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# practical **Wireless**

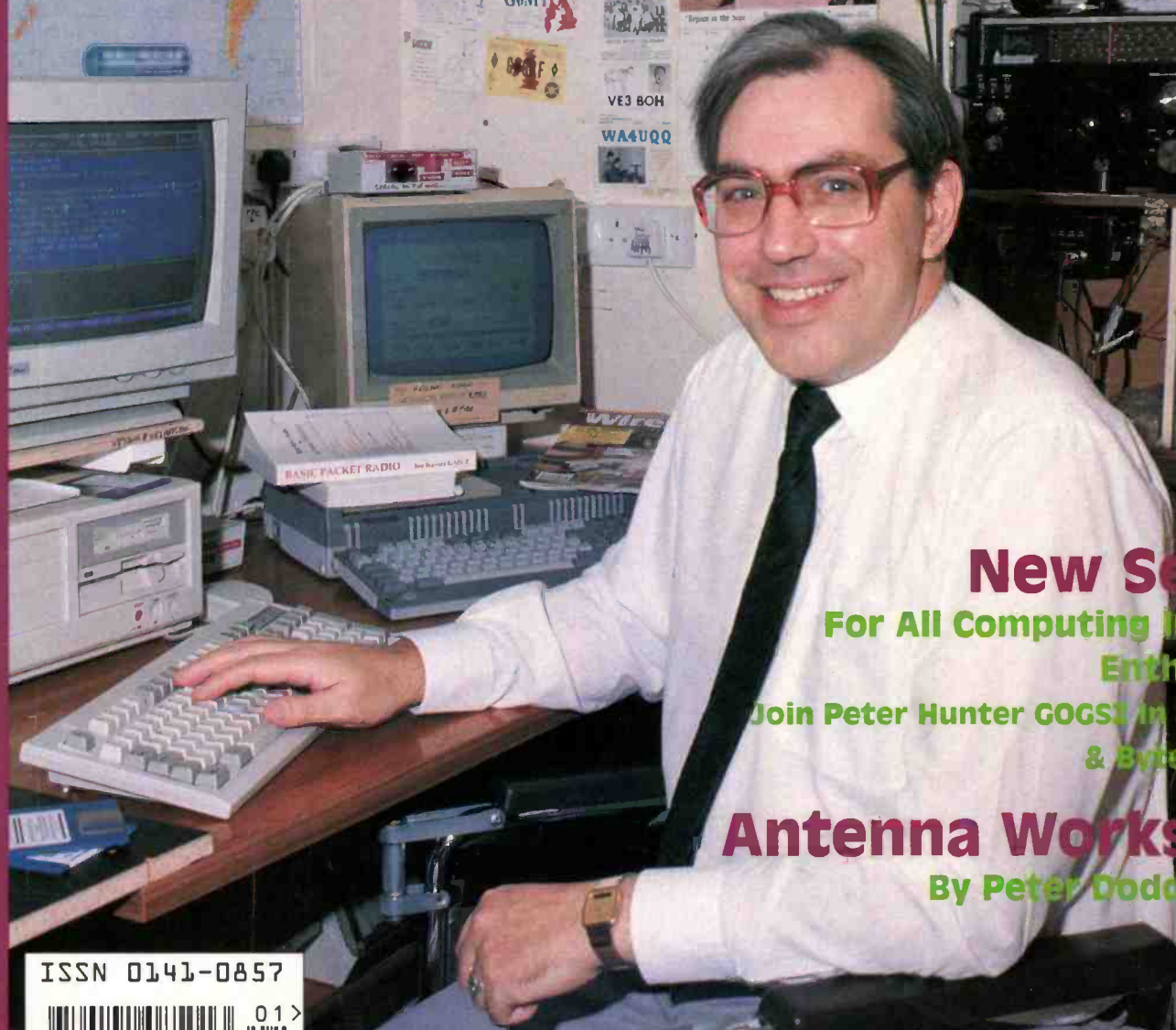
## *Kit Building Special*

### **Kit Reviews**

Hands Electronics 3.5MHz & The Ramsey Electronics 144MHz Receivers

### **Kit Showcase Guide**

Find The Kit You Need



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# practical Wireless

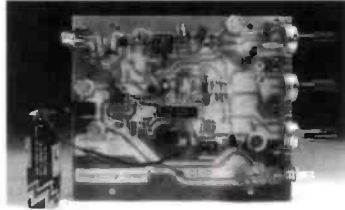
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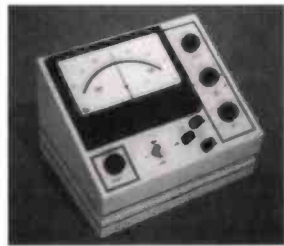
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### Staff

#### EDITORIAL & ADVERTISEMENT OFFICES

Practical Wireless  
Enefco House  
The Quay  
Poole  
Dorset BH15 1PP  
Poole (0202) 678558  
(Out-of-hours service by answering machine)

#### CREDIT CARD ORDERS

(0202) 665524  
(Out-of-hours service by answering machine)  
FAX Poole (0202) 666244

#### Editor

Rob Mannion G3XFD

#### Art Editor

Steve Hunt

#### Technical Projects Sub-Editor

NG ("Tex") Swann G1TEX

#### Production/News

Sharon George

#### Editorial Assistant

Donna Vincent

#### Advertisement Manager

Roger Hall G4TNT  
PO Box 948  
London SW6 2DS  
071-731 6222  
Cellphone (0860) 511382  
FAX 071-384 1031

#### Advert Copy and Sales (Poole Office)

Marcia Brogan  
Poole (0202) 676033  
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### COMING NEXT MONTH

Practical Wireless looks into the  
world of receiving and the receiver

Don't miss it!

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Packet Panorama will appear in February.

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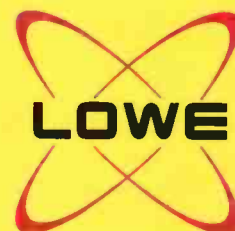
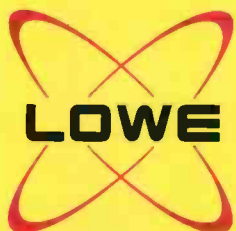
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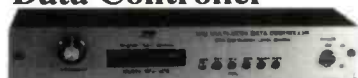


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HF ATU**



The MFJ-948 is a complete 300 Watt aerial matcher in one box. It will match coaxial, balanced feeder and single wires. A dual needle VSWR/Power meter makes adjustment simple and a 3 way aerial switch completes the package. Fantastic value! £129.00

**Other MFJ Products:**

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MFJ-704	HF Low Pass Filter	39.95
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**G5RV With Compact Option!**

Full Size 80-10m 102ft	£21.95
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Using our EL-40XC coils you can operate the half size version on 80 metres without affecting its performance on the other bands. The length is increased by only a few feet but as this added length of wire may be dropped vertically at the end, the overall length remains the same. 80-10m In 66ft of space! Coils £18.95 per pair.

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**600 Watts**

**£799!**

**AL-811**

This linear is incredible value. We have put it through its paces and it really stands abuse. 3 rugged 811A tubes provide up to 600 Watts output from 160-10m. A hunky mains transformer and full metering is included. Used by DX-peditors it has to be amazing value at **£799 inc VAT**

**AL-80BX 1kW from 160-10m 3-500z tube. £1499.00.**

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The AZDEN PCS-7000 is possibly the most underrated rig available. It is simple to operate and can store tone-burst information in its memory. In order to promote it we are, for a limited period, offering you the chance to purchase at "factory prices." There's no catch; these are genuine current production models complete with all accessories plus our money back warranty if goods returned within ten days. How's that for an offer!

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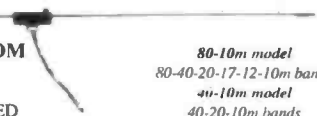
CP-4	10-15-20-40m vertical with radials	£149.00
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V-2000	6m/2m/70cms 2.15dB/6.2dB/8.4dB 2.5m	£99.00
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**£169.95!**

**FACTORY  
PRICES**

2 Metres  
5 Watts  
Rx 130-169Mhz  
Full Warranty

**70 Cms Model**

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**£179.95**

This new exciting handheld from Maplin Electronics is offered to you at a direct factory price. And with the current exchange rate you will agree that this is amazing value. You get a proper English handbook, two battery packs (4 and 6 x AA cells) helical aerial and carry strap.

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**NEW!**

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### DR-119E 2m Mobile

50 Watts  
**£309.95** RX: 135-174MHz



The latest 2 metre mobile from ALINCO now offers superb value. No larger than a car radio it boasts 50 Watts output and extended receiver coverage. Completely re-styled it offers all the usual features including memories, scanning etc, and comes with microphone, mounting kit and full warranty. For more details send or phone for brochure.

**NEW!**

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ELECTRONICS GmbH.

### Special Offer

The DJ-F1E is outselling any other 2 metre handheld we stock. Its performance, reliability and construction are unsurpassed. So convinced are we that the DJ-F1E offers the greatest value ever, we are happy to offer you a full refund if you are not immediately happy with its performance or features. That's right, return the transceiver to us within 10 days of purchase and we'll offer you a refund or an alternative, the choice is yours! That's confidence. Peter G30JV



**£259**

**NEW!**

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### DJ-180 2m Transceiver

**£169.95!**

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- ★ 10 Memories
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- ★ 2 Watts Option
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- ★ AC Charger
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- ★ Battery Warning
- ★ Steps 5kHz - 25kHz
- ★ Superb Audio
- ★ 132 x 58 x 33mm



Alinco break the price barrier again! Forget the cheap old-fashioned technology, this is brand new designed stock that will rock the market. Ideal as second rig or for those who only occasionally use 2 metres.

### DJ-F1E 2m FM

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- ★ Rx: 108-174MHz
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- ★ AC Hod Charger
- ★ Many Accessories

**FREE! Mail Order Price List. From UK's LEADING HAM RADIO STORE**

Important Notice: some prices may be subject to alteration owing to exchange rate variations. Please check when ordering.

### NEW Packet Radio Kit

**£49.95** Ramsey — USA  
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- ★ Powered directly from RS-232 port.
- ★ Includes free software for IBM



#### Other Kits

AR-1 Airband VHF Rx.....	£22.95
FR-1 FM broadcast Rx.....	£19.95
HR-20 20m DC Rx.....	£26.95
HR-40 40m DC Rx.....	£26.95
HR-80 80m DC Rx.....	£26.95
QRP-20 20m QRP Tx.....	£27.95
QRP-40 40m QRP Tx.....	£27.95
QRP-80 80m QRP Tx.....	£27.95

This is a truly amazing kit for all those who want to get into packet radio without committing themselves to a large outlay. The complete kit of parts is provided with circuit, board layout and comprehensive manual. It can be put together in an evening. All you need is an RS-232 lead to your computer and cable connection to your transceiver mic socket. You'll be receiving and sending Packet signals in no time at all. If you haven't tried Packet radio, here's your chance to do so with minimum outlay and guaranteed results.

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**£189.95**  
Post Free  
1.8 to 30MHz



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70cms module for FT726R

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2m module for FTV107, 707, 901 etc

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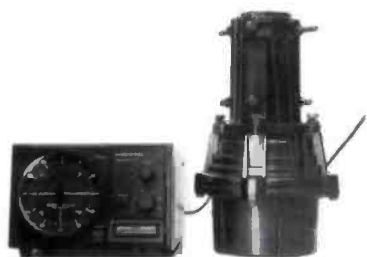
*Seasons Greetings*



**FT736R** - Probably the finest dualband base transceiver in existence - ideal for satellite operation - whole host of options available.



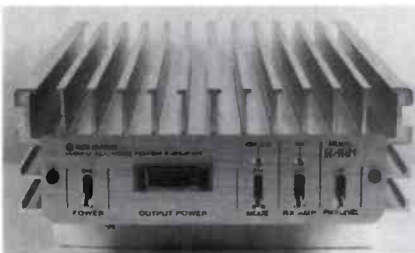
**FT890** - Yaesu's latest HF winner available either with or without internal ATU - ideal for mobile/base - too many options to list - ring for details.



**Rotators** - We have a wide range of rotators to suit all applications from TV to multi-element HF antennas. Computer control is an option on some of the larger models to give extra flexibility of operation.



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All the Daiwa range, except the PS140MKII, feature variable voltage with switchable voltage/current metering. Both the PS304 and RS40X feature a cigar lighter socket, convenient for powering your handheld transceiver.

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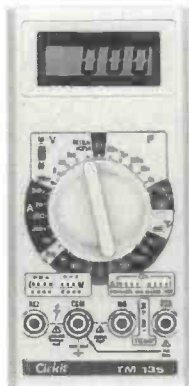
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HM1005	100MHz, 3 channel, 6 trace, delay time base	£930.60	<b>£899.00</b>



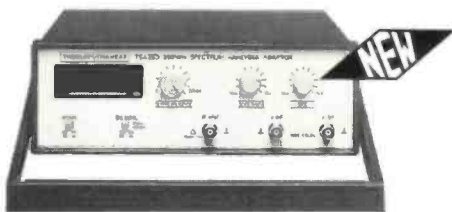
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- 400kHz to 250MHz frequency range
- LC display of centre frequency
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The new TSA250 will adapt any conventional 'scope into a highly cost effective spectrum analyser. With numerous applications in RF design and development work, EMC investigations, and education.

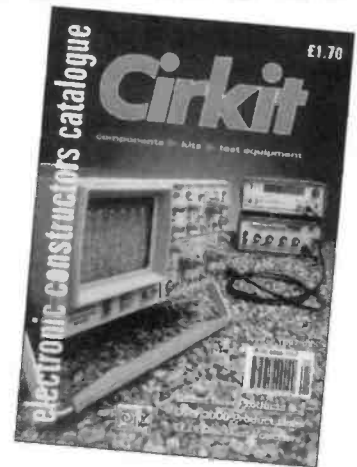
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Postage and packing; standard £1.40, next day delivery £4.60.  
Prices correct at time of going to press, but may change in line with exchange rate fluctuations.



The new year brings some interesting changes in *PW*. Firstly, as I promised in the last issue, our new column 'Bit & Bytes - The Computer In Your Shack', written by Peter Hunter GOGSZ, makes its first appearance.

Peter intends to make 'Bits & Bytes' a thoroughly practical column. It's not going to be an academic series, and he's aiming to help you enjoy using the computer as it should be in our hobby - as yet another sophisticated tool.

'Bits & Bytes' will appear every other month, alternating with 'Packet Panorama'. In this way, I feel that I can best serve the needs of our readers. If you disagree, I'd be pleased to hear your opinions on the subject!

As from the February issue of *PW*, the 'Reflections' column written by Ron Ham will be replaced by a new series called 'Valve & Vintage'. Ron Ham's new column is being introduced because of the interest shown by readers in valves, valved gear and vintage equipment.

Feed-back from readers, plus my own feelings on 'Reflections', led me to think carefully about using editorial space in *PW*. So, bearing in mind that the areas covered by 'Reflections' have often overlapped those in David Butler's excellent 'VHF Up' column in 'Backscatter', I have decided to make the changes.

Ron Ham is the ideal choice for the new column, as he spent over 40 years in the radio and TV servicing industry. During that time he acquired an enormously wide knowledge of servicing, history and practical hints and tips.

On the vintage equipment side, Ron was also the curator of the historical collection of radio equipment at the Chalk Pits Museum at Amberley in West Sussex. And although he's no longer doing that job, he still has contact with the museum.

In his new column, Ron intends to answer your letters, give advice and discuss various receivers, equipment, servicing and problems. He invites you to write to him with queries on older equipment, particularly if it's valved.

# Keylines



We're introducing this column because readers are continually asking for a regular series dealing with valves and the associated techniques. So, it's up to you to support 'Valve & Vintage', and Ron Ham will do his best to provide the column **you** want.

On Tuesday November 3, Tex Swann G1TEX and I spent an enjoyable evening with the South Dorset Radio Club in Weymouth. We'd been invited to provide a *PW* stand at what the club called an 'Activity Night'.

The event turned out to be a very well attended amateur radio promotional evening. The club had contacted the local evening newspaper, colleges, schools, the scouts and everyone was welcomed.

Their idea worked, and interested people were already waiting as we arrived. As the event was held at the local football club's headquarters, several people (attending a match between local clubs) came in on the off-chance and were obviously interested.

Along with the *PW* stand, there were a number of others to interest the visitor including: an h.f. demonstration station, RAYNET, a s.w.l. set-up, a Morse stand manned by the Dorset RSGB examiner, an amateur TV demonstration (with excellent quality pictures) and a packet radio station.

There were also many Novice radio amateurs in evidence. I was particularly pleased to see that there were Novice licensees representing all age groups from 12 to 60 years.

It was a very successful evening. We'd only had a very short time to prepare for the evening, as the invitation came late. Despite this, when we were preparing,

several telephone calls for help brought immediate responses from both the RSGB, and the Radiocommunications Agency.

Because of the RSGB and RA co-operation, we were able to take copies of *RadCom* and the RA booklet *How To Become A Radio Amateur*, etc., with us. It just goes to show, that if **we all work together**, we can show other people what an enjoyable hobby radio can be!

*Rob Mannion G3XFD*

## Services

### Queries

We will always try to help readers having difficulties with a *Practical Wireless* project, but please note 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 IRCs for overseas readers).
- 4: Make sure you describe the query adequately.
- 5: Only one query per letter please.

### Back Numbers & Binders

Limited stocks of many issues of *PW* for past years are available at £1.80 each including post and packing. Binders, each holding one volume of *PW* are available price £5.50 each (£1 P&P for one, £2 for two or more). Send all orders to the Post Sales Department.

### Subscriptions

Subscriptions are available both for the UK and overseas. Please see current issues for the latest prices.

### Constructional Projects

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 their own.

Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article. The printed circuit boards are available, mail order, from the Post Sales Department.

### Mail Order

All *PW* services are available Mail Order, either by post or using the 24hr Mail Order Hotline (0202) 665524. Payment should be by cheque (overseas orders must be drawn on a London Clearing Bank). Access, Mastercard or Visa please.



# Receiving You

**Dear Sir**

Hooray for Patrick Allely GW3KJW! I enjoyed reading his article 'Plain Speaking' in the November *PW*. I too cannot abide the 'Radioese' brigade's operating style.

How about full phonetics on a BBC quality f.m. v.h.f. band, nicely topped off with 'stroke mobile'. I reserve stroking for the cat!

Many thanks for striking a blow for the plain language group.

I'm still chuckling.

**David Ginsberg G0JGX**  
Kendal  
Cumbria

**Editor's reply:** Patrick Allely's article certainly stirred up a lot of comment from readers, in support and against his stance for plain speaking. Personally, I support his feelings, although my wife thinks I'm often guilty myself, even when talking to non-radio enthusiasts!

**Dear Sir**

According to *Practical Wireless*, if I have a subscription, then I will know all about *PW* Subscribers Club. Well to put it briefly, I have and I don't!

Since sending my remittance back in April I have certainly received *PW* by post, but nothing else. Have I missed out on something which may have been sent but not received?

I await your comments with interest.

**C. W. Trippett**  
East Looe  
Cornwall

**Editor's reply:** Thank you for your letter Mr Trippett. The *PW* Subscribers' Club is in the magazine every month, and it can be found under the 'regular articles' section, and subscribers (you're automatically a member of the club) can take advantage of the special offers available to them.

**Dear Sir**

Your 'Keylines' in the November *PW*, was read with great interest regarding the lack of a powerful voice in amateur radio.

Personally I couldn't agree more. As Public Relations officer for the Barnsley & District Amateur Radio Club I have worked with the club to broaden the image that amateur radio should project.

The club has had airtime on BBC Radio Sheffield and articles in the local press. For years I have been saying that the amateur radio fraternity have been selling themselves short.

Unfortunately, a great number of radio amateurs shut themselves up in a little room and cut themselves off from the world at large as if they are ashamed of what they do. We certainly need a more powerful voice than mine, such as MPs and the like whom I regret know very little about our hobby.

Of course, we could educate them so that we would be on a level like American amateur radio. They have Senators and Congressmen and women who hold call signs. They also do a good job.

If we could educate the media on the same basis then things will happen. We have to think positively. It's not what we can take out but what we can put into amateur radio. How many people reply to questionnaires from *PW*, RSGB, RA, etc.? I'm convinced, if every radio amateur or listener answered questions submitted by the latter bodies quoted, things would get done.

One thing is for sure. If you don't inform the media to explain what amateur radio is really about, then they will make it up and nobody will profit. So get out your pens as G3XFD suggests **and do something!**

**J. Caledon-Scott G4LRS**  
Barnsley  
South Yorks

**Dear Sir**

It has been particularly pleasing to learn recently of contacts on 10GHz by novices. They are to be congratulated on some very fine results.

Any means of helping others - and not just novices - to operate on the microwave bands is to be encouraged.

Of all the higher bands it's probably easiest to get started with wideband gear on 10GHz. The only difficult area is likely to be that of ensuring that transmissions are within the permitted frequency limits.

As in so many areas, the biggest problem of all lies in taking the first steps. So what can be done? Two sources of help spring to mind. Firstly, *Practical Wireless* could produce articles for beginners on the construction and operation of simple wide-band 10GHz gear. Secondly, experienced amateurs and radio clubs

## ★★★★★★ STAR LETTER ★★★★★★

**Dear Sir**

You may be interested to know how things worked out on my visit to France, shortly after submitting the review article about the 'Accelerated Learning French' language course I wrote for the November *PW*.

Although I had not completed the course, what I had learnt was very helpful. My first major conversation in French, booking a hotel room, was almost a re-run of the first lesson of the course.

I discovered that the local French people understood most of what I was saying, and I was even complimented on my accent! Because of this, I really believe the course has provided a good basis to learning French.

**Clive Hardy G4SLU**  
Parkstone  
Poole

**Editor's reply:** Thank you for the letter Clive, and I hope that your little postscript will encourage other people that they can also learn a foreign language.



Send your letters to the editorial offices in Poole. They must be original, and not duplicated in any other magazine. We reserve the right to edit or shorten any letter. The views expressed in letters are not necessarily those of *Practical Wireless*. The Star Letter will receive a voucher worth £10 to spend on items from our Book, PCB or other services offered by *Practical Wireless*. All other letters will receive a £5 voucher.

could help with frequency measurements, advice and, above all encouragement.

**Pat Walker G8HMG**  
Redhill, Surrey

**Editor's reply:** I'm in complete agreement with you Pat, and I'm hoping that we can do something on microwave operating fairly soon. It would be very helpful if other interested readers could write to me on this subject.

Dear Sir

It was with some considerable interest that I read D. J. Burton G0SFV's letter in November's *PW* regarding the mix-up in the issue of his class A licence. As the licence holder of G0RSR, I must tell you of our experiences in getting that call sign.

In February of this year, we applied to the RALU at Chesterfield for the call sign G0RSR, for use by our Scout Group. We were told it would probably be three months before the licence would arrive. Then SSL took over the issuing of Amateur Radio licences from April 1, and the call was eventually issued to us in May. We were even on the air for HF NFD in June signing G0RSR/P.

I noticed at the time, but did not pay attention to it, the fact that the licence validation document was handwritten, but correctly showed all the appropriate information. At the beginning of July, I received a second validation document from SSL, this time it had all the relevant information automatically printed.

However, for some reason the station address (our Scout HQ) had been changed to that of the mailing address (my own address). I wrote back to them with the correct

station address and waited.

At the beginning of September, a third validation document arrived, this time with the same information as the second document but with the postcodes changed! I immediately telephoned SSL, and they corrected the details over the telephone. I was informed that a new document would be dispatched the following day. It has still to arrive.

So, G0SFV, I am afraid that you are not the only one who has had problems with SSL. I would not be surprised if there were dozens more. It must be terribly distressing to have your identity taken away from you, for that is just what a call sign is.

I sympathise and send my sincere wishes to you, and I do hope that SSL reimburse you for your losses.

Meanwhile, any personalised G0RSR material would be welcomed by our group.

**Peter Swynford  
G0PUB  
Reading  
Berkshire**

**Editor's comment:  
Thank you for your letter Peter. I also hope (for the sake of our hobby) that SSL's all-too-obvious problems are sorted out soon.**

## COMPETITION CORNER

### Spot The Difference



Keeping warm in the shack during winter need not be a problem!



Mark the 12 changes made to this version of the cartoon. See below for details of entry to this month's Competition Corner

### David Moore G1VJL

Following the tragic death of David Moore G1VJL on 27 June 1992 at Woodford Air Show, we recently received a letter from his wife, Deanna Moore, with a little information on David.

David joined the Fleet Air Arm in 1968 and was a serving officer during which time he was in 360 RN/RAF Squadron at RAF Watton and 803 Squadron in Ark Royal. When he left the service about 14 years later, he did some air taxi work and then joined Rolls Royce and was flying with them until his unfortunate death at Woodford, whilst flying the *Spitfire*. He flew in exhibitions around the world and also did about 10 to 15 air displays in the *Spitfire*.

He was a gentle and kind man, who is greatly missed by friends and family, especially Deanna and their two children, Daniel 17 years and Melissa 14 years.

Enquiries regarding the following equipment to **Deanna Moore, Old White Hart, Downend, Horsley, Gloucestershire GL6 0PF. Tel: (0453) 833554.**

Kenwood T56805 with 12V p.s.u. mic., etc., £600. Trio TH41e 430MHz handie, £110. Icom ICOZAT 144MHz handie, £110. MFJ 949C tuner, £100. Asden PC55000 with gutter-mount antenna, £130. Eddystone g.d.o. 3MHz to 115MHz, £20. Base station 144MHz antenna, £20. Kenpro antenna rotor, £25. Capco loop antenna and controller, £120. 300pF spaced capacitor, £15. Uniden charger, £5.

### First Prize

A year's subscription to *Practical Wireless* or a £20 book voucher.

### Second Prize

Six month subscription or £10 book voucher

Subscription  Voucher

Name .....

Address .....

.....

.....

.....

Send your entry (photocopies acceptable with coupon) to: Competition Corner, Spot The Difference Competition, January '93, *PW* Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP. Editor's decision on the winner is final and no correspondence will be entered into. Entries to reach us by Friday 22 January 1993.



## Badger's In Business

John Badger G4YZO, of 'Badger Boards' fame, has made a good recovery from a heart attack he suffered at the Harlaxton Manor rally in May. As usual, John is busy with his kit-supplying business and in training people in amateur radio and slow Morse practice.

Regarding Morse, John plans to be on air again soon with c.w. on 144MHz for an hour around 10pm until 11pm (local time). The evening classes John is associated with are held at Perry Common School, College Road, Birmingham. John reports that he now has the service of the school for both the RAE and the Novice examination.

Currently, there are 35 people attending the RAE classes and eight in the electronics building class and seven in the Morse class. There's also the chance of Novice Classes, and John would appreciate if prospective pupils for any of the classes could contact him as soon as possible at **87 Blackberry Lane, Four Oaks, Sutton Coldfield B74 4JF. Tel: 021-353 9326.**

## RAE Class

Midland ARS have RAE classes each Wednesday, 7.30 to 9.30pm. Classes are £2 each, which includes tea and coffee. John Badger is the class instructor. Further details from

**G6DRN on 021-443 1189 or G4OMP on 021-382 3606.**

## Accelerate Your Learning

The latest research from Harvard University suggests that we each have, not one fixed IQ, but seven different types of intelligence. It gives a clue as to why some people currently do better at school than others - but why we could all do better.

Some people are more visual learners, some prefer to hear what they are learning, and others need ways to get physically involved to gain true understanding. And we each have an individual combination of different types of intelligence. All these variations add up to many different learning styles. It's not brain power we lack, it's the techniques to use our own particular brain to the full.

Different people need different approaches if they are to learn well. Accelerated Learning Systems has spent four years refining a learn-to-learn programme called *Accelerate Your Learning*.

*Accelerate Your Learning* enables people to explore and develop their own learning style. Learning **how** to learn is a fundamental skill. **What** you learn can become out-dated - **how** to learn is a skill for life.

An *Action Handbook* and *Audio Tape* let users discover what type of learner they are and then develop a systematic plan of action for learning in the way that suits them best.

The premise is that when you learn the way your brain works best, learning becomes more natural, more enjoyable and, therefore, quicker. That's why it's called *Accelerated Learning*. It helps people develop more of their true potential.

The basic programme creates the ability and motivation to learn well. A *Super Skills Supplement* builds on that ability and confidence, giving practical techniques for reading and absorbing information faster, improving writing skills, remembering better, studying more effectively and getting better exam results.

Finally, an *Action Video* demonstrates how all the techniques work in practice, from GCSEs, 'A' levels and further education programmes, to learning complex new skills at work. It also shows how to adapt the methods to help younger children learn more efficiently.

Who can benefit from such a programme? Obviously, students in secondary education, anyone taking evening classes or trying to gain a new skill or parents who want to be better equipped to help their child to learn.

It is also an important programme for any adult involved in training, re-training, or returning to work. (An Accelerated Learning Language Course was reviewed in November '92 *PW*).

*Accelerate Your Learning* is a comprehensive package at an affordable price of £26.95 (plus p&p). Available from:

**Accelerated Learning Systems Ltd.**  
**50 Aylesbury Road**  
**Aston Clinton**  
**Aylesbury**  
**Bucks. HP22 5AH.**  
**Tel: (0296) 631177.**  
**FAX (0296) 631074.**

## Winter 1992/1993 Catalogue



Cirket have just published the Winter 1992/1993 edition of the Electronic Constructors' Catalogue.

As before, this edition includes many new products. With 23 product sections, 192 pages and over 3000 lines, the catalogue also includes the usual discount vouchers, and is available from most larger newsagents or directly from **Cirket Distribution Ltd., Park Lane, Broxbourne, Hertfordshire EN10 7NQ. Tel: Sales (0992) 444111, Enquiries (0992) 441306.**

## Nottingham RAE Course

A special short RAE course is to be held at the Arnold & Carlton College, Digby Avenue, Nottingham. The course starts on Thursday 7 January 1993. There will be 16 weekly meetings, each on Thursdays, 6.30 to 9.15pm, with the objective of taking the RAE in May 1993.

The course is intended for students with some basic knowledge of radio. It should be ideal for Novices wishing to obtain a full licence and also as a revision course for those already aiming to sit the RAE in May.

Further information can be obtained from the course tutor, **Alan Lake G4DVW on (0602) 382509.**

## Amateur Radio Programme On WWCR

The American short wave broadcasting station World Wide Christian Radio, based in Nashville, Tennessee, has recently introduced an amateur radio programme. The new programme, *Radio Techniques* is hosted by Howard Weinstein K3HW and Bill Quin KA2VUE.

The programme covers amateur radio from the north American perspec-

tive, and it's broadcast weekly. *Radio Techniques* can be heard at 2200UTC on Sundays and at 0600UTC on Tuesdays. Frequencies to listen out on include: 12.160 and 17.525MHz (2200UTC) and 7.395MHz (0500-1100UTC). Full details on WWCR's schedule and programming can be obtained from them at **World Wide Christian Radio, 1300 WWCR Avenue, Nashville, Tennessee, TN 37218.**

## EI Activity Day

Following the success of the EI Activity Day held on March 17 last, the Irish Radio Transmitters Society have decided to promote a second EI Activity Day in 1992 to give amateurs and short wave listeners world-wide another chance to qualify for the IRTS Diamond Jubilee Award.

The date set is Sunday December 27 and all EI counties should be active on that day.

The Diamond Jubilee Award is being issued to mark the Diamond Jubilee of the IRTS, which was founded 60 years ago in 1932.

It is available to amateurs who work at least 20 of the 26 EI counties during 1992 (s.w.l.s on a heard basis), on any band, any mode, (no endorsements).

QSL cards are not required, send a log extract verified by two amateurs together with IR £3 (or equivalent), to **Diamond Jubilee Award Manager, IRTS, PO Box 462, Dublin 9.**

The latest date for receipt of applications is 1 April 1993.

## Low-Cost Full-Featured Frequency Measurement To 1.3GHz

The SAJE SC-130 and SC-40 are full featured (microprocessor based) hand-held frequency counters providing portable high performance at a reasonable price.

The design incorporates an angle mounted 16x1 liquid crystal display, giving excellent readability from a wide viewing area, whether in hand-held or bench applications.

Operation of the instruments is straightforward. Annunciators are displayed to assist in defining and editing set-up and measurement criteria. A battery condition indicator gives readout of the battery condition.

Both instruments provide a full range of features including measurement of frequency, period, count and RPM with a unique view facility enabling Min, Max, Average and Difference readings to be displayed. In frequency mode, a range of gating rates from 0.15 to 10 seconds is provided, plus a switchable low-pass filter. A display

hold function is standard.

The SC-130 offers a frequency range of 5Hz to 1.3GHz and the SC-40 from 5Hz to 400MHz. Both instruments provide good sensitivity and high accuracy.

The instruments are housed in rugged ABS cases with a separate battery compartment for a PP3 size battery.

The size of the instrument is 165mm(l)x87mm(w)x38mm(d) and weighs only 250g.

The instruction book provided is concisely written and ensures easy understanding of the counters and all features.

The SC-130 is priced at £109.00 plus VAT and the SC-40 at £89.00 plus VAT.

The SC-130 and SC-40 are designed and manufactured in the UK by SAJE Electronics.

For further information, please contact:  
**SAJE Electronics**  
**117 Lovell Road**  
**Cambridge CB4 2QW.**  
**Tel: (0223) 425440.**  
**FAX (0223) 424711.**



## National Success For Naval College

The need to provide music for church services on board Royal Naval ships inspired a Naval Engineer Officer, Sub Lieutenant Jeff Crofts (22) from Bristol, to design and build the MIDI Accompanist, gaining him the top award in the Young Electronic Designer Awards (YEDA) competition.

The MIDI Accompanist relies on the MIDI (Musical Instrument Digital Interface) connection found on the back of most modern electronic keyboards. The MIDI Accompanist is a sequencer, as it is a dedicated unit that gives instructions on the MIDI interface concerning the sequence of previously stored notes that are to be produced by the keyboard.

The MIDI Accompanist reads the music from cartridges that must be specially recorded and encoded, but allows the user flexibility in controlling how they are played back. The user can control the speed and can transpose the music while it is playing. Playback can also start with an optional introductory phrase.

The data is held on a 64K byte PROM, which represents some 12 000 notes in up to 200 sequences. The Accompanist is expandable to hold four such PROMs. The music is originally played on a keyboard and recorded on a PC using a commercial sequencer program. The music is edited then stored as MIDI files. These files are heavily compressed by a specially written PASCAL program, to produce a proprietary file format. Information is added concerning how the music sequences should be replayed, and the complete cartridge is programmed.

Sub Lieutenant Crofts designed the instrument whilst studying at the Royal Naval Engineering College (RNEC), Plymouth. It's the second year running that an RNEC entry has won the YEDA top award.

## Newly Published - The Art Of Soldering

Newly published by the long-established Bernard Babani Company, is a slim but useful book entitled *The Art Of Soldering*, written by R. Brewster, and available at £3.95.

This little book covers a very wide range of soldering topics, from choosing your soldering iron to accessories and fluxes. In only 84 pages the book provides a wealth of simple, practical and comprehensive information. Ever needed to repair a car radiator? Model railway equipment? De-solder a large p.c.b? Puzzled by that 'dry' joint? If the answer is yes, you'll find all you need, and a lot of other information you should know in this surprisingly helpful little book. Both the novice and experienced enthusiast will find it a worthwhile reference source.

**G3XFD**

### The Art of Soldering

R. BREWSTER



## Essex Amateur Radio Services Ltd.

When it comes to the crunch, the boys at Essex Amateur Radio Services Ltd. (EARS) have got their act together. Formed by David G3RCQ who buys and sells used amateur radio equipment, EARS is a new company, with a fully-equipped in-house service department, run by Bob G6AKL. Bob has been involved with the repair and service of all amateur and p.m.r. equipment for the past 16 years.

The staff have, between them, 61 years of experience in the hobby. The company can supply and service new and used amateur radio, p.m.r., CB and scanning equipment. They can be contacted on **(0708) 374043** or **(0850) 320134**.



## Can You Help?

I am writing regarding the theft of a Kenwood TS430S serial no. 3090109, from a parked car (it was covered with a travel rug and sleeping bags on the rear seat), in Queensborough, Kent. The equipment was stolen on the night of August 1. The owner of the equipment is Martin Ouwehand PA3EHW. Anyone with any information regarding the above is to contact **Sheerness Police (0795) 584140, quoting crime ref. no. BD8039-92.**

I have recently acquired from an ex-WD disposals unit, a small device, marked Electrolytic Conductivity Simulator. It has an 11-position rotary switch and is graduated from one to 100 000 mhos. The unit is made by Electronic Switch-gear (London) Ltd., of Hitchin, Herts. The calibration seals are intact, so presumably the interior is in sound order. There is, of course, no paperwork, manual or circuit diagram. A letter addressed to the firm has been returned marked 'gone away', so my enquiries are: Do you know a present address for the firm? Can you tell me anything about such a unit and in particular, how it is used? **Charles Trippett, 'Blue Haze', Listowel Drive, Barbican, East Loos, Cornwall PL13 1LB. Tel: (0503) 263495.**

I am trying to restore an old Philips radio which I believe dates from the mid-thirties. I sorely need a circuit diagram plus any additional information which may exist about this radio. My job is compounded by the fact that someone, sometime, tried to repair the radio and made an absolute mess of it, snipping out wires, shorting components, etc. The model number is Type 534U and the serial number is E1715E03. The number 25997 is stamped on to the chassis itself. The name 'Multi-Inductance' appears on a tag on the rear of the radio and seems to be a logo/trade-name or sorts. There are seven

valves in it and the pins are all of the side contact variety. My telephone number during the day is **010-353-61-29011. My address is 74 Stoneyhurst, Doora Doyle, Limerick, Ireland.**

Wanted for a BC348. Dial front and cover for the aperture right-hand side of front panel covering the bases of the three valves r.f. mixer and oscillator. A metal case is also required to complete the receiver. **P. Robins G8BSK, 290 Priory Road, St. Denys, Southampton SO2 1LS.**

The Sony Broadcast Amateur Radio Club/Training Group, has been given a Yaesu FTV-250 144MHz transverter to partner the FT-101 h.f. transceiver. Unfortunately, the receive converter board, PB1517A is missing. To make the transverter work again, either at PB1517A board is needed, or a 144MHz to 28MHz down converter from which a 116MHz r.f. can be taken to the transmit mixer board. Can anyone help with a board, down converter or information? Please write to **Stephen Harding, Sony Broadcast Amateur Radio Club, Sony Broadcast & Communications Ltd., Jays Close, Basingstoke, Hampshire RG22 4SB. Tel: (0256) 483454.**

I am a civilian signals instructor with 188 Squadron, Air Training Corps, in Ipswich. We have recently acquired a Pye Marine CAT receiver for our h.f. station and would very much like to obtain the matching transmitter. The receiver covers 60kHz to 31MHz in eight switched bands. Intended as a GP receiver, both ship and shore based, it is mains-powered, using 50 or 60Hz a.c. at 100-150V and 190-240V. If you have anything suitable, please contact me, collection can be arranged. **Brian Leighton G3JWP, 225 Bramford Road, Ipswich IP1 4AD. Tel: (0473) 226373.**

Roy Price GW3SYL, has many very old bit and bobs connected with amateur radio, among them some old PWs. He has very kindly offered to give them away to any Novices, for the price of postage. So, all you Novices out there, contact him at **93 Amroth Road, Ely, Cardiff, S. Glamorgan CF5 5DT.**

I have been trying for over a year now to obtain a circuit for my 'FDK Multi Palm IV', which I bought at our local radio club (Binstead). It should be a six channel RX/TX, but has been butchered. All connections to the selector switch have been severed and cut back, and the set now only works on one channel. I would like to get all six channels working again.

