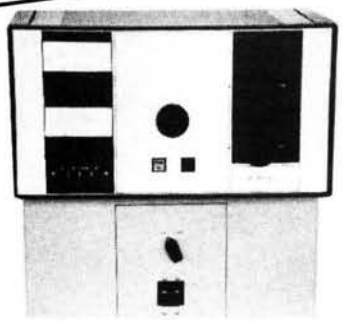

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BNOS

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LPM 432-1-50 70cms. 1W in, 50W out	£175.00
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LPM 432-3-50 70cms. 3W in, 50W out	£165.00
LPM 432-10-100 70cms. 10W in, 100W out	£195.00
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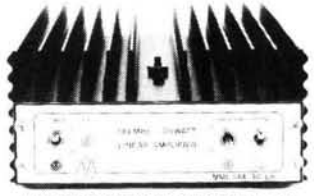

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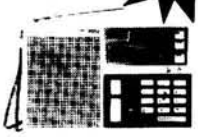

New SW-1 in stock £249

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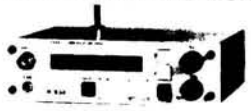
VHF/UHF AIRBAND MONITOR



SIGNAL R535
£249
Carr. Free

This latest receiver covers both civil and military bands. Coverage is 108-143MHz & 220-380MHz AM. Featuring a 60 channel memory, the receiver will enable you to monitor virtually any air traffic. The 12 volt requirement makes it ideal for base, mobile or portable work.

SONY ICF2001D RECEIVER SUPER PORTABLE AM/SSB/CW + AIR BAND COVERAGE

PRICE DOWN

Described as "the best portable on the market" by a recent reviewer, it covers 150kHz-300MHz AM/SSC/CW plus AM VHF air band and FM broadcast. Memories scanning, etc. are all included. The SSB performance is superb and can match many base station receivers. 230/110v AC power supply included.

£299 FREE SECURICOR

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BP23 Ni-cad battery pack	£15.95
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DCC127A 12v car PSU	£19.95

All our Sony stocks carry UK cards and do not have serial numbers etc. removed from boxes!

R537S AIR-BAND MONITOR 118-136MHz

This well known receiver is ideal for the serious air-band enthusiast, superb sensitivity and selectivity, this pocket size monitor is unrivaled in value for money. 2 fixed channels are possible and the squelch control ensures silent background. Complete with battery and whip.

£69.50 CARR FREE

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15dB Gain

£89.00 plus post £3.00

CLP 5130 Beam

As used by M.O.D.

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CLP 5130 50MHz-1300MHz version in stock **£179.00 + £7.00 carriage**

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£759

26 NOVEMBER

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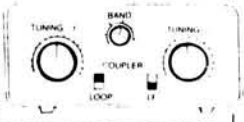
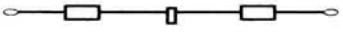
GLOBAL AT1000 AERIAL TUNER



The AT100 is a receiver aerial tuner designed to give you maximum performance from your receiver. Covering the frequency range 150kHz to 30MHz it matches all the modern receivers produced in recent years. Ideal for matching long wire, dipoles or balanced feeder.

£69.00 POST FREE

NEW MINI-DIPOLE KIT LF-8040 £29.95



A new low priced hf antenna that will fit into most gardens. The kit is complete with wire and provides a coaxial fed dipole that needs no atu. It covers 80 & 40 metres and has a total length of 70ft. Just follow the instructions and plug your coax feeder into the SO239 socket, and you are ready to go. **£29.95 plus £1.50 post.**

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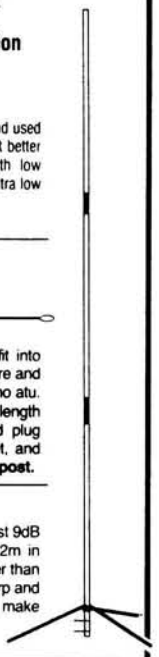

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AIRBAND FREQUENCY GUIDE
(RTTY and FAX Guide now out – see bottom of page)

The new edition of this famous guide will be available at end of August. Now running to 100 pages, it is crammed with gen that is essential reading for the airband enthusiast. Lots of editorial and pictures plus new cross reference of frequencies in alphabetical and numerical order. Order your copy today.

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VC10 VHF conv. for R2000	£161.95
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FRV8800 VHF converter	£100.00
IC-R71 Short wave 150kHz-30MHz	£825.00
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Sony ICF2001D band Short wave + air band	£299.00
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FRG9600 Scanner 60-950MHz	£509.00
IC-R7000 Scanner 25-2000MHz	£957.00
AOR 2002 Scanner 25-1300MHz	£475.00
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Yaesu FT767GX	£1550.00
Yaesu FT747GX	£659.00
Icom IC735	£939.00
Icom IC751A	£1465.00

2M Transceivers

Kenwood TH21E	£189.00
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Kenwood TS711E	£898.00
Kenwood TH205E	£215.26
Kenwood TH215E	£252.00
Kenwood TH25E	£258.00
Yaesu FT290 MK11	£429.00
Yaesu FT23R + Pack	£255.00
Icom IC2E	£225.00
Icom IC02E	£269.00
Icom IC28E	£359.00
Icom IC275E	£1039.00
Icom IC3200E	£556.00
Icom IC Micro	£239.00

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Icom IC4E	£285.00

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HP4A TVI Braid Breaker	£7.95
HK708 Morse key	£21.95
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New Diamond VSWR Meters:	
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★ Reverse repeater etc.

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FREE 24HR DELIVERY U.K. MAINLAND

Designed for optimum performance combined with small size, the ALINCO ALR-22E reaches new heights in both technical performance and value for money. We've managed to keep the price down to a level that cannot be matched by any other manufacturer although we believe that a small increase will shortly be made to the price. What better time therefore, than now to purchase one of these super rigs. You won't see prices like this again! Technically it's superb and inside it looks very much like some of its more expensive competitors! Measuring only 5.5" × 6.5" it will fit into most places and if you ask, we will extend the frequency range to cover 140-170MHz on receive. We could bore you with the specification but frankly its just the same as all the others (apart from the price of course). We could tell you about all the various features it has, but again its not much different from the competition. Lets be honest, apart from being scome £100 cheaper than some of its competitors and having an extended receiver coverage, it really is like most other rigs. So if money is no object and you only want 144-146MHz coverage, you probably won't be interested in the ALR-22E. If on the other hand these things are important to you. why not send for the full colour brochure today.

★ 2M FM 144-146MHz
★ RX 137-170MHz! option
★ 3 Watts output
★ Battery Saver
★ 10 memories
★ LCD Readout
★ S-meter
★ Tone Burst
★ Priority
★ 12.5KHz steps
★ 12v DC operation!

Another winner from ALINCO. A true handy transceiver with no extras to buy! Unlike its competitors, you get the nicad pack (500mAH) AC charger, and provisions for direct 12v DC charge. Measuring 168 × 61 × 30mm it's a beauty! Optional accessories include speaker-mic, mobile bracket and high power packs. Get the facts today!

DJ-100E 2M FM 137-170MHz!

NEW IN STOCK

£219

ALD-24E 2m/70cm Dual Band FM

£449

★ 2m/70cm. Full duplex operation.
★ 25 watts FM on both bands.
★ Single antenna socket output.
★ 21 memories & 2 "call channels".
★ Programmable scanning and priority.
★ 12.5KHz & 25KHz steps.
★ Includes all hardware & microphone.
★ Bright LCD readout.
★ Reverse repeater operation.
★ 12 months warranty parts & labour.

OTHER ALINCO ITEMS

ALR22HE 50 watt	299.00
ALR72E 70cm mobile	299.00
MM1 mobile mounts	10.95
ALX2E 2m h'held	189.00
EBP3N Batt pack	28.95
EBP2N Batt pack	23.00
EDH10 DC to DC	16.95
ESC5 Case and clip	15.50
EDC2 Cigar charge cable	6.50
ELH230D11 30w Amp	75.00
ELH260D 50w Amp	119.00
DC1 DC leads for mobiles	5.95
DC2 DC lead for amps	4.50

NEW DUAL BAND HANDHELD!

The new ALINCO DJ-500E will shortly be available covering 2m & 70cm with full duplex. Features include 10 memories on each band and programmable offsets. Receive frequency can be extended from 130-169 & 420-469MHz approx. Measuring 58 × 176 × 30 mm it is pretty compact. As usual all the standard accessories are supplied at the basic price. Watch for our super opening price!

ALINCO DJ-500E 2M/70 cm

★ 2m/70cm Coverage
★ Full duplex
★ Extended Rx ranges
★ Programmable Memo
★ Scanning
★ Keyboard Entry
★ Compact size
★ No extras
★ Price? T.B.A.

WATERS & STANTON

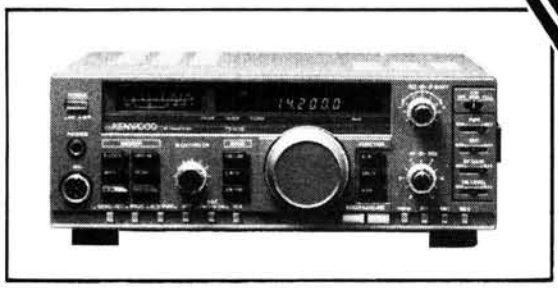
RETAIL & MAIL ORDER:- 18-20, Main Road, Hockley, Essex SS5 4QS.
Tel: (0702) 206835, 204965
RETAIL ONLY:- 12, North Street, Hornchurch, Essex RM11 1QX.
Tel: (04024) 44765
Visa and Access by telephone. 24hr. Answerphone.

DEWSBURY ELECTRONICS

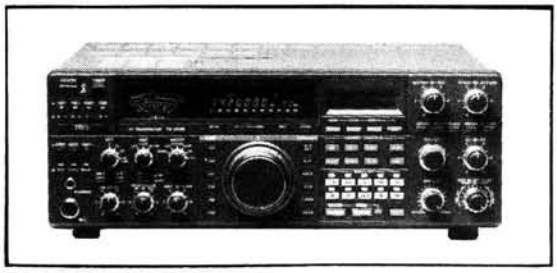
G4CLX

IF IT'S KENWOOD IT MUST BE DEWSBURY

A FULL RANGE AVAILABLE

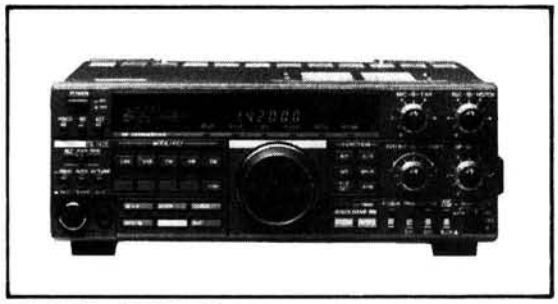


TS-140S £862.00



TS-940S £1995.00

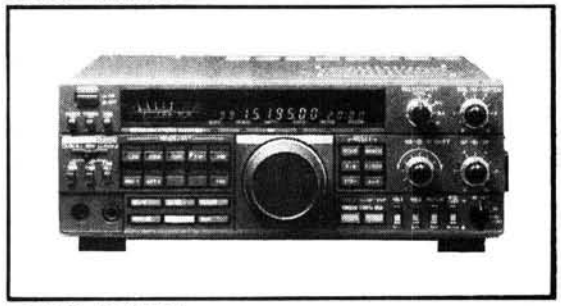
APPROVED KENWOOD DEALER



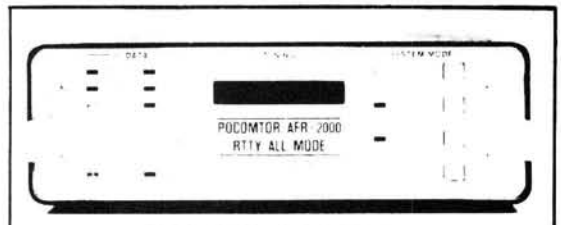
TS-440S £1138.00

APPROVED KENWOOD DEALER

R2000 £595.00



R5000 £875.00



POCOMOTOR AFR2000
RTTY ALL MODE DECODER

PRICES FROM £412.85

NEW PRODUCT NEWS

KEYBOARD TO MORSE CODE

From the makers of the **STAR MASTERKEY** a new **MORSE KEYBOARD.**
Send perfect morse as easily as typing a letter.
Variable transmission. Speed 1-99 wpm or up to 400 wpm.
Indication of speed on 7 segment display.
Type ahead buffer with status leds transmission of stored messages.
Indication of operating mode on leds. Sidetone and relay output for all types of transmitter.

Send S.A.E. for details of products shown

STAR MASTER – KEYER £54.70

Stockists of DAIWA – JRC – BENCHERS – VIBROPLEX – MICROWAVE MODULES – YAESU – ICOM

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

VISA

Access

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

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

The New Licence

I was interested to read the new licence conditions, published in the September issue of *Practical Wireless*.

Many features of it give me cause for concern. Take, for example, the infamous clause (aa) from the Notes to the Terms and Limitations Booklet BR68.

It has long been a tradition in amateur radio that the first steps that one takes in becoming a real "ham", rather than just an operator, lie in converting pre-existing surplus equipment. This was certainly true in the post-war years, with the cornucopia of ex-WD gear, and it was true for me when I was first licensed as G8DXY and I used Pye Rangers and the like. Is this now to change, the most suitable equipment to convert being CB gear?

I am not aware that I would be prevented from importing and/or manufacturing if I did **not** possess a licence. Surely it is privilege that is granted, not restrictions, by being issued with a licence?

Can this be the thin end of the wedge, which ultimately results in all home constructed transmitters being proscribed?

It is perhaps odd that clause (aa) should appear right at the end, where it is guaranteed to cause a furore, with its obvious visibility. Perhaps it is an attention-getter, intended to distract comment from other areas.

Gareth Alun Evans G4SDW, Chippenham, Wilts.

In the latest issue of Radio Communication, *it mentions that the matter of clause (aa) is "in hand" with the DTI. We shall have to wait and see what transpires.—Ed.*

Why Not Open Up the "B" Licence?

Suddenly it seems that the "Novice" or "Student" licence is being promoted by the RSGB and others as a way of attracting younger radio enthusiasts. I would suggest that this is not the way we should be heading at all.

Many keen radio enthusiasts take the RAE and gain a "B" licence, but after a few months are never heard from again. Why? I would suggest that the 'VHF Up' portion of the spectrum cannot really sustain the enthusiasm that h.f. can. "B" licensees soon become bored with the endless drivel to be heard on 2m and simply don't feel the necessity to learn c.w.

It seems illogical that a Morse test makes the difference between someone being confined to v.h.f. and above, despite the fact that such an operator may well know more about operating practice, theory, etc., than an "A" licensee. Many "A" licensees will readily admit that they took the Morse test solely to get on h.f., and don't intend using c.w. again.

Instead of campaigning for yet another type of licence, why not make more use of what we already have? Forget the "Novice" licence; open up h.f. to "B" licensees, so that "A" licensees only are permitted to use c.w. on h.f. A "B" licensee would be able to construct and use the much simpler equipment needed for h.f. Being able to communicate across the world with something you've built yourself is more than enough to encourage anyone even half serious about the hobby to take the RAE and stay with it.

D. J. Carr, Ramsgate.

If equipment for the h.f. bands is to be "much simpler", it needs to be for c.w. or for a.m. 'phone, neither of which seem to be what Mr Carr is really looking for to encourage his frustrated band of "B" licensees. I fear it's not quite as simple as this.—Ed.

OUR SERVICES

QUERIES

We will always try to help readers having difficulties with a *Practical Wireless* project, but please observe the following simple rules:

1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice **must** be accompanied by a stamped, self-addressed envelope (or envelope plus International Reply Coupons for overseas readers).
4. Write to the **Editor, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** giving a clear description of your problem.
5. Only one project per letter, please.

BACK NUMBERS AND BINDERS

Limited stocks of many issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.40 each, including post and packing to addresses at home and overseas (by surface mail).

Binders, each taking one volume of *PW* are available Price £3.50 plus £1 post and packing for one binder, £2 post and packing for two or more, UK or overseas. Prices include VAT where appropriate.

CONSTRUCTION RATING

Each constructional project is given a rating, to guide readers as to its complexity:

Beginner
A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.

Intermediate
A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.

Advanced
A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on his own.

COMPONENTS, KITS AND PCBS

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for our more recent projects are available from **CPL Electronics,** and from **FJP Kits** (see advertisements).The **printed circuit boards** are available from our **PCB SERVICE** (see page 75 of this issue).

CLUB NEWS

If you want news of radio club activities, please send a stamped, self-addressed envelope to **Club News, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** stating the county or counties you're interested in.

ORDERING

Orders for p.c.b.s, back numbers and binders, *PW* computer program cassettes and items from our Book Service, should be sent to **PW Publishing Ltd., FREEPOST, Post Sales Department, Enefco House, The Quay, Poole, Dorset BH15 1PP,** with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders **must** be drawn on a London Clearing Bank.

Credit card orders (Access, Mastercard, Eurocard or Visa) are also welcome by telephone to Poole (0202) 678558. An answering machine will accept your order out of office hours.

SUBSCRIPTIONS

Subscriptions are available at £15.50 per annum to UK addresses, £18 to Europe, and £19 elsewhere (by Accelerated Surface Post). For further details, see the announcement on page 34 of this issue.

Audio Visual Cable Check

Tracecomm is a cable location system used for locating single conductors within cables containing two or more conductors. The novel system uses the first two wires in a cable to operate a voice link between the cable ends using built-in handsets.

When the voice link is established, operators can co-ordinate the testing of remaining conductors. This is achieved using the integral waveform generator and loop detection circuitry which is built into a transmitter unit. Frequency and amplitude are adjustable.

On the remote unit, an l.e.d. bar-display progressively illuminates to a fully lit display when the cable end is in close proximity or is touched.

The system is housed in a rugged briefcase and operates from a 240V a.c. mains supply.

Cable Check Systems.
18 Quay Lane,
Gosport,
Hants PO12 4LJ.
Tel: 0705 528396

Catalogues

At a recent exhibition we picked up details on the Altron Alitower System (available from Allweld Engineering). The catalogue contains all the details on the mast with information on the spec and typical applications.

Allweld Engineering,
Unit 6, 232 Selsdon Road,
South Croydon,
Surrey CR2 6PL.
Tel: 01-680 2995.

Video Tape Talk

John Kelly recently made a video recording of G5UM delivering, what he calls, his "standard talk about v.h.f. then and now". The video was made at the G5UM QTH in Leicestershire and, as the title suggests, is virtually a historical record of the development of v.h.f. in the UK over many decades.

John Kelly is willing to hire the video of this talk to clubs interested (it runs for just over an hour). The hire charge is £5.

It's available on both VHS and Betamax, so don't forget to mention which you require.

John Kelly.
Matlock Audio Visual Productions,
7 Collingwood Crescent,
Matlock,
Derbys DE4 3TB

Radio Shack

We would like to apologise to Radio Shack Ltd and any readers who were misled by a typesetting error on page 72 of our October 1988 issue.

The correct price of the PRO-2021 is £199.95, and not as given in the advertisement.

TOPS CW Club Contest

The annual 3.5MHz Band c.w. contest starts on December 3 at 1800 and finishes at 1800 on December 4. Competitors should call either CQ TAC or CQ QMF. The organisers say that CQ TEST should **not** be used to avoid confusion with any other contest that may be running.

QSO should be within the frequency range of 3.5–3.585MHz, with 3.5–3.512MHz reserved for contest DX contacts. Any QSO between stations in the same continent on the DX band will be monitored and disallowed.

Solo operators must take one or two breaks totalling seven hours. Multi-operator stations can operate the full 24 hours without a break.

QSOs with GB6AQ during the contest will bring a 10 point bonus.

Full details, including the scoring system, may be obtained by sending an s.a.e. to the Contest Manager.

Logs for this event must arrive not later than 31 January 1989.

GW8WJ,
2 Ffordd Ty Newydd,
Prestatyn,
Clwyd LL19 8PB.

Understanding Transistors Program

This hardware/software package is aimed at GCSE, ITEC, BTEC Level II and other students. It's written for the BBC-B or BBC-B+ and is available on disc or cassette.

The program comes with a circuit ready-built in a 100 x 100 x 38mm white plastics ABS box. This links to the BBC via a cable and D connector. The circuit is a transistor switch and/or common emitter amplifier.

Included with the board for the investigations are: l.e.d.s., capacitors, transistors, a speaker and resistors. The worksheets comprise 30 A4 pages.

The program monitors the circuit and records the values of 2 currents and 6 voltages. Then various screens can be chosen to display these results in different ways. When the components are changed, the results change too.

The program costs £39 and full details can be obtained from:

J. McCormack.
Computer Aided Training,
1 Windergate,
Frizington,
Cumbria CA26 3QS.
Tel: 0946 810597.

Special Event Stations

GB6AQ: This station will be active from December 1 to December 28 inclusive, using c.w. only. The operator will be D3AWR in Newcastle-on-Tyne.

Can You Help?

G1ZCY is looking for the alignment details and operator's manual for the Mizuho SB-2M, which he recently purchased. If you can help, drop him a line at:

100 Cold Bath Road,
Kingsheath, Birmingham
B13 0AH.

Mr Holt has "inherited" a Hallicrafters Super Sky Rider communications receiver. Unfortunately, it's not quite in working order. So, does anyone have a manual or circuit diagram that will help Mr Holt. All expenses, he says, will be gladly paid. If you can help, write to:

Ken Holt,
3 Hallsreads Close,
Dove Holes,
Buxton,
Derbys SK17 8BS.

PC Instrumentation Products

MetraByte's Personal Computer Instrument Product family is a series of "board level instruments" that plug directly into any IBM PC/XT/AT or compatible I/O slot.

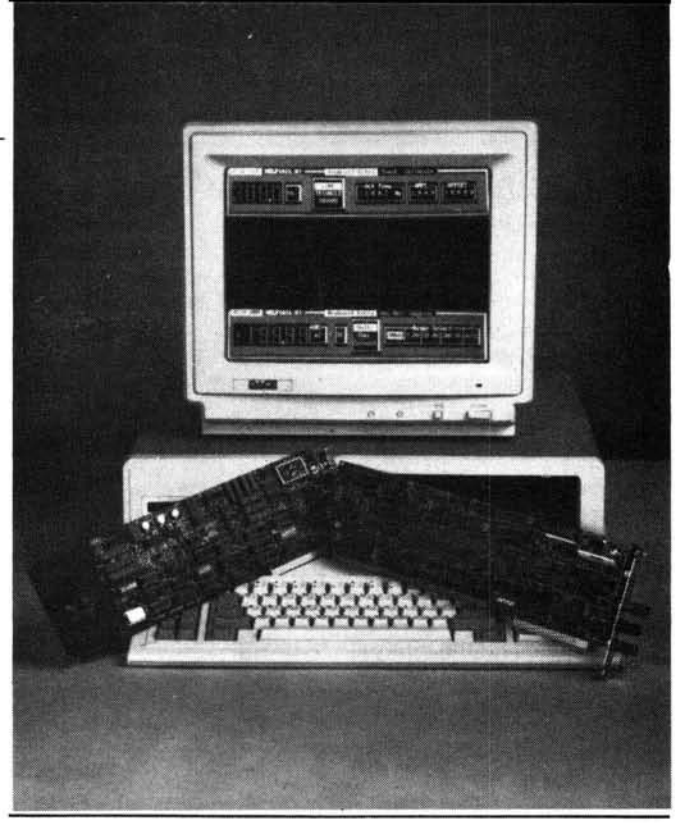
There are two cards available, the PCIP-DMM, a full feature $4\frac{1}{2}$-digit digital multimeter and the PCIP-SST, a 5MHz function generator.

The DMM provides the user with five functions, direct current and volts, alternating current and volts and ohms—all in nineteen ranges. All connections are made through three standard "banana jack" compatible binding posts. All required software is included.

The SST is capable of producing sine, square and triangular output waveforms. Features include 1Hz to 5 MHz operation, 20V pk-pk amplitude capability, 50Ω output impedance and ±0.5% frequency accuracy. Connections are made through three standard BNC connectors. All required software is included.

If you would like to know more about these systems, contact:

Keithley Instruments Ltd.
1/3 Boulton Road,
Reading,
Berks RG2 0NL.
Tel: 0734 861287



Stamp Thanks

Several months ago we published a request from John Allsopp asking for used postage stamps. Apparently amateurs from all over the world have sent stamps and he would like us to thank you all on his behalf.

The original good cause has been met, so John says if people would like to continue to send stamps to him, he's sure he can find another worthy amateur cause for the donation.

It just goes to show how effective amateurs can be when they put their minds to it.

John Allsop G4YDM.
30 Manor Park,
Concord Village,
District 11,
Washington,
Tyne & Wear NE37 2BT.

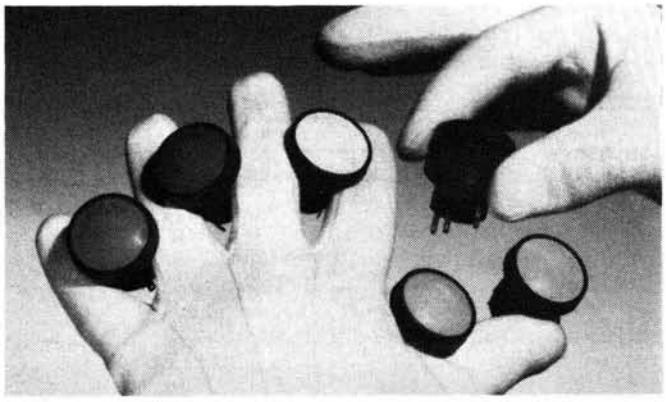
Sealed Switches

ITW Switches have launched an improved version of their Flexibutton range. These switches are designed for use in harsh environmental conditions and have a waterproof seal. The design improvements mean that they now also have the American Underwriter's Lab's highest flame retardant rating of 94-VO and the operational temperature range has been extended down to –40°C and up to 100°C.

The body of the push button is matt black and cylindrical in shape with a curved dome at the top covering the switch mechanism. The dome is available in six different colours.

Solder, quick connect or p.c.b. terminals are available for momentary, alternate, single pole and double pole action versions. Rated as a maximum 5A/250V, the switches can also operate down to 10mA/5V.

ITW Switches.
Norway Road,
Portsmouth,
Hants PO3 5HT.
Tel: 0705 694971.



1989 International Skill Olympics

The hunt is one for Britain's most talented young Radio and Television service engineer to take on the rest of the world. The domestic electonic industry, national rental companies and manufacturers are being asked to enter their brightest young technicians for the National Elimination Competition being organised by the Radio Television and Electronics Examination Board.

The winner of the Elimination Competition will represent Great Britain in the 1989 International Skill Olympics being held at the National Exhibition Centre in Birmingham in August 1989. This is the 30th of these prestigious events and over 400 competitors from 20 countries will compete in up to 40 craft skills.

Britain has an excellent record in the Skill Olympics and during the last event the Radio and Television Servicing entrant came 5th.

Applicants must be under 23 years of age on 1 January 1990. Nomination forms can be obtained from:

The Organiser,
RTEEB,
57–61 Newington Causeway,
London SE1 6BL.

The Radiophile

Some readers may remember reading about a publication called *RadioGram* in the past. Well, it's changed its name to *The Radiophile*.

This is because the former title was drived from "radiogram," the early term for a message sent by radio. With the scope of the magazine being increasingly widened, they believe that the new name will more aptly reflect the purpose and content of a publication devoted to the interests of those who have a great affection for all aspects of vintage radio.

The June/July issue that landed in our office has articles on the Ekco AD65 receiver, The EMI Story, A Home-made Accumulator and some very interesting short stories.

The subscription rates are £8 for six issues or £15 for twelve issues in UK and Ireland, £10 for six issues or £19 for twelve issues for Europe and Scandinavia. Other areas need to write first. The magazine is published bi-monthly.

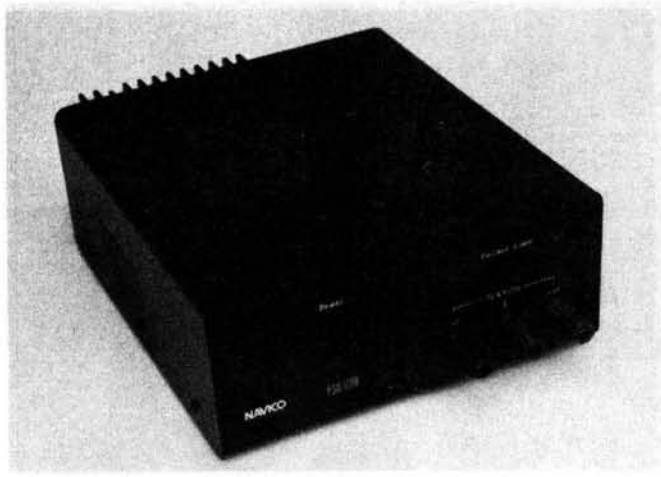
The Radiophile,
Larkhill,
Newport Road,
Woodseaves,
Stafford ST20 0NP.

Power Supplies

Navico have two power supplies available, the PSU1208 and the SMR1208.

The PSU1208 is a general purpose 12 volt regulated power supply. It utilises a toroidal transformer and power m.o.s.f.e.t.s. Short circuit protection is provided as standard with clear current limit indicator. The supply is isolated, but an earth terminal is provided. The supply is suitable for radios requiring up to 8 amps at 12.6 volts.

The SMR1208 is a switch mode p.s.u. using m.o.s.f.e.t. control. The unit was designed to convert 24V supplies to the 12V needed for Navico v.h.f. products.



The PSU1208 costs £75 and the SMR1208 costs £49 (both exclusive of VAT). More details from:

Navico Ltd.
Star Lane,
Margate,
Kent CT9 4NP.
Tel: 0843 290290

Twin Axial Connectors

The latest type of connector to be added to the Maplin range is the twin axial type. They are for r.f. applications, particularly data transmission cables where screened twisted pairs are in use.

The connectors have two pins in a metal body with screwed locking rings. They also have a keyway to ensure that plugs cannot be incorrectly mated. The normal impedance is 100Ω and frequencies of up to 250MHz can be handled with minimum loss. The working voltage is 500V peak.

All connectors are nickel-plated brass with gold-plated pins and sockets. The prices range from £2.75 for the Twinax Chassis Socket (JB09K) to £5.85 for the Twinax T Adaptor (JB11M). For more details:

Maplin Electronics,
PO Box 3,
Rayleigh,
Essex SS6 8LR.
Tel: 0702 554161.

Can You Help?

Ernest J. Hooks has found that a filter manufactured by Elldee Electronics (formerly of Lowestoft) has solved the TVI problems of some of his friends. Does anyone know where this company is now, or where you can get hold of the device. If so write to:

Ernest J. Hooks,
9 Curtis Walk,
Lisburn,
Co. Antrim BT28 1HE.

Marco Expansion

Marco Trading of Wem are pleased to announce the opening of its third retail shop, Supertronics.

Supertronics is five minutes walk from New Street Station and Birmingham's main shopping area. It's next door to Rusty Lee's restaurant. They have over 1000sq ft of sales area offering not only a wide selection of components, including transistors, i.c.s, resistors, cable, etc., but also speakers from 4W to 200W. There's also test equipment (new and secondhand), alarm equipment, and also an on-site audio and video repair service.

They're open Monday to Saturday, 9am to 6pm, closed Wednesdays.

Supertronics,
65 Hurst Street,
Birmingham B5.
Tel: 021-666 6504.

Screen Europe

Screen Europe is a bi-monthly magazine for DXTV fanatics. The issue we saw contained loggings, some history, scanner news, a home-brew project and an article on using computers.

The subscription rate is £4.75 per year. Also available is an extensive range of data sheets for the beginner on many subjects: Propagation, Antennas for DXTV, Photographing and Videoing DXTV and a French TV data sheet. Apparently this can be very useful if you live in the south of the country as it includes a list of all the French TV companies and style of programming as well as a map of France with all TV transmitters and channels marked.

If you would like to know more about the magazine, then send an s.a.e. to:

Tim Anderson,
2 Burry Road,
Silverhill,
St. Leonards,
East Sussex.

Veneered Cabinets

If you are trying to renovate an elderly piece of hi-fi equipment or enjoy building reproduction vintage gear, one problem you often encounter is where to obtain the proper cabinets from.

We've heard of a new company that aims to provide quality veneered loudspeaker cabinets. There are two sizes available at the moment: LS/35A in black ash or walnut (£45 per pair), 30 litre in black ash or walnut (£60 per pair).

The prices quoted include VAT but not carriage, the firm says that will be at cost.

If you would like more information on the cabinets, contact:

Vulcan Loudspeaker Company,
64 Leedham Road,
Rotherham S65 3EB.
Tel: 0709 544105.

Battery Adaptor

Nevada have just introduced a new adaptor which will allow fast charging of many standard hand-held battery packs.

The BCA-A1 simply slides on to the top of the NiCad pack and allows any proprietary charger to be plugged on to the adaptor's standard d.c. socket. It is suitable, says Nevada, for most Icom, Kenpro, CTE and other popular hand-held transceivers.

The adaptor costs £9.95 including VAT. For more details, contact:

Nevada,
189 London Road,
North End,
Portsmouth,
Hants PO2 9AE.
Tel: 0705 660036.

Diamond VSWR Meters

The Diamond range of meters are replacing the old Welz range that has now been discontinued. In actual fact, the Welz name was originally used to market meters made by Diamond.

The SX200 is designed to cover 1.8 to 200MHz with three power ranges: 5, 20 and 200 watts. The meter is able to read both r.m.s. and approximate p.e.p. for s.s.b. and a.m. transmissions.

As full scale deflection is 1 watt, the meter should prove useful for QRPers, as well as those who use much greater powers. The price for the SX200 is £65 including VAT. More details from:

Waters & Stanton Electronics,
18–20 Main Road,
Hockley,
Essex SS5 4QS.
Tel: 0702 206835.

Price Reductions

It's not often these days that you hear about prices going down. Well, West Hyde Developments Ltd., have announced price reductions across a whole range of its products.

The largest reductions are on Teko, Internorm and Combicard 500 ranges. The reasons for the reductions are things like favourable exchange rates, re-engineering and increased volumes of production. Price reductions range between 4 and 30%, depending on the range and size of enclosure.

West Hyde Developments Ltd.,
9–10 Park Street Industrial Estate,
Aylesbury,
Bucks HP20 1ET.
Tel: 0296 20441.

Indicative Switches

Instead of an expensive bulb to provide an indication that the switch is in the "on" position, ITW Switches have introduced a different idea. The switch has a rectangle of a bright colour, hot stamped onto the switch paddle. This is visible when the switch is on, providing a low-cost solution to indicative switching.

Rocker switches with matt black bodies and red indicator panels are available ex-stock, with alternative colours available on request. Rated at 12A at 250V, the switches can handle high currents of up to 83A for 20ms.

There is a choice of either quick connect or solder terminals, and one or two pole versions including changeover action.

ITW Switches,
Norway Road,
Portsmouth,
Hampshire PO3 5HT.
Tel: 0705 694971.

Cat's Whiskers Award

The Cat's Whiskers Award is presented by the North Cheshire Radio Club for receiving 14, 18, 22, 26 and 30 words per minutes sent after the RSGB's slow Morse transmissions on Sunday nights.

Any text for the Cat's Whiskers Award should be sent to:
North Cheshire Radio Club,
Morley Green Social Club,
Mobberley Road,
Morley Green, Wilmslow,
Cheshire SK9 5NT.

VHF/UHF Antennas

Allgon Ltd was not a name that rang bells for v.h.f./u.h.f. antennas and mounts, until recently.

They supply a range of mobile mag-mounts, bumper mounts and the kind you drill a hole in the car roof for, as well as the cable and connectors needed. As for the antennas to go with them, as they're not just an amateur radio supplier they have a wide range of types available. Frequency ranges such as 31.5–45MHz, 68–170MHz, 68–225MHz, etc., can be catered for. You also get pruning instructions with the antenna.

If you would like more details of the Allgon products, contact:
Eric Sweetland G1KRL,
Dolphin & Custom Communications.
Tel: 0604 30833.

ASTUR

Do you own an Atari ST computer that you use for the hobby, or would like to use? If so, then ASTUR may be the group for you.

The ASTUR group is a self-help user group dedicated to the use of the Atari ST computers in amateur radio—particularly with digital communications techniques.

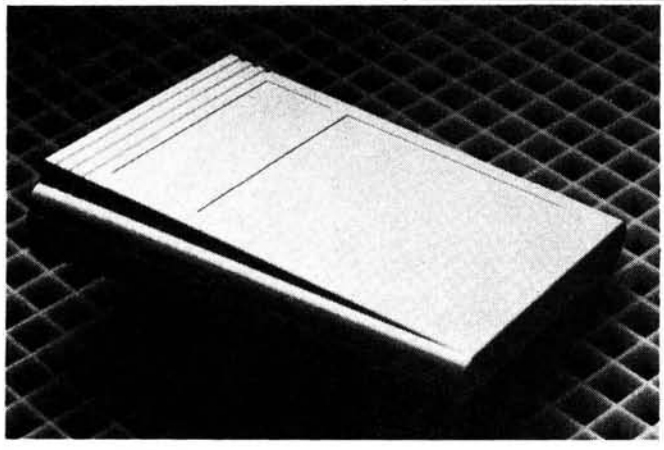
The group was created to form a link between all amateur radio hobbyists throughout the world, regardless of affiliation or special interest. The idea is to foster a free exchange of ideas, techniques and general information between its members concerning the use of the Atari ST.

For more information on joining the group, send 2IRCs to:
ASTUR,
W. Elsschotlaan 21,
B-8460 Koksijde,
Belgium.

New Catalogues

The mini version of the Kanga Products Catalogue contains brief details of the twelve kits available. Just about enough information for you to decide whether you're interested. Send an s.a.e. to: ***Kanga Products, 3 Limes Road, Folkestone CT19 4AU.***

The Barenco catalogue contains details of the company's comprehensive range of mast support hardware, connectors and cables. There's 14 A5 pages and the price marked on the front is 20p.
Barenco, 27 Park Road, Barnstone, Notts NG13 9JF. Tel: 0949 60607.



