

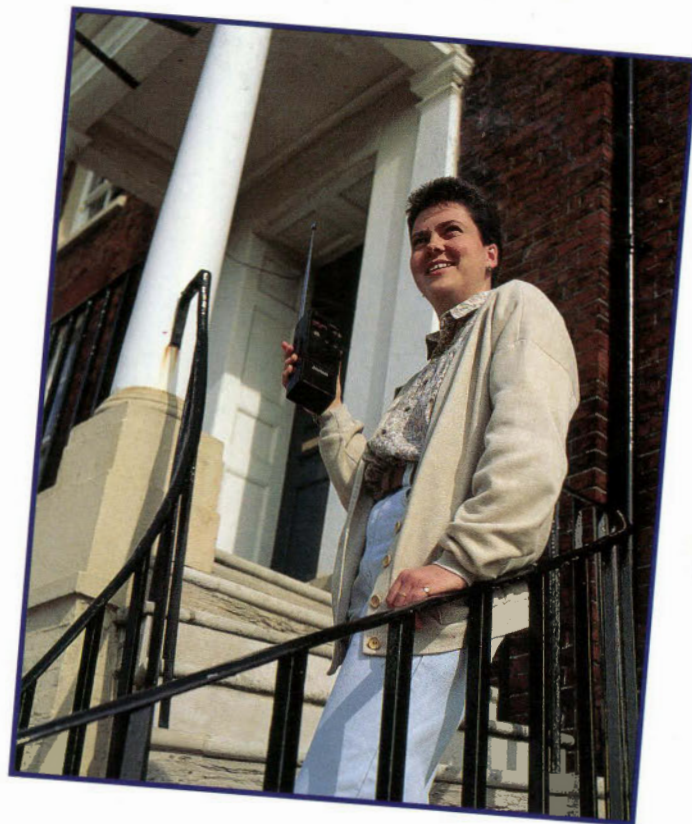
PW

Reviews

**Yaesu FT-990 HF Transceiver & The
Jesan 27MHz Hand-Held CB Rig**

Constructional

**PW Challenger Super-Simple
3.5MHz Transmitter**



Plus

Fred Judd G2BCX Looks At Long Wire Antennas

Full PW QRP Contest Results

**Getting Started The Practical Way, Competition, Focal
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Scene, Reflections, Christmas Gift Offers And Lots More!**

DECEMBER 1991

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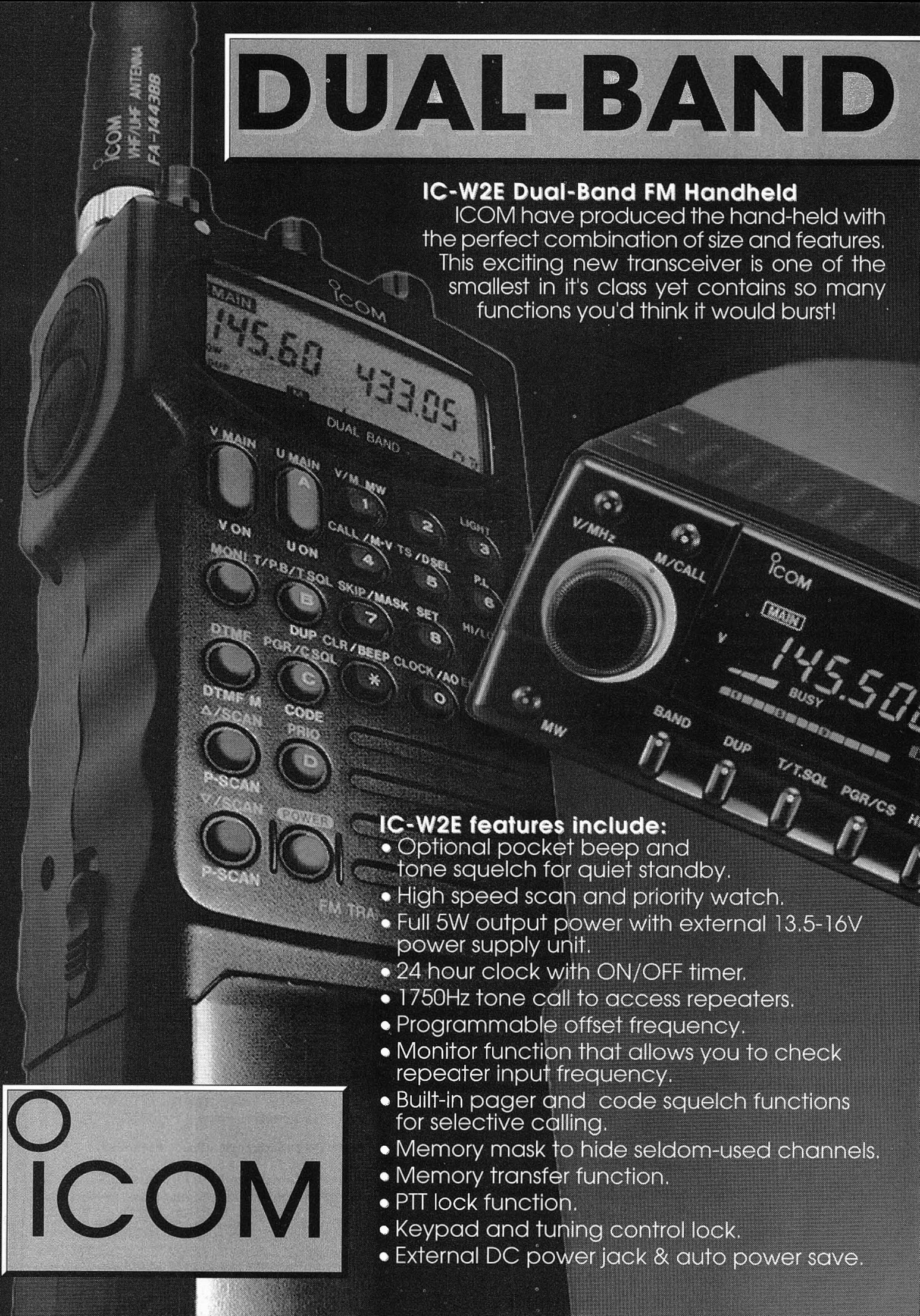
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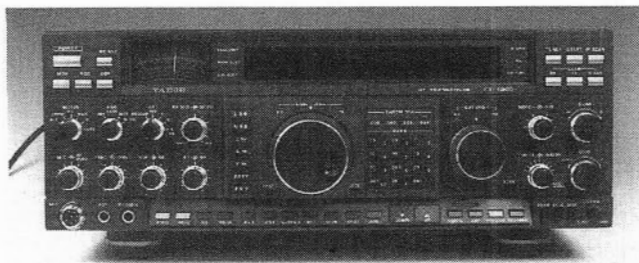
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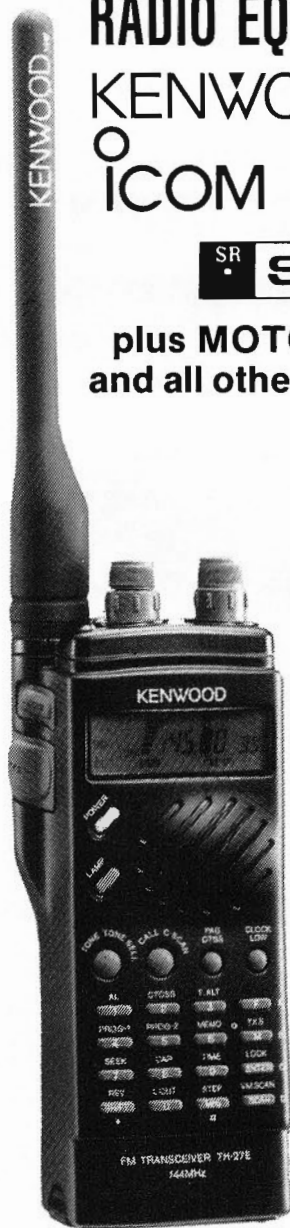
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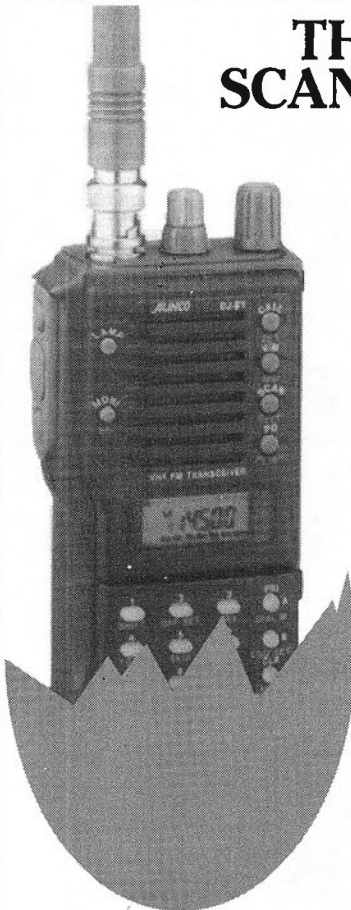
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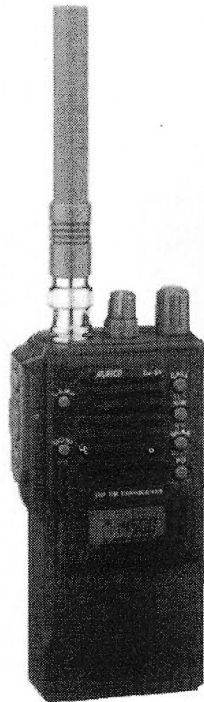
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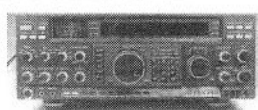
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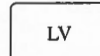
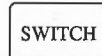
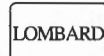
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Band Coverage: Sony Multiband Receivers offer reception across all or a combination of the following bands: FM, LW (Long Wave), MW (Medium Wave), SW (Short Wave), PSB (Public Services Band), SSB (Single Side Band) and SAT (Satellite Broadcasting). Some models offer continuous waveband coverage of SW. Others require the SW band to be 'broken down' into a number of broadcasting bands for easy reception. This is why there is a choice of Sony radios offering 12-band, 9-band, 8-band, and 7-band shortwave reception.

PPL Synthesized Circuitry: Advanced microprocessor circuitry which ensures accuracy and ease of reception. Dual-loop circuitry employs twin synthesizers and allows precise tuning in 100Hz steps from 150KHz to 29999.9KHz. Triple-loop circuitry employs three synthesizers for exceptionally precise tuning in 10Hz increments on the CRF-V21, allowing reception of FAX, RTTY and SSB signals.

Memory Preset Tunings: Pre-programmed frequencies can be automatically selected by presets.

Memory List: Allows recall and display of all stations stored in the memory. The CRF-V21 will give a hard copy print out of this information.

Memory Scan/Programme Memory Scan: Memory scan searches all stations stored in the memory, while programme memory scan searches the memorised stations in programmed order.

Auto Scan: Allows effortless scanning of stations within a specified band with a 1.5 second hold at each broadcasting frequency.

Define Scans: Scanning of stations within a specified frequency range.

Spectrum Analysed Tuning: This system, on the CRF-V21 allows monitoring of reception conditions while tuning. The analyser depicts radio signals for each frequency in graphical form on the large display screen. Strong broadcasts are displayed as high bars. Simply use the jog dial to move the cursor to the desired high point on a graph and the corresponding frequency will be tuned in. The CRF-V21 also allows you to print out displays so that you can keep a record of reception conditions.

Direct Tuning: Frequencies can be input directly via the 10 key tuning keypad. Simply key in the frequency and press EXECUTE.

Manual Tuning: Using either dial or keys, stations can be tuned by increasing or decreasing the frequency at your own pace. This method is also useful for fine tuning after using the auto scan function.

Priority Reception: Allows station frequency to be given priority status in the memory, so that the receiver will automatically tune it when transmission occurs. This is particularly useful when a station is difficult to receive or when broadcasting is at odd times.

Active Search: This function will automatically scan stations stored in the memory to determine whether broadcasts have occurred and to monitor the strength of signals. This is useful for determining when part-time stations (like shortwave broadcasts and amateur

stations) are broadcasting, and for monitoring changes in reception conditions of broadcasts which are difficult to receive.

Synchronised Detection System: SDS produces reception that is virtually free from phasing interference and distortion, thus overcoming one of the principal problems of SW reception.

Dual Conversion System: A receiver system of this type contains both a fixed oscillator and a variable oscillator to convert incoming radio signals to the intermediate frequency. This guarantees interference-free, highly sensitive reception.

RF Gain Control: Prevents sound distortion when a very strong signal is received.

AM Attenuation: Alters the input sensitivity of the AM antenna. The DX mode is used normally but if a strong signal from a local station is causing interference, the LOCAL mode should be used.

Station Name Tuning: With the frequencies and names of various stations memorised by the receiver, it is possible to tune by selecting the station name.

Multiple Memory: The ICF5W77 can memorise 162 frequency memories.

Key Protection: This feature, when in operation, will prevent functioning of all buttons.

Squelch Control: Adjusts the level of the signal (and noise) so that the signal (and noise) below the adjusted level is suppressed. This ensures better reception for stations with a higher level signal.

Card Tuning System: A new feature found on the ICF5W800, the Sony Card Tuning System helps ensure fool-proof multiband tuning. Three tuning cards are supplied with the unit, each one permitting 20 station settings to be memorized. Card One is pre-programmed to receive a variety of UK stations. Card Two contains international shortwave settings, while Card Three is left blank for programming the user's favourite stations.

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Keylines

I enjoy writing 'Keylines' every month. This particular job provides me with the opportunity of having a 'chat' with readers, although it's rather a one-sided 'conversation' until you respond either by a direct letter or via 'Receiving You'.

You'll all realise of course, that when I do write an editorial, I base it on personal experience wherever possible. Last month, for example I wrote about my experience with Ding Coombes, who was my personal 'Elmer'. I particularly enjoyed writing this 'Keylines', but was totally unprepared for the response from readers!

It appears that 'Elmers' have operated just as widely through the British Isles as I'd thought they had. I know this because I've received letters, FAXes, and 'phone calls and comments from many of you who have also had the benefit of a personal 'Elmer'.

Many Purposes

Editorials serve many purposes. 'Keylines' is my monthly chance to have direct contact with you, and it often generates feedback on topics I've covered. However, despite the fact that I'm used to some sort of comment from readers (complimentary and critical), the response arising from the October's 'Keylines' was overwhelming.

Unusually, some of the comments arrived on the FAX machine, and I only hope that those of you who FAXed from school didn't get into trouble for doing so! One or two of you even managed to catch up with me at rallies, to volunteer support for the 'Elmer' register.

I intend to write directly to those of you who've volunteered to be an 'Elmer', and I hope that everyone who has expressed

an interest will be linked with someone who wants some help. Incidentally, I'm pleased (but not really surprised) to find that quite a few of the volunteers are already registered Novice Instructors. Perhaps the ranks of Novice Instructors will swell even more, now that they know that there's a real need for them.

Largest Number

By far the largest number of replies and reactions to October's 'Keylines', came from school radio clubs and their organisers and helpers. Although I'm involved in running a school radio club myself, I was very pleased to see just how many clubs there are in British schools. There's even a school radio club in Devon where the pupils run everything themselves, with only 'token' adult present!

I hope to visit this school in the next month or so, and I fully intend to take some photographs so that we can all benefit from the well-planned activities of these youngsters. It will be interesting to see how well they manage to run the club committee. I've no doubt that they do better (remembering my own efforts as an 'adult') than so-called 'grown-ups'!

Another, very interesting letter came from Paul Robertson G7JCG who attends a school in Alcester, Warwickshire. Paul, who got his licence this year, has done everything correctly and an embryonic school radio club is under way, but now the club needs some local help.

School Clubs

There are often specific problems associated with school radio clubs. The main difficulty usually, (believe it or not) in my experience, is finding somewhere for the club to operate from. The second, is often the most to

difficult to solve, and that's the finding of experienced helpers.

The usual reply from headmasters, when asked about a school club is 'Yes, you can run a club at school, but we can't spare anyone to help'. I think that we can get an inkling of the difficulties involved, from the comments of a headmaster friend of mine who recently described himself as being a 'head-manager'. Nowadays, he regards himself as driving a desk rather than a school!

If amateur radio is to encourage younger people, we've got to show them what they're missing. The vast majority of schools just aren't science or radio-orientated. This is despite the fact that there could be many keen un-discovered enthusiasts whose talents, and possible careers, could be still-born.

So, with that in mind, I suggest that everyone who has volunteered to be an 'Elmer', please contact a nearby school. By all means show them amateur radio, but you'd be surprised at the fascination they show when you make a simple telephone from dynamic earpieces.

This simple technique really starts the sparkle of interest in their eyes! I've found that the simple 'phone leads on to a crystal set (using the earphone) and then they usually build a ZN414 i.c. radio, all by using a baseboard and drawing-pin system. After that, the enthusiasm leaves you, the instructor well behind!

I'd be pleased to hear from anyone in the vicinity of Alcester who could help and guide a fledgling radio club. Although I'm too far away to help regularly, I hope to visit the club, provide some practical advice and moral support. However, the real work is done by the club members and the helpers. So, let's be hearing from you please.

practical Wireless

LOOK OUT FOR OUR NEW FRONT COVER LOGO STARTING NEXT ISSUE

It's appropriate that as *Practical Wireless* enters its 60th anniversary year, that we're making sure that we do so in style. We're all very proud of the magazine's heritage, and there's a new logo starting with the next issue.

Along with the new logo, one of the biggest improvements will be a change to a higher quality glossy paper. There will be full colour and two colours available throughout the magazine. There will also be much higher quality photographic reproduction, with advantages to be had for everyone.

The new printing system will enable our art editor Steve Hunt to use his artistic expertise and the second colour to full effect. As a result technical articles with circuit diagrams, p.c.b. designs and appropriate overlays will be more attractively designed, providing a much easier read.

Rob Mackie, our photographer and technical artist, in conjunction with Steve, will be able to use many more of the production and presentation aids to produce an even better magazine for our readers.

So, we'll be entering the new year in style. There are some interesting projects under way, and I hope to be letting you have news of one or two of them very soon. In the meantime, everyone on the *Practical Wireless* team is looking forward to sharing the enjoyment of a wonderful hobby with the support of our new technology and most importantly, you the reader.

73 DE Rob Mannion G3XFD

- ✓ Practical Wireless 60th Anniversary Year
- ✓ Look out for our new logo starting from the next issue
- ✓ Higher quality glossy paper
- ✓ New two colour editorial style
- ✓ Higher quality photographic reproduction
- ✓ Attractively designed and more clearly defined p.c.b. overlays in two colours

practical Wireless

Receiving You...

Dear Sir

With reference to your 'Keylines' of the October 1991 issue of PW. I think setting up an 'Elmering' list is a terrific idea. I had an Elmer of my own when I was about ten. Thanks to that kindly person's good and patient teaching, I have been involved in radio and electronics ever since, both professionally and as a keen s.w.l. and amateur. So, please include my details on any such list or register you're preparing. It should be top priority of any radio amateur to help newcomers to our hobby in any way possible.

By now you will have also discovered the book included with this letter, I noted in your editorial that your copy of Practical Wireless Circuits had been mislaid some years ago. So, I hope you don't mind my taking the liberty of sending you my spare copy for your own collection.

Keep up the good work at PW Rob, and I hope to see you very soon at one of the many shows you attend every year. Oh, by the way, yes it's me again! Perhaps you remember the operator you spoke to at the the Science Museum station GB2SM on 144MHz, when you were mobile on the way home from London to Dorset?

Anyway, take good care of yourself and pass my best regards to all the team at the PW office.

**Wayne S. Dillon
G0JJQ
Greenford
Middlesex**

Editor's reply: My immediate thanks go to G0DXB, G1WGO and G0JJQ and to everyone else who wrote, FAXed and has voiced their support for the 'Elmer' scheme. The response was overwhelming, and I'm sorry I can't print all your letters. Special thanks go to Wayne

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

Letters must be original, and not duplicated to any other magazines. We reserve the right to edit or shorten any letter.

The views expressed in letters are not necessarily those of Practical Wireless.

G0JJQ for his kind gift of the book, which was a far more modern edition than the one I had lost. It's already out on loan to a school club member. Incidentally, Wayne and his fellow operators at GB2SM are 'doing their bit' very well. My own school radio club members were fascinated to see the station in action at the Science Museum, during a school trip to London. Just like the production of PW, helping newcomers to the hobby only needs teamwork. Keep it up lads!