Have tried the firms with ads in the mags for circuits, and also the importers Waters & Stanton, all with no luck. Can anyone supply me with a circuit for a 'FDK Multi Palm IV'? I will gladly reimburse postage costs. **H. Clark G3SOR on Isle**

**of Wight (0938) 296538.**

As a recent h.f. operator, I am a proud owner of an FT-75. I would like to ask other users of this radio if they would like to establish an FT-75 users group. The aim of this club would be to promote the use of this radio, providing information about the FT-75, exchanging ideas and modifications, and also having a regular net on one of the h.f. bands. If anyone is interested, they can contact me, **Lee Greaves GORSZ, at 15 Heathville, Dallington, Northampton NN5 7HT.**

**Douglas Byrne G3KPO, of 52 West Hill Road, Ryde, Isle of Wight P033 1LN, tel: (0983) 67665,** is searching for a weekly magazine which is normally thrown away, the *Radio Times*, pre-1950 and wartime or pre-war in particular. There must be some old copies lining cupboards or chests of drawers, or even boxes in the attic somewhere?

I have a requirement for a 10-20mΩ 150W rheostat with on/off switch, but am unable to find a local source of supply. I would be grateful for your assistance in locating this item. **V. L. Nicholson, 14 Meadway, Maldon, Essex CM9 7JR. Tel: (0262) 856247.**

I am trying to track down the circuitry of an add-on digital frequency display for a Yaesu FT200 transceiver. I think it may have been built circa 1983 to 1985. Anything you can do to help me will be gratefully appreciated and I will cover any copying costs. **Ron Grant G3XPH, 43 Catisfield Lane, Fareham, Hants P015 5NT. Tel: Titchfield 843219.**

Having recently retired, I now have more time to indulge in my hobby of servicing/restoring valved (only) receivers, e.g. HRO, CR100, R216, R200, etc. If you have any reader whose set refuses to 'co-operate', is a bit 'deaf' (or even mute), perhaps I could help. There would be no charge for my time, just the cost of any replacements agreed to be necessary. Anyone interested should first write, describing the equipment and the fault. I would then get in touch. **E. F. C. Owen, 28 Chartfield Road, Reigate, Surrey RH2 7JZ.**

I am trying to locate a copy of technical bulletin DTB4 published some years ago. Buy or photocopy. All expenses would be met. **Mr J. McGowan, 20 Keats Avenue, Romford, Essex RM3 7AR.**

I'm rebuilding an H2S radar display system, and require circuits of indicator units 162, 182 and 184. Also required is an indicator unit graticule assembly, approx. 7" diameter clear Perspex disc engraved with parallel or offset lines, having a milled metal edge about .5" width marked around the circumference 0-350. **Mick Green G4EZM, tel: (0253) 47176.**

## COMPETITION WINNERS

### November 1991 Caption Competition

**Winner:** G. J. Edwards, 36 Glan Cullen, Llangernyw, Clwyd LL22 8PY 'It's a job to make a distinction between the tappets and the Morse key'.  
**Runners-up:** Leo Barr, 7 Southwold Gardens, Silkswoth, Sunderland SR3 1LG 'What with local financial restrictions and the C & G minimum class size, it was the only way'. Richard Marris, 35 Kingswood House, Farnham Road, Slough, Berks S12 1DA 'Why worry? c.w. always beats the QRMI'

### December 1991 Spot the Difference

**Winner:** Matthew Moore, 164 Ardenlœ Avenue, Belfast BT6 0AE.  
**Runners-up:** D. S. Brown, 45 Millhead Road, Honiton, Devon EX14 8RA. Mr D. Jenkins, 143a Priory Street, Carmarthen, Dyfed SA31 1LR.

### January 1992 Wordsearch

**Winner:** Bruce Flett, 10 Ingale Paddale, East Kirkwall, Orkney KW15 1UY.  
**Runners-up:** Mr H. B. Lyman, 44 Shannock Court, George Street, Sheringham, Norfolk NR26 8DW. Mr F. J. Barns, Apartment 1101, Edificio La Caleta Del Sol-11, Carretera De Palmos S/N, Apt. De Correos 153, Saint Feliu De Guixol, Spain.

### February 1992 Ramsey FTR-146 Receiver Competition

The kit took 30 hours to build.

**Winner:** D. Holland, 31 Ghyll Edge, Lancaster Park, Morpeth, Northumberland NE61 3QZ 'I'm unemployed and can't afford to buy one' 29 hours 42 minutes.  
**Runners-up:** C. Jenkins-Powell, 12 Norman Court, Heningford Grey, Huntingdon, Cambridgeshire 'I have never built anything that has worked, first time and I am running out of kits to try' 29 hours 41 minutes. C. I. Kneller, 26 Sedgely Road, Winton, Bournemouth, Dorset BH9 2JW 'Being a pensioner just passed the NRAE I could become operational' 29 hours 30 minutes. D. A. Brudenell, 1 Marlow House, 11 Sutherland Drive, Birchington-on-Sea, Kent 'Having only a Sony 2001 receiver and not TX - what excitement it would be to hear my call sign being transmitted' 31 hours 30 minutes. Belfast Royal Academy Amateur Radio Club G17DAW, Noel Moore, Cliftonville Road, Belfast, BT14 6JL 'It would be put to good use by the five pupils who are taking the RAE in June '27 hours 31 minutes.

### March 1992 Spot the Difference

**Winner:** Mr W. Duschek, Gerhard Hauptli STR 30, D W7034 Gœrtringen, Germany.  
**Runners-up:** Mr W. H. Lewis, 42 Leyshon Road, Gwaun Cae Gurwen, Near Ammanford, Dyfed, South Wales SA18 1EN. Mr L. A. Mackenzie, 90 Tay Street, Newport on Tay, Fife DD6 8AP.

### April 1992 Caption Competition

**Winner:** Mr P. Howett, 23 Dakhill Avenue, Kidderminster, Worcestershire DY10 1LZ 'My TNC has great difficulty operating me sometimes'.  
**Runners-up:** Mr K. Darbyshire, 24 Neston Road, Walsaw, Bury, Lancs B18 3DB 'Looks like another one of them Packet Repeater Group meetings'. Ian Ruddock G8NCZ, 294 Willowfield Tower, Harlow, Essex CM18 6SD 'They are studying for the RAE!'

### May 1992 Spot the Rig

The jumbled up rig was a Yaesu FT-747GX/HF Transceiver.

**Winner:** Mr C. Haines, 29 Woodlands Close, Walton Stone, Staffordshire ST15 0DX.  
**Runners-up:** Mr E. R. Hawitt, 8 Embleton Road, Headley Down, Bordon, Hants GU25 8AJ. Michael Seaward, 7 St Diats Road, Stratton, Nr. Bude, Cornwall EX33 9AF.

### June 1992 Wordsearch

**Winner:** James Mander, 26 North Lane, Medmenham, Marlow, Bucks SL7 2EJ.  
**Runners-up:** L. Hibbs, 56 South Road, Impington, Cambs CB4 4PN. Pat M. Ateer, 20 Hillside, Dublin Road, Antrim.

### July 1992 Spot the Difference

**Winner:** Leslie Wright, The Old Coach House, Belan, Welshpool, Powys SY21 8SF.  
**Runners-up:** Alan Weaver, 116 Maldon Road, Tiptree, Essex CD5 0BN. Kieron Mallin, 14 Cresacre Avenue, Barmburgh, Doncaster, South Yorkshire.

### August 1992 Spot the Rig

The jumbled-up rig was a Trio 9R59DS.

**Winner:** W. A. Pond G1YGL, Wheatlands, Hadleigh Road, Boxford, Colchester, Essex CO6 5JA.  
**Runners-up:** Bob Armstrong, 159 Gunnersbury Lane, Acton, London W3 8HP. Mr K. R. Barnes, 3 Ayot House, Ayot St. Lawrence, Welwyn, Herts AL6 9BP.

### September 1992 Wordsearch

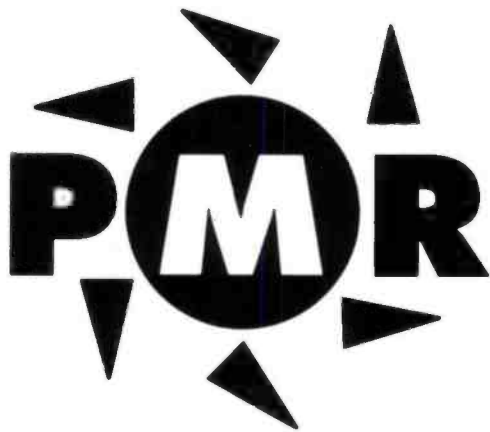
**Winner:** Colin Williams, 11 Heath Farm Road, Norton, Stourbridge, West Midlands DY8 3AX.  
**Runners-up:** John Desmond, 4 Rathmore Lawn, South Douglas Road, Cork City, Eire. Mr H. Hall, 3 Ravensdale Avenue, Mansfield, Notts NG18 2DU. Mr C. Parker, 64 Cardigan Lane, Leeds LS4 2LD.

### October 1992 Spot the Difference

**Winner:** Mr D. G. Alcock, The Hollies, 18 Albert Road, Evesham, Worcestershire.  
**Runners-up:** J. Licchelli, 70 Tredington Close, Woodrow South, Redditch, Worcestershire B98 7UR. Mr D. A. King, Cartref, Iden, Rye, East Sussex TN31 7PT.

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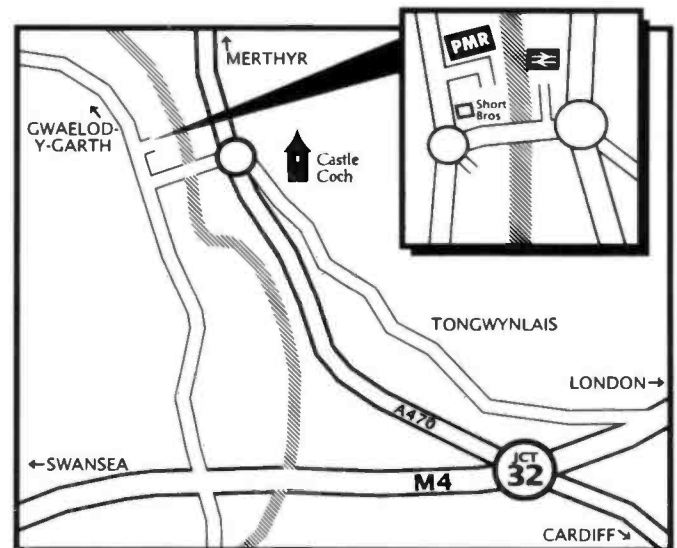


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NEEDS CONTACT:**

**PHIL GW4 REX**

**BRIAN GW8 OKR**



# Club News

Please send in all of your 'Club News' items to Sharon George at the editorial offices in Poole.

## Armagh

**Mid-Ulster ARC.** 2nd Sundays (September to June), 3pm. The Silverwood Hotel, Lurgan, Co. Armagh. **Bill G17BQH** on (0693) 61298 evenings only.

## Avon

**Bristol ARC.** 159th Scout HQ, Firtree Lane, St. George, Bristol. December 10 - QRP/Home-brew Play & Display night with Dave G4ZBT, 17th - Management evening, 24th - Computer evening with Barry G0CFM. Lance Whitelegg G0CCU on (0272) 721744.

## Bedfordshire

**Bedford & DARC.** Tuesdays, 8pm. Club room of Bedford Utd. FC., Firhill Park, Clapham Road, Bedford. Gavin Carmichael on (0234) 365660.

**Shefford & DARS.** Thursdays, 8pm. Church Hall, Amptill Road, Shefford, Bedfordshire. **Paul G1GSN** on (0462) 700618.

## Berkshire

**Maidenhead & DARC.** The Red Cross Hall, The Crescent, Maidenhead, 7.30pm. December 15 - Christmas Quiz. **Neil G8XYN** on (0628) 25952.

**Newbury & DARS.** Wednesdays, 7.30pm. Bucklebury Memorial Hall. December 16 - Compact Disc Technology by Steve Price G4BWE. More details on (0635) 46241.

**Reading & DARC.** 2nd & 4th Thursdays, 8pm. The Woodley Pavilion, Woodford Park, Haddon Drive, Woodley, Reading. December 10 - AGM with Wine & Cheese, Chris Nunn G0M2N. Nick Challacombe G0LGG on (0734) 722489.

## Buckinghamshire

**Aylesbury Vale RS.** 1st & 3rd Wednesdays, 8pm. Village Hall at Hardwick. January 13 - Annual Dinner with presentations. **Martyn G4XZJ** on (0296) 81097.

**Milton Keynes & DARS.** 2nd Mondays. North Bucks Youth Sports Hall, Haversham Road, Wolverton, Milton Keynes. December 14 - Open night. **Julian Winson G3FGB** on (0908) 611005.

## Cheshire

**Stockport RS.** 2nd & 4th Wednesdays, 7.45pm. Room 14, Dialstone Centre, Lisburne Lane, Offerton, Stockport, Cheshire. December 16 - Christmas Party, January 13 - Metrology by D. Jones G4GRU. **Jim France G3KAF** on 061-439 4952.

## Clwyd

**Delyn RC.** Every other Tuesday, 8pm. Gwernymyddf Community Centre, Gwernymyddf, near Mold, Clwyd, North Wales. December 15 - Mince Pie night. **Steve Studdart GW7AAV** on (0244) 819618.

**Rhyl & DARC.** 1st & 3rd Mondays, 8pm. WRVS Centre, 116 Vale Road, Rhyl. December 14 - Social evening, 21st - Hot Pot Supper. **Ken Padley GW7IAR** on (0745) 338276.

**Wrexham ARS.** Maesgwyn Community Centre, Maesgwyn Road, Wrexham. December 15 - Christmas Buffet. **Ian Wright GW1MVL** on (0978) 845858.

## Cornwall

**Cornish RAC.** Village Hall, Perranwell Station, Perranwell, nr. Truro, 7.30pm. December 14 - Computer Section, January 7 - Beating Around Africa by Peter G3WKP, 11th - Computer Section, 12th - Activities night. **Geoff Bate** on (0209) 820836.

## Derbyshire

**Buxton Radio Amateurs.** Lee Wood Hotel, Buxton, 8pm. December 22 - Social evening. **Derek Carson G4IHD** on (0298) 25506.

**Derby & DARS.** Wednesdays, 7.30pm. 119 Green Lane, Derby. December 16 - Christmas Party, 23rd - Video Show. **Richard Buckby G3VGV** on (0773) 852475.

**Dronfield & DARC.** 1st & 3rd Mondays, 7.30pm. Dronfield Woodhouse Sports & Social Club, 117 Carr Lane (opp. Miners Arms Pub), Dronfield Woodhouse, nr. Sheffield. **Piers Oldham G7HRW** on (0246) 290444.

## Devon

**Appledore & DARC (Devon).** 3rd Mondays, 7.30pm. Appledore Football Clubroom. December 18 - Christmas Party. **Trevor Brookes G0JRZ** on (0237) 477777.

**Torbay ARS.** Fridays, 7.30pm. ECC Social Club, Highweek, Newton Abbot. December 18 - Christmas Party. **Andy Stafford G4VPM** on (0803) 329055.

## Dorset

**South Dorset RS.** 1st Tuesdays, 7.30pm. Wessex Lounge of Weymouth Football Club. December 12 - Christmas Dinner. **Mike Lenzi G7HNY** on (0305) 773860.

## Down

**Bangor & DARS.** 1st Fridays, 8pm. Winston Hotel, Queens Parade, Bangor, Co. Down. January 8 - Quiz

night, followed by a mini talk on Curing TVI part 1, by G13USK & G14JTF. **Des Buckley G13HCP** on (0247) 460251.

## East Sussex

**Hastings Electronics & RC.** 3rd Wednesdays, 7.45pm. West Hill Community Centre, Croft Road, West Hill, Hastings. **G3YYF** on (0424) 830454.

**Southdown ARS.** 1st Mondays, 7.30pm. Main hall of the Chaseley Home for Disabled Ex-Servicemen, South Cliff, Eastbourne. Wednesdays (Morse) & Fridays (Novice & RAE), 7.30pm at the clubrooms, Hailsham Leisure Centre, Vicarage Road, Hailsham. January 4 - AGM. **John Vaughan G3DQY** on (0323) 485704.

## East Yorkshire

**North Ferriby United ARS.** Fridays, 8pm. North Ferriby Utd. FC Social Club, Church Road, North Ferriby, East Yorkshire. December 11 - DIY RTTY by Chris G6KIA, 18th - Christmas natter. **Frank Lee G3YCC** on (0482) 650410.

## Essex

**Braintree & DARS.** 1st & 3rd Mondays, 8pm. Community Centre, Victoria Street, Braintree. December 21 - Cheese & Wine Party, January 4 - G7EIG talk/video on work of the Trinity House lighthouse tenders. **Eddy Scherer, 21 Maysent Avenue, Braintree, Essex CM7 5TZ.**

**Dengie Hundred ARS.** 1st & 3rd Mondays. Henry Samuel Hall, Steeple Road, Mayland, Essex. December 21 - Quiz night with local radio clubs. **Tracey** on (0621) 858185 after 6pm.

## Greater London

**Crystal Palace & DRC.** 3rd Saturdays, 8pm. All Saints Parish Rooms, Beulah Hill, London SE19 (opposite junc. Grange Road). December 19 - Christmas social. **Marino Fiorentini G7HUC** on 081-653 1090.

**Edgware & DRS.** Watling Community Centre, 145 Orange Hill Road, Burnt Oak, 8pm. December 10 - Junk Sale, January 14 - AGM. **Howard Drury G4HMD** on (0923) 822776.

**Loughton & DARS.** Room 12 of Loughton Hall, 7.45pm. December 18 - Directional Aerials For 2m, Ray G0LWF, 31st - Seeing the old year out at the Victoria Tavern, Smarts Lane, Loughton. **Ray Pedley G0LWF** on 081-500 2811.

**Silverthorn RC.** Fridays, 7.30pm. The Chingford Community & Adult Education Centre, Friday Hill House, Simmons Lane, Chingford, London E4 6JH. December 18 - Christmas Party. **Andrew Mowbray G0LWS** on 081-529 4489 between 5.30 & 6.30pm weekdays only.

**Southgate ARC.** Winchmore Hill Cricket Club Pavilion, Firs Lane, Winchmore Hill, London N21. December 10 - AGM. **Brian Shelton G0MEE** on 081-360 2453.

## Gwynedd

**Dragon ARC.** 1st & 3rd Mondays,

7.30pm. Four Crosses Hotel, Menai Bridge. December 21 - Christmas Party, January 4 - Looking Forward To Another Year by Alison GW0NUV. **Tony Rees GW0FMQ** on (0248) 600963.

## Hampshire

**Basingstoke ARC.** 1st Mondays, 7.30pm. Forest Ring Community Centre, Sycamore Way, Winklebury, Basingstoke. December 17 - 144MHz 'The Turkey Settler' foxhunt, OS185, Fox: Alan G8FMH. (0256) 25517.

**Horndean & DARC.** 1st Thursdays, 7.30pm. Horndean Community School, Barton Cross (off Catherington Lane), Horndean, Hants. January 7 - The Portsmouth Repeater GB3PC, John Lewis G3MYI. **Stuart Swain G0FYX** on (0705) 472846.

**Itchen Valley RC.** 2nd & 4th Fridays, 7.30pm. Scout Hut, Brickfield Lane, Chandlers Ford. December 11 - Christmas Party. **Maurice Cheeseman G1IPQ** on (0703) 736784.

**The Submarine ARC.** Thursdays, 7pm. HMS Dolphin, Gosport, Hants. **Mr Talbot G0SBV** on (0703) 898887.

**The Three Counties ARC.** Every other Wednesday, 8pm. Railway Hotel, Liphook Hampshire. December 16 - Quiz night. **Kevin Roche G8GDS** on (0420) 83091.

## Hereford & Worcester

**Bromsgrove & DARC.** Fridays. Avoncroft Arts Centre, South Bromsgrove, Worcester. December 11 - Christmas Party, January 8 - Morse Keys. **Joe Poole G3MRC** on (0562) 710010.

**Woodpecker RG.** Mondays, 8.30pm. Richmond Place Club, Edgar Street, Hereford. **Chris** on (0432) 352441.

## Hertfordshire

**Dacorum AR & TS.** 1st (informal) & 3rd (formal) Tuesdays, 8pm. The Heath Park, Cotterells, Hemel Hempstead. December 15 - Christmas Dinner. **Dennis Boast G1AKX** on (0442) 259620.

**Hoddesdon RC.** Alternate Thursdays, 8pm. Conservative Club, Rye Road, Hoddesdon, Herts. December 10 - Christmas social, January 7 - Social evening. **Roy G4UNL** on 081-804 5643.

**Verulam ARC.** 2nd & 4th Tuesdays, 7.30pm. RAF Association Headquarters, New Kent Road (off Malborough Road), St. Albans, Hertfordshire. 2nd Tuesdays - activity evenings & 4th Tuesdays - main monthly meetings. December 13 - Christmas rally (details in 'Radio Diary'), 15th - AGM. **Walter Craine G3PMF, 5 The Crescent, Abbots Langley, Watford, Hertfordshire WD5 0DR.**

## Humberside

**Bridlington & DARS.** Alternate Thursdays, 7.30pm. Combined Cadet Building at Bridlington Upper School, Bridlington. December 10 - Christmas Dinner, January 7 - Low Profile DX by John G3EZZ. **Norman Bedford G4NJP** on (0262) 673635.

## Kent

**East Kent RS.** 1st & 3rd Thursdays, 7pm. Parkside Youth Centre in Herne Bay. **Matthew Gainsford 2E1AWE** on (0227) 741741.

**Maidstone YMCA ARS.** Fridays, 8pm. YMCA Sports Centre, Melrose Close, Maidstone, Kent. December 11 - Christmas Special, 18th is RAE. **Colin Roberts** on (0622) 670936.

## Lancashire

**Fylde ARS.** 2nd & 4th Thursdays, 7.45pm. South Shore Lawn Tennis Club, Midgeland Road, Blackpool. December 10 - Supper & Social evening. **Eric Fielding G4IHF** on (0253) 726685.

**Hesketh ARC.** Every other Tuesday. Birkdale, Southport. January 5 - HARC Open evening - for anyone interested in communications. **Bernie G7DEM** on (0704) 63344.

**Preston ARS.** December 10 - Christmas Buffet, January 7 - Paddle Keys International by Mr Crowhurst G4ZPY. **Eric Eastwood G1WCQ** on (0772) 686708.

## Lincolnshire

**Grantham RC.** 1st & 3rd Tuesdays, 8pm. Kontak Sports & Social Club, Barrowby Road, Grantham. January 5 - HF Antennas by John G3VXS. **John Kirton G8WWJ** on (0476) 65743.

**Spalding & DARS.** Fridays, 8pm. The Riverside Centre, The Old Fire Station, Double Street, Spalding, Lincolnshire. December 11 - Fitting RF Connectors G3XDA, January 8 - AGM. **David Johnson** on (0778) 425367 (6-7pm).

## Merseyside

**Liverpool & DARS.** Tuesdays, 8pm. Churchill Club, Church Road, Wavertree, Liverpool. December 15 - RSGB, G3AVJ, 22nd - BYOB, 29th - Open night, January 5 - The History Of Liverpool Club by G4CVZ/NARSA arrangements, 12th - Activity night. **Ian Mant G4WWX** on 051-722 1178.

**Wirral & DARC.** Irby Cricket Club, Mill Hill Road, Irby, Wirral, 8pm. December 16 - D&W The Anchor, Irby, January 6 - D&W The Greave Ounung, Greasby, 13th - AGM. **Paul Robinson G0JZP** on 051-648 5892.

## Mid Glamorgan

**Nelson & DARS.** Tuesdays, 7pm. The Basement, rear of the Salvation Army building, Perrott Street, Treharris. **Leighton Smart GWOLBI** on (0443) 411736.

## Norfolk

**Dereham ARC.** 2nd Thursdays, 8pm. St. Johns Ambulance Hall, Yaxham Road, Dereham. December 10 - social evening. **Mark Taylor GOLGJ** on (0362) 691099.

## North Yorkshire

**Hambleton ARS.** West House, Allertonshire School, Northallerton at

7.30pm. **Nigel Robertshaw G0NHM** on (0609) 776608.

## Nottinghamshire

**Mansfield ARS.** Polish Catholic Club, off Windmill Lane, Woodhouse Road, Mansfield. January 7 - Chairman's evening - talk & slide show by Mick G8EHX. **Mary G0NZA** on (0623) 755288.

**Nottingham ARC.** Thursdays, 7.30pm. Sherwood Community Centre, Mansfield Road, Nottingham. December 10 - Quiz, 17th - Christmas Social, January 7 - How To Deal With Elec. Emergencies by Andrew Farrar, British Red Cross, 14th - Morse & The Morse Test by Ron G4NZU. **Ian Miller G4JAE** on (0602) 232604.

**South Notts ARC.** Highbank Community Centre, Farnborough Road, Clifton Estate, Nottingham, or Fairham Community College, Farnborough Road, Clifton Estate. December 11 - Construction, 18th - on air, 20th - Christmas Dinner, January 8 - Talk-in S22/AGM. **Ray G7ENK** on (0602) 841940.

## Oxfordshire

**Oxford & DARS.** 2nd & 4th Thursdays, 7.45pm. British Legion Club, Haddow Road, Crotch Crescent, Marston Road, Oxford. December 10 - Christmas Mince Pie Party. **Terry Hastings G0CFN** on (0865) 863526.

**Prudential ARS** is open to all employees & ex-employees of the Prudential companies. **David Dyer G4DNX** at 'Highbank Cottage', Underhill, Moulsoford, Oxon OX10 9JH.

## Scotland

**Dundee ARC.** Tuesdays, 7pm. College of Further Education, Graham Street, Dundee. December 15 - Question & Answer evening, January 5 - Construction night, 12th - Working DX On The VHF Bands by Allan Duncan GM4ZUK. **George Millar GM4FSB, 30 Albert Crescent, Newport-on-Tay, Fife DD6 8DT.**

## Somerset

**Taunton & DARC.** 1st & 3rd Fridays, 7.30pm. The Basement, County Hall, The Crescent, Taunton. Other Fridays informally for station operation, Morse code class, natter. January - 8 - The Early Days of Airborne Radar by Doug Hall G5JJ. **Mr Lindsay-Smith G3WNI** on (0823) 680778.

**Yeovil ARC.** Thursdays. Red Cross HQ, Grove Avenue, Yeovil, Somerset. December 10 - This Is Packet Radio by G7KBE, 17th - Mince Pies & RF, 29th - Club Quiz & Operating Club Station, January 7 - talk on clubs '2m Linear' by G3FQO & committee meeting, 14th - Introduction to Club Project Transmitter Board G3MYM. **Cedric White G4JBL** on (0258) 73845.

## South Yorkshire

**Barnsley & DARC.** Mondays. Radio club room & shack, at the rear of the Oarton Hotel, Station Road, Oarton, Barnsley. December 14 - Junk Sale, 21st - proposed talk, January 4 - on the air night. **Ernie G4LUE** on (0226) 716339.

## Suffolk

**Sudbury & DARC.** 1st Tuesdays, 8pm. Five Bells Inn, Great Cornard, Sudbury, Suffolk. January 5 - club night with raffle. **Colin Muddimer G0PAO** on (0787) 77004.

## Surrey

**Surrey RCC.** Terra Nova' The Waldrons, Waddon, Croyden, Surrey. December 21 - Christmas Natter night. **Berni G8TB** on 081-660 7517.

**Sutton & Cheam RS.** 3rd Thursdays, 7.30pm. Sutton United Football Club, The Borough Sports Ground, Gander Green Lane, Sutton, Surrey. Natter nights - 1st Thursdays. December 17 - Christmas Buffet & Get-together, January 5 - committee meeting, 7th - natter night, 10th - 3.5MHz AFS Contest (CW). **John Puttock G0BWW, 53 Alexandra Avenue, Sutton SM1 2PA.**

**The Kingston & DARS.** 3rd Wednesdays, 8pm. Alfriston, 3 Berrylands Road, Surrey KT5 8RB. December 16 - Christmas Special (film or talk). **Ray Fuller** on 081-398 1128.

**Wimbledon & DARS.** 2nd & last Fridays. St. Andrews Church Hall, Herbert Road, Wimbledon SW19. December 11 - Christmas social. **Chris Frost G0KEB** on 081-397 0427.

## Warwickshire

**Stratford-Upon-Avon & DRS.** 2nd & 4th Mondays, 7.30pm. Home Guard Club, Main Road, Tiddington, Stratford-Upon-Avon, Warwickshire. December 14 - Aeronautic Electronics by Nick Feakes G0NKY, 25th - Christmas Morning Greetings on the air, 11am, 145.275MHz, January 11 - New Year social. **Alan Beasley G0CXJ** on (0608) 82495.

## West Midlands

**Coventry ARS.** Fridays, 8pm. Baden Powell House, 121 St. Nicholas Street, Radford, Coventry. December 11 - NQTA & Morse Tuition/Novice Licence Class, 18th - social evening. **David G1ORG** on (0203) 311468.

**Solihull ARS.** 3rd Thursdays. The Shirley Centre, 274 Stratford Road, Shirley, Solihull, West Midlands. December 17 - Christmas social. **Colin Taylor G3USA** on 021-777 9965 evenings or (0827) 53344 daytime.

## West Sussex

**Mid-Sussex ARS.** Thursdays, 7.45pm. Marle Place Further Education Centre, Leylands Road, Burgess Hill, West Sussex. December 11 - Grand Christmas Dinner. **Chris Coward G3YTU** on (0444) 458992.

## West Yorkshire

**Bradford ARS.** 2nd & 4th Thursdays, 8pm. Polish Ex-Service Club, Shearbridge Road, Bradford, West Yorkshire. **Charles Bolt G0ACX** on (0247) 494694.

**Denby Dale & DARS.** Pie Hall, Oenby Dale, nr. Huddersfield, 8pm. **Ivan Lee, Clayton Lodge, Sunnyside, Edgerton, Huddersfield HD3 3AD.**

**Halifax & DARS.** 1st & 3rd Tuesdays, 7.30pm. Running Man Public House, Pellon Lane, Halifax. December 15 - Christmas social. **David Moss G0DLM** on (0422) 202306.

**Keighley ARS.** The Ingrow Cricket Club, Ingrow, Keighley, 8pm. December 10 - natter night, 17th - Christmas Buffet, January 7 - natter night, 14th - Mountain Rescue - Search Dogs by Neville Sharp. **Kathy Conlon G0RLO** on (0274) 496222.

**North Wakefield RC.** Thursdays. The White Horse PH, Fall Ings Lane, East Ardsley, nr. Wakefield. Morse starts 7.30pm, with Novice class Fridays. **John Hoban G0EVT** on (0924) 825443.

**Otley ARS.** Tuesdays, 8pm. Shack at the rear of the RAOB Club, Westgate, Otley, West Yorkshire. **Jack Worsnop G7DFC** on (0274) 636197.

**Pontefract & DARS.** Morse on Mondays, Novice on Tuesdays, normal meetings on Thursdays. Carleton Community Centre, Carleton, nr. Pontefract, 8pm. **Colin Wilkinson** on (0977) 677006.

**Spen Valley ARS.** Thursdays, 8pm. Old Bank Working Men's Club, Mirfield. Alternate Thursdays - 'Noggin & Natter nights'. **Ian Barraclough G7DWY** on (0484) 716453, early evening.

**Wakefield & DRS.** Tuesdays, 8pm. First Floor Rooms, Ossett Community Centre, Prospect Road, Ossett. December 15 - RSGB Video, 22nd - night on the air, January 5 - Construction evening. **Dave Ackrill G0DJJ** on (0924) 240577.

**White Rose ARC.** Wednesdays, 8pm. Moortown RUFC, Moss Valley, King Lane, Leeds. **Mrs Betty Cappelluto** on (0532) 555488.

## Wiltshire

**Chippenham & DARC.** Thursdays, 7.30pm. Sea Cadets HQ, Long Close, Chippenham. **Barry Winslow G0LJA** on (0225) 706265.

**Trowbridge & DARC.** 1st & 3rd Wednesdays, 8pm. Southwick Village Hall, 8pm. January 6 - AGM. **Ian G0GRI** on (0225) 864698.

NEWS club



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TEN-3	.....10m 3 element Beam
A4S	.....20-15-10m 4 element Beam
A3S	.....20-15-10m 3 element Beam
A3WS	.....17-12m 3 element Beam
D40	.....40m Rotary Dipole
D4	.....40-20-15-10m Dipole
D3	.....20-15-10m Dipole
D3W	.....30-17-12m Dipole
R7	.....40-10m H/W Vertical
R5	.....20-10m H/W Vertical
AP8	.....80-10m Vertical
AV5	.....5 Band HF Vertical
AV3	.....20-15-10m Vertical
A50-6S	.....6m 6 element Beam
A50-5S	.....6m 5 element Beam
A50-3S	.....6m 3 element Beam
AR-6	.....6m Ringo Vertical
17B2	.....2m 17 element Beam
13B2	.....2m 13 element Beam
124WB	.....2m 4 element Beam
A144-7	.....2m 7 element Beam
A144-11	.....2m 11 element Beam
A144-20T	.....2m 10 element X Oscar
AR-2	.....2m Ringo Vertical
ARX-2B	.....2m Ringo Ranger II
AR-270	.....2m/70cm Vertical
424-B	.....70cm 24 element Beam
A430-11	.....70cm 11 element Beam
416TB	.....70cm 8 element X Oscar
ARX450B	.....70cm Ringo Ranger II

## MIRAGE/KLM

COMMUNICATIONS EQUIPMENT

40M-2	.....40m 2 element Beam
20M-4	.....20m 4 element Beam
15M-4	.....15m 4 element Beam
10M-4	.....10m 4 element Beam
KT34-A	.....20-15-10m 4 element Beam
KT34-XA	.....20-15-10m 6 element Beam
6M-7LD	.....6m 7 element Beam
6M-5	.....6m 5 element Beam
2M-20LBX	.....2m 20 element Beam
2M-16LBX	.....2m 16 element Beam
2M-13LBA	.....2m 13 element Beam
2M-22C	.....2m 11 element X Oscar
2M-14C	.....2m 7 element X Oscar
432-30LBX	.....70cm 30 element Beam
432-20LBX	.....70cm 20 element Beam
435-40CX	.....70cm 20 element X Oscar
435-18C	.....70cm 9 element X Oscar

### LINEAR AMPLIFIERS

A1015G	.....6m 10-150w g/f rx
B3030G	.....2m 30-300w g/f rx
B3016G	.....2m 30-160w g/f rx
B1016G	.....2m 10-160w g/f rx
B108G	.....2m 10-80w g/f rx
B215G	.....2m 2-150w g/f rx
D3030N	.....70cm 30w-100w
D1010N	.....70cm 10w-100w
D15N	.....70cm 2w-20w

### GASFET PRE-AMPLIFIERS

KP-1/2M	.....2m Indoor unit
KP-1/70	.....70cm Indoor unit
KP-2/2M	.....2m Masthead unit
KP-2/70	.....70cm Masthead unit

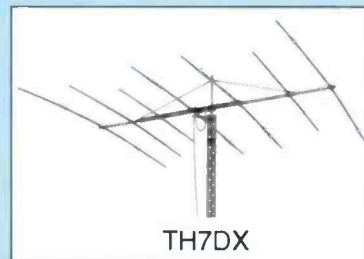
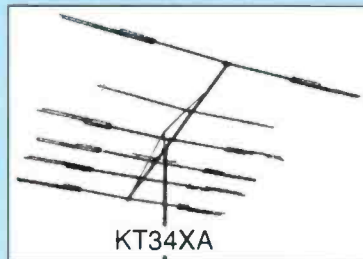
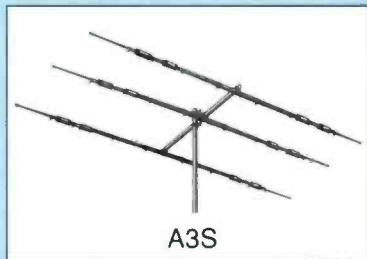
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7-1	.....40m Rotatable Dipole
205CA	.....20m 5 element Beam
204BAS	.....20m 4 element Beam
203BAS	.....20m 3 element Beam
155CA	.....15m 5 element Beam
153BAS	.....15m 3 element Beam
105BAS	.....10m 5 element Beam
103BAS	.....10m 3 element Beam
TH7DXS	.....20-15-10m 7 element Beam
TH5MK2S	.....20-15-10m 5 element Beam
EXP14	.....20-15-10m 4 element Beam
TH3JRS	.....20-15-10m 3 element Beam
TH2MK3S	.....20-15-10m 2 element Beam
DX88	.....8 Band HF Vertical
12AVQS	.....20-15-10m Vertical
14AVQ	.....40-10m Vertical
18VS	.....80-10m Vertical
66DX	.....6m 6 element Beam
64DX	.....6m 4 element Beam
215DX	.....2m 15 element Beam
216SAT	.....2m 8 element X Oscar
7031DX	.....70cm 31 element Beam
7030SAT	.....70cm 15 element X Oscar

### ROTATORS

T2X	.....Windload 1.9m <sup>2</sup>
HAM IV	.....Windload 1.4m <sup>2</sup>
CD45 II	.....Windload 0.79m <sup>2</sup>
AR40	.....Windload 0.28m <sup>2</sup>

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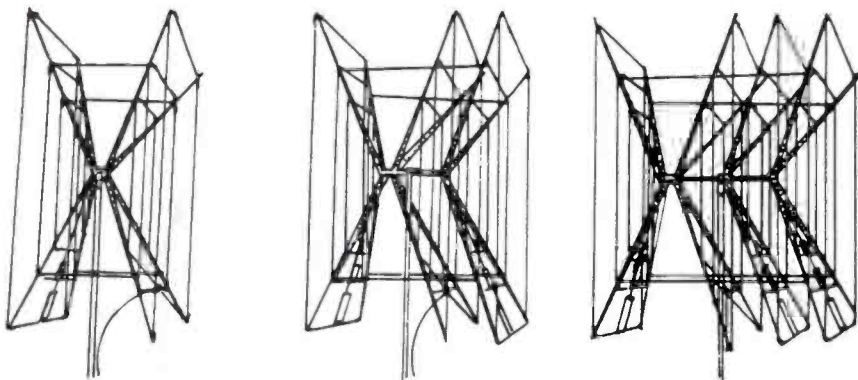
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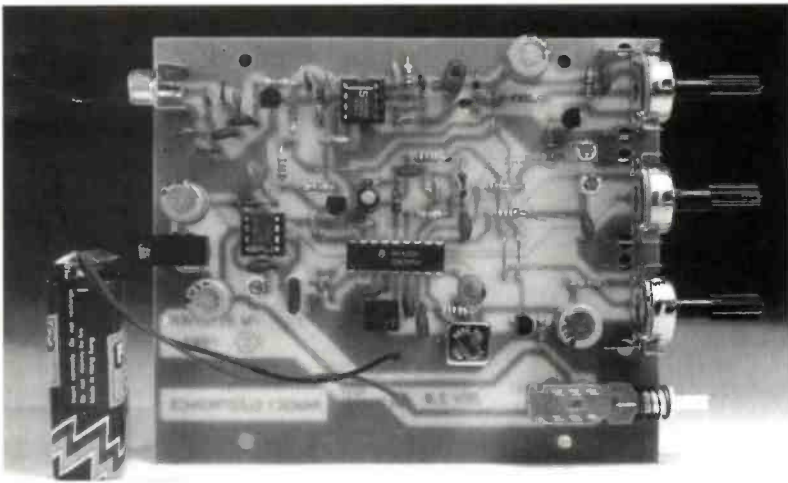
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# The Ramsey FR-146 Receiver Kit

In spite of its small size, the Ramsey FR-146 receiver is capable of good performance.



*When the opportunity came to try out a Ramsey FR-146 144MHz receiver kit, direct from America, our technical sub-editor, Tex GITEX, jumped at the chance. Here's what he thought.....*

# Review

Whenever possible I try not to miss an opportunity to try out any kit that is available. I'd come across Ramsey Kits before, but it was the first time I had seen this particular project.

## Adventurous Beginner

Ramsey kits are aimed at what I would call an adventurous beginner. They come with full instructions that almost anyone who can identify components can put together. But, and here's the great **but**, they are manufactured so that anyone with an ability to read a circuit diagram, and component values, can be successful.