Membrane Switches Case

West Hyde Developments Ltd. have introduced a new keypad case especially designed for membrane switches.

The new range is called Avanta. Two shallow recesses on the top face of the case will accommodate 12 to 16 membrane key arrays. If the case is used with membrane switches that are hermetically sealed, because the unit itself is sealed, it makes it suitable for hazardous environments.

The two halves of the case are fixed together by four screws from below and can be fixed in two different ways to form either a level or a slanting top surface. For more details on the Avanta, contact:

West Hyde Developments,
9–10 Part Street Ind. Est.,
Aylesbury,
Bucks HP20 1ET.
Tel: 0296 20441.

Valved Communications Receivers

The DST100 series (Part 1)

Unfortunately, since writing this article, Chas Miller has disposed of his DST-100, and we have not been able to unearth a photograph of the beast.

This month, Chas E. Miller looks at a real mammoth among receivers, measuring over 600mm wide by 400mm high and deep, and weighing in at around 51kg (that's 24 × 15.5 × 15.5in and 1cwt!).

In common with many military radio circuits, that for the DST100 uses the grouped system for component values. For example, in this instance, all resistors designated R1 are 250kΩ, all designated R2 are 500kΩ, and so on. To distinguish between individual resistors on the diagram, they are suffixed –A, –B, etc. Thus R1A will be found in the r.f. stage and R1K in the output stage, but they are both of 250kΩ value.

The same sort of arrangement is used for capacitors and any other components of which a number of identical units are fitted. It is also applied to the valves of a receiver, but in the case of this article the valves have been redesignated V1, V2, V3, etc., as in normal civilian practice, in order to avoid confusion in the necessarily highly detailed circuit description that follows.

General Description

The DST100 family are large receivers designed and developed for fixed station reception of c.w. and m.c.w. at low signal strengths in the range 50kHz to 30MHz. They are complex 13-valve sets with some unusual, perhaps unique, features. They operate optionally as either single or double superhets on all bands save the very lowest, which has single superhet working only. There is a single r.f. amplifier stage, but with its sensitivity enhanced at the operator's discretion by "r.f. regeneration", in other words, reaction. The r.f. and first local oscillator coils are contained in a large turret which dispenses with the conventional wafer-type wave-change switch. On the h.f. bands, electrical bandspreading is available.

Separate controls are provided for r.f. and i.f. sensitivity, and there is a choice of six levels of i.f. selectivity. The various i.f. transformers are fitted with octal-type plugs and fit into sockets identical to valve-holders. There are two a.g.c. lines, one derived from the first i.f. (2MHz) stage and the other from the second i.f. (110kHz). The 110kHz i.f. amplifier is also subject to reaction, and is followed by an extremely rare infinite impedance detector. Somewhat unusual in British communications receivers is the variable tone control and the use of a power beam tetrode as final a.f. amplifier. Despite this, however, no provision is made as standard for loudspeaker reception, sockets being provided only for 4000Ω headphones and a 600Ω telephone line.

Two meters are provided on the front control panel, one to indicate signal strength (by measuring the a.g.c. voltage) and the other to monitor the total h.t. current drawn by the receiver.

The differences between the various Marks (II, III and III* are not great, being confined mainly to the detailed design of the antenna and first local oscillator coils (see later). In addition, Marks II and III are semi-tropicalised, whilst Mark III* is fully tropicalised.

The Circuit in Detail

Because of the complex working arrangements of these sets, reference should be made to the block diagram, Fig. 1.1, in conjunction with this description. The full circuit diagram will appear in Part 2.

The frequency coverage is divided into seven bands: G 50kHz–126kHz; F 126kHz–310kHz; E 310kHz–780kHz; D 780kHz–1.9MHz; C 1.9MHz–4.8MHz; B 4.8MHz–12MHz and A 12MHz–30MHz. There is approximately five per cent overlap on each band.

The six levels of i.f. selectivity are designated: "Sharp" (1kHz); "2" (1.4kHz), "3" (1.6kHz); "4" (1.8kHz); "5" (2kHz); and "Broad" (12/25kHz).

On the r.f. ranges A to F (i.e., between 126kHz and 30MHz) and selectivity levels "Sharp" to "5", the receiver acts as a double superhet with the 2MHz and 110kHz i.f.s mentioned previously. On "Broad" selectivity, only the first i.f. is employed, the receiver operating as a conventional single superhet. On r.f. range G, the receiver operates as a single superhet using the second i.f. on 110kHz, and with only the first five selectivity options available. From all this it will be apparent that some highly complicated switching circuitry is involved. To avoid lengthy discussion of this, we shall look at the three main operating systems one at a time.

1. Bands A–F
Selectivity "Sharp" to "5"

In general, provision is made in all Marks for antennas of either 75Ω or 600Ω impedance, applied to r.f. transformers, with the exception that in Mark II receivers bands A and B accept only 75Ω inputs. In these sets the other antenna primary coils have separate windings for the different inputs, whilst in the III and III* single, tapped coils are employed. These coils are not interchangeable with those of the Mark II.

In all Marks, the secondary windings couple signals to the r.f. amplifier (V1, CV21/VP41). This valve, having a 4V heater, is fed from the main 6.3V heater line via a 3.5Ω 3W resistor. Its sensitivity is controlled both manually and by the a.g.c. line.

Tuned anode coupling is used to transfer amplified r.f. signals to the grid of the first frequency-changer (V2, ARTH2/ECH35). The triode section of this valve is used only for the injecton of signals from the separate local oscillator (V3, 6J5G), its anode being strapped to the screen grid of the hexode section. In Mark II sets, local oscillations are coupled from the cath-

ode of V3, but from its anode in Marks III and III*, the l.o. coils differing and again being non-interchangeable. In all Marks, a small variable capacitor across the oscillator section of the gang provides electrical bandspread.

The optional r.f. regeneration is applied to the anode tuning coil of V1. It is provided by a cathode-coupled Hartley oscillator (V4, 6J5G) which has its output controlled by a variable resistor in the h.t. supply to its anode. Since the tuning of V4 is common to that of the r.f. amplifier anode, the frequency of its oscilllation is always in step with that of the signal.

There are two i.f. transformers, in series, in the anode circuit of V2. That nearer the anode is for the 2MHz i.f., and the other is for 110kHz operation on band G as described later in (3); otherwise it is made ineffective by having its primary winding shorted out. This is achieved by a simple relay with on/off contacts.

The i.f. signals at 2MHz appearing at the anode of V2 are coupled to the first i.f. amplifier (V5, ARP34/EF39). This valve, too, is subject to both automatic and manual gain control.

Amplified i.f. signals at the anode of V5 are transferred both to the grid of the second frequency changer (V6, ARTH2/ECH35) and to that of another i.f. amplifier (V7, 6B8G) which again amplifies the signal purely to obtain an a.g.c. voltage. We'll return to this a little later.

The second frequency changer V6 operates in conventional manner with its triode section providing local oscillation, but at fixed frequency to give a second i.f. of 110kHz. An i.f. transformer of intricate design (incorporating the components for the variable selectivity) transfers this i.f. signal from the anode of V6 to the 3rd i.f. amplifer (V8, ARP34/EF39). The gain of this valve is varied both by the manual i.f. gain control and a.g.c. In addition, reaction may be applied to the grid via a winding in the i.f.t. connected into the screen grid circuit. The amount of reaction is controlled by a variable resistor shunted across the feedback winding.

A second 110kHz i.f. transformer of similar design to the first (but lacking the reaction winding) passes the amplified signals on to the detector (V9, 6J5G). This is extremely unusual in being of the infinite impedance type, a design largely neglected since the early days of radio and not earning so much as a passing mention in many textbooks. For this reason the following description is given.

The infinite impedance, or negative feedback detector, is a variation on the anode-bend type. In the simplified

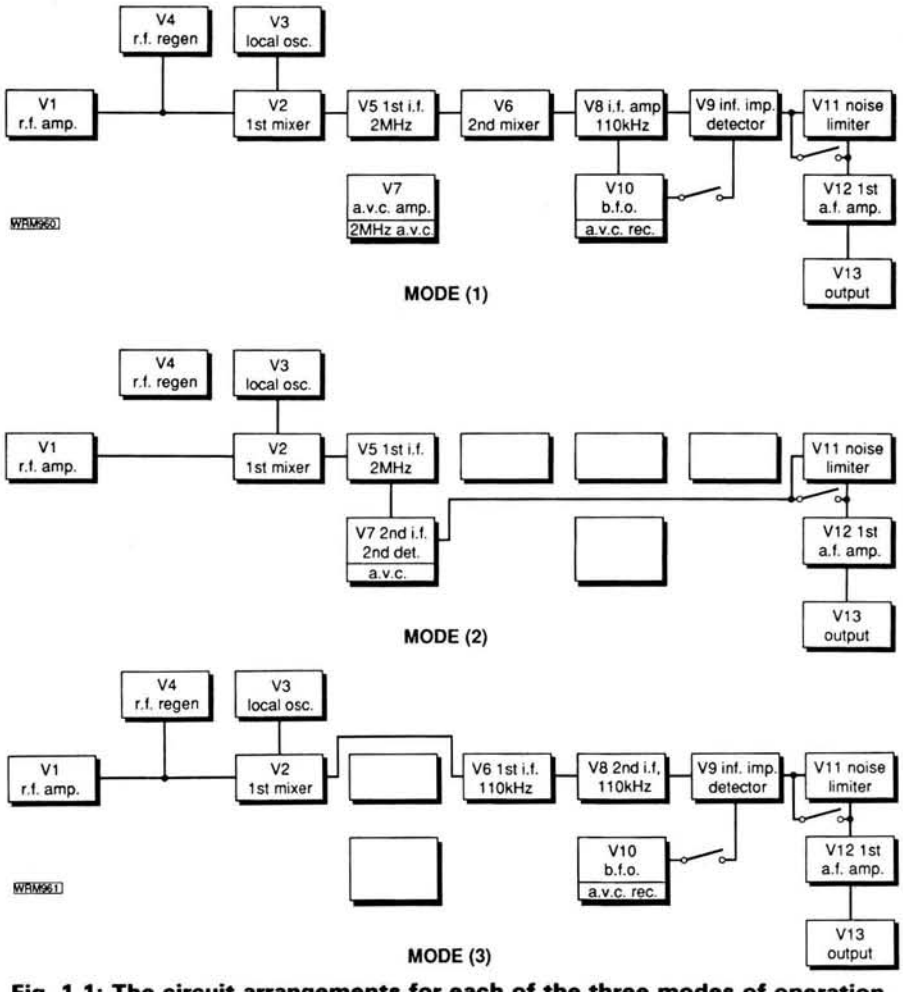


Fig. 1.1: The circuit arrangements for each of the three modes of operation, simplified to block diagram form

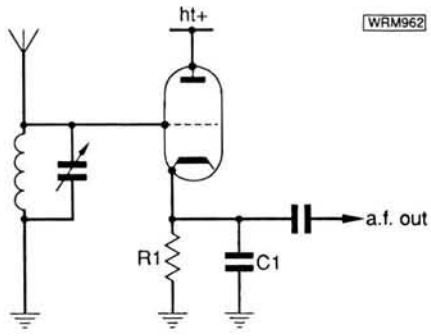


Fig. 1.2: The basic infinite impedance detector

circuit, Fig. 1.2, it will be seen that the anode of the valve is taken directly to h.t. +ve and the cathode to h.t. –ve via a 100kΩ load resistor (R1). Since this is also the bias resistor, a considerable negative bias will be applied to the grid of the valve and its anode current will be small. Positive swings of the r.f. input will counteract the bias and cause the voltage across R1 to vary in step with the modulation voltage of the signal. The amount of negative feedback obtained with this arrangement is 100 per cent, endowing it with an extremely high input impedance, hence its name, but giving it a gain factor of less than unity. At the same time the high impedance imposes minimal damping on the tuned circuit and enhances its *Q*. This effect is so strong that measures may have to be taken to prevent the valve from presenting a negative resistance to the tuned circuit and bringing about ultra-sharp tuning (with loss of high audio notes) and possible instability. The cathode bypass capacitor C1 provides stabilisation; its value is chosen to present a low reactance at r.f. but a high reactance at a.f.

For satisfactory demodulation the input level to the infinite impedance detector must be high, so in the days of simple detector—amplifier—output receivers its use was confined mainly to local-station reception. In this role the excellent selectivity obtainable from a simple tuning arrangement makes it eminently suitable in areas where there are a number of strong stations which would cause overlap with conventional grid-leak or anode-bend detectors. It will be appreciated that the foregoing characteristics may be exploited in a receiver in which narrow tuning is a virtue and having a good deal of pre-detector gain, as with the DST100.

A separate a.g.c. line derived from the 110kHz i.f. amplifier is provided. This uses two diodes (part V10, 6R7G) with one acting as a.g.c. rectifier and the other being shunted across the output of this. The exact purpose of the second diode is not made clear in either the circuit or the official service manual, but it appears to serve as a "clamp" to prevent the a.g.c. from

coming into effect until a predetermined signal level is exceeded. The a.g.c. voltage obtained from V10 is combined with that obtained from V7, which is delayed conventionally by virtue of the cathode bias on this valve. The combined a.g.c. voltages are applied to V1, V5, V6, V7 and V8 on bands A–F, and to V2 on bands B–F.

The a.f. signals derived from V9 are passed to the a.f. gain control, and thence the first a.f. amplifier (V12, 6Q7G) either directly or via the optional noise limiter (V11, 6H6G). The two diodes of this valve are connected to present a variable impedance to the incoming a.f., controlled by its amplitude, and thus attenuate any high-level, briefly-pulsed interference. Bias for the noise limiter is obtained from the cathode circuit of V12. The latter acts as a conventional amplifier, resistance-capacitance coupled to the output stage (V13, 6V6G), a variable tone control of the bass-cut type being included in the coupling network. A transformer in the anode circuit of V13 matches its output to 4000Ω and 600Ω.

For c.w. reception a b.f.o. is provided, employing the triode section of V10 in a conventional oscillator circuit, and with its output applied inductively to the grid of V9.

2. Bands A–F
Selectivity "Broad"

The r.f. amplifier, first frequency changer and 2MHz i.f. amplifiers work as in (1) above, but the signals passed to V7 are now demodulated by its other diode and passed on as a.f. directly to the noise limiter and output sections of the receiver. Thus the receiver operates as a single superhet, and the second frequency changer, 110kHz i.f. amplifier and infinite impedance detector are idle. The a.g.c. is derived solely from V7.

3. Band G
Selectivity "Sharp" to "5"
("Broad" inoperative)

Once again the r.f. amplifier and first frequency changer operate as in (1), but the local oscillator frequency is chosen to give a 110kHz i.f. at the anode of V2. The relay opens to bring the 110kHz i.f. transformer into play, and signals are passed on directly to V6, bypassing V5 and V7, which are idle. V6 now operates simply as an i.f. amplifier, and the rest of the valves operate as in (1) above, again in single superhet mode. The a.g.c. is derived from V10 alone.

NEXT MONTH *Chas E. Miller describes fault-finding and alignment procedures for the DST100, together with a few suggested modifications.*

Feature

Practically Yours

By Glen Ross G8MWR

As amateur radio gear gets ever more complex there appears to be less scope for the average amateur to get involved in home constructed equipment. One of the few areas that is still open to the constructor and experimenter alike, is that of antenna design and construction. This month we look at an indoor antenna for the 144MHz band. Being designed specifically for indoor use, the materials cost can be kept low. It might be just the project for keeping you amused over the Christmas holidays.

The Lazy-H

Not, as you may think, the name of a western style cattle ranch, but an antenna system which was in common use some forty years ago. It has the advantage of being reasonably broad band, easily matched and fairly tolerant of nearby objects. Just the thing for putting up in the loft. Another attraction of this antenna is that it has a gain of around 5dB, in both front and back directions, all without the use of switching or rotation.

Construction

The dimensions and general layout of the antenna are shown in Fig. 1. The antenna consists of four radiating sections which are marked "A", a phasing harness made up from two equally spaced conductors marked "B" and a matching section "C". Spacers marked

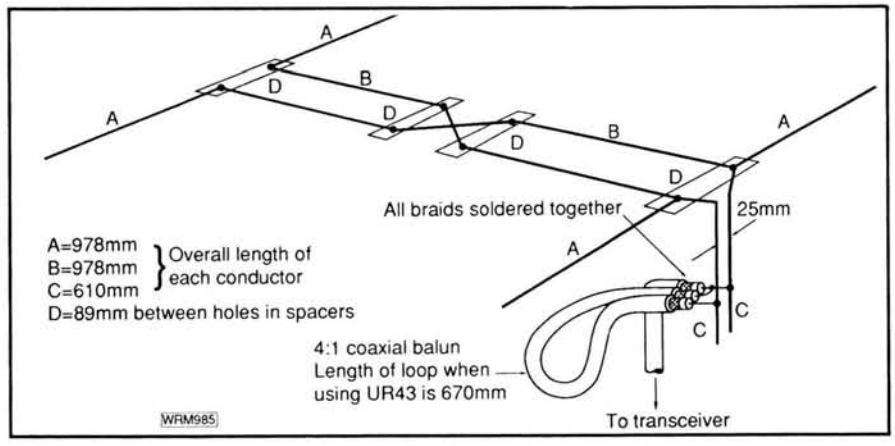


Fig. 1: Main antenna elements are made from pvc insulated conductors stripped from either 1·00mm² or 2·5mm² twin and earth mains cable

"D" are made from small lengths of dowel with holes drilled either end. Through these two holes, spaced 89mm apart, are threaded the conductors. For correct antenna operation it is essential that conductors "B" cross over exactly as shown in Fig. 1.

The matching section consist of two lengths of tinned copper wire (about 20 s.w.g., but this is not critical) spaced 25mm apart. The easiest way to make this item is to use a suitable length of wood with two screws at either end, and stretch the two pieces of wire between them. Tails should be left at one end to solder to the antenna feed points. The antenna can be mounted horizontally in the roof space by stringing its radiating elements between the joist timbers. In some instances this may not be possible, so try extending the elements with nylon cord.

Matching

The antenna has a balanced feed point with an impedance of approximately 275Ω. We need to convert this to 50Ω unbalanced and this is best done with a balun, the details of which are shown in Fig. 1a. To tune-up the system put your v.s.w.r. bridge into the feed line and attach the balun at approximately 300mm in from the open end of the matching section. Now apply some power and check the v.s.w.r. Depending on the match it may be necessary to move the balun connection points up and down the matching section, until a low v.s.w.r. is obtained. **PW**

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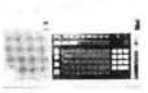

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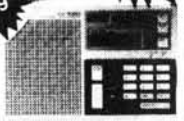

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Heinrich Rudolph Hertz (1857–1894)

One hundred years ago in 1888, Heinrich Hertz, a German physicist, announced that he had generated, detected and measured electromagnetic waves, confirming Maxwell's theory that "ether waves", as they were then called, could exist. Hertz has of course been recognised for his work in this field by the adoption of his name as the unit of frequency (abbreviated to Hz).

In this article, F. C. Judd G2BCX asks whether, in view of this accomplishment in 1888, he should also have been honoured by making this year the "wireless centenary year", or will this now be related to the more practical application of wireless transmission and reception, as for instance by G. Marconi, at a later time?

Heinrich Hertz, the eldest of five children of parents Gustav and Elisabeth Hertz, was exceptionally intelligent and as a child excelled in many school subjects, except music; he was tone deaf. On completing his secondary education he decided to become a structural engineer and accordingly served as an apprentice for one year. At the age of twenty he went to a school in Munich to learn engineering, but his interest soon changed and he took up the study of natural science, mathematics and magnetism. In 1878 Hertz became a student under Helmholtz and Kirchhoff at the Berlin Academy of Science.

In 1879 a prize was offered by the Academy for research on the establishment of a relationship between electromagnetic forces and the dielectric polarisation of insulators. Hertz was encouraged by Helmholtz to take up the work with a view to winning this prize. The problem was however complicated by the fact that electrical oscillations at a sufficiently high frequency could not be generated.

To Hertz this was a challenge; a problem to be overcome and in his own words:

> "I reflected on the problem, but abandoned it for the time. In 1886 I took it up again and by using apparatus that was available I produced electric waves and found that by the use of parallel conductors I could determine the presence, or absence of these waves, in the form of nodes or loops, by means of tiny sparks across various positions on these parallel rods. In the same year Sir Oliver Lodge found the same effects while investigating the operation of the lightning conductor. This work of mine was in 1886/7 and was described in a paper *On Very Rapid Electric Oscillations*".

In 1885 Hertz had become professor of experimental physics at the Karlsruhe Technical High School and in 1888 received his Doctorate and was appointed assistant to Helmholtz. Determined to prove that electromagnetic waves could be made to exist in space, he constructed apparatus which consisted of two flat metal plates each connected to a short metal rod terminated with a metal sphere. These were arranged as shown in Fig. 1(a) with the spheres nearly touching, each plate and rod being connected to one of the outputs of an induction coil. This assembly formed what was in effect a "dipole" antenna, but which was at the time regarded as a "capacitor" which could be charged up by means of the induction coil.

Heinrich Hertz (Courtesy GEC-Marconi Ltd)

When the potential across the "capacitor" reached a critical level it discharged itself via the two spheres (the spark gap) resulting in a sudden disruption of the electric field, this in turn, creating a magnetic flux in space. The persistence of the flux also produced an electric current in the reverse direction thus initiating an oscillatory process. Provided the oscillation was started suddenly, most of the energy thus generated was radiated by the "Hertzian dipole" as a damped wave.

Provided current in the induction coil primary was interrupted at short regular intervals, a series of damped waves could be produced and radiated almost continuously. The induction coil and d.c. interrupter became the "transmitter". For reception and detection of the electric waves at a distance, albeit a short one, a resonator consisting of a circle of metal with a gap terminated by two metal spheres was used. This is illustrated in Fig. 1(b). Radiation from the transmitter was "detected" visually by the appearance of very small sparks across the gap between the spheres. With other apparatus, though similar to that described, Hertz succeeded in generating electromagnetic waves with wavelengths from a few metres to 30 centimetres—ultra short waves!

Some years before the experiments by Hertz, a Professor Thomson had discovered, quite by accident, during a lecture in Philadelphia, that small sparks were being produced at a distance from an energised induction coil he was using for a demonstration. This discovery was not widely publicised and Thomson did not investigate further. Neither did he connect the phenomenon with the Maxwell theory. Why then is Hertz and not Thomson (and others) credited with the discovery and production of electromagnetic waves? Thomson's discovery was accidental as the result of a demonstration for a specific purpose. Others did not take their work to a final stage, i.e., to produce a radiated electromagnetic wave and detect its presence at a distance. Hertz on the other hand carried out a series of experiments directly based on the Maxwell theory that radiation in this form was possible. Not only did he succeed in generating these waves, but also proved that

they behaved in a similar manner to light waves, i.e., they could be reflected and refracted, and travelled at the same velocity as light.

Hertz said of his work: "Such researches as I have made upon this subject form but a link in a long chain. Lack of time compels me, against my will, to pass by the researches made by other investigators; so that I am not able to show you in how many ways the path was prepared for my experiment and how near several investigators came in performing these experiments themselves."

In an electrical journal, Hertz described how he radiated electromagnetic waves. Whilst on holiday in the Alps a young man happened to read the article which for him created a fascinating idea. Why not use the Hertzian waves for signalling? Guglielmo Marconi terminated his holiday and returned to his home in Italy to bring this fascinating idea to fruition!

The Hertz experiments with electromagnetic waves were published in 1888 in a paper entitled *Electromagnetic Waves in Air and Their Reflection.* He summarised the paper by saying: "The hope of these experiments was to test the fundamental hypotheses of the Faraday-Maxwell theory and the result of the experiments is to confirm the fundamental hypotheses of the theory."

During the summer of 1892, Hertz suffered an illness, originally caused by a decayed tooth but which developed into chronic blood poisoning from which he died on New Year's Day in 1894, a few weeks before his 37th birthday.

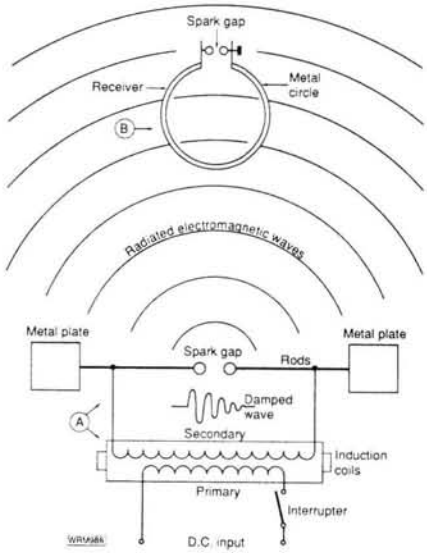

Fig. 1: (a) The induction coil and capacity radiator used by Hertz to generate electromagnetic waves. (The "transmitter" and Hertzian dipole).
(b) The ring resonator "receiver" used for the detection of electromagnetic waves at a distance from the "transmitter"

One of the best tributes to Heinrich Hertz was expressed by Professor Herman Ebert on 7 March 1894: "In him there passed away not only a man of great learning but also a noble man, who had the singular good fortune to find many admirers but none to hate or envy him. Those who came into personal contact with him were struck by his modesty and charmed by his amiability. He was a true friend to his friends, a respected teacher to his students, who had begun to gather round him in somewhat large numbers, some of them coming from great distances; and to his family he was a loving husband and father".

Was this great scientist also the "Father of Wireless"? ***PW***

Notes:

1. Earlier this year The Microwave Theory and Techniques Society of the American IEEE ran a Hertz Centennial Celebration in New York.
2. Thanks are due to GEC-Marconi Limited (Publicity Dept) for information concerned with the life and work of Heinrich Hertz, the photograph and details of the apparatus used by him for the experiment in 1888.

References:

1. "Heinrich Hertz: A Short Life" by Charles Susskind FIEEE. Published in the American *IEEE Journal* Vol. 36, No. 5, May 1988.
2. *Radio's Hundred Men of Science* by Orrin E. Dunlap Jr., published by Harper and Brothers, New York and London, 1944.
3. *A History of the Marconi Company* by W. J. Baker, published by Methuen Co. Ltd., 1970.
4. *Hertz and the Maxwellians. A Study and Documentation of the Discovery of Electromagnetic Wave Radiation (1873 to 1894)* by J. G. O'Hara and W. Pricha, published by Peter Peregrinus, 1987.

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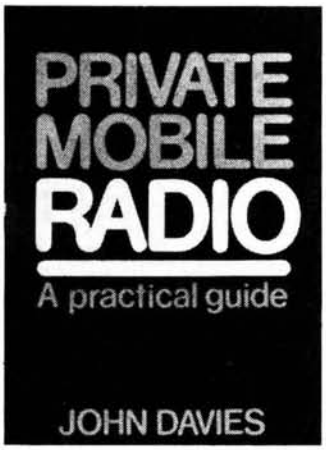

This book was written for people like industrial managers and engineers, surveyors and communications officers of public industries, indeed anyone faced with having to establish a private mobile radio scheme.

The first chapters deal with those principles of telecommunications which the author feels are the minimum essential background information needed. Because the people reading the book are likely to have other duties than radio and cannot afford the time to study too deeply, the writing has been kept as practical and "non-theoretical" as possible.

Later chapters deal with the practical aspects of establishing a scheme. This includes information of the types and performance of the components of a system, the available facilities and the alternatives to a private scheme.

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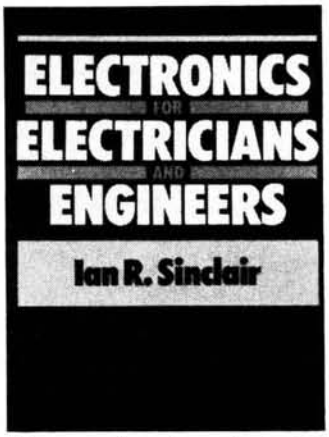

The rapidly changing technology of electronics has left many technicians requiring an updating of their skills. The same problems have faced other engineers, who now require a knowledge of electronics to understand new developments in their own subjects.

This book has been written for those sorts of people. The aim is to explain principles and devices in clear terms, without assuming a high level of prior knowledge. The early chapters are concerned with a revision of modern electrical principles. In the chapters that deal with electronics, the emphasis has been on principles and devices, but sufficient circuit diagrams have been included to illustrate how the various electronic components are used.

Chapters include such subjects as: Fundamentals, d.c. circuits, a.c. circuits, ions, diodes, transistors and i.c.s.

Using Your 80m λ/2 on Top Band

Following on from his recent article on "Getting to Know Your λ/2", P. B. Buchan G3INR describes how this antenna may be used on Top Band with a suitable a.t.u.

The 3.5MHz λ/2 end-fed antenna featured in the earlier article has been used at the author's QTH for some four or five years. During that period it has been called upon to radiate signals on at least four different bands, all of which require a different matching unit. On Top Band (1.8MHz) the antenna operates as a λ/4 radiator which, most of you will know, presents a low-impedance feed point to the transmitter.

The following describes a means by which a suitable matching unit may be designed by first finding the end impedance of the antenna. In the main, the idea follows on from the earlier article in using and applying instrumentation that has been featured in past issues of *PW* (3), (4) and (5).

Finding Feed Impedance

For a series or current-fed antenna, a similar approach is made to that when finding the feed impedance of a parallel, or voltage-fed system. First a matching unit is made up, making the assumption that the feed impedance would be about 50Ω. From the formula (2) for *Q*, which incidentally is chosen to be ten, a capacitor value can be determined, followed by the inductor value required to achieve resonance.

$$Q = \frac{Xc}{R\ load} \qquad \text{Formula 1}$$

Where:
Xc is the value of matching unit capacitance at resonance
R load is the antenna feed impedance at resonance.

The values calculated are as follows, 200pF, 35μH and 4μH for the link winding. A coil of 26 turns with a winding length of 65mm on a former 55mm in diameter, gave about 35μH. For the capacitor, most likely a receiving type will have to be used, one with a maximum value of 500pF will suffice. The 5μH link winding should consist of 6 turns, wound on in the same "sense" as the main coil and close wound, see Fig. 1(a). At this point calibrate the capacitor, using the LCR Bridge (3). Connect the coil and capacitor in series and arrange the circuit as in Fig. 1(b).

Noise Bridge

Experience gained in experimenting with the antenna on 3.5MHz (1) should have given you a feel for using the instrumentation, especially the noise bridge (4), which can give very deep but narrow nulls. The next step is to connect the antenna to the matching unit, and insert the noise bridge between this and the receiver. Switch the receiver on and tune it to about 1.65MHz, switch off the a.g.c. if possible, reduce the r.f. gain in any case, and put the receiver in to a.m. mode. These experiments may be done using a receiver that does not have switchable a.g.c. or a.m. mode, although it is easier to "catch" the null with a.g.c. off and the wider bandwidth that the a.m. mode offers.

Now turn on the noise bridge. A fairly high noise level will be heard, be careful to start with low audio gain if phones are used, and commence tuning the matching unit capacitor for the best null. On obtaining a null make a note of its capacitance and then tune the receiver to 1.7MHz, once again tune the capacitor for a null, and note the value. Continue up the band in steps of about 50kHz, making a note of the capacitor value at each frequency, up to say 2MHz. For a check it is experimentally prudent to repeat the procedure but go from 2MHz down the band. This is good scientific discipline, and can reveal faults in your method, as well a check on your figures.

Arriving back at 1.65MHz, assuming all is well, remove the antenna and in its place connect a calibrated carbon variable resistor (about 250Ω), as described in (1). One end of the resistor must be connected to earth.

Tabulating Results

Once more obtain a null in the receiver noise, but this time adjust both the matching unit capacitor and the resistor. This null can prove elusive, but persevere, because a value of R and C will be found which meet the requirements, note the value of R. A guide is that the capacitor value will be less than the value obtained with the antenna connected. If not then the antenna is resonant below 1.65MHz. When the null has been achieved move up the band as before to 2MHz. A table of results may be constructed, see Table 1, plot a graph from the table, see Fig 2. As before (1), the two graphs cross at a frequency, about 1.75MHz in this case, where the value of capacitance is the same for both antenna and resistor. This is the resonant frequency of the λ/4 antenna.

The experiment was carried out by using earth as a reference point, the value of R obtained at resonance (33Ω) is for this condition, if a counterpoise was substituted for the earth a different value may be obtained. On this occa-

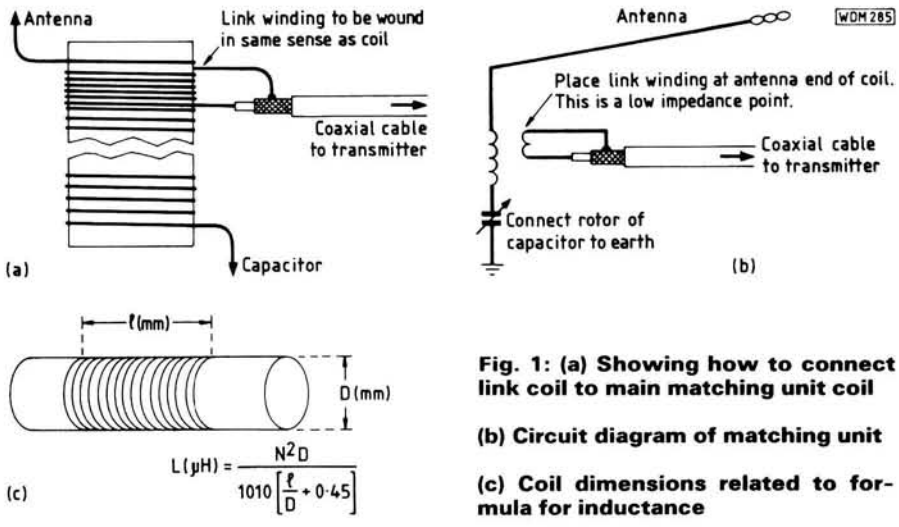

Fig. 1: (a) Showing how to connect link coil to main matching unit coil

(b) Circuit diagram of matching unit

(c) Coil dimensions related to formula for inductance

sion a counterpoise was considered too unwieldy with a length of 40 metres. A λ/4 counterpoise would be necessary (8).

So, the result agrees well with theory, that a quarter wave antenna exhibits an impedance of about 35Ω (2). However, the matching unit used for the experiment was designed for a load of 50Ω. A new design must be worked out for the value of 33Ω.

Returning to the equation in formula 1 we obtain values of 300pF and 30μH for the new load value of 33Ω, the 4μH remaining the same for the link winding.

Coil Design

Basing the coil design as before (1) on the premise that the most efficient coil has a winding length to diameter ratio of one (6), all that remains is to choose a former of suitable dimensions. In the previous article (1) a diameter of 60mm or 80mm was recommended for an inductance of 37μH, for this unit an inductance of 30μH is required therefore a diameter of 60mm was chosen. From the formula (7)

$$N_{coil} = \sqrt{\left[\frac{(L\mu H) \times 1010[^{1}/_{D} + 0.45]}{D}\right]}$$

= 27 turns Formula 2

27 turns is the number required. Calculating the number of turns for the link with a winding length of say 15mm we have,

$$N_{link} = \sqrt{\left[\frac{(L\mu H) \times 1010[^{1}/_{D} + 0.45]}{D}\right]}$$

= 6 turns Formula 3

Remember the link winding must be wound on in the same sense as the coil winding and it is important to be placed as shown in Fig. 1(a). The rotor of the capacitor is earthed, this will eliminate a tendency to hand capacity, if it is placed between the coil and antenna. Note that when transmitting, the stator of the capacitor is a voltage point.

Useful Experiment

A further valuable exercise may be carried out with same antenna. It was recorded (1) that the antenna showed a number of resonant points in addition to the λ/4 and λ/2 points. One of these resonant points was at a frequency near 5MHz. At 5MHz this antenna is 3λ/4, a useful length which offers the opportunity to measure the end impedance and design a matching unit to suit.

Clearly 5MHz is not an amateur band allocation, however, 3λ/4 antennas cut for operation on 7, 10 or 14MHz can provide useful performance. The following exercise shows how such as antenna may be catered for.