Dear Sir

In answer to your request in the October PW 'Keylines' for volunteers to help beginners, I would like to submit my name.

I don't profess to know a great deal about the hobby, so it will probably be of great help to me also. I have been licenced since 1983, and during that time I have managed to acquire quite a varied junk box, much to my wife's annoyance!

So with the junk box and advice, I am sure that I could be of some help to beginners. Please put my name on your list if you think I can help.

**Bill McGill G0DXB
Rotherham, South Yorkshire**

Dear Sir

With reference to your 'Keylines' article in the October 1991 edition of Practical Wireless. I should be pleased to help a beginner,

although my operating experience in this particular location is very limited at present.
**K. R. Bolton G1WGO
Folkestone
Kent**

★★★★★STAR LETTER★★★★★

Dear Sir

I am writing about Mike Rowe G8JVE's article, the PW Robin Frequency Counter published in the July and August issue of the magazine. The project is really great, simple and cost effective. It will be a really useful tool in my shack.

I have a major problem in the construction of this project as the dual display i.e.d.s used in this project are not available here in my country, India. Could you please request Mike Rowe to re-configure the display board using the more commonly available display i.e.d.s and publish an article as a supplement to the frequency counter?

We also have problems with coils and inductors when building projects featured in your magazine, since the formers are not available either. As very few circuits contain instructions on winding the inductors, we have great difficulty in this respect.

I would appreciate a project from PW featuring an inductance meter (using discrete components). Also, some more details on the inductors used in projects, such as the former outside diameter measurements, number of turns and gauge of wire. This could be very useful during our construction.

My special thanks must also go to George Dobbs G3RJV for the PW Marland s.s.b. transmitter project, as it was really great!

**Charudatt Uplap
Bombay, India**

Editor's reply: Thank you for the most interesting letter Charudatt. You have hit on an old problem for many of our overseas readers, and the information will be passed to Mike G8JVE. In future, we will always try to include the information you need for winding your own coils. George Dobbs (he'll be pleased to hear about your success with the Marland TX), will be discussing 'dip meters' in 'Getting Started The Practical Way' soon, which should help readers who want to make their own coils. We're also planning to publish several items on inductance measurement in the near future. I am also aware of the problems associated with projects using i.c.s, hence the approach adopted with the Marland s.s.b. transmitter.

Dear Sir

I have been buying PW for decades. I certainly like the more experimental approach to amateur radio in today's PW. Unfortunately, here in New Zealand the magazine bought from the shops is nearly four months behind!

I have been licenced as ZL3PN since 1950, when I was 16 years old. All my gear is home made and valved, and I am still building both solid state and valved equipment.

Many of us in New Zealand are now very active on longwaves (l.f.). Radio amateurs here are allowed on 165kHz to 190kHz with 5W radiated output.

It's nearly 80 years since radio amateurs were allowed on longwaves. In New Zealand we must obtain a special permit first, use amateur call signs and narrow bandwidth modes only. It's a tremendous challenge to radiate a signal from a small town garden!

I made the first long distant contact with Bruce ZL1WB, up in Whangarei in the North Island. It's a great band during solar disturbances, and for providing tremendous groundwave signals into the Southern Alps areas.

The main propagation mode is via very long groundwaves, skywaves from the ionosphere, and daytime long distance waveguides or ducting. The NZHRT is proposing that 165-190kHz be made an amateur band worldwide at the next WARC.

My transmitter on 181kHz is an all-valved job. All active amateurs on l.f. at the moment are using valves. The younger lads are trying to make solid state transmitters work on l.f., but they act like 'fast blow' fuses with all the unknowns on longwaves. Best regards.

**George Boorer ZL3PN
Timaru
New Zealand**
Editor's reply: What an interesting letter George, thanks for writing to us from ZL. I think that the

best answer for PW readers in New Zealand has got to be a subscription! As regards news of an l.f. allocation here in Europe, it's gone very quiet since the proposal was briefly mentioned by the RSGB. However, as l.f. is used here extensively for broadcasting, I don't think we'll get the same part of the spectrum you have, for a while yet. Mind you, when we do, there's a certain QTH near Droitwich with two very good masts, buildings, and BBC transmitters set up on 198kHz I'd like to use! It's a fascinating area of the spectrum, perhaps we really ought to go 'd.c.', what do readers think of the idea?

Dear Sir

Receiving the November '91 issue of PW completes my 30 year collection of this great magazine. I have every issue from November 1961 (when I was still at school) and all the blueprints and booklets given away with the magazines.

Hooked on wireless after first reading PW, I started listening to short waves on a 1940s domestic set.

I remember the great feeling of achievement when I made my first repair. This I did with a 35Z4 rectifier valve purchased from an advertiser in PW.

Over the years I have built quite a few of the projects. These include the 'Luxembourg' tuner in the 60s and the 'Treasure Tracer' in the 70s.

I obtained a B licence in 1978, followed by an A licence in 1983. My first QSO on 144MHz was via a 'Slim Jim' antenna. This was built from the original article in PW by Fred Judd G2BCX.

My main interest nowadays is in vintage equipment and I would like to see some 1930-40 articles reprinted in PW. Thanks for a great magazine, and I'm looking forward to the next 30 years. Is my 30 year collection a 'record'?

Finally, I must congratulate young **Richard Marks 2E1AAQ** on his excellent article last month. Well done Richard!

Alex Blyth GM4TAL
East Lothian, Scotland

Editor's reply: Congratulations Alex on your 30th anniversary as a PW reader, and long may you remain so! It would be interesting to know how far other readers' unbroken collections go. Finally, many other readers have also sent their congratulations to Richard Marks 2E1AAQ, and we're going to pass them on to him.

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 the past years are available at £1.65 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.

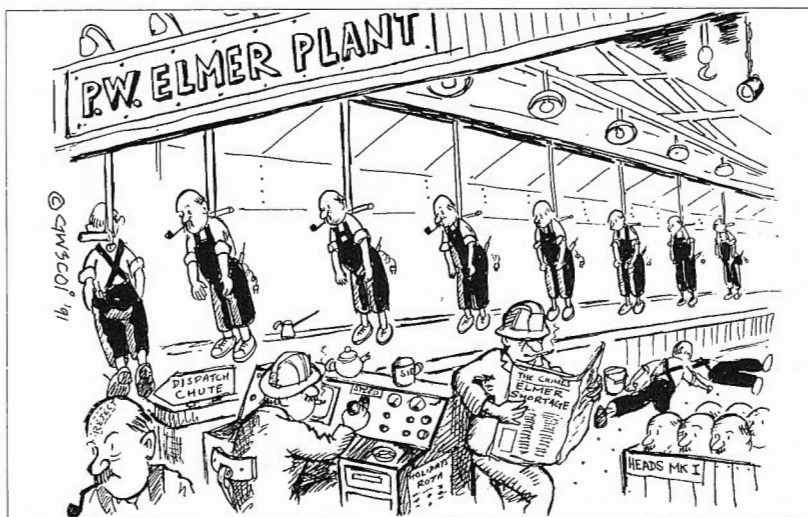
Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article. Kits for many of our recent projects are available from CPL Electronics who advertise in the magazine.

The printed circuit boards are available, mail order, from the Post Sales Department.

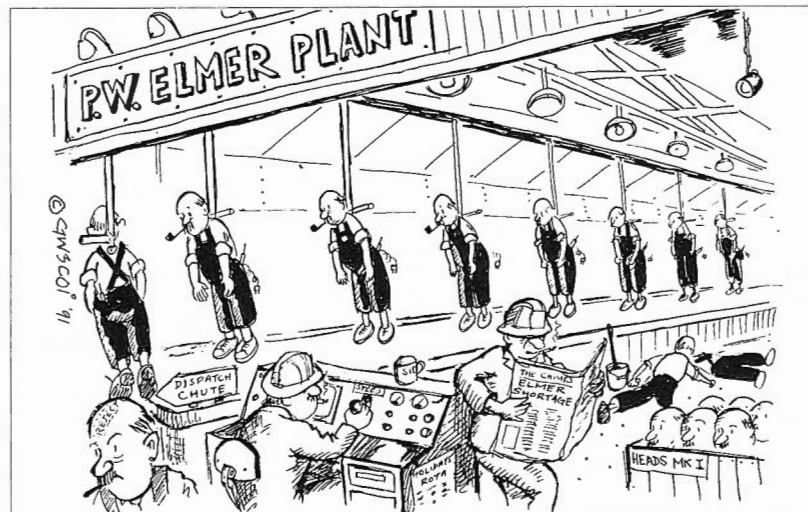
Mail Order

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.

SPOT THE DIFFERENCE



Please send your entry, with name and address attached on a separate sheet.



Circle the ten differences and send the cartoon, along with your name and address to: PW Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP.

We do accept photocopies, but you must return the flash below as proof of purchase.

Closing date is Friday 3 January 1992.

The Editor's decision on the winner is final and no correspondence will be entered into.

PRIZES

First prize winner can choose either a one year subscription to *PW* or £20 in vouchers for the book service.

The two runners-up can choose from either a six month *PW* subscription or £10 in book vouchers.

- ☐ Subscription
☐ Voucher
(please specify)

**SPOT THE
DIFFERENCE
DEC 91**

Newsdesk '91

Cases Added To Howes' Kit Range

Well-known kit makers, C.M. Howes Communications, are introducing a new range of custom-made matching cases and 'hardware' to compliment their very popular range of kits. The cases, in a 'Hardware package', have a ready-punched and anodised aluminium front panel, which enables the home constructor to achieve a professional look to their project. In addition, the hardware package contains the knobs, switches, sockets, nuts and bolts, etc., to suit the particular project.

For further information, contact **Dave Howes G4KQH on (0327) 60178.**



BARTG

The British Amateur Radio Teledata Group (BARTG) has announced its new membership secretary. He is **Peter Adams G6LZB, 464 Whippendell Road, Watford, Herts WD1 7PT. Tel: (0923) 220774.**

If you'd like to join BARTG, the UK's national group for all aspects of data comms via amateur radio, then send your name, address, callsign (if held) and £10 subs for 1991 (all members receive all the 1991 issues of their quarterly magazine *Datacom*), to Peter at the above address.

BBC World Service

BBC World Service is to start broadcasting in Ukrainian early next year. It will be the first time the BBC has transmitted any Soviet language, other than Russian, and will bring the total number of languages broadcast by the World Service to 38.

The BBC Ukrainian Service will add up to seven hours a week to BBC World Service's output, which has now exceeded 800 hours, the highest weekly level since the end of the Second World War.

Britain has overtaken Germany as western Europe's biggest international broadcaster in terms of hours on the air, and already the BBC World Service has more listeners than any other world-wide - at least 120 million tune in regularly every week to its broadcasts.

The Ukrainian Service will be run alongside the BBC's existing Russian Service, which first went on the air in 1946 and was jammed on and off for 24 years of its history.

The BBC's Ukrainian programmes will be broadcast on short wave from London and will also be offered to domestic radio stations in the Ukraine for rebroadcast as part of their own schedule.

The Jet Cat

Having the reputation of providing the lowest-priced, highest quality range of radio-controlled vehicles, Maplin have added to their range with the recent introduction of the 'Jet Cat'.

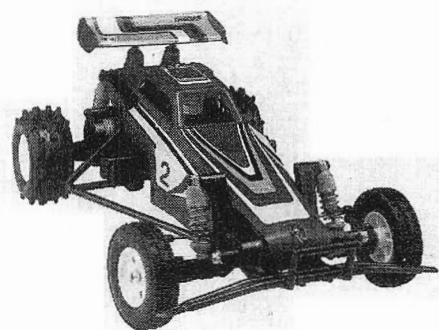
This is a well-built, high performance and expandable 1/10 racer, intended as an introduction to the world of modular model racing. This modular concept allows the user to build up a radio-controlled model with components that meet the current specifications and budgets.

In common with much more expensive models, the 'Jet Cat' features independently adjustable hydraulic oil-damped suspension for each of the four wheels, and 'oilite' bearings throughout which offer durability and low friction. The wheels are fitted with semi-pneumatic tyres, those of the two rear drive wheels being wide and heavily treaded for excellent traction, even in the roughest terrain. The speed control is electromechanical and offers three-step forward and reverse motion. The chassis is moulded from a tough, lightweight, engineering plastic.

A wide selection of spare parts are available and a complete list is supplied with the model. In addition to the model, the user will need a radio-control receiver and transmitter, the servos that operate the steering and speed control, a high-powered NiCad battery pack and of course a motor. Typical Maplin prices for these items are: racing motor £7.95. Radio-control system £39.95. NiCad racing pack £14.95. Body paints.

Ordering details: GL41U Jet Cat Car, £59.95.

For further information, tel: **(0702) 552911 Enquiries.**



RAIBC

The Radio Amateur Invalid and Blind Club (NI area) is a charity with a difference. They realise that there are so many other charitable organisations asking for cash and donations from the public - that is why they adopt another approach.

The group asks the public for air miles, trading stamps and petrol coupons of all kinds. They have found that because in a lot of cases these are items that generally clutter up the dash-board of most cars, until they are sucked up in a vacuum cleaner or go out-of-date, their efforts have often been rewarded in the past. These tokens are converted into cash, which is then used to provide home study courses and radio equipment for blind and disabled people, who in some cases, are house-bound.

So, RAIBC (NI) would like to renew their appeal to the public, that you have another look in your cars for any tokens, vouchers and stamps, (especially the BP Lifestyle vouchers which go out-of-date on December 31 this year). These can all be sent free-of-charge to **RAIBC (NI), Freepost BE1769, Belfast BT12 5BR.**

Newsdesk '91

Thanks!

The Oscar Victor Activity Group would like to thank all the people who donated prizes, and also turned up from as far afield as GM and Hampshire, for their activity weekend back in August.

They had a very successful weekend and with all the activities, e.g., raffle, tombola and auction, etc., they raised £100 which is to be donated to the RNLI.

They will be doing the same again next year, but hopefully bigger and better. They hope to see the regulars again next year and hopefully a few new faces.

If anyone who activated OV00 this or last year would like an activated certificate, they are now available on receipt of a large s.a.e. GB10V and GB40V QSL cards are also available on receipt of an s.a.e. (via G7BXA).

Peter Austin G7BXA
24 Fairfield Terrace
Leeds
Yorkshire LS13 3DH.



Leicester Show Prizewinners

Rob Mannion G3XFD, Editor of *PW*, is shown receiving two £100 prize vouchers donated for the magazine's Leicester Show free prize draw by Alinco, the Japanese amateur radio equipment manufacturers. Presenting the vouchers on behalf of Alinco was Meiko Iwasaki, accompanied by her colleague Toyo Komatsu, German Vice-President of Alinco GmbH, Germany.

The Alinco vouchers, which can be used towards any Alinco amateur radio product, were eventually won by **Mr D. Edmunds G3MJW** of Wellingborough, Northamptonshire and **Mr Ian Waller G4TQT** of Chapeltown, Sheffield.

Winners of the Kenpro KT-44 u.h.f. hand-held transceivers, donated by **Mike Devereux of Nevada Communications**, Portsmouth, were **Clem Phillips G4IMI** of Quinton, Birmingham and **Mr D. Biltcliffe G6NB** of Bicester, Oxfordshire.

Winners of the hourly 'bottle of champagne' draw were: **G8ELD**, **GW0IXK**, **G6ELD**, **G0CXJ**, **G3FQH/G3VQH** (husband and wife team!), **EI2DJ**, **EI2DW** (another husband and wife team!), **G1LRI**, **G3SBW**, **G3CWC**. All winners will be notified. **Congratulations to you all!**

Wireless-Line

The recorded amateur radio news service provided on (0898) 654632, with news and information supplied by the staff of *Practical Wireless*, is to cease.

Wireless-Line will be recorded for the last time on Friday November 22, ceasing on November 29.

Practical Wireless, December 1991

The 1992 Valve Catalogue

The 1992 Valve catalogue will be available soon from The Vintage Wireless Company Ltd., and will cost £2 post paid UK or £3 post paid overseas. The cost is refundable with your first purchase.

There will be valve lists and prices, equivalents (including rare European), military code explanations (USA, RAF, Army and Navy), used valves available, valve cartons, valve holders, accessories, miscellaneous, valve holder guide and valve manuals, etc.

A refund coupon will be enclosed with each catalogue and you deduct the cost from your first valve purchase made from the catalogue.

All customers who have already sent an s.a.e. for what was to be a normal valve list, which has now turned out as a much grander affair, are asked not send additional funds. Your s.a.e. will be accepted as payment, but no refund slip will be enclosed.

the vintage wireless company

VALVE CATALOGUE - 1992



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

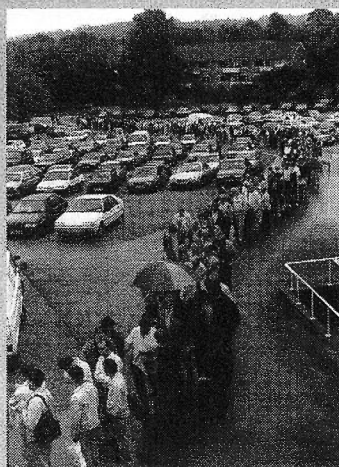
BARTG 1991 Rally

The British Amateur Radio Teledata Group's rally, BARTG '91, proved to be a success earlier this year, with attendance up on 1990, they had over 2200 visitors. The rally had over 55 traders selling just about everything from home-brew kits, expensive black boxes, antennas, computers and software - in fact, just about everything to do with amateur radio and data comms in particular. In addition to the traders, they also had a flea market which had a very varied range of items on sale.

All-in-all, it was a very good rally considering it was run by only seven BARTG committee members, plus five other volunteer helpers. The rain stopped mid-morning, leaving them with a lovely sunny afternoon!

Plans are already underway for BARTG '92 and if they can get more volunteers to help next year, it could be even bigger and better than BARTG '91.

Ian Brothwell G4EAN
56 Arnot Hill Road, Arnold, Nottingham
NG5 6LQ. Tel: (0602) 262360.



Club News...Club News...Club News...

Aylesbury Vale RS meet 1st & 3rd Wednesdays, 8pm at the old Village Hall, Hardwick. November 20 is a talk by Ray Willis G6NPP on RAYNET and December 4 is the 'G6NB Construction Contest', start building! Further details about the club from Geoff on (0280) 817496 or Martyn on (0908) 560026.

Barnsley & District ARC meet Mondays in the radio club room and shack, at the rear of the Darton Hotel, Station Road, Darton, Barnsley. November 18 is a talk by the Rev. George Dobbs G3RJV on 'Amateur Radio On A Shoestring', the 25th is a Junk Sale, December 2 is a Shack night and the 9th is a talk by G3ZDM on Jandek Kits and other technical topics. For further information, ring Ernie G4LUE on (0226) 716339.

Bradford ARS meet 2nd & 4th Thursdays, 8pm at the Polish Ex-Service club, Shearbridge Road, Bradford, West Yorkshire. November 28 is their AGM and December 12 is a Social evening. Charles Bolt G0ACX on (0247) 494694.

Braintree & District ARS meet 1st & 3rd Mondays, 8pm at the Community Centre, Victoria Street, Braintree. D. Andrews, 22 Arnhem Grove, Braintree, Essex CM7 5UQ. Tel: (0376) 27431.

Bromsgrove ARS meet at Lickney End Social Club, Alcester Road, Burcot, Bromsgrove. November 26 is a night on the air and December 10 is a Social evening. Mr D. Edwards G4ZVR, 2 Mason Close, Headless Cross, Redditch, Worcs B97 5DF. Tel: (0527) 546075.

Conwy Valley RC meet 1st Thursdays, 7.15pm at The Studio, Penrhos Road, Colwyn Bay, Clwyd. December 5 is 'Satellite Communications', a talk given by Roger Millward G6W1VCN. For further details, contact Merfyn Jones G4ANNL, 72b Princes Drive, Colwyn Bay, Clwyd LL29 8PW. Tel: (0492) 530725.

Coulsdon ATS meet 2nd Mondays, 7.45pm at St. Swithun's Church Hall, Grovelands Road, Purley, Surrey. Andy Briers G0KZT on 081-668 7004.

Coventry ARS meet Fridays, 8pm at Baden Powell House, 121 St. Nicholas Street, Radford, Coventry. On November 15 they have some mini lectures and the 22nd is a night on the air & Morse tuition. For further details phone Jon on (0203) 610408.