The kit comes complete with a small (A5) sized, well-written booklet that contains the circuit diagram and circuit board overlay. Also included are hints and tips on good soldering and building methods, and step-by-step instructions on assembly.

Each step has its own space to tick, with a pen or pencil, when you've completed this step. You may say 'well I don't need that!'

Despite this the tick system could help you. This is because I've lost count of the number of times I've been disturbed during a project, then returned to the job and put the wrong component onto the p.c.b.

## Pleasant Assembly

But enough of this rambling, what was the kit like to assemble? The short answer to that question is, pleasant. All the parts supplied, were all good quality components.

With the exception of one coil, I had no problems at all. However, The one coil that I was less than happy about, was the first local oscillator (l.o.) coil. This is a narrow, tall former that seems to be less than mechanically stable on the board.

Mechanical stability is one of the worst causes of drift in v.h.f. oscillators. The problem oscillator coil was rather mobile on the p.c.b. It wasn't that it didn't fit, just that it had projections on the base that allowed it to move around.

The movement, coupled with what I considered to be an over-long former, could lead to instability in some cases. The second cause of oscillator drift is the variable capacity diode (varicap diode).

The capacitance of a varicap diode changes, not only with reverse voltage, but also with ambient temperature. To overcome these sources of instability, a small amount of automatic frequency control (a.f.c.) is applied to the first l.o. causing it to move back onto the right frequency if either the transmitter or the l.o. change frequency. This is the reason that the l.o. works on the high side of the

input signal.

These days, with synthesised transmitters, there is little to worry about. But with this relatively simple l.o. there is a distinct chance of drift. Hence a very welcome a.f.c. loop.

The circuit can be described in simple terms. The receiver consists of a transistor r.f. amplifier (135-175MHz) following a very simple low-pass filter. This feeds an NE602 i.c. working as a mixer/oscillator (the oscillator is 10.7MHz higher than the wanted signal) followed by a simple transistor (10.7MHz) i.f. amplifier.

The latter stage feeds a MC3359 type mixer/oscillator f.m. demodulator chip. There is only the minimum of i.f. tuning necessary, as ceramic resonators are used throughout.

## Simple To Align

It's a simple set to build, simple to align, and it's simple to work. I changed the tuning potentiometer for a multi-turn device to give easier frequency setting. The first l.o. coil was changed for a Toko S18 two and a half turn (red) with a ferrite core. This improved stability and made tuning slightly easier.

To change the overall frequency range would require a little more work. The two coils in the input low-pass filter and the l.o. coil would have to be changed to something more appropriate, and a little more experimentation would be required.

I could, with just a few modifications, make this the basis of a multi-band f.m. receiver....

I could also make it into a scanning receiver in any of those bands, stopping on any signal encountered... I could use it as the receiver side of a radio microphone that my son is asking for... I could use it on the output of my 1296MHz transverter to monitor the activity on that band.... The list is almost endless.

## Conclusions

The Ramsey FR-146 kit is a good cheap starter receiver kit. It's reasonably sensitive and there are other kits available covering other bands. However, it is comparatively easy to change the received frequency of any of these kits. With a little thought and experimenting, it can be made to do many things, and become the basis of a system.

The Ramsey Kit FR-146, costing £26.95 plus £1.50 p&p, is available from Waters & Stanton of 22 Main Road, Hockley, Essex SS5 4QS. Tel: (0702) 206835/204965.

PW

# WHAT A GOOD IDEA



## Tuned Traps

This idea came about after one of the traps in my antenna became faulty. I had extreme difficulty finding, at a reasonable price, high voltage capacitors to make up a new trap. Looking through the junk box, an idea was triggered by the sight of double-sided p.c.b. material.

The idea, although not new, was to use this p.c.b. material as both capacitor and former for the coils forming the trap. A piece of double-sided p.c.b. material, some 62mm by 50mm, had a capacitance of about 70pF. Using two pieces in a cruciform arrangement, and with the copper trimmed back from all the edges, I thought that I should be able to get a suitable coil (about 4.5µH) to resonate on 7.05MHz.

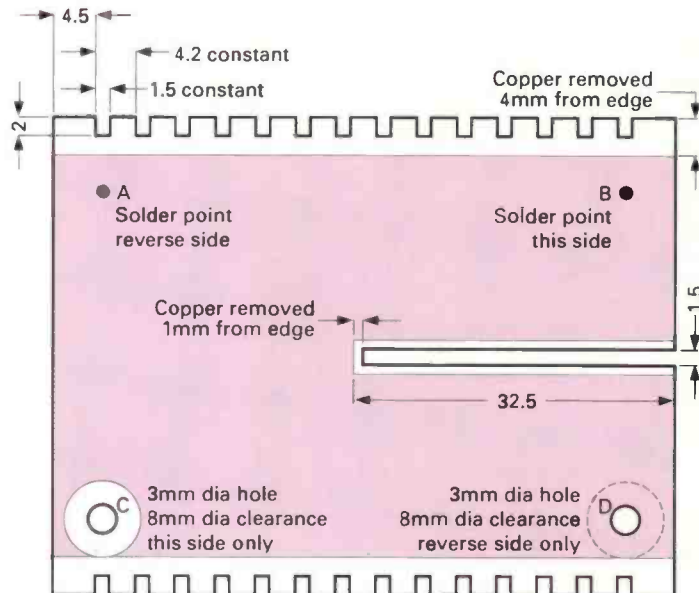
## Almost Any Wire

After some calculations I arrived at 11.5 turns of wire in a 50mm length. I had some 2.5mm diameter wire in the junk box which I used. You can use almost any wire with a thickness greater than about 1mm, but the thicker the better.

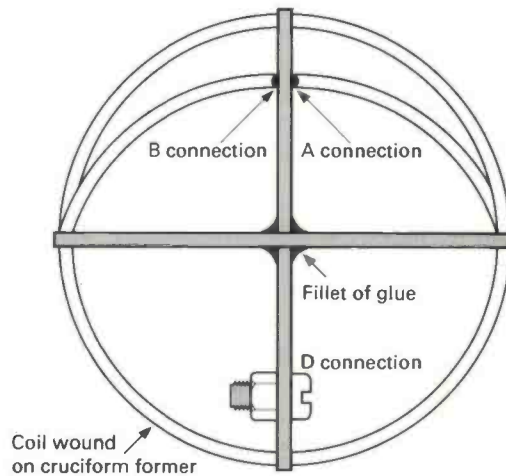
All that's really left is to tune the traps to 7.05MHz, using whatever method you find easiest. I use the method using a receiver, outlined in the ARRL *Radio Handbook*, as it's more accurate than using a g.d.o.

If the resonant frequency is too high, try squeezing the coil turns together. Or if too low in frequency, try carefully trimming a little more copper from one of the formers. Or spreading the coil turns a little more apart.

**M. Schofield G4WUP**  
Broadstairs  
Kent



**Fig. 1: Use two interlocked pieces of p.c.b. material, made to this general shape, to form the 'capacitors' of the tuned trap. The resulting cross shape becomes the former for the coil.**



**Fig. 2: Looking 'end-on' to the cross, showing the various connections made in making the trap.**

## Cheaper Battery Pack

I, like many amateurs, own a Yaesu hand-held transceiver. These are fine until that fateful day you discover that the battery pack won't hold its charge any more. Faced with this problem, but unable to afford a new battery pack (FNB-10 7.2V 600mAh), I searched for a way out of my predicament.

Turning the problem over in my mind and the battery pack in my hand, I noticed that there are slots on the battery pack. Being inquisitive I inserted a small coin into one of these slots and twisted. With small popping sounds the spots of glue, holding both halves together, parted. Repeating this treatment on the other slot, I was amazed to find standard-size rechargeable cells inside.

Carefully extracting the cells and wiring, I replaced the cells with new ones. These new cells cost only about £1 each at rallies, and are cheap compared to the original component.

Finding a suitable glue to hold the two halves of the battery pack together was rather more difficult. In the end I settled for using black insulating tape wound around the case. It doesn't look very pretty, but as I use the hand-held in a soft pouch, who's to notice? And it was cheaper.

**Harry Wagg G6RYM**  
Rock Ferry  
Cheshire



# Antenna

**In his introductory article as the new Practical Wireless antenna specialist, Peter Dodd G3LDO takes a look at the diode voltmeter, the heart of the r.f. measuring instrument.**

The most important part of many items of test equipment used for measurements at r.f. is the diode voltmeter. It's used in s.w.r. meters, r.f. power meters and field strength meters to name but a few.

The diode voltmeter is simplicity itself, comprising a diode, resistor, capacitor and a d.c. meter. However, like many apparently simple things, there's more to it than meets the eye!

## Field Strength Meter

The principle of the diode voltmeter is best shown by its use in the diode field strength meter (f.s.m.), as in Fig. 1. In practice, the diode f.s.m. comprises a tuned circuit followed by a diode voltmeter.

The voltmeter, under ideal circumstances, is able to measure half the peak-to-peak voltage of the r.f. waveform. This is developed across the tuned circuit when an r.f. signal is input to the antenna socket.



Peter Dodd G3LDO

## Three Aspects

There are three aspects of the diode voltmeter, which affects the way it measures an r.f. waveform. The first is the voltage/current characteristics of the diode.

The second aspect is the choice of filter components between the diode and the voltmeter. The third is the resistive value of the voltmeter.

The diode conducts on the

positive half cycles of the r.f. waveform, as shown in Fig. 2. The current through the diode (shown shaded), charges the capacitor C1. During the non-conducting phase, C1 discharges through R1 and the meter.

Provided the time constant of C1 and R1 is large, compared with the r.f. waveform frequency, then the degree of discharge will be small. The difference between the true

peak value and the measured value will then be insignificant.

In my article 'Experimenting With Beam Antennas In The Back Garden' (PW September), I described some experiments that could be done using v.h.f. models of h.f. beam antennas.

The most important item of test equipment used in the experiments was a diode f.s.m., similar to that shown in Fig. 1. It enabled me to measure the r.f. field strength on a meter as the antenna was rotated.

## Reasonably Sensitive

A f.s.m. needs to be reasonably sensitive. It should also have a linear response, i.e. the d.c. voltmeter reading should be directly proportional to the r.f. peak-to-peak waveform. The current/voltage characteristic of the resistor is a straight line. This indicates that it's linear, i.e. the current through the resistor is proportional to the voltage across it, and Ohm's Law applies, i.e.  $I = V/R$

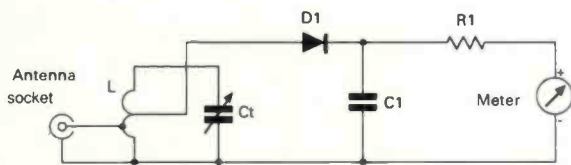


Fig. 1: Circuit of a diode field strength meter or f.s.m. (see text).

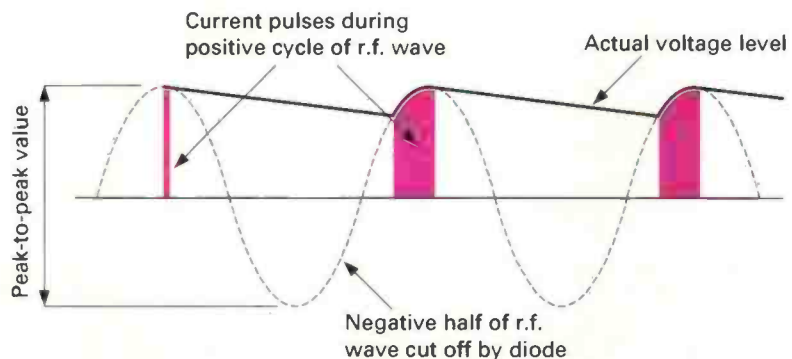


Fig. 2: The current and voltage waveforms in the diode voltmeter, as they appear when measuring an r.f. signal.

# Workshop

However, in the direction of conduction, the characteristic of the diode is decidedly non-linear. This is particularly so when the voltage level is small.

In any practical application, the diode is in series with a resistive load, usually a meter. Under these circumstances the characteristic is a composite of the diode and resistive load, as in Fig. 3.

## Resistive Component

As the resistive component is increased the steepness, or gradient, of the slope is reduced. This shows that the circuit is less sensitive.

You can now see that sensitivity and linearity of the f.s.m., is dependent on the resistance and sensitivity of the meter. A digital voltmeter (d.v.m.) is preferable in this application for two reasons.

Reason number one, is that the higher input impedance of the digital meter results in a more linear and sensitive instrument. The other reason, is that the input impedance is the same for all d.v.m. ranges, so that the characteristics of the diode are not changed if the range is changed.

The observable resolution and range of the digital voltmeter is

greater than the analogue type making it easier to record the test results.

## Germanium Diode

Although the point contact germanium diode gives good linearity, provided the load resistance is high enough, it's difficult to find. Unfortunately, this type does not appear on the list of diodes in many manufacturers catalogues these days. For this reason I investigated the properties of other diodes.

I tried three different types of diode for a f.s.m. to be used at v.h.f. They were germanium, silicon (signal types) and Schottky barrier (the latter also sometimes known as hot carrier diode).

## Characteristics

The illustration, Fig. 4, shows two sets of characteristics of the diode f.s.m. The first set of characteristics was produced using a 50 $\mu$ A(600mV) analogue meter.

The second set was produced using a digital voltmeter as the field strength indicator.

The characteristics of a BAT85 diode, although not shown, are

similar to that of the germanium diode.

## Construction Simple

Constructing a diode f.s.m. is so simple, that providing construction notes seem superfluous. However, the following points may be of some help.

The size and shape of the enclosure, is unimportant, but it should be made of metal. This is to prevent r.f. energy from entering the tuned circuit, by any path other than the pick-up antenna.

The capacitor value is not critical. The f.s.m. I have in current use, employs a two-gang type (although I only use one gang) air-spaced variable.

The variable capacitor was of unknown capacity, removed from an old transistor receiver. It has a built-in slow-motion drive, which is an added bonus.

## Coil Dimensions

The coil dimensions for the diode f.s.m., depends on the frequency range you want to cover. I make most measurements at v.h.f. (144-146MHz).

The inductor is 20mm in

diameter and 15mm long. It comprises two turns (self supporting) of 18s.w.g. wire, with the antenna tapped one third of a turn from the earthed end.

I would suggest that you make coils of solid tinned copper wire where possible. This enables you to find the optimum tapping point for both the diode and the antenna connector, to get the greatest sensitivity.

It's worthwhile taking a little time finding the best tapping point. For example, the Schottky barrier signal diode BAT85 operates more efficiently in this circuit, if it's tapped well down the coil.

So, that's it for this time. I'm looking forward to doing regular antenna construction articles, and reviews of commercially-made antennas and related equipment.

I'll always be interested to hear what readers would like to see in *PW*. Your letters are always welcome and you can write to me at 37 The Ridings, East Preston, West Sussex BN16 2TW.

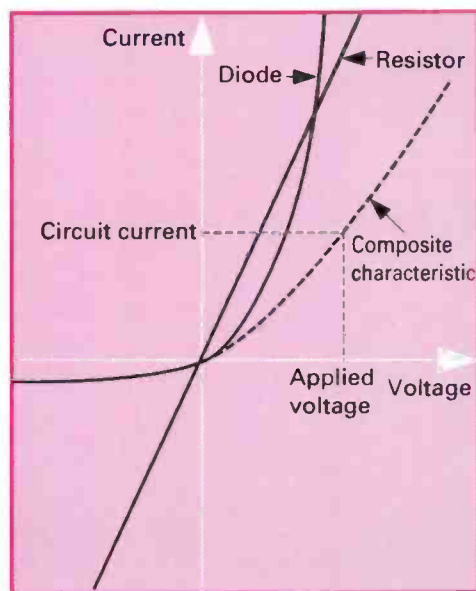
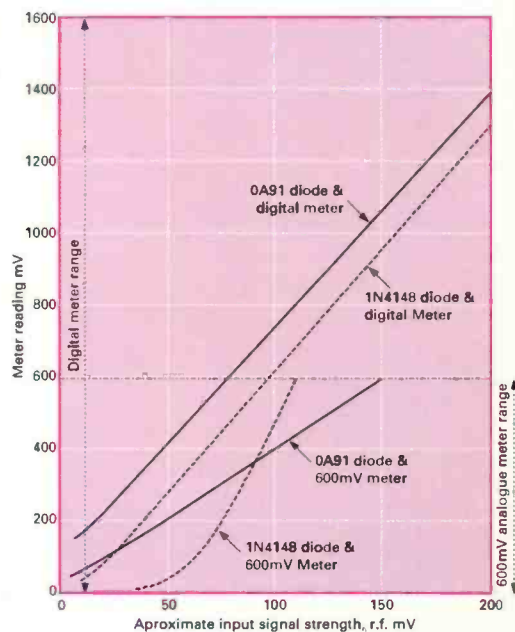


Fig. 3: Composite characteristics of a diode and a resistor.

Fig. 4: Graph showing approximate input signal strength, r.f. mV, using a diode and digital meter, and a diode used with an analogue meter.





# KIT SUPPLIERS S

**Badger Boards** of Sutton Coldfield started, as the name suggests, as p.c.b. manufacturers. They have now branched out into supplying kits of all levels from simple audio oscillators to more complex ones, such as a spectrum analyser.

For more information, send an A5-sized s.a.e. to **Badger Boards, 87 Blackberry Lane, Four Oaks, Sutton Coldfield B74 4JF. Tel: 021-353 9326.**

**Brian Jordan G4EWJ** is just starting out as a kit supplier, and he has every intention of being successful. As this list was being compiled, a well presented Morse tutor kit, Brian's first, arrived on the editorial desk. This kit, with an impressive specification, is the first of a line of kits to be introduced now and in the near future.

The MTR1 Morse tutor kit costs £31.50 from **Brian Jordan G4EWJ, 42 Ben Nevis Road, Birkenhead L42 6QY. Tel/FAX 051-643 8506.**

**Cedar Electronics** can support and supply spares for the Heathkit series of high quality educational kits. They may be contacted at **12 Isbourne Way, Broadway Road, Winchcombe, Cheltenham, Glos. GL45 5NS. Tel: (0242) 602402.**

**Circuit Distribution Ltd.** make their catalogue available through high street newsagents. Their winter 1992/93 catalogue has a large section on 'Kits and Modules'.

Many varied items may be found here, including antenna tuning units, r.f. power amplifiers and pre-amplifiers, along with h.f. transceivers. For more information and their catalogue, contact **Circuit Distribution Ltd. Park Lane, Broxbourne, Herts EN10 7NQ. Tel: (0992) 444111 or FAX (0992) 464457.**

**C. M. Howes Communications** supply kits of high quality, covering almost all aspects of the hobby. They can supply active antennas for both h.f.

and v.h.f. /u. h.f. A variety of h.f. transceivers can be built up from the various kits on offer. If you like the idea of a kit, but are unable to build one, then the p.c.b. s can be supplied ready-built.

For more information, send an A5-sized s.a.e. to **C. M. Howes Communications, Eydon, Daventry NN11 6PT.**

**Coltec Electronics** produce a series of kits from oscillators to wavemeters, and iambic keyers to power supplies. All of the kits are contained in an A5-sized catalogue, which is available from them at **330 Brays Road, Sheldon, Birmingham B26 2PS. Tel: 021-722 2429 or 021-628 7839.**

**F. G. Rylands** can supply **plans only** for many types of radio-related projects, although many of the plans concentrate on receiving loop antennas for various bands.

For more information about the plans that can be supplied, contact **F. G. Rylands, 39 Parkside Avenue, Millbrook, Southampton SO1 9AF. Tel: (0703) 775064.**

**Greenweld Electronics** of Southampton, have been in the business of supplying components for many years. In their latest catalogue, which costs £2, there is a small section listing the kits available. Only a few of these kits are radio related, many of the kits are novelties, that might make simple presents.

For more

information, contact **Greenweld Electronics, 27 Park Road, Southampton SO1 3TB. Tel: (0703) 236363 or FAX (0703) 236307.**

**H. Corrigan** can supply small radio related kits. Do you fancy fitting a beat frequency oscillator (b.f.o.) to your radio? If so, he may be able to supply one to suit. For more information, contact **H. Corrigan, 7 York Street, Ayr KA8 8AR.**

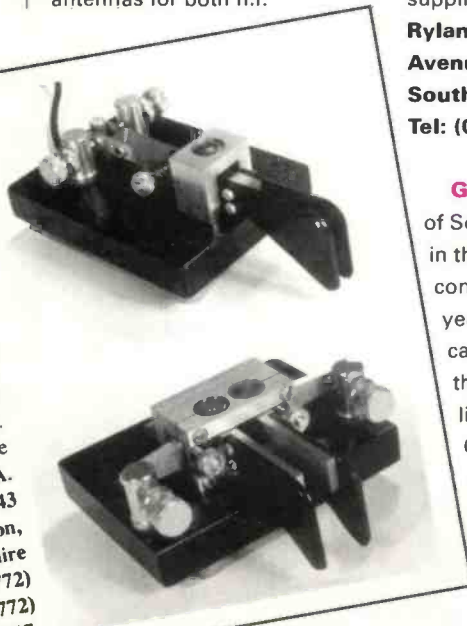
**Hands Electronics** are, at present, not large suppliers of kits, but they intend to change this before very long. They have assembled a good range of kits, covering receivers to test gear. They even have some kits suitable for valved projects.

Their catalogue is available from **Hands Electronics, Tegryn, Llanfyrnach, Dyfed SA35 0BL. Tel: (0239) 77427.**

**J. A. B. Electronics Components** are more normally noted for supplying components for projects, rather than kits. But all that is changing. In their comprehensive A4-sized catalogue, three pages are devoted to the various kits that they can supply. Most of the names found here, are well-known projects from *PW* and other magazines. Kits are being added to the list all the time.

For a copy of their catalogue, send £1.25 to **JAB Electronic Components, 1180 Aldridge Road, Great Barr, Birmingham B44 8PB. Tel: 021-366 6928 or FAX 021-366 6237.**

**Kent Keys.** Not every kit for the radio enthusiast has to be electronic. There are some kits which fall naturally into this area, even though these kits are mechanical. One series that certainly fits into the amateur radio area, is a range of Morse key kits. These kits are superbly engineered and may be assembled in an evening. More details are available from **R. A. Kent (Engineers), 243 Carr Lane, Tarleton, Preston, Lancashire PR4 6YB. Tel: (0772) 814998 or FAX (0772) 815437.**



# HOWCASE

**Jandek** can be found at rallies throughout the year. Kits and components nestle side by side on their stall. The kits cover most of the sections of an h.f. transceiver. In fact, the various kits can be built up into a versatile QRP rig covering almost any h.f. band.

For their short-form catalogue, send a medium to large s.a.e. to **Jandek, 6 Fellows Avenue, Kingswinford, West Midlands DY6 9ET. Tel: (0384) 288900.**

**Kanga Products** kits are well-known to all members of the G-QRP club. Dick Pascoe GOBPS, is extremely supportive of all of the ideas and circuits that have appeared in *Sprat* magazine. Kits such as 'OXO' and 'Oner' are of the simpler variety, but more complex kits are available. Send a medium s.a.e. to **Kanga Products, 3 Limes Street, Folkestone, Kent CT19 4AU. Tel: (0303) 276171.**

**Lake Electronics** The Lake DTR series of c.w. transceivers, well-known by QRP operators and attendees of rallies, are available for the 1.8, 3.5 and 7MHz bands. These are not the only kits that can be supplied. There are antenna tuning units, filters, as well as power and s.w.r. meter kits to choose from, in their A5-sized catalogue. The catalogue contains details of the quality kits supplied.

For a copy of their catalogue, send an A5-sized s.a.e. to **Lake Electronics, 7 Middleton Close, Nuthall, Nottingham NG16 1BX. Tel: (0602) 382509.**

**Mainline Electronics** are suppliers of almost any r. f. component you care to mention. They can also supply a series of kits, covering h.f. to microwaves. Do you fancy a (under-run of course) 1kW h.f. amplifier, or perhaps a 2.3GHz transverter? If so, Mainline have something for you in their catalogue.

For a copy of their A4-sized catalogue, contact **Mainline Electronics, PO Box 235, Leicester LE2 9SH. Tel: (0533) 777648/780891 or FAX (0533) 477551.**

**Marco Trading** may be found at the larger rallies, with their stock spread over many tables. In their catalogue, they have a section devoted to the many kits they can supply. Among the kits are radio receivers, for short wave and v.h.f., and test oscillators. A shortened winter supplement, including a small section on kits, was available in the December '92 issue of *PW*.

For a copy of their full catalogue, contact **Marco Trading, The Malting, High Street, Wem, Shrewsbury SY4 5EN. Tel: (0939) 232763 or FAX (0939) 233800.**

**Spectrum Communications** Would you like to build your own transmitter or transverter? Spectrum Communications supply kits of parts to produce various transverters and linear amplifiers. These, and their range of pre-amplifiers, may be seen at their shop at 60 Park Street, Weymouth, Dorset. For a free catalogue, contact **Spectrum Communications, Unit 4, Grove Trading**



**Maplin Electronics** catalogue is available, priced £2.95, through branches of W. H. Smith (£3.45 mail order) or from Maplin shops. A large section of this catalogue is given over to 'Kits and Modules', featuring illustrations and descriptions of the many kits they can supply. For more details, contact **Maplin Electronics, PO Box 3, Rayleigh, Essex SS6 8LR.**

**Estate, Dorchester. Tel: (0305) 262250.**

**Tandy** This high street shop is better known for things electronic, computing or audio, rather than kits. But, they supply a range of electronic starter kits which may be used to make up electronic circuits and radios. These kits range in price, from about £5 to £35. Look in your local telephone book for the local Tandy shop. If you are unable to find your local Tandy store, contact **InterTAN UK Ltd., Tandy Centre, Leamore Lane, Walsall, West Midlands. Tel: (0992) 710000.**

**Waters & Stanton** now supply Ramsey kits, which are a series of transceivers and receivers for h.f. and v.h.f. See this issue for a review of the Ramsey FR-146 receiver kit. The kits can be simple, as in the h.f. receivers, or more complex, as in the 144MHz synthesised transceiver kit reviewed in the January '92 issue of *PW*. **Waters and Stanton, 22 Main Road, Hockley, Essex SS5 4QS. Tel: (0702) 206835 or FAX (0702) 205843.**

## Reading On Kits And Construction

There are several books available to help the kit-builder. For example, if you're relatively new to the radio hobby, **A Beginner's Guide To Modern Electronic Components**, by the well-known author R. A. Penfold, could prove very useful indeed. Published by Babani, the book covers a wide range of modern components, their basic function and how to decipher colour codes and numbers. Importantly, for the beginner, it doesn't assume any knowledge of electronics. Available from the *PW* Book service at £3.95 plus £1 p&p.

Another book of interest to both the relatively new and the more experienced constructor, is **Practical Ideas For Radio Amateurs** by Ian Poole G3YWX. Published by Argus Books, this useful little book is written by well known amateur radio author Ian Poole, packed with constructional ideas, tips, component identification, how to use components, circuits, testing, and general reference. Available from the *PW* Book Service for £4.50 plus £1 p&p (limited number only). Write to **PW Publishing Ltd. FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP.**



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Shortly available BNC's and PL259's to fit the FB Cable.

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- Large graduated control knobs (1-9 indicator)..... **£3.57**



# BOXING IT UP

## PART 2

Last month, I concentrated on working with plastics materials. This is because I consider that plastics are a very useful alternative nowadays. Despite this, metal boxes and cabinets are still very popular.

Suitable metals are mild steel sheet or aluminium sheet. Both can be obtained quite cheaply as off-cuts either directly from metal-working companies, or local scrap dealers.

Be careful when buying, not to buy too thick a material. The metal may be sold by weight and it could end up being more difficult to work.

### STAINLESS STEEL

Take my advice, and look out for metals such as stainless steel. They look fine until you come to work them, and then you realise their shortcomings for the home-constructor.

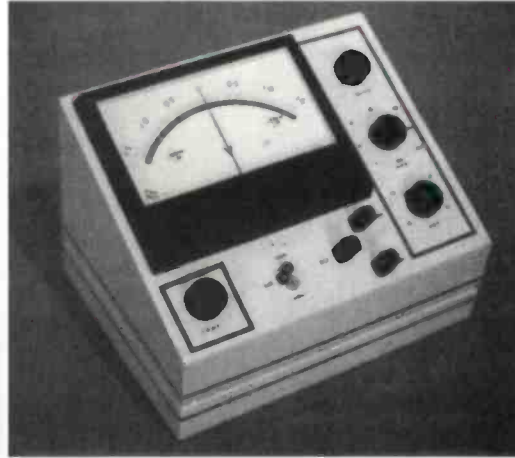
Material thicknesses of 0.75mm or 1mm will be adequate for most things you want to do. Metals of around this gauge should come reasonably cheaply.

When you get the metal, don't worry that if it seems very flexible as a sheet. Once it has been folded up, it becomes rigid and strong.

### WORDS OF CAUTION

I've got a few words of caution, before telling you how to start the business of making things. Take heed, because you could avoid a lot of cuts and scratches!

When you buy your sheet metal, it's highly likely that it will have been cut with a power guillotine or press. This action can leave it with very sharp edges.



Stephen Harding G4JGS explains how you can create good-looking and practical boxes and enclosures.

Small cuts are a source of irritation, and they take a while to heal and not always cleanly. This is because steel in particular is often coated with protective chemicals, to stop corrosion.

So, before you start work, clean the metal by using old newspapers, which are particularly effective. Aluminium sheet may have a thin sheet of plastics similar to cling film on it, to protect the surface. It's best to leave it on, as it forms a useful surface for marking out.

*Editorial note: Readers who do try working with sheet metal are asked to follow G4JGS's safety tips as closely as possible. My own advice is that a pair of strong gardening gloves (available from hardware shops) are used when handling or cutting the metals. Don't forget that most of us are working alone in the workshop,*

*and help may not be immediately available if unnecessary accidents occur!*

### MARKING OUT

Traditionally, marking out on metal is done using a dye called Engineer's Blue. In use, it's spread as a thin film of blue liquid all over the metal. After it's dried, the 'blue' is scratched away with a sharp scriber, to reveal a sharp silver line on a blue ground.

Using the 'blue' is okay, if you want to go in for precision metal-working. But for the average home constructor a sharp HB pencil will do.

Fine felt-tip pens of the permanent-marking variety are an alternative, and you can get away with water-based pens sometimes. Raid the children's pencil case and try them out!

If you fancy using a scriber, but not the messy blue, try using a thick felt-tip pen filled with permanent ink. When it's dry, scratch through the film using the scriber.

The felt-tip pen idea works very well, and it's less messy. If you go wrong, you can clean the ink off with surgical spirit and cotton wool and try again.

### AMBITIOUS SHAPES

If you're feeling very ambitious, you can create all sorts of shapes in metal just like you can in plastics. But for ease of construction, the

'double U' method is the best shape.

With this method you make two shapes which interlock to form a closed box. Then with tabs put onto one 'U', you can drill through both, using self-tapping screws to hold the assembly together.

As I recommended when using plastics, I suggest you get some card and make a simple model. This way, you can easily find out exactly what shape and size you want.

### METAL TO PLASTICS

The order of construction is different when you're using metal to plastics. When working metal, all the holes, cut-outs, etc., must be done while it's still in a flat sheet form.

Because of the marking-out process, working with metal becomes a little bit more critical. This is because it's easy to overlook something. Mistakes can be rectified later, but it's more difficult (compared to the plastics method) because metal is a harder material to work.

Cutting to shape is best done with a pair of tin-snips. These are used like a large pair of scissors.

If you have difficulty in holding the tin-snips in your hand, clamp one arm of the snips in a vice. With this method, you can use your body weight, rather than the strength of your hands.

Don't try to cut right into corners, you'll always overdo it. Cut as close as you can, and then remove the metal by flexing it up and down until it breaks off. The little piece of rough metal can then be cleaned out with a file.

When drilling metal it helps if you mark the centre of the hole. Traditionalists will insist on a centre-punch, but a sharp nail, etc., or anything that leaves a sufficiently deep mark on the surface of the metal, to help the drill start, will do.

When drilling, watch out as the drill breaks through. The bit can snatch, and try to pull the metal right up the shank of the drill.

So, when drilling, hold the job firmly in a vice or something similar. Whatever you do, don't hold it with your hands.

Even when the drill breaks through the metal cleanly, it will leave a small raised area around the hole. The raised area should be

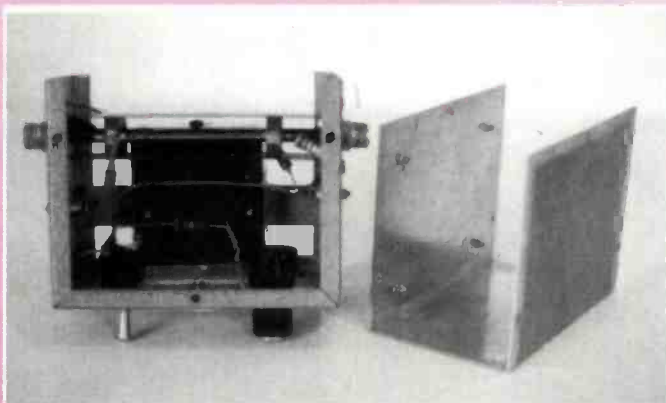


Fig. 1: An enclosure made up by using the 'U' assembly method (see text).

## WORKSHOP SPECIAL ARTICLE

*In the second and final part of his very practical approach at making boxes and enclosures for radio use, Stephen Harding G4JGS takes a look at working with metal.*

removed with a file. The same applies to all corners and edges, which should also receive attention from the file to remove any sharpness and roughness.

### CLAMPING DEVICE

Once all the holes have been made, the next stage is to fold the box to shape. The best way of doing this, is to use some form of firm clamping device.

A bench vice is ideal for holding the job, but it's rarely the right size. To extend the vice, two pieces of angle-iron or fairly substantial angled aluminium are ideal.

Slip the angle-iron or aluminium extenders into the jaws of a vice, leaving a small gap. You can then place the metal sheet between them, so that you can just see the line you want to fold on.

Next, clamp the vice up tight. If you haven't got a vice, you can use anything which will grip firmly. Self-gripping wrenches (Mole Grips or 'G' clamps are suitable).

You can also drill a couple of holes at the ends of the angle pieces. Then you can thread a nut and bolt through, and this will provide a firm bending jig when bolted to the bench.

To start the bending process, fold the metal progressively over until it is at the right angle. If you're intending to make a right angle (90°) it's best to go slightly over 90°, and bring it back later.

To get a really sharp fold, place a piece of wood along the fold line and hammer onto the wood. Don't hammer directly onto the metal, even with a soft-faced mallet. If you make this mistake, you'll leave hammer marks which will spoil the finished appearance of the project.

### COMPLEX SHAPE FIRST

When you're ready to start the assembly, the base or more complex shape is made first. Start by folding up the tabs, and do the longest folds next.

Before making each fold, check that you know which way you have to bend the metal! You can bend it back again if you get it wrong, but the result is usually pretty untidy.

Once the bending has been done, you'll probably find you can't get it



**Fig. 2: The completed and assembled enclosure, made with the 'U' method.**

into the vice or your bending bars. To make the final folds, a length of wood is needed.

You should clamp the length of wood firmly, and slightly back from the line you want to bend on. This is because when you bend the metal up, you won't get as tight a bend, as you achieved on the earlier folds. This will keep it to size rather than making it slightly too big.

If you wish, there's no reason why you shouldn't form all of the shape that's required over a piece of wood. Just make sure that you provide enough clearance to get it out!

Once the shape is formed, place it on a flat surface to find out which way you'll need to twist it, to get it to stand firm. Adjust the shape by twisting with your hands, and don't forget to protect your hands from the sharp metal.

It may take several attempts to adjust the shape, so keep at it. Once you have got the shape right, you can put a few blobs of solder on corners to hold them firm.

To solder in this way on a large surface area, you need a powerful soldering iron, to get enough heat to make the solder flow. Of course you can't do this with aluminium unless you have access to the specialised solder, but carefully placed epoxy-resin adhesive might make up for it.

### FOLDING THE TOP

Compared with the rest of the job, folding the top is easy because

there are only two folds to make. The best way of doing it, is to mark it out, make the first fold and then offer it up to the base.

If your marking-out isn't accurate, it will show up and you can adjust it accordingly. Once all is to your satisfaction, the last thing to do, is to remove any sharp corners that you didn't spot earlier.

It's rather surprising, that when you alter the angle of the metal you find new sharp areas. Be careful, and remember, safety first!

### GREAT TEMPTATION

Now you've got this far, there's a great temptation to resist. It's all too easy at this stage to install the circuit in the box, fit all the controls and get on and use it.

If you are tempted, at least the shack mouse will be safe. But your efforts won't look as good as they should, and they won't rival the black or grey commercial boxes.

So let's resist the temptation, and finish the job off properly. To do this, there are several finishes that can be applied. The most obvious is the spray paint that's sold for touching-up car paintwork.

The various touch-up paints are relatively cheap, are easy to apply and they look good. Their drawback is that they are not very scratch resistant unless heat treated, and for plastics this is out of the question.

For use on plastics, the touch-up paints also need a special etching primer which is expensive. So, we

require something which is easy to apply, hard-wearing and attractive without needing any special preparation.

In my experience, one of the best paints on the market is made by Finigans. Their paint comes in two forms, the traditional hammer-finish (as used on metal cases) and a smooth high-gloss.

Both types of the Finigan's paints are available for brush application, and in aerosol-can form for spraying applications. The range of colours is not fantastic, but they can be obtained from most hardware stores.

### PREPARATION THE KEY

Preparation of the surface, is the key to getting a good finish. It must be thoroughly degreased, especially if it's metal and any loose particles removed.

In my opinion, the best way of degreasing is to wipe the entire surface with surgical spirit or methylated spirits. Use a soft cloth, and keep turning it to find a clean area of material for maximum effect.

When you've cleaned the surface, it will require 'keying'. One of the best materials for this, is a coarse steel wool pad.

If you come across any imperfections in the surface (join lines, hammer marks, etc.) now's the time to get rid of them. You can do this by filling them with plastics filler, and when it has thoroughly cured, rubbing it down so it's smooth.

Finally, wipe all the dust off with a clean tissue. Please try and resist the temptation to finger it revelling in its exotic smoothness. You're leaving greasy finger marks all over the job, and they won't help the paint to 'grip' the surface!

### SPRAY OR BRUSH

Whether you spray or brush the paint on, is a matter of personal choice. The place where you do it needs to be well ventilated and dust free.

If you're using the aerosol spray-paint, shake the can for a long time. Paint supplied for brushing, needs to be thoroughly stirred. If you don't stir properly, the pigment may not be evenly spread, giving poor results.



## WORKSHOP SPECIAL ARTICLE

Before you actually start painting, spread plenty of clean newspaper around and place your box on it. Put something inside it, so that the box is supported clear of the surface. By doing this you'll avoid having to peel newspaper off because the paint has stuck to it.

It's best to mask out the joining surfaces where they fit together. A layer of paint can be more than enough to spoil the matching fit. Now you can apply the paint.

Apply the paint sufficiently thickly, so that it doesn't show any application marks, but not so thick that it 'runs'. Let it dry, (about 20 minutes for Hammerite or Smoothrite) and then apply another coat.

Leave it to dry, and if the desired colour intensity and coverage has not been achieved, paint it again. Generally two coats is enough, especially of Hammerite.

Once you have got the surface as you want it, leave the job alone for at least 24 hours. This will enable the job to be really dry before you start to handle it.

### FINISHING TOUCHES

Now you've reached this stage, it's time to consider the finishing touches. Extra care taken now, will be repaid by a better finish on your project.

Controls need labelling. And, unless you're one of the (rare) gifted calligraphers, don't try hand-labelling. It can look awful!

My advice is that you go to your local stationers, and buy some dry transfer lettering. This is widely available in a tremendous range of styles and sizes.

Don't buy the big A4 sheets, unless you are going to do a lot of lettering. Instead, I recommend that you buy the A5 or A6 sheets, as they're much cheaper and you don't waste so much.