The procedure follows that already described, remembering that a 3λ/4 is a current feed systems, and fed against ground. Assuming a 50Ω end impedance at resonance, and a Q of 10, commence by finding the capacitive reactance of a matching unit e.g.

$$\frac{Q = X_c}{R} = 10, \text{ then } X_c = Q\ R \text{ ohms} = 500\Omega$$

Formula 4

The values obtained were as follows 65pF, 65μH and 1.6μH for the link winding. A suitable coil was found from the box and the experiment carried out commencing at 4.7MHz. The final results showed that in fact the antenna was resonant at 5.4MHz, not

46 ▶

Table 1 (R=33Ω)

Freq. (MHz)	C ant. (pF)	C res. (pF)
1.65	550	440
1.70	450	415
1.75	375	375
1.80	325	365
1.85	280	350
1.90	250	330
1.95	215	315
2.00	190	300

Table 2 (R=62Ω)

Freq. (MHz)	C ant. (pF)	C res. (pF)
5.0	135	84
5.1	120	80
5.2	98	75
5.3	82	73
5.4	70	70
5.5	57	65
5.6	50	62
5.7	4.5	60

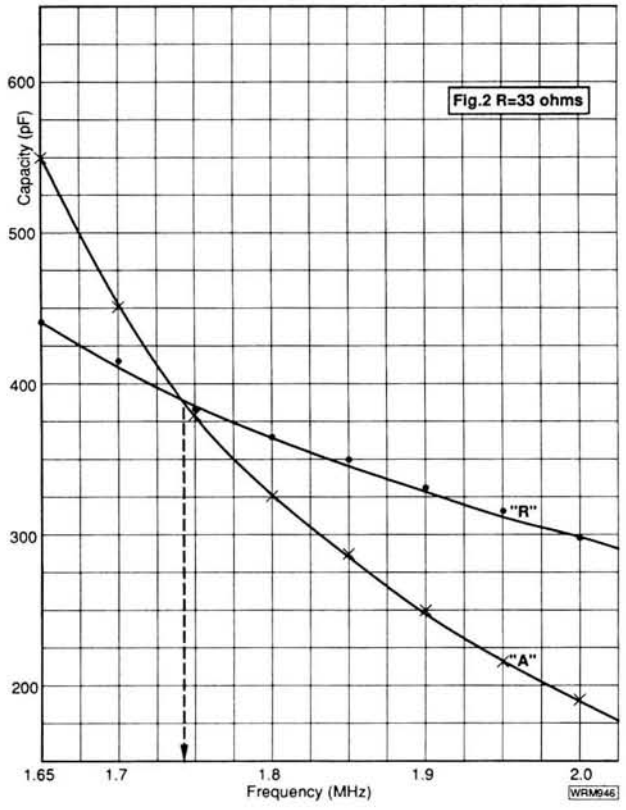

Fig. 2: Shows variation of the capacitor in the matching unit with antenna connected "A" and with resistor connected "R". The resonant point is at 1.74MHz

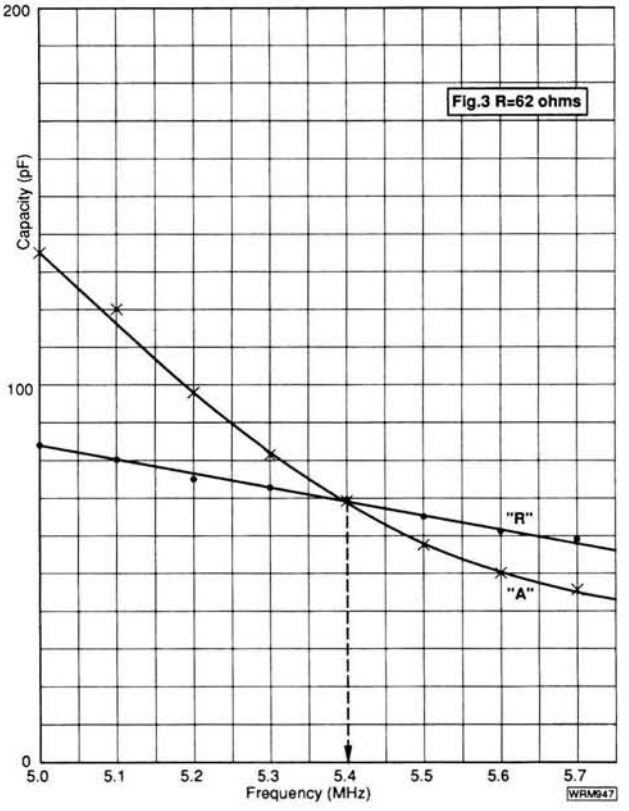

Fig. 3: Shows variation of the capacitor in the matching unit with antenna connected "A", and with resistor connected "R". The resonant point is at 5.4MHz

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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: £69.50 including VAT and delivery.

Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

In this, Part 9, R. F. Fautley G3ASG completes his look at the component parts of a superheterodyne receiver.

The Beat Frequency Oscillator

For the reception of a.m. (amplitude modulation) signals only, this stage is not required. If it is fitted, then it could be made inoperative whilst listening to a.m. signals, for example broadcast stations, by fitting an on/off switch in series with its +12V line to simply remove the d.c. supply.

The beat frequency oscillator (b.f.o.) is simply an oscillator of the type shown in Fig. 8.1 using suitable component values to enable it to oscillate at the intermediate frequency of the receiver. For the reception of s.s.b. (single sideband) signals, the oscillator could be crystal controlled like the circuit shown in Fig. 4.9, with output taken via a capacitor from the transistor emitter.

For those more advanced types who want to receive c.w. stations too, it's preferable to use an oscillator that can be varied in frequency as the circuit shown in Fig. 8.1. A small variation in frequency can be useful to alter the a.f. note in the headphones slightly when interfering stations appear. In fact, the frequency could be varied slowly until one interfering station produces a zero beat and becomes all but inaudible. Receiving and reading Morse is rather more of an art than a science! Only practice and experience in using the available controls can result in pulling out an elusive weak DX station from under the pile of stations that are usually heard calling on top of him.

In a similar fashion, a variable b.f.o. is sometimes useful when resolving s.s.b. speech transmissions to act as a "speech clarifier". This is because it is essential to tune the receiver **precisely** so as to obtain undistorted speech from the otherwise garble of incorrectly tuned signals. Operation of the b.f.o. at the much lower intermediate frequency makes for easier manual control in resolving sideband signals, rather than attempting to tune them in accurately with the main receiver tuning control at the higher station frequency. This is because the same angular rotation of the two controls will give a much smaller frequency change for the b.f.o. than that for the main tuning.

Demodulator

There are two types of demodulator that are important to recognise:
(a) the envelope detector
(b) the product detector
The simplest of these is the envelope detector. This is essentially the same in operation as the old crystal set in Fig. 2.6, and it's used for receiving a.m. broadcast stations. Very few amateurs use a.m. these days, but where they do, then the envelope detector could be used to listen to them.

A simple diode a.m. detector with a.g.c. rectifier is shown in Fig. 9.1. The components L1, C1, L2 and C2 are tuned to the i.f. and the demodulator diode, D1, behaves in a similar way to the diode in the old crystal set. Components C3, R1 and C4 filter out the r.f. part of the rectified output using suitable values to prevent attenuation of the higher audio frequencies. Those values are part of a design problem outside the scope of this series. Resistor R4 is the diode load resistor.

The b.f.o. input is fed to D1 via a small capacitor C7 and so mixed with any incoming c.w. signals, thus providing an audible note from what would otherwise be detected as zero frequency, i.e. no audible signal at all. The b.f.o. frequency must be about 1000Hz above or below the intermediate frequency for this to happen.

A sample of the i.f. signal is fed via C6 to the a.g.c. rectifier diode D2, with the diode load resistance being providing by R2 and filtering by R3 and C5. The a.g.c. is taken from L1 rather than from L2 to prevent the b.f.o. voltage (when in use to receive c.w. signals) from being rectified by the a.g.c. diode D2 and so giving a false a.g.c. voltage to the controlled stage or stages.

The cathode of the a.g.c diode is connected to earth to provide an increased d.c. negative-going output for any increase in input signal. Any decrease in signal level, usually due to the signal fading, results in less a.g.c. output and an increase in the gain of the i.f. amplifier (and any other controlled stages) to maintain a nearly constant output level.

Nearly all amateur equipment these days uses the single sideband mode for transmitting speech and to demodulate

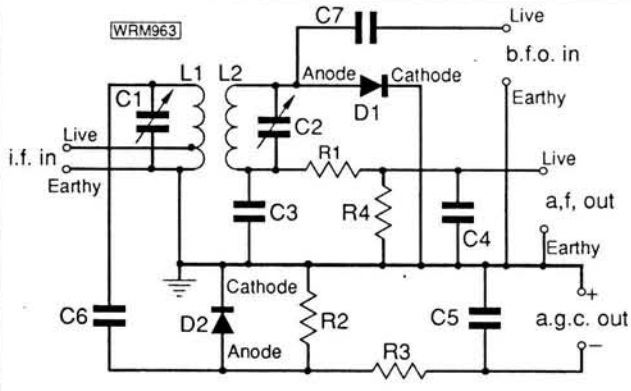


Fig. 9.1: An envelope detector for a.m. signals with a.g.c. rectification

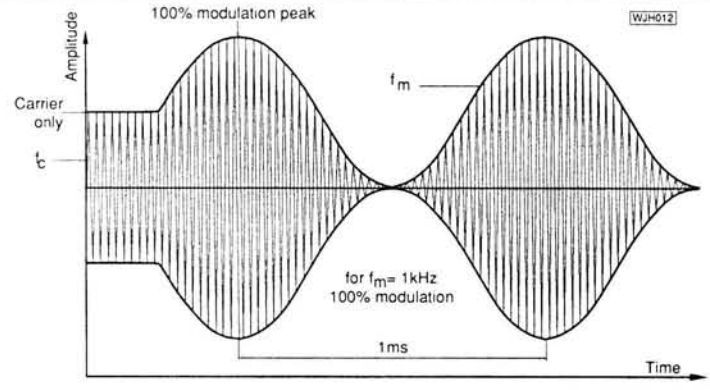


Fig. 9.2: Amplitude modulation as seen on an oscilloscope

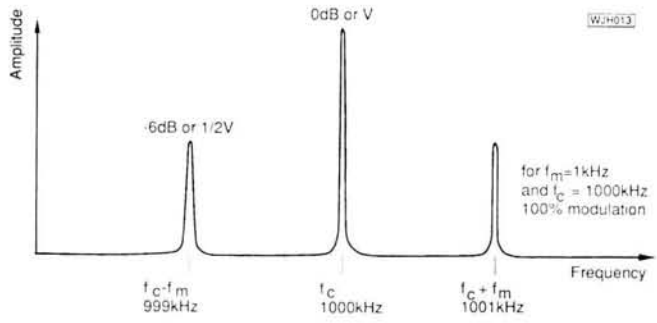


Fig. 9.3: Amplitude modulation as seen on a spectrum analyser

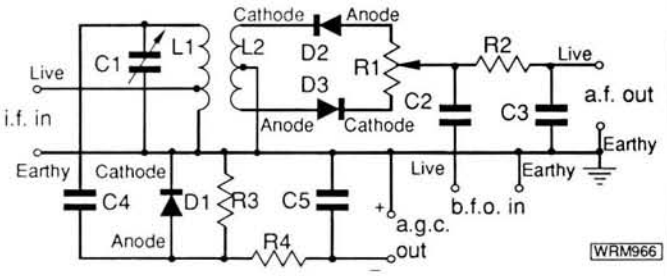


Fig. 9.4: A balanced diode product detector for c.w. and s.s.b. signals with a.g.c. rectifier

these signals a product detector is usually fitted.

Why is the old diode envelope detector not suitable for resolving s.s.b. signals? To understand this, it is necessary to first have a look at the differences between the two modes.

The a.m. signal consists of two separate parts, a carrier wave which is at a **constant** level, whether any intelligence (speech or music) is being broadcast or not, and a second part which consists of signals representing the modulation (i.e. speech and music).

Ideal s.s.b. signals do not have this carrier wave at all, so that the whole of the signal is devoted to transmitting the intelligence. How then, does this difference affect the type of demodulator required?

Recovering the a.f. part of an a.m. signal was described in Part 6 (Fig. 6.2 where the close-spaced lines represented the carrier wave). If you look back, they don't look very constant in amplitude do they? Well, mathematically if an a.m. transmitter is modulated by a single tone **it can be shown that** the signal consists of not one, not even two, but actually **three** discrete signals. Forget the maths, but if you could **see** the signal envelope on an oscilloscope (called the **time domain** because the signal is viewed against a horizontal **time** axis) it would look like Fig. 9.2. Still, it doesn't look like three separate signals does it?

Now look at Fig. 9.3. This is the **same** signal shown on a spectrum analyser, which presents it in the **frequency domain,** so called because the horizontal axis is calibrated in **frequency.** Now the three signals are quite clearly in view, and if the **amplitude only** of the modulating single tone is varied a bit up and down, the centre line which represents the carrier remain constant in amplitude whilst the other two go up and down together with the modulation signal.

If we vary the **frequency** only of the modulating tone whilst its amplitude remains constant, the two outer signals on the spectrum analyser display will move closer to the unchanging centre carrier for a lower modulating frequency, and further away for higher modulating frequencies, whilst all their amplitudes remain constant.

Why are there three signals on the display when we only have two to start with? The two we know about are the r.f. carrier and the a.f. modulation, so where does the third come from? Remember when we talked about "beats"? Well, modulation of one signal by another (e.g., an r.f. carrier modulated by an a.f. signal) is the result of "mixing" the two signals in a similar way to the superhet mixer, resulting in extra signals having different frequencies from the two we started with.

Because of the type of non-linearity of the circuit used for amplitude modulation, the resultant beats obtained by the process are given by:

f_c, $f_c + f_m$ and $f_c - f_m$

where:

f_c is the carrier frequency (r.f.) and
f_m is the modulation frequency (a.f.)

All of these three are radio frequencies, the three observable on a spectrum analyser as described previously. It is interesting that the type of non-linearity used for amplitude modulation results in f_m vanishing completely.

So, there are different **types** of non-linearity associated with different types of beats, called heterodyning, intermodulation distortion, modulation, mixing (frequency changing), rectification and demodulation. Also there is "harmonic distortion" which is often quoted in the specification of audio amplifiers. This refers to the level of harmonics produced by an amplifier for pure input tones. In the terms we have been using, these harmonic frequencies are (as in music) whole number multiples of the original signal frequencies.

$n \times F$

where:

n is any integer greater than 1 and
F is the frequency of the input signal

What electronic and radio engineers call the "second harmonic" (twice the original frequency), in musical terms is referred to as the "first harmonic" or "first overtone" just to add to the general confusion!

This means we have seven of what were thought to be different processes, being in fact just different aspects of the same thing!

The problem still remains. Why can't a simple envelope detector be used to receive s.s.b. signals? Remember that the a.m. signal always has a carrier regardless of whether it's modulated or not. When passed through the diode demodulator (a very non-linear device) the carrier and any sidebands present (caused by speech, music or other modulation) will produce beats. So, one of the beats produced will be:

$(f_c + f_m) - f_c$

which is the same as: $f_c + f_m - f_c$ or just f_m, the modulation alone—which is what we want. Another beat will be:

$(f_c - f_m) - f_c$ or $-f_m$

Don't worry about the negative sign (it's only maths!) as it turns out to be the same as f_m. So we've demodulated the a.m. signal satisfactorily.

What happens if we try to listen to an s.s.b. station in the same way? Well, as there is ideally no carrier transmitted at all, and only one sideband is present, modulation comprising a similar single sinewave tone will produce only one discrete r.f. signal. Passing this signal through an envelope detector will produce only a bit of d.c. and some r.f. harmonics, but **no audio at all.** As there is no constant carrier signal present, a complex speech wave will simply produce beats between all the component frequencies of the signal, i.e. unintelligible garbage. As an exercise, just try listening to single sideband signals on the amateur bands using an a.m. receiver!

How do we receive s.s.b. signals then? Very simply we **put a carrier in** by mixing a fixed oscillator signal (which is present whether any signals are being received or not) with the s.s.b signal. Thus we make the signal into a pseudo-a.m. signal with only one sideband. Demodulation with an envelope detector would then make speech intelligible. This method is called the "poor man's s.s.b.". A more efficient demodulator for s.s.b. signals is the **product detector.**

Looking at Fig. 9.4, the i.f. signal is tuned by C1 and L1, and fed to two diodes, D2 and D3. The b.f.o. signal (in this case referred to as the "carrier insertion oscillator") is also applied to the diodes via C2 and the potentiometer R1, which is used as a "balance

control", Potentiometer R1 is adjusted to obtain a minimum b.f.o. signal at the i.f. transformer primary L1 and so prevent rectification of the b.f.o. signal by the a.g.c. diode, D1. The whole business of balanced modulators will appear again later when we get to transmitters.

The complex output from the detector is filtered to remove the r.f. signals by R2 and C3, and the a.f. part only passed to the following a.f. amplifier. A controlling a.g.c. signal is rectified by D1 in a similar way to that described for the envelope detector.

There are many different circuits for demodulating s.s.b. signals that use transistors, f.e.t.s, diodes and even valves, but they can all be recognised by looking for the two input and one output ports, just like mixers. Ports? Just another name for input or output terminals.

The AF Amplifier

The amplifier we looked at in Fig. 7.1 can be used to raise the audio signals to a level suitable for headphones, but if loudspeaker operation is required a further higher power stage is necessary. A simple a.f. power amplifier is shown in Fig. 9.5.

Transistor Tr1 is just an amplifier providing a high enough signal level to drive the two power transistors Tr2 and Tr3, which are connected in "push-pull". The term "push-pull" gets its name from the way the circuit operates. During the half-cycle that the base of Tr2 is being driven positive, the base of Tr3 is being driven negative. Whilst one transistor is "pushing" the other is "pulling". Similarly, the collector of Tr2 will reach a negative peak at the same instant that the collector of Tr3 reaches a positive peak.

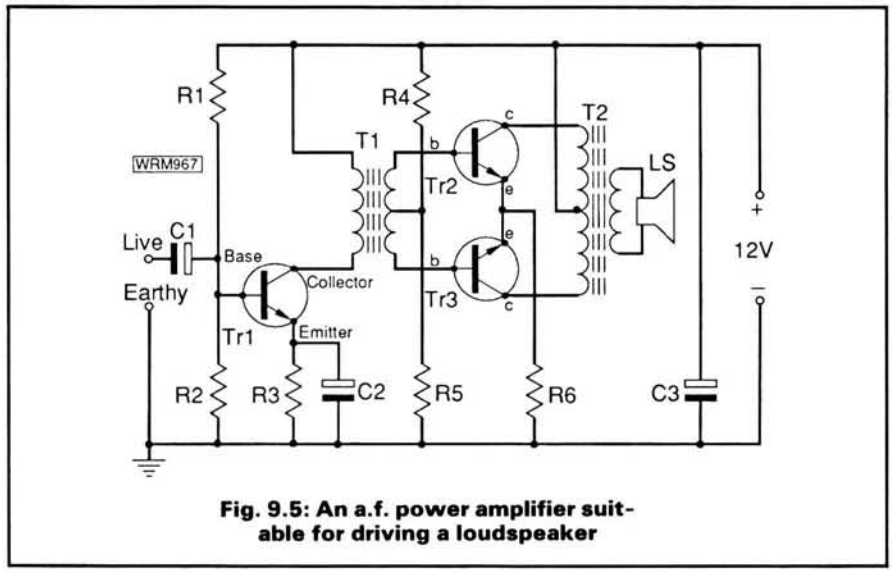


Fig. 9.5: An a.f. power amplifier suitable for driving a loudspeaker

Input transformer, T1, has its secondary winding centre-tapped to provide equal and opposite signals to each base connection. In other words, to provide each base not only with the same level of input signal but also with 180° phase shift. Output transformer T2 combines the output power from the two transistors to drive the load provided by the loudspeaker.

Biasing and other components setting the quiescent d.c. conditions for the amplifier should be recognisable by now, but if not, take a look back to the description of the a.f. amplifier shown in Fig. 7.1.

There will be quite a lot more about amplifiers of various types, or classes, in following parts when we start to look at the different varieties used for transmitting.

The PW "Marlborough" MW Converter

The needs of most medium wave and long wave DXers are often neglected by receiver manufacturers, who seem to include these bands as an afterthought. With this in mind Bryan Roberts G4POL has sought to redress the balance of things a little with this high performance converter.

Medium wave and long wave DXing has a considerable listener population around the world, not perhaps the same number as that of short wave but nevertheless substantial. From my observations the needs of this section of listeners is sometimes overlooked. A major problem is that of antenna size, but this has been overcome by the use of ferrite rod antennas which are built into all but the most expensive receivers. This type of antenna is very effective if you are able to turn the receiver for the best result, something which is a little more difficult to do with a base station receiver.

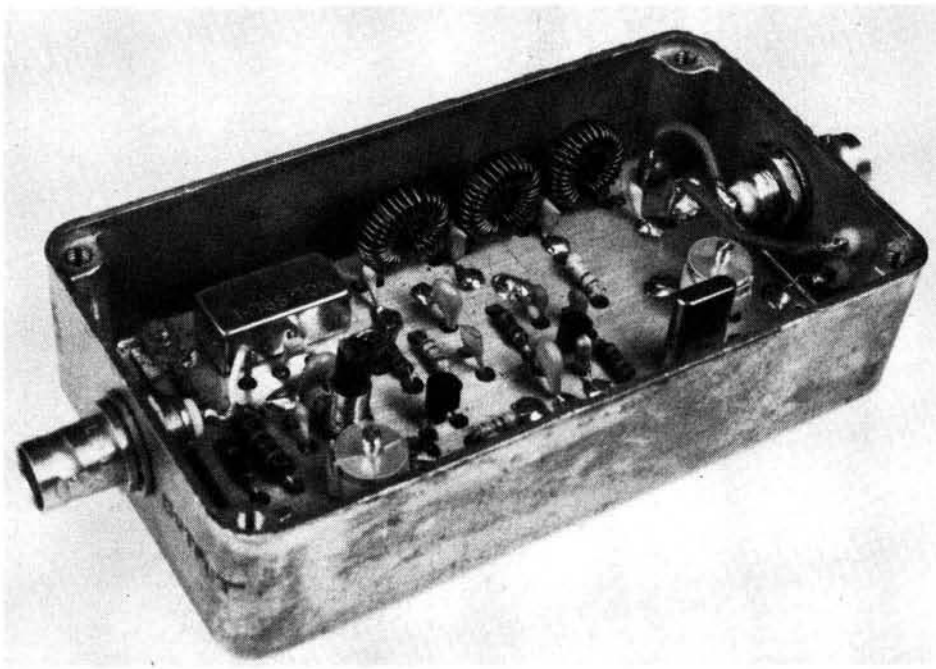
The serious DXer will probably have a frame antenna like those published in earlier issues of *PW*. This type of antenna provides a low impedance to match a standard receiver input. The problem that arises is when you try to bypass the internal antenna, in most cases this is not an easy task. This article outlines an inexpensive way to overcome the problem.

The result will be a high performance converter, as shown in Fig. 1, which when placed ahead of a short wave receiver tuning 10 to 12MHz will tune signals from d.c. to 2MHz.

Choice of IF

The i.f. has been carefully chosen to provide the fewest possible problems for the listener. You should remember that the strength of signals on the short wave broadcast bands can be enormous, and the slightest breakthrough will cause the weak medium wave DX station to be lost.

As a result of careful observation a tuneable i.f. of 10 to 12MHz was chosen, the reasons being threefold: first the medium wave signals end at 1.6MHz will be at 11.6MHz on the receiver dial, the 25 metre band which contains numerous strong signals begins at 11.7MHz so i.f. breakthrough will be minimal. Secondly the 10 to 12MHz portion provides an easy reference for tuning, e.g. radio station WINS New York on 1.010MHz would read 11.010MHz on the dial. Lastly the second channel interference (crystal frequency plus intermediate frequency) at 20 to 22MHz, contains very few strong signals and most are so far removed from the required frequency that there should be no problem at all.



Circuit Description

Once again the ubiquitous SBL1 double balanced mixer returns as the heart of the design, which as it happens differs very little from the author's *PW* "Woodstock" design of March 1987. From Fig. 2 you will see that signals

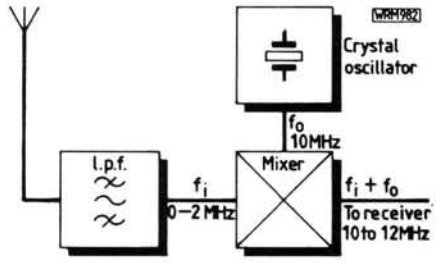
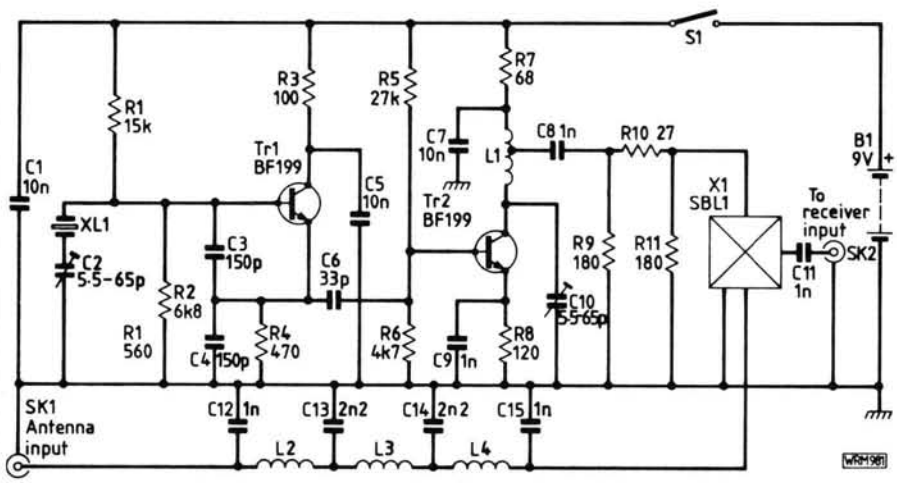
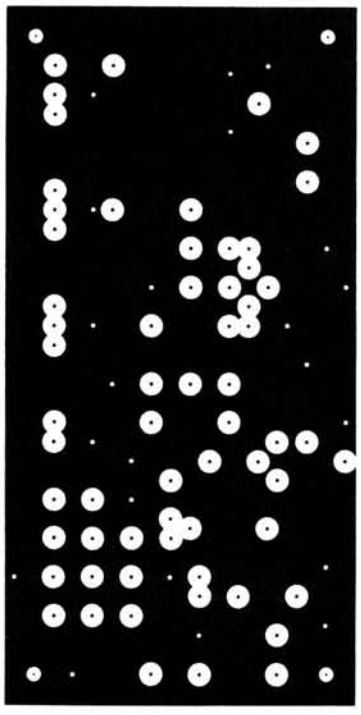


Fig. 1: Block diagram of converter

Fig. 2: Circuit diagram





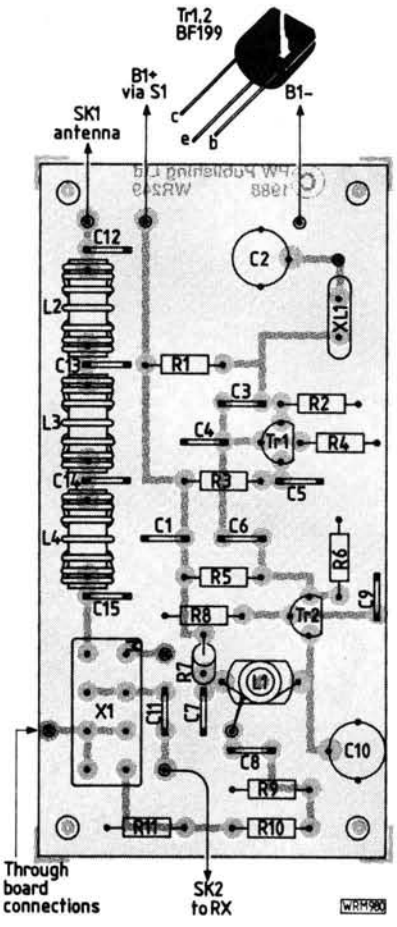
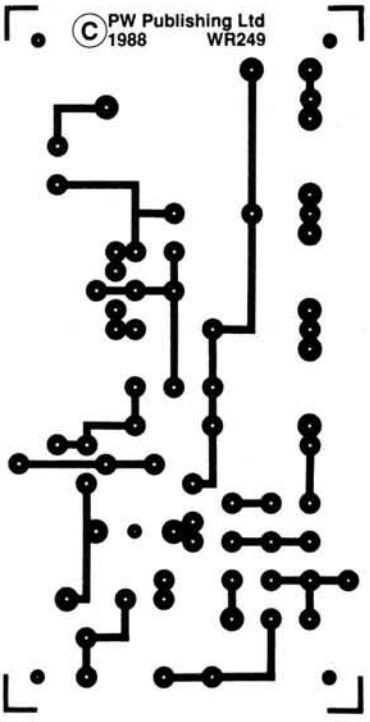


Fig. 3: Full-size p.c.b. track pattern and component location diagram



appear at the 50Ω input of a 7-element Chebyshev filter which has a cut-off frequency of 2MHz. This filter provides 50dB of rejection at the intermediate frequency and considerably more at twice the i.f. The filter allows v.l.f., l.w. and m.w. signals through plus the top band signals from 1.8 to 2MHz, this is an extra bonus for those who may not have top band facilities. Signals from the filter are then fed directly to the 50Ω input port of the mixer. The Colpitts oscillator is based on an HC/18U 10MHz crystal, the signal is buffered by Tr2 filtered by L1 and matched via an attenuator pad to the input of the mixer.

The resultant output is fed directly to the input of the station receiver. Conversion loss of this converter is 6dB or 1 S-point, most receivers have sufficient sensitivity to overcome this loss without noticeable difference.

Construction

The layout and track patterns of the double-sided printed circuit board are shown in Fig. 3. The board is made from copper-clad, glass fibre material. The upper side acts as a groundplane. Where leads of components pass through the board the area around the holes in the groundplane should be cleared using a drill bit to prevent short circuits.

Once the board is prepared, solder in all the resistors followed by the capaci-

SHOPPING LIST

Resistors

0.25W 2% Carbon film

27Ω	1	R10
68Ω	1	R7
100Ω	1	R3
120Ω	1	R8
180Ω	2	R9,11
470Ω	1	R4
4.7kΩ	1	R6
6.8kΩ	1	R2
15kΩ	1	R1
27kΩ	1	R5

Capacitors

Sub-miniature, ceramic plate

33pF	1	C6
150pF	2	C3,4
1nF	5	C8,9,11,12,15
2.2nF	2	C13,14

Sub-miniature, ceramic disc

10nF	3	C1,5,7

Miniature foil trimmers

6–65pF	2	C2,10

Semiconductors

BF199	2	Tr1,2[3]

Miscellaneous

XL1 10MHz HC18/U crystal[1]; X1 SBL1 block mixer[1]; 5.23mm dia Neosid (52-002-60) type former; F29 material core to suit former[2]; T20/2 toroid (3)[1]; 34 s.w.g. enamelled copper wire[3]; 24 s.w.g. enamelled copper wire[3]; S1 s.p.s.t. miniature toggle switch; (A9 Box S/No FL10L) aluminium project box[4]; SK1,2 50Ω coaxial; battery connector; B1 6-F22 (PP3); p.c.b.; Veropins; hook-up wire; adhesive feet (4); 6BA nuts, bolts, spacer etc.

[1] Cirkit Holdings plc, Park Lane, Broxbourne, Herts EN10 7NQ. Tel: 0992 444111.
[2] CPL Electronics, 8 Southdean Close, Hemlington, Middlesbrough TS8 9HE. Tel: 0642 591157.
[3] Cricklewood Electronics Ltd, 40 Cricklewood Broadway, London NW2 3ET. Tel: 01-450 0995.
[4] Maplin Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex SS6 8LR. Tel: 0702 554161.

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tors. Note that all connections except those of X1 to earth are made on the upper surface of the board rather than by passing the lead through a hole in the board. Take care to bend the "earthy" leads of the ceramic plate capacitors outwards using fine nosed pliers to avoid damaging the capacitor body. Next install the crystal and coils, L1 should be wound after its former has been glued into the printed circuit board.

Alignment

For those without test equipment the alignment procedure is as follows: first check all connections and supply polarity. Connect the converter to the station receiver and tune the receiver to exactly 10MHz. Adjust the core of L1 so that it is level with the top of the coil winding. Set C2 to half mesh and switch on the converter, the 10MHz oscillator should be heard on the receiver and an S-meter reading obtained. Tune C2 to obtain the strongest S-meter reading. Then peak C11 for maximum S-meter reading.

Once this is completed your converter is aligned. For those who possess a frequency counter the crystal frequency may be measured at the junction of C8/R9,10. Once this is done adjust C11 for maximum S-meter reading. This completes the alignment.

Table 1: Coil winding data

Coil No.	Turns	Wire s.w.g.	Coil Former	Remarks
L1	24	34	5.23	tapped at 7 turns from collector of Tr2. F29 core material.
L2	29	24		single layer coil wound on T50/2 toroid
L3	32	24		single layer coil wound on T50/2 toroid
L4	29	24		single layer coil wound on T50/2 toroid

General

The author used a 30m long wire antenna to feed the converter and signals were received from 12kHz to 2MHz with very strong S-meter readings, using either a Racal RA17 or Sony ICF-7600DS as the conversion receiver. An important factor in receiving good, low-noise signals at these frequencies is to provide the converter with a good earth system. This can either be a connection to the cold water feed of the house, or if this appears to be run in plastics pipe then some form of external earth mat or stake. Never use the electrical mains earth for r.f. or make any connections to gas piping.

The strong signal handling of this converter is excellent and the station receiver will overload long before the converter. If you should decide to place the converter with the frame antenna as a remote unit, e.g. in a loft, make sure you use a good quality coaxial connection between the converter and the receiver to eliminate any possibility of i.f. breakthrough.

The results provided by the converter have proved the project to be excellent value for money, so hopefully this will attract more listeners to the art of medium wave DXing. **PW**

Crops and Coils Part 4

Learning from the Pioneers

Learning, I was told, was the process of adding to knowledge already acquired. Having said that, it is generally accepted that the best way to establish a sound foundation for learning science subjects is to understand the work of early investigators says George Pickworth.

The fundamentals of radio were well established by 1920, and from then on, development was really a series of innovations. As the pioneers used simple equipment to demonstrate many basic principles, it was not difficult to repeat some of their experiments. I found this most rewarding by opening new "files" ready to accept information as learning progressed.

During the late 1930's while still a schoolboy experimenter, I was given several old wireless books published before the First World War. They explained how to construct high voltage generators and early kinds of wireless equipment, such as Leyden jars, spark transmitters, coherers and other detectors. I was therefore able to build various electronic devices using ordinary materials in much the same way as the early pioneers.

My interest in how technology evolved was not limited to radio. It applied very much to agriculture, and was of real value when I began my career by advising farmers using old and laborious methods, on ways to raise the level of of their technology very quickly by "jumping" many of the intermediate stages.

Without Wires

Before Marconi made his famous experiments with Hertzian waves, pioneers had already experimented with other ways of communicating without wires, such as modulated light beams, inductive methods and earth conductivity.

The earth conductivity pioneers used a sender consisting of a battery in series with a telegraph key, connected to two earthing rods about 15m apart. The receiver consisted of similar earthing systems and a sensitive galvanometer. However, this system seems to have been forgotten until the 1930's, when a group of experimenters using powerful audio amplifiers claimed to have communicated over a considerable distance.

My attempts to communicate with this method had no success, probably because of the poor conductivity of the sandy soil, and my small battery operated amplifier. However, on a remote part of the farm well away from power lines, my friend and I were able to communicate over a distance of several hundred feet, using the inductive system. The 2m square loops, supported by grandmother's runner bean canes, were connected in a transceiver arrangement to their respective amplifiers. While we had the benefit of valve amplifiers, the pioneers used carbon microphones, capable of passing several amps, in conjunction with induction coils. They were really mechanical amplifiers.

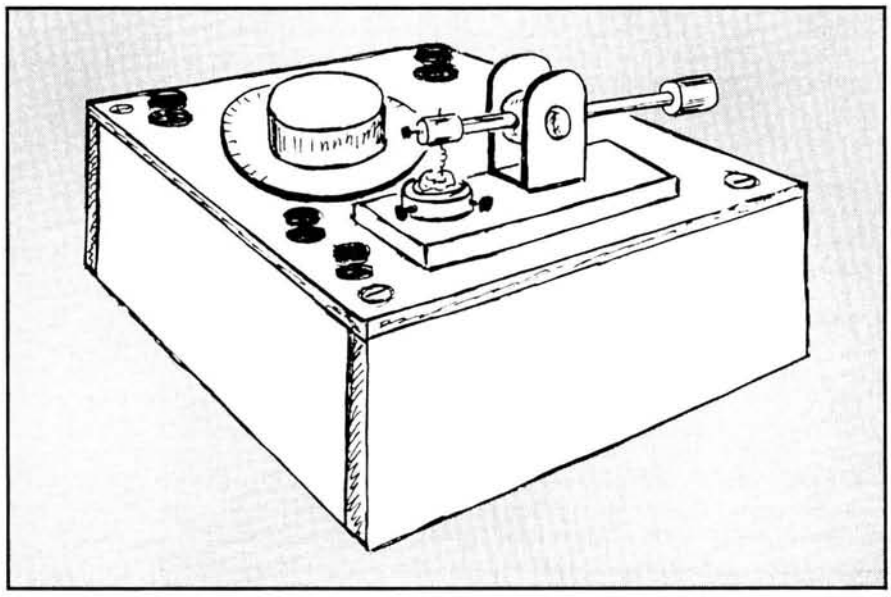


Fig. 4.1: The author's bedside crystal set

Hertzian Waves

However, the most interesting part of the experiment with the inductive system, was that my friend could also hear GBR transmitting on about 16kHz. Unfortunately I could not, and as a result of this, belatedly discovered that I had impaired my hearing by driving a noisy farm tractor, and shooting rabbits with a 12 bore shotgun. Nonetheless, the fact that the headphones converted Hertzian waves into an audible tone, demonstrated that both they and sound waves behaved the same when converted into electrical impulses. However, to radiate as Hertzian waves, frequencies within the audible range required enormous antennas like the one at Rugby.

The early pioneers could generate appreciable power at up to 100kHz, using wave mills (high frequency alternators) and not withstanding the problems with large antennas, used these frequencies for communication. Obviously, frequencies above audibility could not be detected directly with headphones, but the heterodyne system neatly overcame this problem at frequencies within the range of their wave mills.

Incidentally, it is possible to resolve v.l.f. transmissions by the heterodyne method using an audio signal generator. Moreover, now that frequencies around 10kHz are being used for global communication, it can be revealing to use a pair of hi-fi headphones and a wide-band amplifier connected to a loop or long wire antenna, or even a pair of earth rods spaced as far apart as possible. Filtering out mains induced hum can unfortunately be a difficult problem.

While the upper limit for wave mills was about 100kHz, spark transmitters could generate appreciable power at frequencies up to hundreds of MHz. However, frequencies around 1.0MHz were the most favoured by early experimenters as they could be radiated with antennas of practical size, but as this was beyond the limits of heterodyne receivers using wave mills, experimenters developed devices to detect these signals directly.

Detectors

The first and simplest detector was that used by Hertz, who observed sparks jumping a tiny gap in a wire ring, placed close to a very high frequency spark transmitter, but the coherer was the first practical detector. It consisted of glass tube loosely packed with metal filings, typically steel with a small amount of silver or nickel. When used to detect signals around 1.0MHz, it was connected to a Marconi type antenna, but for very high frequencies it was located in the centre of an Hertzian antenna.