Derby & District ARS meet Wednesdays, 7.30pm at 119 Green Lane, Derby. November 27 is 'Scanners - their uses and abuses', an illustrated talk by Richard Hillier G4NAD of ADR (UK) Ltd., December 4 is a Junk Sale and the 11th is a Constructor's Contest. More details from Richard Buckley G3VGV, 20 Eden Bank, Ambergate, Derby DE5 2GG. Tel: (0773) 852475.

Dragon ARC meet 1st & 3rd Mondays, 7.30pm at the Four Crosses Hotel, Menai Bridge. November 18 is a talk on 'Pre-radio Communications in Anglesey' by Thomas Roberts and December 2 is Ron Watson-Jones with some more amazing films. Tony Rees G6WFMQ on (0248) 600963.

Dunstable Downs RC meet Fridays, 8pm at Chews House, 77 High Street South, Dunstable, Beds. November 29 is 'Your Other Hobbies'. Further details from Wendy Jefferson on (0582) 451057.

Echford ARS meet in the Community Hall, St. Martin's Court, Kinston Crescent, Ashford, Middlesex, 7.30pm. Further details from P. Townshend G6PMT on (0344) 843472.

Fareham & District ARC meet Wednesdays, 7.30pm in Portchester Community Centre, Westlands Grove, Portchester, Fareham, Hants. November 20 is a talk by Chris G8JFJ and December 4 is a talk on 'Reliability' by Ron

G3XPH. Details from Rod Smith G0ERS on (0705) 373572.

Fylde ARS meet 2nd & 4th Thursdays, 7.45pm at South Shore Lawn Tennis Club, Midgeland Road, Blackpool. November 28 is an Informal meeting with programme review and December 12 is a Supper & Social evening. Eric Fielding G4IHF on (0253) 726585.

GB3HZ Repeater Group meet at Chiltern Communications, Lincoln Road, Cressex Industrial Estate, High Wycombe, Bucks, 8pm. Details from Francis Rose G2DRT on (0494) 814240.

Gloucester ARS meet at St. Johns Ambulance HQ, Heathville Road, Gloucester at 7.30pm. More info from J. Beckingham on (0452) 528533 Ext. 2741.

Great Lumley AR&ES meet Wednesdays, 8pm at Great Lumley Community Centre, Great Lumley, Nr. Chester-le-Street, Co. Durham. For more details, contact Barry G1JDP on 091-388 5936.

Halifax & District ARS meet 1st & 3rd Tuesdays, 7.30pm at the Running Man Public House, Pellon Lane, Halifax. November 19 is Brian Gray G0GRR on 'ESP'. For further details, contact David Moss G0DLM, Beechwood Lodge, Leeds Road, Lightcliffe, Halifax, West Yorkshire HX3 9NU. Tel: (0422) 202306.

Hambleton ARS meet in Room A5 of Northallerton Grammar School at 7.30pm. November 18 is RAE, the 25th is 'Radio Astronomy' (cont.) by Ken Shearman G1XLZ, December 2 is RAE and the 9th is 'Fault-Finding Techniques' by Tony Nicholson G8FLV. For more details, contact Nigel Robertshaw G0NHM on (0609) 776508.

Horndean & District ARC meet 1st Thursdays, 7.30pm at Horndean Community School, Barton Cross (off Catherine Lane), Horndean, Hants. December 5 is Liquid Crystals (Merck Limited). For more information, contact Stuart Swain, 35 Mavis Crescent, Havant, Hampshire PO9 2AE. Tel: (0705) 472446.

Horsham ARC meet at the Guide Hall, Denne Road, Horsham, West Sussex, 8pm. They have their AGM on December 5. Further details from Peter Stevens G8SUI, 11 Nutwood Avenue, Brockham, Betchworth, Surrey RH3 7LT. Tel: (0737) 942150.

Ipswich RC. Contact Mrs S. Elden G8HYE, 124 Larchcroft Road, Ipswich IP1 6PD.

Keighley ARS meet at The Cricket Club, Ingrow, Keighley, 8pm. Further details from Kathy Conlen G1IGH on (0274) 496222.

Kettering ARS meet Tuesdays, 7.30pm at the Electricity Sports & Social Club, Eksdale Street, Kettering. November 19 is 'A Dealers View of Radio' and December 10 is their Christmas Supper. All enquiries to Len G7EHM on (0536) 514544.

Kidderminster & District ARS meet alternate Tuesdays, 8pm at The Queens Head, Wolverley, Worcestershire. For more details contact Geoff Philpotts G7JIR, 62 Eneley Close, Stourport-on-Severn, Worcs DY13 0AH. Tel: (0299) 379229.

Lothians RS meet on the 2nd & 4th Wednesdays, 7.30pm in the Orwell Lodge Hotel, Polwarth Terrace, Edinburgh. Further details from Mel Evans at 56 Southouse Road, Edinburgh EH17 8EU or telephone 031-664 5403.

Loughton & District ARS meet in Room 14 of Loughton Hall, 7.45pm. November 29 is an Inter-Club Trivia Quiz. For more details contact Mike Pilsbury G4KCK on 081-504 4581.

Maidenhead & District ARC meet at The Red Cross Hall, The Crescent,

Maidenhead, 7.30pm. Details from Neil G8XYN on (0628) 25952.

Mansfield ARS meet at the Polish Catholic Club, off Windmill Lane, Woodhouse Road, Mansfield. On December 5 they have their Christmas Social evening. Further information from Mary G0NZA on (0623) 755288.

Morecambe Bay ARS meet every other Tuesday, 7.30pm at the Trimpell Sports & Social Club, with Morse instruction each Tuesday during club meetings. For more details, please contact J. Burrow G0NYD, 36 Longfield Drive, Cragbank, Barnforth, Lancashire LA5 9EJ. Tel: (0524) 733212.

Nelson & District ARS meet Wednesdays, 7pm at Llancaich School Nelson. They also run a c.w. class at their meetings. Anyone wishing to find out further information is welcome to call in, or otherwise contact Leighton Smart G0WLB1 at 33 Nant Gwyn, Trelewis, Mid-Glamorgan, Wales CF46 6DB. Tel: (0443) 411736.

Norfolk ARC meet Wednesdays, 7.30pm at 'The Norfolk Dumping', The Livestock Market, Harford, Norwich. November 17 is a Surplus Equipment Auction/Bring & Buy, the 20th is RAYNET, Pat Bates G0IYD, the 27th is an Informal & Committee meeting, December 4 is Licence conditions, Q & A and the 11th is their Christmas Party. Jack Simpson G3NUJ on (0603) 747992.

North Bristol ARC hold their meeting at S.H.E., 7 Braemar Crescent, Northville, Bristol. November 15 is a brief talk on some home-brew ideas and projects by Chris G0LOJ. Chris Budd G0LOJ on (0454) 618267.

Nottingham ARC meet Thursdays, 7.30pm at the Sherwood Community Centre, Mansfield Road, Nottingham. Further details from Rex Beasall on (0602) 733740.

Poole RAS meet 2nd Fridays, 7pm at Lady Russell-Coates House, Lower Constitution Hill Site, Bournemouth & Poole College of FE. More details from Phil G0KKL on (0202) 742453.

Prudential ARS is open to all employees and ex-employees of the Prudential companies. Those interested overseas should contact Alan McCulloch ZS6KU, PO Box 2291, Helderkruid, 1733, South Africa. Those in the UK can contact Dennis Egan G4XKE, 4 Hazel Grove, Longmeadow, Dinas Powis, South Glamorgan CF6 4TE. Tel: (0222) 512555.

Reading & District ARC meet 2nd & 4th Thursdays, 8pm at The Woodley Pavilion, Woodford Park, Haddon Drive, Woodley, Reading. Win Robinson G4JTR, 4 Hilltop Road, Caversham, Reading RG4 7HR.

Rhyl & District ARC meet 1st & 3rd Mondays. November 18 is a talk by Nigel G7HUY and December 2 is a Homebrew night (G00 Project). Introduction & explanation by Dave G4WDMR. For more details, contact Ken Padley G7IAR, 67 Rosehill Road, Rhyl, Clwyd LL18 4TS. Tel: (0745) 338276.

Salisbury Radio & Electronics Society meet Tuesdays, 7.30pm at Grosvenor House Centre, Churchfields Road, Salisbury. For further details, contact Bert Newman G2FIX on (0722) 743837.

Shefford & District ARS meet Thursdays, 8pm at the Church Hall, Amphil Road, Shefford, Bedfordshire. On November 14, they have John Armstrong from AKD on 'The AKD Product Range', the 21st is a Junk Sale, the 28th is 'A Guide To All Things IBM Compatible' by Nigel G1JKF, December 5 is 'VHF Contests Through The Ages' by Don G4LOD and the 12th is The Constructors' Contest. For further information,

contact Nigel G1JKF on (0908) 274473.

Silverthorn RC meet Fridays, 7.30pm at The Chingford Community & Adult Education Centre, Friday Hill House, Simmons Lane, Chingford, London E4 6JH. More details from Andrew Mowbray G0LWS on 081-529 4489 between 5.30 and 6.30pm weekdays only.

South Dartmoor ARC meet Mondays, 8pm at South Dartmoor School, Balland Lane, Ashburton, Devon. This radio club has a committee of only one adult - the rest being school-age youngsters! Although anyone wishing to join in is welcome. For more details on this Novice-run radio club, contact Peter Thornhill G6ZKQ, 21 Elmbank, Buckfastleigh, Devon TQ11 0DX. Tel: (0364) 43433.

South Dorset RS meet 1st Tuesdays, 7.30pm in the Wessex Lounge of Weymouth Football Club. December 3 is WX Sat. Reception by Chris G4RAK. Geoff Gwilliam G4FJO, 13 Overlands Road, Wyke Regis, Weymouth DT4 9HS. Tel: (0305) 781164.

South Notts ARC meet at Highbank Community Centre, Farnborough Road, Clifton Estate, Nottingham. For further details call Trevor G4IRH on (0509) 672734.

Southgate ARC meet at Winchmore Hill Cricket Club Pavilion, Firs Lane, Winchmore Hill, London N21. On November 28 they have a Construction Demonstration and December 12 is their AGM. Brian Shelton G0MEE, 22 Berkeley Gardens, Winchmore Hill, London N21 2BA. Tel: 081-360 2453.

Spalding & District ARS meet Fridays, 8pm at The Riverside Centre, The Old Fire Station, Double Street, Spalding, Lincolnshire. November 15 is a talk on 'Amateur Fast Scan Television' given by Frank Dimmock G0CDF and December 12 is their Christmas Social. Further details from David Johnson, 65 West Street, Bourne, Lincolnshire PE10 9PA. Tel: (0778) 425367 (6-7pm).

Spenny Valley ARS meet Thursdays, 8pm in Old Bank Working Men's Club, Mirfield. Alternate Thursdays are 'Noggin & Natter nights'. November 21 is Home Construction by Rev. George Dobbs G3RJV and December 5 is 'Band 3 Radio Systems' by John Abbot. Further details from Ian Barraclough G7DWY on (0484) 716453, early evening.

Stevenage & District ARS meet in Ground Floor Lecture Room, 'D' Block, Ridgmond Training Enterprise, Ridgmond Park, 7.30pm. November 19 is Practical Antenna Testing, the 26th is a Computer evening, December 3 is Practical Feedline Testing and the 10th is a Construction Projects evening. More details from Pete Daly G0GTE, 48 Lincoln Road, Stevenage, Herts SG1 4PJ. Tel: (0438) 724991.

Stirling ARS meet Thursdays, 7.30pm at premises near Throsk, Stirling. Details from Brian Mulleady G0MKWL, QTHR or on (0324) 36235.

Stourbridge & District ARS meet 1st & 3rd Mondays, 8pm at Robin Woods Community Centre, Scotts Road, Stourbridge. November 18 is an Annual Surplus Sale and December 2 is an On Air Discussion evening. Details from Dennis Body G0HTJ at 53 Grove Road, Wollescote, Stourbridge, West Midlands DY9 5AE.

Stratford-Upon-Avon & District RS meet 2nd & 4th Mondays, 7.30pm at the Home Guard Club, Main Road, Tiddington, Stratford-Upon-Avon, Warwickshire. November 25 is an AMTOR Demonstration by Peter Harris G3WVO and December 9 is a Chaired Discussion evening. Further details from Alan Beasley G0CXJ, 2 Ilmington Road,

Blackwell, Shipston-on-Stour, Warwickshire CV36 4PE. Tel: (0608) 82495.

Sutton & Cheam RS meet 3rd Thursdays, 7.30pm at Downs Lawn Tennis Club, Holland Avenue, Cheam, Surrey with natter nights on 1st Mondays, in the Downs Bar. November 21 is 'Packet Radio' by Peter Burton G3ZPB, the 26th is a Committee meeting, December 1 is a 144MHz Fixed & AFS Contest and the 2nd is a Natter night. More details from John Puttock G0BWV, 53 Alexandra Avenue, Sutton SM1 2PA.

The Three Counties ARC meet every other Wednesday, 8pm at the Railway Hotel, Liphook Hampshire. November 20 is a Club night on the Air HF & VHF and December 4 is a Quiz night. Kevin Roche G6GOS on (0420) 83091.

Torbay ARS meet Fridays, 7.30pm at the ECC Social Club, Highweek, Newton Abbot. November 15/29 & December 6 are Club nights and November 22 is a talk on 'Communications in British Gas'. More details from Andy Stafford G4VPM on (0803) 329055.

Trowbridge & District ARC meet at 8pm, in the Territorial Army Centre, Bythesea Road, Trowbridge, Wiltshire, 8pm. On November 20 they have an Open & Social evening. More details from Ian Carter on (0380) 830383.

Verulam ARC meet 2nd & 4th Tuesdays, 7.30pm at the RAF Association Headquarters, New Kent Road (off Malborough Road), St. Albans, Hertfordshire. 2nd Tuesdays are their activity evenings and 4th Tuesdays are their main monthly meetings. On November 26, D. Pearson will give a talk on 'Jandek Kits' and on December 8 the club will hold their annual rally at Hatfield Polytechnic (more details in 'PW' Radio Diary). More details from Walter Craine G3PMF, 5 The Crescent, Abbots Langley, Watford, Hertfordshire WD5 0DR.

Wakefield & District RS meet Tuesdays, 8pm in First Floor Rooms, Dssett Community Centre, Prospect Road, Ossett. November 19 is 'Simple Test Equipment' G0DJJA, the 26th is a members' HF Contest night, December 3 is 'Earth's Magnetic Field' G2FKZ and the 10th is a members' VHF Contest night. John Bailes G0MVA on (0924) 260048.

West of Scotland ARS meet Fridays, 7.30pm at the Scout HQ, 21 Elmbank Street, Glasgow. For further details, please contact John Power G0MKT0, PO Box 599, Glasgow G3 6QH.

Whitton ARG meet Fridays, 8pm at the Whitton Community Centre, Percy Road, Whitton, Twickenham. On November 23 they have a Barn Dance. The club produces a monthly newsletter, *Whitton Post*, which details other activities throughout the centre, of which there are loads! More details from Rosalind Catley, 15 Park Close, Hounslow, Middlesex. Tel: 081-894 2950.

Wiesbaden ARC - DA1WA - is a club mainly for US military personnel stationed anywhere near Wiesbaden, Germany. For more details, contact Robert Kipp DJ0PU, Hugelstr. 25, D-6070 Langen, Germany.

Wimbleton & District ARS meet 2nd & 4th Fridays in St. Andrews Church Hall, Herbert Road, Wimbleton SW19. November 29 is a Meet the Committee evening. Chris Frost G0KEB, 61 Selbourne Avenue, Tolworth, Surrey KT6 7NR. Tel: 081-397 0427.

Wirral ARS meet 1st & 3rd Wednesdays, 7.45pm at Ivy Farm, Arrowe Park Road, Birkenhead, Wirral. November 20 is 'Packet Radio Cluster' by John Bell G0CMM and December 4 is 'SSB QRP Radio' by George Dobbs G3RJV. More details from Alec Seed G3FOO on 051-644 6094.

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**COME AND VISIT OUR TOTALLY REFITTED LONDON SHOWROOM WE
NOW HAVE AN EXTENSIVE RANGE OF PRE-OWNED UNITS**

Rob Mannion G3XFD doesn't always get on so well with 'all singing and dancing' modern rigs, but the state-of-the-art FT-990 seems to have impressed him.

There's always a danger in amateur radio magazines, that journalists and others may seem to be overdoing the superlatives when they're writing equipment reviews. It may get so bad as to leave the reader thinking 'here we go again, all praise and no criticism, closely followed by the hard sell'.

Well, there's no fear of that. This is *Practical Wireless*, and we believe in saying what we mean in our reviews. We're independent and we don't 'work in the trade' so to speak.

In fact, all our advertisers welcome our independent views and want us to be objective. There's only one other major problem, and that's brought about by the impressive technology. Very often, the only genuine complaint that reviewers can mention regarding imported equipment, is that the rigs are often too complicated!

There's a lot to be said for absolute honesty. I'm especially proud to stand in front of you all (albeit in print) and say that when I say I like something, or am impressed...that's what I really mean!

Excellent Equipment

I've used Yaesu gear for many years, and they have always produced some excellent equipment. My only complaint is that nowadays they aren't cheap. Mind you, the marvellous little FT-75 hybrid h.f. mobile rig, of which I have had quite a few samples, wasn't cheap in its day but it was an excellent rig. You pay your money and you make your choice!

Yaesu have excelled themselves with the FT-990. I was fortunate to have it on loan for a few weeks and used it on the h.f. bands, working some interesting DX. After I'd finished, I could only say one thing: it's a superb transceiver.

Before I started the review period, I had a problem. What could I compare this beautiful - if expensive - machine with? In the end, I could only compare the rig with its own big brother, the even more expensive FT-1000.

Yet, after I had used the FT-990 for a while, I realised that Yaesu had come up with a really superb piece of gear. As I've based my comparison on the Yaesu FT-1000, (which costs £2995), I must say that in my opinion the FT-990 at £1849, offers a far more realistic-value-for-money option than its 'big brother'. If I had £3000 to spend, I'd certainly buy the FT-990, and perhaps replace my car or the mobile rig!

Operator's Rig

The major comment I have to make on the FT-990 is that it's an operator's rig. It's amazingly operator friendly and in my opinion it will make the ideal



contest operating transceiver.

Although it might seem to be a conflict in terms, the FT-990 is so sophisticated - it's simple to operate! That surely makes modern technology a success, rather than a hindrance?

The receiver performance, especially on the very crowded 7MHz band, outclassed any rig I've ever used. I confidently joined the melee trying to work a DXpedition to one of the rare Irish islands. Despite the tremendous QRM, the Great Blasket Island team heard me, and gave me a very good report.

Encouraged by the way the rig performed, I launched myself off on one of the busiest log entering sessions I've had for a very long time. Despite the fact that I was not using beam antennas, the FT-990's 100W (even when I drove it to that level) proved more than adequate.

I used the transceiver on s.s.b. and c.w., but it comes ready-to-go on f.m. and is also fitted with separate interface jack sockets for RTTY and packet radio. The only problem for me was that I knew that the rig would have to go back eventually. But, before it did go back, I was determined that I have the benefits of this excellent Yaesu design for as long as possible.

Why So Good?

I wondered why the FT-990 was so good, when it was billed by Yaesu, as the smaller brother of the FT-1000. Although I have had several sessions with an FT-1000 (reviewed in the January 1990 *PW*), I had found it difficult to drive. Not so the FT-990. The manufacturers have cracked the biggest problem, sophistication without complication.

So, to find out just how they achieved this miracle, I turned to the comprehensive manual. The manuals produced by this company are definitely part of the success story. Yaesu have had a particular style with their manuals, and their style has hardly changed since I first used their products over 20 years ago.

Yaesu have always produced easy-to-read manuals, and even the early editions provided easy, informative reading relatively free of 'Japanese English'. The manual supplied with the FT-990 seems to have broken

Yaesu FT-990 HF Transceiver



with Yaesu's long held presentation style, and the technical authors involved have produced an even brighter, modern, informative and 'chatty' approach.

The more I read, the more I realised why the rig is so easy to use. The FT-990 has no less than six microprocessors which are programmed to make the simplest possible interface between the operator and the rig. They're not making false claims either, and I felt humble when I realised that the FT-990 might be more intelligent than this particular operator!