Apply the transfers according to the manufacturers' instructions. And don't forget to leave space for the control knob to go on the shaft!

The final, really professional touch is achieved by using the 'go faster stripe' kits sold in car accessory shops. You only need the narrow stripes, and for less than a £1, you'll get enough to do a family car, and your latest project.

You can use the 'go faster



**Fig. 3: Typical rub-down transfer lettering, suitable for use on front panels, and a pack of the 'go faster stripe' lining material available from car accessory shops (see text).**

stripes' to take the eye away from join lines. This is achieved by laying them down parallel to, and on either side.

Good effects can be made by grouping similar controls together by putting a line round them. It's amazing what you can do with the transfers.

### ENHANCE THE EFFECT

If you only lightly stick the transfers in place to start with, you can easily move them to enhance the effect. Once you're satisfied, rub them down (and the lettering) with a soft cloth.

Finally, seal the whole lot in place, protecting it by spraying one coat of clear lacquer all over the outside of the box. The lacquer sold in car accessory shops, as the final stage of a two-part paint process, is best.

All that has to be done now, is to fit your circuits and use the device. I make use of double-sided sticky pads to hold the bits and pieces inside.

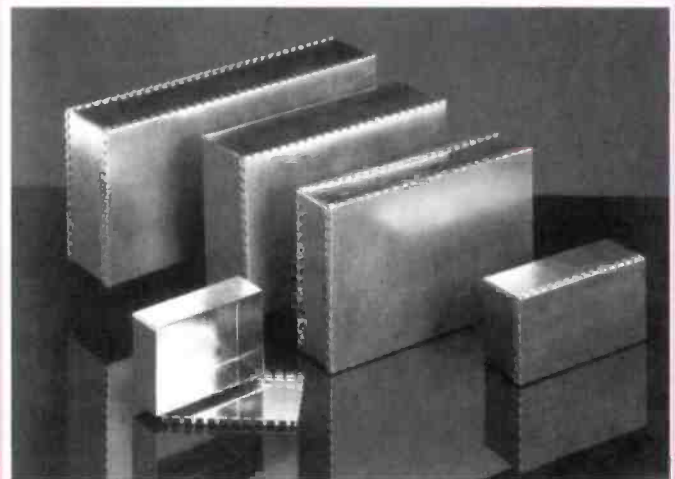
Don't forget that a neat layout inside, is just as important as all the hard work you've put into making the outside look good. Remember this, and you'll be proud to show off your workmanship, and who knows, you might even win the constructors' cup at the club competition!

PW

### TRANSFER SERVICE

The G7LUL panel transfer service, based in Plymouth, can produce a personalised lettering transfer from your own artwork. The service includes front panels, and any other transfer that you require. All the transfers come with either white or black 'see through' self-adhesive hard wearing plastics membrane.

All you need to do is to send your (clear and un-blemished) black-on-white master, and G7LUL will send you back your size-for-size transfer. For further details on sizes, price list and information on their design service contact: F. P. Russell, G7LUL Panel Transfers, 63 Fleet Street, Keyham, Plymouth, Devon PL2 2BU. Tel: (0752) 563222.



If you're keen to try making and using plastics enclosures for your projects, but have been put off by the r.f. screening problems, there's a new product that can probably help. Cirkit have introduced a range of metal screening cases, which although may not be considered as being good enough for an external casing, could easily have a plastics casing made to fit around them. The cases, made in a range of sizes, can be soldered to, are very versatile and details of sizes and prices can be found on page 69 of the Cirkit Winter 1992/1993 catalogue, available from high street newsagents. For further information contact: Paul Bennet, Cirkit Distribution Ltd., Park Lane, Broxbourne, Hertfordshire EN10 7NQ. Tel: (0992) 441306.

### Suppliers for most materials are:

**Design Craft & Graphics Ltd., 12 Hanborough Business Park, Long Hanborough, Oxford OX7 2AB. Tel: (0993) 882588.**

**K & M Ltd., 1 Wharf Lane, 24A New Wharf Road, Lowgates, Barlborough, Stavely, Chesterfield, Derbyshire S43 3TZ. Tel: (0246) 477471 or 812872.**

**More information on Finigans paints from: Huntings Specialised Products Ltd., Acorn House, New Lane, Leeds LS11 5DZ. Tel: (0532) 441100.**

# The Hands Electronics RX1 3.5MHz Receiver Kit



*When the Editor learned about the Hands Electronics receiver, he thought that the well-known home-construction enthusiast, the Rev. George Dobbs G3RJV, was the 'best man' for the job!*

Over the last few years, a number of companies have appeared in the amateur radio market offering r.f. kits for the constructor. These vary from small accessories to complete receivers, transmitters and transceivers.

A new name in the kit field is Hands Electronics. Their kits have a heavy accent on the v.h.f. and u.h.f. areas of the hobby, filling gaps in the current market.

Within the range of kits, there are h.f. projects, including a QRP transmitter and a superhet receiver for 3.5MHz. As I'm always interested in any new product which encourages amateur radio construction, I agreed to build and test the receiver.

## Generic Receiver

The Hands Electronics RX1, is what I would call a generic NE602 receiver. Since it appeared in the mid 1980s, the Signetics NE602 integrated circuit has provided amateur radio constructors with a useful building block.

Originally, the i.c. was designed for cellular telephone applications. However, the NE602 is another fine example of amateurs grasping the electronic 'crumbs which fall off the rich man's table'.

The NE602, which has been made inexpensive through commercial application, has proved its worth when turned to amateur radio applications. The eight-pin dual-in-line packaged i.c. contains a double-balanced mixer, a bipolar variable frequency oscillator and a voltage regulator.

This chip is the stuff of amateur radio receivers! And the Hands RX1 follows in a line of projects based upon this i.c. In this kit, there are only four active devices, excluding the regulator chip, which makes for a simple and compact circuit.

## Block Diagram

A block diagram of the receiver is shown in Fig. 1. From the illustration, you can see that the RX1 is a simple, single conversion receiver without r.f. stage, automatic gain control (a.g.c.) or S-meter, although these can be added.

Signals from the antenna, at 50Ω impedance are selected by a band-pass filter. This is a carefully designed three-pole Butterworth filter with a passband of 500kHz.

The signals are then transformer-coupled into the ports of the balanced mixer of an NE602, which forms the r.f. mixer.

The internal oscillator circuit, is used for the local oscillator in a Colpitts type circuit. The kit also provides extra pads for frequency coverage adjustments and temperature compensation, should the builder wish to experiment.

The main tuning capacitor has trimming and padding capacitors, allowing adjustments to enable the receiver to cover the whole 3.5MHz band. The balanced output from the NE602 mixer is then inductively coupled to a ladder filter.

## The Ladder Filter

The receiver ladder filter uses off-the-shelf TV colour burst crystals, to provide an example working on the receiver's intermediate frequency of 4.433MHz. Hands Electronics claim that, unlike many other amateur designed ladder filters, this version has a symmetrical response and is computer designed with Butterworth coefficients.

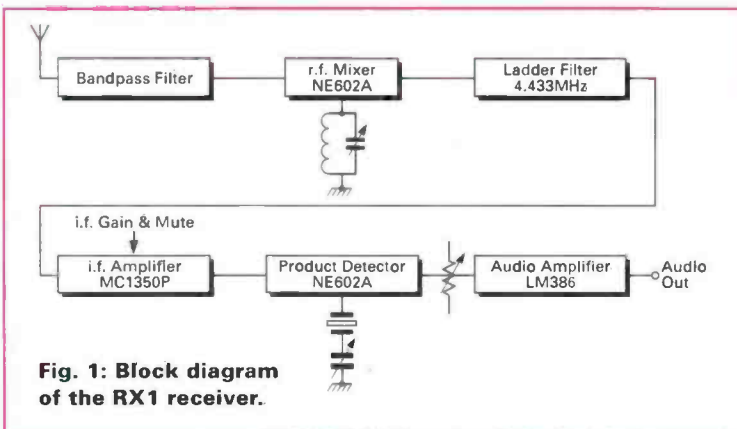
The printed circuit board and the components provided, allow for two choices of bandwidth. It can provide a selectivity of 2.4kHz or a narrower design for c.w. use.

The manufacturers advise less experienced constructors to at least begin with the 2.4kHz design. For more advanced constructors, extra pads are on the board, so they can tailor the response of the filter to suit their own needs.

## Intermediate Frequency Amplifier

The i.f. amplifier is an MC1350P, a device commonly used in such circuits. The gain facility in this chip is used to provide a manual i.f. gain control. There's provision on the board to apply 12V to this port to mute the receiver when used with a transmitter.

The i.f. signal is fed to another NE602, which acts as



**Fig. 1: Block diagram of the RX1 receiver.**

Review



both the product detector and beat frequency oscillator. The b.f.o. is configured as a variable crystal oscillator (v.x.o.), to allow adjustment of the carrier insertion frequency.

The audio stages come from the familiar LM386. There's also a three-legged regulator i.c., and this provides a stabilised 6V supply for the other i.c.s apart from the LM386.

### Good Quality Board

The construction is based around a good quality, doubled-sided p.c.b. The top of the board is a groundplane, including many of the grounding points in the circuit.

The p.c.b. is well made and tinned. It also has the component placements clearly silk screened on the top side. The components supplied appear to be of good quality, with no apparent substitution of inferior or surplus parts.

With the Hands kit all the controls are supplied. These included a switched potentiometer for the volume control, the i.f. gain potentiometer and a good quality Jackson variable capacitor for the main tuning.

The required antenna, power and audio output plugs are also supplied. An optional case is available for the RX1. I built mine in the case supplied by Hands Electronics.

The construction manual supplied with the RX1 kit, is at an intermediate level. That means, it's neither of the Heathkit 'tick it off step-by-step' kind nor the 'here's a circuit and the bits now do it yourself' type.

The manual begins with a general guide to construction, including how to identify components. The circuit diagram is supplemented with a clear layout drawing, and component check list. There's also a test and alignment section, which describes how to get the receiver going.

### Construction Manual

The construction section of the manual is adequate for all levels of constructor, with the probable exception of real beginners. This is because there are a number of links to be fitted between the ground plane and the underside tracks.

The fitting of the links are explained, but they are perhaps somewhat lost in the text. I can remember once helping a kit builder, sort out a kit which he had spent many hours trying to fix, only to find he had left out a critical ground link. So, check these carefully!

The placement of components is greatly aided by the screen-printed locations on the top of the board. Personally, I prefer to build from the circuit rather than a layout diagram.

I always find a ground plane on the top of a board disconcerting, because I cannot see the shadow of the tracks through the board. In this case, both the layout drawing and the printed locations make the task easy.

### Winding Inductors

Clear instructions are given for the winding of three inductors (four if the c.w. version of the filter is used). My advice to the manufacturers (on any revision of the manual) is that they include drawings of how the inductors look, and their location on the board.

I say this, because in articles I've written in the past which involved hand-wound inductors and transformers, these appear to have caused constructors the most problems. Because of this, I used to have a standard letter and drawing for the mixer transformer for the PW 'Teme'. I thought it was simple, but plenty of others didn't!

### No Special Equipment

The kit manual claims that no special equipment is required to set up the receiver. So, I decided to align it 'bareback' - without the use of test equipment.

After following the recommended d.c. tests, I switched on the receiver and followed the instructions in the manual. As advised, I set the trimmer and padder capacitors on the v.f.o. at half mesh - and hit the band first time!

In fact, I was very impressed by the v.f.o.'s frequency determining component choice. With very little adjustment, the receiver covered almost exactly 3.5 to 4MHz. Past experience with home built v.f.o.s has taught me that this is no easy achievement!

I set the trimmer on the b.f.o. by ear, for best s.s.b. reception. I then repeated the whole alignment exercise with test equipment and found that very little adjustment was required. The manual is right - you can do it without test equipment.

The description of how to set up the receiver, is a little fussy. It could perhaps be improved by adding, or merely only having, a simple numbered list of steps.

Nothing, for example, was said of how to read the v.f.o. frequency with a frequency counter. In fact, this can be picked off pin 7 of the NE602. However, using the frequency counter does require light coupling into a sensitive counter, so perhaps that's why the technique was left out.

The v.f.o. can be listened for on another receiver. But the only methods of finding the band suggested in the manual, are those using a signal generator or listening for signals on the band.

In my case, I found signals as soon as I switched on the receiver. I suspect it would have been more difficult if the v.f.o. was well out of band, as the band-pass filter gives tight selectivity.

### Good Performer

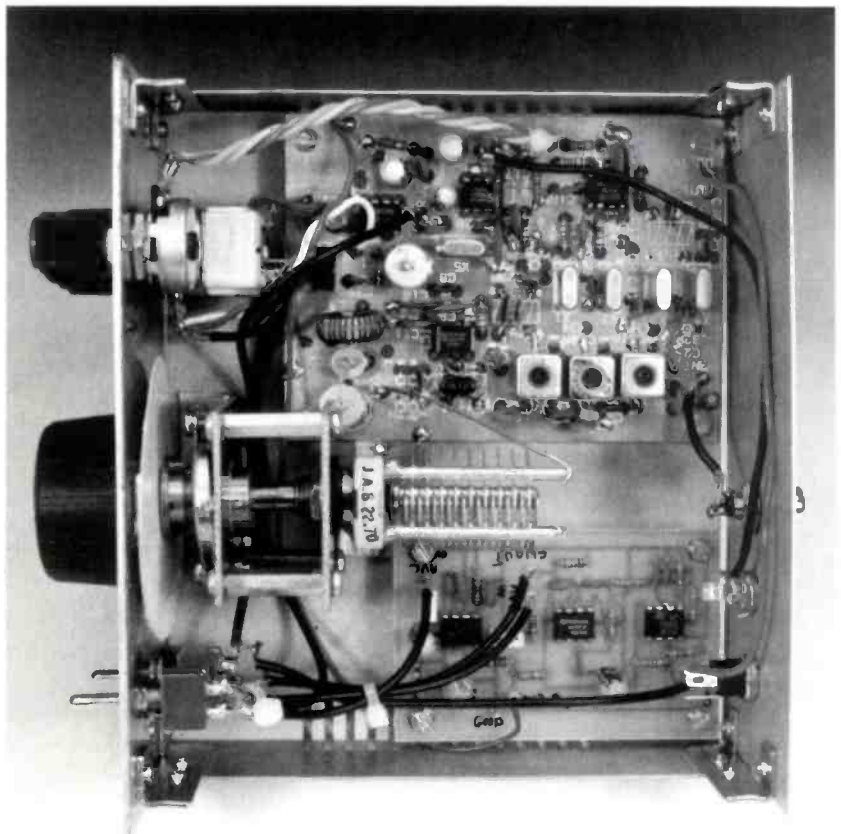
The RX1 proved to be a good performer. The stability of the basic receiver was good, and the long term drift was negligible.

The sensitivity was well within the requirements of the 3.5MHz band. The receiver proved that it was capable of detecting a signal of less than 1µV.

I used the receiver over several nights of listening, using my 40m long doublet antenna via an antenna tuning

# Review

Fig. 2: Internal view of the completed kit.



DON'T BE SEDUCED BY  
ITS GOOD LOOKS.

BE SEDUCED BY ITS  
PERFORMANCE.



If someone can make a dual-band transceiver as small and feature-packed as this, who cares about its looks? Especially if it's also so sturdy that it shrugs off the knocks and shocks of a lifetime's use. And especially if it has a host of product features, from built-in DTSS and paging functions to alphanumeric

memory, simultaneous dual-frequency receive and message paging. We'll tell you who cares. Kenwood cares. Which is why the TH78E isn't just the neatest dual-band transceiver you can buy, it's also the best designed. Right down to thoughtful touches like the sliding keypad cover.

So visit your nearest Kenwood approved dealer, pick up the TH78E and admire its ergonomic curves at close quarters. Or simply take in the wonders of its specification. Either way, it's love at first sight.

*Kenwood TH78E is part of a range of hand portables from £240 to £430.*

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unit (a.t.u.). I heard plenty of DX on 3.5MHz. In my opinion, the RX1 would make a useful receiver for an amateur radio station, and even a front-line receiver for a simple station.

## Optional Case

I built my RX1, in the optional case supplied by Hands. The case is supplied with all hardware and the slow-motion drive. The case is smart and compact, but it has plenty of room to mount a small transmitter, such as the Hands 3TX.

A dial assembly is supplied with a spare disc. The spare disc enables the builder to roughly calibrate the scale, and then transfer the markings neatly to the second dial disc.

Hands Electronics are to introduce a kit for an automatic volume control (a.v.c.) and 750Hz active filter board. I was sent a sample board to try with the receiver. The board contains two circuits: the 750Hz active filter and an a.v.c. based upon a v.o.g.a.d. (voice operated gain adjusting device) chip.

## Active Filter

The active filter uses one high-pass, and two low-pass elements. It can be switched in and out of the volume control line of the receiver.

The a.v.c. circuit provides a constant audio output. At the same time, it protects the audio amplifier from very

large signals and resulting audio distortion. It also saves the operator's ears when using headphones, the circuit is based on the Plessey SL6270 v.o.g.a.d. chip.

I received the sample board in ready-built form, without much data. In operation, it certainly enhances the performance of the receiver.

The active filter was more than useful for c.w. reception. The a.v.c. circuit also provides some extra audio pre-amplification which is useful.

I suspect that the pre-set gain of the v.o.g.a.d. in the sample I had, was a little high. I say this, because it proved possible to overdrive the LM386, but the gain can be changed.

## Useful Kit

My conclusion is that the RX1 is a useful addition to the h.f. kit market. It provides a simple but viable station receiver.

This is not a novelty kit but a 'proper' amateur band receiver. Hands Electronics also hope to add converters for other amateur bands.

My thanks for the kit used in the review, go to Hands Electronics of Tegryn, Llanfyrnach, Dyfed, Wales SA35 0BL. Tel: (0239) 77427, who can supply the RX1 kit for £39.90 (£1.50 postage). Prices for the case, kit and the a.v.c./audio filter kit are available on application.

PW

## Errors & Updates

### A Low Cost 1.2GHz Pre-Scaler

Pages 18-23 PW August 1992

Two errors crept into the track pattern and component overlay drawings (Figs. 3 and 4) on page 21 of the August 1992 issue. There was a small section of track missing in the drawing Fig. 3, connecting pin 4 of IC4 to the 0V rail. The complete track pattern is reproduced again here for you. Please make this link to allow the circuit to work as described.

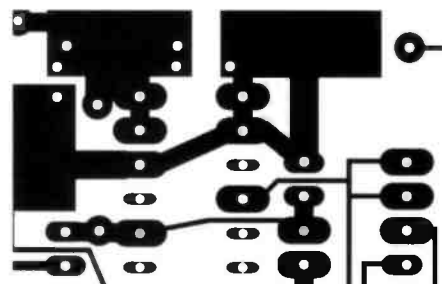
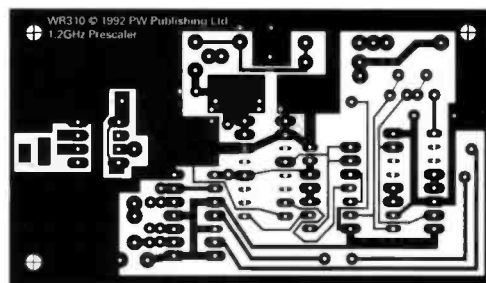
New versions of the p.c.b. will have this fault corrected. The other small error, which has been corrected on the p.c.b.s. is that capacitor C3 is shown reversed. The positive side of C3 should be towards C10, and not as shown in the drawing Fig. 4 on page 21 of the August issue.

### WR308, Getting Started The Pactical Way

Pages 39-43, PW July 1992

For readers who have purchased the p.c.b. WR308, a link went missing in the manufacture of the original p.c.b. To make the circuit work as described, please link pin 7 of IC1 to the nearest 0V point. This error will be corrected on all p.c.b.s sent out after 23 November 1992.

Please accept my apologies for these errors. Editor



Board	Article (Project) Title	Issue	Price	Board	Article (Project) Title	Issue	Price
WR314	UHF Pre-Amplifier	Dec 92	£Call	WR286	Meon-4 (RF PA)	Jun 91	£5.54
WR313	10MHz Transmitter	Nov 92	£4.65	WR287	Morse (Speedbrush)	May 91	£4.85
WR312	Receiver/Mixer (Getting Started)	Nov 92	£4.15	WR255	Meon-4	May 91	£6.76
WR311	Oscillator BFO (Getting Started)	Sept 92	£2.60	WR285	Scope Probe PSU	Apr 91	£4.87
WR310	1.2GHz Pre-scaler	Aug 92	£3.75	WR284	Scope Probe	Apr 91	£5.75
WR309	Volt Reg/Divide by 100	Aug 92	£3.15	WR283	Sudden Receiver	Mar 91	£4.54
WR308	TTL 1MHz Oscillator (Getting Started)	July 92	£2.20	WR282	Repeater Toneburst	Feb 91	£5.10
WR307	Crystal Checker (Getting Started)	June 92	£4.25	WR281	High Voltage PSU	Jan 91	£4.70
SET	<b>WR303/304/305/306</b>	Apr 92	£19.30	SET	<b>WR263/264 +WR276-80</b>	Jul 90	£21.96
WR302	Inductance Bridge				Marland Transmitter	Sep 90	
WR301	GDO (Getting Started)	Apr 92	£4.75	WR272	NiCad Recycler	Jun 90	£7.06
WR300a	Challenger Receiver	Feb 92	£4.75	WR275	Low Voltage Alarm	Jun 90	£6.49
WR300	OSCAMP Oscillator	Mar 92	£4.75	WR273	Valve PSU	May 90	£7.00
WR299	OSCAMP Amplifier	Feb 92	£5.20	WR274	RX Attenuator	May 90	£5.84
WR297/298	Multivibrator (Getting Started)	Jan 92	O/S	WR271	Product Detector	Apr 90	£5.05
SET	Additional Beaver boards		O/S	WR270	Badger Cub	Apr 90	£5.04
SET	<b>WR295/296</b> PW Beaver	Oct 91	£12.00	WR269	Glynme	Feb 90	£6.83
SET	<b>WR292/293/294</b> Chatterbox	Aug 91	£14.00	WR268	Irwell (RF PA)	Feb 90	£6.12
SET	<b>WR290/291</b> Robin Freq. Counter	Aug 91	O/S	WR264	Irwell (Relay)	Feb 90	£5.10
SET	<b>WR292/293/294</b> Chatterbox	Aug 91	£14.00	WR263	Irwell (VFO)	Jan 90	£6.12
WR289	Meon-4 (Control)	Jul 91	£4.67	WR267	PW 49'er	Jan 90	£6.12
WR288	Morse Master	Jun 91	£4.89	WR266	Tuned Active Antenna	Jan 90	£5.71

The p.c.b.s. for all the latest projects are now available. We have a stock of boards for many other projects produced in the past, but these stocks are subject to variation. Please check price and availability before ordering. Add £1 p&p to orders for one board (or one set of boards) and £2 p&p to orders of two or more p.c.b.s.

You can telephone your order using Access or Mastercard by calling (0202) 665524 at any time. Please allow 28 days for delivery.

### Club Discount. An additional saving.

Radio and electronics club members, save money on p.c.b.s when you order through your club. Tell your club secretary to send for details, marking the envelope 'PCB discount information' to our editorial offices.

Please note that this list is only of our more recent p.c.b.s, call the office for more details of boards available back to 1980.

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### BIRMINGHAM

South Midlands Communications,  
504 Alum Rock Road, Alum Rock,  
Birmingham. Tel: 021 327 1497

### BIRMINGHAM

Ward Electronics, 422 Bromford Lane,  
Ward End, Birmingham.  
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### BRISTOL

AMDAT, 4 Northville Road, Northville  
Bristol. Tel: 0272 699352

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Lowe Electronics, 162 High Street,  
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Tel: 0223 311230

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PMR Ltd, Industrial Estate, Gwaelod-y-  
Garth, Cardiff. Tel: 0222 810999

### CLACTON ON SEA

Coastal Communications, 19 Cambridge  
Road, Clacton on Sea, Essex.  
Tel: 0255 474292

### CORK

Intronic Ltd, Windsor Hall,  
Glounthaune, Cork, Eire.  
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### COUNTY TYRONE

Tyrone Amateur Electronics, 44 High

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Ireland. Tel: 0662 242043

### CUMBERNAULD

Lowe Electronics, Cumbernauld Airport  
Cumbernauld. Tel: 0236 721004

### DONCASTER

Alan Hooker, 42 Nether Hall Road,  
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Tel: 0302 325690

### EALING

Martin Lynch, 286 Northfield Avenue  
Ealing, London. Tel: 081 566 1120

### EASTCOTE

Lowe Electronics, 223 Field End Road,  
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### EDGWARE

Haydon Communications, 132 High  
Street, Edgware, Middx.  
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### FIFE

Jaycee Electronics, 20 Woodside Way,  
Glenrothes, Fife. Tel: 0592 756962

### HANGER LANE

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### HAYWARDS HEATH

Bredhurst Electronics, High Street,  
Handcross, Haywards Heath, West  
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### HOCKLEY

Waters & Stanton Electronics, Spa  
House, 22 Main Road, Hockley, Essex  
Tel: 0702 206835

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Leeds. Tel: 0532 350606

### LEEDS

Lowe Electronics, 34 New Briggate,  
Leeds. Tel: 0532 452657

### MAIDSTONE

Lowe Electronics, Chatham Road,

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### MATLOCK

Lowe Electronics, Chesterfield Road,  
Matlock, Derbyshire. Tel: 0629 580800

### NEWCASTLE

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Woolsington, Newcastle.  
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### NEWPORT PAGNELL

Photo Acoustics Ltd, 58 High Street,  
Newport Pagnell, Bucks.  
Tel: 0908 610625

### NEWTON LE WILLOWS

Amateur Radio Comms Ltd, 38 Bridge  
Street, Earlestown, Newton Le Willows  
Merseyside. Tel: 0925 229881

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House, Happisburgh, Norfolk.  
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### SLOUGH

Lowe Electronics, London Heathrow,  
6 Cherwell Close, Langley, Slough,  
Berks. Tel: 0753 545255

### STOURBRIDGE

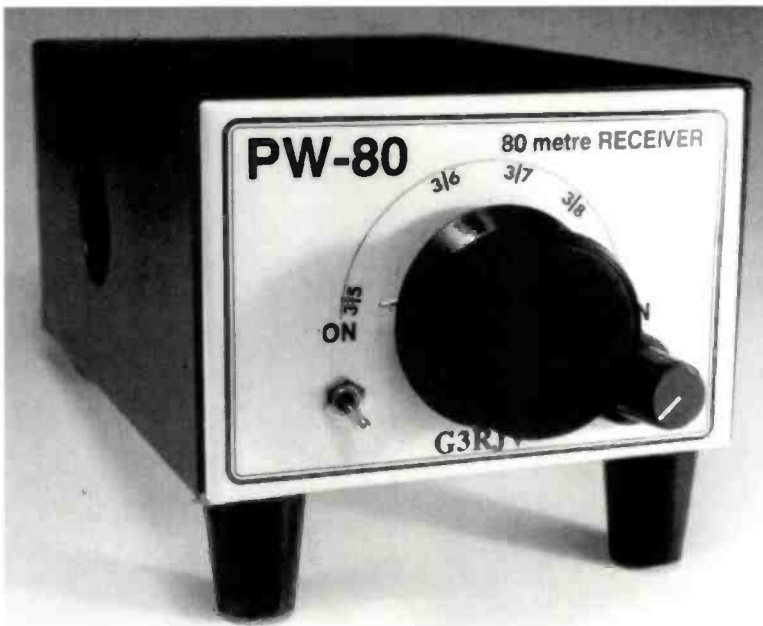
Dewsbury Electronics, 176 Lower High  
Street, Stourbridge, West Midlands.  
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# Getting Started - The Practical Way



**The completed PW-80 direct conversion receiver.**

If you've followed the last few parts of this series, then you're almost ready to complete an amateur band receiver. The two most important circuit elements of a d.c. receiver, the v.f.o. and mixer board, are already completed.

You may recall that the mixer converts the incoming radio frequency signal, to an audio signal by 'beating' it with the v.f.o. The resulting audio signal is at a very low level, and only the strongest stations would be heard, even if a pair of sensitive headphones were used.

The lack of audio is a small price to pay for simplicity. The receiver only requires an audio amplifier to increase the strength (amplitude) of the audio signal to a comfortable listening level.

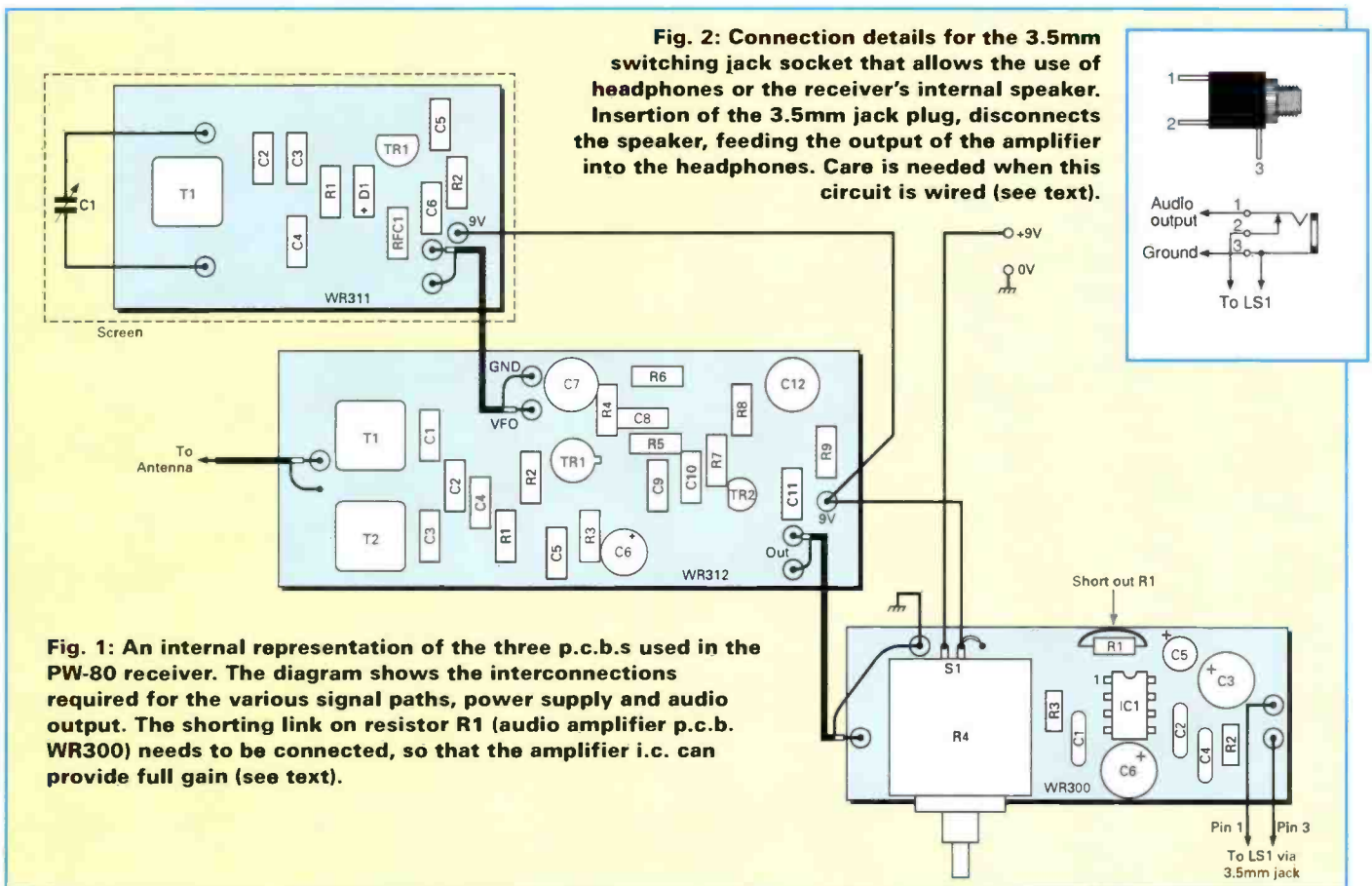
## Already Built

Fortunately, we have already built an audio amplifier in this series. This amplifier will serve the purpose in our receiver.

In 'Getting Started - The Practical Way' February 1992, I described an audio amplifier which formed half of a piece of test equipment called the 'OscAmp'.

The whole circuit is based on an LM386 integrated circuit. The full circuit, p.c.b. design and component overlay, can be found on pages 32 and 33 of the February issue of *PW*.

In the February 'Getting Started', Fig. 1, shows a



**Fig. 2: Connection details for the 3.5mm switching jack socket that allows the use of headphones or the receiver's internal speaker. Insertion of the 3.5mm jack plug, disconnects the speaker, feeding the output of the amplifier into the headphones. Care is needed when this circuit is wired (see text).**

**Fig. 1: An internal representation of the three p.c.b.s used in the PW-80 receiver. The diagram shows the interconnections required for the various signal paths, power supply and audio output. The shorting link on resistor R1 (audio amplifier p.c.b. WR300) needs to be connected, so that the amplifier i.c. can provide full gain (see text).**

resistor (R1) in the circuit path between pins 1 and 8. This resistor sets the overall gain of the amplifier.

Making R1 a lower value increases the gain. And for this application we require maximum audio gain, so a short circuit is used by connecting a link wire in place of, or across R1.

In Fig. 1, on the audio amplifier p.c.b. (marked WR300), the wire link is shown across R1. Additionally, in my prototype receiver, I also used a higher value 100k $\Omega$ , potentiometer for the volume control.

## Boards Joined

The photograph in Fig. 3 and the diagram, Fig. 1, show how the three p.c.b.s are joined to make the PW-80 Receiver. The power supply is a 9V battery, switched on or off by S1. Power must be taken to all three boards.

The signal paths all use screened lead. The ideal screened lead to use is miniature 50 $\Omega$  impedance coaxial cable, but this can be expensive and not too easy to obtain.

In practice, thin screened cable of the type sold as microphone lead, does the job very well. The inner core carries the signal, and the outer screening is joined to ground on the p.c.b.s.

The v.f.o. output is taken via screened cable, to the v.f.o. input point on the mixer board. The mixer board also receives the radio signal input from the antenna.

Any suitable antenna socket can be used for the signal input. Choose the type that's in normal use in your shack.

I tend to use the well-known 'phono' plugs and sockets for low power radio work. They're cheap and cheerful, and they serve the purpose well.

Another screened lead, takes the audio signal from the mixer board to the audio amplifier. The original p.c.b. allows for the volume control to be connected directly to the board. This is not so convenient for this application.

Having the audio amplifier board 'hanging' from the volume control, presents problems when mounting the board into a small case. However, the board can be used with an external volume control which is mounted on the front panel of the receiver.

If you do use an off-board volume control, I recommend that you use a combined volume/on-off switch potentiometer. I would also strongly advise the use of screened cables for these connections.

## Small Loudspeaker

The LM386 audio amplifier i.c. can drive an 8 $\Omega$  loudspeaker. I used a 50mm diameter speaker in my prototype receiver.

The output level of the LM386 is only just enough to drive a speaker in good conditions, so the option of using a pair of headphones is included. The usual way to do this, is to use a switched jack socket.

A pair of headphones of the type used on personal cassette players will work well with the receiver. But, to work correctly, they should be converted for non-stereophonic use.

The conversion is done by changing the jack plug to a 3.5mm mono type, although this means the headphones can't be used for the cassette player again.

So, buy a pair for the job, and don't borrow a pair from a son, daughter or spouse! It's not a real problem, because a pair of headphones with a 3.5mm jack is a useful item to have around the shack.

## Prototype Case

The photograph shows how the three boards fit into a case. The prototype receiver was mounted in an aluminium case 152mm x 114mm x 76mm, sold by Minfford Engineering as 'Aluminium Box type AB31' (address at end of text).

Any box of similar dimensions could be used. Although a slightly smaller box would do, an adequate front panel is required to allow for a readable tuning scale. Practical Wireless, January 1993

The case I used, also allows space for a small internal 9V battery (a PP3 would fit inside but its life would be limited). In practice, I provided a couple of terminals on the back panel to connect the receiver to a larger battery.

To make the project tidy, I mounted the mixer board and the audio amplifier board on the v.f.o. enclosure. In the photograph, you can see that the mixer board is on the bottom of the enclosure.

You can also see the audio board is mounted on the top, using stand-off pillars. This keeps the whole of the electronics together, even without using the box.

The v.f.o. enclosure is mounted on its side, on the bottom of the case. This gives the correct height for the tuning shaft, to allow good use of the front panel for a tuning scale.

The layout of the v.f.o. and other boards may be seen in the photograph. The on-off switch/volume control and the tuning capacitor are all on the front panel.

Mounted on the rear panel are the 3.5mm audio output jack, the antenna input socket and two terminals for the 9V supply. The side panel nearest the audio board has a 50mm loudspeaker held in place with glue, which I applied from a hot glue gun.

## Casing The Job

When it comes to casing the job, experienced metalworkers will no doubt make their own enclosure. They'll be able to fashion the case in such a way that it looks like a commercially-made piece of equipment.

We, lesser mortals, rely upon pre-built boxes and hand-tools to do the best job we can! However, the years have taught me a few ways of making my cases look better.

The first rule, is to make sure that everything is well marked out **before any hole cutting in the case begins**. Holes in aluminium cases have a sort of finality about them!

I always use a punch to locate the holes, as aluminium is soft and a drill bit can easily 'walk' across its surface. I also drill all my holes smaller than required, and then bring them up to size with a small hand reamer. Drills have a habit of making oblong holes in aluminium!

The finished front panel can make the difference between a crude looking project, and a piece of fine work. Some constructors spray their cases with car spray-paint, and use rub-down lettering to obtain an attractive finish. Car spray-paint is sometimes difficult to get to 'key' onto bare aluminium.

When I'm using spray-paint, I use a 'false front' made from thin card or paper. It might sound crude, but it can produce a very smart result.

## Receiver Completed

After the receiver is completed, and everything is seen to fit on the front panel, remove all the controls from the front panel. Then, you'll need to cut a piece of paper or thin card, somewhat larger than the panel.

The use of paper or card, means that any colour may be used for the panel. Lay the paper face down on a flat surface, and then place the front panel face-down on to the paper.

Using a ball-point pen, mark out the outer edges of the front panel and mark around the insides of all the holes. The indentations of the pen marks should show on the front of the paper.

The words or other legends can now be added to the paper. I use rub-down letters, but because it's paper, they may be typed or even hand-written on the front.

Remember, you must leave enough space for the knobs to fit on the front. It's so easy to mark the letters, only to find that a knob covers part of the words. Smear a little adhesive from a glue-stick on the front of the case, which will lightly fix the paper to the front panel.