In either case, the objective was to cause a high frequency current to pass throught the tube. This caused the filings to cohere and reduce their resistance, so that a small direct current could also pass and operate a relay to switch on other devices. While being reasonably sensitive, its drawback was that the filings had to be restored to their original high resistance by gently tapping the tube after each operation, and although this could be done automatically, it was too slow for radio telegraphy.

There were other devices capable of detecting a high frequencey current, such as the Geissler tube and hot wire ammeter, but were not sensitive enough for practical communications. On the other hand "telephones" as they were originally called, could be made extremely sensitive and were developed into the familiar headphones. Indeed, the 8000 ohm impedance headphones were the most sensitive devices available to early experimenters. But as already explained, these frequencies were too high for "direct conversion" with a wave mill, which was the only device available to pioneers that would give a pure tone.

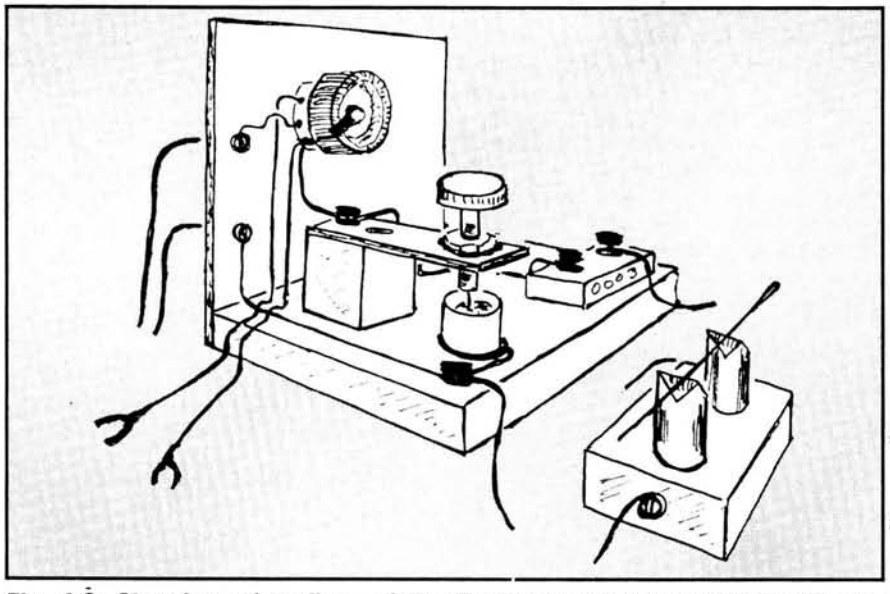


Fig. 4.2: Sketches of replicas of the Fessenden detector and the Massie Oscillaphone

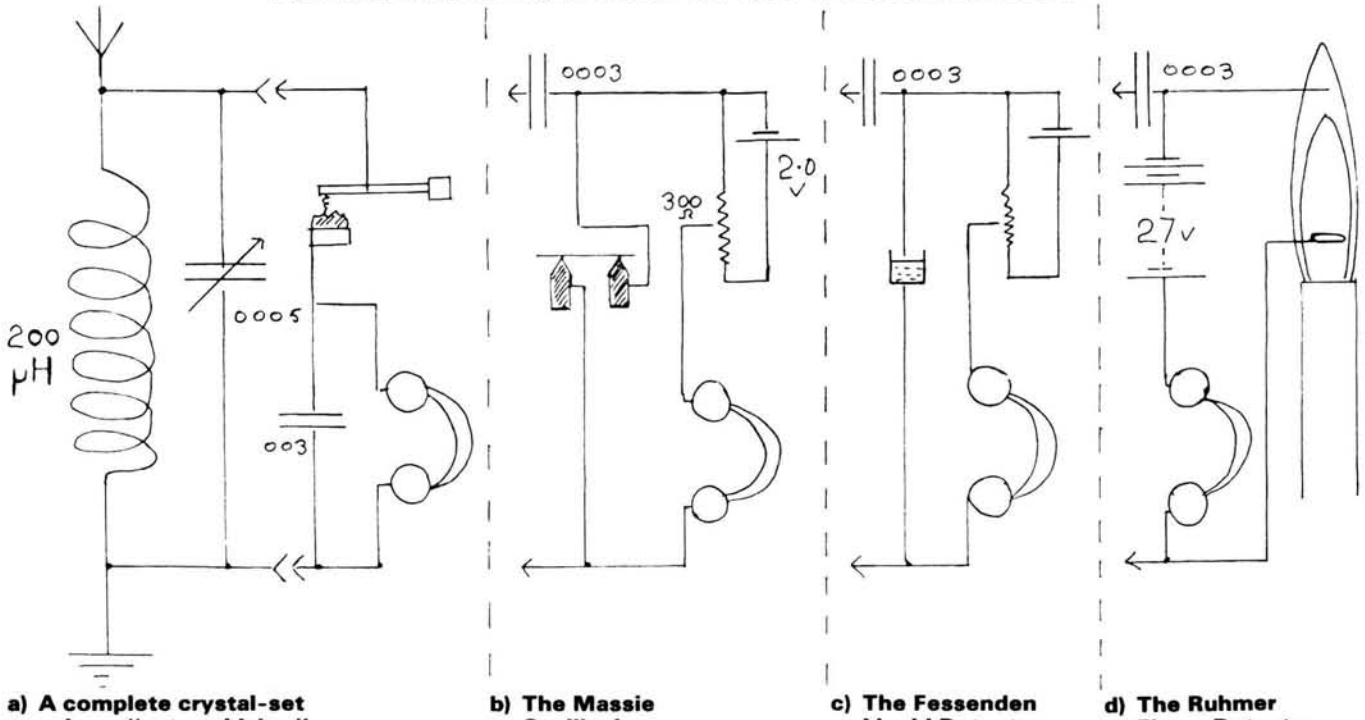
However, spark transmitters generated a very "rough" wave and it was discovered that when this was rectified to produce pulsed d.c., and fed to a "telephone", the inertia of the diaphragm caused it to respond to the average strength of the pulses, and thus give an audible indication. Notwithstanding that the detector now consisted of headphones and a rectifier, the rectifier was called the detector.

With the advent of radio telephony it was found that a small condenser, typically 0.003μF, shunted across the headphones greatly improved performance. By allowing its charge to leak through the headphones, the potential across the condenser varied in sympathy with average level of the pulses. As the headphones were driven by fluctuating d.c., operators took care to ensure that their headphones were connected in correct polarity, otherwise the pole pieces could become demagnetised. The same applied to my crystal set which operated continuously.

Replicas

While most young radio enthusiasts in the 1930s were using valves, many, including myself, continued to have an interest in crystal sets. They used no power and the only hazard could possibly come from electrical storms. One was perfect for listening to the news and the "big bands" late in the eve-

Fig. 4.3: Schematic diagrams of the four types of detectors discussed.



a) A complete crystal-set using a "cats-whisker" detector.

b) The Massie Oscillaphone

c) The Fessenden Liquid Detector

d) The Ruhmer Flame Detector

nings when snug in bed. However, I was so fascinated by the earlier kinds of detectors that I decided to make replicas of some, and the crystal set tuner was ideal for trying them out.

The tuner consisted of about 50 turns of wire wrapped around a 50mm diameter cardboard tube and a 500pF tuning condenser salvaged from an old receiver. A "cats whisker" was used as a detector and like most other experimenters, I tried many different materials with varying degrees of success. But the solid state detectors including the "cats whisker" were relatively late comers to the scene.

One of the earliest successful detectors was with the Massie Oscillaphone. It consisted of a sewing needle bridging a pair of carbon rods with their ends filed to a sharp chisel shape. Although sensitivity fell short of the "cats whisker" detector, the fact that such a simple device could resolve radio stations was nothing short of amazing.

In 1910, the liquid detector, invented by Professor Fessenden was considered the standard. In its simplest form it consisted of short length of Wollaston (platinum) wire tipping the edge of a 20 per cent solution of nitric acid contained in a tiny glass cup with a platinum contact sealed inside.

I made one in the school chemistry lab using the glass blowing torch. It was one of the "perks" for being the lab boy.

Both the Oscillaphone and the liquid detector required a small d.c. in order to operate, so a 2 volt accumulator and potentiometer had to be adjusted with great care, otherwise only a roaring noise was heard.

These two detectors were invented for use with spark transmitters where audio quality was unimportant, nonetheless, the liquid detector was the best device available during early experiments with radio telephony using a modulated arc lamp. It eventually gave way to the silicon point-contact rectifier.

This solid state device might well have developed directly to the transistor had it not been overshadowed by the Audion (triode) thermionic valve. In the meantime, ionised gas detectors were being tried.

Flame Detector

Professor Ruhmer found that gas ionised in the flame of a Bunsen burner to produce a conducting flame, made a very simple detector. I was so fascinated with this device that I constructed a replica and tried it out in the chemistry lab, as gas was not available on the farm.

The cathode was made in the shape of a tiny trough holding a pinch of alkaline salt (sodium bicarbonate) and was placed in the lower part of the flame while the anode was located higher in a hotter part. The electrodes should have been platinum, but were salvaged from a discarded radio valve. When properly adjusted, the flame detector proved quite sensitive, but was upset by the slightest draft. Nonetheless, it was improved by Dr De Forest who went on to develop the Audion which contemporary writers considered as a logical successor to the flame detector.

Remarkably, the Audion was used only as a detector until Armstrong and others discovered that it could be used an an amplifier. This made regeneration possible and infinitely more sensitive receivers, but it also led to the development of large transmitter valves which make broadcasting a reality in the early 1920s.

Back to Crystal Set

Although triode valves were used in domestic receivers when broadcasting started, they were beyond the reach of many people. So they turned to crystal sets which were not only relatively cheap, but cost nothing to run. The detector was the "key" to the crystal set and by testing virtually every substance known, the thousands of experimenters narrowed the field to a few crystalline minerals. They were often used in pairs such as bornite and zincite, zincite and tellurium or carborundum and steel and eventually the more familiar "cats-whiskers" type using a single galena crystal.

Although these experimenters developed "wireless" as a practical means of disseminating information to the nation, most of their work was based on observation and experiment, and not on scientific theory. So they were called empiricists and sometimes denigrated by scientists. Yet this same approach was used to discover virtually every agrochemical and thus brought about modern farming methods. But in this case the tens of thousands of potential agrochemicals were evaluated systematically by relatively few scientists.

The government, quickly realising the importance of radio for disseminating information, took control, even to the extent to trying to prohibit home made receivers. Antennas were restricted to 30m long and complicated formalities were introduced for applying for a listener's licence which cost ten shillings, almost a week's pay for many people.

Silicon

The most fascinating thing about the evolution of detectors is that the transistor was not invented before the valve. It is indeed very strange that the fused silicon point-contact detector which proved sensitive, easy to make and with none of the drawbacks of liquid detector, should then have been neglected. Contemporary writers tell of some samples of fused silicon being better than others. Perhaps some materials contained the right amount of impurities to work as a rectifier whereas other samples were too pure. Could that have been the reason why it was neglected?

Even more remarkable, experimenters had discovered that in order to work, some solid state detectors needed a forward voltage greater than that developed across the tuning coil, so many ingenious biasing systems were developed. If those early experimenters missed discovering the transistor it must have been by a "hairs breadth". Perhaps they did but failed to appreciate what they had.

I never made a replica of the silicon detector. How I wish I had.

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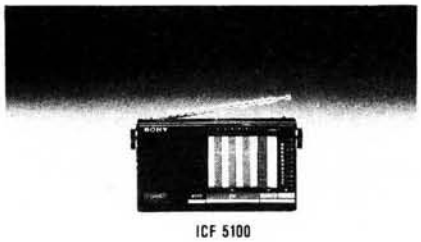
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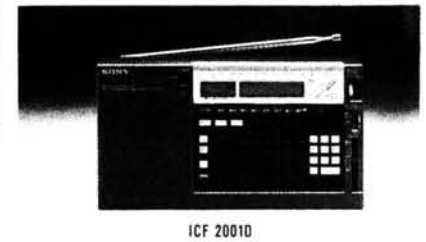

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Designed to make you proficient in Morse code in the shortest possible time, this book points out many of the pitfalls that beset the student. *87 pages* **£4.95**

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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 issues 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 Canon A1 camera and Kiron 28-85mm lens plus accessories. All mint condition. Would exchange for similar conditions Sony ICF-2001D receiver.
Tel: 061-705 1761. *E806*

Have Belcom LS-102L 28MHz transceiver, boxed, mobile mount, v.g.c. Plus Realistic PRO-2008 scanner, also v.g.c. Plus portable compact disc player with p.s.u., brand new, unwanted present. Would exchange for FT-707 plus PC-707 a.t.u. Ian. Tel: 0692 82075 day time. *E807*

Have Murphy CD-70 compact disc player with headphone socket, skip, repeat etc., boxed and in mint condition. Would exchange for Grundig Satellit or similar digitally tuned h.f. receiver with b.f.o. Kevan, 31 Mansefield Place, Newton Stewart, Wigtonshire, Scotland. *E811*

Have CT-100 and CT-300 Catronics RTTY terminal unit and v.d.u. Would exchange for rotator or 144MHz hand-held. Tel: 0235 816947. *E814*

Have Wayne-Kerr B-641 auto balance universal bridge with handbook. Would exchange for rotator or 144MHz hand-held. Tel: 0235 816947 *E814a*

Have Serviscope type S32 with handbook. Would exchange for rotator or w.h.y? Tel: 0235 816947 *E814b*

Have Yashica TL Electro "X" 35mm camera, with 1:1.4 50mm lens, also Pentacon 4/300 lens, plus auto Chinon 1:28 135mm lens. Would exchange for radio gear i.e. 144MHz or h.f. gear or w.h.y? Tel: 0692 82075 day time. *E815*

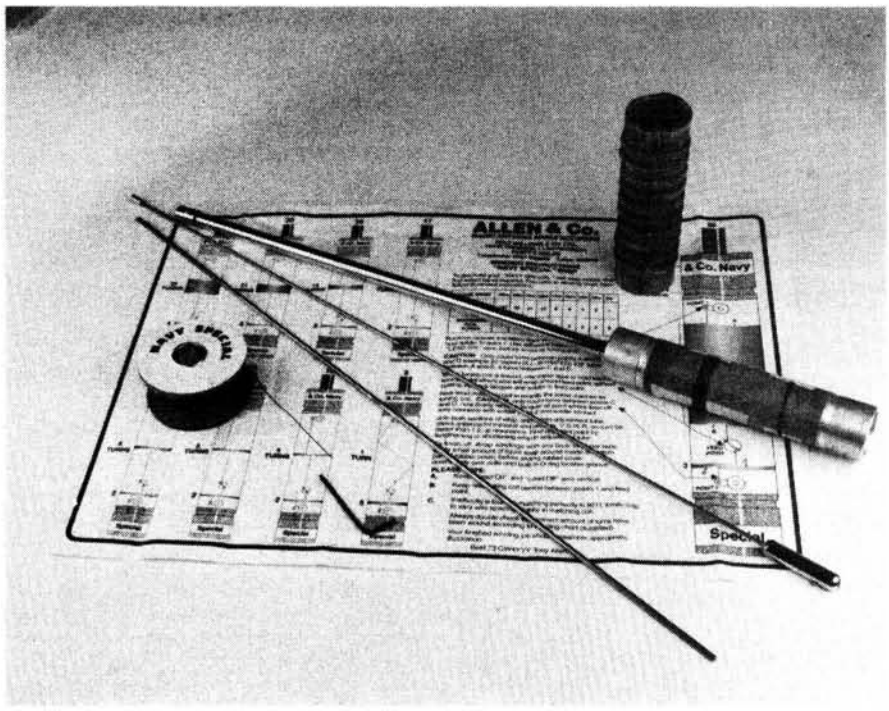
Have Marconi CR200 receiver, rare set, g.w.o. Would exchange for h.f. receiver and w.h.y? Wanted Pye C.A.T. receiver and information on this set, part of 619 RN equipment. Tel 0202 680500 *E825*

Have complete computer outfit, Triumph Adler (Matmos) machine, DSDD disc drive, runs CPM and Basic, also Seikosha 80 col. printer, plus green screen v.d.u. Would exchange for decent scanner. Tel: 0823 432909 *E826*

Have Peugeot 104GL 1977, with left hand drive, new engine 1987. Would exchange for Sony ICF-2001D or similar short wave receiver with fine tuning knob. Tel: 01-731 7217 *E827*

PW REVIEW

The Allen & Co "Navy Special" Self-wind Mobile Antenna



Paul Essery GW3KFE has been trying out an unusual design of mobile antenna. The "Navy Special" can be wound by the user to suit any one of the h.f. amateur bands from 3.5MHz upwards, or the 144MHz v.h.f. band. Tuning around any chosen band is achieved by adjusting the length of the whip for a precise match to the chosen frequency.

The vast majority of h.f. band mobile whips, whether home-made or bought, are a compromise between electrical and mechanical requirements. Too often, favouring the electrical needs has resulted in a very shaky mechanical design.

The "Navy Special" antenna is designed to be fitted to the same gutter-mount fitting you would use on 144MHz. You might even get away with using a mag-mount at low speeds, but only at the cost of a considerable loss of signal strength of the lower bands, where the low capacitance of a mag-mount to the car roof inhibits useful radiation by in effect inserting resistance into the ground-plane arrangements. All my initial tests were therefore carried out using a gutter-mount.

The whip is a base-loaded type. The designer, GW4YYY, opted for this simply for mechanical strength. There is a metal piece at each end of the coil former, and all is solid and strong. Doubtless this affects the *Q* of the finished coil slightly, but if the instructions are followed carefully, this effect would only be significant on a 3.5MHz version where the coil former is fairly well filled.

Assembly

The antenna comes in a bubble pack containing an instruction sheet, a coil of enamelled wire, a roll of tape, the base section on which the coil is wound, the two pieces of the whip proper, the linking piece which enables the two whip sections to be adjusted for length and, most important, the outer rubber sleeve which provides the final weatherproofing. The constructor's contribution is a few hand tools, solder and an iron, a spot of washing-up liquid to ease the rubber sleeve into place, and time—a little time.

Although a pretty well-equipped workshop was to hand, I chose to use the kitchen table. No vice, nothing special from the workship, I didn't even turn the dog out!

For a first essay, I chose to wind the antenna for 80m. The coil section has a PL259 (UHF) plug at its base to mate with the gutter-mount. The instructions tell you first to take the supplied length of wire, and solder its end to a tag identified as point 1. Then bring the wire straight down the former, securing it with a snippet of the supplied tape before cleanly winding on 107 turns.

The difficulty with this bit of the exercise is counting to 107 while keeping the tension on the wire as you wind. My own method was to press the wire against the former with the left thumb as the right hand grasped and rotated the whole assembly. Care was taken to ensure a nice tidy, close winding to this point. After this another right-angled bend, again secured with a bit of the tape, leads you to the feed point, where a bit of wire pokes out of a hole in the former. The aim is to end up with the winding equidistant between Point 1 and the feed point.

To check the number of turns wound, I used a penknife blade, feeling and counting the number of "bumps" crossing each turn. Go gently, lest you scratch the enamel wire.

Next you wind, in the same direction and in the same manner, three turns close-wound equidistant between the feed point and the tag, point 2. Make off the wire and solder.

It had taken only 20 minutes but I'd almost finished, and had I intended to wind for just one band, all that would have been left to do would have been to cover the winding with a nice layer of the supplied tape, reach for the washing-up liquid dispenser and put a small amount in the rubber sleeve before sliding it home to weatherproof the coil.

The number of turns to be wound for any band is quoted in the table given in the instructions.

Testing

In fact, at this stage I taped the winding and carried the unsleeved whip out to the car for a trial. Now it must be realised at this point that the operating bandwidth of any 80m mobile whip like this is pretty narrow. My initial test methods were as follows. First, the transmitter was tuned to mid-band into a dummy load via an s.w.r. meter. Secondly, the antenna was fitted into its gutter-mount and a field-strength meter was laid on the opposite corner of the car roof. Thirdly, without touching the settings of the

transmitter, it was connected via the s.w.r. meter to the antenna feeder coming in from the gutter-mount.

While swinging the v.f.o. up and down the band, the s.w.r. will be seen to drop to a minimum at some frequency; the field-strength meter should maximise at the same frquency. Now, if you have a PA Tune control on the rig it can be tweaked for maximum as given by the instructions for the rig. Leave the Load control alone. Switch back to receive and all should sound lively if the band is open and conditions aren't awful. It's obviously worth checking with the main station for a "feel" for the band before stepping outside.

The first shot was in fact not far from mid-band. I then tried it at the c.w. end by extending the whip top section, and the other band-edge too, by shortening the whip. Once I was satisfied, the signals were rolling in nicely, and quite workable.

Most people will tend to use 'phone when operating mobile, and it is worth finding the correct lengths for, say, every 50kHz up the band. These can then be plotted on a graph, or marked on the top section. Thus you will be able to set the antenna correctly for any chosen frequency within the band.

Make no mistake, if you don't resonate the antenna to the chosen transmit frequency, it won't radiate for toffee! That applies to any mobile whip, in essence, but it is doubly important on the lower bands.

Rewind!

As there was still plenty of wire left, and tape, I decided that before fitting the sleeve, I would check the winding details given on every band. I wouldn't recommend you to try this for yourself, because if you break the wire marked "feed point" close to the hole, you might be in trouble. However, I got away with it. Partly because I was getting the knack, and partly because of the fewer turns involved on the higher frequency bands, each coil took less time to wind.

Each time, as a mobile antenna it "hit the band" quite nicely. Each time, the s.w.r. dropped at resonance to 1.2:1 as the instructions said. On each band, the best s.w.r. coincided with maximum on the field-strength meter—a point worth checking, as it is possible to load up a mobile antenna for 1:1 s.w.r. yet have nothing coming out of the antenna!

The final check was to wind the "Navy Special" for 145MHz and operate on the local repeater. No significant difference was noted between the "Navy Special" and my normal 2m antenna, in areas where it was known we would be "on the limit" of the repeater in this hilly area.

So, the antenna had been tested on all bands for which operation is claimed. It could probably be made to "perk" on 50MHz and 70MHz too, but the instructions don't cover these bands.

At Home

Though not mentioned in the instructions, nor among the original design goals, the possibility of using the "Navy Special" in situations where outside antennas are forbidden came into mind next.

I mounted an SO239 connector on a bit of aluminium which was clamped to the operating table with a G-cramp. For an earth, I used the normal station earth, plus a single quarter-wave radial attached to the SO239. The radial, which was lost under the carpet, was a little fussy, but nonetheless, after a bit of playing around, the arrangement would radiate a passably decent signal. And, after all, an amateur who is reduced to this sort of thing doesn't expect to radiate a fully competitive signal. It seemed to be comparable in strength to the signal from the mobile set-up, which is the best one can reasonably hope for.

Sleeving

The instructions say liquid soap. I used the smallest possible amount of neat washing-up liquid. Once it was all on, it became clear that GW4YYY's comments that "it won't come off again in a hurry" were quite true. I reckon if you decided to change bands, you would need a replacement sleeve. Mine was an early sample, later production sleeves will have a ridge at each end, to slip into provided recesses on the metalwork and give an even more positive seal.

Fitting the rubber sleeve made no apparent difference to the tuning peak on 3.5MHz, nor the output field strength.

Conclusions

The mechanical design is quite impressive, and the price, at around £14.50, even more so! The "Navy Special" is available from several dealers, including Lowe, Raycom, A. Kelly, Dewsbury, Ward Electronics and TJB QSL Cards.

I understand that Allen & Co are proposing to offer a range of other antenna types based on similar principles, including designs to get signals out of small gardens. ***PW***

▶ 26

quite where the g.d.o. (1) had suggested. Table 2 and graph Fig. 3 show the results. The impedance at resonance was 62Ω, about 25 per cent greater than the estimated value of 50Ω. Suitable values for a matching unit as follows, 48pF, 18μH and 1.6μH for the link winding.

Earthing System

The earth system at this station consists of three, 3 metre long, earth rods, spaced at about 10 metre intervals down the garden and connected together at the tops. The final connection brought into the station serves as an r.f. earth, this system works satisfactorily up to and including 7MHz, above 7MHz the 2 metre or so lead in is too long.

Matching units are very important items in the station's instrumentation. It is well worth while taking time and trouble in understanding their design and operation. Write up your results and keep them for future reference. Good experimenting. ***PW***

References

(1) Getting to Know Your λ/2 End Fed Antenna *Practical Wireless* June 1988

(2) *ARRL Antenna Handbook* 13th Edition 1977 page 97

(3) PW "Itchen" LCR Bridge. J. Thornton Lawrence GW3JGA. *PW* April 1987

(4) RF Noise Bridge. E.A. Rule. *PW* December 1985

(5) FET Dip Oscillator. J. Thornton Lawrence GW3JGA. *PW* October and December 1985

(6) *Radio Engineering*. F.E. Terman 2nd Edition 1937 page 39

(7) *Radio and Electronic Laboratory Handbook*. M.G. Scroggie 8th Edition 1971 page 519

(8) *HF Antennas for all locations*. L. Moxon G6XN

Appendix

$$L\,(\mu H)=\frac{N^2\,D}{1010[1/D+0.45]}$$

To make N the subject of the equation.

(1) Multiply both sides of the equation by $1010[1/D + 0.45]$

$$L\,(\mu H)\;1010[1/D+0.45]=$$

$$\frac{N^2D}{1010[1/D+0.45]}\times 1010[1/D+0.45]$$

This leaves:

$$L\,(\mu H)\;1010[1/D+0.45]=N^2\,D$$

(2) Divide both sides of the equation by D

$$\frac{L\,(\mu H)\;1010[1/D+0.45]}{D}=\frac{N^2D}{D}$$

This leaves:

$$\frac{L\,(\mu H)\;1010[1/D+0.45]}{D}=N^2$$

(3) Turn the equation round and take the square root of both sides.

$$N=\sqrt{\left[\frac{L\,(\mu H)\;1010[1/D+0.45]}{D}\right]}$$

All dimensions are in mm

In the Know

A radio constructor's guide to finding information, electronic components and surplus equipment.

There's a passage that reads, "Seek and ye shall find". The problem is very few people know where to start seeking. Hopefully after reading the following pages all that might change.

Information comes in two main forms, written and spoken, both conveniently matching the human senses. Like all forms of information the act of communication may introduce errors, particularly where the human brain is concerned.

The problem with some visual information, by which I mean drawings, etc., is that the eye can be fooled. But having said that, there is the saying, "a picture tells a thousand words'. Quite true! But without text, (written information), to help interpret the drawings, it would be hard going to say the least.

The Written Word

The most popular way of storing information is via the written word, this combined with drawings gives us a very versatile system through which we may communicate.

Many people neglect reading these days, whether it be for enjoyment or reference, yet all the secrets of man's discoveries are stored in books. Every scrap of research is stored for our further enlightenment. You may think books are old fashioned; maybe they are, but even if information is stored on a modern computer system, the information won't leap off the v.d.u. or magnetic disk straight into your brain. You've still got to master the art of reading and understanding the information that is displayed.

Unfortunately, understanding comes with time and experience so we can't help you there. What we can do is give you some idea where to look for the information in the first place. Knowing how to drive an information system is the key; lending and reference libraries can be your fountain of knowledge.

Libraries

Rows and rows of books all with a number. Well the numbers do have their uses. They are based on something called the Dewey Decimal System. Each subject, say for instance "Amateur Radio", has a number. In each lending library there is one very important book, it's called the Subject Index. Within its covers there are lists of every subject covered by UK lending libraries. The first thing to do, is look up the subject "Amateur Radio" in this index, you'll find it under 621.

Once the subject has been found, note its allotted number and any others that are related to the particular sector of information.

Near, or next to the subject index, you will find a machine that looks like a giant slide viewer. This is known as a Microfiche machine, and is for viewing microfilm. The folder next to the machine will hopefully contain, on microfilm, your county's catalogue of books. Now taking the number, or numbers obtained from the subject index, look for the microfilm page that contains that number. They will be numbered something like; 350-470 and so on. If you're looking for number 389, then this is the page to view. At this point it may be wise to quietly attract the attention of the librarian, to show you how the machine works. Once mastered you'll be scooting around the book titles in no time.

Having found the book with the subject index number you're interested in, check to see whether the book is actually at that branch. Remember you're looking at the county library catalogue! To the extreme right of the book title and author's name you will notice a code, this code tells you which library has the book. A list of library codes is given in the Microfiche folder, it's common sense to look for book titles that have your local library's code next to them.

If the book you require is not held at your library, then you have two choices, either travel to the library were the book is held, or ask the librarian if he or she could order its temporary transfer to your library. A small fee is charged for this service, and no doubt you will be asked if you are a member of that library. If you're not a member, then join. It's free and believe me it's worth it. After all, not many things are free these days, particularly information.

Books

Well, you should have found your way round the library by now, but if you're still struggling ask the librarian for help, that's one of their jobs. Using the library is one way of obtaining information, it may not seem very convenient for reference use, but as mentioned it is free.

Books are expensive to buy new, but if you can afford to indulge once in a while, do so; or have a running book list to give relatives ideas before Christmas and birthdays.

One of the most useful assets to any shack, or home come to that, is a well-stocked book shelf.

Be selective though, start building your own library on firm foundations.

Please note that not all books in your library have to be new or the latest edition. Books dealing with radio and electronic theory can be anything up to ten years old, or older in some cases, as this sort of information changes relatively slowly, apart from the inventions of new active devices, e.g. transistors, integrated circuits etc, and new communications modes. Bear in mind that second-hand bookshops tend not to buy technical books, because they are of limited interest.

So second-hand books of a technical nature are more likely to be found at jumble sales and lately car boot sales. This also holds true for large bundles of technical or hobby based magazines generally at a hundredth of their original cost.

The list of books that follow are a few well chosen titles that the author has constantly at his disposal. It is not a plug for the *PW* Book Service, although they can supply some of the titles mentioned.

There are a number of other books that could be included, most of which are the *PW* reprints which feature prominently in the *PW* Book Service pages. Once you have got the bare bones of a home library you should know by then in which direction your interests lie. If you intend to become a radio amateur or serious short wave listener, then books on building receivers, transmitters and antennas together with books on specialised communication, e.g. data modes, TV and Microwaves could be useful.

If on the other hand you intend to become a more general electronics enthusiast, then books on power supplies, amplifiers, household gadgets, computers and digital electronics will be of more interest.

Although this seems an over generalisation of people and their interests, it may help you decide before you make any further purchases.

Booklist

The Radio Amateurs Handbook ARRL
Radio Communications Handbook RSGB
Practical Electronics Calculations and Formulae
F. A. Wilson, Bernard Babani (publishing) Ltd BP 53
Further Practical Electronics Calculations and Formulae
F. A. Wilson, Bernard Babani (publishing) Ltd BP144
Amateur Radio Techniques
Pat Hawker, G3VA. RSGB
Foundations of Wireless and Electronics
M. G. Scroggie and S. W. Amos, Newnes Technical Books
Test Equipment for the Radio Amateur
H. L. Gibson, G2BUP. RSGB
Radio Data Reference Book
G. R. Jessop, G6JP. RSGB

General titles to look for depending on individual interests

Transistor Selector Guide
Linear IC Data Book
Digital IC Data Book
Operational Amplifier Cook Book
Timer Cook Book
CMOS Cook Book

Magazines

Working for *PW* Publishing Ltd, we regularly receive copies of other magazines in the electronics and radio hobbyist field. This gives an interesting overview of the hobby in general, as well as providing a wealth of information on suppliers of equipment and components. It would be unfair to neglect magazines as a source of information, so a quick résumé of what the other titles may offer can't hurt. Please do keep on buying *PW* and *SWM;* but while you're in your newsagents have a quick flick through the "opposition". Most magazines tend to specialise in their coverage of the hobby, we'll call it radio and electronics, for want of a better title. The fact that you are reading this supplement means in general terms that your main interest lies in radio. As an amateur or short wave listener you no doubt buy *PW* and *SWM* because they specialise in radio orientated projects and articles. So to narrow the field down a little we will only look at magazines that serve your interest.

Practical Wireless

To start with let's look at *Practical Wireless*. Having run since 1932 its main theme was and is radio, both construction and listening, now with a bias towards the licensed radio amateur. Within the covers of today's *PW* you will find constructional articles on test equipment, receivers, transmitters and antennas, together with sound radio and electronic theory. It also has historical radio features in contrast to the latest equipment reviews, both technical and practical. There are regular columns to be found in "On the Air" with news and reception reports covering just about every mode of amateur communication, including propagational information and studies.

Short Wave Magazine

The sister publication to *PW*, *Short Wave Magazine*, has a very similar pedigree, although in recent times *SWM* has gone back to its roots, catering for those with an interest in the receiving aspect of the hobby. It has news and features on domestic radio stations from all round the world. It also carries reviews on all the latest receivers and scanners. There are regular columns on airband reception, scanning, digital communication, DXTV and satellites and their reception. Also information on amateur communications, and receiver and antenna construction.

Amateur Radio

Amateur Radio magazine, as its title suggests, is aimed at the licensed amateur. Its content is very similar to that of *PW*, although it tends to include more reviews of all types of amateur equipment, prime movers and ancillaries. The constructionals tend to be of a simpler nature although still useful. Two of the regular columns not found in most other magazines are; "50MHz", news views and technical chat on the UK's latest band, and "Second-Hand", a light hearted but useful insight into buying, using, and repairing second-hand equipment and components.

Ham Radio Today

Another magazine aimed at the amateur market, its constructional content is low with projects of intermediate complexity. There also seems to be a lack of regular columns, although their Radio Tomorrow section is worth keeping an eye on. It carries lots of information on forthcoming radio events and rallies. This magazine regularly carries two or three rig reviews, so if you're into buying equipment rather than building it, this could be beneficial.

Radio & Electronics World

Although its title suggests that it covers ground in general electronics, it doesn't really. This magazine is pitched firmly at the feet of the s.w.l. and radio amateur. Having said that, it does however, have a rather nice regular feature called "Data File". This gives practical circuits and theory on all the building blocks of electronics and radio.

There seems to be a distinct, but refreshing lack of equipment reviews. The constructionals are relatively broad in their appeal, showing a good spread of interest, nearly something for everybody. This magazine has some nice regular features, two of which are not found elsewhere, "ATV" and "Network 934", both titles are self-explanatory.

Elektor Electronics

Not strictly a radio oriented magazine but interesting nonetheless. This magazine, being of an international nature, has a very fresh approach to the hobby in general. Its projects are of a generally high technical standard and have an almost clinical approach. They range in interest from all forms of amateur communication, right through audio and hi-fi, and all forms of test equipment, to full blown digital systems, such as d.i.y. computers and robotics. It lacks a lot of the homely regular features covered by most magazines and its "Information" section reads like some of the professional electronics journals.

Television

You may think from reading the title that this magazine has nothing to offer our hobby; well you would be wrong. Although this magazine is really aimed at service engineers working in the radio and TV trade, there is always something in it for us.

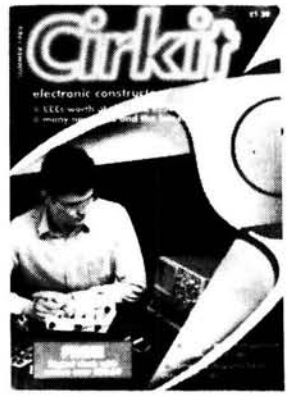
In the recent past it has run constructionals on satellite TV equipment, and v.h.f. monitoring receivers using scrap TV parts. It also carries a regular column on DXTV reception, including practical ideas and projects. Also from time to time it runs articles on microwave theory, I suspect to teach engineers about techniques used in the satellite TV industry. Most of these articles take a surprisingly low technical key, well within the reach of us mortals. Some of the adverts carried in this publication are often worth a closer look. Difficult-to-obtain or obsolete components are often carried by trade component suppliers. Some of the suppliers even sell that elusive domestic type surplus equipment, which is so often mentioned.

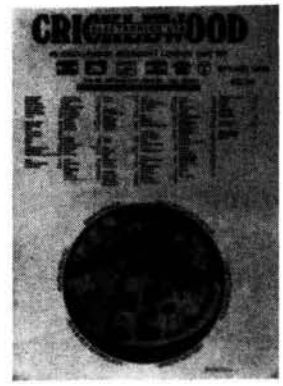
Component Advertisers

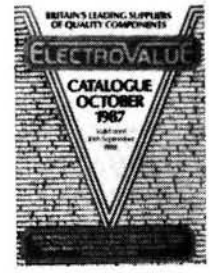
The one thing all the magazines mentioned have in common is that they all carry adverts. Each magazine has its regular advertisers, some of whom advertise in more than one publication at a time. These adverts can help crack one of the biggest problems facing constructors today; where to obtain components. If the publication you regularly read doesn't seem to carry the parts you need, look elsewhere. The two magazines to keep an eye on are *Elektor* and *Television*, they sometimes carry the less well known component suppliers.

Magazine adverts have changed over the past few years. Almost gone are the days when a component supplier would take up three full pages listing every last item they stocked. Most component suppliers these day confine themselves to advertising their latest catalogue.

The list of component suppliers that follows is by no means definitive, most of those that are mentioned produce component catalogues or detailed price lists; to those that we have missed we apologise. If you're a serious constructor then your library should contain a good few of these companies' catalogues and lists.







Aerial Techniques
11 Kent Road
Parkstone
Poole
Dorset BH12 2EH
Tel: 0202 738232

Very extensive range of component parts used for TVDXing, plus antennas and antenna support hardware.

AJH Electronics
151a Bilton Road
Rugby CV22 7AS
Tel: 0788 76473

Good selection of p.m.r. and ex-government type surplus equipment, plus ex-equipment r.f. components.

Barenco
27 Park Road
Barnstone
Nottingham NG13 9JF
Tel: 0949 60607

Extensive range of diy mast and antenna support hardware.