Interference Rejection

The techniques of interference rejection on today's crowded bands is of vital importance. The failure or partial success in a designer's search for the ultimate 'perfect' receiver, can utterly destroy their efforts. In my opinion, they've achieved excellent results with the FT-990.

Yaesu's designers have incorporated rejection facilities by both i.f. shifting and i.f. notch filtering. These are initiated by operation of push-buttons, bringing a selection of bandwidths into play.

The FT-990 also has another aid up its sleeve, which I found to be very effective. This 'secret weapon', used against interference, is known as the dual digital s.c.f. (switched capacitance filter) audio filter.

This amazingly efficient filter has independently adjustable selectivity skirts, facilities which Yaesu claim are unique to the FT-990.

Tex Swann G1TEX, put the FT-990 through its paces on receive and transmit, although he was moaning because it was only on a dummy load when he was transmitting! The sensitivity and selectivity results can be seen in **Tables 1** and **2**. We found that our results either consistently matched the manufacturer's claim or were slightly better.

There are plenty of operator-friendly controls available, they all help to make intensive operation on the crowded bands much easier. Among these, I found the automatic mode independent a.g.c. action to be very useful. When band conditions required it to be used, I found the excellent a.g.c. to be of great help. This facility can be switched in and out manually.

Practical Wireless, December 1991

Good Foundation

Even with all the state-of-the-art electronics, a good basic receiver design is an essential foundation. To this end the FT-990 has been built on a firm rock. However, a quick look inside the transceiver's innards will immediately tell you that this is one rig that you don't touch when it needs servicing!

The designers have used modular construction wherever possible. It's a beautifully made, very complex rig. They've used plug-in p.c.b.s wherever possible to provide excellent r.f. circuit isolation and reliability.

Perhaps I am old-fashioned, but to me the most important control on a receiver is the main tuning knob. Compared to the importance of the other controls, it might not seem to be that important nowadays, but I feel that it's the essential control. I think that if you're not happy with the tuning knob, you might as well get another rig!

In this respect I'm pleased to report that the Yaesu designers obviously agree with me regarding the tuning control. It's silky-smooth and just begs you to spin it up and down the bands.

The large flywheel-type knob drives a magnetic-encoder. By the feel of the knob, I'd imagine that the designers have used the magnets providing the encoding, to load the knob to provide the flywheel effect.

It's a delight to use and I feel that it will considerably reduce operator fatigue, especially during contest working. It was just another factor that made the receiver very pleasant to use.

Frequency Stability

Frequency stability and accuracy is assisted in the FT-990 by the use of only one master oscillator. This oscillator is used to drive all the direct digital synthesisers.

RECEIVED

Frequency ⇒ Mode (BW) ↓	100 – 250 kHz	250 – 500 kHz	0.5 – 1.8 MHz	1.8 – 30 MHz
SSB, CW (2.4 kHz)	< 2 μ V	< 1 μ V	< 2 μ V	< 0.25 μ V
AM (6 kHz)	< 10 μ V	< 2 μ V	< 4 μ V	< 1 μ V
29-MHz FM (for 12 dB SINAD)	—	—	—	< 0.5 μ V

Table 1.

Table 2.

Button	Modes	Minimum –6 dB BW	Maximum –60 dB BW
2.4 kHz	all except FM	2.2 kHz	4.0 kHz
2.0 kHz	all exc. AM, FM	1.8 kHz	3.6 kHz
500 Hz	CW, RTTY, Packet	500 Hz	1.8 kHz
250 Hz	CW, RTTY	240 Hz	700 Hz
—	AM (wide)	6 kHz	15 kHz

Just in case fortunate owners of the FT-990 think they need extra frequency stability, Yaesu offer the optional TCXO-2, a temperature-compensated oscillator. The TCXO-2 provides exceptional 0.5 p.p.m. frequency stability from -10 to +50°C.

I must be quite frank here, as I don't think many owners will find the accessory is required. Drift, even at switch-on, is so minute that it's only detectable using laboratory equipment.

The receiver coverage is continuous from 100kHz to 30MHz in 10Hz steps. The general coverage performance also proved to be as good as the amateur bands results. I found myself chasing the DX on the broadcast bands, listening to some old favourites on medium waves and the 6MHz (49m) band.

Integral Power

I'm pleased that Yaesu decided to incorporate an integral power supply. It's of the switched-mode type and even during extensive periods of running at full power, the unit stayed relatively cool.

During the review period, I found that it was very convenient not to have to remember the power supply every time I moved the rig. Hands up all those operators who have arrived with a rig, only to find they've forgotten the power supply!

I consider that the integral supply is an excellent idea, but Yaesu may be considering the introduction of a 12V powered version of the FT-990. If they do, I feel sure this rig will be in demand for many DXpeditions.

Many Features

Operation on air, using the many transmitter features is exceptionally easy. Everything is made so simple, from the front panel keypad controlling one-touch band selection to the two independent v.f.o.s for each band. The associated memories hold frequencies, modes and i.f. bandwidth settings for receiving. They even hold clarifier off-sets and repeater shifts for transmitting if they're needed.

One particular feature proved to be of special interest. This was the adjustable pass-band shifting r.f. speech processor. Using this handy feature you can tailor the transmit audio to suit your own voice!

Built-In Keyer

The built-in-keyer, with memory and iambic action should please any c.w. enthusiast. I used it and found the sidetone pitch could be altered fairly easily via the little panel on the top of the FT-990.

Incidentally, many of the operator-adjustable controls were to be found under this panel. Unfortunately, Yaesu have chosen a magnetic latch to secure the lid. Every time the rig was moved, it tended to flap open. Mind you, I suppose we were moving the rig around much more than is normal. But, I must say that this was positively the only criticism I could find on the physical side of the transceiver!

As a keen Morse man, I was exceptionally pleased with the performance on c.w., and I found the selectivity with the supplied s.c.f. audio filter and 2nd i.f. 500Hz bandwidth filter, to be very good. However, I wondered

Specifications

General details

Frequency range (general receiving coverage) 100kHz to 30MHz
Transmitting frequency coverage 1.8 to 2MHz, 3.5 to 4MHz, 7 to 7.5MHz, 10 to 10.5MHz, 14 to 14.5MHz, 18 to 18.5MHz, 21 to 21.5MHz, 24.5 to 25MHz and 28 to 29.7MHz.

Basic frequency steps 10Hz for J3E, A1A and J1D and 100Hz for A3E, F3E and J2D.

Emission modes J3E (l.s.b./u.s.b.), A1A (c.w.), J1D, J2D (f.s.k.), A3E (a.m.), F3E (f.m.).

Antenna impedance 16.5 to 150Ω, 50Ω nominal.

Supply voltage 100 to 117V or 200 to 234V a.c. ±10% 50 to 60Hz.
Power consumption (approx.) 60VA (receive) 470VA for 100W transmit power

Dimensions 368 x 129 x 370mm

Weight (approx.) 13kg.

Receiver

Circuit type triple-conversion superhet
Intermediate frequencies 47.21 and 10.94MHz and 455kHz

Squelch sensitivity 1.8 to 30MHz (c.w., s.s.b., a.m.) <2μV
28-30MHz (f.m.) <0.32μV.

Intermediate frequency rejection (1.8 to 30MHz) 80dB or better.

Image rejection (1.8 to 30MHz) 80dB or better

Intermediate frequency shift range ±1.2kHz

Audio output 2W into 4Ω with <10% t.h.d.

Transmitter

Power output Adjustable up to 100W (25W a.m. carrier)
Duty cycle 100% at 100W (s.s.b.) 50% at 100W on f.m. and RTTY, three minute transmission period)

Modulation types Balanced, filtered carrier (s.s.b.) Low-level, early-stage (a.m.), variable reactance (f.m.)
audio frequency shift keying (a.f.s.k.)

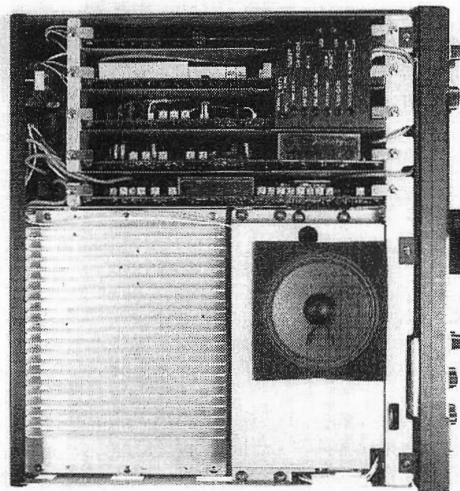
Maximum f.m. deviation ±2.5kHz
Shift frequencies (a.f.s.k.) 170, 425, and 850Hz
Packet radio shift frequencies 200 and 1kHz
Harmonics At least 50dB below peak output
Carrier suppression (s.s.b.) At least 40dB below peak output
Unwanted sideband suppression (s.s.b.) At least 50dB below peak output

why (with a rig at this price) does the 250Hz 3rd i.f. filter come as an **extra?**, although I've noticed that this is also common practice with other manufacturers.

I'm not going to list everything on this superb transceiver, but I must mention the very efficient automatic antenna tuning unit. It's the same as fitted on the FT-1000.

I found that the automatic a.t.u. coped extremely well with my trapped dipole, counterpoised half-wave for 7MHz **and** a half-wavelength of wire on 7MHz.

The auto-tuning of the antenna is very quick, and it's even quicker once the information is stored in the rig's memory. Once I had operated on all the h.f. bands, the rig 'remembered' where it was antenna-wise, and band changing was extremely easy. It's the first truly automatic antenna tuning unit that I can say I've trusted! It will particularly benefit disabled amateurs, and especially blind operators.



REVIEW

Conclusions

No review is going to give this superb transceiver full justice. The specifications (all of which the transceiver matched or exceeded on test) make for an ideal rig. But to appreciate how good it is, you must try the FT-990 out for yourself.

Apart from mentioning the excellent reports on speech transmission I received, and the comments on the clear c.w., I can only suggest once again that if you can afford this rig, go and try one, you'll not be disappointed.

Yaesu are going to have problems trying to better this receiver's performance and ease of operation. Perhaps if they tried hard, they could reduce the price and many more of us could afford one!

My thanks go to South Midlands Communications Ltd., of S. M. House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hampshire SO5 3BY, tel: (0703) 255111, for the loan of the review model which is available from them at £1849 including VAT, carriage extra.

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The Long Wire - A Simpl

Fred Judd G2BCX takes an in-depth look at that old favourite, the 'long wire'. This month Fred starts off by delving into the theory of this very practical antenna.

The 'long wire' is a simple antenna. It's not too expensive, and it is capable of operating with reasonable efficiency on any band of frequencies between 1.8 and 30MHz.

This most practical of antennas may also be of interest to holders of the new 'A' Novice Licence, as well as Class 'A', full licence holders about to embark on the h.f. bands for the first time. In other words, it's a most useful system and an ideal 'starter antenna'.

Simplest Antenna

The simplest of all antennas for h.f. bands operation is a length of wire, the longer the better. They are normally used in conjunction with some form of tuner to achieve resonance.

This form of radiator, was the basic 'multi-band' antenna of the early days of amateur radio and they worked well. With reasonably good DX conditions, QSOs with Australia, New Zealand and places of similar distances were commonplace!

These DX QSOs took place on 14 or 28MHz with a tuned end-fed antenna approximately 30m long. Operation with an input power of 10W, or less, with such good results was common practice!

Antennas of this type, used with a simple 'tuner' unit (dealt with later in Part 2) can still be an attractive proposition for many amateur radio operators.

Naturally Resonant

A single wire with a finite length of a quarter, a half, or three-quarters of a wavelength, or more, will be naturally resonant at a frequency applicable to the wavelength (see Fig. 1).

The single wire under consideration, may also consist of any odd or even number of whole wavelengths. This will again be directly related to a particular frequency, as in Fig. 2.

If a wire, several complete wavelengths long, also includes an 'extra' quarter or half-wavelength, it will still retain the frequency/wavelength relationship. In this case, we could say that a wire is an odd, or even number of quarter-waves, or half-waves in total length.

Here's an example: 5 quarter-waves = 1.25 wavelengths, 7 half-waves = 3.5 wavelengths and so on. Confused? How about another example?

Example 2: A wire antenna is a quarter-wavelength long at 1.8MHz. At this frequency one wavelength = $300/1.8 = 166\text{m}$.

The electrical length and also the physical length of the antenna is $166/4 = 41.6\text{m}$.

Let us now regard that we now wish to operate this antenna at 10MHz, which corresponds to a wavelength of 30 metres. The electrical length now becomes $41.6/30$ or nearly 1.4 wavelengths with a horizontal radiation pattern as in Fig. 3.

For the 28 to 30MHz band, this antenna would be nearly four wavelengths long. You can put the calculator away now!

Quoted Degrees

Antenna length is often quoted in degrees (still regarded as electrical length). This is useful when determining the current and voltage distribution along an antenna.

The example, Fig. 4, is for one wavelength, or 360° in length. Note however, the 90° phase difference between the current and the voltage. This also applies to the antenna formats in Figs. 1 and 2, although these illustrations show only the sinusoidal current along the wire.

Note that the voltage and current, always with a 90° phase difference, constitute a 'standing-wave' without which there would be no radiation. Antennas that are self-resonant are known more formerly as linear radiators (or antennas).

If the antenna is a half-wavelength, or more, in electrical length, it can be directly 'voltage fed' at one end. But if the antenna is a quarter or one eighth of a wavelength (physical length) long at frequency of operation, it will be 'current fed'. I'll talk more about this later on.

Velocity End Effect

You'll often read about 'velocity and end effects'. These 'effects' might as well be mentioned, although they apply mainly to antennas some fraction of a wavelength, to a whole wavelength long, normally fed via a transmission line.

The velocity of a radio wave travelling along a Practical Wireless, December 1991

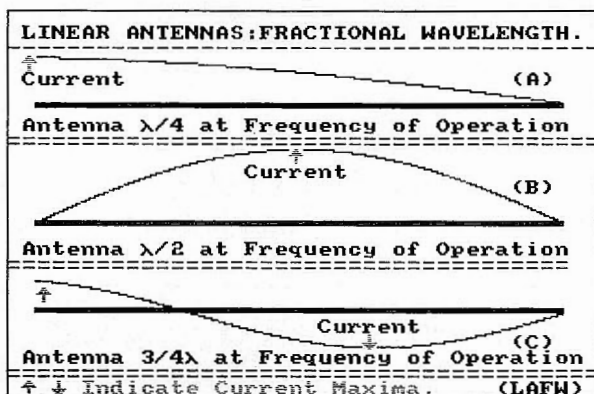


Fig. 1: Antenna (A). Current fed and operated at f_1 . (B) same antenna, voltage fed and operated at $f_1 \times 2$. (C) Current fed and operated at $f_1 \times 3$.

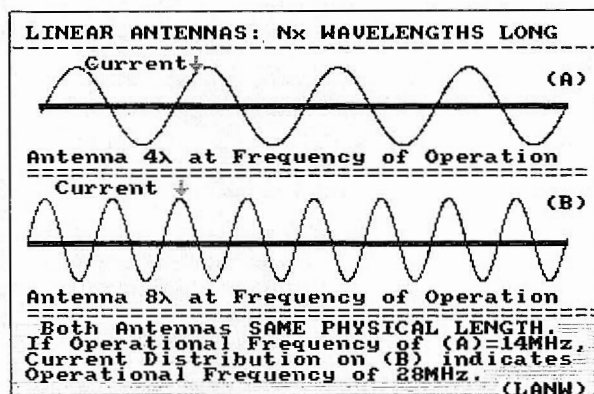


Fig. 2: Illustrates the 'harmonic' relationship between two antennas of same physical, but each a different number of 'wavelengths' long, by virtue of the different frequencies of operation.

e Antenna For All Occasions

conductor is reduced slightly. Because of this, it's usually necessary to shorten the physical length of the antenna by 2 to 5% in order to maintain exact resonance.

Insulators at each end of a wire antenna, together with nearby structures and trees, etc., can cause capacitive loading (capacitance added to self-capacitance of the antenna). This effect is generally more pronounced at the higher frequency bands, e.g., 14, 21 and 28MHz.

However, for a single half-wave wire antenna, an 'end effect' correction factor of about 5% will take 'velocity effect' into account as well. With this taken into account, the physical half-wavelength in 'metres' can be derived from the simple mathematics: $150 \times 0.95/f(\text{MHz})$.

With end, or voltage-fed antennas normally tuned to precise resonance with a tuner, the maths I've just mentioned can be ignored. Instead, the antenna length can be determined from the formula $300/f(\text{MHz}) = \text{wavelength, in metres}$.

You should divide by two or four to obtain a half, or quarter wavelength. To convert metres to feet, you need to multiply by 3.281.

Shortest Wire

The shortest 'resonant' wire antenna with a reasonable degree of radiation efficiency, is one-eighth of a wavelength. Although it's self-resonant, a 'current feed' is necessary as the impedance at the feed point is very low.

The same applies to a quarter-wavelength. For the 1.8MHz band the physical lengths would be about 20 and 40m respectively. Either antenna can be fed from an a.t.u.

This antenna can also be used on the higher frequency bands. It will then become one or more half-waves long (electrically) at the operational frequency.

Although no transmission line is required, as the 'input impedance' of the antenna will now be 'high' it must be 'voltage fed'. The tuner output terminal must therefore present a high and equivalent impedance, as well as a low impedance for a current feed.

The antenna system as described, is often referred to as 'harmonic operation'. This term is used because of the frequency relationship that exists between most of the amateur h.f. bands.

Bands that are almost harmonically related to 1.8MHz the lowest allocated frequency, together with their respective electrical lengths, are shown in Fig. 5. In practice the system is reasonably efficient.

Flexible Tuner

While harmonic operation is desirable, it's not essential if space is limited. As I mentioned earlier, a flexible antenna tuner can really make h.f. operation much easier.

With a suitable antenna tuner, a wire antenna of approximately 30m or other convenient length (a little shorter or longer) can be tuned to resonance. This would enable operation on any band of frequencies within the h.f. spectrum.

For low power operation, as required by the Novice Practical Wireless, December 1991

licence, the necessary tuner need not be expensive, especially if it's home constructed. A home-brewed tuner would be ideal in fact because it can be designed for whatever the antenna is required to do. More about this later!

The antenna, tuneable for multi-band h.f. working as I described earlier, may seem to be a crude arrangement. Despite this, it could turn out to be a better proposition than an expensive commercially-made, inductively loaded, so-called multi-band h.f. antenna. The commercial product may not be so 'multi-band' or as efficient, as some manufacturers would have you believe!

Next time I'm going to describe a practical tuner and provide full constructional details, so you can get the best out of your 'long wire'.

Fig. 3: Annotations give details. Antenna (A) laying east to west or vice versa. (see text).

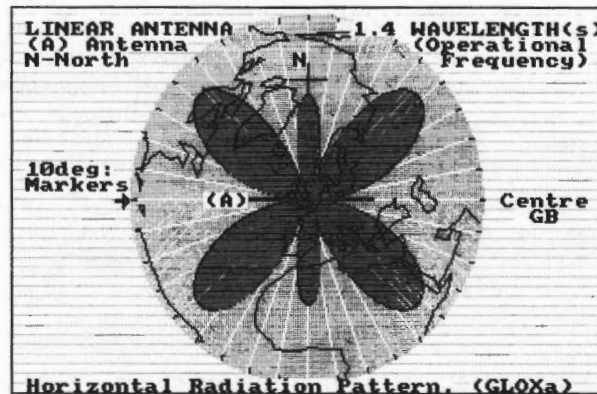


Fig. 4: Current and voltage distribution on a LINEAR antenna one wavelength (360°) long. If the currents in each half-wave were IN-PHASE then the antenna would be a two half-wave collinear antenna.

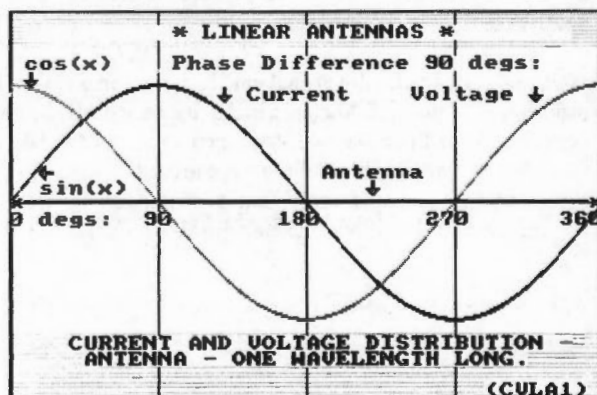


Fig. 5: Harmonic relationship of frequency bands to which a 'primary' antenna is 0.25 wavelength at 1.8MHz.