*In the final part of this series of 'Getting Started', the Rev. George Dobbs G3RJV explains how to complete the direct conversion receiver that's been featured over the last few months.*

**Continued on page 41**





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C558  
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Transmitter:

RF Power Output	Battery Type	VHF			UHF		
		Hi	Mid	Lo	Hi	Mid	Lo
	CBT151GY	2.0W	2.0W	0.35W	1.5W	1.5W	0.35W
	CBT150	2.5W	2.5W	0.35W	2.0W	2.0W	0.35W
	CNB151GY	2.5W	2.5W	0.35W	2.0W	2.0W	0.35W
	CNB153	2.5W	2.5W	0.35W	2.0W	2.0W	0.35W
	CNB152	5.0W	2.5W	0.35W	5.0W	2.5W	0.35W

Receiver:

Circuitry	VHF section		UHF section
	Double Conversion Superheterodyne		
Intermediate Frequency	1st IF	21.80 MHz	23.05 MHz
	2nd IF	450 kHz	450 kHz
Sensitivity (12dB SINAD)	0.150µV		
Threshold Squelch Sensitivity	0.112µV		
Selectivity (2-signal method)	55 dB		50 dB
Audio Power Output	200 mW at 10% distortion		
S/N Ratio at 0.5 µV Input	25 dB		

C500 Accessories

- CLC500 Carrying case C500 with CNB111 batter
- CLC501 Carrying case C500 with CNB120 battery
- CMP111 Speaker microphone
- CMP113 Tie-pin microphone
- CMP115 Speaker microphone (small size)
- CNB111 Nicad battery pack (3.5W-VHF/3.0W-UH)
- CNB120 Nicad battery pack (5)
- EBATT Empty battery case for dry cells
- CSA111 Desk top charger CNB111 and CNB120 battery
- C102/230-1 Plug-in charger CNB111 battery
- CWC20 Plug-in charger CNB120 battery
- CAD111 Charging adaptor for battery only
- CAW1208 Mobile adaptor for direct use from car battery
- CMC01 Mobile charger car battery to CNB111 battery
- CMB111 Mobile bracket
- CHP111 Headset with P.T.T switch
- CTN500 CTCSS tone squelch unit
- CTD500 Touch tone unit for use with remote control

C164/468 Accessories

- CLC160 Carry case for use with CNB160
- CLC161 Carry case for use with CNB161
- CLC162 Carry case for use with CNB162/163
- CNB160 Nicad battery pack (6V @ 300ma)
- CNB161 Nicad battery pack (7.2V @ 700ma)
- CNB162 Nicad battery pack (12V @ 600ma)
- CWC150K Wall charger for CNB160/161/163
- CWC151K Wall charger for CNB162
- CSA160E Desk top rapid charger for all nicads
- CAW150 Mobile power supply cable
- CHP150 Headset with PTT/Vox
- CMU160 Memory unit - 30 channels
- CMU161 Memory unit - 200 channels
- CAX03 Button cover
- CAX160 Remote battery adaptor
- CAW150 Mobile power cable
- CCA160 Charging sleeve
- CTN160 CTCSS module
- CMP111 Standard size speaker/mic
- CMP115 Small speaker/mic
- CHP111 Headset boom/mic
- CMP113 Tie-pin mic and earphone
- CMB111 Mobile bracket

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C5608D Accessories

- CAW560 Dual microphone cable
- CAW561 2m microphone extension cable
- CAW562 4m microphone extension cable
- CTN5680 CTCSS tone squelch unit
- CTD5680 DTMF touch tone unit
- TAZ08 Slim-line extension speaker (4-8 OHMS/5W)

C112/412 Accessories

- CLC412 Carrying case
- CMP111 Speaker microphone
- CMP113 Tie-pin microphone
- CMP115 Speaker microphone (small size)
- CMP111 Mobile bracket
- CNB412 Nicad battery pack (12V-600mAH) - Slim-line 7.2V-400mAH)
- CNB414 Nicad battery pack (12V-600mAH)
- CWA150 AC charger CNB412 battery
- CCA412 Charging adaptor
- CSA160E Desk top charger
- CMA412 Mobile adaptor
- CKP412 Keypad
- CTD412 DTMF unit
- CTN412 CTCSS tone squelch unit

C150/C528 Accessories

- CLC151 Carrying case C150 with CNB151 batt.
- CLC152 Carrying case C150 with CNB152 batt.
- CLC528 Carrying case C528 with CNB151 batt.
- CLC521 Carrying case C528 with CNB152 batt.
- CMP111 Speaker microphone
- CMP113 Tie-pin microphone
- CMP115 Speaker microphone (small size)
- CMB111 Mobile bracket
- CMC150K Mobile charger for CNB150/151/153
- CHP111 Headset with P.T.T. switch
- CNB151 Nicad battery pack (7.2V-700mAH)
- CNB152 Hi-power battery pack (12V-600mAH)
- CBT151 Empty battery case for dry cells
- CSA160E Desk top rapid charger for C150/C528 (replaces CSA150)
- CWC150 AC charger CNB151 battery
- CWC151 AC charger CNB152 battery
- CTN150 CTCSS tone squelch unit
- CTN520 CTCSS tone squelch unit
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	2nd IF	455 kHz	455 kHz	
Sensitivity (12dB SINAD)	0.150µV			
Threshold Squelch Sensitivity	0.112µV			
Selectivity (2-signal method)	55 dB		55 dB	
S/N Ratio at 0.5 µV Input	30 dB			
Audio Power Output (10% Distortions)	150 mW			

Transmitter:

RF Power Output	C188 Series				C488 Series				
	Hi	Mid	Lo	Hi	Mid	Lo	Hi	Mid	Lo
	with CBT181								
	1.2W	1.2W	0.15W	1.2W	1.2W	0.15W	1.2W	1.2W	0.15W
	with CBT182								
	1.5W	1.5W	0.15W	1.5W	1.5W	0.15W	1.5W	1.5W	0.15W
	with CNB181								
	1.2W	1.2W	0.15W	1.2W	1.2W	0.15W	1.2W	1.2W	0.15W
	with CNB182								
	5.0W	2.5W	0.15W	5.0W	2.5W	0.15W	5.0W	2.5W	0.15W
	with CNB183/184								
	2.5W	2.5W	0.15W	2.5W	2.5W	0.15W	2.5W	2.5W	0.15W

Performance specifications are nominal, unless otherwise indicated, and are subject to change without notice.

We are a main agent for ICOM, KENWOOD, YAESU, ALINCO and all popular brands of scanning receivers, SWR meters and aerials, plus a large selection of plugs and sockets.

Lee Electronics

## Scratch And Waterproof

The next stage is to make the front panel scratch and waterproof. This is done with clear, sticky-backed plastics, the sort of stuff that is sold to cover books.

Carefully lay the plastics material over the front panel. A little care is needed here, because it can wrinkle easily. It's a good idea to allow a little extra of the plastics material, to wrap around the edges of the panel.

The holes can now be cut out, using a sharp-pointed modelling knife. This is done by pressing the knife against the edge of the hole to get a clean cut.

This type of front panel can hide a 'multitude of sins'. Any scratches are hidden, and it's even possible to hide wrongly drilled holes.

I have often used a case a second time, by drilling new holes in the gaps between the original holes. The original holes are then hidden by the paper front. The plastics covering protects the rub-down lettering from being scratched.

## Setting-Up And Calibration

There are two simple tasks required to get the receiver working - the setting-up and calibration. All we have to do, is get the v.f.o. tuning range correct, and peak the input inductors on the mixer. The v.f.o. is particularly easy to set up.

As I've already described, setting-up the v.f.o. can be done using a frequency counter. It can also be done by listening for the signal on an existing receiver.

When you're actually carrying out the procedure, it's useful to add frequency calibration points on the front panel. The simplest way is to attach a pointer to the shaft of the slow-motion drive.

The in-line drives usually have a wider shaft just behind the small knob shaft, which moves at the rate of the variable capacitor. This often has a plate on it, fitted with a couple of screws for attaching a scale.

I used one of the screws on the drive to hold a stiff wire pointer. The calibration is then done with the receiver or the frequency counter.

The number of calibration points depends on the dedication of the constructor. I only use a few!

In practice, the calibration marks can be added on top of the clear plastics covering after the receiver is completed. Alternatively, the calibration can be added before the plastics covering is applied.

The second choice, adding the calibration before the covering is applied, means extra work. This is because the controls need to be mounted on the front panel, and then removed again after calibration, and finally returned after the plastics covering is added.

## Receiver Selectivity

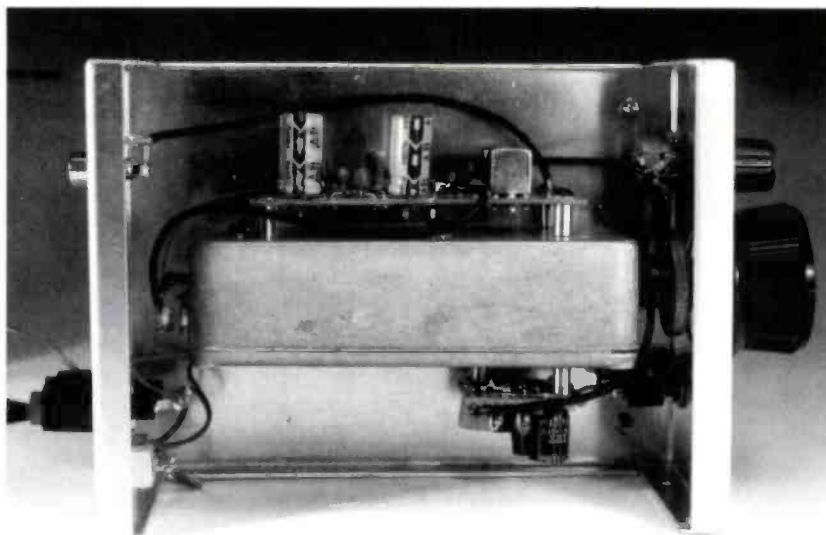
The receiver selectivity, is its ability to sort out one station from another. This depends upon the input tuned circuits on the mixer board, and the bandwidth of the audio amplifier (don't forget the i.f. is actually at audio frequency).

On the mixer board, the inductors have adjustable cores to peak the required signals, and to reject the unwanted signals. As the inductors are set and left to cover the whole band in this circuit, the result is somewhat of a compromise, albeit a well worked out compromise!

In practice, the cores are best adjusted using a trimming tool designed for the job. A small screwdriver will work, but it's best to avoid using one, as the metal shaft will affect the tuning.

Also, (be warned!) these cores are brittle, and they can be easily broken by careless application of a screwdriver. There are two cores to adjust, and the one nearest the mixer will probably have the greatest effect on the tuning.

The idea is to effect a compromise with the cores, to give the best peaked signals across the band. To do this, I usually begin by peaking a signal in the centre of the band. Practical Wireless, January 1993



**Fig. 3: The photograph shows the internal layout of the PW-80, the interconnection details between the various p.c.b.s and the method of mounting the boards with stand-off pillars on the die-cast aluminium v.f.o. box (see text).**

followed by adjustments at the low end.

You may be fortunate enough to have a signal generator which can give a signal on the 3.5MHz band. If so, the job is easy, but ought to be done with the weakest signal strength that can be heard in the receiver.

If a signal generator isn't available, don't worry! You can use signals on the band. After all, that's what the receiver will be used for!

When using the off-air method, it's best to look for signals that are clear but not very strong at the required parts of the band, before peaking them with the adjustable cores.

## Funny Old Band

The 3.5MHz allocation, is a funny old band. During the daytime there may only be a few s.s.b. signals from the nets that use the band.

During the evening however, there could be too many signals! Remember that this receiver is designed for a 50Ω antenna input impedance.

Few of us have an antenna which gives a natural 50Ω termination on 3.5MHz. So, to overcome this, an antenna tuning unit (a.t.u.) will be required for best results. (Don't forget that we built one earlier in this series).

## Not Sophisticated

The PW-80, may not be the most sophisticated amateur bands receiver, but it will certainly receive plenty of signals. And it's much more fun when you have built it yourself!

Well, that's the end of this series of 'Getting Started - The Practical Way'. We've been together now for almost two years, and have covered everything from resistor networks to working with integrated circuits, and ending up with a useful little receiver. **PW**

A suitable case for the PW-80 receiver is sold by: Minfford Engineering of Sun Street, Ffestiniog, Gwynedd, North Wales LL41 4NE. Tel: (0766) 762572.

*This series has been aimed at the beginner. I've enjoyed reading your letters, and I have had great pleasure in helping readers to get going in the hobby. I hope you've enjoyed it too, because that's what it's all about! Cheerio for now.*

**Are you late in getting started?** Don't worry if you've missed part of the G3RJV series. If you want to build the PW-80 direct conversion receiver, photocopies of the articles dealing with this project are available for 85p (including postage) each. Readers requiring the full set should write to: **Getting Started Receiver, Atten. Donna Vincent, Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP.** The issues relevant to the PW-80 are: February, May, September, November and December.





**Fig. 1: Peter Hunter GOGSZ in the shack.**

# Bits

## The Computer

*Peter Hunter GOGSZ, asks you, is there a computer in your shack? If so, do you make full use of its facilities? Or, is it used for one purpose only? If you can't answer these questions positively, our new contributor is determined that you'll soon be getting the best out of that versatile electronic 'tool' sitting on the bench.*

**W**elcome to 'Bits & Bytes - The Computer In Your Shack'. If you don't have a computer at the moment, are you thinking of adding one to your shack equipment list in the future?

And, if so, are you worried about what to get and how to use it when you get it?

Don't worry, I'm not being nosy! But if any of these questions gain a yes from you, then 'Bits & Bytes' is especially for you. If you answered **no** to any or all of these questions, then read on, because you may still find items of interest to you.

Thanks to the newly introduced Novice Licence, amateur radio is seeing an increasing number of younger people entering into our hobby. As these 'newcomers' have grown up with the computer, it's only natural that they should bring their computers, and computer knowledge into the hobby with them.

Please don't misunderstand me. I'm not suggesting that the Novice Licence, or the younger generation brought computers into the amateur radio shack! We all know that radio amateurs have been using computers, almost since the day computers were generally available.

### Computer Aware

Nowadays, an increasing number of people are very computer 'aware'. It's this obvious fact, that has dictated the need for a column such as 'Bits & Bytes' in *PW*.

The response to the 'Computing In Radio' supplement in the April 1992 *Practical Wireless* is proof of this demand. And, the requests and response in letters sent to 'Receiving You' has added weight to the need.

So, here I am, to fill that need for you! And, it's my intention as the months go by, to look at the many ways in which a computer can be put to good use in the radio shack.

I'll review as much amateur radio-related software (programs), and computer hardware (add-ons), as I can get my hands on! But mainly, I want this to be better known as a 'lets-help-each-other', and 'learn-how-to-do-it' column. It's got to be a practical radio computing column, because this is *PW*!

### Computer Knowledge

There are many radio amateurs out there, with a lot of knowledge about computers. There are also a considerable number of amateurs with very little knowledge of computers.

So, it seems only natural that we should pool our knowledge and help each other. After all, isn't this what amateur radio enthusiasts around the world have been doing for many years now?

Sharing the knowledge is especially important, with regard to designing and building equipment, and learning new operating skills. Well, we can build our own computers, and learn new ways of using them if we help each other.

# s & Bytes

## In Your Shack

### The Hunter Family

First, I'd better introduce the Hunter family! The photographs show my wife Elaine G1W0Q, and myself in our shack.

It's mainly due to my largeness, and partly the shack's smallness, that stops us from both fitting into the same photograph! The pictures also show the radio and computer equipment we use.

We haven't always been in wheelchairs though. When we married in March 1984, and moved to Norwich from London, I was a driving instructor with the British School of Motoring.

Elaine was working full-time for a cosmetics company. We had no real interests in amateur radio at that time, but were both very interested in computers.

During 1985/86 I had two fairly major operations on my back, both of which were unsuccessful. After that, rheumatoid arthritis started to take a hold.

Although I can get around the bungalow with one or two sticks occasionally, I need the chair most of the time. In 1986, Elaine was diagnosed as having severe Multiple Sclerosis, and she can now only get around with her electric wheelchair.

### A Real Boon

Amateur radio has been a real boon to us. It allows us to chat to people all over the place. We particularly like packet radio.

Elaine likes packet radio because the MS effects her speech to the point of embarrassment at times. I like packet because you don't need elaborate antennas!

It's just as well that elaborate arrays aren't required. This is because the local council's planning department have only granted us permission for a single 10 metre pole, with one vertical antenna on top.

It's a pure coincidence that the guy wires to this pole resemble a G5RV! But I did, at one stage, consider holding the planning committee to their word.

I thought of placing a half-wave vertical antenna for 1.8MHz on my mast. Sorry, I meant pole! But, for obvious reasons, I decided against that idea.

Our shack radio equipment comprises a Kenwood dual-band v.h.f./u.h.f. f.m. transceiver, and a Yaesu FT707. Both rigs are on loan from the Radio Amateur Invalid & Blind Club.

The RAIBC also helped make arrangements with the City & Guilds for us to sit the RAE at home. This extremely helpful facility was further extended by the RSGB when I took the Morse test at home.

### The Shack Computer

The computer that we've got in the shack now, is Practical Wireless, January 1993

an IBM PC/AT 386 compatible machine. I built it myself, using components I bought from magazine adverts. Some parts I bought new, but the majority were second-hand.

Over the years, we've had many different computers. Normally, we would sell or exchange one set-up so as to get another. Our decision was not always the right one though!

### Make And Model

Well, now it's time to get down to work, and get a couple of points clearly understood. Firstly, the make and model of computer that you have is **not** important.

Computer gear is like amateur radio equipment. It's not vitally necessary to have the very latest, super-powerful 'all singing all dancing' gear, to be able to get it to do what you want.

Somewhere, you will find programs written for just about any type of computer. This is one of the reasons I like packet radio so much. A bulletin put out on packet radio, can find an assortment of information that would otherwise seem non-existent.

### Age And Education

My second point is that **age** and **education** are not factors for consideration, when it comes to using a computer in the shack. In fact, these are two areas where the computer will really be useful.

If you tell the computer to remember something, it will. For the rest of its life if you want it to. And it will remember **exactly** what you told it, and not many humans can do that!

There's no need to worry if you are not too good at maths or spelling, or electronic calculations. The

**Elaine Hunter G1W0Q shares the interest in computers and the shack with husband Peter.**





# MARTIN

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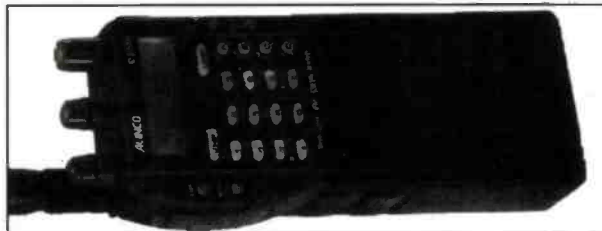
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Readers and customers will be delighted to know that once again, I am able to re-introduce the highly successful **BUY NOW -PAY LATER** scheme, introduced about the same time last year! With thanks going to Tricity Finance, (and your's truly), this crafty little scheme means you can select the rig of your choice, and pay 'not a penny!', until 3 months are up. You can then pay the balance in full, with **NO INTEREST CHARGES**, or pay 'lumps' off your amount owed on a monthly basis.

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The antenna system at the Hunter's home, the pole also supports a G5RV antenna.

computer is faster and more accurate than I will ever be! Just remember that if you can control a machine by pressing buttons, you can control a computer.

You could be forgiven for mistakenly thinking this is going to be a computer course. It isn't!

'Bits & Bytes' won't be one of those articles that goes on and on about computers either. There are enough of those in the computer press if that's what you want.

## Different Ways

In 'Bits & Bytes' I will be looking at the different ways in which a computer can be put to use in the shack. At the same time I will endeavour to answer any problems you may be having.

The problem sharing may involve things such as: getting

a program up and running, or fitting an add-in card (TNC for instance) into your PC. In this way, I'll be trying to show that, not only can anyone operate a computer, but everyone that has one can benefit from their machine.

The main purpose of the column is so that we can help each other to get the most out of our computers. Now when I say we, I mean you as well!

I need you to talk to me. This has got to be a two-way exercise. Please don't panic - I'm not going to ask you to write long letters for me to include in this column.

I'm quite happy to do all the writing. What I need from you is **information**.

## Software Items

You may have some software items that you use all the time, or often for a certain task, such as for log-keeping during a contest. If you do, just drop me a line and tell me about it.

If it's in the Public Domain or Shareware and works on a PC, send me a copy (I'll send your disk back). If it has copyright and/or is not for the PC, then tell me about it anyway.

Tell me what it does, how well it works, and where our readers can get a copy. That's the sort of thing that will help me to help you.

Likewise, if you have any helpful hints or tips

## Club Activities

Do you run a club for amateur radio computer users? If you do, whether for a specific computer or for computers in general, please tell me about your activities. Send me a newsletter if you produce one. At the very least, give me details of a contact address. I'll always find room for this sort of information.

that you think readers would like to hear about, let me know. I'll always put your name to anything you tell me.

It may be, for example, that you have found a new way of storing information about sked's on the computer. Share it with us.

Also, if you're trying to find the best way to do a certain task, let me know. If I can't help you, I'm sure that one or more of our readers will be able to assist in some way.

## Open Invitation

Next, I'm offering an open invitation to all those software writers, publishers, librarians, etc., who read *PW*. The invitation is also open to those clever people who make the hardware that we add on (or plug in) to our computers.

I'd like to hear from those enterprising people who advertise PCs in kit form. And we mustn't forget those who write books about using the computer with amateur radio equipment.

To everyone, I ask you to please send me your products for review! Any review that I do will include one or more photographs.

I'll also include full details of who supplied the item being reviewed. But, take heed, as there won't be any complicated technical details in this column.

All items will be looked at, and reported on, through the eyes of the user. The reviews will be a hands-on description, from installation (or assembly) to operation, and beyond!

If the software you produce or sell is not for the PC, please send me details anyway. It's useful to let everyone know what is available for their computers.

## Not Data Comms

In case you haven't realised it, this is **not** a data communications column. Although I'll be looking at software, and possibly hardware, for all the popular data modes, 'Bits & Bytes' is a **computer in the shack** page!

Even if you never use the computer with your radio equipment, there are many ways in which the computer can be put to very good use. This is especially true now that we are allowed to keep logbooks on magnetic media (computer tape or disk).

PW

In this first column I have tried to give you some idea of my intentions for the future. But as yet, I've had no items to review, and no feedback from you.

Hopefully, by the time the next 'Bits & Bytes' is published, I'll be up to my ears in mail!

There are three ways in which you can contact me. You can use the postal service and write to me at: 2 Mayes Close, Bowthorpe, Norwich NR5 9AR. Alternatively, you can send me a packet message via: G0GSZ @ GB7LDI.#35.GBR.EU. You can also telephone or FAX me on Norwich (0603) 748338. The telephone will very often be switched to the answering machine, but I always listen to my messages, and act upon them!

So, it's cheerio until the next edition of 'Bits & Bytes', and in the meantime I'm looking forward to hearing from you all.

73 de Peter G0GSZ.

# Teaching An Old Hand New Tricks



As he approached retirement, Ernie Godfrey found that his interest in the radio hobby was re-kindled by the Rev. George Dobbs G3RJV's 'Getting Started - The Practical Way'. And as we've got a kit-building theme, he thinks his experiences might encourage a few others to get going again.

**Ernie Godfrey says "You could say that I've been 'converted' by the Rev. George Dobbs G3RJV and I'm definitely an old hand that's been taught new tricks!"**

**M**y interest in radio or 'wireless' as I first knew it, began, when as a schoolboy, I made my first crystal set. Crude as it was, it worked. But I was more fascinated by the fact that I could, without seeing or hearing it, pluck this unseen force out of the air and turn it into speech or music.

My first copy of *PW*, if my memory serves me right, cost three old pence (about 1½ new pence). The manuals of those days by F. C. Camm and J. Scott-Taggart were showing wireless sets where you had to screw the various components on to a wooden base-board.

## War Work

World War Two started just about the time that I left school as a 15-year old, and I soon found myself put into war work. After that I eventually went into the army, so very little was done to further my hobby.

It was during the post-war years, with mountains of surplus equipment available, when my interest was first rekindled. And, I'm actually writing this story mainly with 'old hands' like myself in mind, who, when younger, would burn the midnight oil chassis-bashing!

Hack-saws, hammers and a hand-drill, were some of the tools needed in those days. You often ended up with the occasional hole in the kitchen table, but if the project worked, it was worth the effort.

Over the years, I have made many projects that appeared in *PW*. But as the years rolled by, my valued projects got fewer and farther apart, and to me it was the end of an era.

I did, however, have a go at a couple of simple transistor circuits from the 'Take 20' series that appeared in the 1960s. I must admit though, I wasn't as enthusiastic as I was with valves.

Despite my fall-off in interest, I still got my *PW* every month, just so to keep up-to-date. Apart from the ancient magazines that can be seen in the doctor's or dentist's waiting rooms, it's the only one I read. Strange isn't it, that you never see copies of *PW* in the waiting rooms?

## Back Issues

With the approach of winter last year, I found myself browsing through back issues of *PW*. My attention kept focusing on the 'Getting Started - The Practical Way' series by the Rev. George Dobbs G3RJV.

"Why not give it a try?" I thought, especially as I still have the skills that I've acquired over the years. Good fortune has also provided me with the steady hand that's needed for this work.

Mind you, my eyes could do with replacement spectacles, I was well overdue for a new pair. So, what was I waiting for, 'if you can't beat 'em, join 'em!'

To date of writing, I've made the r.f. probe, the transistor tester and the multivibrator featured in the 'Getting Started' series. I didn't have any problems in either the construction or testing.

However, I did go away from the general lay-out in the case of the multivibrator project. I used BC108 transistors instead of the specified BC183s, as apart from not having them to hand at the time, I remembered the BC108 being used in a similar *PW* circuit.

In fact, my transistors were salvaged. I'd recovered them from my junk box, and tested them on the transistor tester I'd just made!

When I started building the projects, I'd already decided to house them all in one box, rather than have three individual boxes. This is how I ended up with a plastics box measuring 180 x 100 x 75mm, with all the components mounted under the lid.

My wife spotted the project box as she passed me working in the kitchen. Her comment was "I don't think you'll get much more in there!"

However, with the test leads made up, I'm pleased with what I've built and how it looks. Yes, I think I am going to like transistors, so now to tackle integrated circuits!

You could say that I've been 'converted' by the Rev. George Dobbs! And I'm definitely an old hand that's been taught new tricks!

PW



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## Radio Diary

\* Practical Wireless & Short Wave Magazine in attendance.

*If you're travelling long distances to rallies, it could be worth 'phoning the contact number before setting off, to check all is well.*

**December 13:** Centre of England Christmas Radio, Computer Electronics & Communications Rally will be held at the National Motorcycle Museum, near the NEC, Birmingham, junction 6 M42. Opens 11.30am (11am for disabled visitors). Admission is £1, with a reduction for RAIBC members. Over 60 traders in three large halls, ample parking, bar & restaurant facilities. Concessionary rates for those wishing to visit the museum. Talk-in on S22. Christmas Special - 'spot the cracker', which will be on many of the trade stands to win a free prize. **Frank Martin G4UMF on (0952) 598173.**

**December 13:** The Verulam Amateur Radio Club Christmas Rally will be held at the University of Hertfordshire (formerly Hatfield Polytechnic). Doors open 11am. There will be a bar, refreshments & a grand raffle with excellent prizes. Free parking with talk-in on 144MHz (S22). **Walter Craine G3PMF, 5 The Crescent, Abbots Langley, Watford, Hertfordshire WD5 ODR.**

### 1993

**January 24:** The Lancastrian Rally will be held at the University of Lancaster. Doors open 10.30am for

the disabled. **Sue G10HH on (0524) 64239.**

**February 7:** South Essex ARS Radio Rally will be held at The Paddocks, Long Road (A130), Canvey Island, Essex. Doors open 10am. Trade stands, Bring & Buy, home-made refreshments, free parking. Parking outside main door for disabled visitors. Talk-in on S22. **Ken Hendry G0BBN on (0268) 755350.**

**February 27:** Tyneside ARS 5th Annual Rally will be held at the Temple Park Leisure Centre in South Shields. All usual trade stands, free parking. Talk-in S22. All the amenities of the Leisure Centre, including heated pool & gymnasium. **Jack Pickersgill G0DZG on 081-265 1718.**

**March 13/14:** The London Amateur Radio & Computer Show will be held at Picketts Lock Centre, Picketts Lock Lane, Edmonton, London N9. Large trade presence, free parking, lectures, disabled facilities, Bring & Buy, special interest group section. Talk-in on 144 & 430MHz. (0923) **678770.**

**March 28:** Bournemouth Radio Society's 6th Annual Sale will be held at Kinson Community Centre, Pelhams Park, Millhams Road,

Kinson, Bournemouth. Doors open 11am to 5pm. Talk-in from G1BRS on 144MHz S22. Amateur radio & computer traders, clubs & specialised groups. Refreshments. Admission £1, including free raffle ticket. **Ian G2BDV on (0202) 886887.**

**April 18:** Marske-by-the-Sea Radio Rally will be held in the Marske Leisure Centre, High Street, Marske-by-the-Sea, near Saltburn. Doors open 11am. Usual traders, Bring & Buy & refreshments. Talk-in S22. **Mic G710N on (0287) 610030.**

**April 26:** The Bury (Lancashire) RS will be holding another Hamfeast/Rally at the Leisure Centre, Bolton Street, Bury. **Laurence G4KLT on 061-762 9308.**

**May 3:** Dartmoor Radio Club Rally will be held at Yelverton War Memorial Village Hall, Meavy Lane, Yelverton, Devon. Doors open 10.30am. Talk-in S22. **Ron G7LLG on (0822) 852586.**

**May 9:** The 9th Yeovil QRP Convention will be held at the Preston Centre, Monks Dale, Yeovil, Somerset. Featuring lectures, displays of home-made QRP equipment & vintage radio, on-air QRP stations & trade stands. Refreshments, doors open 9am,

admission £1.50, talk-in S22. This convention is not a rally, but a convention for amateurs not only to attend interesting lectures about the technology & practice of low power communication, but also to meet other QRPers. There will also be the usual friendly QRP Contest on 3.5 & 7MHz, during the evenings of the previous week. This event is known as the QRP 'Funrun'. **Peter Burridge G3CQR, 9 Quarr Drive, Sherbourne, Dorset DT9 4HZ. Tel: (0935) 813054.**

**May 16:** The 2nd National Vintage Communications Fair will be held at the NEC, Birmingham. Doors open 10.30am to 5pm. Hundreds of items for sale, including vintage radios, telephones, gramophones, jukeboxes, radiograms, etc. Admission will be £3. **Jonathan Hill on (0398) 331532.**

**May 30:** Maidstone YMCA Radio Rally will be held at YMCA Sportscentre, Melrose Close, Maidstone, Kent ME15 6BD. Doors open 10.30am (10am for disabled). Entry is £1 per adult. Exhibition station GX3TRF (on h.f.). All-day video show for juniors. Refreshments & snacks available. Bring & Buy tables for hire. **Brenda Puncher G0LJK on (0622) 850277.**





## Common German Christian names

It is easier to recognise them in the DRM if you have seen them before. These are some of the names which have been popular at different times over the last 60 years. Names whose spelling is identical to English names (e.g., Peter or Barbara) have not been included. Variants and diminutives are given in brackets.

Male Names	Female Names
Andreas	Angelika
Bernd	Beate
Dieter	Betina
Erich	Birgit
Ernst	Brigitte
Fritz	Dagmar
Franz	Elke
Gerhard	Franziska
Günter (Günther)	Gerda
Hans	Gisela
Hermann	Gudrun
Heinz	Hannelore
Helmuth (Hellmut)	Helga
Joachim (Jochen)	Hildegard (Hilde)
Jürgen	Inge
Klaus	Ingrid
Kurt	Ilse
Lothar	Marlies
Manfred	Petra
Matthias (Matthias)	Regine, Regina
Norbert	Renate
Rainer	Sabine
Rudolf (Rudi)	Sigrid
Stefan	Silke
Udo	Susanne
Ulrich (Uli)	Ulla, Usch (both short for Ursula)
Werner	Ulrike
Wolfgang	Ute

## Numbers

Together with their pronunciation

German	Pronunciation
1	eins
2	zwei
3	drei
4	vier
5	fünf
6	sechs
7	sieben
8	acht
9	neun
10	zehn
11	elf
12	zwoölf
13	dreizehn
14	vierzehn
15	fünfzehn
16	sechzehn
17	siebzehn
18	achtzehn
19	neunzehn
20	zwanzig
21	einundzwanzig
22	zweiundzwanzig
30	dreissig
40	vierzig
50	fünfzig
60	sechzig
70	siebzig
80	achtzig
90	neunzig
100	hundert (einhundert)
200	zweihundert
1000	tausend (eintausend)
2000	zweitausend

Note: Having identical vowels in "zwei" (two) and "drei" (three) means that the two will often get confused. If there is any danger of confusion (e.g., in heavy DRM) people will use "zwo" instead of "zwei".

## Days of the Week

English	German	Pronunciation
Monday	Montag	moantaak
Tuesday	Dienstag	deenstaak
Wednesday	Mittwoch	mitwoch
Thursday	Donnerstag	donnerstaak
Friday	Freitag	fry-taak
Saturday	Samstag	sumstaak
(Northern regions: Sunday	Sonntag	zontaak
on Sunday	Sonntag/am Sonntag	
on Sundays	sonntags	
every Sunday	jeden Sonntag	yaiden zontaak

## Time

English	German	Pronunciation
It is 1 o'clock	es ist ein Uhr	es ist ine oor
It is 2 o'clock	es ist zwei Uhr	es ist tsuy oor
It is half past two	es ist halb drei	es ist haalb dry

Note: half past two = half to three!  
 quarter to/past Viertel vor/nach feertel foar/nach

## The German Alphabet

This is used to give the Q code and also for call signs.

A aa	K kaa	U oo
B bay	L ell	V fow (as in fowl)
C tsay	M memm	W vay
D day	N enn	X ix
E ay	O o	Y üpsilon
F eff	P pay	Z tset
G gay	Q koo	
H haa	R air	
I ee	S ess	
J yot (Austrian: yay)	T tay	

Next month we start another language, learn those QSOs in French!

# Basic QSOs In German

*In this final part of 'Basic QSOs In German', Gareth Roberts GW4JXN, lists many useful names and items commonly found in amateur radio conversations.*

**For those who have some knowledge of German there follows a list of the most common technical words and phrases. The pronunciation is not given.**

absorption wavemeter - der Absorptionswellenmesser	frequency modulation - die Frequenzmodulation
ammeter - das Amperemeter	fuse - die Sicherung
amplifier - der Verstärker	ground wave - die Bodenwelle
amplitude modulation - die Amplitudenmodulation	high-pass filter - das (der) Hochpassfilter
antenna - die Antenne	indoor antenna - die Zimmerantenne
antenna tuning unit - das Antennen-Abstimmgerät	insulator - der Isolator
	ionosphere - die Ionosphäre
balun - der Balun	jack - die Buchse
beam - der Beam	lightning protection - der Blitzschutz
calibrator - das Eichgerät	line of sight - auf Sichtweite
carrier - der Träger	lower sideband - das untere Seitenband
coaxial cable - das Koaxkabel	low-pass filter - das (der) Tiefpassfilter
coil - die Spule	metal case - das Metallgehäuse
condenser - der Kondensator	meter - das Messgerät
cross modulation - die Kreuzmodulation	modulated wave - die modulierte Welle
deviation - die Abweichung	omnidirectional antenna - die Rundstrahlantenne
dial - die Skala	operator - der Funker
directional antenna - die Richtantenne	parasitic oscillations - parasitäre Schwingungen
disturbance - die Störung	plug - der Stecker
dummy load - die künstliche Antenne	power supply unit - das Netzteil
	preset - voreingestellt
the earth - die Erde	preset potentiometer - der Trimmer
to earth - erden	pulse modulation - die Impulsmodulation
earthed - zu Erde/geerdet	radiate - strahlen/abstrahlen
fading - das Fading/der Schwund	the range - die Reichweite
feeder - die Verbindungsleitung/das Antennenkabel	readability - die Lesbarkeit
final stage - die Endstufe	receiver - der Empfänger
fixed - fest	repeater - der Umsetzer/die Relaisstation
	r.f. amplifier - Der HF-Verstärker
	rotating antenna - die drehbare Antenne
	rotator - der Rotor
	satellite - der Satellit
	selectivity - die Trennschärfe
	sensitivity - die Empfindlichkeit
	shielded cable - die abgeschirmte Litze
	short circuit - der Kurzschluss
	sideband - das Seitenband
	skip zone - die Tote Zone
	sky wave - die Raumwelle
	sound frequency - die Tonfrequenz
	splatter - der Splatter
	standing wave - die stehende Welle
	switch - der Schalter
	to test - prüfen
	transceiver - der Transceiver
	transistor - der Transistor
	transmitter - der Sender
	troposphere - die Troposphäre
	tuned circuit - der Schwingkreis
	to tune up - abstimmen
	upper sideband - das obere Seitenband
	valve - die Röhre
	variable - veränderlich/variabel
	vertical antenna - die Vertikalantenne
	voltmeter - das Voltmeter
	wavelength - die Wellenlänge
	wavemeter - der Wellenmesser
	Yagi - der Yagi





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LW8/2M	8 Ele Yagi	33.60
LW10/2M	10 Ele Yagi	40.77
LW16/2M	16 Ele Yagi	59.46
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# Using Those Versatile Vacuums

## Part 2

*In the second and final part of his look into the world of valves and valved equipment technology, Phil Cadman G4JCP provides useful tips on where to find old equipment. Finally, Phil takes the mystery out of the rather puzzling subject of valve reference numbers.*



Following the first part of my look at using those 'versatile vacuums' in the October *PW*, I'm going to take a look at scrounging. In my early days in the hobby, this was the best means of maintaining a vigorous junk-box.

Funnily enough, in those days, most people contributed to my junk-box with a glad heart. They were only too pleased for someone to take their old radio and TV receivers off their hands. After all, it saved them a trip to the rubbish dump!

However, if you are intending to work on the design of valved equipment, rather than the odd bit of construction, a well-filled junk-box is even more essential than it was 20 years ago. The main reason is the lack of easily-available off-the-shelf components.

### Prudent Purchases

Prudent purchases at rallies and other events may pay dividends, especially if they're used later. However, being realistic, a proportion of the stuff you collect will probably never be used.

When you do have a clear-out, don't forget others may benefit. It's best to advertise your surplus junk.

At this point, I'm going to appeal to any old-timers who may be thinking of disposing of their precious collection of junk. Please remember those valve enthusiasts who are just starting off.

Don't forget also, that you'll be able to help in other ways too. Your accumulated knowledge will be invaluable, provided that those young whipper-snappers will listen. So, all you experienced types, please try to pass your knowledge on.

### Equipment For Dismantling

Now, it's time for a list of suitable valved equipment for dismantling. In preparing the list, I've considered the *Practical Wireless*, January 1993

value of the components the various items mentioned might contain.

Unfortunately (or fortunately, depending on the way you look at it) a lot of older equipment is actually worth more, 'intact' to a collector, than the components it contains. With this in mind, I've provided some advice on what not to dismantle, no matter how useful the innards may be!

Mains radio receivers were once a lucrative source of components, the situation is now complicated by their value to collectors. Don't dismantle any radio that was made before the mid 1950s, unless it's literally falling apart.

Radios from the late 1950s and the first half of the 1960s, may be worth something, particularly if they're in good condition. Even if they're not especially collectable, radios from this period invariably sound better than their successors, mainly because of the larger cabinets and generous audio output.

You could always use one of the older receivers in the shack to listen to the news! But, if you have a radio where the cabinet is really poor, or it has a major fault, I'd suggest that you could then start dismantling it for spares.

### Mains Transformer

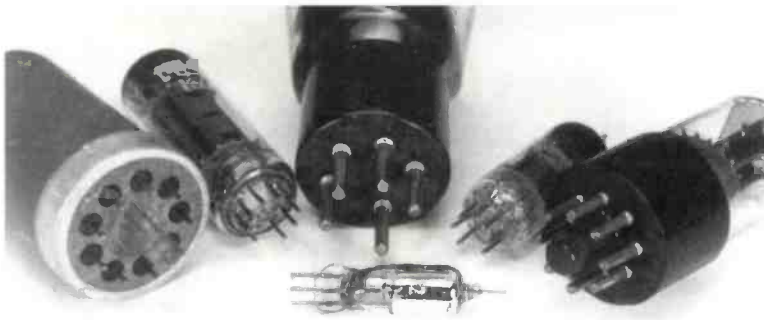
Unless the radio you're dismantling is an a.c./d.c. model, the first item to go for (after you've removed the valves) is the mains transformer. Then you should remove the audio output transformer and the tuning capacitor.

The next stage is to remove what you can! But, beware of the smoothing capacitors and any paper capacitors, for the safety reasons I've already mentioned in part 1, published in October.

Don't take any risks. The circuit and advice in Fig. 4, in the October *PW*, will reform and test electrolytic capacitors.

**Phil Cadman G4JCP says that you can still enjoy using valves, and find many jobs for those versatile vacuums in your shack.**





There are a great number of valve bases, and some were very specialised and are now rarely seen.