Billington Valves
39 Highlands Road
Horsham
Sussex RH13 5LS
Tel: 0403 40214

Specialised supplier of valves, both receiver and QRO transmitter types. Extensive range, rarities obtained.

Bi-Pak
PO Box 33
Royston
Herts SG8 5DF
Tel: 0763 48851

Extensive range of components and tools. Specialising in bargain packs of components.

J. Birkett
25 The Strait
Lincoln LN2 1JF
Tel: 0522 20767

Good selection of electronic components and equipment mainly r.f. orientated.

Bonex Ltd
12 Elder Way
Langley Business Park
Slough, Berks SL3 6EP
Tel: 0753 49502

Extensive range of components including r.f. specialist, i.e. Toko inductors and filters; plus tools, test equipment, books and kits.

J & N Bull Electrical
250 Portland Road
Hove, Brighton
Sussex BN3 5QT
Tel: 0273 734648

Good selection of electrical and electronic components and modules both computer and domestic.

Colomor (Electronics Ltd)
170 Goldhawk Raod
London W12 8HN
Tel: 01-749 3934

Specialist supplier of valves and transistors.

Cirkit Distribution Ltd
Park Lane
Broxbourne
Hertfordshire EN10 7NQ
Tel: 0992 441036

Extensive range of components including r.f. specialist, i.e. Toko inductors and filters; plus tools, test equipment, books and kits.

Cricklewood Electronics Ltd
40 Cricklewood Broadway
London NW2 3ET
Tel: 01-450 0995

Extensive range of components specialising in new and old technology semiconductors. Good source of obsolete devices.

Electromail
PO Box 33
Corby
Northants NN17 9EL
Tel: 0536 204555

All RS components including their very useful component data sheet service. Very extensive range of components, books, tools and test equipment.

Electrovalue Ltd
28 St Judes Road
Englefield Green
Egham
Surrey TW20 0HB
Tel: 0784 33603

Very extensive range of components, tools, books, test equipment. Also full range stockist of Siemens Ferrite cores and inductors.

Farnell Electronic Components Ltd
Canal Road
Leeds LS12 2TU
Tel: 0532 636311

Very extensive range of brand named lines including components, tools, test equipment and technical publications.

Greenweld Electronic Components Ltd
443 Millbrook Road
Southampton SO1 0HX
Tel: 0703 772501

Extensive range of components, tools, books, test equipment and kits, plus a bumper selection of domestic grade surplus and bulk bargain component packs.

Golledge Electronics
Merriott
Somerset TA16 5NS
Tel: 0460 73718

Extensive range of crystal and ceramic filters plus delay lines, ceramic resonators and crystals. Crystals made to order.

Maplin Electronic Supplies Ltd
PO Box 3
Rayleigh
Essex SS6 8LR
Tel: 0702 554155

Very extensive range of components, tools, books, test equipment, kits. Also HeathKit stockist in addition to being able to supply small quantities of all Jackson Brothers components.

Marco Trading
The Maltings
High Street
Wem
Shrewsbury SY4 5EN
Tel: 0939 32763

Extensive range of reasonably priced components, tools, TV, audio and radio spares. Their bargain bags and special offers on surplus equipment and components, are worth looking out for.

Merley Electronic Salvage
35 Chichester Walk
Wimborne
Dorset BH21 1SL
Tel: 0202 882269

Good selection of ex-computer surplus, plus r.f. components and equipment.

Minffordd Engineering
Sun Street
Ffestiniog
Gwynedd
Tel: 076 676 2572

Extensive range of reasonably priced aluminium/steel enclosures.

P.M. Components Ltd
Selectron House
Springhead Enterprise Pk.
Springhead Road
Gravesend
Kent DA11 8HD
Tel: 0474 60521

Very extensive range of valves and semiconductors plus c.r.t.s and other components.

Radio Component Specialists
337 Whitehorse Road
Croydon, Surrey
Tel: 01-684 1665

Good general selection of components plus aluminium enclosures and panels.

Sandpiper Communications
Pentwyn House
Penyard
Llwydcoed
Aberdare
Mid Glamorgan CF44 0TV
Tel: 0685 870425

Extensive range of antennas and component parts for antenna construction and erection.

Sendz Components
63 Bishopsteignton
Shoeburyness
Essex SS3 8AF
Tel: 0702 332992

Extensive range of TV and Radio replacement modules and components plus domestic equipment surplus. Big selection of TV tuners, both foreign and British, good for TVDX.

The Scientific Wire Company
811 Forest Road
London E17
Tel: 01-531 1568

Specialised supplier of enamelled, tinned and silver plated copper wire. All standard wire gauges held.

West Hyde Developments Ltd
9-10 Park Street Ind. Est.
Aylesbury
Bucks HP20 1ET
Tel: 0296 20441

One of the most extensive ranges of plastics, ferrous and non-ferrous cases and enclosures, plus knobs, grilles, handles and enclosure hardware.

K. R. Whiston Ltd
New Mills
Stockport SK12 4PT
Tel: 0663 42028

Good supplier of light mechanical engineering items: fasteners, metal stock, both ferrous and non-ferrous, plus mechanical and electrical surplus.

W. H. Westlake
Clawton
Holsworthy
Devon
Tel: 0409 253758

Extensive selection of r.f. connectors, adaptors in addition to coaxial and balanced feeder cables.

Verospeed
Stansted Road
Boyatt Wood
Eastleigh
Hants SO5 4ZY
Tel: 0800 272555

All Vero product lines, plus very extensive range of tools, components, test equipment and books.

The Vintage Wireless Company Limited
Tudor House
Cossham Street
Mangotsfield
Bristol BS17 3EN
Tel: 0272 565472

Very extensive selection of obsolete and vintage wireless parts plus data sheets, books and test equipment. Large catalogue plus regular antique wireless news sheets.

Special Interest Groups

The diversity of different interests within the hobby of radio and electronics is amazing. To do justice in describing and listing every-one of these groups or societies that currently exist, would take for ever and would probably read a bit like the phone book. So to save you all the boredom and frustration in looking up every last single one of these groups, we have isolated a few that you might find useful for starters and also provided a few useful pointers to help you find the rest. The list is in alphabetical order and again we apologise to those that we had to leave out.

AMRAC

(AMateur RAdio & Computers) is a self-help users group dedicated to the use of computers in amateur radio particularly with digital communications techniques. Although this group has been very active in the past, producing regular news letters, it now seems that AMRAC has gone into a state of suspended animation. Further details will be published in due course in *PW*.

AMSAT UK

The Radio Amateur Satellite Organisation of the United Kingdom, affiliated to the RSGB. AMSAT UK started in a very modest way in 1973, specifically to keep those interested in satellite communication in touch with one another. As successive satellites were launched interest mushroomed, with AMSAT UK now boasting many members. They produce a regular journal, *OSCAR NEWS*, packed with the latest information on all amateur satellites, plus orbital data on NOAA series weather satellites.

If you wish to join AMSAT UK you may do so by writing to the Hon. Secretary, Ron Broadbent G3AAJ, at AMSAT UK, London E12 5EQ, enclosing an s.a.e. Upon receipt of your request an information pack and application form will be sent by return of post.

BARTG

The British Amateur Radio Teleprinter Group was formed in 1959 by a few enthusiasts who realised the potential for amateur operation of what was then a little used mode. With the release of more and more ex-commercial equipment interest in the mode soon blossomed, BARTG today can boast a membership of over 2500 and is affiliated to the RSGB.

The group has kept pace with the times and is now involved in the forefront of modern communication technology with AMTOR, Packet Radio, Fax, in fact all forms of digital data transmission.

A regular journal, *DATACOM*, is produced filled with news and constructionals ranging from simple mechanical to the most up-to-date electronic designs.

If you wish to join BARTG membership for 1988 costs £8.00. A membership application form can be obtained from Pat Beedie GW6MOJ, Ffynnonlas, Salem, Llandeilo, Dyfed, Wales SA19 7NP. Tel: 0558 822286. Mailbox No 558822286.

BATC

The British Amateur Television Club was founded in 1949 to represent the interest of amateur TV enthusiasts in the UK and overseas.

It is the largest and oldest such organisation and is recognised as the world's leading authority on the subject. The club is affiliated to the RSGB and is run by a voluntary staff who are elected by the club's membership.

The BATC produces a quarterly magazine, *CQ-TV* which is issued free to each member. The journal consists largely of technical articles, covering all forms of video transmission and reception, theoretically and practically.

If you wish to join BATC write to the Membership Secretary enclosing an

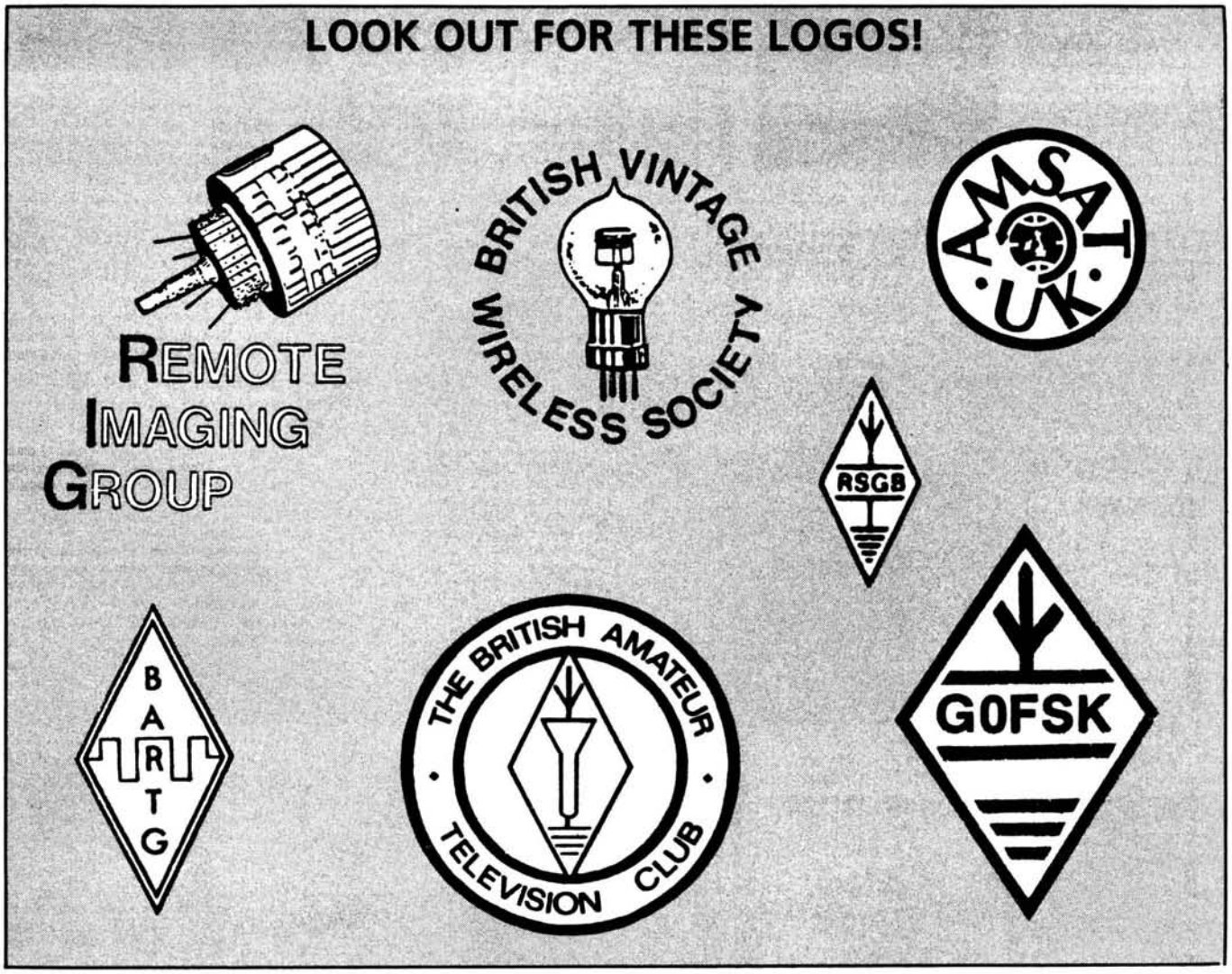
s.a.e. The address is Mr D. Lawton G0ANO, Grenehurst, Pinewood Road, High Wycombe, Bucks HP12 4DD. Tel: 0494 28899. Mailbox No. 533769425. A membership fee of £6.00 had been set for the year starting January 1988.

BVWS

The British Vintage Wireless Society was formed in 1976 to provide a forum for collectors of vintage wireless equipment and those interested in studying the history of wireless.

The society produces quarterly, a high quality journal covering the technology used in vintage wireless equipment, plus news and information on restoration and preservation of equipment. All this information is interspersed with nostalgic old adverts, humorous anecdotes and drawings. The society meets four times a year for lectures, demonstrations, swopping of information and equipment. The BVWS currently has 800 members, both here and overseas Yearly membership costs £10 for UK members, with a higher rate for overseas subscriptions. For further details send an s.a.e. to, Mr Robert Hawes, 63 Manor Road, Tottenham, London N17 0JH. Tel: 01-808 2838.

There is also a magazine produced by a famous BVWS member, Mr Chas. E. Miller. The name of this bi-monthly publication is *Radiophile*, formerly *Radio Gram* and unlike the journal of the BVWS it covers a more specialist technical field of interest. For more information and latest subscription rates send an s.a.e. to *Radiophile*, "Larkhill", Newport Road, Woodseaves, Stafford ST20 0NP.



Computer User Groups

CRUG

The Commodore Radio Users Group is a newly formed self-help group for Commodore users, it boasts a comprehensive members software library, together with technical information on interfacing nearly all types of CBM machines. The group produces a quarterly journal free to its members. Membership is currently set at £8.00 per year, payable to Commodore Radio Users Group, for further details send a s.a.e. to, c/o Mr Simon Lewis GM4PLM, 69 Irvine Drive, North Clippens, Linwood, Paisley, Renfrewshire PA3 TB. Tel: 0505 29363.

SARUG

The Spectrum Amstrad Radio Users Group is a well established self-help group for Spectrum and CPC users. The group boasts a comprehensive members software library, together with archive technical information on interfacing, etc. A very informative news letter is free to all members three times a year. Membership is currently set at £5.20 per year plus 3 s.a.e. for newsletter posting. For further details contact, Paul Newman G4INP, S.A.R.U.G., 3 Red Lion Lane, Leiston, Suffolk IP16 4JZ.

PDL

The Public Domain Library although not strictly an amateur radio based organisation, is nonetheless useful. It carries free software for both the hobbyists and computer enthusiasts, and is now showing a bias towards amateur radio type programs. Most of the software is available in CPM or MS-DOS format although some other systems can be accommodated. This means most PC Machines are catered for. Membership is currently set at £15.00, charges levied are not payment for software, they merely contribute to the running cost of the library. For further information on membership and software list, send a s.a.e. with request to, Public Domain Software Library, Winscombe House, Beacon Road, Crowborough, Sussex TN6 1UL. Tel: 08926 63298.

G-QRP Club

The G-QRP Club was founded in 1975 to promote low power amateur communications (5 watts or less). The interest in this mode seems to be great, and universal, as the club now boasts 4000 members in 54 countries. Membership is open to both s.w.l.s and licensed amateurs alike. Cost of membership is £5.00 a year and for that princely sum you get 4 copies of *Sprat* the journal of G-QRP, plus many other services. *Sprat* contains a wealth of news on QRP events worldwide together with information awards, some of which are unique to G-QRP Club, plus constructional information on receivers and of course QRP transmitters as well as antennas. The G-QRP is also affiliated to the RSGB.

Services available to G-QRP members are an internal QSL system, low cost Morse training tapes and cut price p.c.b.s and components.

For further details and free copy of *Sprat* send an A5 size s.a.e. to, G-QRP Club, St Aidan's Vicarage, 498 Manchester Road, Rochdale, Lancs OL11 3HE. Tel: 0706 31812.

Microwave Society

The Microwave Society, not to be confused with The Microwave Committee run by the RSGB, was set up about five years ago. With the aim to provide a means through which newcomers could enter the world of microwave communication. They have around 800 honorary members in 10 countries. If you feel you would like to know more about microwave communication then send your request along with £2.00 to, Glen Ross G8MWR, 81 Ringwood Highway, Coventry CV2 2GT. Tel: 0203 616941. Mailbox No. 203616941. Please make cheques payable to the Microwave Society.

In addition to this information pack the Microwave Society holds a stock of useful microwave parts, including project p.c.b.s, dishes, feeds and wave guide flanges. A detailed price list can be obtained from G8MWR as can help with microwave problems.

RIG

The Remote Imaging Group was formed in 1985 to cater for those radio enthusiasts interested in receiving weather satellite pictures. Interest in this field has grown in the last few years and RIG now boast a growing membership close to a thousand members. The group publishes a quarterly newsletter which gives satellite orbital data, constructional project, news and views. A great deal of expertise and assistance can be provided by the group's members. RIG is an RSGB affiliated Society. The annual membership fee of RIG now stands at £4.00 per year. For further details send an s.a.e. to, Mr P. Seaford, 14 Nevis Close, Leighton Buzzard, Beds LU7 7XD.

RSGB

The Radio Society of Great Britain although not specifically a special interest group, it being the national Radio Society, does however represent many special interest groups and societies affiliated to it, along with the interest of every licensed UK amateur. The services alone provided by the RSGB are too numerous to mention as are all the affiliated societies and groups. The RSGB produces a wide variety of technical books and publications including their monthly journal *RadCom*. The journal is packed with news, views, technical and practical information on every facet of amateur radio.

For membership details write to the Radio Society of Great Britain, New Member Department, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE. Tel: 0707 45105. Prestel page 8107. Further information on the RSGB and all its functions, plus a full list of affiliated special interest groups, see the members handbook section in the latest edition of the RSGB *Amateur Radio Callbook*.

Further Sources

There are two further sources of information regarding clubs, user groups and societies. The first is, keep an eye on *PW* and *SWM* magazines as they regularly have news on new or just forgotten user groups and societies. The columns to watch are News Desk, On the Air or any of the regular columns in *SWM*. The second source of information is not so accessible as the first. This is the British Telecom information system Prestel, by its nature you will already have to be familiar with its workings in order to use it. You will also be familiar with the fact you need to be a Prestel subscriber before you can access the system.

Some of the clubs and societies listed in this supplement quote Mailbox numbers as well as telephone numbers. This means they subscribe to Prestel and if you are so equipped, i.e. with a computer and modem, you can find out more about the club's workings, as well as communicating with them. There are many pages of information regarding clubs and user grops, try starting at page *810# "ClubSpot", then by using the menu explore the system.

Start With a Kit

The author, working in his capacity as Technical Projects Sub-Editor, at the *PW* offices often has cause to answer cries of help from would-be constructors. They often go something like, "Dear Sir, I passed my RAE a few months ago now, and although I get a great deal of pleasure from talking to my friends on !$$MHz using my Mark-!$%R Japanese transceiver, I somehow feel there must be more to this hobby than meets the eye. I've heard people talking about 'home brew' equipment and experimenting with antennas. Where do I start with building my own test equipment for instance, a g.d.o. or noise bridge?"

That's how it goes anyway, and my answer normally takes the form of; "Why not try building a kit as a start. In the field of 'home brew' there are a number of companies producing kits for beginners. They can be bought from—and then follows a long list of possible kit suppliers". As I have already mentioned you can never have too many catalogues or price lists from component retail companies. So the list that follows may spur you on to do two things, one obtain information from those companies listed and two ultimately try your hand at "home brewing".

Some of the companies produce kits that have varous skill ratings. If you're just starting out, try the water with a kit that will give you a useful end product, i.e. a g.d.o. or signal tracer, but will not be outside your skills. Other companies produce very specialised kits, that as an end product normally give a very high specification piece of equipment. These are obviously not for beginners but are for those enthusiasts who require specialised high specification equipment not normally available as off the shelf items.

Cambridge Kits
45 Old School Lane
Milton
Cambridge

Interesting selection of kits aimed at both s.w.l.s and radio amateurs. All kits include parts, case, pre-wound coils, p.c.b. and instructions. List by s.a.e.

Cirkit Distribution Ltd
Park Lane
Broxbourne
Hertfordshire EN10 7NQ
Tel: 0992 444111

Very wide variety of kits covering TV, audio, r.f. and digital. Majority of kits aimed at s.w.l.s and radio amateurs. See latest Cirkit catalogue for full details.

CPL Electronics
8 Southdean Close
Hemlington
Middlesbrough TS8 9HE
Tel: 0642 591157

Very wide selection of kits for past and present *PW* projects dating back to 1984. Also good selection of individual components as used in *PW* projects. List with full details by s.a.e.

F.J.P. Kits
63 Princes Street
Chadsmoor
Cannock
Staffs WS11 2JT
Tel: 05435 6487

Wide selection of kits for past and present *PW* projects dating back to 1985. Also F.J.P. kits for 50MHz, 70MHz, 144MHz linear amplifiers, plus "build for you service" on all kits. List with full details by s.a.e.

C.M. Howes Communications
Eydon
Daventry
Northants NN11 6PT
Tel: 0327 60178

Interesting selection of kits aimed at both s.w.l.s and amateurs. All kits supplied with screen printed p.c.b. and all necessary parts plus instructions. Catalogue by s.a.e.

Kanga Products
3 Limes Road
Folkestone CT19 4AU

Nice selection of r.f. projects most of which have appeared in recent *HRT* and *PW* articles. List by s.a.e.

Lake Electronics
7 Middleton Close
Nuthall
Nottingham NG16 1BX
Tel: 0602 382509

Interesting selection of r.f. projects aimed at both s.w.l.s and radio amateurs. Kits supplied with all parts including hardware and instructions. List by s.a.e.

L.M.W. Kits
102 Stamford Street
Ratby
Leicester LE6 0JU
Tel: 0533 386364

Good selection of kits specialising in u.h.f. and s.h.f. transverters plus weather satellite receiver systems. See Bonex Ltd catalogue for more details.

Maplin Electronic Supplies Ltd
PO Box 3
Rayleigh
Essex SS6 8LR
Tel: 0702 554155

Very extensive range of kits covering all aspects of the hobby, r.f., a.f., digital, computing, robotics and remote control. See Maplin Electronics Supplies catalogue for full details.

Piper Communication
Severn Road
Chilton
Didcot
Oxon OX11 0PW
Tel: 0235 834328

Very extensive range of kits for v.h.f., u.h.f., s.h.f. and microwave, transceive systems. Product range consists of kits designed and packaged in West Germany by SSB Electronics and EME. List by s.a.e., telephone enquiries welcome before 9pm.

Spectrum Communications
Unit B6
Marabout Industrial Estate
Dorchester
Dorset
Tel: 0305 62250

Extensive selection of kits based around receive and transmit converters for 50MHz, 70MHz and 144MHz, plus matching linear amplifiers and receiver accessories. List by s.a.e.

Where there's muck . . .

Once Upon a time every large town could boast at least one army surplus store, selling everything from miles of Khaki webbing to No 19 sets. Alas those days are gone, so today's constructors are either stuck with building from new components or winkling out surplus parts at the local radio rally. Either way things can prove to be expensive, particularly those parts bought from some of the less reputable surplus traders. So where does all the surplus go these days, all right so there can't be much ex-government equipment around; fortunately there haven't been too many wars to generate it. There is however, a vast wealth of new and surplus gear available from industry, at ridiculously low prices, both equipment and components. The problem is knowing just where to look for it.

Most of this gear, not all unfortunately, finds its way into certain scrap yards. Your locality within the country will affect the type, quality and quantity, of the scrap that is available. But with the increasing number of small light industry parks springing up all over the country, there will almost certainly be a scrap yard near you. If there's some doubt in your mind, just look in the Yellow Pages, under "scrap metal merchants". Forget the ones that are dealers in just crashed and old cars.

Although, if you're looking for a cheap receiver to hang a short wave converter on, then don't forget car radios. There are also lots of other useful items to be had from auto scrap yards i.e., speakers, a high current diode pack out of alternator (great for beefy power supplies), ammeters, switches, electronic ignition units, car head lamps (good for load testing power supplies), in fact the list is endless.

Right, back to the real scrap merchants, the ones that say in their advertisements, non-ferrous metals, factory clearance, skip service supplied. All these mean that from time to time they will deal with electronic and electrical scrap.

Once you have located your local scrap yard, don't go bowling in there expecting to find heaps of goodies, in fact don't go bowling in there at all. Scrap yards are like any other industrial site, they can be very dangerous and dirty places. They are very nearly always muddy, and if you don't announce your presence you will fall foul of the scrap man, and/or his machinery.

Ground Rules

Here are a few rules and hints on using scrap yards. The first thing you must always do before actually entering the yard, is ask the proprietor if he minds you looking around. If he then asks you what you are looking for, tell him, electronic scrap, aluminium plate, angle or transformers. In fact whatever you need. Remember, they know where everything is and how much it cost them to buy in the first place.

If he says no we haven't any, or he just doesn't want you poking around, don't argue just leave. You could try politely asking him if he knows of another yard in the area that might help you.

If on the other hand he says yes help yourself, it's over there, then go and have a ferret around.

Remember the dirt and danger I mentioned—stay well away from any working machinery, that includes people using cutting equipment. Always go to the yard dressed in old clothes, plus wellingtons and be prepared. That means take a small but well chosen selection of tools, these are; two or three screwdrivers, cross head and straight, medium sized adjustable spanner, assorted set of Allen keys, small cold chisel and hammer, Junior Hacksaw, pliers with wire cutting facility, plus a few thick plastic carrier bags and a piece of rag. The tool kit can be left in the car when not in use, just in case while you're on an outing you stumble across a good scrap yard.

Buying

Be selective in what you take to the scrap yard office, remember scrap men usually buy and sell everything by weight and the type of metal involved. Fortunately for us it takes a lot of time and trouble to process electronic scrap, so scrap men are glad to see the back of it. Unless of course it's all housed in nice aluminium cases or racks. This is where the tools come in to play, if you find a nice panel meter, don't take the case or panel that it's attached to, unless you fancy it of course. Remove the meter from the panel, after that it looks light, uninteresting and of no intrinsic value to the scrap man.

There's one sure-fire way to pay a lot for your items of scrap; that is go staggering into the yard office, looking really enthused, with a great heap of non-ferrous material i.e., cases front panel etc. The man at the weighing machine gets very excited and his eyes light up with little pound signs. Always if possible strip the equipment down and leave the heavy bits behind.

There are occasions when a scrap man will say "that pile of equipment is sold" or "reserved", that means don't touch. If you pay no heed to warnings of this nature you will be asked to leave in no uncertain terms and told never to return.

If on arrival at the office, the equipment you want is weighed and a price is quoted, but it seems a little high, just bear in mind what that panel meter or transformer might cost new. Believe me you're not paying scrap prices but it's very close and generally very reasonable. Scrap men don't like to haggle, they are very shrewd business men and must be treated with respect, because if you don't next time the gates will be shut.

Once you have found a good scrap yard visit it about once every fortnight. Try to get to know the staff, ask them if they have any regular deliveries of electronic scrap.

Paying For Your Hobby

It is possible to recoup some of your hard spent cash, if after you get the scrap home you decide to completely strip it down to last nut and bolt. Save all the aluminium, brass and copper separately, and when you have several carrier bags full take it back to the scrap yard. This is called recycling and you will be surprised at the amount of cash to be gained from it. Remember the scrap man needs what he calls "clean scrap", this means if you have an aluminium plate with one steel screw in it, the scrap is "dirty" and the price drops accordingly. If you want top reclamation prices always separate the different types of metal from one another.

Friends from time to time may ask if you know the whereabouts of, say, a heavy current transformer for use in a 12 volt power supply. Well if you have your wits about you next time you're up the yard try looking for an old battery charger. They often contain the makings of a high current p.s.u. There are generally bins for items like motors and transformers in most scrap yards. This is often true of aluminium scrap, that has come from places like double glazing firms. This is good stuff if you're into making your own chassis.

All in all over the years that the author has frequented such places, he has gained some very useful pieces of equipment, his latest acquisition being a fully working chart recorder, just the job for recording solar noise peaks.

Even if you can't use all the scrap you obtain you can always sell it on at radio rallies, to other amateurs that are not "in the know". Always be on the look out for things that might sell, they could pay for your next rig!

Domestic Salvage

There's one municipal site we all visit from time to time, that is the local council refuse tip. The more observant amongst you will have noticed that there are a number of people down at the tip, who seem to spend most of their time going through what you've just dumped. These people make a very legitimate living out of salvaging scrap metal and other domestic items. These people are called Totters and they are licensed by the council to remove items of scrap for salvage purposes.

Now if you are like the author, places like council tips and scrap yards hold an almost hypnotic attraction. The thought of all those useful bits and pieces going to waste seems to make you want to hang around to collect a few choice items. Unfortunately, there's a problem with trying to do this in most council or city dumps. You could at the least, have a nasty confrontation with one of the Totters, and at worst be hauled off by the Police for stealing!

To avoid both these rather embarrassing situations, it might be worth while seeking permission from one of the council officials before attempting to remove any equipment. It may be possible to buy the item of interest. Failing this, if there's a Totter hanging about, ask him if you can buy or have whatever's taking your fancy. Remember my comment about the price of scrap, well much the same applies to domestic salvage. If you think the price is unreasonable leave the item in question behind, it's only junk!

You may think the author is a little strange frequenting such places, but remember the saying, "Where there's muck there's money". A friend of the author on a recent trip to the dump ended up with a very nice Eddystone communications receiver, in working condition, for just a few pounds.

He was lucky; he was in the right place at the right time, but who knows, tomorrow could be your lucky day. As a last thought on the subject, please also remember my comments about scrap yards being dangerous places. The same goes for rubbish tips, with the added danger of coming face to face with some rather unpleasant rodents, with some nasty diseases I might add. So take care not to disturb great piles of rubbish in the search for goodies. The Totter knows what's worth saving, both for selling outright to you and me, and for scrap. So all the goodies are normally stacked neatly to one side for your perusal. Good hunting!

Radio Rallies

There are literally dozens of radio rallies taking place all over the UK every year, from Camborne to Ipswich, from Brighton to Aberdeen. The majority take place between March and November. They are held in Scout huts and village halls, in marquees and schools, in racecourse stands, sports centres and exhibition centres. Most are organised by local radio clubs, some by specialist national societies or groups, a few by the Radio Society of Great Britain.

Radio rallies, even the ones called mobile rallies, are not like car rallies, where participants race about all over the countryside. Instead they are meetings of radio enthusiasts, who come to greet old friends and make new ones, and to buy and sell all manner of equipment and bits and pieces. Some have programmes of lectures or talks on radio matters taking place during the day, in which case they are often called conventions.

The majority of radio rallies are one-day affairs, mostly held on Sundays, and open from around 10 or 11am to around 5 or 5.30pm. A few extend to two days, either Friday and Saturday or Saturday and Sunday. This year's 75th Anniversary RSGB National Convention at the Birmingham National Exhibition Centre in July was unusual in lasting three days.

What will you find at a radio rally or convention? The largest part is usually formed by stands occupied by radio traders, selling their wares. The larger equipment dealers and importers tend to limit their attendances to the biggest and most popular events. The smaller dealers pop up all over the place, sometimes appearing at more than one show on the same day, perhaps with a husband doing one and his wife doing the other!

At some rallies, dealers will entice you with money-saving special offers, and occasionally one may have a stock-room clearance sale of discontinued lines.

You'll also find quite a few component specialists selling new, surplus and second-hand stocks, antenna suppliers, second-hand instrument and receiver dealers, and individual enthusiasts trying to raise a pound or two by selling unwanted items from their shacks.

At the biggest events, the smallest traders are organised into a separate section called a flea-market, a term we've borrowed from across the Atlantic to mean a collection of rows of trestle-tables.

Rallies can be good places to buy technical books. You can save on the postage and packing costs, and take advantage of the occasional special offer. The RSGB and several dealers have books for sale, and of course we mustn't miss a plug for the *Practical Wireless/Short Wave Magazine* Book Service here. Each year, you'll find us at around 20 to 25 events. For details, see the News pages in *PW* and *SWM* each month.

At most rallies there's usually a bring-and-buy stall, for individuals with a rig or receiver, or some other item to sell. Bring it with you and book it in, stating your asking price. With luck, it will be exactly what some other enthusiast is looking for and he'll make you an acceptable offer during the course of the day. Don't forget to keep an ear on the public address announcements, in case you're called to do some hard negotiating. A small percentage of the selling price generally goes into the funds of the club organising the rally. If the item isn't sold, don't forget to collect it at the end of the day; the organisers don't want to have to cart it away.

Rallies can be good places to pick up a bargain, but be sure what you're being offered, and whether it carries any form of guarantee. You will sometimes find dealers specialising in production-line or service-department rejects of all manner of electrical and electronic goods. For example, you might pick up a £25 domestic TV distribution amplifier for a fiver—"sort of working" but required only a little fault-finding and an 80p regulator i.c. to restore it to full operation. If you're not so lucky, you may finish up with something good only for stripping down for spare parts. If that's what you're after, fair enough, just keep your wits about you.

Household Stores

For those radio enthusiasts who really get "stuck-in" to home-construction, especially those who like to build and experiment with antennas, the ordinary components—resistors, capacitors, semiconductors and so on—are often just the starting point in the quest for bits and pieces. Hardware, such as nuts, bolts, metal sheet, angle and tube, electrical accessories and the like, can be just as hard to come by, though some of these are nowadays included in the mail-order catalogues which we list elsewhere in this supplement.

There are, of course, specialist suppliers of metal, fastenings, electrical fittings, etc., but many of these are not too keen on supplying anyone who's not "in the trade". Other sources are household stores, though how useful these may be depends largely on your luck, and where you live.

Household stores fall into three categories: the traditional ironmonger or hardware store, the DIY store or supermarket, and the surplus store.

Ironmonger's/ Hardware Stores

In these modern times, the traditional ironmonger's or hardware store has all but disappeared. Younger readers may never have been lucky enough to visit such an Aladdin's cave, staffed by helpful assistants who actually knew all about their wares. The walls behind the counters were racked out from floor to ceiling with purpose-built wooden shelves and drawers, and if what you wanted wasn't to be found there, the assistant would disappear through a doorway at the back of the shop, shortly to return from the seemingly limitless store-rooms hidden elsewhere, triumphantly bearing the item in question.

I'm pleased to say we have such an emporium, called Boone's, still operating in Poole High Street, just a stone's throw from our office. If you have such a shop near you, support it with your custom; the world will be a poorer place when they have gone.

Because these stores hold most of their stocks loose, rather than prepacked, they will happily sell you the six washers or screws you might want for a particular job, rather than having to buy a pack of ten or twenty, as is the modern trend. It may or may not turn out more expensive that way, only experience and local knowledge can tell you that.

DIY Stores

The ironmonger's and hardware stores have mostly given way to the ever-growing chains of DIY superstores. They form a useful source of all sorts of mechanical and electrical bits and pieces that a keen radio constructor living in or near a large town can make use of. And, though not on the same scale, quite a few villages are sprouting their DIY shops or mini-markets, too. The advantage of these DIY stores, as in any other self-service shop, is that you can see what they have for sale, but unfortunately few have staff who can advise you.

We have a selection of DIY superstores in and around Poole, including B & Q, Sandfords, Great Mills and Homebase. Some chains cover large parts of the UK, others are more localised. Each has its strengths and weaknesses in terms of the items they carry, the way they are displayed, etc.

If you have one or more of these superstores within travelling distance, get to know what sorts of things they stock that may be of use to you. What might they be? Well, apart from the obvious, such as electrical plugs, sockets, switches, cables, conduit, mini-trunking, terminal blocks and boxes, pvc tape and so on, how about the following examples.

For pipe or tube and associated fittings, in copper, steel or plastics, look in the heating department (microbore), plumbing department (supply and waste pipe), rainwater goods department (gutter down-pipe), home brewing department (tubing), gardening department (hose-pipe), or the hardware or bedroom/kitchen furniture departments (chrome-plated tube intended for clothes hanging rails or worktop legs).

For tools, screws, washers, nuts, bolts, brackets, plates, adhesives, aluminium sheet, and extruded sections of assorted shapes and sizes (far greater variety than just the traditional aluminium angle nowadays), in aluminium or plastics, look in the hardware department.

For aerosol paints, exhaust clamps (useful for antenna construction), a further selection of brackets, nuts, bolts and washers, look in the motoring department.

And of course, if you're fitting out your workshop or operating desk, your DIY store can supply timber, laminated board for shelves, etc., shelf brackets, kitchen worktops (they make lovely desk-tops), and very often cheap book-cases too.

Different DIY superstore chains stock different lines or brands of goods, and very often these can come in different sized packs, too. For example, plastics mini-trunking is stocked by one of our local stores in 2m lengths, and in another in 3m lengths. As yet another option, the local electrical factors stock it in 4m lengths! Often you can save money by going to the place that has the right length or pack for the job in hand.

Surplus Stores

Surplus stores, too, can often provide all sorts of materials the constructor needs. The prices are generally lower, but you can never be sure whether a particular item will be available at the time that you want it, because the goods are mostly discontinued, bankrupt or damaged stocks.

YELLOW PAGES

The Yellow Pages Directories published by British Telecom can form a useful source of guidance to local supplies and services.

As with any directory or index, some perseverance is often needed to find the right category or classification heading for the sort of firm you're looking for, though since the reintroduction of a cross-reference system the Yellow Pages Directories are a lot more usable.

A few useful classification headings for the radio hobbyist are:

For Amateur Radio or CB Equipment:

- Radio communication equipment

For Antennas and Aerials (antenna mounts, poles, brackets, erection, etc.):

- Aerial mfrs & suppliers
- Concrete—ready-mixed
- Television & radio aerial services

For Hardware and Tool Supplies:

- Do it yourself shops
- Hardware retailers
- Household stores
- Tool mfrs & suppliers

For Metal Supplies (offcuts sometimes available to callers):

- Aluminium & alloy rods, sheets etc
- Aluminium stockholders
- Brass & copper stockists
- Iron & steel merchants & importers
- Non-ferrous metals
- Steel stockholders
- Stainless steel stockholders
- Pipe, tube & fitting stockholders

For Printed Circuit Board Manufacture and Materials (offcuts sometimes available to callers):

- Printed circuit mfrs

For Sheet Perspex (offcuts sometimes available to callers):

- Sign makers

Now you're *in the know*, you can get cracking with something constructive.