LINEAR ANTENNAS: HARMONIC RELATIONSHIP					
1st fo: 1.8MHz.	3.5	7.0	14	21	28MHz.
ANTENNA Primary Length	Number of Wavelength(s) that Antenna becomes for Related HF bands above.				
0.25λ	0.5	1	2	3	4
0.5λ	1	2	4	6	8
1.0λ	2	4	8	12	16
1.5λ	3	6	12	18	24
2.0λ	4	8	16	24	32
Shortest Feasible Primary Length 0.125λ	0.25	0.5	1	2	4
(***)	(***): 0.125λ at 1.8MHz. = 66 Feet (20 Metres)				
	(LAHR)				

Radio Diary

* Practical Wireless & Short Wave Magazine in attendance

***November 17:** Bridgend Rally. Further details from **Charles Sedgebeer**, 50 Minffrwd Road, Pencoed, Mid Glamorgan, South Wales CF35 6SD.

November 24: The West Manchester Radio Club's 'Winter Rally' takes. All details as August Rally. Admission £1. **Dave G1100** on (0204) 24104 evenings only.

December 1: The Bishop Auckland Radio & Electronics Rally will be held at the Sunnydale Leisure Centre in Shildon, County Durham. Doors open at 11am, disabled 10.30am at ramped entrance. The usual traders will be present and talk-in will be via S22 on 145.550MHz. All enquiries to **G4TYF** or **G0FBK**, **QTHR** or telephone (0388) 606819.

December 8: The Leeds & District ARS have their 'Christmas Rally' at The Pudsey Civic Centre, Dawsons Corner, Pudsey (at junction of the Leeds Ring Road with Bradford Road, do not follow signs for Pudsey). Doors open at 10.45am, all the usual facilities. More details from **Geff Stubbs** on (0532) 585801.

December 8: Now in its 7th year, the Verulam Christmas Rally will again be held at Hatfield Polytechnic, adjacent to the A1 (M). Traders' stands are located on two floors with the main hall being located on the first floor (together with the Bring & Buy stand). A smaller number of stands are available in the ground floor refectory (together with the catering and bar area). Access to the rally will be from 8am with the rally opening to the public at 11am, although they will try to open at 10.30 if all traders are set up. Table space is allocated on a first-come-first-serve basis, so early booking is recommended. Further details from **Steve Dunning** on (0923) 211643.

***December 15:** The Centre of England Christmas radio rally will be held at the British Motorcycle Museum, Bickenhill, near the NEC Birmingham (junction 6 M42). Doors open 10.30am, admission £1, OAPs 50p, children free. Over 60 trade stands in three large exhibition halls, Bring & Buy, talk-in on S22, bar and restaurant available, ample free parking, concessionary rates to visit museum. **Frank Martin G4UMF**. Tel: (0952) 598173.

1992 dates

January 19: The Oldham rally will be held at the Queen Elizabeth Hall, Civic Centre, Oldham. Doors open 11am, 10.30am for disabled and for those taking the Morse test. Bar & catering facilities available and parking is free. Details from **Kathy G4ZEP** on 061-624 7354 day or 061-652 8617 evening.

January 26: The 2nd Lancastrian rally will be held at the University of Lancaster. Opening times are 10.30am for the disabled and 11am for everyone else. Further details from **Sue G10HH** on (0524) 64239 or **QTHR**.

February 2: South Essex ARS have their 7th mobile radio rally at the Paddocks Community Centre, Long Road (A130), Canvey Island, Essex. All the usual traders, Bring & Buy, refreshments, free car parking, including parking for the disabled outside the main door. Doors open 10am. Talk-in on S22. For further information contact **Dave Speechley G4UVJ** on (0268) 697978.

February 16: The Kidderminster & DARS rally will be held at the Harry Cheshire School, Habberley Road, Kidderminster, Worcs. Doors open 10am. **G8JTL**. Tel: (0384) 894019.

February 23: The Northern Cross rally will be held at the Rodillian School on A61 between Leeds and Wakefield (junction M1/M62). Doors open 11am, disabled 10.30am. On-site parking. Dealers, groups and craft stands, Bring & Buy. Morse test. Car crime prevention demo. Bar & refreshments. Talk-in S22. Entry 50p (programme draw prizes). **Dave Gray G0FLX** on (0532) 827883.

February 29: Tyneside ARS have arranged a new venue for their annual rally, the Temple Park Leisure Centre in South Shields, Tyne and Wear. The centre offers up to 18 000 square feet of floor space, all on one level, with easy access for traders where needed. Catering facilities, including a bar on site, as well as family rooms. For those other members of the family not wishing to partake in the Rally, all the amenities of the Leisure Centre are there too, including heated Leisure pool and gymnasium. Plenty of free parking. Further details about the Rally from **Jack G0DZG** on 091-265 1718.

March 15: Wythall RC will be holding their annual rally at Wythall Park, Silver Street, Wythall (nr. Birmingham). Doors open 11am to 5pm. Usual traders, bar and refreshment facilities, Bring & Buy. Talk-in S22. Admission 50p. Full details from **Chris G0EYO** on 021-430 7267.

April 5: The 6th Launceston Amateur radio rally will be held at Launceston College. Doors open 10.30am. **Maggie**. Tel: (0409) 21219.

April 19: Centre of England Easter Sunday radio & electronics rally, held at the National Motorcycle Museum, Bickenhill, nr. the NEC (Jct. 6 M42). Doors open 10.30am, 10am for disabled. Admission £1. Over 60 traders, ample parking, Bring & Buy. Talk-in S22. Bar & refreshment facilities. Details from **Frank Martin G4UMF** on (0952) 598173.

***June 14:** Royal Naval ARS have their annual mobile rally at HMS Mercury, Nr. Petersfield, Hants. There will be dozens of trade stands; a Bring & Buy; flea market; radio-controlled power boats and trains; local radio clubs and repeater groups; childrens' rides and amusements; vintage fire engine; TV detector van; ices and refreshments; arts and crafts' exhibition; two Grand raffles; spectacular arena displays and other attractions, making this a great day out for all the family. 144 and 430MHz talk-in, free parking and picnicking, free admission for children, adults £1.50, no dogs except guide dogs. For full details, contact **Cliff Harper G4UJR**, 34 Neva Road, Bitterne Park, Southampton SO2 4FJ. Tel: (0703) 557469.

June 28: The 35th Longleat amateur radio rally. Details from **Shaun G8VPG** on (0225) 873098.

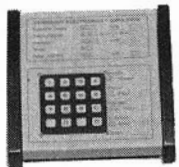
July 25/26: Norfolk ARS are planning a 2-day event. **G4ONF**. Tel: (0603) 747782.

November 28: The Greater London amateur radio & computer show will be held at Harrow Leisure Centre, Christchurch Avenue, Harrow, Middlesex. Doors open from 10.30am to 4.30pm. **CLPK, 18 Litchfield Close, Clacton-on-Sea, Essex CO15 3SZ**.

DEWSBURY ELECTRONICS

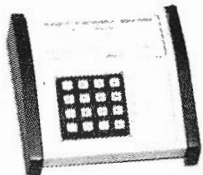
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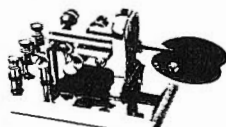


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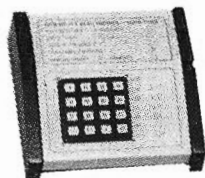
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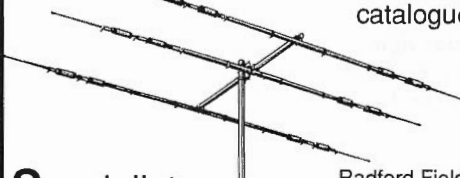


D3W



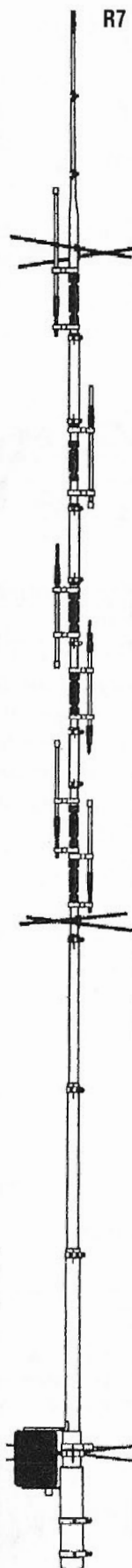
24, 18, 10MHz
Rotary Dipole

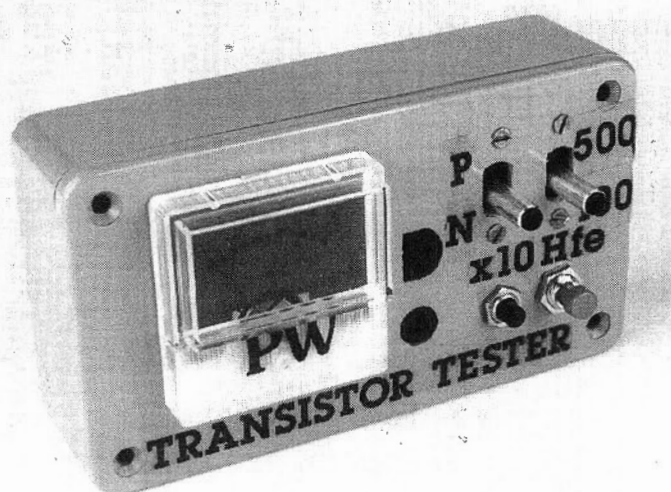
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Getting Started - The Practical Way

This month the Rev. George Dobbs G3RJV tackles the subject of transistors, and shows you how to make a simple but effective transistor tester.

The transistor was invented by Shockley, Bardeen and Brittain at the Bell Laboratories in the USA during 1947. The word 'transistor' describes its operation as it's a three terminal device which can amplify a signal (current). It is said to 'transfer current across a resistor'.

Nowadays integrated circuits (i.c.s) have replaced transistors in many applications. Despite this, i.c.s are themselves arrays of transistors, with other components, gathered in one package to perform a particular function. Whatever you do in electronics, you'll be meeting plenty of transistors!

Standard Stock

The more experienced constructor will keep a stock of the standard types of transistor available for instant use. Very often these will have been bought at bargain prices from amateur radio rallies.

Sometimes the bargain types are sold as unmarked, but good, transistors. Other transistors sold as surplus, may be slightly out of specification but are perfectly acceptable for normal use. A simple transistor tester is a great asset to any radio constructor, and will prove very useful in proving how much of a bargain you've got!

Tester Described

The transistor tester described here, is a version of a circuit that's been part of my workbench equipment for about 20 years. Although I now have more

sophisticated equipment to do the job, I still use this little tester when I wish to make a quick check of a transistor.

It will measure the small signal gain (called the H_{fe}), the leakage and match up pairs of transistors for almost any *nnp* or *npn* type. It can also be used to 'sex' transistors, or in other words sort out whether they are *nnp* or *npn* devices.

In this series we've already looked at the basic structure of the transistor. We have also used the transistor as a switch in the diode tester circuit (PW October '91).

The simple circuit, Fig. 1, shows a bipolar *nnp* transistor as a d.c. amplifier. The resistor, R_b , 'forward biases' the transistor, that is, it provides a small positive voltage on the base. This controls the base-emitter (input) current.

The collector current (output) is indicated by the meter (M1). R_c is a series resistor controlling the amount of current flowing through the meter. A small input current produces a larger output current, and this provides an indication of the amplifying properties of the transistor.

Practical Circuit

The circuit of the simple transistor tester is shown in Fig. 2. It looks complex, but it's only a development of the simple circuit in Fig. 1.

The transistor plugs into the socket, marked E, B and C for emitter, base and collector. The resistors R1, 2 and 3 act in the same way as R_b in Fig. 1, but are switched, with S1, to provide two reading ranges which roughly equal a gain of 100 and 500 times.

The meter, M1, indicates the collector current and displays the approximate gain. The resistor R4, which is operated by a push-button switch S4, increases the range of M1. This permits the gain of transistors with a large leakage current to be estimated.

The switch, S3 may also look very complicated but don't let it worry you! This switch only serves to reverse the polarity of the battery supply, so measurements can be made with *npn* or *nnp* transistors.

Basic Functions

As the tester is very basic, the functions provided are limited. This is because it relies on a simple circuit, using cheap standard components.

The resistor values are a compromise and the meter, chosen for cheapness, is not a high precision instrument. Despite this, it does show if the transistor is *nnp* or *npn*, and if it works or not. It also gives an indication of the transistor's gain, but this is only an approximate figure. However, these basic facilities are enough for most of us lesser electronics mortals!

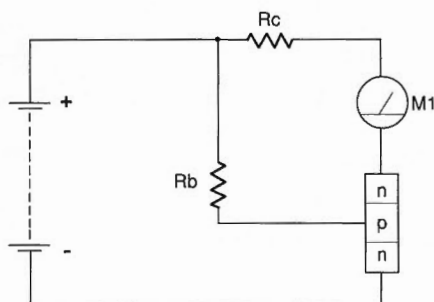
The transistor to be investigated, is tested in what's called the 'common emitter mode'. Funnily enough, this is probably the most common configuration.

The most important parameter to be measured is the small signal gain, H_{fe} . With S1 in the position shown, a full scale reading is equal to a gain of about 100. Switching over gives a full scale reading of about 500. Pressing the push-button switch, S2, allows the reading to be taken.

When the transistor is plugged into the socket, before the push-button, S2, is pressed, there should be no readable indication on the meter. If a current is shown, this is the leakage current (I_{co}) of the transistor.

Older types of germanium transistor often had a large leakage current. This is the current passed by the device before it has any input current.

Fig. 1: A bipolar *nnp* transistor as a d.c. amplifier (see text).



Germanium Transistors

Some older germanium transistors can have a leakage current large enough to completely swamp the gain reading on the meter. The push-button, S4, has been added so that it may be depressed to increase the range of the meter in such cases.

Having said all that, nowadays it's probably unusual to find or to use such transistors. The tester could probably do without the extra push-button switch S4, but it is useful to add belt and braces for the sake of two components.

If the transistor to be tested, when it's plugged into the socket, causes the meter pointer to move heavily over to full scale deflection, you should reverse the *npn/pnp* switch, S3. The rule should be: if you're not sure whether the transistor is *npn* or *pnp*, you should begin the test with the switch in the *npn* position. In practice, *npn* types are more common than *pnp* types.

Simple To Build

The transistor tester is simple to build. All the components are directly wired on the underside of the box lid. This is shown in Fig. 3.

I used two types of transistor socket to cater for large and small types of transistor with wire leads. This type of transistor socket doesn't have mounting points, so they are glued. I used the rapid setting epoxy resin adhesive Araldite, to fix the sockets into holes carefully drilled and shaped with needle files.

The switches S1 and S3 in my tester are miniature sliding types, but any appropriate switches will do the job. The novice constructor, may find it more helpful to use standard-sized slide switches which have a larger spacing between the contacts.

Slide switches usually come in the d.p.d.t. (double-pole, double throw) change-over format. The switch, S1, only needs to be a simple single-pole change-over type, while S2 and S4 are single-pole 'push on' types, with S3 being a double-pole change-over switch.

The values of the resistors, R1, 2 and 3 are high. They're all MΩ (mega-Ohm) values. I used two 10 mega-Ohm resistors connected in series to form R2. This makes a total three resistors wired in a line. This technique is useful, and you can make up a 20MΩ resistor from five 4MΩ resistors in series.

Simple To Use

The transistor tester is very simple to use and it follows the description of the circuit operation. To start the testing, you should insert the transistor into the socket.

If there is an immediate reading this will be the leakage current. If this is high, the push-button, S4, may need to be used to increase the meter range in order to proceed. If the meter needle moves hard against the end stop on the high side, you should reverse the *npn/pnp* selector switch.

Next, you should set S1 to the 100 range and press the push-button S2. The meter reading will then show the approximate gain, with full scale deflection being around 100.

If the meter reaches the end of the scale, switch S1 to 500, in which case full scale deflection is around 500. The meter scale is actually marked with a 0 - 5 scale, so that a simple conversion has to be done to get the actual values required.

That's it! You've now got a transistor tester of your own. It's a very simple instrument to use, so you can try it out with a few transistors. Then it's ready to use on your work bench. I think you'll be using it very often in the future. See you next time.

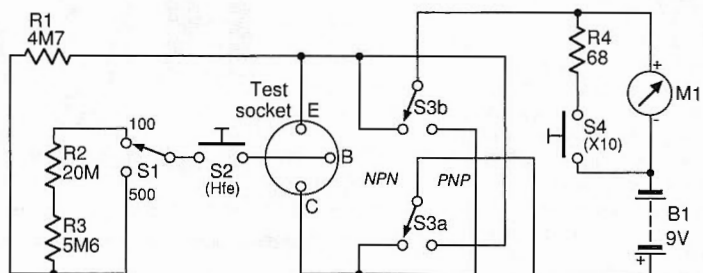


Fig. 2: The circuit of G3RJV's simple transistor tester, which is developed from the basic amplifier configuration in Fig. 1.

Shopping List

Resistors

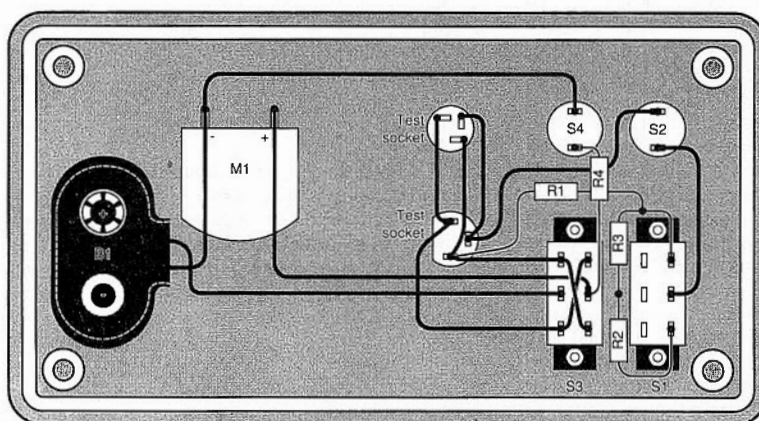
Carbon film 5% 0.25W

68Ω	1	R4
4MΩ	1	R1
5.6MΩ	1	R3
20MΩ	1	R2 (see text)

Meter, Maplin Electronics type LB80B, or similar 'signal' meter. Transistor sockets Maplin type WR29G and WR31J (or similar). Switches S1 and S2 double pole sub-miniature types, Maplin catalogue reference FH35Q (or similar) Only one pole on S1 is used. Push-button switches S2 and S4 are push-to-make, Maplin reference FH59P (or similar). PP3 battery, battery connector, plastics box (the Maplin LH60Q, an ABS housing of 120 x 65 x 40mm is suitable).

Do you find switching confusing? Don't worry, just look back at 'Getting Started The Practical Way' on page 55 April PW, and you'll soon be sorted out!

Fig. 3: Diagram showing the interconnecting wiring of the simple transistor tester. Note that there are two transistor test sockets shown on this diagram, although for clarity only one of is shown on the circuit diagram in Fig. 2.



CB HIGH & LOW

By 'Quaynotes'

Well, I've been very busy recently. Firstly, I have been gathering together all my notes so I can share some of the years of experience with you all. Secondly, I have been in contact with one or two people to arrange some interesting equipment reviews and antenna comparisons on your behalf.

"What we want to know is what equipment we need, and where to buy it and to have reliable, objective opinions" wrote one correspondent in answer to my suggestions in the summer.

Well, I promised that I'd listen. And to keep that promise, I have had some very interesting new 27MHz antennas from Nevada Communications in Portsmouth to look at, but more about that soon.

Popular Hand-Held

I heard about the popular Jesan CB-950 hand-held rig while I was in contact with Mike Devereux from Nevada Communications in Portsmouth. Knowing that many younger people and other beginners have their first introduction to CB via a hand-held rig, I thought it a good idea to review it in High & Low.

Mike Devereux duly sent one for review, but not to me! I had reasoned this idea out carefully. Surely, if the review is to be aimed at looking at a rig for a beginner, it must of course be sent to a real beginner.