**Warning:** *Be very careful with electrolytic capacitors rated for use at 200V or more, and especially if they have not been in use for some time. Such capacitors can explode with great violence, creating havoc within equipment and possible injury to you! It's always a good idea to re-form capacitors, and this can be done by placing a 15-20W 250V bulb in series with the capacitor and the h.t. supply. If the capacitor is literally a short-circuit (which they can be!) the bulb will illuminate. If the capacitor is in order, reforms or becomes less 'leaky', the bulb filament will gradually become less bright, and will eventually extinguish. After a final check to see that the leakage current is within the h.t. supply's capability, you can use it quite safely.* Editor.

### Salvaging Resistors

It's hardly worth salvaging resistors, particularly if they're of the old carbon composition type. Wire-wound resistors however, are a different matter. Unless wire-wounds have been damaged physically or overheated, they're certainly worth keeping.

Even a collection of mains-droppers, salvaged from old a.c./d.c. receivers, can be useful. They can, for example, be made into made into a dummy load, for testing power supplies.

### Valves And Holders

If the radio you're breaking up uses valves, other than types with octal and B7G/B9A bases, it may be worth taking the trouble to salvage the holders. These won't necessarily be for use in projects, but they can provide useful spares for repairing other elderly or restorable equipment.

The valves used in radios, by the way, fall broadly into two groups, those from equipment with mains transformers and those from a.c./d.c. sets.

For our purposes, valves from equipment using mains transformers are by far the most useful. This is because they'll have 5 or 6.3V heaters (filaments) and characteristics optimised for 250 - 350V h.t. supplies.

Valves designed for use in a.c./d.c. equipment will probably have heaters that require 100mA. Unfortunately, this means that the heater voltage will vary from valve to valve and be relatively high when compared to the 6.3V heater valve.

There's another problem in using valves designed for a.c./d.c. circuits. This occurs because they will have had their characteristics optimised for h.t. supplies operating between 170 and 250V.

Examples of specialised disc-sealed valves, rarely used in amateur radio, but they make interesting mantel piece ornaments!



Using valves designed for a.c./d.c. use, can prove difficult because of their awkward heater requirements, unless you want to employ one or maybe two. In this case, a low voltage transformer can provide the necessary heater supply.

### Battery Receivers

Another interesting source of valves, are those from 'all dry' battery-powered radios. Almost all battery radio receivers are worth keeping, if they're in good condition.

Spares for 90V h.t. and 1.5V heater valve-equipped receivers are virtually unobtainable. So, it's a good idea to keep a spares box.

You may even be lucky enough to find a 'mains eliminator'. These were, at one time, a popular alternative to the (always expensive) all-dry batteries.

Fortunately, you don't have to wait for luck to bring you a suitable supply, because *PW* has published a circuit! The 'Power Supply For Battery Radio', designed by Stefan Niewiadomski, is ideal for the job and was published in May 1990, and there's a p.c.b. available for the project.

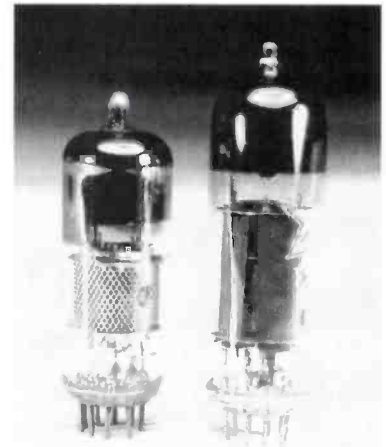
### General Advice

I had better end up with some general advice, and old TV receivers are a good source of valves, if nothing else! However, almost all the valves are for a.c./d.c. use.

Fortunately, there are some very useful types of valves in older TV sets. These include the EF80, and the ECC81/82/83 double-triodes.

You'll also find the ECL80, triode/output pentode. This 6.3V 300mA heater valve is very useful in QRP transmitting projects.

Look out for the EF85/EF183 and EF184 valves. When used carefully (because of the high gain they provide) the EF183 and 84, in particular, can be very useful.



**Valves using the B9A base (pictured here) along with the slightly smaller B7G base versions, are still very much in use today. Such valves, especially the EF183 and EF184, can provide excellent results.**

Mains powered tape recorders are a particularly good source of spares. Fortunately, older tape recorders don't seem to be so collectable (at the moment) and they are easily obtainable to break down for transformers, valves and good quality audio components.

Record-players and radiograms can also be a good source. Your decision to dismantle, must depend on the condition of the equipment. They might become really collectable!

### High Fidelity Equipment

When it comes to valved high fidelity equipment, my advice is that you put the screwdriver away! The rule, when it comes to such equipment, must be 'leave it alone'.

The value of valved audio equipment varies, and depends on who made it. But the general rule is that it's usually worth more intact, than as spares. Leak, Radford and especially Quad valve amplifiers, are worth more than their original list prices.

## Start Collecting

So, it's time for you to start collecting! Look out for bargains at rallies and events, and you'll soon be in business.

With just a little care, you can find the bargains. For example, you'll see good quality oil-filled transformers and capacitors about. But be careful and check these for leaks.

If any oil-filled component is leaking, or feels oily,

don't buy it. I don't know of any way of identifying the dangerous pollutant insulating (PCB) oils, so it's best to avoid suspect transformers or capacitors.

Apart from that final warning, my advice is to get out there, start working and using those versatile vacuums and having fun. After all, there's a lot of valves waiting to be used! It will be a terrible shame if we preserve the artifacts of the valve era, without making some attempt to record the knowledge that accompanied them.

PW

## Valve Identification And Coding

Many valve data books include information on how valves are identified, so I'll not go into any great detail here. What follows will get you by, until you are familiar with the identification systems used by the various manufacturers.

### American Valves

**1st number(s) - approximate heater voltage.**

**suffix G - glass, some early valves were metal-cased and had no suffix, the G was added to distinguish the glass version.**

**suffix GT - glass, but with slim-line, tubular shape.**

**Example 5Z4G**

5 - 5V heater

Z4 - identification

G - glass, old bulbous shape.

In a nutshell, the valve number is not a great deal of help. Best to get an equivalents book or a data book that covers American valves.

### British valves - Mullard system.

**1st letter heater voltage or current**

D 0.5 to 1.5V

E 6.3V

G 5V

P 300mA series connection

U 100mA series connection

**2nd and subsequent letters - class**

A diode

B double diode

C triode

F pentode

H hexode (or heptode)

K heptode

L output pentode or tetrode

M magic eye indicator

Y half-wave rectifier

Z full-wave rectifier

Two or three letters may be combined, indicating two or three valves in one envelope.

e.g:

CF triode pentode

ABC triple diode (single diode plus double diode) triode

**1st digit base type**

2 B10B (also was used for B8G base)

3 octal

4 B8A

5 B9D

8 B9A

9 B7G

**2nd and subsequent digits - variant**

**Examples ECC83 and PL36**

E 6.3V heater

CC double triode

8 B9A base

3 variant

P 300mA heater

L output tetrode

3 octal base

6 variant

Where the class letters are transposed with the numbers, for example ECC88 becoming E88CC, this indicates a special quality type. The two are normally interchangeable, but some slight differences are to be expected in the characteristics.

### British valves - Mazda.

**1st digit heater voltage or current**

1 1.4V

6 6.3V

10 100mA series connection

20 200mA series connection

30 300mA series connection

**2nd and subsequent letters - class**

C frequency changer

D diode(s)

F tetrode or pentode

FD tetrode or pentode with diode(s)

FL tetrode or pentode with triode

L triode(s)

LD triode(s) with diode(s)

M magic eye indicator

P output pentode or tetrode

PL output pentode or tetrode with triode

U half-wave rectifier

UU full-wave rectifier

### Final number - variant

**Example**

**30PL1**

30 300mA series heater for series connection

PL output tetrode with triode

1 variant (obviously the first in this case)

One important point to note concerns Mazda-octal based valves. Mazda-octal is not the same as normal octal (international-octal) although at first glance they look the same. Mazda-octal valves have, apart from Mazda written all over them, a thicker central spigot than international-octal valves and the pins are not quite equi-distantly spaced. It is worth salvaging one or more Mazda-octal valveholders if you need a replacement. Despite what I have just said, by the 1960s, Mazda-octal based valves had effectively died out. Mazda meanwhile went about producing international octal based valves. So, not every Mazda valve with an octal base is a genuine Mazda-octal, you still have to look for yourself.

There are a few other systems attributable to both the manufacturers I have mentioned above and to those I have not. However, none are as informative and so I feel they are not worth mentioning here.



# Reflections

*This month, Ron Ham recalls memories of the early days of 'wireless' communications he obtained by talking to veterans from the days of sparks and land-lines. He also wishes all his readers a very merry Christmas and a happy New Year!*

Reliable communications, over great distances, unconnected by wires, is what the subject of 'wireless' is all about. From the beginning, with a spark transmitter and coherer detector, the armed forces have taken a great interest in the subject.

Under battle conditions the need to transfer information speedily and clearly between two stations, before the enemy can 'listen in', is of the utmost importance. Many years ago, I had the opportunity of talking to veterans of the First World War, and learnt about their experiences with both wireless and land-line communications.

In the 1914-18 war, a small Marconi spark transmitter was used in the air by Royal Flying Corps observers. They reported (by Morse code) the positions of German artillery to the army below.

The ground station was often manned by a soldier listening on a robust, wooden-cased 'crystal-set', like the Johnson and Phillips MkIII tuner. They didn't have the luxury of two-way communications by wireless, so the land operator would acknowledge the message by waving his hand or a flag.

Referring to the RFC in December 1939, the late John Clarricoats wrote, "The chief job of the 1915-1918 wireless operator was to act as 'the ears' between a roving plane and the battery to which he was attached.

His equipment was primitive (usually a MkIII tuner) and his only means of communication with the observing machine was by means of 'white' ground strips which, sad to relate, seldom lived up to their name."

A great deal was learnt by the military about wireless (soon after

called radio) communications during that conflict. They particularly realised the need to have a civilian reserve of trained engineers and telegraphists.

Between the wars, the art of radio developed rapidly. By 1939 it was in daily use on land, sea and in the air for communications, navigation, science and international broadcasting.

On the technical side, the thermionic valve had replaced the spark-gap, coherer and crystal detector at the 'heart' of both transmitter and receiver. However, the majority of transmissions were then on frequencies below 20MHz.

Many of the lower frequency bands became 'cluttered', and were subject to man-made and natural interference. Although extensively used, these 'long' wavelengths were not really ideal for short-range air-to-air and air-to-ground conversations.

## Early Tests

Early tests above 30MHz, suggested that the clarity of the v.h.f. bands was the answer to relatively 'local' contacts. The higher frequencies had the added advantages of smaller antennas and lighter and less current-hungry equipment.

These factors made v.h.f. operation very attractive for airborne use. But, before this could be proved, much experimental work with new ideas, constructional techniques, valves, components and antennas had to be done.

In my view, a large amount of the credit for pioneering v.h.f. communications in the air must go to a particular dedicated group. The

group consisted of pre-war radio amateurs, the *Daily Herald* newspaper and the magazine *Popular Wireless*.

The tests started in May 1933, when signals on 56MHz were transmitted from an amateur station installed at the top of the North tower of London's Crystal Palace. They were successfully received some 209km away by a *Daily Herald* reporter with a receiver installed in a *Puss Moth* aircraft.

The plane, chartered by the Editor for the occasion was flying at 10 000ft "somewhere North of the Wash". The 'Palace' signal may well have exceeded this range, but the pilot had to turn back due to a shortage of fuel.

The group built on their success, because, a few weeks later, two De Havilland Dragon-Moths, carrying transmitters and receivers for 56MHz were again chartered by the papers. Once these planes were in the air, two-way communication was soon established between them and, as the flight proceeded, with other amateur stations on the ground.

A great deal was learnt about the behaviour of v.h.f. signals through amateur activity on 56MHz. There was also the bonus of hearing and identifying the 'hissing' noise from the active sun in July 1938 and June 1939.

The development of valves like the 'acorns', EA50, EF50, RK34, RL17 and SP61 in the late 1930s helped. These valves made it possible for RAF fighters, from about 1942, to work air-to-air and air-to-ground on higher frequencies between 100 and 124MHz.

The pre-1939 work on 56MHz, is a classic example of the radio

enthusiast's ability to come up with ideas to produce and tackle the 'impossible' at low cost. Another typical case, comes from John Tye (Dereham) who has built a Scott-Taggart ST300 broadcast receiver from original components that he had preserved from days gone by.

Among his problems was the reproduction of the high tension and grid bias batteries, and the low tension accumulator. Congratulations are due to John for the following answers. First of all, having a poster-size print made from a photograph of an original battery, and cutting out the labels to make up the dummy.

Secondly, of course for building up the set itself, Fig. 1, but, take a look at the Ever Ready GB battery between the two valves on the left. The label came from a valve box and the frame work is a cut-down video-tape box. Thirdly, for a realistic looking accumulator, Fig. 2. "A cut-off coffee jar and wood plates, hi." Obviously the set will be powered from 'hidden' sources.

## Wartime Radio Masts

In the October *PW*, I mentioned the two wooden radio masts, relics from the Second World War, located on an iron-age hill-fort, known as the Trundle, on the South Downs near Chichester. This prompted an interesting letter from Jack Hesling (Rustington) who worked on a similar site, while serving in the RAF. He told me that such masts, Fig. 3, were about 27m high and carried four vertically polarised dipoles, on cross arms, for v.h.f. communications.

Jack kindly sent a sketch of the array that he remembered from which I made a drawing, Fig. 4. The original operating frequency was in the 100-124MHz range, but when in the post war years, the 'airband' was extended to 156MHz, the dipoles were changed to the broad-band 'cage' type, Fig. 5.

"I expect the Trundle masts provided the v.h.f. communications for Tangmere aerodrome," said Jack. He reckoned that the equipment most likely used, would have been the same as it was at his station, the R1132A receiver and T1131 transmitter.

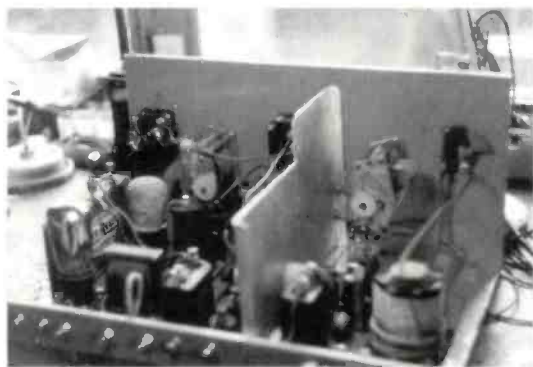


Fig. 1.  
56

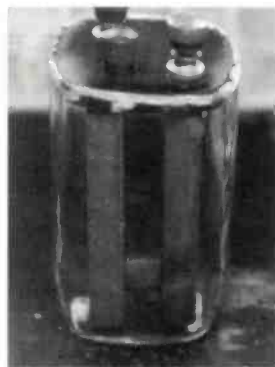


Fig. 2.



Fig. 3.

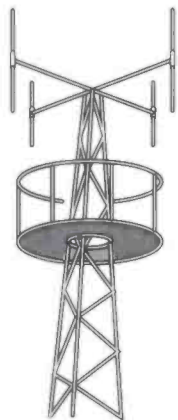


Fig. 4.

"We were the next v.h.f. site east of Tangmere" and "when I climbed our receiver mast (and stood like Eros on top of it!!) I found, scratched in the woodwork at the top an 'admission' by a WAAF that on the date given, she had climbed the mast and left her autograph!" wrote Jack. "Brave girl!" he remarked and continued: "the masts were climbable using footrests as on telegraph poles."

Among the photographs I took when Joan and I visited the site on July 12 was one looking up inside the mast from the bottom, Fig. 6. This shows the base of the upper platform and the footholds sticking out on the lower left. At Joan's suggestion, Fig. 6 was taken deliberately for the 'odd angle' section of a local photographic competition. It won first prize and made me £1 richer, hi!

### Talking Calculator

The time had come for me to replace my 20-year old desk calculator and I chose Tandy's 'Talking Calculator' seen in Fig. 7. Its convenient size (approximately 177x130x30mm) and shape appealed to me, as did the 54x20mm liquid crystal display and the relatively large keys.

The instrument is powered by two 'AA' batteries and the unit is switched on and off by the respective green buttons, below the memory keys, at the lower right. The speech emitted from the

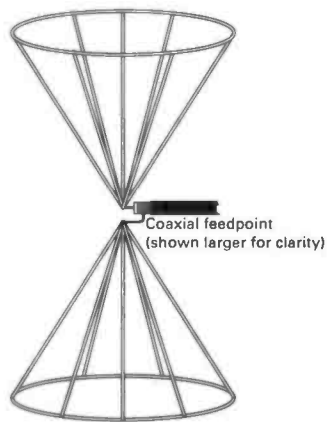


Fig. 5.

35x14mm speaker grill, top right, is 'clean' and distinct.

The adequate volume of speech is controlled by a three-position switch just below the display. For example if you press  $9 \times 3 = 27$ , the voice synthesiser says 'nine times three equal twenty seven'.

Press 'AC' and it says 'all clear', 'M+' and it responds 'memory plus' and there is yet another option, say an answer to a sum is 738, it will say 'seven three eight' or, by changing a command, 'seven hundred thirty eight'.

Of course as the symbols '+', '-', '%', and '÷' are pressed the machine replies 'plus', 'minus', 'point' and 'percent' respectively and there is a 'REP' key, next to the 'off' button, to repeat the answer. This calculator retails for £19.95 and is no doubt available from your local Tandy store.

### Variety Of Calculators

Like many people in the late 1960s and early 1970s, I worked my way through a variety of electronic calculators, simply because each one had more functions than its predecessor. My mind naturally turned toward computers, so I began with a magazine on the subject.

Now, after 17 years of using a computer, I still find these specialist journals, like *PW*, an excellent source of learning and advertising material. In recent years most magazines, dedicated to the 'PC', carry a free disc with 'try-out'

programs, on the front cover. For instance, I found a very good astronomy program, called Sky Globe, on the disc given with the October issue of *Personal Computer World*.

Fig. 7.

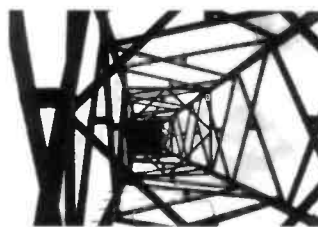


Fig. 6.

### Observations

During August, Ron Livesey (Edinburgh), using a 2.5in refractor and a 4.0in projection screen, located three active areas on the sun's disc on days 1, 5, 6, 7, 10, 11, 12, 13, 14 and 23rd, and four on the 3, 4, 16 and 17th. Early reports for September came from **Cmdr Henry Hatfield** (Sevenoaks) and **Patrick Moore** in Selsey.

Henry, using his spectrohelioscope, identified one sunspot group with an active plage, seven filaments and seven small quiescent prominences on the sun at 1410 on the 5th. Patrick projected the sunspot group seen in Fig. 8 on to his screen at 1350 on the 7th. In addition, on the 5th and 6th, Henry's radio telescopes recorded individual bursts of ('hissing') solar radio noise at 136 and 1297MHz.

### Auroral Reports

Now it's time to start the reports, and we start off with auroral. "Much magnetic and radio-aurora activity on September 9/10 following upon high solar radio wave emissions reported by Bruce Hardie on the 6th," wrote Ron Livesey in a 'Stop Press' section of his August report to the British Astronomical Association.

My thanks to **Ern Warwick** (Plymouth) for the reminder that the German propagation beacon DK0WCY, situated 20km South of the Danish border, often transmits auroral warnings on 10.144MHz.

### Magnetic

On to magnetic observations now. The various magnetometers used by Ron Livesey, **Karl Lewis** (Saltash) and **David Pettitt** (Carlisle), between them, recorded magnetic 'storm' conditions on August 4, 21, 22 and 23rd.

### Meteor Display

Last month, I talked about meteor particles burning-up in the earth's atmosphere, giving a wonderful display of bright lights darting across the night-sky.

The meteor activity brought a response from an interested reader. My thanks to **Andrew Jackson** (Birkenhead) for a copy of a piece in

the *Daily Post* of August 18 which began, "Reports of brilliant white flashes of light and strange objects in the sky prompted a barrage of calls from anxious people across the North West." Of course, the public are concerned about such things and the article continued, "Last night experts said meteor showers were the cause of lights seen across the region and into North Wales." To my mind this was part of the Persiids shower which ranges from July 23 to August 20 with a peak around the 12th.

The paper referred to a similar article they did almost to the day 56 years ago, in 1936, when "a falling meteor lit up the Merseyside coastline, brightly illuminating it for several seconds." Such press-items are valuable to researchers because the event was reported by people who were there at the time and able to give a first-hand account of what they saw.

I passed Andrew's cutting to Dr. John Mason, the President of the British Astronomical Association, who told me that over 200 reports had reached Howard Miles and himself about a fireball at 2150 on August 16. There was a "major fireball track line stretching from Merthyr Tydfil, across Anglesey, over the Irish Sea and terminated off Kintyre," said John.

Howard and John are part of the BAA's fireball survey team and they soon learnt that this one had been observed as far afield as Aberystwyth, Anglesey, Arbroath, Birmingham, Borders, Cardiff, Glasgow, Merseyside, Oban, Oxford, Pembroke, Sheffield and Wigton.

Sonic booms were heard two to three minutes after the fireball was seen and the ground was illuminated like daylight in parts of Wales, were among the reports. "It appeared so large in the sky that many people thought it was closer than it was," said John.

As you've probably read in 'Keylines', this is the last 'Reflections' column, and I hope you have enjoyed the series. However, I also hope you'll enjoy my 'Valve & Vintage' spot as from the February issue of *PW*.

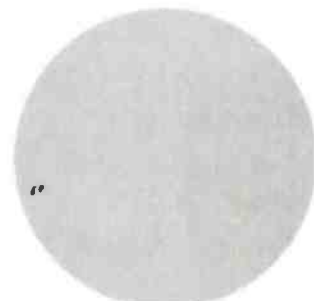


Fig. 8.



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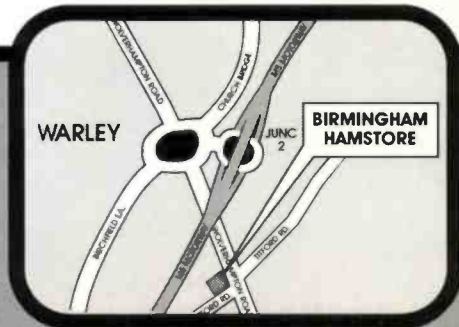
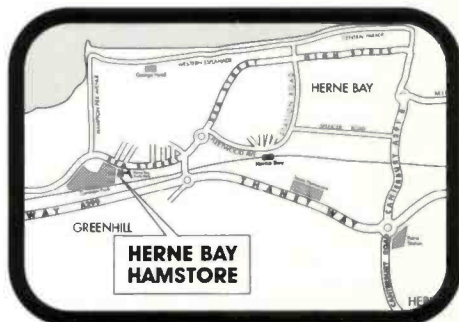
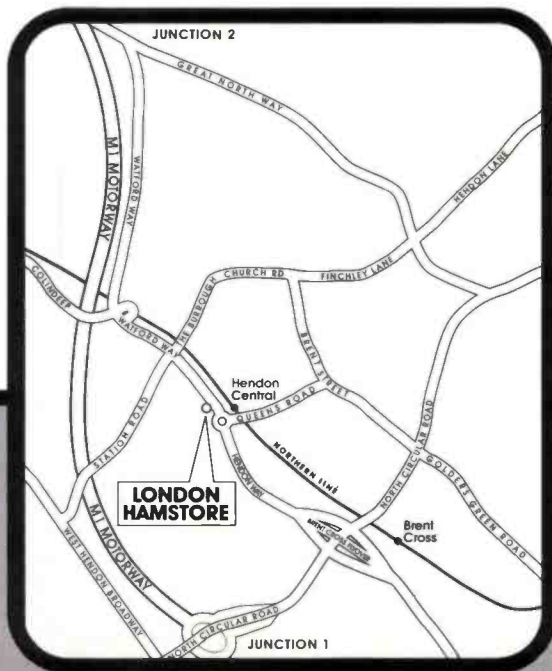
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## Project HUTSAT

The HUTSAT is an ongoing three-year amateur satellite project by a group in Finland, to test the technology leading to the production of an engineering model. This then proceeding to an ARIANE satellite launch in 1997 to 1998. Already, this groups 10GHz transmitter prototype is being rapidly developed by the AMSAT-DL team, to be delivered to Germany for incorporation in the PHASE-III-D project.

The main objective is to use the latest GaAs-f.e.t. technology and to give occupancy of the currently unused amateur space frequencies. HUTSAT is planned to carry a digital transponder, BBS and DSP experiments using 435, 1260 and 2400MHz links.

## New Russian Launch

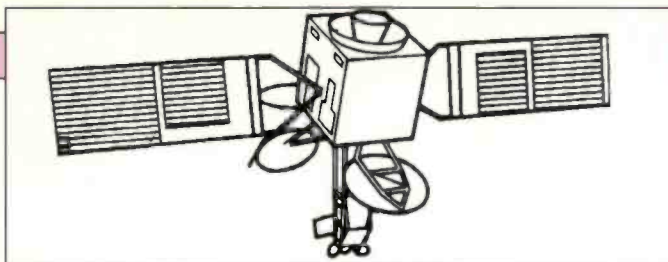
The next Russian amateur radio satellite launch is planned for early 1993. The launch will place RS-15 into a near circular polar orbit, with a 2300km altitude at 67° inclination. The satellite will thus give excellent intercontinental QSO coverage, with all of North America, South Africa, Asia, the Caribbean and much of South and Central America being in mutual range of Europe. This 70kg package has been built by a team under the auspices of chief constructor V.N. Arbuzov at the NPO of Applied Mechanics in Krasnoyarsk.

The RS-15 satellite carries a further technical development of the now famous BRTK transponder complex series as flown in the earlier RS satellites. The latest model has been designed by the Laboratory of Space Technology of the Tsiolkovski Museum of Cosmonautics, club station RS3X in Kaluga C.I.S.

The satellite was designed within a group headed by Alexander Papkov UA3XWU and Viktor Samkov. Alex, the chief architect, can be seen in Fig. 1 demonstrating the BRTK-10 assembly, whilst Victor can be seen building it in Fig. 2.

## The Equipment

The RS-15's assembly of equipment consists of a Mode A



# Satellite Scene

by Pat Gowen G3IOR

*Contributions from several developing new amateur radio satellite groups reveal that we have many new satellites coming in the future. A few of these are described this month by Pat Gowen G3IOR. Pat also has a few tips for your Christmas stocking.*

linear transponder and two beacons, one at either end of the 40kHz linear non-inverting downlink passband, a bulletin board with 2mb of memory, a command complex, and a 64-channel metered parameter telemetry system.

The frequencies to be used for RS-15 are as follows:

Uplink passband: 145.857MHz to 145.897MHz  
Downlink passband:  
29.357MHz to 29.397MHz  
Beacon 1: 29.398MHz  
Beacon 2: 29.353MHz

## Output Power

The transponder downlink transmitter will produce 5W of radio frequency output power, while the beacons will run either 0.4W or 1.2W according to command instruction. The transponder will have quarter-wave monopole antennas for both uplink and downlink.

The Laboratory of Aero-Cosmical Technology belonging to the Russian Defence and the 'ROSTO' Technical Sports Organisation, have both assisted in the co-ordination required for satellite launch and operation. As has the space laboratory headed by V. S. Yamnikov, and the RS control station RS3A, from whence Andy Mirinov RK3KPK sent the photographs for us to see. Public relations are conducted by Dr. Alexander Zaitzev RW3DZ.

Any readers interested in experimental work with RS-15 are invited to contact V. Yamnikov at

the Laboratory of Aero-Cosmic Technology, ROSTO; ul. Zemlynoi Wal 46/48; MOSCOW 103 064, RUSSIA, or via e-mail to rw3dz@rw3dz.public.su for A. Zaitzev.

## Israeli Microsat

The Israeli Institute of Technology is now constructing TECHSAT. It will carry amateur radio multi-user capability packet store and forwarding experiments, a 'GPS' (Global Positioning System) receiver, telemetered and radiation measurements.

Digital Signal Processing (DSP), a Star sensor, a c.c.d. Camera with Image Compression are carried, and it will provide measurements of the earth's ozone layer, all formats compatible with existing digital communications software as used on the current AO-16, LO-19, UoSAT-22 and 24 amateur satellites.

## Uplinks And Downlinks

The microsat will have three uplinks at 145.850, .980 and .930MHz, the former two at 9600bps m.s.k., the latter at 1200bps BPSK. The three downlinks appear on 1269.700, .800 and .900MHz, the first two working at 9600bps m.s.k. and the last at 1200bps BPSK.

Emergency stand-by transmitters, totally independent of the main system, will also be carried functioning in the 435 and 1269MHz space bands. The link power budget is designed to work

with simple omni-directional ground-station antennas, with a circularly polarised canted turnstile 70cm antenna and the same type of antenna for the 145MHz uplink aboard the satellite. The TECHSAT's 23cm patch antenna is omni-directional circularly polarised, whilst the emergency transmitter will be permanently connected to a linearly polarised monopole.

The 50kg satellite will be 3-axis stabilised, and will be initially launched by ARIANE into a sun-synchronous 700km high orbit. Then using a momentum wheel, it will be accelerated to stabilise using magnetometer data to eventually provide a 1° accurate orbit using its static horizon sensor. The total power consumption of all its equipment is expected to be no more than 9W. The spacecraft's schematic layout, provided by Jim Stone 4X1RU, is shown by Fig. 3.

## University Of Mexico Satellite

Project manager, David Lieberman XE1TU, working alongside XE1MGI, XE1XES and XE1YLS, a team of radio amateurs and students at UNAM (the Autonomous University of Mexico), tells us that their new OSCAR satellite may be in orbit by early 1993. It is to be known as UNAMSAT-1, and is to be a further astronomical research satellite along the lines of SARA OSCAR-23.

## Meteor Sounder

The primary mission of UNAMSAT is to act as a meteor sounder. It will contain a specially ITU licensed 40.097MHz transmitter with 60W of pulsed r.f. output. This can be varied between one and 10 milliseconds in duration with a pulse repetition rate of between one and 10 seconds, all controlled by a 68HC05 c.p.u.

The resulting meteor echoes will be detected on a receiver operating on the same frequency. It will be measuring both their amplitude and Doppler shift, in order to obtain research data on the full-sky spatial and velocity distribution of meteors. The main focus of the experiment is to search for high-velocity meteors

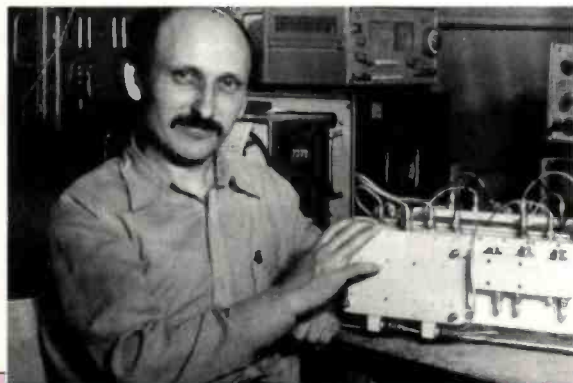


Fig. 1: Alexander Papkov UA3XWU showing 'RS' BRTK design assembly.



Fig. 2: Viktor Samkov busy building and testing the BRTK 'RS' complex.



originating from outside our solar system.

The transmitter is frequency controlled, and has a class 'E' power amplifier. The meteor receiver is an s.s.b. 'Zero-IF' design, recommended by Tom Clark W3IWI. The returned echoes will be digitized and stored in the normal V-40 MICROSAT computer's RAM. After each pulse, the spectrum of the received signal will be determined using the onboard V40 as a DSP Fourier transform spectrum analyser. When a meteor echo is detected, the echo will be saved for later transmission as a special telemetry frame.

The 1-10 second repetition rate for the meteor transmitter will be adjusted depending on the state of charge of the batteries, and other spacecraft power requirements. It will also be dependent on the time domain requirements of the echoes.

### Standard Downlink

The data downlink will be sent using standard amateur AX.25 packet specifications. When UNAMSAT-1 is not involved in meteor research, it will run as a standard PACSAT message store-and-forward satellite, just like the other microsat series AO-16, DO-17, WO-18 and LO-19.

As with the earlier MICROSATs, it will have five modules, each about 20cm on a side. Four of the five modules are updated clones of existing MICROSAT hardware/software.

### The Design Team

The dual 435MHz p.s.k. transmitters have been designed by YT3MV, the V40 c.p.u. by WA7GXD, and the others from TAPR, the Tucson Amateur Packet Radio group, with modifications by I2KBD and ITAMSAT. The power system and the 'BCR' Battery Charge Regulator is by KE3Z and the ARRL.

The 5-channel 145MHz FSK receiver is by W3IWI, and the software, similar to that of the other microsats, is from NK6K and G0/K8KA. The AART Bus architecture is by W3IWI and N5BRG.

The V40 c.p.u. will have 4mb of bulk RAM vs 8mb. Power for UNAMSAT-1 will be provided by the latest high efficiency Gallium Arsenide solar panels of BSFR technology, as earlier flown on the MICROSAT series.

An innovative new addition is the brand-new on-board experiment in the 5th 'TSFR' ('This Space For Rent') module. The final 145MHz uplink and the 435MHz downlink have yet to be IFRB and AMSAT agreed.

Whilst Dave XE1TU has been responsible for technical development of UNAMSAT-1, the scientific direction for the project has been provided by UNAM Professor of Astronomy, Arcadio

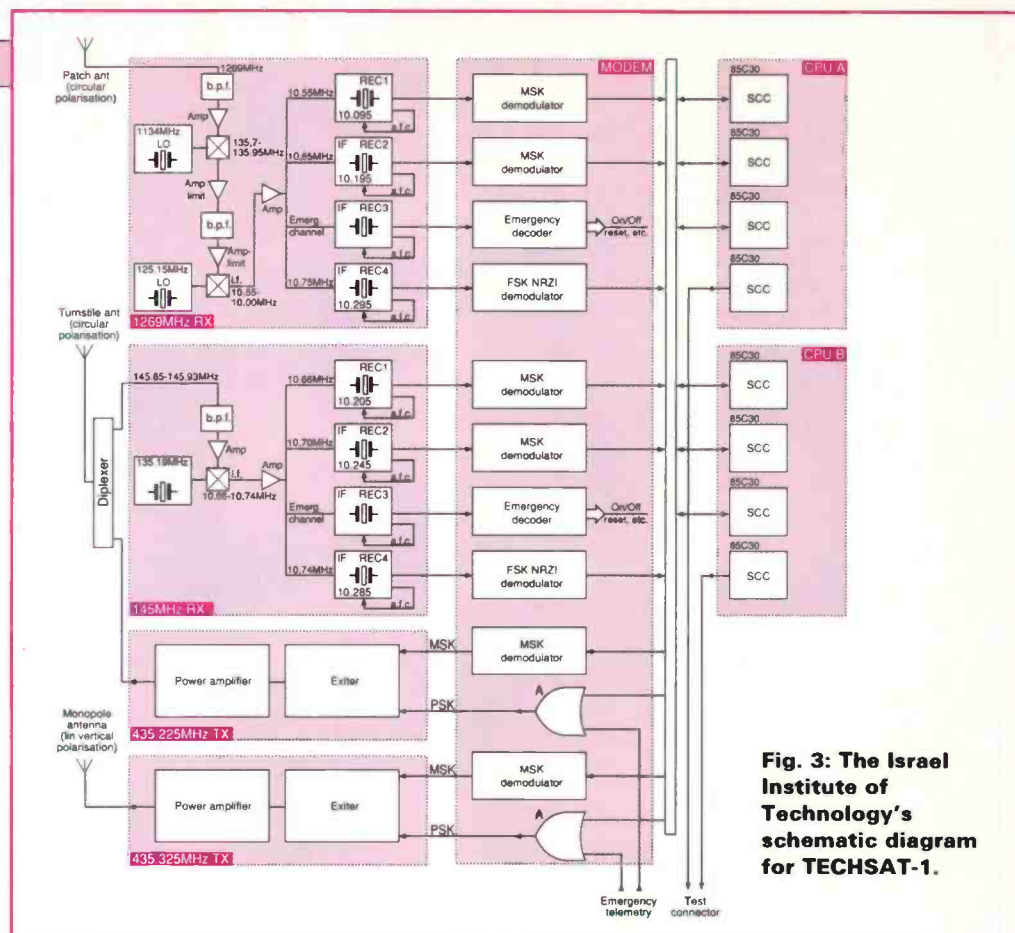


Fig. 3: The Israel Institute of Technology's schematic diagram for TECHSAT-1.

Poveda. AMSAT-NA provided the technical details of the MICROSAT satellites. Technical assistance from AMSAT-NA has been provided by W3GEY, N4HY, NK6K, W3IWI and WD4FAB. Aid from ITAMSAT was co-ordinated through I2KBD.

### Political Problems

As a few international political problems arose with the earlier planned ESA launch of UNAMSAT-1 by ARIANE, it is now planned to be placed into 1000km high orbit with a large meteorological satellite. This is to be launched by the Russian Space Agency and the Russian Academy of Sciences, using a decommissioned SS-18 ICBM. At the time of writing, the launch is scheduled for the first week of December 1992, so it may well be operational by the time you read these details.

### Christmas Stocking

As you probably have enough handkerchiefs, socks and ties to last a lifetime, you may well need to suggest to your nearest and dearest, as to what you would most gladly welcome by way of your Christmas present. What could be better than some bedtime reading on satellites? I offer the following suggestions.

### Information Books

*The RSGB Space Radio Handbook* written by John Branegan GM4IHJ is available from the RSGB, Lambda House, Cranborne Road, Potters Bar, Herts

EN6 3JE. It is filled with information, descriptive tables and drawings on satellites and general space information, with some excellent 'DIY' experiments included.

*The Mir Manual* also written by GM4IHJ, is specific to the MIR space station, and is packed with data, diagrams and experimental content. This is available from 8 Whitehills, Saline, Fife, Scotland KY12 9UJ. *The U-o-5 Manual* comes from the same source, and may be used as a valuable resource for either UoSAT-OSCAR-22 or the new KITSAT-OSCAR-24. These three manuals will be reprinted if demand requires it.

*The Satellite Experimenters Handbook* by Marty Davidoff K2UBC, is a regular bible and is a must for the satellite enthusiastic, be it beginner or expert. It contains virtually all you need to know on every aspect, from antennas to Z-axis, and comes from the AMSAT Headquarters at 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910-4703, USA. (Telephone USA 301-589-6062, FAX 301-608-3410. *Decoding Telemetry from the Amateur Satellites* by G. Smith is also available from AMSAT, as is *Weather Satellites* by R. Taggart.

### Fundamentals

*Astronomical Formulae for Calculators* by J. Meuss, is published by Willmann-Bell, P.O. Box 35025, Richmond, VA 23235, USA, and from the same source comes *Methods Orbit Determination for the Microcomputer* by Boulet. *Fundamentals of Astrodynamics*

by Bate is available from Dover Publications USA. *Orbital Motion* by A. E. Roy is from Adam Hilger UK, and *Cambridge Encyclopedia of Space* by Martin Rycroft is from Cambridge University Press, UK.

### Magazines

For regular magazines, first and foremost consider a regular subscription to *Practical Wireless*. If you have this already, think about taking *Aviation and Space Week* and/or *Flight International* both of which are available from newsgroups. *SpaceFlight* comes from BIS, 27 South Lambeth Road, London SW8 1SZ.

*Oscar Satellite Report* is published and available from R. Myers Communications, PO Box 17108, Fountain Hills, AZ 85269-7108, USA, and *Satellite Operator* is from the same source. *The Journal of Environmental Satellite Amateur User Group* hails from the Dallas Remote Imaging Group, PO Box 117088, Carrollton, TX, USA.

If you can read German, the *AMSAT DL Journal* from AMSAT DL.e.v, Holderstrauch 10, 3350 Marburg 1, Germany, is the excellently produced magazine of AMSAT-DL.