SPECIAL NOTICE TO READERS

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Yesterday's World of Technology

In Part 2, the concluding part, of this short series, F. C. Judd G2BCX finishes his look at Electricity, Magnetism and Sound in the 19th Century.

Dynamical Electricity

The fundamental and well known experiment with frog's legs by Professor Galvani was almost certainly one that led to the discovery of dynamical electricity and finally to the "Voltaic Pile" by Volta—which was perhaps the earliest form of battery.

It consisted of a series of discs piled one above the other in the following order. At the bottom a disc of copper, then a disc of cloth moistened by acidulated water (or brine), on which was next placed a disc of zinc. This arrangement was then repeated, copper-cloth-zinc, several times ending with a disc of zinc. So it really became a number of "cells" in series, i.e. a battery. The first copper disc was the positive connection and the last zinc disc was the negative connection. A voltaic pile is quite easy to construct.[1]

The term "battery" came into use later when a number of individual low voltage "cells" were connected in series to obtain a higher voltage. Various combinations of metal plates immersed in liquids were employed to produce single cells. Prominent inventors in this field were Daniell (1836), Bunsen (1843) and, of course, Leclanche. It is interesting to note the variation in voltage produced by cells using different elements and liquids.

Daniell 1 and 1.02
Bunsen 1.77 and 1.87
Groves 1.82
Leclanche 1.32

Ohm's Law

Dynamical electricity warrants at least some reference to the work by George Simon Ohm (1822), to whom we are indebted for the present day knowledge of the conditions which regulate the action of voltaic current. From his experiments with short and long lengths of wire and a magnetic needle, Ohm discovered that the same current passed through a long wire produced less deflection of a magnetic needle than the same current passed through a short wire. Ganot quotes, "Accordingly, Ohm supposed that there was greater 'resistance' to the passage of current in the long wire and proved that the resistance is inversely proportional to the strength of the current". On this principle, Ohm founded the celebrated law that bears his name:

The strength of the current is equal to the electromotive force divided by the resistance. Which, expressed in its original form, was:

$$C = E/R^1$$

C being the current
E the voltage and
R^1 the resistance

Detection of Voltaic Currents

In 1819, Oersted published details of a discovery that connected magnetism and electricity and which, in the hands of Ampere and Faraday, became the source of a new branch of physics. What Oersted discovered was the direct action that a fixed current exerts, at a distance, on a magnetic needle. The original "Oersted experiment", which was actually five separate experiments, is quite easy to carry out. A replica of the original, but quite simple, equipment is fully described in *Ganot's Physics.* [1]

The Electroscope

This is usually called a "Bennetts' Goldleaf Electroscope"[1] as its essential component was a single or double strip of goldleaf. Nowadays, instead of goldleaf, ordinary metal foil such as that used for chocolate wrapping, or cooking foil may be used. An electroscope is easy to construct, as can be seen from Fig. 2.1. In this case it employs a single hinged foil leaf in conjunction with a small strip of thin brass of the same size. It is housed in a glass jar with a screw-on plastics lid (a clear glass coffee jar will do nicely).

The electroscope was one of the earliest, but nevertheless very efficient, detectors of high voltage electricity—especially static electricity. It will indicate if a voltage charge in the presence of the electrode at the top is positive or negative. When the charge is positive, the foil leaf will open up away from the brass strip and stay that way until the charge transferred to it has decayed, or is removed by earthing the electrode. If a positive charge is first used to open the leaf, then the presence of a negative charge will close it.

The foil leaf must be perfectly flat and free to move on its hinge (see detail). To test the electroscope, first vigorously rub one end of a plastics ruler, or strip of Perspex, etc., with a dry cloth, silk handkerchief or small piece of nylon tufted carpet. This will create a positive charge and when the material so charged is held just over, but not touching, the electrode the leaf will open up.

For further information concerned with applications for a single or double leaf electroscope see reference 1. It can be used in conjunction with the Wimshurst machine, the Electrophorous, or with any other method used to produce static electricity.

Electricity & Magnetism

These elements were employed in many of the inventions of the early

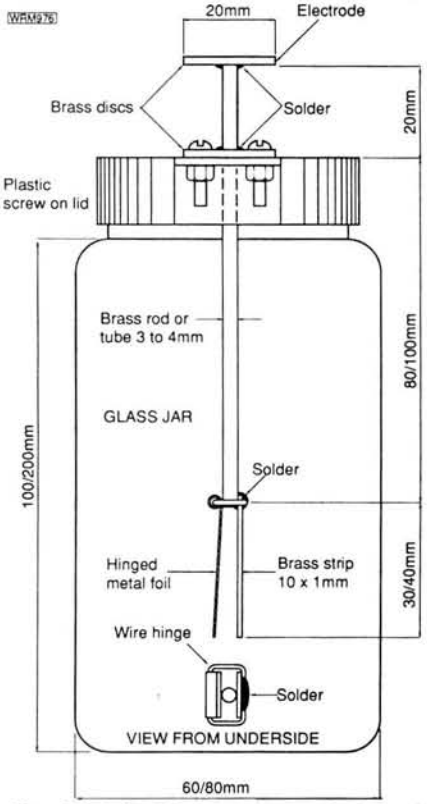

Fig. 2.1: The Electroscope. A detector of static electricity. Dimensions given may be varied

1800s. Among them were the telegraph systems, electro-magnetic generators capable of delivering sufficient power for arc lights, etc., electric alarms and even electric clocks. Many of these machines are described in great detail by Ganot.[1]

A Simple Experiment

Details for constructing, what is in effect, an electric motor are given in Fig. 2.2. It stems from an early experiment that utilised electric current, magnetism and what was described as **a coil of copper wire.** This experiment was featured some time ago in a TV science programme in which frictional energy was also demonstrated. The coil of wire is wound, as illustrated, with the start and end brought out at right angles and straightened. These must be scraped completely clean down to bright copper and form the spindle on which the coil will rotate. The upright wires that support the coil, and provide bearings for the spindle, are spaced about 70mm apart. If a small flat, or round, magnet (north pole facing upwards as illustrated) is not available, an ordinary bar magnet may be used with its north pole held near the coil.

With the 1.5V cell in situ, place the coil on its wire bearings as shown. It may require a gentle push to start it rotating, although it should run without prompting. Whilst the coil is rotating, the current taken from the cell is about 300mA. If stopped, the coil will be a virtual short circuit across the cell, so after running remove it from the bearings.

Sound

Although this is a scientific subject with many different facets and worthy of deeper study, it is one that has held the interests of scientists for many, many years. The most familiar development has been that of sound record-

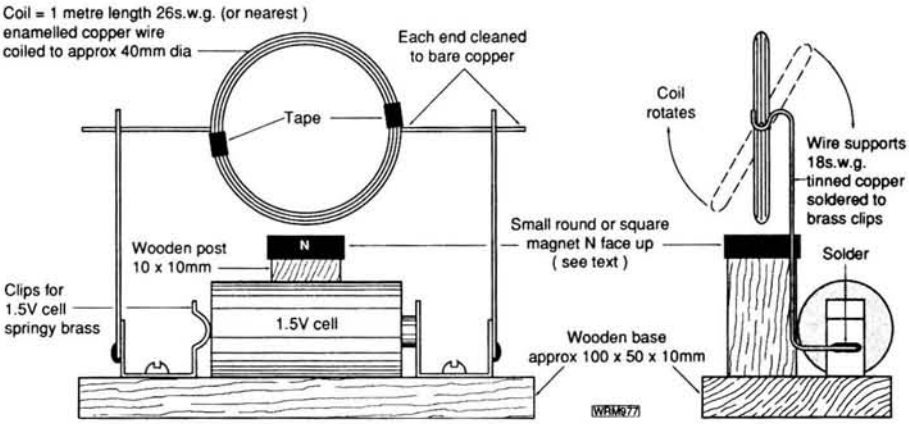

Fig 2.2: An experiment with electricity and magnetism. No prizes are offered, but how does it work? Make one and see if you can provide the answer

ing and reproduction. It began with the "Phonautograph" invented by Thomas Alva Edison in 1877 and is shown in Fig. 2.3. It employed cylinders covered with metal foil, a threaded groove on this being vertically modulated from a stylus attached to a diaphragm, i.e. a mechanical form of microphone which also served for replay of a recording.

The author has built a working replica of this, but to do so a lathe is required. The first disc record player was produced by Berliner in 1888. although at that time Edison was still working on improved versions of his grooved cylinder system.

Another important invention was a "microphone" that could convert sound waves into voltages that varied according to the frequency and ampli-

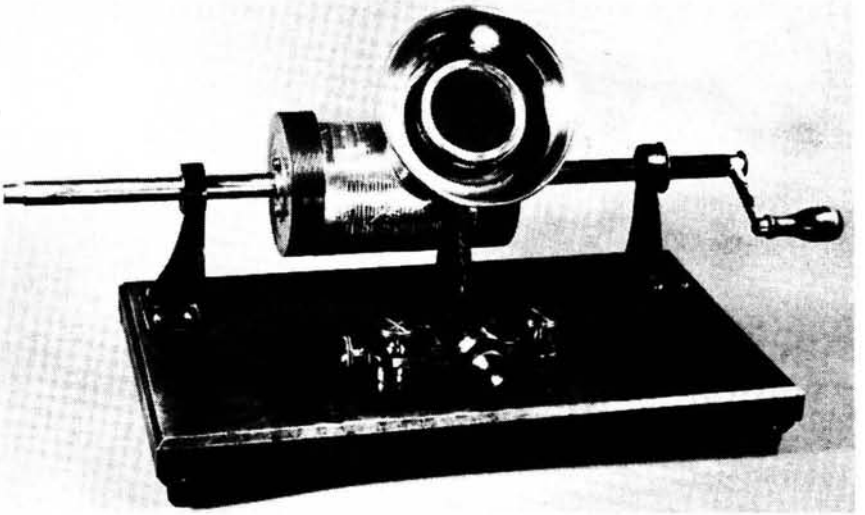

Fig. 2.3: The original "Phonautograph", the first recording phonograph invented by Thomas Alva Edison (1877)

Notable years in the history of discoveries and inventions in electricity, magnetism, sound and wireless

Year BC
2600 Magnet used by the Chinese as a compass
1000 Greeks obtained lodestone from Magnesia

Year AD
1600 Gilbert investigated magnetism and published findings
1671 Otto Guericke invented the first machine for generating electricity
1724 S. Gray discovered the principles of conduction and insulation
1742 Improvements on Guericke's electrical machine by Gordon
1745 Invention of the Leyden Jar
1746 Discovery of "earth return" conduction by Winkler
1748 Conclusion that electricity travels instantaneously by Watson
1752 Franklin identified lightning and electricity
1780 Discovery of "current" electricity by Galvani
1796 Volta produced the "voltaic" pile (battery)
1811 Sommerling used water to conduct current for electric telegraph
1820 Oersted discovered the connection between electricity and magnetism
1820 Construction of the first instruments for measuring current
1820 Ampere invented the "astatic" needle
1825 Electro-magnet invented by Sturgeon
1828 Improvement on the electro-magnet by Henry
1831 Faraday discovered magneto-electricity
1832 Henry discovered induction
1832 Samuel Morse invented Morse code
1842 Morse signals sent by conduction through water
1849 Signalling by induction between England and France suggested as possible by Wilkins
1850 Guitard discovered "coherence" of dust particles
1854 Lindsay filed a patent for communication by conduction
1864 Clerk-Maxwell predicted that electro-magnetic waves existed
1866 Coherence for protection against lightning by S. A. Varley
1876 Bell credited with the invention of the microphone
1879 Hughes experimented with Hertzian waves
1880 Bell invented the Photophone. Voice transmission by light
1882 Dolbear applied for a patent for wireless (?) telegraphy system
1883 Development of the principle of cohesion by Lodge
1884 Trowbridge suggested signals to ships at sea by induction
1885 Signals to trains in motion by induction by Edison
1888 Hertz discovered electro-magnetic waves (propagation through the air without wires)
1891 Branly introduced the coherer detector
1892 Wireless signals over 5 miles by Preece
1895 Marconi made first "wireless" experiments in Italy
1895 Popoff (Russia) experimented with wireless (later claimed as inventor)
1896 Marconi in England increased distance of wireless transmissions
1897 Lodge patented the system "tuning" wireless apparatus
1899 Marconi had the first wireless transmission across the English Channel
1900 Marconi had the famous patent No. 7777 for wireless tuning system
1901 Marconi had the first wireless transmission across the Atlantic
What followed will, eventually, also become history—FCJ

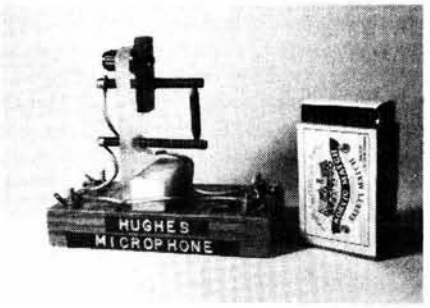

Fig. 2.4: Replica of the original microphone invented by Professor Hughes (circa 1850)

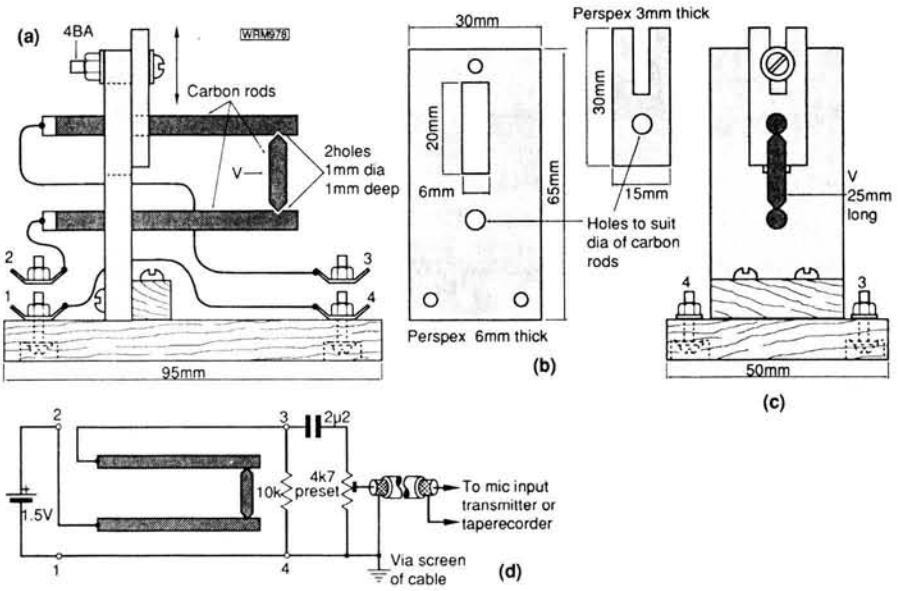

Fig. 2.5: Construction details of the Hughes microphone. (a) The general assembly. (b) The Perspex supports. (c) The end view. (d) The circuitry for testing with a tape recorder of transmitter

tude of the original sound. This enabled speech, etc., to be transmitted along wires and converted into audible sound be means of an electro-magnetic "head-phone", probably the forerunner of the telephone. It is almost certain, however, that the first microphone was invented by a Professor Hughes, and this became known as the "Hughes Microphone" (Circa 1850). Hughes also invented a "typewriting telegraph" (Circa 1859).

The Hughes Microphone

As a tribute to the scientists of the 19th century and the inventor of a device (later to become the carbon microphone used by radio amateurs in the early days of radio telephony), the following deals with constructing a working replica of the Hughes microphone.

As the photograph (Fig. 2.4) shows, the replica Hughes Microphone (built by the author) is quite small and very easy to make. Moreover, it functions better than one would expect from what appears to be a fairly crude arrangement. In fact, it was tested with a tape recorder and then on the air on both 3.5 and 144MHz. It provided perfectly readable speech although, as expected, a rather high noise background. The tested "dynamic" range, reference 0dB standard recording level, was about 20dB, i.e. noise level that much below speech peaks of 0dB.

The details for construction are shown in Fig. 2.5 Very little explanation is necessary, except that the carbon rods were taken from run-out pen cells and are just the right diameter. Care is required to extract these without breaking them. The best way is to carefully cut the cell open, loosen the filling compound and withdraw the rod complete with the brass cap.

The small hole at the end of the upper and lower rods is drilled to about half the diameter so as to leave a shallow conical cup. The pointed tips of the small upright rod "V" fit into these but loosely, hence the adjustment provided for raising or lowering the height of the top rod. Incidentally, Hughes described the "loose contact" as one which provided "semi-conduction", not to be confused with the modern meaning of this term. The two longer rods are secured to the Perspex supports with Araldite.

Little current is required to energise the microphone and is the reason for the 10Ω resistor in series (Fig. 2.5d). The remaining bit of circuitry is to set the output signal level to that required and provide a fairly low output impedance. If signal output is very distorted and limited, gently tap the small rod "V" to loosen its contact with the other rods.

The author is indebted to The University of East Anglia for details concerned with static electricity generators, and to the Institue of Electrical Engineers, London and the Marconi Co. of Chelmsford for historical information included in this series.

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(1) *Elementary Treatise. Ganot's Physics.* 10th Edition. (Edition 15 is best). Originally published as *Ganot's Elements de Physique.* First English edition published 1881 by Longmans, Green and Co. London. Copies can be obtained by local libraries from the British Lending Library, Boston Spa, Yorkshire.

(2) *Text Book of Physics* by J. Duncan and S. C. Starling. Part 5 Magnetism and Electricity. Published by MacMillan & Co., London (1922).

(3) *A Textbook of Physics* by E. Grimsel. Publisher not known. Extracts on Wimshurst Machine obtained from the Institution of Electrical Engineers, London.

(4) *Electronics Inventions and Discoveries* by G. W. A. Dummer. Published by Pergamon Press, London. Available from libraries only.

(5) *A History of the Marconi Co. (Part 1)* by W. J. Baker. Published by Methuen & Co. (1970). Copies available from the Marconi Co., St Mary's House, Victoria Road, Chelmsford, Essex CM1 1NY. (Price £8.75). Also available at libraries.

On The Air
On The HF Bands

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

Conditions

As always, variations from day to day, band by band and the little surprise to give pleasure. I listened on 14MHz (20m) in the mornings and noted how the general noise level dropped from its summer level as we went through the months. Most mornings, the VKs made S9 into Europe, sometimes the ZLs too. On the bad mornings, not a lot was audible beyond the Europeans. Turning to 21MHz (15m), most mornings it was still in its night-time slumber by the time I left to earn a crust, save of course for the odd EU who maybe hadn't noticed the band was dead!

Towards the later part of the month, the equinoctial gales came along. September 19, beautiful sunshine along the Shropshire Union Canal bank for photography and since then heavy wind and rain, the former enough to slew the beam round, complete with mast, nearly 45 degrees against the pull of the guys until the wind dropped, when it slowly unwound itself. The morning mists of this season make travel more of a hazard than ever and often the cause of noise on the local v.h.f. repeater.

Events

As I haven't had much use out of the radio this month, I am more than ever dependent for this section on the *DX News Sheet* from RSGB, and *The DX Bulletin*. Both, of course, come through the post, so both have in the main failed to surface. However, I have one of each to hand and both have items of interest.

Of course, lots of rare and semi-rare ones will appear for the CQ WW Tests. Steve G4JVG advises that he will be on from Cocos-Keeling, VK9Y, as AX9YG outside the test, and VK9YG during the Contest period. QSL to his home call, with return postage, and Steve would appreciate any donations to help meet the costs.

TDXB also notes that the 18 minutes past the hour propagation reports have been "temporarily" taken off the air; the story is that they have had a computer failure and have to buy new equipment. Considering just how much effort SESC have made to suspend this service, over the past few years I wonder if it will ever reappear! Even now, the data can be manually downloaded, but this they decline to do, even on a once-per-day basis!

One notes that peace threatens to break out in various places such as Iraq, Iran, Burma, Afghanistan; who knows, perhaps we may yet see some of the old but inactive countries like these back on the air. Certainly one would like to work a legitimate ZA.

Insurance Contacts

The uncompromising attitude of TN4NW on this business has stirred up a lot of talk. Most of the "not in the log" returned QSL cards are the result of the pathetic habit of transmitting half a callsign. Quite apart from causing confusion, it also warrants that the DX station can only handle half as many QSOs, since he must every time get the caller's complete call after he has copied the partial call. TDXB's Special Bulletin mentions a couple of cases. First, KP2AH mentions that after three QSOs with T5GG his first two QSLs had come back with the magic "not in the log" written on them, while the third QSO seems to be OK and the card is awaited. However, but for the help of GW3CDP and OE6EEG, five QSLs, five letters and five green stamps would have been wasted.

Another one to suffer refers to the SORASD expedition; WOBA got his card back endorsed "not in the log" but this time EA3AOC did add the further information that at the correct time, he in fact entered a 9Y4BA in the SORASD log. You can't tell me that anyone can mix up WOBA and 9Y4BA, even allowing for language problems; clearly the contact was lost simply and solely because of the use of "short-form" calls. Whether at the DX end or the common-or-garden end, the use of short forms of callsign is not just illegal, but it also actually slows down the rate at which QSOs can be made. Wouldn't it be better all round if we all went back to operating properly? In the meantime, for those who want the certificates, insurance contacts are a "must" as long as there are boneheads around who insist on this half-a-callsign caper.

Turning now to *DX News Sheet*, I had to chuckle at the reason for the cessation of activity in VP8 South Georgia shortly; it seems that the seals which visit the island during the Antarctic summer, are liable to eat the antennas, which is not good for antenna or seal!

V47NXX will shortly be moving to Anguilla where he hopes to obtain a VP2E callsign. Anyone who works this one should have their WAB details to hand, as it is understood that Paul is very keen on this particular award programme.

New Country?

The word goes round that three American and one Aussie operators will be activating Rotuma (IOTA OC-60) with the callsign 3D2XX; it is suggested that under the revised DXCC Countries Criteria, this would be a new country. On the other hand, 3D6XR was on from this same spot some years ago, but at that time was refused new country status.

Silent Keys

I was very sorry to hear of the passing of Jack Korndorffer G2DMR. Jack was a man of parts; I recall a couple of decades ago listening to his distinctive voice and signal riding high over a pile-up on Top Band back along in the days when chasing counties was the done thing. G2DMR was on the DXCC Honour Roll, and in fact was hunting the last few for the 5BWAZ when he was taken ill. Our sympathies to Jack's wife and family and to his friends.

Were that not enough, I also have to mention the death of Norman Hyde G2AIH, back in May. Norman was a stalwart in the ranks of ten-metre specialists, first licensed back in 1934. From his high QTH up on Epsom Downs, G2AIH was for many almost a beacon on 28 MHz over a large area. He will be sadly missed. Again, our condolences to his wife Molly; a sad loss indeed.

EI

A letter from Conor McGlynn, as Co-ordinator, mentions the Terenure College ARC, EI2BY will be working all bands and would welcome contacts; every Saturday from 11 in the morning until lunchtime. The operation is in fact from ARSI's HQ, and the QSL Bureau is Box 938, Dublin 6.

The 1.8MHz Band

It is fairly axiomatic that when noise on 14MHz is high, on 1.8MHz it can be expected to be worse, at least in the summer. Maybe that is the reason why there are so few reports this time.

G3BDQ mentions that he managed nothing very exotic—just a string of assorted Russians.

G2HKU used his s.s.b. to reach out to ON7BW, while the c.w. went to C30LFL. However, the static on most evenings for Ted was around the S8-S9 mark, which seems to have kept many stations off the band. Incidentally, most of Ted's contacts were made using the British-built version of the Century-22. Apparently Ten-Tec have stopped building the Argosy and the Century-22 in USA and have shifted production to KW Electronics.

The 3.5MHz Band

A note from LA6WEA to *DXNS* reminds us that openings to North America and South America are likely to be of short duration for those poor souls who are in Arctic areas—a simple fact of life, alas, that we learn in RAE class. However, what it DOES mean is that if you hear JW, OX, or JX stations trying to work the Americas, you don't jump in to call the American end until the short opening from the Arctic area is over. You will have the gratitude of these chaps, and who knows, maybe JX1UG who will be active on the band ere long, might be more willing to work YOU!

G2HKU (Sheppey) mentions just a single contact, on c.w., with OH0/OZ1JVN.

New reporter G0JEE (Stafford) uses an FT-902DM, running 100 watts into a W3EDP at 6m. Most of Bernard's time on the band was spent in August chasing the RSGB members for the 75th Anniversary Award; but some new countries were raised on s.s.b., notably GJ4TAF, ON6YB and HB9/OZ1JKP.

G3BDQ (Guestling) has been playing around with a tilted terminated folded dipole just 7m long, with the high end at 5.5m and low end at 2.5m; it even works on 7MHz where it is 1 or 2 S-points down on the normal antenna. John hopes to get a T2FD up soon, cut for 3.5MHz (80m), when it will cover 1.8-14MHz nicely. Anyway, the 7m version, on 3.5MHz, s.s.b. contacted with JA4DND and UA9CSS.

The 7MHz Band

Quite a nice band this, but often neglected, partly one suspects because of the small-garden caper, but also because one wonders if people ever use the r.f. attenuator button on this band or on 3.5MHz!

SWL Barry Smith (Stockfield, Northumberland) recently bought one of the Sony receivers. Barry doesn't actually mention anything logged on the band, but he does go on to comment that "7MHz around dawn has been superb".

Gordon Hudson GM4SVM (Stirling) notes that he has recently returned to the h.f. bands after a two-year break while he was at college. This, he says, makes it all the more noticeable how conditions have perked up since his last major "bash" back in 1984/5. Currently the big problem, apart from parts awaited to enable an antenna overhaul to go ahead, is the 7MHz inverted-V. It seems the ferrite balun overloads at about 10 watts up the spout, which doesn't help the p.a. much, nor the incoming signal report, nor probably the outgoing speech quality! Perhaps the best answer is to throw it away and operate the antennas without any balun. Incidentally, Gordon uses a TS-520 as the main rig.

G3BDQ uses the band occasionally, but this time he contented himself with JA9CZE on s.s.b. and JA5RH on c.w.

On the other hand, G2HKU seems to have been quite active, with for example c.w. to HB0HTB, W2JL, ZL1ST, WA2O, ED9IA, OH0/OZ1JVN, WA2QKU, K4EWG, N2GIC, OH4ML/OH0 and HB0/HB9NL.

WARC Bands

Just the one mention this time, from G2HKU; on 10MHz Ted worked W2HEC and ZL2AGY; on 18MHz I2QHQ, and on 24MHz K2MGR, W2GDV, and HB0/DL1GK. All, of course, on c.w.

The 14MHz Band

Don at G3NOF often found the long path open 0600-0900Z to VK, ZL, JA, with short path also open to West Coast N. America. Asians, JAs, VKs, were also noted on the short path, around 1600-1800Z. Contacts using s.s.b. were completed with AI6V, AP5HQ, AX8MQ, AX0NE, ED9IA, FR4FD, JA7DSL, JA9YBA, JR5JAQ, N6AR, NL7NF, OY9JD, P29VU, UA0QO (Zone 19), VE8RCS, VI88WA, ZL4OD, 3B2BD, 8Q7OF and 9V1XI.

GM4SVM mentions just one contact on the band, the c.w. one with UA3TTX/UF2F.

Sideband was employed by G3BDQ to work out to C30EAM, WA1IDP/CU2, 5H1MK, 4U1VIC and other lesser fry.

Turning to G0JEE at Stafford, Bernard has clocked up some 79 countries so far, albeit he hasn't yet got many of the QSLs in. He uses a two-element inverted-V form beam, mounted at 11 metres high. Islands raised included LA3NY/P (Mosterhaven), LA9WBA (Smola), IK3BPN/IL4 (Braon), GB75ARN (Arran), OH0AM (Aaland), GD3FLH (Calf of Man), OH1AD (Kemio), I5OVS/IA5 (Elba), FP5DF (St Pierre et Miquelon) and 5B4ES (Nicosia). Other QSOs included VO7AA, UA9UWM, UW9UWU, UA9CI, UA9CBO, WA1PS, UA1ZEE, OD5IZ, VE2VU, VE3CVA, and 7X4LX. As for "new ones" the need was satisfied with ZS1AU, FP5DF, 5B4ES, EA9TI and C30LFG.

The c.w. signals from G2HKU went out to JR3AKG, JA2BJW, AX4XA, TK/DL7HZ, KH6IJ, KH200JHM, WA4SNI, C30EAN, OY7ML, HK3RQ, PY1PA, K2SG, K6RA, 4N7EC, W6DU, KE0DR, AA200GM, N9DIH, LU1XQH, K4FU, OH0/OZ1JVN, HK3NR and VK3MR.

The 21MHz Band

I stick to my view that this band has been the best of the bunch when I have lent an ear to things of an evening. In the mornings however, it has usually still been asleep when I went off to work. VK and ZL in the morning and S. America in the evening about sums it up, plus a half-hour idly listening to SU1ER running a US list operation.

For G3NOF the long path to VK and JA has often been open 0700-0800 changing to short path as early as 0800Z together with Asians through to 1700Z. Around 0700 Don noted some stations over the N. Pole, from KL7, VE8, KH6; Africans came in mornings and afternoons, S. Americans up to midnight. North Americans were noted from noon to midnight UTC on various days. Contacts using s.s.b. were made with BY5NC, FG4ES, HL88AQB, HL88AS, HL88FEI, HL88IFD, HL88IUA, HL88KAT, HL88Y, many JAs, JI6KVR/6 (Goto Is), NP4Z, RL8PYL, T3OBC, TA4A, UA0FF (Zone 19), UW0LI (Zone 19), VE8RCS, VK2PLU, VK3GMA, VK3PTS, VK5BWZ, VK5PWZ, VK6CI, VP2VM, VP8BRR (S. Georgia), VP8BQO (S. Orkneys), VP8BRT (S. Orkney), VP8BRY (Falkland Is), VU2BEG, VY1CW, YB0KM, YB0DPZ, ZD8RP, 6K24SO, 5N9GM and 9M2AR.

Most of the GM4SVM activity was on this band: s.s.b. accounted for EA6ZZ, YC6HBJ, HK0HEU, A4XRS, while the c.w. listing involved UO5OOH, UI8AP, TA2AH/A, UD6DCY, JA7AYW, ZL4SH, HB0/HB9NL, C31ON, OH4ML/OH0 and KD6PP.

The s.s.b. listing from G3BDQ includes a string of W6/7, Indonesians and JAs, plus A4XRS, AX4KRP, VK5NTT, YE9ZZ, UA0SKL, HL4VP, HL88DCU, 3DA0AN, S83H, ZD8RP, J87CD, ZF2LJ, PZ5ES, SU1ER, LU4L, VU2DAC and VU2GSW.

Turning to G2HKU we find Ted made it on c.w. to VE3CFL, PY5BI/ZP9 and LU1HNL.

The next three deadlines are: Nov 24, Dec 22 and Jan 25

The 28MHz Band

Much more activity nowadays, chiefly because of the rising sunspot count and —in this area at least—a thinning of the ranks of the pirate CB types who often used to infest the band.

First I must mention the Ten-Metre FM Group and its Newsletter. This used to be the Southern group, but as they now have more than half their members from out of the area, the decision to drop "Southern" was logical. If you are at all interested in the use of f.m. on the 28MHz band, then this is one for you.

G3BLG (Clacton-on-Sea) uses a Trio TR-9000 144MHz rig, driving a PW Meon transverter modified to get himself onto 28MHz. Ted says this combination, dedicated to the one band, is much nicer in use than the average h.f. multi-band rig; quieter on reception, fewer "birdies" in the band, and so on. To prove the point, the G3BLG ribbon folded dipole up in the loft was activated and the following stations raised on c.w. 9J0A, UZ0AXX, UJ8JCM, RL1P, 4X1IP, RD6DEX, 9J2AL, 5H1HK, PU1HLN, RW6AH, T77C, KA4VXL, CT4OX, ZP3CA, OD5DK, W3FM, LU3EX, 4N4SP, LU1FA, JH3KDZ, HK1AMW, HZ1HZ, 4X6UL, TA1AG, PY9UFO, FY5YE, FM5BH, K1EA, HK3RQ, PT7AQ, ZS6DM and almost all the European countries.

G3BDQ stuck to s.s.b. and managed to make his signals go to PY4ZT, YC0SQT, Z23JO, VK6AEA, JS6DQJ, 7P88DP (the Pope's visit to Lesotho) and CE0ICD (Robinson Crusoe Island).

G3NOF (Yeovil) found the band varied quite a lot. Sometimes poor, sometimes very good. 0800-1000 has often been the right time for the short-path VK and JAs, followed by openings to KH2, KH0, H4, HL, and HS, up to 1300Z. US stations have been noted at odd times between 1100 and 2300Z, but not too many, and few from the Western Reaches. South America was to be heard some evenings and a few ZL4s were noted around 2100Z; Africa was noted both in the mornings and the afternoons. Contacts using s.s.b. were made with A22RB, C9MKT, CE3NR, CE6EZ, CP2DP/6, FM4BH, G4PEU/HH2, H44MB, HI8FHD, HL88IXH, HP1XHT, HS0B, JA1DQL, JA2IVY, JA2JPG, JA3GAK, JA5MXP, JA5QJD, JA7OWD, JA8FUO, JA8NFV, L50F, K1BAZ, KP2J, NP4Z, P29VU, PYs, SP5DRH/JW, YB2FRR, YC8IS, ZC4JA, ZF1HJ, V21AR, V21YL, VK1OP, VK5DT, YS1OD, ZD7BJ, ZS1EC, ZL4LZ, 4U1UN, 5B4ES and 5H1HK. So—the DX is there if you care to be active and hunt it!

Final Comment!

Please be sure to write your callsign clearly . . . it was a little embarrassing, for yours truly, after mentioning G0ISN, only to realise, when the real G0ISN telephoned to ask what the blazes, that what I had in good faith taken as G0ISN was in fact G0ISW. Apologies to both stations, nonetheless.

VHF Up

Reports to Norman Fitch G3FPK
40 Eskdale Gardens, Purley, Surrey CR2 1EZ.

When I reported in the October issue that a new European tropo record on 144MHz had been achieved by GI4KIS and EA8BEX, I assumed it would stand for some time. However, it has been substantially exceeded already. Other events covered this month include an excellent spell of tropo to Europe and an Aurora.

The postbag was lighter this time due to the disruption caused by the postal strike, but many readers did get letters through and others took the trouble to telephone their reports. I was also able to get more news "on the wireless."

The Awards Program

For the benefits of new readers a reminder that there are two series of awards on offer. The first is the VHF Century Club. To become a member you need to have confirmations of QSOs with at least 100

other stations on the particular band. The VHFCC has categories for all v.h.f. bands from 50MHz up but excluding 144MHz.

The second is the QTH Squares Century Club and to join this you need to have confirmations of contacts on the chosen band with stations in at least 100 different locator squares. The squares are the main ones, such as ZL (I091) and CF (JN25), etc.

The QTHCC covers all v.h.f. bands from 50MHz up and there are stickers for each additional 25 squares. Both awards are managed from the Purley address now.

Any reader wishing to apply for membership should send an s.a.e., or IRC if overseas, asking for a copy of the rules and an application form. Membership certificates are issued free but applicants must pay the return postage.

Contest Notes

The final three sessions of the 1.3/2.3GHz Cumulatives are on Nov 15, Dec 1 and Dec 17 from 2030 to 2300UTC. Two sections; F for single-op fixed and O for all other stations. Send your logs for all sessions to G8HHI at 43 Bartons Drive, Yateley, Camberley, Surrey GU17 7DW.

The last two legs of the 432MHz Cumulatives are on Nov 23 and Dec 9, 2030–2300UTC. Again, F and O sections and entries to go to GM8MJV at 2 Dudley Avenue South, Edinburgh EH6 4PJ.

The 70MHz c.w. contest is on Dec 11, but that is all I know. Last year it was 1000–1300. There should just about be time to give details next month.

DXpedition News

XJ (IN79) square is 99 per cent "wet", the only land being the Lizard Peninsula. Consequently, it is always in demand. **Roger Taylor G4HZA, Mike Ray G4XBF** and **Peter Croucher G4YPC,** all from Surrey, operated from IN79JX for a week from Sept 17 and were lucky to catch some very fine tropo conditions.

When I contacted G4YPC/P there on the 22nd, Peter said that on 144MHz they had worked about 30 OKs, a few SPs, I2FAK (EF), some EAs and many D, F, HB, OE, ON, PA and Y stations. They were also QRV on 432MHz and with low power on 1296MHz.

More Tropo Records

On the morning of Sept 9, a number of EA8 stations were putting in very strong tropo signals on 144MHz into Wales, the Midlands and north of England, parts of Northern Ireland and southern Scotland. This will be detailed later in the 144MHz paragraphs.

Two GMs were vying for what must surely be a new European record. I make the winner **Duncan Paterson GM0KAE** (CTR) in I086CD who worked EA8BML (IL27GX), the QRB being 3264.1km. In a brief opening Duncan got an RS51 report with his 25W from a Kenwood TR-9130 and two 9-ele Yagis.

George Szymanski GM4COK (LTH) is in YP04b, which is probably I085JX, and his QRB to EA8BML is 3260.5km, so there is less than four kilometres in it, even though the GMs are about 40km apart.

I have assumed all stations are in the middle of their squares. More accurate distance calculations would require exact latitude and longitude values to be used. My computer program uses the subroutine with ellipticity correction—Program 5.4 in John Morris's *Amateur Radio Software*—by the way.