So, enter Donna 'Toad' Vincent from the *PW* office, to try her hand out on CB. I knew she was very keen from our many chats on the 'phone.

Toad Trials

Donna 'Toad' Vincent is a patient young lady and has to be, judging by the trials and tribulations of anyone working in amateur radio publishing. Donna ('Toad' is a friendly nickname) duly passes all the mail on to me, and on my infrequent visits to the *PW* office in Poole she is always very helpful and friendly.

As she's also fast developing a keen interest in radio communications, I asked her if she would like to try the Jesan hand-held. It seemed to be the perfect opportunity for Donna to try her hand on 27MHz, and find out about the Jesan.

Donna was very keen to have a go. She has been surrounded by keen radio enthusiasts for nearly two years now, and she hopes to study for the RAE next year. In the meantime she was very keen to have a go and try her hand out on CB. So, it's over to you Donna!

This month 'Quaynotes' starts off with some news on future antenna and equipment reviews. With the help of Donna 'Toad' Vincent from the PW office, he also looks at a hand-held transceiver that could be a good starter rig for newcomers.



Take One Rig

When I was asked if I would like to take one of the Jesan CB hand-helds to 'play around with', I was a little apprehensive. I had never used CB radio before! However, after a quick lesson on how to use the hand-held, I was left to discover the exciting world of CB.

I soon found my way around the rig, which is quite large for hand-held use. All the switches were clearly marked and easy to use. I spent my first evening listening and generally familiarising myself with the method of operating.

Listening was a fascinating experience, and I was surprised at the number of people using CB. At times all 40 channels seemed to be busy and the varied conversations were interesting.

Bad language only seemed to appear late in the evening and I was able to avoid this problem. Several operators were using 'echo' effects, and this seemed a strange thing to do as it made them very difficult to copy. They sounded as if they were in their bathrooms!

Once I'd got over my nerves, I moved on to calling other 'breakers'. This resulted in some very interesting conversations, as well as me picking up some useful hints and tips from my new friends.

As a complete beginner I found the rig very enjoyable to use, mainly because it was not covered in fancy switches and dials. Complications like that would've put me off immediately.

The only real criticisms of this rig that I have, is the length of the antenna which is 1.5m when fully extended, and the brightness of the I.e.d. panel display. I found that the

antenna restricted my movements when I was operating indoors, so I soon learned that an external antenna is best.

Although I found that the I.e.d. display is fine indoors or in the shade, outside in sunlight I found it to be almost unreadable unless I screened it with my hand.

I thoroughly enjoyed using this rig, and in my opinion it is ideal for the beginner like me. I should also point out that enthusiasm for CB radio has infected our house. As a result of the test sessions my mum, sister and dad are now fascinated with what's on the bands! That's it from 'Toad' for now, but I look forward to working you on 27MHz in the near future.

Good Introduction

Well, Donna seems to have had an good introduction to CB radio. She enjoyed the experience so much that she's now the proud owner of a Jesan hand-held.

Having introduced a beginner to CB via the hand-held, I thought it best to have a good look at the rig on the bench. It had proved itself as a very simple method of getting someone on the air quickly, but what was it like otherwise?

Firstly, I must say that for a hand-held transceiver - it's a big rig. In fact, because of the very angular styling, the Jesan transceiver looks and feels even bigger than it really is.

Donna also commented on that old problem with hand-held rigs, the long antenna. However, the long antenna is necessary for the rig to operate correctly. Even then the antenna has to be a technical compromise due to the true length of whip that's needed at a frequency of 27MHz.

This transceiver has a front panel mounted I.e.d. display showing the channels, bar indication type S-meter and power output. When it's switched on, the receiver automatically selects channel 9.

A useful (and necessary) feature is the ability to switch off the I.e.d. to save battery power. Tuning is exceptionally easy, as it's carried out by using the 'up and down' channel select buttons. This facility is most useful because in effect it acts as a form of scanning unit.

The Jesan is fitted with a front panel mounted r.f. power push-button switch. This is of the push-to-operate type, push again to switch off, type of control. When the rig is in the low power setting, only one segment of the S-meter (it doubles as a power indicator) illuminates. When high power is chosen, two segments light.



Tight Fitting

The transceiver is supplied with a (very) tight-fitting carrying case. This allows operation of the top mounted squelch and volume controls and the main transmit-receive switch on the side.

Access to the auxiliary power input is from a side panel mounted coaxial socket, using one of the standard input jacks found on imported charging equipment. The user has the option of fitting either eight non-rechargeable 1.5V cells, or 10 NiCad rechargeable batteries.

As most operators would use the rig on NiCad power, there's no way of bypassing the charging facility. In other words, when external power is connected, whatever batteries are fitted, will be in parallel with the incoming supply at all times. This means, that ordinary non-rechargeable cells should be removed when an external power source, such as a CB main 13.8V d.c. unit, or car battery, is used to avoid possible damage by explosion.

Specifications

Transmitter

Power output	4W (high) 0.4W (low)
Modulation type	F3E (f.m.)
Deviation	±1.5kHz
Spurious emissions	All harmonic and spurious suppression greater than MPT 1320 requirements

Receiver

Type	Dual conversion superhet with r.f. stage and 455kHz ceramic filter
Frequency control	Crystal-controlled p.l.l. synthesiser providing 40 channels
Sensitivity	1µV for 10dB S/N
Selectivity	60dB down at ±10kHz
Squelch range	1mV
Intermediate frequency	First i.f. 10.695MHz, 2nd i.f. 455kHz.
Image rejection	55dB
Audio output	500mW maximum at 8Ω load
Current drain	120mA standby (no signal) (maximum) 1.2A (high) 500mA receive
External antenna	50Ω nominal (phono socket)
Power source	Nominal 12V

General

Microphone	Built-in electret condenser type
Speaker	57mm moving coil type
Meter	Bar type, i.e.d. (S-meter on receive, relative power indication on transmit)
Batteries	8 AA/UM3 1.5V cells or 10 NiCad rechargeable cells.

Easy To Use

Like Donna, I found the hand-held easy to use. I soon found the external antenna socket to be handy and when I used the Jesan CB-950 with a mag-mount antenna on my car roof, nobody I worked could tell it was only a small rig!

My only real 'niggle' involved the battery compartment. I found that the supplied dummy batteries (made from angled metal) didn't make good electrical contact. Strangely enough, this was due to the hard plating on the surface of the metal! I had to work on the metal with a mild abrasive quite a bit, before contact was reliably made.

Despite the dummy battery problem, I don't think it will be much of a problem in practice because most operators will opt for NiCad batteries. I would anyway!

Summary

So, what do we think of the Jesan CB-950? Donna liked it, and despite its large size she found it very easy to use. I found it to be very simple to use, and it coped very well with strong interfering adjacent channel signals, suffering very little from the form of interference commonly known as 'bleed over'.

I've discussed the results with Donna and in our opinion we think that this transceiver will prove very popular as an introductory rig. It will also suit anyone needing a sturdy, good-value-for-money stand-by transceiver for the car or emergency use.

Our thanks go to Mike Devereux at Nevada Communications at 189 London Road, North End, Portsmouth, Hampshire PO2 9AE, tel: (0705) 662145 for the loan of the transceiver, which is available from them at £79.95.

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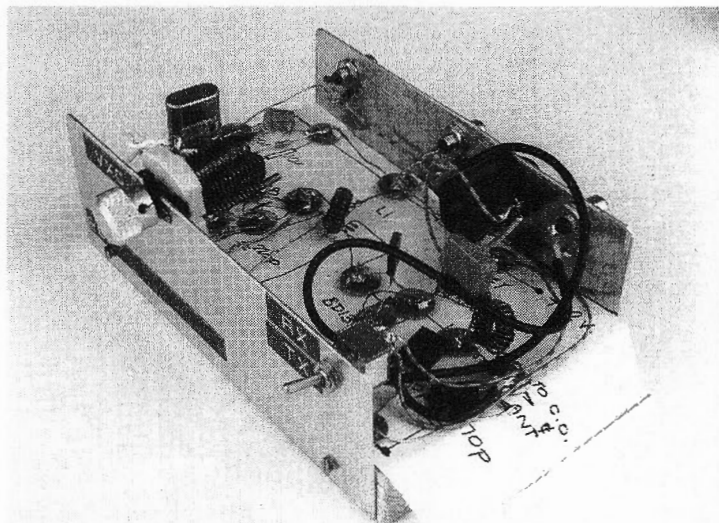
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The PW Challenger

A Simple 3.5MHz CW Transmitter

Steve Ortmyer G4RAW describes this simple c.w. transmitter as an ideal Novice project. As it's so easy the circuit also offers a challenge to more experienced, but reluctant home-brewers. So, find that soldering iron and get busy!



When I was 11 years old I wanted to build a transistor amplifier for my crystal set. As the circuit looked complicated, I hit on the idea of drawing out the circuit and sticking the paper on a board.

I then pushed drawing-pins into the wood, at various points on the circuit diagram. It was then a comparatively simple job to solder the components to the board, using the pins as terminals. To my delight the circuit worked!

Novice Training

When the Novice training schemes started, I was interested to see the drawing-pin and baseboard method used as part of the training in the official manual. Many people will have used this technique over the years, and it still forms a useful part in training.

The *Novice Instructors Manual* gives details of two

'test sets' which the students have to make as part of their tuition. The test sets are made on boards, using the very same method that I'm suggesting.

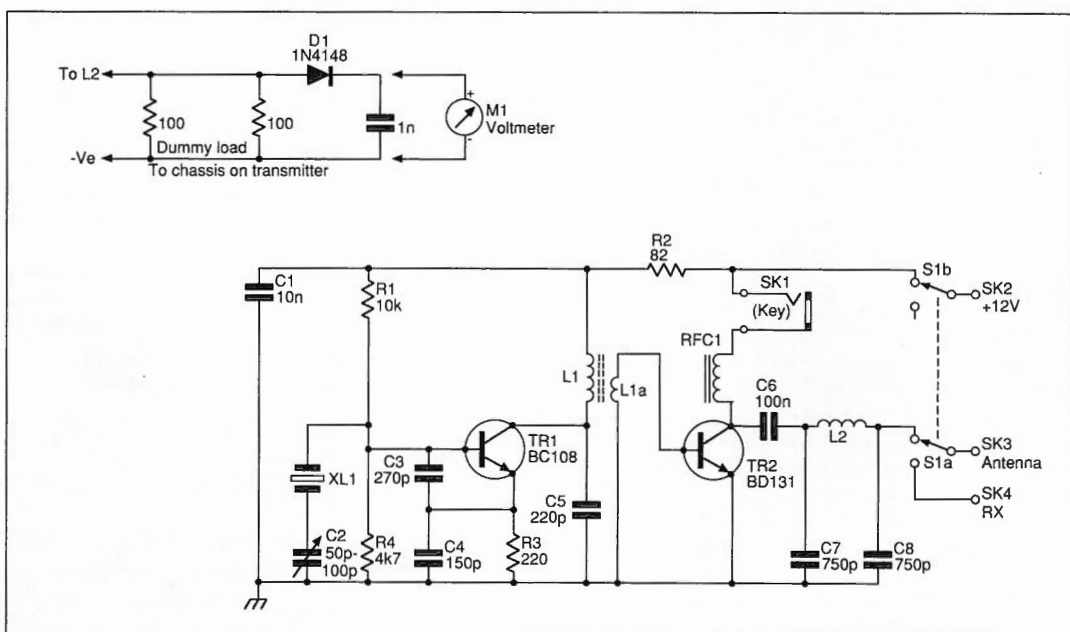
So, I thought that as Novice trainees would be familiar with this very simple technique, they'd like to have a go at building a simple transmitter using the pin-board method. It may also offer a delightfully lazy challenge to all you reluctant home-brewers!

Once you've built this project, you may even be more energetic and make it up permanently on a p.c.b., and perhaps build a box for it! There's also a Challenger receiver, built in the same way to follow in a future article.

Crystal Oscillator

The circuit, shown in the lower part of Fig. 1, is based on a simple crystal oscillator and power amplifier

Fig. 1: Circuit of the ultra-simple 3.5MHz transmitter (below) and a suitable dummy load/r.f. voltage probe (left).



(p.a.) using two transistors. Similar circuits have appeared in *Sprat*, the G-QRP Club journal, which incidentally, I recommend as another 'good read'.

The PW Challenger circuit and other, similar versions, seem to be off-shoots and developments of the 'Universal QRP Transmitter' by Wes Hayward W7OI and Doug DeMaw W1FB. This design was first described in their well-known book *Solid State Design For The Radio Amateur*, published by the ARRL.

Challenger Construction

To start the Challenger construction, you should first draw out the circuit to fit the wooden base. The base material must be soft enough to allow the drawing-pins to be pushed in.

Wooden floorboard off-cuts are ideal for the baseboard. Only people with cast iron thumbs, and a surplus of drawing-pins should try using chipboard!

Next job is to stick the drawn circuit onto the board. After this, the (good quality brass) drawing-pins are pushed into the baseboard at the locations shown in the diagram, Fig. 3.

As the drawing-pins have a relatively large surface area, they need quite a bit of heat when it comes to soldering. The best way round this, is to thoroughly 'tin' all the pins before starting the actual wiring-up.

By previously 'tinning' the drawing-pins, when you come to solder the various connections, you'll only need to melt a small area of the solder. This method has a double advantage because the joint is easier to make, and the pins won't take as long to cool down, reducing the chances of 'dry joints'.

Two Inductors

The two inductors in the circuit are wound on toroids. If you haven't wound a toroid before, don't worry, it's not a difficult process!

When you're winding this form of coil, you only have to remember that every time the wire passes through the central hole in the toroid, you've completed another turn. It's as simple as that.

Wiring Up

Wiring up can be done by using either ordinary tinned (non-insulated 22s.w.g copper wire, or the ordinary type pvc insulated single-core wire. I suggest that it's a good idea to make the 'earth' or 'chassis' line from plain tinned wire.

Very often with the drawing-pin method, the actual component leads can be soldered directly to the drawing-pins. You save wire and time this way, and it's easier for the inexperienced constructor to follow the circuitry.

To help inexperienced constructors, the outlines and connections of the two transistors are shown in Fig 2. The outline, and the circuit symbol for the diodes used in the circuit are also shown.

The front and rear panels, which can be of wood, metal or plastics, is mounted on the baseboard by using wood screws. Another, extremely simple way of making front and rear panels is to use p.c.b. material.

Off-cuts from p.c.b. material have the advantage of being easy to cut, and of course you can make solder connections. It's also very simple to make larger holes in this type of board, to mount tuning, volume and switching controls.

Simple Switching

The transmit-receive switching is very simple, and it's based on a double-pole change-over switch

How Difficult?
How Much?

Beginner
Approximately £10 (depending on material to hand)

Shopping List

Resistors 0.25W 5% Carbon Film

82Ω	1	R2
220Ω	1	R3
4.7kΩ	1	R4
10kΩ	1	R1

Capacitors polyester or disc ceramic

150pF	1	C4
220pF	1	C5
270pF	1	C3
750pF	2	C7, 8 (see note*)
10nF	1	C1
100nF	1	C6

*Note: C7 and 8 must be silver mica or polystyrene, preferably silver mica. As 750pF is an odd value, 680pF and 68pF in parallel will do the job.

Capacitors (variable)

50/100pF	1	C2 (see text)
----------	---	---------------

Semiconductors

1N4148	1	D1
BC108	1	TR1
BD131	1	TR2

Inductors

L1	38 turns of 26s.w.g. on a T-50-2 toroid
L1a	5 turns of 26s.w.g. wound over L1
L2	22 turns 22s.w.g. on a T-50-2 toroid
RFC1	(radio frequency choke) 6 turns of 30s.w.g. wound on a ferrite bead

Miscellaneous

Double-pole change-over switch, suitable crystal (XL1) see separate address list, wooden baseboard size to suit (150 x 80 x 20mm suggested), front and rear aluminium panels to suit, phono type sockets for 12V d.c. supply, transmit antenna output and receiver antenna output, 6.3mm jack socket for Morse key, brass drawing-pins, 50Ω miniature coaxial cable (miniature microphone cable is a good substitute), plastics jack socket for Morse key. (A metal type is unsuitable for mounting on the aluminium front panel because there is 12V on both sides of the socket).

Toroids available from: Ferromagnetics, PO Box 577, Mold, North Wales CH7 1AH.

Crystals in Novice band (3.565-3.585MHz) available from Electrovalue, PO Box 99, Corby, Northamptonshire, NN17 9RS @ 50p (3.579MHz) and (3.575MHz) from Cricklewood Electronics, 40 Cricklewood Broadway, London NW2 3ET for 99p.

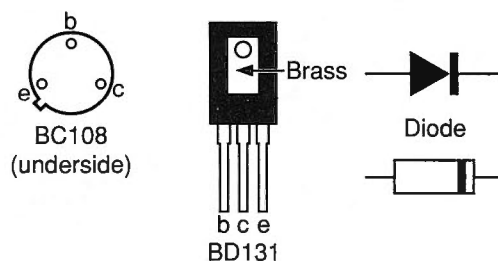
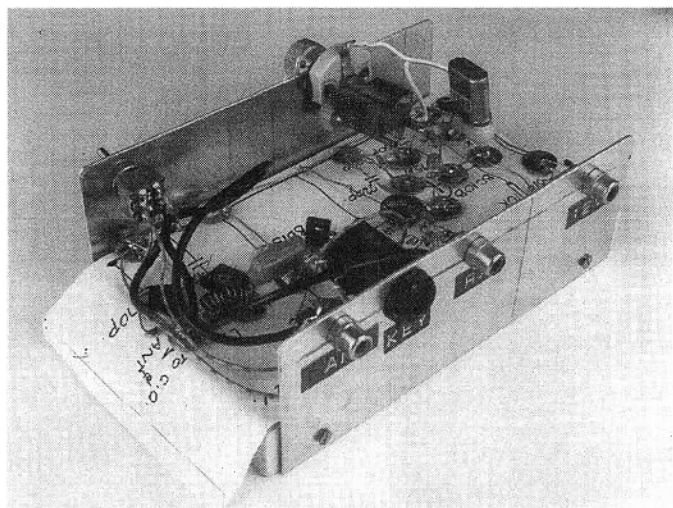


Fig. 2: Semiconductor outlines, and diode symbol showing cathode identifier band.



Looking at the transmitter from the rear, showing the antenna, Morse key, receiver and 12V power 'phono' type plug sockets.

(d.p.c.o.). The switching wiring diagram is shown on the right-hand side of the main circuit in **Fig. 1**.

Don't forget to check the action of your d.p.c.o. switch, to make sure you have got it right. I suggest that you arrange the transmit/receive switch to be in the transmit position when the toggle is down.

I give you this advice because many toggle switches work in the opposite direction (see 'Getting Started The Practical Way', page 42 October issue, **Editor**) to their operating levers. It's best to check, so that you don't run into problems.

Start Testing

Don't forget to check for short circuits, wrong connections and other mistakes. Once you have completed the wiring and checks, you can start the testing stage of the project.

When you're testing the transmitter, a dummy load

should be connected to the transmitter output. A suitable dummy load and r.f. voltage probe can be made up from two 100Ω 1W resistors in parallel. A suitable circuit is shown in **Fig. 1**, above the main circuit diagram.

Connect up a suitable 12V power supply (I used a CB radio power unit) and check for r.f. output using the dummy load.

The output power depends on the transistors and the supply voltage. I tried 12V which provided 1.75W, and a 13.8V CB supply which gave 2W. A 15V supply resulted in an output of 2.5W. As the Novice licence permits 3W into the antenna or 5W input, there should be no problem regarding power levels with this little rig.

Once you have proved you have r.f. output, listen to your receiver when you are transmitting. You will notice that varying C1, the vxo (variable crystal oscillator) frequency will change slightly, but not by very much on this band.

The value is not critical, and any value between 50 and 100pF will provide a slight frequency shift. Despite this, it's still useful to be able to move frequency, even if it's only by 1.5kHz!

On The Air

Using the Challenger on the air is as equally simple as the constructional method. Placing the transmit-receive switch in the transmitting position provides a 12V supply to the crystal oscillator. You can then 'net' the receiver to the transmitter frequency by listening for the signal.

Don't forget to switch the receiver beat frequency oscillator on, or to select the c.w. position on the receiver. You can soon identify your signal by its strength and the fact it goes off when you put the switch back to receive.