*OSCAR News* is the newsletter of AMSAT-UK, and comes with membership of the organisation, details from G3AAJ QTHR. *The AMSAT Journal*, which incorporates the 'AMSAT Newsletter', is the magazine of AMSAT North America, from AMSAT-NA Headquarters at the address given earlier. Happy reading and Happy Christmas everybody!



# Mathematics For The RAE

Before we hand over to Ray, I must apologise for two mistakes that crept last month's column. It was impossible to choose the correct answers to questions i and iii, because there weren't any! The mistakes were ours, and not the author's. The answer to question i) was 1.592kΩ, and the answer to question iii) was 37.9pF. *Please accept my apologies for these errors. Editor.*

Here are the answers for those questions that had correct answers printed:

- ii) a
- iv) d

I'm sure you got them all right, in spite of the errors.

This month, I intend to look at resonance, and I shall start with the series resonant case. Look at the circuit diagram Fig. 1. Here you can see that all the elements of the circuit are in series. From previous issues we know that the reactance of a capacitor falls with frequency, but the reactance of an inductor rises with frequency. In this circuit terminals A and B are the external connections.

## Equal But Opposite

At just one frequency the reactances must be the same numerically. At this frequency the (positive) reactance of the inductor is equal, but opposite to, the (negative) reactance of the capacitor. The important fact is that the reactances are equal but opposite.

In any circuit containing both reactance and resistance, the effective opposition to the flow of alternating current (a.c.) is called impedance. For the purposes of this series we will only deal with the easiest of cases, those involving resonant circuits, i.e. when both inductive and capacitive reactance are numerically equal.

## At Resonance Only

When we dealt with series circuits, the total opposition to flow of current, was simply the sum of all the individual opposing values added together. When we dealt with resistors, we simply added all the resistance values together to arrive at an answer. At resonance, and at resonance only, we simply add the reactances and resistances together.

At any frequency other than the resonant frequency (or at least very close to it), the total impedance is fairly complicated to evaluate, but fortunately, this type of calculation is not necessary for the RAE. We only need to be able to calculate the impedance of a series resonant circuit, such as Fig. 1, at resonance, and know at what frequency the circuit is said to be resonant.

## Series Resonant

In the series resonant case, the impedance is actually the easiest to calculate. But let's put some figures into the problem. In Fig. 1, let's assume that L=0.1H, C=0.253μF and that R=300Ω.

As we've discovered, the reactance of either an inductor, or a capacitor, depends on the frequency of the a.c. flowing through the component. One important thing to remember, is that the resistance value of a 'pure' resistor doesn't vary with frequency. So we can assume that the resistance of R is 300Ω at d.c. or at 1MHz, or even at 10GHz (10000MHz).

So, back to our problem. What is the impedance of the circuit at a frequency of 1kHz (1000Hz)? I've cheated a little and arranged it so that 1kHz is the series resonant frequency.

From previous sessions, we know that for the reactance ( $X_L$ ) of an inductor,  $X_L = 2\pi fL$ . Again I'm assuming a value of 3.141 for  $\pi$ , as I've done in previous months.

$$\text{Therefore } X_L = (2\pi \times 1000 \times 0.1) = +628.2\Omega$$

We also know that for the reactance ( $X_C$ ) of a capacitor,  $X_C = 1/(2\pi fC)$ .

$$\text{Therefore } X_C = (1/(2\pi \times 1000 \times 0.253 \times 10^{-6})) = -629.2\Omega.$$

I know the two terms are not numerically identical, but with an error of 1 in 629 is almost insignificant. In fact, I'm going to ignore this very small error and say that, numerically, the inductive reactance is equal, but opposite to, the capacitive reactance.

So, at resonance only, the inductive and the capacitive reactances cancel out, leaving only the resistive part. This means that the impedance of the circuit is just the 300Ω value of the resistor R. See Fig. 2 for the overall impedance curve.

For the series resonant case there's an important rule to remember:

**At resonance, the only opposition to the flow of alternating current in a series circuit, is that of the resistance.**

## Resonant Frequency

Finding the impedance was easy to do, but one small problem remains. How do we find out at what frequency the circuit is said to be resonant?

From above, you will see that the resonant frequency (I'll call it  $f_r$  to make it easier), is said to be: the frequency at which the inductive reactance is numerically the same as the capacitive reactance.

$$\text{The resonant frequency } f_r \text{ is where } X_L = X_C$$

$$2\pi fL = 1/(2\pi fC)$$

I won't bother you with the maths involved in resolving the two equations above. But it is important that you remember the final line of this solution, which is:

$$f_r = \frac{1}{2\sqrt{LC}}$$

Sometimes words make these things easier to remember, and the words for this are:

The resonance frequency is:

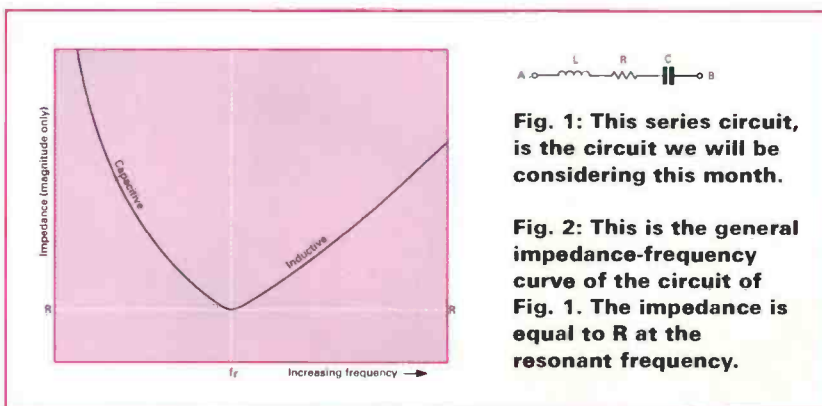
**'one over two pi root El-Cee'.**

This should make it easier to recall when you come to use it.

Space doesn't allow me to give you any questions this month, but you could use the example used above, to verify the equation for the resonant frequency. In the example above, I said the circuit, consisting of L=0.1H and C=0.253μF, was resonant at 1kHz. Try putting these values into the formula and calculate  $f_r$  for the circuit.

That's it for this month. See you next time.

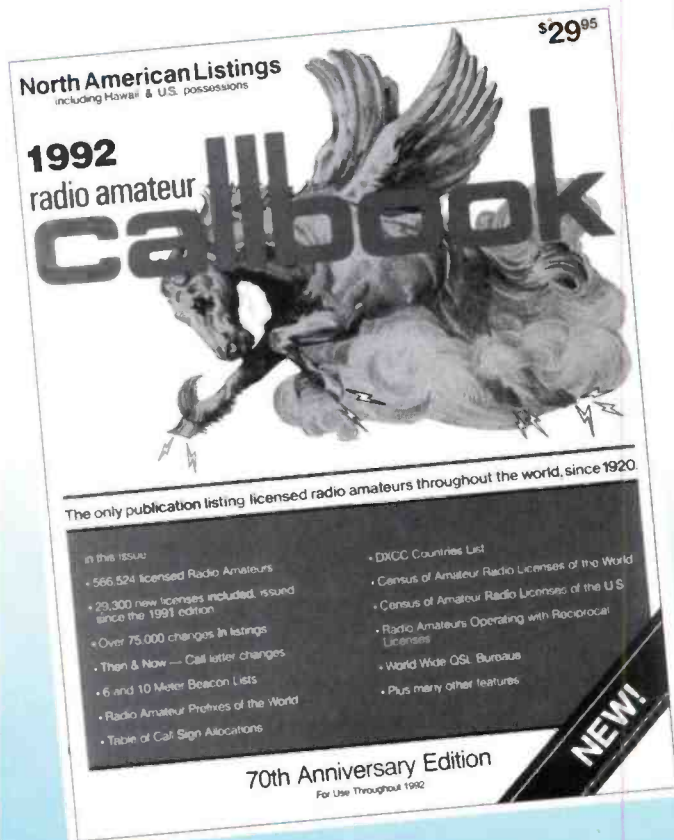
*This month, Ray Fautley G3ASG discusses tuned circuits and resonance.*



**Fig. 1: This series circuit, is the circuit we will be considering this month.**

**Fig. 2: This is the general impedance-frequency curve of the circuit of Fig. 1. The impedance is equal to R at the resonant frequency.**

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287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

I seem, over the past couple of months, to have had a problem with the 'KFE filing system. If anyone has had their report omitted of late, please accept my apologies and I promise to see it doesn't happen again.

Very much of a 'curate's egg' sort of month to report upon this time. There have been some days that were very good, but more that were mediocre. However, that's part of the fun of the thing! No doubt, though, we are sliding more quickly now toward the bottom of the sunspot cycle.

### The WARC Bands

Let's make a start with the WARC bands, and **Don G3NOF** in Yeovil. Don as usual stuck to sideband, and netted on 18MHz A45ZZ, CN8NA, EU10, EV1S, CY0NSM (Sable Is), FR5DX, H44/JA10EM, HK00EP, HB0/DL6MBX, I2ZV, JAs, KF0TB (North Dakota), NL7ZH, OH1AF/OJO, OX3KM, PJ2HB, T20CB, T32GG, T77J, T77T, UA0FF for Zone 19, UC2AA, V51JM, V85PB, VE7CVM, VE71J, VP5JM, VP8ROT (Rothera Base, Antarctica), Ws, XU3UN, ZA/OH1MKT, ZL2ANT, ZL2APW, ZL4DJ, ZS6YA, 5B4ES, 9A/DL9JH and 9Y4NW. Turning to 24MHz, Don notes C07JC, EU10, FR5DX, HK5LEX, HZ1AB, JA1OZU, JA3APL, JU830C/6 (=JT), KB7DMC (Nevada), KP2J, OX3KM, PY2FR, PZ1EL, R040A, RY0U, SV9/DL3SCR/P, UM7MD, VEs, VK6AZL, VP2MEG, VP9MN, W6KKT, Ws, YV1FPT/2, ZA/OH1MKT, ZS6DNO and 9K2MU.

**Ted G2HKU** on the Isle of Sheppey has been 'in the wars' again which has rather restricted his activity this time, but on 10MHz he did manage to key with 4L1AB, ZA1J, ZA1F, UM8MBA and FY5FX.

Next we head for Malta, where **Vince 9H1IP** in M'Scala used 24MHz for ZD8Z and ZB2JI, while a change down to 18MHz yielded KP4CKY, FR5DX, ZB2JI, VP5JM and HB0/DL1MFs.

### Amusing Letter

A most amusing letter from **John Weston-Smith** who apologises for his brief absence - his last report was in July 1964! In those far-off days John used an old ex-WWII PCR3, but now, as a free-lance writer on aviation subjects, he has recently bought a Yaesu 7700 to receive Volmet.

Naturally, John tuned to the amateur bands, found some DX - and seems to have become hooked

again! However, he would like to know if anyone out there might conceivably still have a PCR3 which they would be prepared to part with, for the sake of nostalgia!

I have to admit that the last time I saw one 'used in anger' was around 1948, and I haven't set eyes on one since! Offers or suggestions please, direct to John Weston-Smith, Burgraed House, Chart Road, Sutton Valence, Kent ME17 3AW.

### DXAC Recommendations

The DXAC recommendations are as follows: YU1, YU6 and YU7 remain the 'old' Yugoslavian DXCC country. But 9A Croatia and S5 Slovenia add to the list effective June 26 last, YU4 Bosnia-Herzegovina effective October 15 last, and Macedonia YU5 from September 8.

However, these must 'go through the sausage-machine' before they are finally accepted, so don't submit QSL cards until advised.

Still with DXCC, I understand 5R8GW operations beginning 12 December 1991 are acceptable and cards may be submitted, or if previously rejected, re-submitted.

On the other hand, OHOAY and TF5TP are said to be Slim again.

### TOPS Activity Contest

The TOPS Activity Contest on 3.5MHz comes up again on the first weekend in December; 1800UTC on 6th to 1800 on 7th. Use 3500-3560kHz only, and **only** DX contacts on 3500-3512. Call CQ TAC or CQ QMF, not CQ Test.

Exchange RST plus serial number plus, if a member of TOPS add their membership number, i.e. 599001/883. QSO with own country (or call area if appropriate) count one, own continent two, other continent six, with /MM stations six,

with a TOPS member two bonus points, between TOPS members three bonus points. QSO with GB6AQ, 10 bonus points.

The multiplier is the number of prefixes worked, all-same WPX listings. Final score, total QSO and bonus points times multiplier. Classes Single-op, multi-op, and QRP single-op. Log deadline January 31, to Helmut Klein OE6TKW, Nausegasse 24/26, A-1160 Wien, Austria. Details of the TOPS CW club, from G3AWR at 48 Hadrian Road, Newcastle-upon-Tyne NE4 9QH.

### The 28MHz Band

On the 28MHz band, there has been the odd opening to record; for example Ted G2HKU's keyer connected to C9RJJ.

As for **Kevin GW0PUH** in Pontypool, he has a converted a.m. CB set, to a 2-element tribander at around 12m (45') at the bottom of the valley. Using either eight or 1W of a.m., contacts were made with WA3EUL and N8HYR. In both cases the QSOs were maintained at Q5 when power was dropped to the 1W level.

Even Don G3NOF could find the going a mite sticky on this band, with ZD8LI, 5U7M and 7Q7XX as the total.

**Shaun Inns** lives in the Nechells area of Birmingham and he records OD5MM, OD5RZ, ZS1LVH, D2EL, 9X5AB, ZS1GRM, WP4KET in Puerto Rico, TA1AZ and VO1SA.

### The 1.8MHz Band

As far as I go on the 1.8MHz band, very nearly a disaster! It is generally known that there are no insulators on the end-fed wire...no problem until the next-door neighbour moved out and cleared their garden.

Not knowing any better, they

moved the wire, and then wrapped the end around a brass cup-hook, while forgetting to tell us! Luckily, the odd antics of the s.w.r. seen by the rig alerted us that something was awry before operational power was applied.

Our other reporter on this band is **Ted G2HKU** who mentions c.w. with UA2DK/MM off Ullapool, plus sidebanders with ON7BW and ON7SF.

### The 3.5MHz Band

The antenna problems outlined above didn't help me on the 3.5MHz band either, alas, but I did manage to enjoy the Sunday morning natter-sessions in (comparative) peace.

Short wave listener **Andrew Fryer** in London's SW16 started September well by acquiring a Lowe 225, and hanging up some 30m of wire around the inside of his bedroom. This is connected direct into the receiver (no tuner), and on 3.5MHz Andrew mentions regular mornings with ZL4KF, ZL2JR, ZL1CCR, plus VO1FG, CN8GI, TI4CF all on sideband, plus RV3DCM on the key.

However, during the hours of darkness, reception is marred on this band by an S4 buzz-saw noise, and Andrew wonders what he is up against. My first thought is to wonder if the noise might go away when the TV is switched off. However, the offender may well be in a different house!

### Rare And Special Prefixes


Of course, if you really want to know about the rare (and the special) prefixes you may encounter on the bands, then you need to talk to Geoff Watts, 62 Belmore Road, Norwich, for a set of his lists which have to be the best buy in amateur radio. At least as far as the 1.8-30MHz range is concerned.

### The 7MHz Band

On the 7MHz band, first there is **Eric G0KRT**. Eric is in Worcester Park, Surrey, and uses a Lake DTR7 at about 1W output, fed to a W3EDP antenna modified by the use of a full quarter-wave counterpoise. Eric had two-way QRP contacts on the key with G0PSK, GW00SQ and PA0ANK; other contacts included DLs, DJs, EA2BUR, FE10EI, HB9AEP, IK2SGV, LA5MT, OE6MRD, RA4CQ, RB5QDD, SL0ZG, SM6DOI, SM4POJ, SM4GL, ON4GU, OZ1YLX, Y2JCW, YT3KD and YU3DDR. As a side-exercise, steady

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# GW3KFE



028

PSE/TNX QSL via **73**

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preparations are going ahead to tackle 14MHz.

**Andrew Fryewr** found the band 'jumping with life' as he copied the keying of 9A1HST, 4L0FXC, 4N6GB, RA3WT, YT3KD, JA4AO, RW6AF, NR1R, TF3GCN, RY8I, 9X5HG, PP6AMW, JA0BCO, 4J4GQ, PJ5JP, HK1HXX, 4L1FJ, AA4GQ, UJ8JI and NQ1K. Turning to sideband, the crop included PI5PV, 4Z5AC, FY5FY, P4/WB1CTO (Aruba), LU1IV, YV1GOT, CM6CV, YV5MRR. P30ADA, PJ2HB, 4X4WH, KP4GY, HJ7TMK and FP/SP5XAB/P.

Another puzzler appears in G2HKU's (and others) listings, namely EU00. Ted wonders whether this one is in Moldavia.

### The 14/21MHz Bands

The 14 and 21MHz bands, which are, as ever, where the real business is mostly done. Don G3NOF notes his 14MHz sideband gleanings as being

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A92EV, AP5HQ, C9RDM, EP2HZ, FR5AI/G, FY5FJ, FY5YE, HZ1TA, IG9/IK7RWE (Lampedusa), J28GG, JL1MWI/BV, JT1BV, JW0F, JY5IN, KL7KJ, OX3KM, RH8AY, S21A, SV9/DL3SCR, TZ6NU, TL8NG, VK3AJJ/5 (IOTA OC-139), VP8CFM (S. Orkney), VP8CGK (S Georgia), VP8CKB (S. Georgia), VS6FN, XX9AS, 4S7AVR, 5H3DC, 7Q7LA, 7X2BK, 9M2HB, 9M8FH. On the 21MHz front, we find CU3/NOFHL, D2EL/P, DU3RCM, HZ1AB, KF0BI (S Dakota), P29WK, RA0FA (Zone 19), RE92C, RO200T, S21ZD, UL7GY, US0G, UV1AD (IOTA EU-133), V63DJ, V63JC, VK3AKK, VK3PAE, VP8CLO, VS6DO, assorted Ws including W7LR in

Montana and 8A2P for a YB in disguise.

Ted G2HKU resisted his aches and pains to the extent of going on 14MHz to key with US50BS, BV4CT, ID9/W7SW, N4LTR, 4K3/UA1ZFY at normal power, reducing to 5W for OH1N0A/OH0. On 21MHz, we see HL1AVS, YB6TI, 5N0ZKJ, K9BG and UTVJWL who simply said 'Crimea'. Undercover, or Slim again, we wonder?

### Eritrea

Just as this went down, we note that Carl and Martha Henson have appeared, with call signs 9ER1TB and

9ER1TA. This then was the 'mystery destination' - Eritrea. They were saying it 'was the first operation since Eritrean independence' and they believe this one should now be reinstated on the DXCC List.

### Sources

As always, thanks are due to my sources, including RSGB's DX News Sheet, edited by G4DYO, to Chod Harris and both his *The DX Bulletin* and *The DX Magazine*. Also to The Canadian Amateur, the organ of CARF. In addition, thanks to all of you who write in so regularly with news, and to those who contribute through other routes too. Thanks, to you all - without your efforts, there would be no column to be read.

Finally, I'd like to wish everyone a very merry Christmas and a happy New Year.

**There's a new look to HF Bands as from March. Watch this space!**

### Solar Data for October 1992

The end of September saw an increase in geomagnetic activity due to the passage of a coronal hole in the sun and as a consequence of this, auroras were noted in central England on September 29 and 30. The geomagnetic A index peaked at a level of 29 units on the 30th but reduced to quiet levels of five units by October 4. Solar flares were reported on October 5 and 7, followed by a magnetic storm which commenced on October 9, pushing the A index up to 17 units.

Auroras were reported in central England on October 9, 10, 11, 12 and 13. A minor storm occurred on October 14, although nothing seemed to have come of it. During the period from October 19 to the end of the month the geomagnetic field was very disturbed, although it did calm down considerably on October 24, with the A index dipping to a level of only one unit.

However, by the end of the month the activity was high again, reaching levels of 26 units on October 29 and 30, and further auroral openings were reported on October 27, 28 and 29. At 1816UTC on October 30, there was a major flare and on October 31 a warning was issued of a proton event and the geomagnetic field was at major storm level.

The solar flux levels were quite low during the month, sinking to only 98 units on October 16 but rallying to peak at 229 units on October 31.

### Forecasting 50MHz

My crystal ball is distinctly murky when it comes to forecasting what might happen on the 50MHz band this winter. I suspect that very little in the way of DX will be found, but when it does it will be on the day

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### VHF Up

Reports to  
David Butler G4ASR  
Yew Tree Cottage  
Lower Maescoed, Herefordshire HR2 0HP

that you went shopping!

The operators that catch the openings are those who regularly check the bands and keep up-to-date (possibly via the DX clusters) with what's going on in the way of propagation. Don't forget to keep a look out also for the winter peak in Sporadic-E. It might even reach 144MHz! Auroral activity will probably continue, so keep those 27-day calendars up-to-date and check the v.h.f. bands every day at the appropriate times.

### Auroral Activity

As I've already mentioned, there was a fair amount of auroral activity during October with openings being recorded in central England on October 9, 10, 11, 12, 13, 27, 28 and 29. Admittedly, most of these were fairly weak events but nevertheless there was still DX to be worked via some of them.

**Mervyn Rodgers GM0GDL (I086)** discovered the event on October 11 at 1511UTC when he heard GM00NN at 59A. He then went on to work a number of c.v. stations on the 144MHz band, including ES2XM (K029) for a new country, LA8SJ (J059), LA0GH (J038), OH3EX (KP10) for another new country, OZ7AFG (J056), SM4RKW (J069), SM5DIC (J089), SM5MIX (J078), SK6HD (J068) and GW3YDX (I072) at 1732UTC for his last contact.

All stations were worked on a

beam-heading of 40° with 150W into a 14-element Yagi. Mervyn reports that at 1725UTC he was called by an OH9 station but signals were very weak and no positive identification was made.

At my QTH the event burbled away on the 50MHz band to at least 1900UTC. Unfortunately, very little was heard on this or the 144MHz band.

### October Tropo

Conditions during most of October were nothing to write home about (unfortunately for a v.h.f. columnist!). However, the tropospheric opening on October 7-8 was rather excellent and allowed many contacts to be made on the v.h.f. and u.h.f. bands, with stations up to 1700km away.

**John Regnault G4SWX (J002)** seemed to be ideally located on the east coast, as much of the DX only seemed to penetrate about 150km further west.

Between 1725-2244UTC, he worked 65 x SP on the 144MHz band, including SP7BCA, SP7IDG, SP7JSG, SP7OGR, SP7RJV and SP7SQD in locator K001, SP5EFO, SP5ENM, SP5NHF and SP7AZP in K002,

SP4MPB in K003 and SP5WCK, SP8NCJ and SP8NTX in locator K012, the latter two stations being approximately 1500km distant. Other s.s.b. contacts included OE3EFS/3 (JN78), OK10A (J070), OK1UBR (JN69) and OK1UND (J060).

**Terry Chaplin G1UGH (J002)** enjoyed the good conditions on October 8, working on s.s.b. DG8NCO (JD50), DL9NDS/A (JN59), OK1UBR, OK1VEI (J070) and SP5NHF and hearing OE3EFS/3, OK1AIY/P (J070), OK1IBL (J060), SP5EFO, SP7EBM and SP7LIH (J060).

**Ralph Sachs G2CZS (J001)** has recently changed his 144MHz antenna from an 8-element Yagi to that of a 13-element Cushcraft Boomer, and the improvement was instantly noticeable. He has heard the FX4THF beacon (JN05) on 144.955MHz for the first time and the beacons DL0PR (J044) on 144.910MHz, FX3THF (IN88) on 144.905MHz and GB3ANG (I086) on 144.975MHz are now audible much more frequently.



Fig. 1: The radio room at G2CZS.

During a tropo opening on September 16 he worked EA1BXM (IN73), FC10ET/P (JN38), DL16BF (JN48), DD9JH (J031) and DF0CI (J051). Ralph, shown in the photograph Fig. 1, also made the

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grade during the opening on October 8 by working DH3KR (JO30), DL6NVC/P (JO73), DL7UME (JO62), DL7UTS (JO62), OZ60L (JO65), SL7DL (JO66) and his first Polish stations SP1KV (JO73) and SP5EFO.

It seemed to me that my QTH (I081MX) was too far west to enjoy the opening on October 8, and although I worked a few stations at some very good distances it was obvious that the ducting was suiting other locations. Contacts made on the 144MHz band between 1900-2130UTC included DL6NAA (JO50), DL9NDS/A, Y22ET (JO60), OK1VEI at 1300km, SP6GWB/P (JO80) at 1400km and for the best DX of the evening SP5EFO at 1640km.

Neil Underwood G4LDR (I091) worked OZ5ZS on the 144MHz band and SM7ECM, for a new country on the 430MHz band, during the evening of October 7 and OK1EVI on both bands the following day. Neil also heard SP from locator K002 on the 430MHz band but could not get through the pile-up!

## Meteor Showers

The following data concerning meteor showers during December-January will help you determine which is the best direction to beam at specific times and when the shower is below the horizon.

The Geminids shower lasts from December 6-15 with the predicted maximum activity occurring on Sunday 13th. Between 2000 to 2200UTC beam north or south, 2200 to 0100UTC beam north-east or south-west, 0100 to 0300UTC beam east or west, 0300 to 0500UTC beam south-east or north-west. The shower radiant is low between 0900 to 1900UTC.

The Ursids shower will occur between December 16-24, peaking on Tuesday 22nd. It is not particularly good in the north-south direction but to compensate for this all paths from north-east through east to south-east are quite good, and are available at all times of the day.

The Quadrantids meteor shower will be encountered between January 2-6, peaking sharply on Monday 4th. Between 0100-0400UTC beam south-east or north-west, 0400 to 0600UTC beam north or south, 0700 to 1000UTC beam east or west, 1200 to 1700UTC beam north-east or south-west. The shower radiant is low between the hours of 1500-0000UTC and is therefore not very usable for meteor scatter. I have always found this shower to be particularly good to Scandinavia in mid-afternoon.

## Moonbounce

Now to moonbounce. Conditions for the first leg of the ARRL e.m.e. contest on October 17-18 didn't look all that promising. The geomagnetic field being at minor storm level on the 15th and 16th and the geomagnetic A index reaching 25 units.

Under these type of conditions e.m.e. signals become even more weak and watery, echoes are hard to come by and problems can occur with faraday rotation. Although the geomagnetic activity had reduced to unsettled levels by the 17th, conditions were far from ideal.

At the station of G4SWX, operation started on October 17 at the unearthly hour of 0445UTC and contacts were made on the 144MHz band with DL3BWW (ex-Y22ME), G0LBK, LA8YB, LZ2US, OE5JFL, OZ4MM, SM5FRH (using a QBL5/3500 and 24 x 18-element KLM Yagis), SM7BAE, AA4FQ, WB4WTC, K5GW (very loud and reputed to be a 44-Yagi station), W5UN, K6HXW, WA6MGZ (1.5kW and 8 x M2 Yagis), WA6PEV, K7CA, N8AM, AF9Y and finally at moonset, around 1210UTC, KORRY.

Signals at moonrise, from 2045UTC, were surprisingly strong but after 15 minutes or so they had deteriorated such that only the big stations were audible. In this session, up to 2230UTC, John worked DK1KO, DL8DAT, I2FAK, IK3MAC, OK1MS (1kW and 8 x 15-element Yagis), RA6HHT, SM5MIX (1kW and 4 x 18-element Cushcraft Yagis) and UZ2FWA (1.5kW and 8 x DJ9BV Yagis).

Conditions on Sunday October 18 showed no improvement from that of the previous day but nevertheless contacts were made between 0535-1140UTC with DL5MAE, F1JTA, F6IRF (4 x DJ9BV Yagis), G0GMS (only two Yagis), OH5IY, ON7EH, SK0UX (1kW and four Yagis), VE7BQH, W7VXW and W0HP. John mentions that since getting into 144MHz e.m.e. two years ago he has made over 600 contacts with 202 different stations using his 4-Yagi system. All continents have been worked now that LU7DZ was worked in September at the 11th attempt!

I was unable to find much time to listen for horizon signals as the e.m.e. contest clashed with Jamboree On The Air (JOTA). But in a 20-minute period between 1110-1130UTC on October 18, I heard DL5MAE, DL8DAT, SM5FRH and WA6MGZ on the 144MHz band with my single 18-element Yagi and an FT221. During this time the moon was between 20-15° above the horizon and sinking fast.

## The 50MHz Band

I haven't reported about activity on the 50MHz band since the September issue of *PW*, so it's about time I brought you up-to-date with what's been going on since the end of June.

A total of 82 permits were issued during June to Spanish amateurs, including the DXCC countries of EA6, EA8 and EA9. All permit holders must use the prefix EH in place of the

normal EA, for example EA6VQ becomes EH6VQ when operating on the 50MHz band. The 'rare' call signs to look out for are EH6ET, EH6FB, EH6IF, EH6SA, EH6VQ, EH8ACW, EH9IB and EH9MH.

During June, July and August, 13 Polish special event stations were given permission to operate on the 50MHz band to find out if any interference would be caused to other services. They were HF3PAR (SP3OCV), HF7PAR (SP7HT), SN5PAR (SP5CCC), SN7PAR (SP7ITB), SO5PAR (SP5HEJ), SR3PAR (SP3TYF), SR5PAR (SP5TAV), SR9PAR (SP9JX), 3Z3PAR (SP3CUG), 3Z4PAR (SP4KM), 3Z5PAR (SP5EFO), 3Z7PAR (SP7VMB) and 3Z9PAR (SP9EHS).

All QSLs go via the operator in brackets. The experiment was a success and it is expected that most Polish amateurs would be given 50MHz permits, commencing from November and using the more familiar SP prefix.

Conditions during July and August were predominantly effected by Sp-E propagation. This allowed almost daily contacts to be made with stations up to 2000km away.

Some of the more interesting DX during this period included LY2WR (TV Transmitters RC, Box 927, 2044 Vilnius, Lithuania),

LZ1MC (Slavi Lyutskanov, Box 74, 6000 Stara Zagora, Bulgaria), OY6A (QSL via G6JQV), TA/OZ1DQ (Uffe Lindhardt, Ostrigsgade 49 2 Tv, 2300 Kobenhavn S, Denmark), TA5ZA (QSL via Antoine Baldeck F6FNU, BP 14, F-91291 Arpajon Cedex, France), TSS11 a special Sardinian callsign celebrating the launch of the first Italian astronaut on-board the shuttle *Atlantis* (QSL via IN3WWW), UA2F/DK2ZF (Rolf Niefind, Rademacher Kamp 2, W-2117 Kakenstorf, Germany), UX1A (QSL via K.Leino OH2BC, Pitkankalliontie 6-8B4, Espoo, SF-02170, Finland), UZ2FWA (QSL via Ulrich Mueller DK4VW, Kreuzacker 13, D-3550, Marburg 1, Germany), YL/ES9C (QSL via Tom Soomets ES5RY, Box 177, EE2400, Tartu, Estonia), ZA1A (QSL via OH2BC, see UX1A), 4X11F (Ralph Rosenbaum, 17 Shalom Street, Ra'anana 43561, Israel), and 9K2ZR (QSL via K8EFS, Box 54 R 4 S,

Cochran, Charlotte, MI48813, USA).

It may be worth noting that K8EFS is also the QSL manager for CN8ST, V51E, ZS3E, DL3ZM/YV5 and YV5ZZ.

Apart from the DX already mentioned, a few brief openings into Africa were also recorded with ZS6WB, 7Q7JL, 7Q7LA and 7Q7RM appearing on the band during July-August, generally between 1600-1730UTC.

Band conditions during September noticeably changed as the geomagnetic field became more active, the effects of Sp-E propagation lessened and auroras became more prevalent. Very little African DX was heard, but a new station, 3X0HNU in Guinea, put in a few appearances.

It looked as if there was going to be an upturn in conditions in October when the band opened up to South America on three consecutive evenings between October 4-6, allowing a few UK stations to work PY5CC and ZP5JCY. However, the band quickly settled back to its semi-dormant state and apart from one or two openings to Africa, not very much in the way of real DX was worked. Openings via Sp-E were observed on a few days throughout the month, allowing contacts to be made with EH, I and YU.

On October 11, it was interesting to note that if you beamed south you could work into southern Europe via Sp-E and into Africa via t.e.p. to work A22BW, 7Q7JL and 7Q7LA, and if you

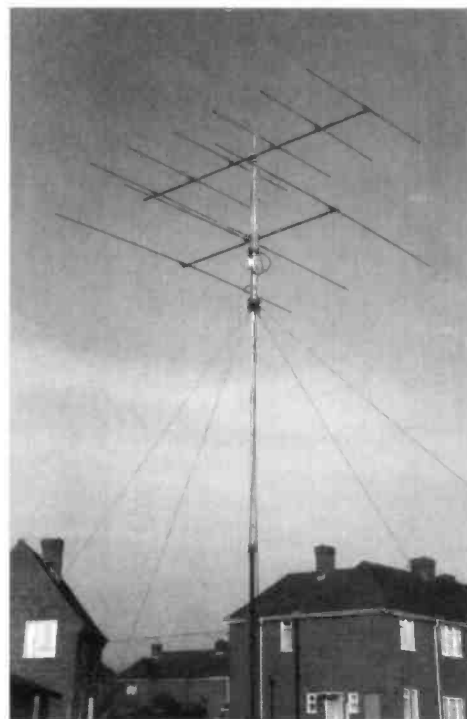


Fig. 2: 50MHz and 28MHz antenna system at the QTH of G7EYJ.

beamed north you could work GMs via aurora. All modes were occurring at the same time, between 1700-1900UTC.

A new beacon, TU2VHF, is now operational from the Ivory Coast in locator IJ76AD. Operating on





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# Back-Scatter

50.094MHz, it has already been heard in the UK during October.

Darren Collins G7EYJ (ID90) runs an FT102, RN Electronics transverter, a mast-head pre-amplifier and a home made 6-element NBS Yagi, as the photograph Fig. 2 shows. Some of his s.s.b. contacts made during the summer have included FR/DJ3DS on Glorioso Island (but unfortunately without a permit!), TA5ZA, V51SW, ZS6AXT, 3Z4PAR, 5B4/G3KDX, 7Q7JL and 7Q7RM. During the UK Six Metre Group contest on June 6, Darren worked CT, F, DL, ES, G, GD, GJ, GM, GW, I, IS0, LA, DE, DH, DHO, DK, DN, DZ, PA, SM, SV, TA, YD, YU, ZB, 3Z and 9H, a grand total of 27 countries in one day! Can anyone else beat this?

At the station of G1KTX (Poole, Dorset) an Icom IC-505 is used along with a 5-element Yagi fixed on a south-easterly heading. He reports that he receives stations in Slovenia quite often, but gets confused with the variations in callsign prefixes. During one 10 minute period he heard 4N, YT and YU, all from the same locator square!

Actually this is a simple matter to overcome. All you need do is buy the RSGB *Amateur Radio Operating Manual* which contains, in one of its chapters, a listing of all ITU callsign block allocations. Of course it doesn't help when the likes of S5 and 9A pop up on the band. You'll just have to read this column to catch up on that news!

## The 70MHz Band

Let's look at the 70MHz band now. Collin Redwood G6MXL (ID90) reports that he will soon be running 50W from a Spectrum Communications amplifier. (I'm sorry but I just can't bear to use the word 'linear' for any solid state amplifier!) He also intends to improve on his antenna system as the 3-element Yagi in use does not appear to be working properly.

I know which antenna Collin has and I must mention that I am not impressed with the method and construction of matching employed. It uses a gamma match system, and when the first drop of rain falls on it (not to mention creepy-crawlies!) the antenna becomes completely mismatched.

Personally, I prefer a balanced driven element with a T-match fed from a coaxial balun or a split dipole driven element with a 'hairpin' match (the centre of which can be grounded), again fed with a coaxial phasing line.

## Changed Antenna

Early in 1992, John Hoban G0EVT (ID93) changed his antenna system from a single 14-element Yagi to 4 x 9-element F9FT Yagis with elevation control. He noticed an immediate improvement in performance.

At the mast-head he uses a Landwehr low noise amplifier, whilst down in the shack a Kenwood TS680S drives an s.s.b. Electronics transverter, a Mitsubishi 25W M57727 power module and a pair of

4CX250B's. In addition to using the narrow c.w. filter in the h.f. rig, John also uses a Datong FL2 audio filter, which he thoroughly recommends.

With the four Yagis in place on the tower, there was little room for anything else. So a 3-element MET Yagi for the 50MHz band was placed on a 5m length of scaffold pole, braced to the back of the house by a pair of ladders! A 23-element F9FT Yagi for the 1.3GHz band was also put on the pole and a number of contacts have already been made.

Contacts on the 70MHz band have been tried using the 50MHz Yagi, the best DX so far being GW4BVY/P. Originally the 3-element MET antenna was cut down to a 2-element and mounted on a 2.5m pole, clamped to a Black and Decker Workmate in the back garden.

Despite these limitations, John managed to work D68BR (LH18) on the 50MHz band with it earlier in the year. It all goes to show that it is possible to work DX even with a lash-up, and that some sort of antenna is always better than no antenna!

## New DXCC Countries

The ARRL DX Advisory Committee (DXAC) has voted to recommend the following new additions to the DXCC countries list. The Republic of Croatia - 9A (was YU2), the Republic of Slovenia - S5 (was YU3), the Republic of Bosnia and Hercegovina - YU4 and the Republic of Macedonia - YU5.

The DXAC intends for the entity of Yugoslavia, composing of Serbia - YU1, Montenegro - YU6, Vojvodina - YU7 and Kosovo - YU8 to continue on the DXCC list. These recommendations then go to the ARRL Awards Committee for consideration in January 1993.

The start dates will be announced later if the DXAC recommendation is adopted. Therefore do not send QSL cards to the DXCC desk for these countries until they have been officially added to the list, and a date for acceptance has been announced.

## Weinheim Convention

Following my report about the Weinheim convention in last month's *PW*, I have received further details from Volker DF7IT. Volker reports that at the barbeque, held at the DL0WH club headquarters on the Friday evening, over 400 steaks, about 700 bratwursts (sausages) and more than 800 beers were sold. I'm not too sure if he means in total or just to the British contingent!

Over 6500 entrance tickets were sold for the convention, held on the Saturday and Sunday, so it really looks assured that this event will continue. Volker mentions that he is looking for people who can give

lectures about v.h.f. matters in English. If you can help and are available between 17-19 September 1993, contact either myself or DF7IT via packet radio @ DB0GV.

## The Winners

The winners of the RSGB 70MHz cumulative contest, held during the first quarter of 1992, were G4ZTR/P and EI2CA/P (runner-up) in the open section and G4ASR and G4SEU (runner-up) in the single operator fixed station section.

The results of the RSGB 144MHz Trophy contest, held in September, make interesting reading. First place in the open section went to G4KUX/P (ID94) making 809 contacts, the best DX being EA1TA at 1354km.

In second place was the station of G4VIX/P (JD01PU) who made more contacts, 830 in total, but was 100 points behind the leader. This shows the importance of choosing the right site for the prevailing conditions!

In the single operator portable section, the honours went to the station of GM4ZUK/P (ID86) who made 225 contacts but was sufficiently far north to make many long distance contacts, thereby increasing the contest score. I guess the opening into Spain also helped! In fact one contact with EA3TI/P at a distance of 1654km was worth 33 points, the equivalent of making 33 local (up to 50km) contacts.

In second place of the single operator portable section was another station operating from Scotland GM8DDH/P (ID75MB), who despite running only 8W into an 8-element Yagi, managed to work some very creditable DX, including FF6KBF/P at 700km.

The winner of the single operator fixed station section was Andy Cook G4PIQ (JD01), who made 574 contacts, beating the Isle of Man club station GD4IDM into second place.

The RSGB v.h.f. contest committee have arranged a fixed station contest on the 70MHz, 144MHz and 430MHz bands, to take place during the Christmas holiday period from December 26-29 between 1400-1600UTC daily. Stations exchange report, serial number, locator and county. The serial number starts at 001 for each band and continues sequentially every day. So, if you work 60 stations on day one, you continue on day two with serial number 61.