Graham Daubney G8MBI (HFD) passed on a strong rumour that LA8OJ (JO28VV) had worked an EA8. If it was 'BML it would be a QRB of 3804km. I have been unable to confirm this at the time of writing.

Meteor Shower Data

The Leonids shower should peak on Nov 17. Best times are: NE/SW around 0400 with a lesser peak at 1130 and a null at 0830; E/W around 0700 with little before 0200 and after 1100; NW/SE best around 0900 with a lesser peak at 0200 and a null at 0500; N/S two equal peaks around 0300 and 1000 with a null at 0700. The radiant is above a mid-UK horizon from 2230, through midnight to 1430.

The Geminids should peak on Dec 12/13. Best times are: NE/SW around 0000 and 0700 with a null at 0330; E/W around 0200 with nulls at 2200 and 0630 and minor possibilities around 1900 and 0900; NW/SE around 2100 and 0500 with a null at 0100; N/S two good peaks at 2200 and 0600 with a null at 0200. The radiant is above a mid-UK horizon from 1630, through midnight to 1230.

Amstrad Computer Programs

The Amstrad PCW8526 and PCW8512 word processors are such good value for money that many journalists and inveterate letter writers now own one. In my limited spare time, I have been re-writing my Sinclair ZX-81 programs into the Mallard BASIC language used by these computers.

To date I have the following up and running: LLNGR which converts latitude and longitude to the National Grid Reference; MOON which predicts the az/el and other parameters of the moon; SUN which does the same for the sun and QRBAZ which computes distance and bearing between two locations using either lat/long or Maidenhead squares.

For satellite buffs I have ELSAT which predicts the whereabouts of OSCAR-10 and OSCAR-13. As time permits I will be transferring many more, including the moonbounce sked planner, meteor shower data, Yagi antenna design, tropo-scatter path loss, h.f. predictions ones, and many more.

If any reader wants further information, or is having any problems with CP/M Plus and Amsoft, drop me a line with an s.a.e. I could supply listings and might consider copying to your own ready formatted CF-2 Amsoft discs. In all cases you would have to pay all postal charges.

Meantime, has anyone else found that, when you use the hash (#) key when typing in a program, LLIST-ing prints out the £ symbol? If this is not a quirk of my '8512 it is probably because there is no universally agreed ASCII code for the pound sign. After all, ASCII is the American Standard Code for Information Interchange and they do not have a pound sign over there. In Mallard BASIC the ASCII code for # is 35 and that for the £ is 163—i.e., half the magic 256 more—so perhaps that has something to do with it.

The 50MHz Band

Welcome to new contributor **Frank van Vliet PA3FAQ** from Dordrecht in Holland. He is building a 144/50MHz Meon transverter, so should be on the band soon. He got his new licence on June 1.

Alistair Southby G1HMN (SRY) is another new contributor whose main inter-

QTH Locator Squares Table

Station	Band (MHz) 1296	430	144	Total
G3IMV	42	122	406	570
G8GXP	45	151	331	527
G4KUX	—	120	372	492
G3UVR	79	129	239	447
G4RGK	48	115	274	437
GJ4ICD	59	119	253	431
G3XDY	81	137	185	403
G3JXN	87	134	179	400
G1EZF	32	93	263	388
G4XEN	—	107	268	375
G6DER	78	110	183	371
G0DAZ	—	114	249	363
G3COJ	44	103	186	333
G4DEZ	48	37	248	333
G6HKM	39	102	191	332
G4SSO	—	92	228	320
G4DHF	—	—	307	307
G4TIF	—	107	198	305
G4RRA	—	51	253	304
G1EGC	23	80	199	302
G6XVV	25	64	211	300
G4SWX	—	—	293	293
G1KDF	35	93	163	291
G8PNN	63	98	128	289
G6MGL	59	89	141	289
G8HHI	31	106	148	285
G8ATK	45	91	143	279
HB9AOF	55	80	141	276
G4MUT	28	90	149	267
G4NBS	59	103	102	264
G4PCS	—	3	258	261
G1LSB	—	126	125	251
G6DZH	—	87	154	241
G3NAQ	—	80	160	240
ON1CAK	—	33	204	307
G3FPK	—	—	233	233
G4IGO	—	—	230	230
G8LHT	4	77	146	227
G1GEY	—	68	158	226
G6STI	22	66	128	216
EI5FK	—	47	168	215
GM4CXP	—	31	184	215
ON1CDQ	—	32	182	214
G4MEJ	—	—	213	213
G0EHV	—	75	137	212
G8LFB	—	—	209	209
GW4FRX	—	—	203	203
G4YCD	—	—	197	197
G8MKD	—	49	142	191
GM0BPY	—	57	129	186
G4DOL	—	—	186	186
GI1JUS	—	—	181	181
GJ6TMM	—	40	137	177
G6AJE	5	57	95	157
G4AGQ	1	41	104	146
G4FVK	20	46	75	141
G6MXL	14	38	88	140
GW6VZW	—	6	121	127
G4TGK	—	—	118	118
G0FEH	—	24	88	112
G1IMM	—	13	98	111
G8XTJ	—	—	110	110
G7ANV	—	—	103	103
GI4OWA	—	—	101	101
G4ZTR	29	29	37	95
G1SMD	—	—	93	93
GM0GDL	—	19	66	85
PA3EUS	—	18	57	75
GM0HBK	—	—	75	75
G0HEE	—	—	73	73
G8PYP	—	6	61	67
GU4HUY	—	—	67	67
G1CRH	—	—	62	62
G0HDZ	—	—	61	61
G1VTR	—	—	55	55
G1NVB	—	—	49	49
G2DHV	2	6	31	39
G7AHQ	—	—	34	34
GM0JOL	—	—	29	29
GM1ZVJ	—	—	21	21

Starting date 1 January 1975. No satellite or repeater QSOs.

est is now 50MHz. He uses a Kenwood TR-751E driving an R.N. Electronics transverter. The antenna is a 3-ele Yagi 8m a.g.l. and the QTH is 40m a.s.l. Alistair started on the band on Aug 7, so caught the tail-end of the Sporadic-E season. Countries worked up to mid-September were CT, G, GJ, GU, GW, LA, OH and 9H. In the second half of August he worked 9H1EL (JM75) and OH1VR/2 (KP20) and was looking forward to the t.e.p. season.

Gerry Schoof G1SWH (MCH) added four more counties: G4IJE (ESX) on Aug 25, GM1EHK (FFE) and GW6JNE (GNS) on Aug 26 and GB6BC (LEC) on Sept 3. His 20 countries is the highest of any table participant.

Ken Osborne G4IGO (SOM) has worked 115 squares on 50MHz. On Sept 5 at 1713UTC he contacted ZS3AT (JG87) and Tom has since confirmed it was a G/ZS3 "first." He peaked to RST569 but Ken heard nothing else from Africa at the time. On Aug 28 at 1547, ZS6PW (KG44) peaked to S5 and at 1555 ZS6XJ (KG33) was heard, while around 1750 Ken saw what he thought was South African TV. On Aug 29 G4IGO worked ZB0E at 0833. Sept 4 brought QSOs with Fs in CD and BD squares around 1116. He was QRV for an opening to Argentina on Sept 8 but no LUs were heard; too much QRM. ZS3AT's c.w. was heard again at 1714 on the 9th and on the 11th, 1730–1825, there was a weak Aurora. On the 13th ZS6PW was copied at S4 at 1921. ZS3AT was copiable from 1923–2059 and Ken worked him twice, at 1923 and 2021. ZS3E's (JG89) keyer was heard from 1925 to 2105. ZS3AT was heard again at 1452 the next day. Finally, G4IGO is claiming his contact with ZC4VHF/5B4 on 7/6/87 at 1350 as a "first."

In a telephone report, **Jerry Russell G4SEU** (WKS) said he worked GB4VR on St Kilda in early August. He enters this year's table for the first time with 35 counties and 13 countries.

Another newcomer to the band is **Martin Lowe G4YCD** (AVN) with 21 table points. **Ela Martyr G6HKM** (ESX) had little to report apart from a couple of new counties on Sept 7, G6HYR (YSW) and G6CZV (MCH).

Colin Redwood G6MXL (DOR) reports cross-band QSOs on Sept 4 with OK3CM (JN88) and DL0MT and an in-band contact with GU8OCJ/P (ALD) the same day. **John Fitzgerald G8XTJ** (BKS) added three new counties since his last report; G5UM (LEC), G1LRP (WMD) and GW6JNE. New ones for 1988 for **Paul Baker GW6VZW** (GWT) were GU2FRO (SRK), G6XCE (CBE) and G8GTD (DYS).

Annual v.h.f./u.h.f. table
January to December 1988

Station	50MHz Counties	50MHz Countries	70MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Total Points
G6HKM	32	13	—	—	77	27	50	18	30	12	259
G1KDF	38	16	—	—	83	18	57	11	25	6	254
G1SWH	47	20	—	—	97	20	54	9	—	—	247
G4XEN	43	14	9	1	66	32	48	9	—	—	222
G4SEU	35	13	67	9	48	11	29	4	—	—	216
G8LHT	8	7	32	5	65	32	41	16	6	2	214
G0IMG	40	14	36	6	47	12	23	12	—	—	190
G4DEZ	33	16	—	—	30	16	27	6	34	10	162
GW6VZW	45	16	—	—	68	17	—	—	—	—	146
G1EZF	—	—	30	5	76	33	—	—	—	—	144
G6MXL	20	9	19	4	42	18	17	6	5	3	143
G4YCD	12	9	—	—	84	30	—	—	—	—	135
G1IMM	26	8	—	—	52	11	31	2	—	—	130
ON1CAK	—	—	—	—	71	33	16	9	—	—	129
GM0EWX	53	12	—	—	49	13	—	—	—	—	127
ON1CDQ	—	—	—	—	63	33	9	9	—	—	114
G4ARI	—	—	33	4	60	13	—	—	—	—	110
G4VOZ	18	11	46	6	—	—	21	7	—	—	109
G0EHV	—	—	35	5	45	19	—	—	—	—	104
G4ZEC	—	—	—	—	75	27	—	—	—	—	102
GW4FRX	—	—	—	—	71	29	—	—	—	—	100
G8XTJ	23	4	—	—	58	14	—	—	—	—	99
G3FPK	—	—	—	—	77	21	—	—	—	—	98
GJ6TMM	23	12	—	—	36	14	7	5	—	—	97
GM0HBK	26	8	—	—	46	15	—	—	—	—	95
G6MGL	19	10	—	—	49	10	—	—	4	2	94
GW4HBK	22	18	43	6	—	—	1	1	—	—	91
GI4OWA	19	14	—	—	40	14	—	—	—	—	87
G7ANV	—	—	—	—	66	21	—	—	—	—	87
G8PYP	13	9	2	1	38	12	6	2	—	—	83
G1SMD	21	17	—	—	25	18	—	—	—	—	81
G1DOX	16	2	19	2	22	5	5	2	2	1	76
G4AGQ	—	—	13	1	35	8	12	3	—	—	72
G1CE1	—	—	—	—	59	12	—	—	—	—	71
G3WND	—	—	60	7	—	—	—	—	—	—	67
G2DHV	5	1	12	1	28	6	7	1	—	—	61
G3EKP	12	3	16	4	7	4	5	1	—	—	52
G4WHZ	3	2	—	—	31	12	—	—	—	—	48
GM0JOL	—	—	—	—	30	10	—	—	—	—	40
G4ZVS	—	—	—	—	34	5	—	—	—	—	39
G0HGA	—	—	—	—	30	5	—	—	—	—	35
G0HDZ	—	—	—	—	30	5	—	—	—	—	35
GU4HUY	—	—	—	—	23	10	—	—	—	—	33
GM1ZVJ	4	3	—	—	14	7	—	—	—	—	28
G8PNN	—	—	20	3	—	—	—	—	—	—	23

The 70MHz Band

Since his last report some months ago, **Tim Raven G4ARI** (LEC) has added another 19 stations to his c.w. ladder total. The most recent four were worked in the Trophy contest on Sept 18, GW4ALG, G3NKS, G4LP and GI3TCU/P (ATM). New counties were G3UAX/P (SOM), GW4MGR/P (CWD), GM4THB/P (DGL), G3NAQ (BRK), G3FDW/P (DHM), G4CW (KNT), G4PBP (WMD), G8KQW/A (IOS) and G3RPD (DVN).

G4SEU thought the Trophy contest was quite the best in the last four years, resulting in 88 QSOs. Among Jerry's best DX were EI9FK/P (Cavan), GM3WOJ, GJ3YHU and G8KQW/A. He has already accumulated more table points up to mid-September than he has ever achieved in any previous whole year.

Rob Gibson G6IGI (KNT) is another new contributor, and he reports that there are quite a number of stations active on the band in Kent and Sussex. Most are using converted commercial a.m. and f.m. radio telephones. He uses both modes at home and mobile. Rob reckons a.m. to be quite effective. He is not QTHR so anyone wanting to contact G6IGI can write to me and I will pass on his address.

G6MXL did not get on till rather late in the contest but picked up the following all-time new counties: G3ZXX/P and G7APD/P (WLY), GW4BVY/P (PWS), G3FDW/P and GW4LWL (GNS).

Ian Harwood G8LHT (YSS) also operated in the contest and had some QSOs with EI and GI. He runs a Meon transverter and a small 5W amplifier, the antenna being an HB9CV design.

The 144MHz Band

As usual, this is the band that saw most of the action this past month. Undoubtedly the main topics are the exceptional tropo propagation from the Canary Islands on Sept 9/10 and the extensive opening to continental Europe on the 19/20th.

First the EA8 event which saw about a dozen EA8s active on the band. I was alerted to the proceedings by G1ECY on the morning of the 9th who had heard GW3KJW in Anglesey working to EA8 around 1000UTC. However, not a whisper of any EA8 in London.

Mick Allmark G1EZF (YSW) heard a dozen of them, including an EB8. He worked EA8ACW (IL28GC), who was running 10W to a 9-ele Yagi and S9 plus 40dB, and EA8BML who was "end stop" on his S-meter. G1SWH contacted EA8ACW, EA8BML and EA8BTA (IL18TK) who was running one kilowatt, the latter also worked by G4ARI.

Peter Atkins G4DOL (DOR) worked EA8BTA on the 9th and again on the evening of the 10th at RS55. G4IGO reckons he was on the extreme edge of the opening. Ken worked EA8s ACW, BML and BTA on the 9th and 'BTA again the next day.

During a subsequent "inquest" QSO, **Nick Peckett G4KUX** (DHM) reported working EA8ACW at 1832 and 'BTA at 2307, but I forgot to make a note of the day. **Paul Pasquet G4RRA** (SRY) concluded a very scratchy QSO with EA8BML on the 9th. G4YCD missed the action on the 9th but did get EA8BTA, who peaked to S5, on the 10th.

Keith Killigrew G6DZH (HWR) heard a faint signal from EA8BTA at 2330 on the 9th which rapidly rose to S8. He got through after a couple of calls, receiving an S3 report. Keith came on at 0730 on the 10th and worked EA8AYY (IL28) at 0843, then 'BML, who was "end stop." Keith dropped power to one watt and still got an RS55 report at 0902. He reckons that equates to 342 microwatts per kilometre.

G8LHT contacted EA8BML on the 9th and GW6VZW did so on the 10th. **Brian Sheepwash GI4KIS** told me that nine EA8s were audible at one period and that they were coming through for 25 hours in Antrim. He put in 70dB of attenuation before losing some signals. His locator is IO64VR, not 86VR, as wrongly reported in the October issue. Even though Brian's record did not last very long, at least he has the satisfaction of making the first GI/EA8 contact.

Mike Robertson GM0BQM (DGL) worked EA8BML at 1436 on the 9th. He turned his beam to the east and copied the

EA8 at RS53A. Beacon DL0PR (E054c) was also Auroral at S9 for over two minutes.

John Nelson GW4FRX (PWS) has an enviable radio QTH with excellent take-offs to most directions. His worst is towards EA8 where the local hill subtends an angle of six degrees. He reckons you lose about 10dB of signal per degree, yet he got an S9-plus report from EA8BML at 1340 on the 9th. John received 'BML at S5 and it was decidedly his best tropo DX to date.

The picture emerging from this exciting event is that the EA8s were workable by stations roughly west of a line joining the Isle of Wight and Humberside. There must have been an extensive high-level duct at the UK end since the high Welsh mountains lie between Yorkshire and EA8.

On an earlier occasion when the EA8/GI path was worked, we know there was a low-level sea duct at the southern end and a high-level duct at the northern end. The puzzle is how these couple together with so little loss of signal.

The colossal signal strengths reported by many observers indicates the only path loss was the free space component. I commented on this in the February issue on page 60, following the November 1987 tropo opening to OK and SP. The duct parameters were known from meteorological sources and the only loss seemed to be over the paths between antennas and duct with the long duct itself virtually lossless.

To complete the scene, I would appreciate receiving further reports, even if you only heard any long DX in the Sept 9/10 period. The important details are how strongly you received the station, what your RX system comprises including any pre-amps, your antenna, the TX output power if you worked the station and your locator.

I would like to hear from stations who expect to work long DX but who could not hear the EA8s this time. Reports from the Irish Republic would be very welcome, too. Maybe one of our regular EI contributors could gather this information?

I have covered this event at length because of its importance in propagation research. I will be very interested to read what Ron Ham makes of it in his Propagation feature.

Now for the rest of the 144MHz news. I spoke to our regular Belgian contributors

Annual c.w. ladder

Station	Band (MHz) 50	70	144	430	Points
G4ZEC	—	—	521	—	521
PA3FAQ	—	—	199	—	199
G4OUT	—	—	191	—	191
G0HGA	—	—	176	—	176
G0HLT	13	—	161	—	174
G4AGQ	—	35	107	10	152
G4VOZ	24	79	—	17	120
G4WHZ	6	—	106	—	112
G0HEE	—	—	111	—	111
G4ARI	—	29	80	—	109
G0DJA	11	—	69	—	80
G4ZVS	—	—	80	—	80
G2DHV	10	33	24	—	67
G3FPK	—	—	63	—	63
GW4HBK	21	33	—	—	54
G0GKN	—	—	52	—	52
G1SMD	21	—	15	—	36
G6DIF	2	—	30	—	32
GU4HUY	—	—	22	—	22
G1DOX	3	5	—	—	8

Number of different stations worked since January 1.

the **Van De Velde** brothers, **Geert ON1CDQ** and **Johan ON1CAK** who reported some good tropo to EA1/2, OZ and SM in early September. They worked GB4VR in early August.

PA3FAQ is a keen c.w. operator and enters the ladder with 199 different stations up to Aug 29. Frank uses a Kenwood TS-770E giving 10W to an 8-ele Yagi by Hy-Gain. G1EZF reported good tropo to northern Spain on Aug 17 and Mick heard EA8BEX at S2 but could not get through.

During the Irish contest on Sept 11—how I wish we got ample advance notice of these—G1SWH worked EI9GD (Waterford) and EI9FD (Cavan). On Sept 6 G4DOL worked IK1LUT and I1CPN/1 (DE), I1NKT and I1DMP (DF), IW2BNA and I1KTC (EF) all at S1 from 1752. Peter also contacted 4U1ITU, FC1BLL (CD) and Fs and HB9s. The next day he worked four HB9s.

The Sept 19/20 period was excellent and G4DOL worked ten OKs in GJ, GK, HJ HK and IJ, SP6GWB/P6 (IK), SP9LJE (JK) and HG1YA (IH). Five OEs in HI square were worked; 5PAM, 5XDL, 5VRL/5, 5UXL/5 and 3EFS/3. Not a bad haul from Dorset.

G4IGO reported on the Sept 6/7 southerly tropo. Ken worked F/DF9PY/P (BC), FC1EPB (BD), FC1BLL and F5GB (CD), FC1JUC/P (DF), F6HYE (DG) and F8ZW (DI). In Spain he contacted EA1s ACD, BLA and QJ (VD), BVP (WD), EDC (YD) and EA2BUF (ZD). Apart from the EA8s on the 9th he worked EA2AGZ (ZB).

Mark Turner G4PCS (BFD) heard weak OKs on Sept 17 and worked EA3AYX (AC) for a new square to bring his band total to 258. On the 19th G4RRA worked OK1KSQ/P and OE5VRL/5. Paul heard nothing beyond the "H" column of squares. The next day he really had a field day with 52 OKs, 20 SPs plus HG1s WD, YA and YI and HG0HO (KN07SU) all on c.w.

New for **Alan McMillan G4SSO** (LDN) was EA2AGZ. He caught the Aurora on Sept 11 around midnight and heard lots of LAs, SMs and GMs. On c.w. he worked SM6CMU, LA9UX and some GMs.

Going back to the Perseids, G4YCD thought the shower was poor this year, a view echoed by G4IGO. On Sept 10, before working EA8, Martin contacted some EA1s. Highlights in the Sept 20 tropo were OE3EFS/3, SP6GWB/P6 and OK1DFC/P (GK).

Before working EA8 on Sept 9 G6DZH worked EA1s ED and TA (VD) and afterwards EA2AGZ. Another new square for Keith was FC1JII (AD). He could not find beacon EA1VHF so presumes it is QRT. I have not heard it for ages, either.

G6HKM is now ". . . the proud owner of an Icom IC-275E." Ela's first CQ call with it brought a reply from GI4KIS on Sept 9. Prior to that she took part in the Sept 3/4 contest but found G activity low and suggests this might have been due to HF SSB Field Day and the National Boot Rally at Old Warden. Londonderry was the single new 1988 county out of it.

EA1s in VD and XD were worked on Sept 9/10 but the needed station in WD was only working Germans. Ela contacted four OZs in FP from 1842 on the 10th and several EIs and GIs were worked on the 17/18th.

G6MXL found the contest better than expected, the highlights being G4EKT/P and G4CDC/P (HBS) and PA0GUS/P (JO23) a new square. On Sept 6 Colin's best DX was EA1YY (XD) and the next day FC1JUC/P was also new. Other contacts were with HB9RSO/P (DH) and HB9HFA/P (DG). DL2OM (DK) was new on the 10th.

G8LHT was pleased with LX/ON7RB/P in the contest. Sept 6 brought QSOs with EA1YY, F8ZW and F6IRS (DH) and the next day FC1JUC/P, HB9CYY/P and some Ds and PAs. Ian worked EA1QJ on the 9th and the next day F5CT (AI), FC1GTX (AD) and F9WW and FC1ETX (AF).

He caught the second phase of the Sept 11Ar and worked a GM in Shetland and LA9DI (FT). In a later report during a QSO, Ian mentioned working DF2UU/P (EI) and FH and FI squares in the Sept 19/20 lift. He has replaced his 12-ele ZL-Special antenna by a 13-ele Yagi from the Tonna stable and finds it much better.

New squares for G8XTJ were FC1JUC/P (DF) on Sept 7 and OK1OA/P (JJ) on the 20th. John mentions the really excellent QSO management by Chris Young when operating as GM4CCC/P (SCD).

In a telephone report, GW6VZW reported two new squares worked; FC1EPB (BD) and EA1BCB (WD). Paul also contacted FC1JUC/P and F5GB (CD). In the Sept 11 Ar, GM0BQM got three new squares including OH1AWW (KP10DL). Mike said the event started around 1500 and was still going on at 0100 on the 12th when he switched off. GB3LER was audible throughout.

The 430MHz Band

G1SWH worked GU8XVJ on Sept 6 and EA1BLA the next day for three more table points. For G4KUX the lift brought EA1QJ and F6DRO (AD). G4RRA only runs 8W on the band so Paul was delighted to work LX1JX on Sept 19.

On Sept 20 G4SSO found Syledis QRM very bad. Alan does not normally hear it. However he did manage QSOs with OK2VIL/P (JJ) on c.w. at RST559 each way, SP6MLK/6 on s.s.b. at RS58 each way and a couple of OEs who were quite strong.

G6HKM wrote, "Not a lot of activity on this band but what there was has been good and worked without any pile-ups. There just seemed to be nobody else around." On Sept 7 Ela worked HB9AMH/P (DH) and F1DPX (ZH) who was running 1kW with eight 21-ele Yagis.

On the morning of the 10th she heard a c.w. CQ call and an s.s.b. QSO resulted with EA1QJ, a new 1988 country and all-time new square. The 17th brought G8NEY (WLT) and three new 1988 counties; GW0HOL/P (GNM), GI4OPH (DWN) and EI5FK (Cork).

On Sept 6 G6DZH worked F6ECI (AF) and EA1BLA, Colin's first Spanish station, best DX and a new square. The next day he had QSOs with F6APE (ZH) and F6HEO (BG), another new square.

On the morning of Sept 7 G8LHT contacted F1YJ (BH), HB9ASB (DG) and FC1BUU (AE). In the evening Ian had QSOs with F6HYE/P (DF) and F6HEO. On the 9th EA1BLA was a new country on the band. On the 20th he worked HB9MIN/P (DH). In a telephoned report **Mervyn Rodgers GM0GDL** (CTR) reported working EI9FD (WN) and EI4DQ (VL) on the 15th.

The Microwave Bands

Mark Page G1EGC (BKS) is now up to 23 squares worked on 1.3GHz his latest being OE5VRL/5 (HI) in the Sept 19/20 lift. On the evening of Sept 7 G6HKM copied HB9AMH/P on 1.3GHz on c.w. while Arnold was operating on 432MHz. A QSO quickly resulted for an all-time new country

on the band. Later that evening Ela contacted G6DER (YSS).

On the 8th she worked F1EAN (AG). During the afternoon of the 16th she was working GI4OPH (XO) on 144MHz and Tim suggested they try 1.3GHz. The QSO was successful giving Ela another all-time new country. The next day G8NEY was worked and at 0814 on the 18th G3AUS (DVN) when the band was wide open but with no activity.

G6MXL runs two watts to a 23-ele Tonna Yagi on 1.3GHz. On Sept 6 Colin worked F1FHI and G3AUS. On the 7th he made QSOs with F1EHN and F6GCT (BI), F6DZK (AI) and F6HYE/P (DF) with whom RS59 reports each way were exchanged. The Frenchman was using 15W to a 23-ele Yagi, F6HEO was also worked. On the 8th, beacon GB3MHL was still strong in Poole but no activity was noticed.

Feel the Width

The trouble with lifts is that all signals are stronger than average. Distant stations usually copied at S6, about 25dB over noise, maybe 30dB or more up on normal. This should not cause any problems for those with decent receivers capable of dealing with large signals without folding up, provided the signals are reasonably narrow.

What the Sept 19/20 lift revealed was that some signals were far from state of the art. There are many reasons why signals may be distorted by which I mean that somewhere along the line the natural voice quality on s.s.b. is no longer linearly amplified.

Some commercial transceivers never sound nice whoever uses them. Follow them with even a decent linear amplifier and they will still sound rotten, but louder. Other transceivers can and do give acceptable performance in the hands of someone who knows how to use them properly, but can sound ghastly if too much microphone gain and/or speech processing is used.

Amplifiers are probably the worst offenders and not only home built ones. Some commercial valved amplifiers seem to be inadequately designed in several respects.

These include inadequate cooling resulting in melting of soldered joints in anode lines, no proper provision for loading, unstabilised grid bias and/or screen grid supplies and generally underrated components.

I wonder if some designers ever consider such parameters as ripple current in power supply capacitors, adequate rating of equalising resistors and capacitors across diodes in rectifier circuits, the quality of r.f. transfer relays, switches, plugs and sockets, and so on?

It is all the more disheartening when an article is published describing equipment designed to ensure a high standard of performance and reliability, it is immediately dismissed by some, who purport to know it all, as unnecessary overkill. These critics are often those whose signals could do with some radical cleaning up.

I make no apologies for dwelling on this topic once again. All of us have a duty to our fellow amateurs not to cause undue interference, this being a licence requirement. The present and new licences require us to carry out periodic tests on our transmissions for this purpose.

We do not have to suffer from habitually bad signals. Most operators are reasonable and willing to co-operate, especially those who may have an unexpected fault condition in their equipment and which cannot be readily detected by normal metering.

The next three deadlines are: Nov 24, Dec 22 and Jan 25

RTTY

Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS

The best news this month is that Elaine gave birth to a smashing daughter on September 28 at 1723 local time. I'm also glad to say that both are doing extremely well, but I'm not so sure about me!

CQ World Wide RTTY DX Contest

The conditions for this contest on the weekend of September 24/25 seemed to be quite good, unfortunately, due to the postal situation, I haven't received any reports but I did manage to find time to do some logging on the Sunday afternoon.

The lower frequency bands seemed to be completely dead, but once I tuned up to 28MHz I got a pleasant surprise. There were very few strong stations, but as there was very little QRM, all were quite readable. The first call I logged was HI3ADI (Dominican Republic), which was quite a good start! This was promptly followed by CE6EZ (Chile), which was again very good. I then started to notice some stations from a little further east, one of which was J52US (Guinea-Bissau) just south of Gambia in West Africa, another good catch.

By this time my ears were becoming accustomed to the band and I spotted VS6UP (Hong Kong) and managed a contact with no problems, which was very gratifying as this is a new country for me. After this they were coming in from all over the globe with the following being a selection: 4X6KA (Israel), CP6IH (Bolivia), ZC4JA (????), HI3FQ (Dominican Republic), HC1DK (Ecuador), LR1V (Argentina).

If I managed this fine selection with my simple station and nest of dipoles, I should think there will be some high scores in this contest.

I will give another update on this contest when I receive some logs from readers, probably next month.

50MHz Packet

I noticed in a recent mailbox message that there's a new Packet Bulletin Board System (PBBS) in Holland. The station is run by Hans PA0HWB and is located at Breda in The Netherlands. The callsign used follows the normal convention of the operator's call followed by the band name in metres, i.e. PA0HWB-6. The software in use is the standard WORLI version and the radio equipment comprises a Yaesu FT-690 running about 15 watts into a 2-element ZL-special, beaming north-west. For those of you who would like to work this station, it can be found on 50.4MHz f.m. using a data rate of 1200 baud.

Hans would very much like to hear from any UK stations and reports can be sent either directly to the PA0HWB-6 BBS or by auto forward via PA8HWB.

BARTG News Broadcasts

The latest press release from BARTG concerns their regular RTTY news broadcast. Bob Andrews, who runs GB2ATG, has recently moved to: 52 Linridge Road, Erdington, Birmingham B23 7HX. This address should now be used for all contributions to the news broadcast. For those of you who are not familiar with GB2ATG, the service is transmitted every first and third Sunday on 3.59MHz, 14.090MHz and 144.6MHz. Full details of the service are included on the back cover of every *Datacom,* which is the quarterly magazine produced by BARTG.

Those RTTY Tones

From the letters I have received, it would seem that some of you would like to see the use of RTTY tones explained, so here goes.

Before we get on to the tones, I ought to try and clarify some of the basics. Teleprinters have their origins back in the days before radio, when the pressure was on to find a mechanised system of communication which was more efficient than Morse code. The transmission medium in use was land-lines.

I'm sure most of you have heard the 5-unit code, Baudot or ITA No. 2 mentioned. These are the names given to the coding used to represent the alphabet, in much the same way as with the Morse code. Incidentally, the correct description for the modern RTTY code is the International Alphabet No. 2 or ITA2 for short. The main difference between this code and the Morse code is that every letter has five elements, whereas in Morse this can be anything between one and six. The reason for choosing a fixed length code is that it is much easier to decode by machine than a variable length code.

In order to send this code the teleprinter needs to be able to send one or two conditions, known as Mark and Space. In a practical land-line link, the receiving teleprinter would have its receive magnet coil connected across the line, whilst the transmit printer would send a current to line for a Mark and remove the current for a Space. The code is transmitted by using a mark or a space, as appropriate, to represent each of the five elements of the character being sent.

One of the main problems with this type of link is that it is very limited in the distance that the signals can be sent, mainly due to the resistance of the cables. One possible solution was to build a system that converts the current pulses into audio tones, one for a mark and another for a space, this signal could then be passed through any speech link and amplified in the normal way.

When designing a radio-based teleprinter link, all the transmitter had to do was to send one of two conditions and it is

obviously rather silly to build a full audio modulation system for just these two states. The solution was to adopt frequency shift keying (f.s.k.) which literally means that the carrier frequency is shifted between two frequencies which are close together. This modulation system is very easy to achieve as it only requires a few additional components around the carrier oscillator. When using f.s.k. the higher of the two frequencies represents a mark and the lower a space.

Having generated an f.s.k. signal the next problem is how to decode it. In a dedicated link this could be achieved using a discriminator in much the same way as you would decode an f.m. signal. An alternative would be to use a standard a.m. receiver and a b.f.o., this set-up will produce an audio tone or beat note which changes in sympathy with the f.s.k. signal. The next problem, of course, is how to convert these two audio frequencies back into a current loop that can be used to drive the receive teleprinter. Well, what is needed is a terminal unit, but it is very difficult to design one unless you know exactly what frequencies you are trying to cope with. Hence the need for some standardisation.

I expect that you have all noticed as soon as a standard is created, someone else creates a slightly different one, e.g. VHS and Beta in the video world. In RTTY there are two standards known as high tones and low tones. Fortunately, the IARU only recognise the low tones as an international standard, but despite this the high tones are by far the most common in the U.S.A. where they originated. The following shows the tones used in both the high and low set for the range of standard shifts.

SHIFT	Low Tones	High Tones
170Hz	1275Hz, 1445Hz	2125Hz, 2295Hz
425Hz	1275Hz, 1700Hz	2125Hz, 2550Hz
850Hz	1275Hz, 2125Hz	2125Hz, 2975Hz

Probably the most common way for amateurs to generate RTTY signals is to connect the output of their terminal unit to the microphone input of the transmitter. If you do this with an s.s.b. transmitter the result is very similar to f.s.k. This is because in a perfect s.s.b. transmitter, a single audio tone produces a single carrier frequency. Now, if you shift that audio tone by, say, 170Hz, the carrier frequency will also change by 170Hz so you can see that the end result is virtually the same as f.s.k.

Having read this description you are probably wondering why is it that amateurs in the USA can still communicate with the rest of the world if they are using different tones? The answer is quite simple, as when receiving a RTTY signal the important point is the shift and you cannot actually tell what originating tones were used or even if it's true f.s.k. The problem is solved in your receiver because you alter your tuning so that you receive the tones that are needed by your terminal unit.

The only time the tone frequencies become very important is when using audio f.s.k. with f.m. modulation. This technique is quite common on v.h.f. RTTY and is simply achieved by connecting the terminal unit to the microphone input of an f.m. transmitter. In this case, the RTTY tones modulate the carrier and it is not possible to alter the received tones by tuning the distant receiver.

I hope this has thrown some light on the use of RTTY tones and if you have any other topics you would like to have explained, please drop me a line.

I think that's about it from me, so keep those reports coming in and hopefully next month I will have a bumper postbag.

The next three deadlines are: Nov 24, Dec 22 and Jan 25

Amateur Satellites

Reports to Pat Gowen G3IOR
17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD

JO-12

The Japanese Mode "J" transponder activity seems as elusive as ever, with still no long-term operational schedule permitting us the opportunity of knowing when it will be on. Even the short-term notices of planned activity, put out a few days ahead of intended mode "on" times, have not worked out in practice as often the transponder is found to be dead on these occasions. Undoubtedly, the problems arise from the size of the satellite, which limits the area of solar cells thus limiting the battery charge capacity, that is the fundamental cause for the institution of recharging periods in what would otherwise have been times of either analogue or digital mode transponder operation. Despite the difficulties imposed, and the patience required in monitoring each pass for signs of life, **Dave Rowan G4CVO** of Newark worked an impressive number of DX stations during the past month.

His log book shows trans-European QSOs with DL1CF, DL6XW, EB6SU, G8TZS, I5IT and I8CVS. Transatlantic attempts produced WB1BRI, W1NU, KC2GG, VE2LI, VE3AVM, WA3ETD (New Hampshire, despite the third district prefix), KA3ONM (PA), W4PDL (VA), W1PIA (Florida, fourth district), WB4TGD (TN), WA4GSS, W8OLM, W8VXH, WA8KVH, KO9Q (WI), W9ODI and K9CJS. "The usual downlink frequency for s.s.b. users to congregate is 435.870MHz, ±5kHz," says Dave. "On c.w. the preferred frequency is between 435.820 and 435.830MHz. There appears to be a black hole at the upper end of the downlink passband, as the top 20kHz from 145.980MHz up seems never to be used."

Rather than the centre of the passband normally used for special modes under the satellite band plan, this would appear to be an ideal band for experimentation as it is devoid of all potentially interfering sources.

Dave reports that the telemetry of "Fuji" is still looking good, the battery is holding up reasonably well and the power output indication varies considerably. "When the satellite is out of range of mainland Europe, the power output channel shows readings of between 10 and 14," Dave tells us, "but when it is under access from out East, we see indications of 23 or 24, thus showing the unnecessary and undesirable levels of uplink power in use that deplete the battery charge and cause the problems of the loss of the planned operational period."

For SSTV enthusiasts, WA8OLM in Michigan is looking for QSOs on JO-12 and OSCAR-13. WA4GSS is similarly interested and can be worked on OSCAR-13 Mode "J" or "B". Schedules may be proposed via their call book addresses, or made on the satellites themselves.

DXpedition Report

Dave G4CVO reports that his recent satellite DXpedition to the Isle of Man as GD4CVO resulted in some forty QSOs accomplished, mainly by employing OSCAR-13 between mean anomaly 190 and 210. Among those were G1EMM, G3AVB, KJ1S, KJ1X, W1BUV, WA1ENO, K2LS, WA2LQQ, K3SZH, KE5AX/6, KR6B (New York, not California or Okinawa), PY7PS, W6QUV, WA6VAP and W7QI (Arizona). "Many were the stations who did not respond to a call," says Dave. "We were using just 15 watts of power to the uplink antenna and could hear our own signal quite well. It was very apparent that many stations, particularly in Europe, were unable to hear modestly powered satellite signals and were using excessive power to enable them to hear their own downlinks. This further attenuated the logically powered stations that they might otherwise have had the opportunity of working."