Various antennas can be used, but if you use antennas other than a 3.5MHz dipole, you'll need a suitable tuner. I use a wire approximately 20m long in conjunction with a 20m long counterpoise, which provides an approximate 50Ω match.

My first QSO with the Challenger transmitter brought a 559 report from Carlisle and a comment "TX sounds fine" from the other station. It gave me quite a thrill, achieving so much from so little. So, I can only suggest that you get those drawing-pins stuck in, find that soldering iron and join the fun!

PW

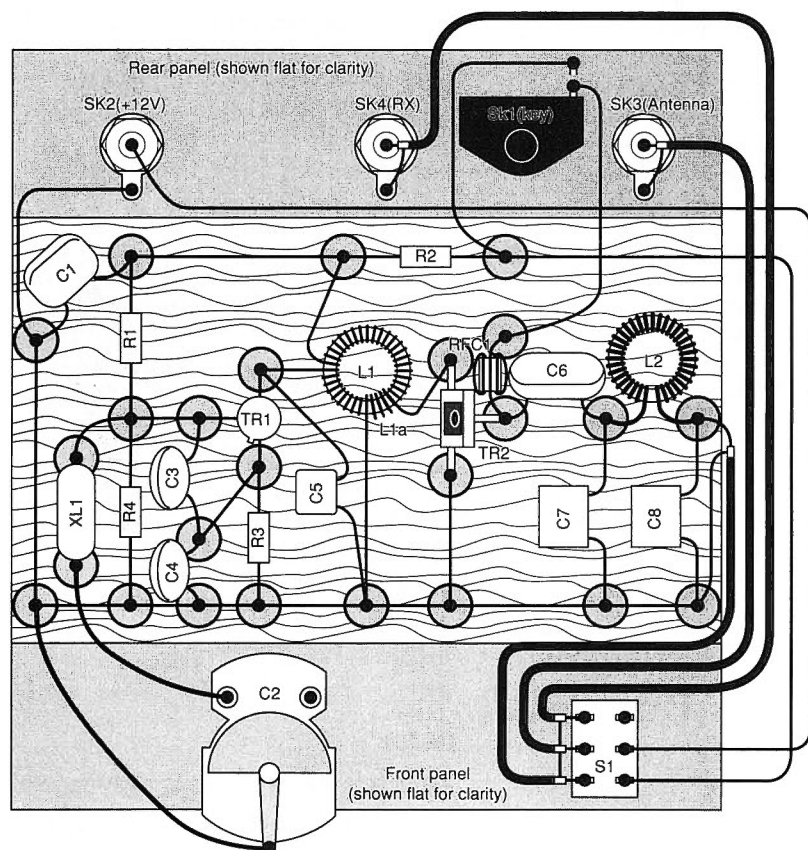
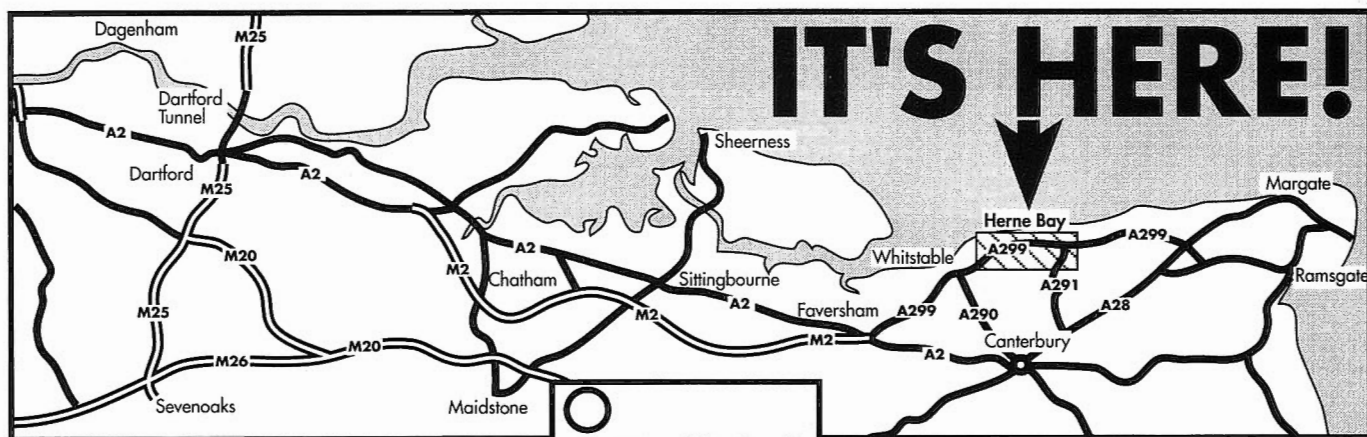


Fig. 3: The completed transmitter showing the point-to-point wiring made possible by the use of the drawing-pin and baseboard method.



Just in case you had forgotten where we are, we thought this map might help. **Icom's Retail Shop** is easily accessible by road or rail and has been serving Amateurs in the south-east for many years.

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QRP Contest 1991 Results

Despite the worst weather ever experienced for the Practical Wireless QRP contest, 51 groups and 41 individuals braving the storms entered the ninth annual event in June this year. The bad weather kept many groups from operating on the popular mountain-top sites. This has given the results table an unusual look. It had become normal for stations on the Welsh mountains to be amongst the top positions. This year there were only two GWs in the top 20.

The Winners Cup goes, again, to the Mansfield Contest Group GOMCG/P, operating from Harboro Rocks in Derbyshire.

The leading Scottish station, the Civil Aviation Authority Radio Society GM4CAA/P, receive the Tennamast Trophy for the fourth time.

From 1984 to 1987, a group known as the Bug Bashers won the contest from a variety of Welsh mountains, and achieved the number one position last year. This year, unable to persuade the others to assist him Chris Easton G8TFI/P, entered as a single ('Solo Bug Basher') operator. He gained, not only the leading single operator position, but also second place overall. This was equalled only once before by a single operator, G0CDA/P in 1988.

The summary of the positions of all 92 entrants was published in last month's *PW*. The list will also be distributed via the packet radio network shortly after this issue is published. Look on your local BBS for a bulletin from G4HLX.

Congratulations to all certificate winners, which includes the leading station in each locator square.

Wet And Windy

There's no doubt, that for those

Neill Taylor G4HLX brings you the views and full results of this year's PW QRP Contest.



Operators from G4BPJ/P standing L-R, David G0AIX, Clive G1CHM. Sitting L-R, Helen G7IWL, Brian G4BPJ. Not forgetting the photographer, Gerald G0JFS.

attempting to go portable for the contest, the wet and windy weather posed formidable problems. The result of the very wet period leading up to the contest, made GW1HGV comment, "The previous week's heavy rain made our normal site inaccessible even with four-wheel drive vehicles".

Getting onto site was a problem for many other groups too, G6DOD/P mentions including a tractor in their contest kit next year. They said, "We didn't get on top of the hill until ten minutes after the contest had started, due to the slippery access track". At G2TQ/P, "Mud on the field was four inches deep".

Miserable Job

Having reached the site, the second problem was erecting the antenna mast. From G0MCG/P, "The rain made setting up a miserable

job, especially in view of the fact that we usually get some sun-bathing in on this contest!" Many groups set up the station the evening before the contest. A single operator G10EJN/P, who backpacked to the summit of Slieve Binnian in deteriorating weather, commented, "By 11pm the wind was fairly howling and the rain really heavy".

Pity those leaving the tent to manually rotate the antenna, like G0MWV/P, "Rain, thunder and lightning didn't help and were a great discouragement to standing outside turning the antenna by hand. So it didn't get turned very often". Entering as a single operator for the first time, G7EKH/P, found that "In the occasional gaps between heavy showers I was able to take the radio to the bottom of the mast, making it easier to rotate the antenna". A few came off lightly, like this, GX4AAX/P

had "Just a few spots of rain".

The major problem presented by the weather was a serious operational one, reported by GW6ORE/P, "Things started to go wrong early on when we were plagued by 'rain static' that lasted for some hours and this caused a constant S5-S9 signal, masking all but the strongest stations". "The last straw", at G6ESJ/P, "when the static level on the receiver rose steadily from S5 to S9, wiping out all chance of contact other than a 40 over 9 signal". Even the winners, G0MCG/P suffered from this effect for some of the time.

Dodgy Lightning

Lightning, such as at G3UAX/P, "The last few hours were very dodgy with heavy lightning. Twice we had to abandon the station and retire to the car". From G6ESJ/P "Due to ever increasing risk of lightning strike we were forced to shut down the station for an hour".

Having erected a tent on a hill-top, it can become rather popular in such conditions, "Great fun, together with all the hill walkers who took refuge in our tent during the worst of the weather" said G6DOD/P.

Most groups seem to have kept their spirits up, despite the conditions. Nevertheless, there were disappointments, as summed up by G6ESJ/P. "We had a higher mast, a better receive capability radio, a speech processor for more 'punch', a digitised CQ and, a better site - all this thrown, almost literally, to the winds by good old Mother Nature".

Conditions

The general view seems to be that propagation conditions matched the weather, and coupled with lower than usual activity, partly again due to the weather, many operators found it quite hard going to keep up a stream of contacts.

For example G2HR remarked "Conditions this year, seemed particularly poor. Some squares (e.g. IO70, 71, 72, 73) seemed unreachable by our, IO91, station. No signals from EI, GI or GM, and those stations worked in distant squares, seemed to be fading

Certificate Winners

Position	Group/Operator	Call sign
Overall Winners	Mansfield Contest Group	G0MCG/P
Runner-up (Leading single operator)	Chris Easton (solo Bug Basher)	G8TFI/P
3rd Place Leading single-antenna station (Runner-up single operator)	Rugby Amateur Transmitting Soc. Doug Mellor	G7APD/P G0GXT/P
3rd placed single op. Leading Welsh station	Chris Partington	G0CLP/P
Leading Scottish Station	Hugh Penny	GW1IKN/P
Leading Irish Station	Civil Aviation Authority RS	GM4CAA/P
Leading fixed station	Michael Quinn	EI3GF/P
	Steve Malpass & others	G00GS

Leading multi-operator stations

Pos	Name	Call	score	QSO	Squ	Loc	Ant	asl	TX/RX
1	Mansfield Contest Group	G0MCG/P	11808	328	38	IO93EC	4x14P +2x17Y	380	IC251E
3	Rugby A.T.S.	G7APD/P	7350	245	30	IO93AD	4x17Y	460	FT225RD
4	R. Thornley & S. Mayer	G1NUS/P	6832	244	28	IO93AB	2x8Y	405	FT290R
5	Roger Stansfield & Colin Potter	G3UAX/P	4888	188	26	IO91GI	2x17Y	300	IC271E
7	Martyn Wright & Neil Underwood	G4RLF/P	4008	167	24	IO80VX	6Q	275	IC211E
8	Oldham Radio Club CG	G10RC/P	3860	193	20	IO93BJ	BJ4x9Y	35	FT290R
11	Stroud District ARS	G4SR5/P	2560	128	20	IO81WS	16Y	265	FT221R
12	South Essex ARS	G4RSE/P	2400	120	20	JO01EN	19Y	55	IC271E
14	Mark Wheeler & others	G6DOD/P	2346	138	17	IO91DI	?	?	FT221R
16	Civil Aviation Authority RS	GM4CAA/P	2310	105	22	IO85DI	17Y	725	FT290R

badly". There was a general lack of activity on the continent, noticed even at G6HH/P on the south coast at Hastings: "The continentals all seemed to have gone out for the day with not one foreign station in spite of our calls in that direction".

One reason for lack of activity was the very good conditions on 50MHz, attracting many operators, particularly on the continent. Confirmed by PE1EWR, "Unfortunately we had to deal with a major opening on 50MHz which took away much (at least my) attention". Like others, G0FUW/P, remarked "A pity the 'lift' didn't get up to 144MHz - that would have livened things up!" In fact there were some rumours of Sporadic-E openings to OH and I, but no one in the contest has such a contact in their log, although several operators report just-missed contacts with F stations which had Es-like properties. At GW60RE/P, "Called by a very strong French station, FC???/P. We exchanged details but before we could confirm his callsign he disappeared. He gave us RS 59 from J010IA - might have been an Es contact".

Poor propagation and fading signals required determination to exchange all the necessary information. GM1FML/P says "I must congratulate the YL on G0GRI/P for her competence and patience as we exchanged information almost letter-by-letter. A lot of inexperienced stations would not have persevered." He went on to tell of another station who gave up as soon as callsigns could not be exchanged in one go.

Contestants, such as G00VA/P, noticed the poor propagation, "I think that this was my lowest entry since first entering this contest in 1985". Newcomers continue to be surprised by the level of activity. G7HME said "The band really came alive! I have never heard so much activity in the s.s.b. section before, and there were plenty of people happy to reply to my 'CQ Contest' calls."

Stimulating

Other groups trying out contest operating for the first time found it a positive experience. For example, G0LAR/P said "If one word had to be

used to describe the event and its outcome, it would have to be stimulating". At GW2F0F/P too, the remark was, "It is the first time this club has ever entered a contest. All of the members operating the station, and those who visited us perched on top of a hill enjoyed it thoroughly".

"As always, a good-natured friendly contest. The XYL says it's a conspiracy putting the contest on Father's Day, though", was how G0FUW/P found the event. OK Steve, but what would she say if we put it on Mother's Day?

Power supplies for portable operation often pose problems, and not just for running the transceiver. A dismay at GW7HMY/P, "On arrival (on the summit of Halkyn mountain) we decided to make a nice hot cup of tea. The kettle took just under one hour to boil!" A novel approach tested by GM1FML/P, "We tried out a solar panel recharger on the hill and got more than 500mA for a large proportion of the day - considering economising on dryfit batteries next time".

"All did not go to plan", said G7APD/P, "the accident happened whilst hoisting up four 9-element Tonnas on a 12m mast, 40 minutes before the contest started. A guy rope fouled on a nearby fence. It all seemed to happen in painful slow motion. Lessons have been learnt. Fortunately four 17-elements on a 18m mast had been erected the evening before".

Operators at G0LAR/P were spending the night before the contest on their site when, to their surprise, "At 4.15am about 40 schoolgirls wandered through the site in single file, as if it were the most common occurrence in the world". At G7EKH/P though, "The only disturbance was a sheep which kept trying to eat my guy ropes". (Try whispering 'Mint sauce' in its ear Ed.)

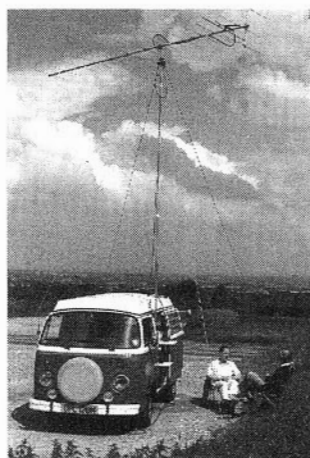
Next Year

As ever, most entrants in this years contest are eagerly looking forward to next year. It takes more than awful weather and flat propagation conditions to put off the keen P W contesters! As G140WA/P said, "Weather: terrible, stuck in a cloud for hours. Conditions: terrible,

Square	Name of group or operator(s)	Callsign	Contestants in square
I062	Michael Quinn	E13GF/P	1
I063	John O'Sullivan	E16AB/P	1
I064	Gerrard Elliot	G140WA/P	1
I070	Bideford Bay ARC	G0JKD/P	2
I071	Pembroke & District ARC	SW20P/P	1
I073	John Hulse & Robin Trangmar	GW60RE/P	1
I074	Fred Sweeney	G10EJN/P	2
I076	Adrian Beale & Stephen Hill	GM1FML/P	1
I080	Martyn Wright & Neil Underwood	G4RLF/P	7
I081	Hugh Penny	GW1IKN/P	7
I082	Chris Easton	G8TFI/P	3
I083	North Wales Wafflers	GW0NWR/P	12
I084	Steve Hartley	G0FUW/P	3
I085	Civil Aviation Authority RS	GM4CAA/P	3
I086	Menstrie Morse Group	GM1RZB/P	2
I090	Peter Thompson	G8DDY/P	2
I091	Roger Stansfield & Colin Potter	G3UAX/P	10
I092	Charmwood AR Contest Club	G00CE/P	10
I093	Mansfield Contest Group	G0MCG/P	10
I094	Great Lumley AR&ES	G1JDP/P	3
I095	Northumbrian ARC	GX4AA/P	1
J000	Hastings Electronics & RC	G6HH/P	1
J001	South Essex ARS	G4RSE/P	4
J002	High Wycombe Contest Group	G1SAS/P	2
J011	Frank Laenen	PE1EWR	1
J022	Gerard Nieboer	PA3EKK	1

Stations using a single antenna

Pos	Group or operator(s)	Callsign
6	Doug Mellor	G0GXT/P
7	Martyn Wright & Neil Underwood	G4RLF/P
9	Chris Partington	G0CLP/P
0	Hugh Penny	GW1IKN/P
1	Stroud District ARS	G4RSR/P
12	South Essex ARS	G4RSE/P
13	I.L. Carter	G0GRI/P
14	Adrian Jordan	G0HAS/P
16	Civil Aviation Authority RS	GM4CAA/P
17	High Wycombe Contest Group	G1SAS/P



a real slog. But I still enjoyed the contest and hope to do it again next year!"

There is one common theme amongst the usual plea for another similar event next summer, as G0MCG/P put it, "next year please organise better weather". Well we

Members from Sutton & Cheam RS, during the contest.

can't do more than our usual policy of a weekend close to midsummer day, which is simple next year as the solstice falls on a Sunday, so we provisionally set the date of the next QRP Contest as 21st June 1992 (but weatherman Jim Bacon G3YLA's working on it).

And the 1992 contest should be a rather special one. G4ARI/P, a real veteran of the P W QRP contest, has noticed this, so let's give him the final word: "I have followed the contest since its inception, and am disappointed to see the number of stations taking part dropping each year." (Actually Tim, the lowest year was 1989). "It's an ideal contest for all types of station from the hardened contesters to the recently licenced. If my calculations are right, next year's P W 144 MHz QRP Contest will be the 10th.

G4HLX says:
"What could be more befitting such an anniversary than a record turn-out for 1992".

Leading single operator stations

Pos	Name	Call	score	QSO	Squ	Loc	Ant	asl, m	TX/RX
2	Chris Easton - One Bug Basher Contesters	G8TFI/P	8769	237	37	I082LB	4x9Y	?	IC202
6	Doug Mellor	G0GXT/P	4475	179	25	I093AF	13Y	500	FT290R
9	Chris Partington	G0CLP/P	3322	151	22	I093AF	8Y	365	TS700G
10	Hugh Penny	GW1IKN/P	3173	167	20	I081JO	8Y	480	FT290R
13	I.L. Carter	G0GRI/P	2363	139	17	I091FN	13Y	240	TR751E
14	Adrian Jordan	G0HAS/P	2346	138	17	I091CL	13Y	270	FT290R
23	Tony Crake - Old G1GVACG	G00VA/P	1744	109	16	I091GI	13Y	280	TR751E
26	Steve Hartley	G0FUW/P	1540	77	20	I084IN	7Y	850	FT290R
31	Dr. Jazz	G1JGE/P	1224	72	17	I084WR	122	455	TR9130
34	John O'Sullivan	E16AB/P	1140	57	20	I063VF	9Y	535	FT290R



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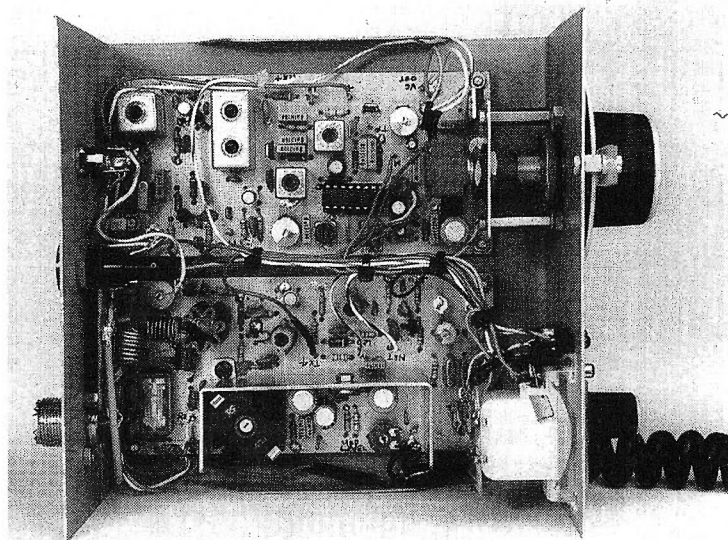
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H.P. TERMS



The PW Beaver A Simple Transmitter-Receiver For 50MHz - Part 3

There aren't many components on the metering and filter p.c.b.s, but they are a little different from the others. The circuits are shown in **Fig. 3.1**. They differ in construction from the main boards as they employ surface-mount techniques.