A German c.w. contest, AGCW-DL, will be held on the 144MHz band on New Years Day, 1 January 1993, between 1600-1900UTC. Entrants call 'CQ AGCW TEST' and exchange report, serial number, power section and locator. The power sections are; A = less than 3.5W, B = less than 25W, C = more than 25W. So I would send, for example 599034/C/ID81MX.

A 144MHz c.w. contest is normally held on the fourth Sunday of January (24 January 1993), but at the time of writing this column I have not received confirmation of the event. Similarly, a series of 70MHz cumulatives take place between January to March each year. Further news of both events next month.

The Nordic activity contest is held every month and is open to all amateurs outside of Denmark, Finland, Norway and Sweden. All operation must be in accordance with IARU Region 1 bandplans and logs must contain contacts with DZ, DH, LA and SM, from at least two different locator squares. No contacts via active repeaters are allowed. Contest exchange is RST and locator, eg. 59 ID81MX.

The band sections are held on the following days, 144MHz on the first Tuesday of each month, 430MHz on the second Tuesday, Microwaves on the third Tuesday and 50MHz on the fourth Tuesday of the month. All sections will run from 1800-2200UTC during the winter and 1700-2100UTC during the summer.

Monthly and yearly results are available, the yearly winner from each European country being awarded a contest Diploma. A full set of rules can be obtained from myself on receipt of an s.a.e.

The remaining Scandinavian activity contests of 1992 are Microwaves on December 15 and 50MHz on December 22, and those for 1993 being 144MHz on January 5, 430MHz on January 12, Microwaves on January 19 and 50MHz activity on January 26.

## Tables

Final entries for the yearly tables must be received by me before the end of January. They will appear in the April issue of *PW* on sale 11 March 1993.

## Deadlines

As usual please send your letters to reach me by the end of the month at the very latest, as I normally write up the column around this time. Don't forget that I can also receive messages via packet radio at my mailbox GB7TCM or at my DX cluster GB7DXC.

Photographs of your shack, antennas or any v.h.f. activity are especially welcome. Other pictorial items such as QSL cards, awards, certificates, etc., are also required. They will all be returned to you.

## Happy Christmas!

And finally, thank you to everyone that has written in to the column with news and photographs. It was very much appreciated.

I wish all readers a Happy Christmas and a DX-filled New Year.

As from the March issue of *PW*, 'VHF Up' will have a new look and new style.

Watch this space for the very best in news and views.



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# Back-Scatter

## Broadcast Round-up

Reports to Peter Shore via the PW Editorial Office

The most startling piece of news from the world of international radio comes this month from Luxembourg, which announced its intention to close Radio Luxembourg, the English service from the Grand Duchy, at the end of December 1992. The station stopped using the familiar medium wave channel of 1.440MHz some months ago, concentrating entirely on the Astra satellite service, as well as a short wave relay.

But now the English service will come off the air entirely as it appears not to be paying its way. The final transmission will be on December 30 on Astra transponder

facilities at Yamata near Tokyo are to be expanded. Three new 300kW transmitters will be in operation from March 1993, together with a similar number of antennas. The new equipment is designed to improve reception in China and South East Asia.

It may be that the BBC World Service will be hiring time on the Japanese facilities, following the success of the agreement which has enabled NHK to operate from the BBC's Skelton site in Cumbria.

Watch this column for more details.

This month's post bag to the 'Broadcast Round-up' column is more extensive than usual, with letters from more distant places than recently. I was delighted to hear from **Asantha Cooray** in Colombo, Sri Lanka, who sent me an extensive loggings list from his QTH, although Asantha doesn't tell us what his receiver is. A selection of his more interesting catches appear later in the column.

From closer to home, regular correspondent **Roy Merrall** has sent lots of news from his base in Luton. Thanks to you both. And don't forget that I would like to hear from more readers with any news, frequencies, tips or suggestions. Please send them in to the *PW* Office in Poole.



**Asantha Cooray, Colombo, Sri Lanka.**

13, audio sub carrier at 7.74 and 7.92MHz. Broadcasts in other languages will continue on both medium wave and satellite channels.

Radio Netherlands is digesting a lengthy report from the Dutch Media Council, which looked in to the future of the Dutch international service. It suggests that Radio Netherlands needs a revised mission and there are fears that the station's current budget of some US\$44 million might be pared down. There is likely to be a debate on the station's future in the Dutch parliament and in the meantime, listeners might like to write to Radio Netherlands outlining their views on the station's role in international broadcasting today. The address is PO Box 222, 1200 JG Hilversum, Holland.

Do not be surprised if you hear advertisements on Channel Africa, the new name for Radio RSA. The station is accepting commercials for the first time in its 26 years of operation. The schedule was published in last month's edition of *PW*.

Radio Japan's transmission

### European Stations All times GMT(=UTC)

Radio Tirana's winter schedule for English now is:

1530-1600 on 9.76 and 7.155  
2200-2230 on 11.825, 9.76 and 1.395MHz  
0130-0200 on 11.84 and 9.58  
0230-0300 on 11.84 and 9.58MHz.

Roy Merrall starts his contribution this month with an unusual BBC frequency. He's come across English to West Africa from Ascension on 11.86MHz at 0800 for 15 minutes on a beam of 27°.

Two stations noted from Italy: the Voice of Europe is a low-power pop station noted often at around 1030 on 13.6658MHz (variable), scheduled for 24-hour operation but generally fading badly after 1100. European Christian Radio is sometimes heard fairly clearly under a weak but usually improving Croatian Radio on 6.21MHz from around 1045.

Heard daily by Roy since mid September on 15.415MHz from sign-

on at 1558 is a Russian language station identifying as "Govorit ..... Golov Israelski Arabska (Ne)Rodina" or similar. He believes this translates roughly as the Voice of Israeli Arab Peace. Curiously, the first two days of observation on September 14 and 15, there followed a German language transmission up to 1700 sign-off, but from then on the programme has been segmented in to what seems to be a variety of eastern European and Russian languages. Signals peak at SIO544 most days.

For those of you lucky enough to have access to satellite facilities, there is a new Swiss music station on Astra, on the same transponder as Swiss Radio International (number 9). It's quite a curious station, broadcasting a mixture of Swiss folk music and country and western music! Called Radio E Viva! It operates out of Zurich and can be found in stereo on audio sub carriers at 7.74 and 7.92MHz.

Radio Ukraine International is now heard at 2200 on 5.96, 7.24, 7.25, 9.60, 9.665, 9.785 and 9.82MHz.

### African And Middle Eastern Stations

There is more evidence of the hire of Russian transmission facilities to clandestine stations. The Voice of Ethiopian Patriotism has been noted on 21.785 and 17.57MHz on Sunday and Wednesday at 1530GMT for 30 minutes. Contact addresses for the station are in Sweden and the United States: Voice of Ethiopian Patriotism, PO Box 5077, S-163 05 Spanga, Stockholm, Sweden and Coalition of Ethiopian Democratic Forces, PO Box 21307, Washington DC 20009, USA.

The Voice of the Broad Masses of Ethiopia on 7.38MHz is clearly quite audible after 1600 despite Radio Ala later on the same channel. Noted in Afar with SIO242, with change to Amharic at 1630. The interval signal is an electronic keyboard sequence similar to the Voice of Ethiopia. Closing announcement and sign-off is on a clear channel at 1700.

Radio Cairo has been observed with woolly modulation in Italian at 1850 on 9.99MHz, followed by Arabic with strong signals.

The Voice of the Iraqi People has added another channel having been strongly heard on 15.58MHz in parallel with 17.955MHz at around 1620. The parallel 15.60MHz frequency seems to be jammed, but remains audible. The full identification is "Idha'at al jumhuriya al ?Iraqiyya min Baghdad; Saut-al-Sha'ab al-Iraqi" usually said fairly

slowly and deliberately often by a YL announcer.

Radio Jordan has been noted on a fairly cluttered 7.155MHz at 1820 onwards, in parallel with the main outlet on 9.83MHz in Arabic (although under a strong Croatian Radio on 9.83MHz).

The KBC's national Service on 6.15MHz has been regularly heard from around 1830 to sign-off at 2111 with SIO peaking at 443, although there is often heavy QSB and QRN.

The RTV Malienne service in Bamako has been surprisingly strong and regularly heard on 9.635MHz from around 0800 sign-on and improves steadily to a peak of SIO 343 at times around 0900. There is a slow fade-out to 1000 at around the station's normal sign-off.

Radio Oman still provides an occasionally strong signal on 11.89MHz at around 2000. Many references to "Masquash" and "Uman". A phone-in programme was recently observed with recorded music between calls. Westminster-style chimes are heard at 2100. The parallel frequency of 9.735MHz is usually buried in a very recorded channel.

Qatar Broadcasting Service is now heard on new 11.8202MHz from around 1730 up to a clear identification on the hour at 1800 and 1900, after which it descends into the clutter.

Roy Merrall is disappointed, as after a fantastic two or three days of National Unity Radio on 9.19MHz, nothing has been heard since September 10, when the English at 1850 was very clear. The SPLA service was heard the following morning, also on 9.19 at around 0500, but no more Radio Omdurman or National Unity Radio. Was it something he wrote for 'Broadcast Round-up', Roy asks!

Radio Tanzania now has an English overseas service on 5.05MHz at 0330-0430 and 0900-1030 and on weekdays only 1530-1915. During weekends, the station is continuous from 0900-1915. Reception is spoilt by a persistent agile clandestine and its attendant jammer right through to final close-down at 2100 (probably the Voice of the Mojahed).

### Asian And Pacific Stations

Radio Afghanistan's broadcasts to overseas are being noted again on 9.635MHz at 1830 in English.

Voice of the Strait First Programme noted signing-on at 2053 on 5.05MHz with a monotonic bell sequence, repeated several times up to announcements in Chinese and programming from 2100. Whilst the Second Programme is heard regularly on 4.90MHz with bells and announcements from 2154, with a



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# Back-Scatter

cluttered parallel on 6.00MHz, sometimes identifiable.

ZXingjiang PBS can sometimes be heard signing on (under Ecos del Torbes) on 4.98MHz with a much clearer parallel on 5.06MHz from around 2250. The signal is a tone sequence on bells, similar to Radio Beijing, followed by announcements.

In Lhasa, Xizang PBS is occasionally heard signing-on at around 2305 in the Chinese service, with very weak signals but the usual bell-like signal clearly definable on 4.75MHz. An occasionally light noise background permits the logging of the Tibetan service on 4.035MHz at around the same time, also extremely weak, on a band filled with local simplex RT channels.

The RTM Sarawak service, Kuching, on 5.0301MHz has been detected occasionally under a variable, possibly new, Radio Continenté (on 5.03MHz) - which identifies with an apparent Caracas base - at around 2230.

## North, Central And South American Stations

Broadcasts to Canadian Forces stationed abroad continue on the facilities of Radio Canada International, and may even be expanded by the Spring of 1993. There is currently a transmission for Somalia and Cyprus at 2000, lasting 30 minutes on 17.875, 17.82, 15.325, 15.14, 13.67, 13.65, 11.945MHz from Canada and on 7.235 and 5.995MHz from Britain. The present mainstream Radio Canada International schedule to March 1993 is unchanged for services to Africa, the USA, Latin America and the Caribbean. Other schedules are:

English to the Middle East:  
0400-0430 on 5.995MHz (via Skelton; Moosbrunn dropped)  
English to Asia:  
1330-1357 on 6.095 and 9.70 via X'ian discontinued  
2030-2100 discontinued  
2200-2230 unchanged  
English to Europe:  
0400-0430 on 9.67 discontinued  
0615-0700 unchanged  
1515-1530 reduced by 15 minutes, 13.65MHz dropped  
1700-1730 unchanged  
1800-1830 discontinued  
2000-2030 unchanged  
2030-2100 now on 5.995MHz  
2200-2230 unchanged  
2200-2300 15.325MHz dropped

## Radio Cuba

Radio Havana Cuba observed strongly in English to 'Europe and the Caribbean' on 17.705MHz at 2100 with *DXers Unlimited* at 2135 on Saturdays. There is also Spanish on 13.66 u.s.b., 15.22 and 17.77 to Europe, Africa and the Middle East at 2100-2300 and English to North America announced as 9.655 at 2200, with SIO to 433.

New station, Radio Continenté in Venezuela, has been noted with a very strong signal in Spanish with an identification on 5.03MHz and an address in Caracas. Presumably this is either a relay of the medium wave outlet on 590kHz or a separate transmission.

## Sri Lankan DX Report From Asantha R Cooray

Radio Alma Ata in English 1800-1900 on 3.955, 4.40, 5.035, 5.26, 5.96, 5.97, 9.905, 15.215, 15.315, 15.385, 17.605 and 17.715MHz. Best results in Colombo from 5.035MHz. The station has a new address of PO Box 4750, Alma Ata 480015.

Radio Bangladesh noted in English 1800-1900 on 12.03 and 15.02MHz.

ORTB Cotonou, Benin with Home Service 1600-2300 and news in French at 1930 and English at 1800 and 2130 all on 4.87MHz.

Radio Botswana in Sebele has English 1700-1900 on 4.82 in parallel with variable 3.365MHz.

Voice of Myanmar, Burma, with home service in Burmese on 4.725 from 1000-1500 and in English on 5.985 from 1430-1600.

Voice of the People of Kampuchea in Cambodian 1100-1400 on 4.91 and 6.09MHz.

In China: Xizang PBS, Lhasa with home service in Chinese and regional languages on 4.75 and 5.24 from 1000-1450; Xianjiang PBS, Urumqi in Kazakh from 1100-1630 on 5.44 and 4.33MHz; Xiangjiang PBS, Urumqi in Uighur on 5.80 and 4.735 from 1030-1600; Huanan PBS, Changsha in Chinese 0900-1600 on 4.99MHz; Guangxi PBS, Nanaing in Vietnamese 1000-1600 and Chinese on variable 5.05MHz. Heard in Colombo with interference from Singapore Broadcasting Corporation Radio one on 5.052MHz.

The HCJB service in English to Asia and Oceania at 0030-0430 on 21.455-u.s.b., 15.155, 9.745MHz with Japanese following at 0430. A new address is announced of Box 17-17-691, Quito, Ecuador.

The VoA's Munich relay was noted on 3.98 at around 1830 in Colombo, and RRI Jakarta National Programme on 4.775, 3.275 variable from 1000 to 1700; RRI Mataram 0900-1600 on 2.493 and 3.22MHz; RRI Ujung Pandang 1600-2100 on 2.49MHz

Voice of Kenya's General Service in English on 4.935MHz from 1300-2100.

The BBC WS Lesotho relay on 3.255 noted from 1800-2100 and the Lesotho National Broadcasting Service in Sesotho on 4.80 including English news at 1600 noted till sign-off at 2000.

Asantha heard RTM Kuching, Sarawak in Malaysia on 4.835 and 7.16 from 1300-1600; Radio 4 in English on 7.295 from 0900-1600 with English news at 1200, 1330 and 1500; RTM Kota Kinabalu on 4.97 around 1300-1600 sign-off; RTM Kuala Lumpur in Tamil at 0700-1500 on 4.845MHz.

Radio Mozambique in Maputo on 3.21 at 1630-2100.

Radio Nepal in English at 1415 on 5.005MHz and WS in English at 1115-1145 on 5.005MHz.

He also heard SBC in Singapore in English, with identification "Radio One 90.5 FM" on 5.01, 5.052, 11.94 from 2200-1600.

As from the March issue of *PW*, 'Broadcast Round-up' is changing format. Look out for an exciting monthly column packed with news, views, advice and reviews.

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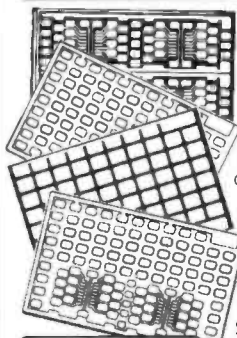
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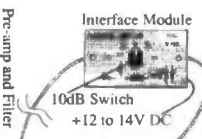


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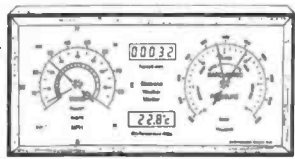

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The receiver is supplied with a comprehensive selection of accessories: DA900 wide band flexible aerial, NiCad pack, Dry battery case (for use with 4 x AAA alkaline cells), Charger, DC lead fitted with cigar lighter plug, Earphone, Soft case, Belt hook, 5 metres (approx) of aerial wire terminated in a BNC connector for shortwave reception and Operating manual.

Versatility is excellent. The AR1500 may be powered from its internal NiCad pack, spare dry batteries may be carried for extended operation and used with the dry battery case, the set may also be plugged directly into the cigar lighter socket of a motor vehicle (external input range 11 - 18V DC).

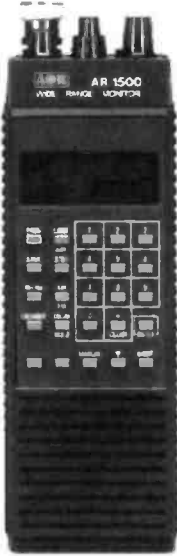
Although offering a long list of facilities and operating modes, the receiver remains easy to operate. Many facilities have been carried across for the well proven AR2000 receiver. The AR1500 has a new 'automatic memory' feature which automatically stores busy channels from search bank 9 into the 100 memory channels of scan bank 9.

There are 1000 memories in total arranged in 100 memories x 10 banks, there are also 10 additional programmable search banks. Each memory will store frequency and mode (NFM, WFM or AM - not SSB) the search banks will also store the step increment. There is a massive EEPROM memory store for all memories and search banks so that no backup battery is required. The memories may be over-written time and time again. The display often provides 'prompts' for selected operations such as a flashing "CH" to invite the user to key in a new memory channel number. All information such as frequency, mode (except SSB), channel etcetera is presented via an easy to see Liquid Crystal Display (LCD). The display is fitted with a switchable light to increase visibility in areas of low level lighting.

The AR1500 can meet a number of requirements to satisfy Airband or Marine enthusiasts. Professional off air monitoring and of course casual listening too. The World's shortwave and Amateur bands can be monitored, even the longer range Oceanic Airband and ship to shore. Of course the performance of this compact hand-held receiver can not be directly compared to that of the AR3000A or dedicated General Coverage Receiver.

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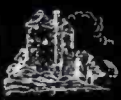
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E810F	25.00	EM87	4.00	U48C110	2.50	6K7	4.00	7025 GE	7.00
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E810F	25.00	EM87	4.00	U48C112	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C113	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C114	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C115	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C116	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C117	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C118	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C119	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C120	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C121	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C122	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C123	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C124	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C125	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C126	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C127	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C128	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C129	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C130	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C131	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C132	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C133	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C134	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C135	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C136	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C137	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C138	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C139	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C140	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C141	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C142	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C143	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C144	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C145	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C146	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C147	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C148	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C149	2.50	6K7	4.00	7025 GE	7.00
E810F	25.00	EM87	4.00	U48C150	2.50	6K7	4.00	7025 GE	7.00



# FOR SALE

**FT ONE** - HF transceiver 100W General Coverage Rx Ham Tx. S/Hand 3 month Warranty £895 0703 251549

**CONNECTORS** - UG88 BNC 5.5mm £1.69 PL259 UHF £0.82; UG21 N type 11.2 £3.70; PL259R UHF 5.0mm £0.94; PL259M UHF Metric thread £0.98; SO239E UHF Socket Cable End £0.67; UG23 N Cable End Socket 11mm £3.76; UG89 Socket Cable End £2.00 Plus many more 0703 251511/0297 34918

**FT102** - HF transceiver 100W. Good condition. FM option All bands £550; FC102 Antenna tuner 1KW (160-10m) £99 0297 34918

**FT767GX** - All band HF transceiver. Secondhand 100W 2m/6m & 70cm options available £975 0246 453340

**HT180** - 10W 80m single band transceiver. 12V DC operation c/w hand mic, power lead & manual £249.00. Also HL100B/10 10m linear amplifier 10W in 100W output £155 0703 251511/251549

**WX1/N** - 2m/70cm Base antenna 4.5/7.2dB £60.25; WX2/N 2m/70cm Base 5/8dB £80.75; WX4/N 2m/70cm Base 7.0/10.8dB £106.25; WX6S 2m/70cm Base 9.2/13dB £219.95 0532 350606/0703 251549/021 327 1497/0297 34918/0246 453340

**TS940S** - 100W HF transceiver All bands Tx General coverage Rx £1595 0703 251549. Also similar model available TS940S HF transceiver £1495 021 327 1497

**TS930** - All band HF transceiver 100W o/p secondhand £895 0297 34918

**6M BEAMS** - CL6DX 6m 6 ele Yagi 13dB £117.50; CL6DX 7 ele Yagi 14dB £172.65; CL6DXZ 8 ele Yagi 14.5dB £235.00; 4Y6M 4 ele Yagi 7dB £66.00 - All new high quality antennas. 0246 453340/0703 251549

**VERSATOWERS** - Many models in stock, ranges from 25ft to 120ft - fully galvanised - All new supplied with Auto Brake winches - Trailer mount versions available - Ring for advice 0703 251549

**FT101ZD** - Classic transceiver - valve PA - 100W RF output Digital display - ideal first HF rig secondhand 3 month warranty £449 0297 34918

**TM241E** - Kenwood 2m mobile 50W output, FM only, compact size. Good condition £279 0297 34918

**HT106** - 6m 10W SSB/CW transceiver - 13.8V DC operation c/w hand mic, handbook, box etc £249; HL166V 6m Linear Amplifier 3/10W in 160W out £215; HL1K16 6m Linear Amp - pair 4CX250B £795 all shipped 6 month warranty 0703 251549

**Ally tube** - 1.25" dia 16 gauge wall per mtr £2.67; 1.5" dia 16 gauge wall per mtr £3.81; 2" 7 gauge wall per mtr £7.05; 2" 7 gauge wall 5m length £35.25; 2" 7 gauge wall 6m length (collect only) £42.30; Also fibreglass tube - FG38 1 1/2" 2.5mm wall 2.5m length £18.86; FG44 1 1/2" 2.5mm wall 2.5m length £23.71 - 0703 251549/021 327 1497/0246 453340/0532 350606/0297 34918

**D Shackles** - Various sizes - All galvanised high quality from 6mm 0.50 to 13mm £1.36; Guy Rope - HT Steel from 3mm-6mm from £0.33 p/mtr., Prestretched polyester from 3mm-8mm from £0.15 p/mtr 0703 251549.

**G-400RC ROTATOR** - New. Boxed unused c/w all instructions/hardware £182.85; G-400 As above with meter display £152.00; G-800SDX H/D Rotator suitable larger antennas, preset variable speed 450 degrees. New £332.00 0246 453340/0532 350606

**FT209R** - 2m handheld c/w FNB3 nicad pack 3W RF output - ideal for beginner, keypad good condition £129.00 0246 453340

**FTV107R** - Yaesu transverter - matches FT107S/m 2m filtered 10W RF output £175.00; Also FTV901R Transverter to suit FT901/902 with 2m card fitted £175.00 0297 34918

**BALUNS** - HF Baluns - High quality, recognised name all 1:1, 2:30MHz; 2kW PEP SO239 £30.50, 3kW PEP SO239 £30.60, 4kW PEP SO239 £36.00, 6kW 'HN' £179, 10kW PEP 'HN' £460; 6m Balun 50MHz 4:1 'N' input 3kW PEP £105.75 021 327 1497

**CV730V-1** - V dipole 40-10m 1kW PEP 19' elements £152; CV48 40m Vertical 3kW PEP 40.3' ele £214.50; AD385 40/80m Switch Box for CV48 £50.00; 714X-3 3/4 Ele Yagi 40-20-15m 3kW PEP £815 All complete with manufacturers warranty 0532 350606/0703 251549

**TS790E** - 2m/70cm Base station 45/40W output Dual display Good condition £1250.00 0532 350606

**FRG8800** - HF Receiver 0.15-30MHz, all modes, VHF option (not included), Mains operation c/w handbook, V good condition £525 0703 251549

**Jupiter II** - VHF/UHF scanner, popular model 25-1300MHz (Some gaps) secondhand £175; VT125 Airband handheld scanner 30CH £129 0297 34918

**Frequency Books** - VHF/UHF frequency guide £5.95; HF Oceanic Airband freq. list £3.95; UK Listeners Confidential frequency list £8.95; INTVHF International VHF FM Guide £2.85; Marine Frequency Guide £4.95; VHF/UHF Airband freq. list £6.95 0246 453340/021 327 1497

**Valves** - 572B £85.78; 6146B £23.75; 12BY7A £10.35; 6JS6C £14.95; 6KD6 £7.64; 4CX250B (EIMAC) £97.07; 3-500Z £137.93; 6GK6 £2.06; 6BM8 £1.76; 6AN8 £3.06; 6EA8 £3.23 + Many More 0703 251549/0246 453340

**FILTERS** - Crystal filters, new unused: TF30F12 12kHz 3.18 MHz 6 pole £15.00; TF30H12 12kHz 3.18MHz 8 pole £15.00; YF90H12 12kHz 8 pole 9MHz £15.00; YF107F2.4 2.4kHz 10.7 MHz 6 pole £15.00; YF107H12 12kHz 10.7MHz 8 pole £15.00 0532 350606

**PRO-80** - Sony Scanner, handheld - FM, LW, MW Broadcast bands + SW, Air & PSB c/w charger, manual etc choice of 2 £219.00 0703 251549

**ICR1** - Handheld scanner, very popular model - huge range, good condition, 100kHz - 1300MHz, extremely small £259 0297 34918

**T200** - 200W peak SO239 Dummy load up to 500MHz brand new, boxed £66.50; T100 100W peak SO239 up to 500MHz boxed £50.00; T25 300W peak SO239 up to 500MHz brand new £11.60; SMC12B 5W peak PL259 (Bulb type) £1.76 021 327 1497/0246 453340

**FT26** - 2m handheld, miniature 2.5W RF output c/w FNB28, NC28C & belt clip. Brand new boxed - ex stock immediately delivery £255.00 0532 350606

**FRG9600M** - 60-950MHz mobile/base scanner, SSB up to 460MHz, 13.8V DC operation c/w owners handbook - good opportunity to buy this popular model £479.00 0532 350606

**IC730** - Mobile 100W HF SSB transceiver c/w hand mic/power lead, General coverage Rx Ham band Tx, good condition £425.00 0246 453340

**FE7-767-50** - 6m module for FT767GX transceiver 25W RF output secondhand £169.00 0703 252549

**TV17** - TVI problems, then why not fit a filter and forget it! HP4A - Braid Breaker £8.95; FC-30MR Low Pass Filter, Cut off 32MHz 1kW PEP SO239 £38.75; CF-BPF2 2m Bandpass 15W PEP SO239 £31.65; Others available 0703 251549/0297 34918

**COAX SWITCHES** - 2 way slide switch Rx only SO239 £2.20; 3 way slide switch Rx only SO239 £5.20; CS201 2 way SO239 DC-600MHz 1kW PEP £17.50; CS201 2 way 'N' type DC-2GHz 1kW PEP (HF only) £27.50; CS401 4 way SO239 DC-800MHz 1kW PEP £69.95 021327 1497/0532 350606

**FT ONE** - Yaesu HF transceiver 100W RF output, mains operation, general coverage Rx, Nice machine £975.00; MD1B8 Scanning desk microphone 8 pin connector to suit FT ONE above £65.00 0297 34918

**FT101Z** - Ham Bands HF transceiver, good condition, Valve PA., analogue display £449 0703 251549; FV101Z External VFO to suit FT101Z £135 081 997 4476

**HX240** - 2m to HF (80-10m) transverter 40W PEP output on HF, shop soiled 6 months warranty £215.00 0703 251549

**DAIWA** - 32A Variable (1-15v) P.S.U. 40A max V/A metering £189.00; 24A continuous variable voltage (1-15v) P.S.U. 32A max V/A metering £129.95; 9A Variable voltage (3-15v) P.S.U. 12A max V/A metering £69.95; 12A continuous fixed voltage P.S.U. 14A max unregulated £65.00 0246 453340/0532 350606

**COAX CABLE** - 50ohm UR76 per mtr 33p, RG58 per mtr 32p, UR67 per mtr £1.00, H100 per mtr £1.08, RA519 per mtr 76p, 75ohm UR70 per mtr 33p, UR39 per mtr 78p, UR57 per mtr £0.88, UR65 per mtr 73p, LDF2/50 heliax 3/8" per mtr £4.35, LDF 4/50 3/8" per mtr £5.17 0703 251549

**FP757HD** - 20A continuous P.S.U. 13.8V fixed suit FT747GX/FT757GX/IV/FT890 £179 0532 350606 Also FC757AT Automatic ATU suits FT747GX, FT757GX. Both secondhand £225 0703 251549

**TS530S** - HF SSB Transceiver 100W good condition 3 month warranty £550 0297 34918

**MAST CLAMPS** - SMC29C 1 1/4" to 2" mast £2.00; SMC65 1" boom to 2" mast £3.33; SMC53 1" boom to 1 1/2" mast £2.06; SMC63 1 1/4" boom to 1 1/2" mast £3.57; SMC73 1 1/4" boom to 1 1/2" mast Heavy Duty £8.90; 59/15 2" mast jointing sleeve 15" long £8.99; CP1 2" mast/boom crossover plate £10.22; 6mm Rawlbolt £1.88; Single Lashing Kit - chimney complete w/wire etc £14.05; Double Lashing Kit - chimney complete w/wire etc £17.63; U Bolt 1 1/2" clearance 40p; U bolt 2" clearance 59p 0703 251549/021 327 1497/0246 453340/0532 350606/0297 34918

**VERSATOWER ROPES** - 1st winch rope 5mm dia x 18.9m £18.21; 1st Parasitic Rope 5mm dia x 13.1m £15.63; Luffing rope 6mm dia x 10.4m £14.10 Other ropes by quotation. Also 4ft Copper Earth Rods c/w clamps £9.81 0703 251549

**FT470** - Dualband handheld FM, 2.5w output on 2m & 70cm secondhand 3 month warranty £220; DLA 80H dualband linear 0.5-25w input auto select 80w out on 2m 60w out on 70cm, new, £339; PS304 13.8V DC P.S.U. 24A continuous suitable for DLA80H above £129.95 Ring now on 0532 350606

**FT ONE** - A good example of this superb HF transceiver, 100W all mode mains operated base radio. General coverage Rx c/w manual £895 0246 453340.

**SMC12040E** - Compact Power Supply 13.8V DC 4A continuous 6A surge £20.39 0703 251549

**FT980** - Base Station HF transceiver, All Band, general coverage Rx, All mode, 100W RF output good condition. Shop soiled 0703 251549

**TS440S** - HF transceiver competes with popular FT990, 100W RF out, very clean machine, only £750 0297 34918

**RELAYS** - Coax relays CX120A Cable connections £18.13; CX120P - P.C.B. (Pin) connections £18.02; CX140D N + 2 Cable £25.70; CX520D 3 'N' £49.35; CX530D N + 2 BNC £49.35; CX540D 3 BNC £49.35; CX600N, 4N £98.70; CX600NS 2N + 2 Cable £83.73; All new, 12V DC coil, <0.2dB insertion loss at 0.5GHz 0532 350606/0703 251549

**MORSE KEY** - HK702 Straight Key Marble Base 1kg £52.50; HK706 Straight Key A.B.S. Base £29.50; HK707 Cranked Arm A.B.S. Base £26.00; HK711 Straight Key Knee Mounting £42.65; HK802 Deluxe Brass straight key £99.95; HK803 Brass Key, Deluxe £91.50; HK804 Brass Key w/o base £97.00; HK808 Straight Key Marble Base £68; MK702 Single lever paddle key £42.50; MK703 Squeeze Key A.B.S. Base £37.80; MK704 Squeeze Key No Base £25.50 0703 251549/021 327 1497/0246 453340/0532 350606/0297 34918

**FT902DM** - Another classic Yaesu HF transceiver, digital display, 100W RF output all bands, Valve PA, ideal for class 'A' licence's first transceiver £550; Also FV901DM Add second VFO to FT901/FT902, 2nd display memories, nice condition £125 0297 34918

**FT101ZD** - Digital display version of this classic transceiver, need we say more. Good clean transceiver, second hand 3 month warranty £485 0703 251549

**RC5B-3** - Heavy duty rotator, Worm drive to eliminate backlash, variable speed, preset 360° £689.00; RC5A-3 Same as RC5B-3 except not quite so H/D £434.00; RC5-3 Light/Medium duty rotator, preset 360° vari-speed £280; RC5-1 As RC5-3 but no preset £223.75 0703 251549/0246 453340/021 327 1497/0532 350606

**BEARINGS** - A range of bearings suitable for most towers and masts. GS-050 up to 1 1/2" mast £20.39; GS-065 up to 2" mast £30.60; AR200AB Offset bearing up to 1 1/2" £17.50; CK46 High quality 2" bearing £35.75; Lower mast clamps for G-series of rotators GC-038 £17.35; GC-048 £29.99; MC1 for Create rotors £35.75 0246 453340/0703 251549

**TH205E** - 2m Handheld FM £155.00; C500 Dualband 2 & 70 handheld 2.5W RF output £149.00 0246 453340

**FT650** - Multimode Base/Mobile transceiver 100W RF output, 6m, 10m and 12m bands 13.8V DC operation £825 - mains P.S.U. available £195 0297 34918

**DJ580E** - Alinco handheld dualbander 2m & 70cms + Rx scanner near mint condition 3 month warranty only £325 0703 251549

**FT767GX** - HF transceiver, very popular model, 100W RF output, general coverage receive, 2m, 70cms & 6m options available shop soiled £1095 0703 251549

**TEN-TEK** - Paragon Nice Machine Ham Bands Tx, Gen coverage Rx, nice price £795 0703 251549

**ANTENNA MOUNTS** - GCCA Gutter clip 4m cable £15.99; SOCA Panel Mount 4m cable £8.50; SOCAL Panel mount 6m cable £9.50; HS-TMK Trunk mount H/D c/w cable £18.91; 50mm Mag mount 4m cable £14.99; GCD Gutter clip only £6.99; TBR Adjustable trunk mount no cable £11.50; FB-4N Low loss cable 'N' plug £15.75; RS-9 Mini booth/hatch mount £6.25; RS16 Mini gutter clip S/Steel £12.75; SSB1 Mini hatchback mount c/w 5m cable £29.75 0532 350606/0703 251549/0297 34918/0246 453340/021 327 1497

**FT5200** - Latest dualband mobile, 2m/70cm 50/40W out, Compact size, c/w mounting bracket, mic, power lead & manual ex-demonstrator £529 0703 251549

**FT790RMK2** - 70cm multimode portable 3W output, c/w cell case, shoulder strap, antenna, mic and handbook £425.00 0703 251549

**FT203R** - Ideal beginners handheld, 2m 2.5W thumbwheel frequency change c/w nicad nice condition £125 0297 34918

**ICR100** - Mobile/Portable scanner 500kHz - 1.8 GHz, 100 memories, AM, FM (W+N) 13.8V DC operation £379 0532 350606

**TRAPPED DIPOLE** - 80-10m potted traps 1kW PEP c/w 14SWG wire £55.75; G5RV antennas Half size £19.95, Full size £26.25; High power traps only 1kW PEP suitable for trapped dipole home construction £21.15; Plus dipole centres from £2.40; Insulators many sizes from £1.76; Antenna wire, 14SWG single strand 35p/mtr, 7 strand hard drawn 35p/mtr, 7 stranded soft 35p/mtr, 7 strand H/Duty 88p/mtr. All normally ex-stock for immediate delivery! Postage Extra 021 327 1497/0246 453340/0532 350606/0703 251549/0297 34918

**FT73R** - 70cm handheld 2.5W output FM only, bargain at only £179 0703 251549

**NRD535G** - Superb quality general coverage HF receiver, 100kHz-30MHz, All mode, brand new complete with manual power lead & 12 months warranty £1395; ECSS Unit £279; CMH530 Rtty decoder module £129; CFL243W Bandwidth control unit £415; NVA319 Matching external speaker £169. All brand new 0297 34918/0703 251549

**IC725** - Compact lightweight HF transceiver, full 100W output all ham bands, 30kHz-33MHz Rx 13.8V DC operation as new £675 081 997 4476

**TR751E** - Mobile 2m transceiver, multimode 25W output c/w dc lead, hand mic and manual must be seen £495 081 997 4476

**FT225RD** - Older style 2m multimode base station - sought after model, good condition secondhand £375 0703 251549

**ICF7600** - Impressive portable receiver, Broadcast FM, MW, LW, SW + some VHF bands with many accessories, manual etc £199 021 997 4476

**HF225** - Low receiver much acclaimed British made receiver 150kHz-30MHz. Good conditions £325 options available 021 997 4476

**HX850E** - Scanner AM/FM, 60-89, 188-136, 140-174, 406-495MHz 20 memories, boxed brand new 3 month warranty £99.95 0532 350606/0246 453340/021 327 1497/0297 34918

**FRG800** - Modern HF receiver 0.15-30MHz all modes, mains operation V/HF converter £449 0246 453340; Also FRV7700 VHF converter to suit above £39; FRV 8800 internal VHF converter 118-174 MHz band new £119 0297 34918

**TS140S** - 100W HF ham bands transceiver Gen. cov. Rx. Good condition must be seen £619 081 997 4476

**FT707** - HF transceiver Mobile/Base 13.8V DC operation Ham bands only c/w mic, manual & power lead, bargain at only £349; FP707 matching P.S.U. 20A peak including speaker only £105. Phone now on 081 997 4476

**ADAPTORS COAXIAL** - A large range of coaxial adaptors ex stock; UG225 BNC Plug/UHF socket £2.23; UG273 UHF Plug/BNC socket £2.08; UG439 BNC Plug/2m socket £4.18; UG146 N plug/UHF socket £3.45; UG201 N plug/BNC socket £4.18. All brand new good quality 0703 251549/021 327 1497/0246 453340/0532 350606

**HF LINEAR** - HL2K 160-10m linear 2x3-500z, 2kW P.E.P. RF Input New boxed £1450; HL1K 160-10m linear 2x4CX250B 1kW PEP RF Input £959; HL100B/10 10m linear 10W in 100W out £182; HL100B/20 20m linear 10W in 100W out £182; Many VHF models available 021 327 1497/0532 350606/0297 34918

**FT470** - Dualband handheld very popular model 270 2.5W output good condition £229 081 997 4476

**FT703R** - 70cms 2.5W Thumbwheel handles ideal for novice nice condition £125 0532 350606

**FT811** - Keyboard handheld 70cms many features good condition 6 months warranty £239 0703 251549

**TR851E** - Kenwood 25W RF output multimode 70cms c/w manual, mic etc £525 081 997 4476

**HANDPORTABLE ANTENNAS** - T144H 1/4 wave BNC telescopic £13.75; HS-7025 1/4 + 7/8 wave 2 + 7/8 wave; CH725 BNC fitting £12.25; HS430 70cms 1/2 wave BNC £8.95; CH1200WS 23cm 2 x 1/4 wave £14.50; CH-600MX 2/70/23 BNC, Good for scanners £24.50. All new 081 997 4476/0297 34918/0703 251549/0246 453340/021 327 1497

**WALL BRACKET** - All galvanised needs 5 rawbolts supplied c/w 2" U bolts - 6" stand off £5.90; 12" stand off £9.75; 18" stand off £14.85; 21" stand off £14.85; 24" stand off £16.35; H/Duty 18" stand off £15.75; H/Duty 21" stand off £14.25; RB025 8mm rawlbolt £1.88 each 0703 251549/0246 453340/0297 34918

**FRG800** - General coverage receiver 150kHz - 30MHz, all mode, keypad freq. entry, dual clock/timer. Mains operation £499 081 997 4476

**FRG7700** - 150kHz-30MHz HF receiver good condition £295 3 month warranty 081 997 4476

**FE7-767-430** - 70cms module for FT767GX, 25W RF output only £175 0246 453340

**ORIGINAL MANUALS** - We can supply most owners and service/workshop manuals for Yaesu equipment. Large stocks held - old and new models Ring now for details 0703 251549/0703 254247

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