The presence of a majority of North American stations worked compared to the very noticeable higher level of Europeans present but not worked firmly illustrates the current situation, which appears to have escalated since the earlier days of OSCAR-10. Dave reminds us that on his first Isle of Man satellite DXpedition, using the same equipment, over 800 QSOs were accomplished. "Either this shows the relative communication values between the two comparable Phase III satellites, or it shows that the alligator problem has escalated—or more like both," he points out. "Surely this must be a lesson for stations to improve their receive capability."

OSCAR-13 Mode "J"

At a series of satellite lectures given by your columnist to radio clubs around the UK, your scribe put the contentious issue of the Mode "J" uplink frequency use for all users or otherwise to the audience (after explaining the differing points of view). Afterwards a vote of preference was taken. From 172 licensed radio amateurs, of whom over 90 per cent were not satellite users but over 70 per cent were regular 144MHz f.m. users, 171 voted for worldwide use of the mode on a permanent basis, none against, with one abstention.

Although possibly not representative statistically of the overall picture, as the club members who attend a talk on satellites must have an interest in satellites to do so, it does firmly indicate by the sheer ratio that the general wish is that the new 144.425-144.475MHz uplink should be maintained for all users. This is on the obvious proviso that proper monitoring of the uplink frequency is performed also. This pre-requisite is quite essential where the population density of amateurs is at a high level, as in a big city, or for a station that occupies a high site where the ground wave coverage from the elevated antenna side lobes could affect a wide area.

The "J" section of the "JL" mode is

performing well, with lots of activity from many countries. In early September, your columnist used c.w. for a half hour session to work JA3KM, F9EA, DL6XW, VU2RM and I7LIT. Stations heard included K0RR, VE6LQ, W7GBI (Arizona), ZS6HS, VK5QR, 4X4IS and numerous JA and European users. When the satellite is in range of North America, all call areas from W1 to W0 are represented and very few alligators are evidenced on this mode compared to Mode "B".

The reason for this is probably that users peak their 435MHz receive antenna to optimise incoming downlink signals so as to obtain the best signal to noise ratio. The aligned wider beamwidth 145MHz uplink transmitting antenna is thus accurately lined up also, so low power is heard to be effective and the receive signal is optimised. On Mode "B", where the wider beamwidth 145MHz antenna is used for reception and the narrower lone 435MHz antenna for the uplink, divergences of offset can give rise to power escalation to overcome this. When the satellite or antenna moves, so that it is aligned, overloading can occur. A further factor is that the third harmonic content of high power 144MHz "linears" can result in overloading the receiver at 435MHz, so minimum transmit power is seen to be advantageous. Whatever the reasons, Mode "J" is a most enjoyable mode and far less costly to the amateur's pocket than alternative OSCAR-13 modes.

New Schedule

As the seasonal sun angle changes and the needed compromise for optimum solar cell sun-facing efficiency for battery charging and best earth pointing of the antenna becomes apparent, the spacecraft attitude requires adjustment and the magnetorquers are put to work by computer command to effect this. To get the best results from the various modes of different antenna beamwidth and to allow a battery recharging period when the minimum solar power is available at parts of the orbit, currently close to perigee, a new use schedule for the new OSCAR-13 satellite becomes necessary. Until the next change, the following schedule is set:

Mean Anomaly 003 to 150: Mode "B"
Mean Anomaly 150 to 200: Mode "JL"
Mean Anomaly 200 to 240: Mode "B" again
Mean Anomaly 240 through perigee to 003: all transponders off to maintain battery charge.

According to optimum earth pointing, a slot in the centre of the Mode "JL" section will be used for Mode "S", when the Mode "J" transponder will be off.

Mode "S"

Whilst reports of the use of the transponder have yet to arrive, the Mode "S" beacon on 2400.664MHz (Doppler zero) is being heard well. G2BFO reports an S2 signal using a long Yagi, whilst DK2ZF reports strong signals using a 144MHz dish.

Mode "B"

The continued presence of needlessly high-powered stations on the 435 to 145MHz modes makes the efficiency of communications difficult to quantify. It is apparent that reasonably good contacts can be made at certain parts of a pass, especially when the alligators are few and the spacecraft is to the south-east of the user. The monopole low gain antenna used close to perigee seems very effective and excellent contacts, though not so distant, can be made with relative ease at these times.

The next three deadlines are: Nov 24, Dec 22 and Jan 25

Mode "L"

The source of the a.l.c. elevation is now thought to be spread spectrum from earth in the uplink passband. Recent tests have given a good indication as to its source. Despite the severe attenuation given relatively low power contacts are possible and G4FIP reports weak, but readable, downlink signals from his 15 watts to a 15dBi uplink helical.

RS-12 and 13

Leo Labutin UA3CR has provided the information on the new pair of transponders that are to be flown together with a new COSMOS ocean navigation satellite next year. They are fundamentally similar to the existing highly popular RS-10 and 11 pair, also operating within the body of a COSMOS NAVSAT and using the same power system. "They are brothers," says Leo. Like their predecessors RS-10/11, RS-12/13 will be placed into a 1000km (621 mile) high polar circular orbit at 83 degrees inclination to earth's equator, giving an orbital period of close to 105 minutes.

They have been designed and built by a group of enthusiasts headed by Alexander Papkov and Victor Samkov at the Tsiolkovski Museum for the History of Cosmonautics in Kaluga.

RS-12 has the following specifications:

Mode "A": Uplink: 145.910-145.950MHz
Downlink: 29.410-29.450MHz
Beacon: 29.4081 or 29.4543MHz

Mode "K": Uplink: 21.210-21.250MHz
Downlink: 29.410-29.450MHz
Beacon: 29.4081 or 29.4543MHz

Mode "T": Uplink: 21.210-21.250MHz
Downlink: 145.910-145.950MHz
Beacon: 145.9125 or 145.9587MHz

Mode "KA": Upliniks: 21.210-21.250 & 145.910-145.950MHz
Downlink: 29.410-29.450MHz
Beacon: 29.4081 or 29.4543MHz

Mode "KT": Uplink: 21.210-21.250MHz
Downlinks: 29.410-29.450 & 145.910-145.950MHz
Beacons: 29.4081 or 29.4543 & 145.9125 or 145.9587MHz

RS-13 has the following specifications:

Mode "A": Uplink 145.960-146.000MHz
Downlink: 29.460-29.500MHz
Beacon: 29.4582 or 29.5043MHz

Mode "K": Uplink: 21.260-21.300MHz
Downlink: 29.460-29.500MHz
Beacon: 29.4582 or 29.5043MHz

Mode "T": Uplink: 21.260-21.300MHz
Downlink: 145.960-146.000MHz
Beacon: 145.8622 or 145.9083MHz

Mode "KA": Uplinks: 21.260-21.300 & 145.960-146.000MHz
Downlink: 29.460-29.500MHz
Beacon: 29.4582 or 29.5043MHz

Mode "KT": Uplink: 21.260-21.300MHz
Downlinks: 29.460-29.500 & 145.960-146.000MHz
Beacons: 29.4582 or 29.5043 & 145.8622 or 145.9083MHz

Both transponders will carry "ROBOT" auto-answer systems, which will respond to a call at the speed sent, similar to the earlier versions in RS-5, 7, 10/11, etc. They will operate on Modes "A", "K", "T", "KA" and "KT" and, like the beacons, will have an output power controllable by ground command to produce either the QRP 450mW or a high power 1.2 watts mode according to conditions prevailing.

The RS-12 system will have an uplink calling frequency (e.g. the frequency of the ground transmitter of the calling station) or 21.1291MHz and/or 145.8308MHz, allowing for a slight offset to cope with the Doppler shift. The downlink frequencies (e.g. the signal from the satellite that we earth users listen for) is 29.4543 and/or 145.9587MHz.

RS-13 will employ 21.1385 and/or 145.8403MHz as an uplink and 29.5043 and/or 145.9083MHz as its downlink.

The transponders of both satellites will have a total r.f. output of some 8 watts, which will provide very strong downlink signals and overcome the attentuation that may occur during the peak periods of high solar flux during daylight on h.f. The orbital close proximity, coupled with the high sensitivity and beefy downlink, should enable mobile to mobile QSOs to be easily accomplished. It furthermore should give a downlink strong enough to be heard by those stations who, instead of improving their receive capability, run optimum power on their uplinks to be able to hear what to them is an adequate downlink signals, at the expense of those who are wiped out whilst trying to share a limited power system.

The d.c. power requirement from the COSMOS NAVSAT system will have a demand of 4.6 watts for RS-12 when the full system is off, peaking to 35 watts when all systems are on giving maximum output. RS-13 will take only 3.5 watts when commanded off and 25 watts when all systems are "GO" and at full demand.

UoSAT and Microsats

Further to the information on the AMSAT amateur radio occupants of the SPOT-II satellite given last month, the following element set is that planned for the launch products. Although differences will occur in practice, this is dependent upon the precise time and date of the

launch. The following Keplerian set will permit your computers to show you the nature, pass times and durations, azimuths and elevations and opportunities for the new UoSAT pair, the BRAMSAT "Dove" and the packet radio store and forward mailboxes.

Epoch Year	89
Epoch Day	001.08680556
Argument of Perigee	14.2740
Right Ascension of Ascending Node	75.000
Inclination	98.7427
Semi-major Axis	7184.209
Mean Motion	14.24652374
Mean Anomaly	134.5884
Eccentricity	0.0018
Apogee	825.9037
Perigee	800.5143
Decay	$1e^{-7}$

The primary payload on the UoSAT-D spacecraft will be the Packet Radio Communications Experiment (PCE) that will be an advanced form of the successful UoSAT-2 OSCAR-II Digital Communications Experiment. It will carry four megabytes of memory for message storage and the hardware and software will be developed under a contract with VITA, the Volunteers In Technical Assistance organisation to test out and later provide a link with development workers in remote areas. The flight of the new OSCAR with the AX.25 system, which will be available to all radio amateurs, will be funded by the University of Surrey and AMSAT-UK.

The AMSAT-UK Colloquium

Over 160 people from 19 countries and all continents came to this years event, again held at the University of Surrey. The talks ranges from simple "getting started" items on satellites to complex spacecraft technology and covered all levels. The 20 papers covered by international speakers included the future USSR satellites, the polar ski-trek, AMSAT Phase IV spacecraft design, OSCAR-9 and 11 operations, UoSAT C, D and E technologies, project HAART, OSCAR-13, digital signal processing techniques, packet radio satellites, the Chinese space programme and a whole lot more. Even more talks resulted as personal contacts between the attendees, many of whom were old friends first met "via satellite". A similar event at the same venue is expected next July.

Fig. 1

Fig. 2

Trans-satellite Tests

A group consisting of G4CUO, I8CVS, ON5UG, WA3ETD, W1NU, KO9Q and ARRL HQ station W1WA are now preparing for a complex experiment to attempt to send a signal across the world by linking RS-10/11, JO-12 and OSCAR-13. It involves transmitting a 21MHz uplink from earth to RS-10/11 on Mode "KT", this 145MHz output going to JO-12 in Mode "JA", this 435MHz output downlink going across to OSCAR-13 in Mode "B" and thence back to earth via its 145MHz downlink.

It just needs each satellite to be in the right mode at the right time and for each satellite to be in radio line of sight of its adjacent link, which is not easy to predict at this stage. Other and simpler combinations are possible, which will be investigated according to the reliability of the planned schedules, which need to be known and maintained long enough ahead to permit the success needed. Whilst technically feasible, it is this last point that is giving the biggest problem.

Already initial tests have shown the project to be workable and fully readable, although weak signals have been heard coming from one satellite via the next acting as an "intermediate frequency" stage. It is possible that the first antipodal,

Fig. 3

Fig. 4

Fig. 5 ▶

e.g. ZL to G, satellite QSO may be made in this way rather than by forward scatter by uplink and downlink re-angulation into sub-horizon satellites.

Trans-polar Ski-trek

Those who followed the communications and journey of the joint Canadian-Russian Trans-Arctic expedition by satellite, plus those who communicated with them by RS-10/11 and who followed the Digitalker and DCE messages on OSCAR-II, may be interested to see some of the photographs taken by the team.

Anatoly Milnikov is shown in Fig. 1 operating from the overnight rest tent, the tiny portable light-weight transceiver is depicted in Fig. 2. Anatoly in his trekking gear is shown again in Fig. 3, with the whole group in Fig. 4. The antenna used is shown by Fig. 5, consisting of ski-sticks joined in series to form the centre mast of an inverted "V" used for h.f. communications and the RS-10/11 downlink.

Propagation

Reports to Ron Ham
Faraday, Greyfriars, Storrington, West Sussex R20 4HE.

Using the Radio Telescope

During the first four years of recording radio waves from the sun, I realised just how important it was to monitor the receiver background noise and actually "hear" the sun in action as well as seeing the shapes of a solar event being drawn on the paper chart. Do keep in mind that any input of r.f. to the antenna from man-made (broadcast, RT, telemetry) or natural (lightning and/or precipitation-static) sources will cause the pen to deflect and draw a misleading spike or a longer pattern on the chart. Although a clear part of the spectrum is selected before using a radio telescope, unwanted signals do sometimes appear and these can be identified and ruled out of the records by listening to the sound. When the system is running, normally the only audio from the loudspeaker should be the steady twittering of receiver noise and the fluctuating "whoOOoshing" of any radio-noise coming from the sun. Text books often describe solar noise as the "seashore effect".

Many individual bursts of various lengths and amplitudes were recorded during the years 1973-75 and continuous noise-storms occurred from January 1-7, a few of the days between March 10 and 17, April 5-11 and 21-24, May 17-22, August 31 to September 5, October 29-30, November 24-26 and December 24-25 in 1973, January 16-19, June 12-18, July 1-4, September 12-19 and October 4-6 and 10-12 in 1974 and January 13-14, February 8-9, March 17-19, May 2-5, July 27-28, August 1-3, 5-8 and 11-12 and November 14-22 in 1975 (all dates inclusive).

At midday on 1 April 1973, a colleague reported hearing solar noise from 14 to 20MHz and my telescope recorded a couple of individual bursts at 136MHz. Something had begun because a two-phase aurora manifested between 1600 and 1800 and 2000 to past midnight. Throughout the initial phase, amateur stations peaking north-east exchanged tone-A QSOs on 144MHz while, lower down, at least 15, mainly east European, broadcast stations were heard "burbling" between 49 and 71MHz. Later, between 2015 and 2056, I heard "burbling" on 3 such stations in the 70MHz band and strong auroral signals from Gdansk on 70.31MHz. Signals from this station were still being received, via aurora, when it went off the air at 2300. Before the main solar storm began on the 5th, noise was recorded at 95MHz during the midday observations on days 2 and 4 and individual bursts appeared at 136MHz on days 2, 3 and 4.

The BBC's World Service warned their listeners about poor reception, *due to ionospheric disturbances* on 30 October 1973, when a noise storm was in progress and I noted similar warnings on 14, 15 and 16 September 1974, during a period of intense sunspot activity. The solar noise on 2 July 1974 was severe and still very strong at sunrise on the 3rd. However, while monitoring this with other equipment in my observatory, a massive burst took place, lasting for 8 minutes and covering the spectrum from 8 to 136MHz. The entry in my log explains,

0822, Burst of radio noise 136MHz, gradually getting stronger and it spread down past 70, 50 and 30MHz to 8MHz. It remained strong on all these frequencies until 0836 when it slowly worked its way back up and died out at 136MHz at 0839. Whilst this burst was in progress, the solar noise drowned out all signals between 8 and 20MHz.

What luck for me!, this was a case of being in the *right* place, at the *right* time and with the *right* equipment ready and working. During this storm solar bursts were also heard at 28MHz on days 2, 3 and 6 and at 50 and 70MHz on the 3rd and 6th, aurora manifested on the 4th and 6th, a radio blackout occurred on the 4th and ionospheric disturbances were reported by the BBC's World Service on the 5th, 9th and 10th.

I wrote the word "severe" against the noise-storm entries in my solar log for 15, 16 and 18 September 1974 and it was no surprise to learn that an aurora, lasting several hours, had manifested during the afternoon of the 15th.

At midday on 13 October 1974, after a 10-day period of solar activity, signals from an OSCAR satellite took on an auroral tone as it crossed the north pole and from about 1400 to 1715 there were many auroral reflected contacts made, on 144MHz, between amateurs in the UK and their opposite numbers in Finland, Ireland, Scandinavia and Scotland. During this period I logged 12 broadcast stations from eastern Europe, via aurora, between 48 and 71MHz. The reflection area for most signals seemed to be due north, but, towards the end of the event they were peaking in the north-east which shows how the movement of auroral ionisation can be plotted by radio. It is very important to include the time and peak beam headings when sending reports to the various auroral co-ordinators. To my knowledge, ionospheric disturbances were reported by the BBC's World Service on October 13, 14, 16, 17, 18 and 22.

More from the solar log next time but for now, back to the world of radio communication in 1988.

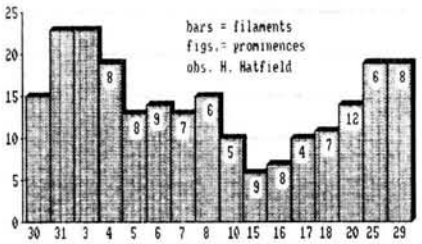

Fig. 1

WRM983

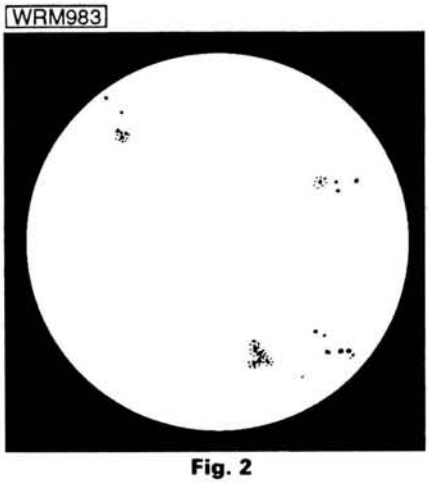

Fig. 2

Solar

At his observatory in Sevenoaks **Cmdr Henry Hatfield** recorded individual bursts of solar radio noise at 136MHz on July 26, 29, August 15, 16, 17 and 20 and prolonged periods of noise on July 30, 31, August 1, 2, 3, 8, 18, 21, 29, 30, 31, September 1, 12, 13, 14 and 15. "Once more the radio noise coincides with 'angry' looking spot groups, especially when they are near the central meridan," said Henry.

The vertical bars in Fig. 1 show the number of filaments that Henry counted among the many sunspot groups which he observed between July 30 and August 29. Apart from days 4 and 17, the prominences, indicated by the number at the top of the bar, were mainly small and quiescent. Cloud cover prevented him counting filaments and prominences on August 9, 14 and 30. Henry saw an "eruptive" prominence on the south-west limb at 0900 on the 25th and a medium sized flare in a spot group near the south-east limb at 0955 on the 29th, a "detached ball prominence" on the west limb at 1407 on September 2 and an "eruptive filament" in one of the three spot groups at 0934 on the 4th. He reports that all plages were active on August 30, September 1 and 2. In addition Henry counted an average of 18 filaments and 7 small quiescent prominences during 8 observations between August 31 and September 13 inclusive.

The position of the sunspots drawn by **Patrick Moore** at his observatory in Selsey at 1530 on August 28 can be seen in Fig. 2.

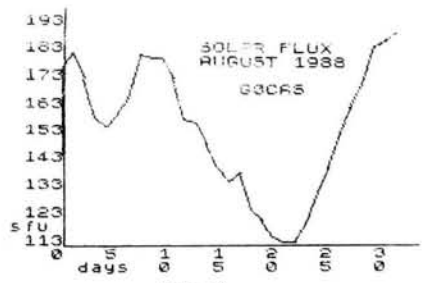

Fig. 3

"The mean solar flux for August was 154.4 s.f.u.," wrote **Neil Clarke G0CAS** (Ferrybridge) and the daily levels for the month can be seen on his computer print out, Fig. 3.

Propagation Beacons

In July and August I had the pleasure of meeting 3 of our readers from Holland, **Chris van den Berg**, at the Chalk Pits Museum Fig. 4, and **Jacqueline van Renesse** and **Erik Knoll NL/9705**, Fig. 5, while they were in Storrington. Jacqueline and Erik are engineering students at the Christiaan Huygens technical college in Rotterdam where they are active with the long established college station PI5CH. Jacqueline's special interest is the 144MHz band and Erik, a member of VERON, is very keen on propagation above 28MHz. At his home QTH and for his beacon observations, Erik uses a Lowe HF-125 communications receiver and a long wire antenna for the h.f. bands and a vertical dipole for Band II.

Although our 28MHz beacon chart this time has been hit by postal problems and ends on September 20, there is still something good to offer, Fig. 6 and my thanks are due to **John Coulter** (Winchester), Erik Knol (Rotterdam), **Ken Lander** (Harrow), Henry Hatfield, Chris van den Berg, **Don Hodgkinson G0EZL** (Hanworth), **Ted Owen** (Maldon) and **Fred Pallant G3RNM** (Storrington) for their logs.

John Coulter heard KB4UPI sending "KB4UPI/B ALEM 63 QSL 6 and 10 MTR 73" (28.265MHz) on September 8 and 10. Along with Don Hodgkinson and Ken Lander, he logged WC8E/BCN on August 28 and September 8.

Fred Pallant found ZD7AF (28.520MHz) at 1202 on September 2 and wrote, "September 6, what a day!, VK beacons at 0715, PY2AMI at 0920, WA4DJS audible from 1150 until after 2000, when W6's were still strong, LU1UG at 1150, JA1DQL (s.s.b.) at 1158 and worked WA4WTG (Florida) at 1748 and W5VVX (Houston) at 1901."

Both Don and Fred were pleased to hear so many Australian beacons and Don reports, "Beacons previously unheard were KE2DI/B (28.286MHz) on August 26, giving its locator as FN02, which would put it in the Buffalo area of New York state and N2BCF/B (28.204MHz) on September 8 giving its QTH as Glassboro, New Jersey." Don thought he heard KF4MS (28.200MHz) on August 31 and is delighted with his best day, September 8, when he logged 22 beacons and worked stations in Japan and in 5 north American states—Illinois, Michigan, Missouri, Pennsylvania and Tennessee.

In addition to the "occasional" beacons already mentioned, KJ4X, N4JHX, VE2HOT, WB4JHS, W8FKL/4 and W9UXO were also reported in your logs.

John Coulter logged PY2AMI (24.900MHz) daily from September 14 to 20 inclusive. Ted Owen heard IK6BAK/B (24.920MHz) on August 29 and Erik Knoll received a very strong signal from DK0WCY on 10.144MHz at 1035 on September 5.

Tropospheric

Although the atmospheric pressure was 30.2in and the weather in the south was fine and warm on September 6, the clouds were appearing from the west and the forecast was for rain moving across Ireland toward Scotland. During the day a limited tropospheric opening produced a number of Continentals, plus Ireland's RTE in Band II. I logged French stations again, using my Plustron TVR5D with its own rod antenna while parked under trees at Ightham Mote, Kent, at 1700 on the 7th.

On the 17th and 18th, the Chichester and District Amateur Radio Club using the special event callsign, GB2NM, from a portable v.h.f. station on the South-Downs, near Amberley, were well pleased with the 100 or so contacts they made on 144MHz, especially as stations in Scotland and the Isle of Skye were among the DX.

The slightly rounded atmospheric pressure readings for the period August 26 to September 22, Fig. 7, were taken at noon and midnight from the barograph installed at my home in Sussex. In Essex, Ted Owen recorded a low of 991mb (29.25in) on September 2 and a peak of 1032mb (30.5in) on the 15th.

Note the period September 4 to 21 when the pressure was above 1015mb (30.0in) when v.h.f. conditions were often very good with known tropo-openings on days 6, 7, 10, 17, 18, 20 and 21.

Fig. 4

Fig. 5

934MHz

"Been a good month for 934," wrote **John Levesley UK-627** from Bransgore at the end of August, because during the month he worked numerous holiday-makers at distances around 80km and four stations in Jersey at 169km.

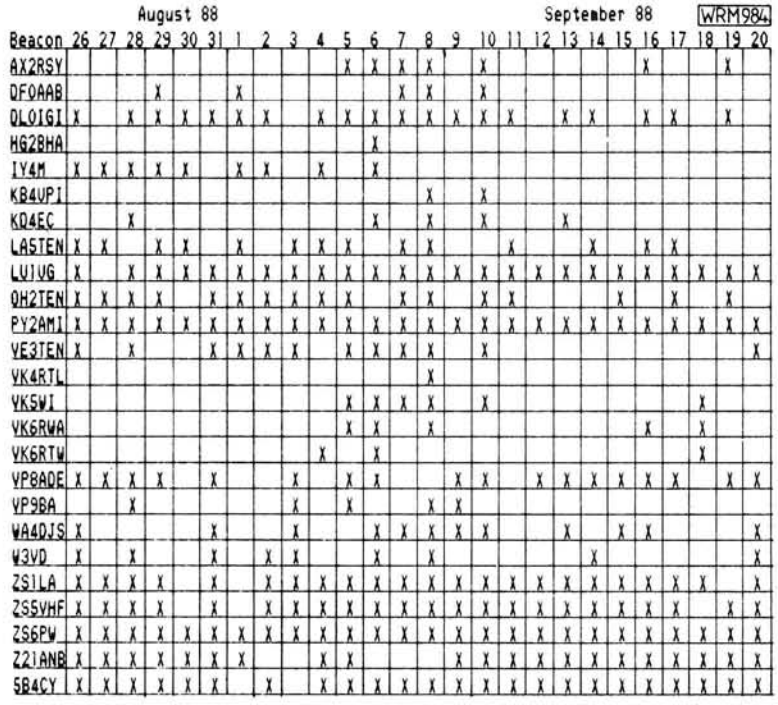

Fig. 6

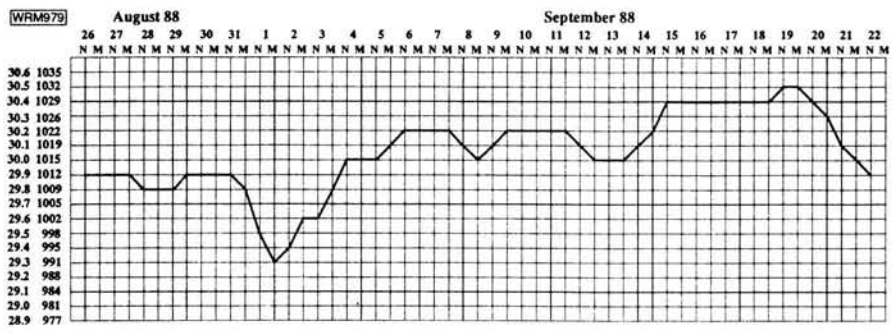

Fig. 7

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IC-04E	FM Handportable. Keypad entry. 2.5W/BP3	£ 318.00
IC-48E	FM Mobile. 21 Mems. 25W.	£ 455.00
IC-490E	Multimode Mobile. Scanning. 5 Mems. 10W.	£ 625.00
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Good tropo conditions coincided with **Les Jenkins' GB-37** holiday in Deal. This was well timed because, with a vertical 12-element quad loop antenna, only 3m a.s.l., Cybernet Delta One transceiver and Crestbyte receiver pre-amplifier, Les worked 38 different stations between September 7 and 12 inclusive. The majority of these were UK club members and the contacts included SB-176 in Leicester at 215km, NG-01 a maritime mobile off the Hook of Holland at 155km and various stations in Essex, Hampshire, Kent, London, Norfolk, Suffolk, Surrey and Sussex.

The next three deadlines are: Nov 24, Dec 22 and Jan 25

Broadcast Round-up

Peter Shore

The latest set of frequency changes by international broadcasters at the end of September have brought about several notable rearrangements of English and other language services, both in the East and the West.

The Soviet Union, for example, has now introduced German and English programmes from Radio Station Peace and Progress (described in the station's opening announcement as "the voice of Soviet public opinion") beamed to Europe. Arabic broadcasts are now directed towards the European continent—perhaps to the Arab sheiks in Knightsbridge . . .

Meanwhile Radio Moscow in Spanish to Latin America has been heard describing itself as Radio Moscow International—everyone seems to be jumping on the name change bandwagon this year (Sweden lost the word "international" earlier this year).

For those of you who thought that the international language of Esperanto was dead, take heart; Radio Havana Cuba has joined the elite ranks of those stations which broadcast in this now somewhat obscure tongue. Each Sunday, Esperanto programmes from Cuba will be heard at 0800, 1700 and 2240UTC.

Radio France International and Radio Japan have reached agreement on programme exchange, with RFI using Radio Japan's Tokyo Yamata transmitter for four and a half hours each day, and Radio Japan having a similar amount of air time on the French Guyana RFI relay station. RFI is also negotiating with the Chinese over programme sales in an effort to increase its Asian coverage.

Radio Sweden is having a tough time at home, with a Foreign Ministry report questioning the value of short wave broadcasts. The report has discounted any suggestion of relay facilities or exchanges with other broadcasters, and even goes so far as to suggest that Radio Sweden could make do with just one h.f. transmitter, instead of the three it currently uses. Radio Sweden has invited comments from listeners on this development; does the future lie somewhere other than international short wave broadcasting?

International broadcasting will be going in force to West Berlin next Spring when the second "International Radio Days" takes place at the International Congress Centre there, opening on May 26. The event, which is being organised by Penvox Communications, is being hosted by Deutsche Welle and it will be interesting to see what involvement may come from the other side of the Wall.

BBC World Service in English launches some new programmes at the end of October, including its first hour-long news programme, called, entertainingly, *Newshour*. This will be broadcast at 2200UTC, and will include correspondents' reports, analysis and press reviews. World Service sources say that if successful, this news broadcast may be considered for inclusion elsewhere in the schedule. Other changes include a strengthening of financial news as well as new feature programmes.

Europe

All times are UTC (= GMT)

Radio Sweden now broadcasts in English as follows:

0230–3000 on 11.95 (u.s.b.), 11.705 & 9.695MHz
0330–0400 on 11.705MHz
1230–1300 on 17.78, 15.43 & 9.565MHz
1400–1430 on 17.86, 15.43 & 15.345MHz
1530–1600 on 17.78, 15.43 & 15.24MHz
1800–1830 on 11.845, 7.265, 6.065 & 1.179MHz
2100–2130 on 9.655, 6.065 & 1.179MHz
2230–2300 on 11.925 (u.s.b.) & 1.179MHz

BRT in Brussels has made some alterations to its schedule;

0030–0055 on 9.925 & 9.675MHz
0800–0825 on 21.815 & 11.695MHz
1000–1025 on 21.81 & 17.595MHz
1330–1355 on 21.815 & 17.555MHz
1630–1655 on 21.81 & 17.585MHz
1830–1855 on 11.695, 5.915 & 1.512MHz
2200–2225 on 9.675, 5.915 & 1.512MHz

In Italy, AWR Forli can be heard with English on 7.125MHz at 0630 for thirty minutes. All other transmissions from the station are broadcast on 7.257MHz.

Radio Netherlands' English language transmissions now have additional frequencies:

0400 on 9.85 & 7.21MHz
0830 on 9.77MHz
1030 on 9.505MHz
1430 on 11.735MHz
1630 on 15.57 & 6.020MHz
1830 on 15.175MHz

Turkey has been heard on 15.105MHz in the morning period around 0800, and during the afternoon on 11.960 at 1500, 9.460 between 1600 and 2100 and on both 11.74 and 9.46MHz beyond 2100, all in Turkish.

Radio Moscow in English for Great Britain and Ireland can be heard now at 2000 on 9.89, 9.825, 9.63, 7.38, 7.37, 7.24 and 1.143MHz. Some Moscow feeder channels that are currently in use for domestic and external services include: 18.87, 14.41, 13.735, 12.16, 10.67, 9.21, 9.2, 8.125, 6.92 and 6.8225MHz. The English language broadcast from Radio Station Peace and Progress mentioned in the introduction can be heard for half-an-hour at 2200 on 7.36, 7.34, 6.145 and 1.323MHz, followed by German at 2230.

Radio Finland now broadcasts in English daily:

0330 on 11.755 & 9.635MHz
0515 on 11.715, 9.635 & 6.12MHz, and on 963, 558 & 254kHz
0730 on 11.755, 9.56 & 6.12MHz, and on 963, 558 & 254kHz
0900 on 21.55 & 17.795MHz
1200 on 15.40 & 11.945MHz (and at 1300, 1400)
1505 on 15.185, 11.850 & 9.64MHz
1930 on 11.755, 9.53 & 6.12MHz, and on 963, 558 & 254kHz
2200 on 11.755, 9.67 & 6.12MHz, and on 963, 558 & 254kHz

Middle East

The English service of Israel can be heard:

0500–0530 on 21.66, 17.63, 17.59, 11.70, 11.655, 11.585, 9.815, 9.435 & 7.464MHz
1100–1130 on 21.66, 17.685, 17.63, 17.575, 15.65, 15.64 & 11.70MHz
1800–1830 on 13.75, 11.655, 11.585 & 9.93MHz
2000–2030 on 11.96, 11.605, 9.855, 9.815, 9.46, 9.435 & 9.01MHz

Iraq's English broadcast at 0000 is heard on 9.69 and 9.515MHz. At 2000, the station is reported to be on 9.77MHz.

Africa

French from Algeria noted at 1030 on 15.16, 9.509 & 9.685MHz. At 1100 a Spanish language programme is carried on 9.685, 9.64 & 9.509MHz.

Radio RSA has English:

0200–0400 on 11.76, 9.615 & 9.58MHz
0400–0430 on 11.90, 9.585 & 5.98MHz
1100–1200 on 21.59, 17.745 & 11.90MHz
1400—1600 on 21.59, 21.535, 17.745 & 11.925MHz
1800–1900 on 21.535 & 17.765MHz
1900–2100 on 15.365, 15.32 & 7.235MHz

The new Danish language programme is on 21.535MHz on Wednesdays only at 1600.

Asia and the Pacific

Radio Japan is heard at 0800 on 21.695, 17.81 & 15.27MHz in English. All India Radio now uses 10.33 (from 10.335MHz) including the English domestic news service at 1530, with 9.95MHz running in parallel.

Tahiti has been heard on 11.826MHz at around 0900 with Polynesian music and relays of France Inter fed from Paris by

Any reports for Broadcast Round-up should be sent to the PW offices

satellite. Sri Lanka Broadcasting Corporation in English at 1230–1730 is now on 9.72 and 6.075MHz (the latter a most unlikely catch in Europe!). The Deutsche Welle relay at Trincomalee in Sri Lanka is now back on the air using 7.20 and 6.17MHz.

Afghanistan's External Service broadcasts in English:

0900 on 17.655, 15.255 & 9.635MHz
1900 on 9.665 & 7.31MHz

The Americas

HCJB in Quito has introduced a new schedule, including English:

0030–0130 on 15.155, 11.91, 11.775 & 9.72MHz
0130–0500 on 15.155, 11.775 & 9.72MHz
0500–0700 on 11.775, 9.72 & 6.23MHz
0645–0700 on 9.655 & 9.61MHz
0700–0830 on 9.655, & 9.61MHz (to Europe)
0700–0730 on 9.745 & 6.13MHz
0730–1030 on 11.925, 9.745 & 6.13MHz
1030–1130 on 11.925MHz
1130–1200 on 11.74MHz
1200–1600 on 17.89, 15.115 & 11.74MHz
1600–1630 on 17.89MHz
1900–2000 on 17.79, 15.27 & 11.74MHz
2130–2200 on 17.79 & 15.27MHz

HCJB currently has one 500kW transmitter out of service, and some of the channels listed here may not be operational until repairs have been effected to the sender.

Radio Nacional de Chile may be heard 2300–0400 on 9.55MHz.

RAE in Argentina broadcasts English:

1730–1830 on 15.435MHz
2200–2300 on 15.435MHz (not Tuesday or Thursday)
0200–0300 on 11.71MHz
0400–0500 on 11.71MHz

Radio Surinam International, carried by Radiobras, is now heard on 17.84 at 1700.

WCSN in Boston has made some frequency changes:

0600–0800 on 7.365MHz
2000–2400 on 9.495MHz

KUSW has moved from 15.69 to 17.715MHz at 1900–2200.

KVOH in California is now on 13.695 at 0100–0800, replacing 17.775MHz.

That's all for this month. Please keep sending your reports.

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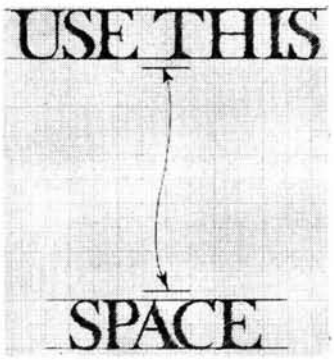
Volume 64—January to December 1988

PRODUCTS

MISCELLANEOUS



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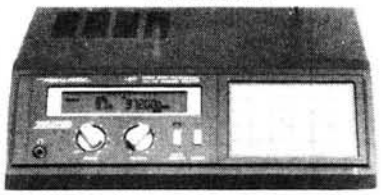

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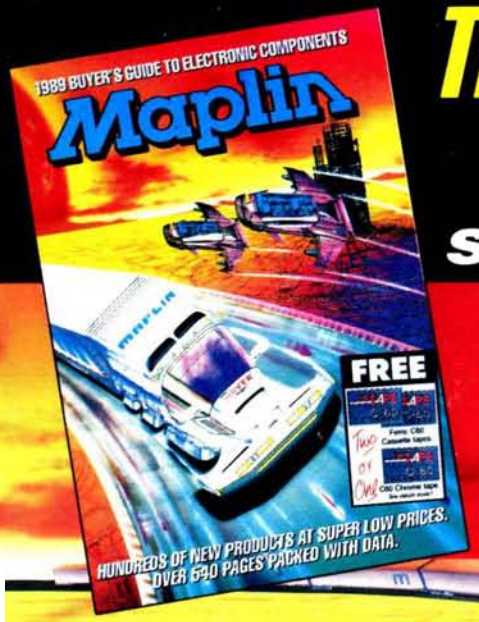

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