It's not a difficult job, but you should carefully orientate the semiconductors using short lead-outs. Don't forget that you're working 'the other way round' now!

The meter board, p.c.b. 4, **Fig. 3.2**, is actually mounted directly on the back of the meter itself. The p.c.b. is secured by using double-sided adhesive tape. The variable resistor R43 is used to set the relative power indication on the meter.

The filtering board, p.c.b. 3, also shown in **Fig. 3.2**, uses the same surface-mount approach as the metering board. The inductor, L12 is wound using 22s.w.g. enamelled wire, 5mm diameter. This board is then supported by 6mm pillars, on the antenna socket mounting bolts. Connection to the antenna socket is then via a short wire link.

Boxing The Beaver

Mark and drill the box to suit your own requirements. The prototype I built was put into a home-made case, similar to the Maplin Electronics 231 box.

I fashioned a dial from aluminium which was then mounted on the front of a Jackson slow-motion, using the drive's flange. The drive itself is mounted on the case front panel, I then used stand-off pillars to correctly place a mounting plate in position for the receiver's variable resistor tuning control.

Connecting Up

Wire up both boards using insulated wire for the d.c. and audio volume control. Miniature coaxial cable should be used for the r.f. connections to the receiver input and the filter boards.

The d.c. power supply input is made by a 2.3mm jack socket, with the polarity protection diode being wired directly from the fuse holder to the case. Connection to the loudspeaker (if you use an external speaker) is by a 3.5mm jack socket mounted on the rear panel. The microphone can be wired directly to the p.c.b. or via a socket.

After the usual checks, and after making a meter check for shorts, connect up the power supply. If the current exceeds 200mA on receive or 400mA on transmit, switch off and look for the reason why!

Transmit Testing

To start the transmit testing, you should set all variable capacitors to half-mesh. The cores of L7 and L8 should be adjusted so that they are flush with the tops of their respective formers. The core of T4, the modulation transformer, has little effect and can be left flush with the top of the ferrite.

Next, operate the 'Net' button, and with a diode probe, adjust L7 for maximum reading on the gate of TR4. Connect a power meter to the antenna socket and operate the p.t.t. switch on the microphone. Now adjust L8, C54, C55 and C69 (C69 is on the filtering board) for maximum reading on the power meter.

Now, it's time to work a friend on air, or use a

This month Mike Rowe G8JVE rounds off the basic Beaver transmitter-receiver with the description of the final power, S-meter and filter boards. Mike also suggests some further ideas for the project.

Fig. 3.1: Circuits of the filtering p.c.b. (left) and the S-metering and power output indication circuit (right).

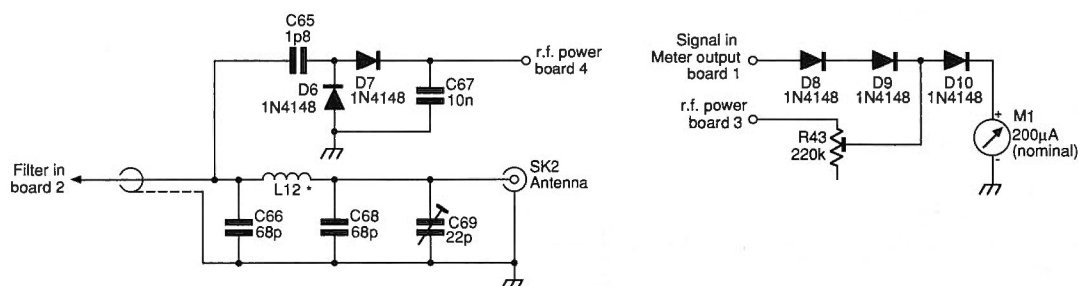
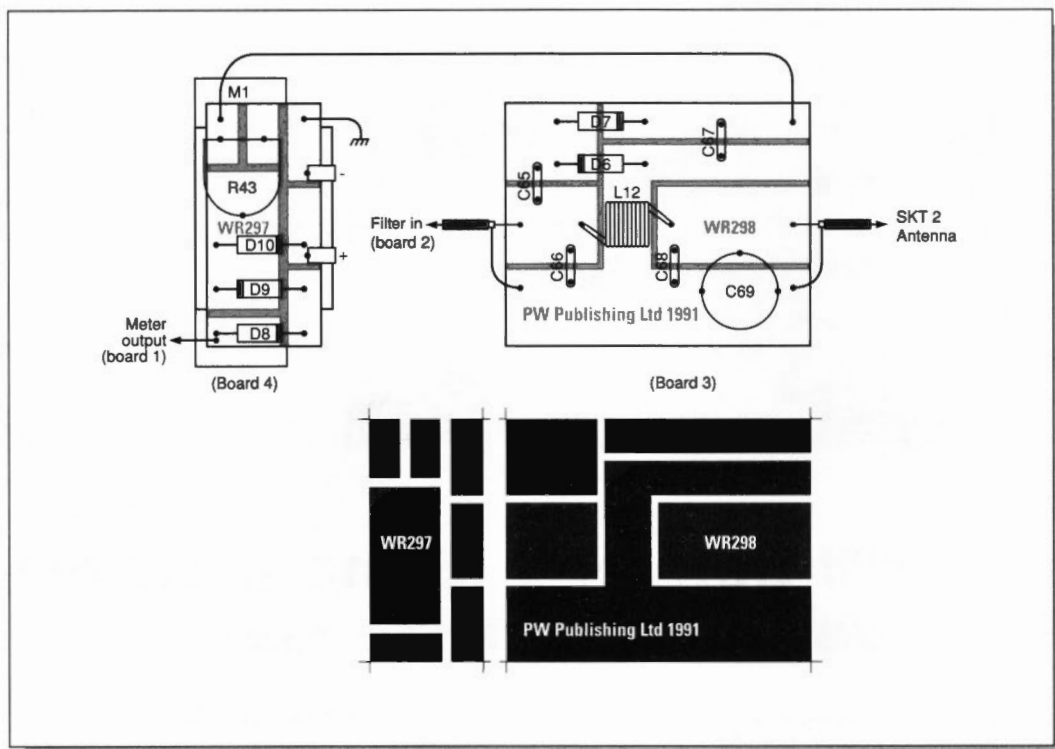


Fig.3.2: Surface-mount type p.c.b. overlay details for the metering board 4 (left) with the p.c.b. design (WR297). The surface-mount design and overlay for the filtering board (board 3) is shown above the associated p.c.b. design (WR298).



monitor receiver, to set the modulation. Increase the modulation level slowly, by adjusting R39 and slight adjustment of C54 to obtain the best modulation quality.

Finally, the power meter reading level on the front panel has to be set. This is done by adjusting R43 on the meter board, p.c.b. 4, so as to provide a two-thirds deflection reading on the scale.

That's it, you're already to go....see you on six!

Acknowledgements: I'm very grateful for the help provided by the Rev. George Dobbs G3RJV for help and ideas on the modulator. Thank you also to STS Communications for the loan of test equipment.

How Much? How Difficult?

£5 + p.c.b.s Intermediate

Shopping List

Resistor (rotary) miniature pre-set p.c.b. mounting
220k Ω 1 R43

Capacitors

Disc ceramic

1.8pF 1 C65
68pF 2 C66, 68
10nF 1 C67

Variable

Miniature foil trimmer

22pF 1 C69

Semiconductors

1N4148 5 D6, 7, 8, 9, 10.

Miscellaneous

(Components not described in previous shopping lists)
Coaxial socket, miniature coaxial cable, double-sided fixing tape.

Shopping For The 2N3553

Sources for the 2N3553 transistor are:

J. Birkett
25 The Strait
Lincoln LN2 1JF
Tel: (0522) 520767.

Raedeck Electronics
Bannerly Road
Garretts Green
Birmingham
Tel: 021-784 8655.

Mainline Electronics
PO Box 235
Leicester LE2 9SH
Tel: (0533) 777648.

PW Beaver Modifications And Up-dates

There are a few modifications that can be made to improve the linearity of the *PW* Beaver transmitter. The system as presented, has a rising audio frequency response, chosen for communications clarity.

Due to the spread of capacitor tolerances, some units may exhibit a slight 'ringing' tone on the transmit audio. This is due to the inductance of T4 and the capacitors C50 and C51.

The latter two components may be reduced to about 1000pF each without undue changes to the circuit action. This value is the recommended minimum which you should use. To increase the low frequency audio, the value of C63 may be increased to a maximum of 470µF.

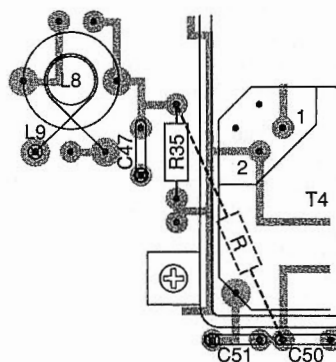
Also due to component value tolerances, some units may not be very linear on loud sounds, producing a rather 'woolly' transmit quality. This may be due to inadequate drive from the m.o.s.f.e.t. TR5, on speech peaks.

Adding a resistor of about 100-150Ω, between pin 4 of T4 and the junction of R35/C47 should improve this problem. The two locations are shown in **Fig. 3.3**.

If you attempt this modification, the value of R32 should be changed to about 22kΩ. This is only to reduce the operating point, and the overall power dissipation of TR5.

To increase the r.f. drive to TR6 even further, you can change the value of R36 to 1kΩ, and R37 to 100Ω. This modification can cause some instability in the p.a. stage, and so a slightly different 'tune-up' procedure must be used. This new procedure is carried out after the unit is fully built up.

Fig. 3.3: Modification details on Beaver transmitter p.c.b. to improve modulation (see text above).



New Tune-up

The new tune-up procedure is much easier if a second *PW* Beaver is available to listen to the signal produced. Should you be unable to get hold of a second unit, remove the 'signal in' connection of the receiver board, and wire the receiver permanently on, and then tune into your own transmitted audio.

If an audio signal generator is available, this makes the testing much easier. Begin by injecting an audio signal of **no more** than 100mV at 1kHz into the microphone input.

Reduce the modulation to zero with R39, then adjust C54 and C55 for a maximum r.f. output (500mW-1W). Increase the modulation until audible distortion may be heard in the received audio.

Readjust C54/55 to try to reduce this distortion, even if this reduces the r.f. output power. If all is well, the displayed r.f. power on M1 should increase by a half to one division of the meter (5-10%) on modulation peaks.

Second Oscillator

The receiver tuneable second oscillator is not on the **high** side of the 2-4MHz first i.f. This fact was incorrectly stated in the first part of the project. The oscillator is actually on the **low** side.

When setting this oscillator, by measuring the frequency with a digital counter, try to get a range of 1.545MHz for a 50MHz received signal and 3.545MHz for a 52MHz signal. Of course, everything is pro rata in between (2.545MHz for 51MHz received).

Beaver Modulation

As presented, the *PW* Beaver needs about 30mV(r.m.s.) audio signal for full (100%) modulation. Most dynamic microphones only provide this level at sound levels, of which most of us are not capable!

There would be little chance of overmodulating and causing 'splatter' with this combination. However, if you are using an amplified microphone, then care must be taken to limit the speech peaks to keep modulation below this level.

A suitable circuit for a 'Microphone Pre-Amp With AGC' was published in the August 1984 issue of *PW*. Reprints are available from the editorial offices.

We have s.s.b. receive capability under construction, which we hope to bring out in a future issue. We also have a 25W p.a. under way for this or any other low power transmitter, again to be presented in a future issue.

Mathematics For The RAE

This month Ray Fautley G3ASG, having finished off the basic theory, turns his hand to show the use of maths in practical everyday situations.

Before I go on with the everyday uses of mathematics, I'll put you out of your misery by giving you the answers to the problems I left you with last month.

- (i) a
- (ii) b
- (iii) d

The last question seemed a bit of a stinker, but it was essentially the same as calculating the resonant frequency of a tuned circuit. So, in having changed it around you could now find the inductance, or capacitance to resonate at a particular frequency. It really wasn't that bad, now was it?

Units

We'll begin applying our maths to problems by first considering the (rather boring) UNITS in radio and electronics, as well as many others subjects.

They are known as SI UNITS (Système Internationale d'Unités) and are shown in Table 1. The SI units are BASIC UNITS and are those nearly always used in formulae found in radio text books. Examples encountered in everyday practical problems, however, are very rarely in BASIC UNITS but in larger (multiples) or smaller (sub-multiples) of the basic units. The most commonly used of these appear in Table 2.

As the formulae relating the various electrical units are usually given in BASIC UNITS, it is most important to ensure that practical values in examples are ALWAYS converted into basic units BEFORE commencing any calculation. Failure to do this could result in errors of several orders of magnitude in answers to problems.

What does 'Orders of magnitude' mean? One order of magnitude is either 10 times or one tenth of the unit. So an error of several orders of magnitude, could result in an error multiplying or dividing the correct answer by hundreds or thousands of times! Obviously a pitfall to be avoided!

Let's look at some examples of converting the practical values encountered in everyday problems into the basic units required when making calculations.

(i) A resistor is stated to have a resistance value of 27k Ω . What is its value in BASIC UNITS?

Table 2 shows us that k Ω is the same as the BASIC UNIT $\times 10^3$. So expressing 27K Ω in BASIC UNITS is $27 \times 10^3\Omega$, or another way, it is 27 000 Ω .

Another example:

(ii) A voltage is given as 2 μ V.

What is its value in BASIC UNITS?

From Table 2, μ V this is the same as the BASIC UNIT $\times 10^{-6}$

So 2 μ V in BASIC UNITS is the 2×10^{-6} V, or two millionths of a Volt.

(iii) A frequency is given as 14.2MHz.

What is its value as expressed in BASIC UNITS? Table 2 shows us that MHz is the same as BASIC UNIT of Herz (Hz), multiplied by 10^6 . So 14.2MHz in BASIC UNITS is 14.2×10^6 Hz, or 14 200 000Hz.

(iv) A capacitance value is stated as 50pF. Express its value in BASIC UNITS. From Table 2, pF is the same as the BASIC UNIT $\times 10^{-12}$. The value of 50pF in BASIC UNITS, is 50×10^{-12} F, or 50 million-millionths of a Farad.

Physical Quantity	Symbol	Unit	Symbol
Electromotive Force	E	Volt	E
Potential Difference	V	Volt	V
Electric Charge or Quantity of Electricity	Q	Coulomb	C
Electric Current	I	Ampere	A
Resistance	R	Ohm	Ω
Power	P	Watt	W
Frequency	F (or f)	Hertz	Hz
Capacitance	C	Farad	F
Inductance	L	Henry	H
Time	t	Second	s

Table 1: Basic Units used in electrical calculations.

Table 2: Basic units with sub-multiples and multiples, only the most common values have been shown.

$\times 10^{-12}$	$\times 10^{-9}$	$\times 10^{-6}$	$\times 10^{-3}$	Basic Unit	$\times 10^3$	$\times 10^6$
		microVolt μ V	milliVolt mV	Volt (V)	kiloVolt kV	MegaVolt MV
	nanoAmp nA	microAmp μ A	milliAmp mA	Amp (A)	KiloAmp kA	MegAmp MA
			milliOhm m Ω	Ohm (Ω)	kilOhm k Ω	MegOhm M Ω
picoWatt pW	nanoWatt nW	microWatt μ W	milliWatt mW	Watt (W)	kiloWatt kW	MegaWatt MW
				Hertz (Hz)	kiloHertz kHz	MegaHertz MHz
picoFarad pF	nanoFarad nF	microFarad μ F	milliFarad mF	Farad (F)		
		microHenry μ H	milliHenry mH	Henry (H)		
	nanosecond ns	microsecond μ s	millisecond ms	second (s)		

PW Special Offer

Older Methods

Although not so commonly seen nowadays, small capacitance values were often expressed in μF . For example, 0.0005 μF for the maximum value of a variable capacitor used for tuning. How do we express this value in BASIC UNITS?

Table 2 shows that μF is the same as the BASIC UNIT $\times 10^{-6}$. So we have 0.0005 $\times 10^{-6}$, now 0.0005 is the same as 5×10^{-4} , and putting the bits together, $5 \times 10^{-4} \times 10^{-6}$ BASIC UNIT $\times 10^{-6}$ or $5 \times 10^{-10}\text{F}$ (500picoFarads).

Thinking Caps On

Did you find Basic units not very interesting? A bit boring? Perhaps, they are a most essential building block to be mastered before continuing, so try these problems out now. The correct answers will appear in the next part of the series.

Problems in the use of BASIC UNITS.

(i) A duration of time is given as 34ns (34 nanoseconds). The time period expressed in BASIC UNITS?

- (a) $34 \times 10^3\text{s}$ (b) $34 \times 10^{-9}\text{s}$
(c) $34 \times 10^{-6}\text{s}$ (d) $34 \times 10^{-3}\text{s}$

(ii) A power level is quoted as 1mW. In BASIC UNITS the power is?

- (a) $1 \times 10^3\text{W}$ (b) $1 \times 10^{-6}\text{W}$
(c) $1 \times 10^{-9}\text{W}$ (d) $1 \times 10^{-3}\text{W}$

(iii) A coil is said to have an inductance of 7.5 μH . This in BASIC UNITS is?

- (a) $7.5 \times 10^{-6}\text{H}$ (b) $7.5 \times 10^3\text{H}$
(c) 7.5H (d) $7.5 \times 10^{-3}\text{H}$

(iv) A resistor has a value of 2.2M Ω . In BASIC UNITS it is?

- (a) $2.2 \times 10^{-3}\Omega$ (b) $2.2 \times 10^6\Omega$
(c) $2.2 \times 10^{-6}\Omega$ (d) $2.2 \times 10^3\Omega$

(v) A current of 25nA in BASIC UNITS?

- (a) $25 \times 10^6\text{A}$ (b) $25 \times 10^3\text{A}$
(c) $25 \times 10^{-6}\text{A}$ (d) $25 \times 10^{-9}\text{A}$

(vi) A frequency of 3kHz is the same in BASIC UNITS?

- (a) $3 \times 10^{-6}\text{Hz}$ (b) $3 \times 10^3\text{Hz}$
(c) 3Hz (d) $3 \times 10^6\text{Hz}$

(vii) A voltage of 1.5kV converted into BASIC UNITS?

- (a) 1.5V (b) $1.5 \times 10^{-6}\text{V}$
(c) $1.5 \times 10^3\text{V}$ (d) $1.5 \times 10^{-3}\text{V}$

(viii) A capacitor has a marked value of 220 μF . In BASIC UNITS its value is?

- (a) $220 \times 10^{-6}\text{F}$ (b) $220 \times 10^{-9}\text{F}$
(c) $220 \times 10^3\text{F}$ (d) 220F

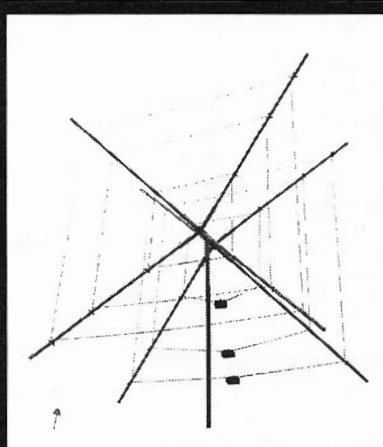
(ix) A current of 5A expressed in BASIC UNITS?

- (a) $5 \times 10^6\text{A}$ (b) 5A
(c) $5 \times 10^{-6}\text{A}$ (d) $5 \times 10^{-3}\text{A}$

(x) A resistance of 4.7k Ω in BASIC UNITS?

- (a) 4.7k Ω (b) $4.7 \times 10^6\Omega$
(c) $4.7 \times 10^3\Omega$ (d) $4.7 \times 10^{-9}\Omega$

*Fairly easy really, weren't they? If so, make up a few more for yourself. If not, go back to **Table 2** again and re-read the worked examples. Answers in the next part of the series.*



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You've seen the review in the November issue of PW, and here's your chance to join the activity on the less crowded allocations. Rob Mannion G3XFD and Tex Swann G1TEX think that the space-saving medium gain Nelson Cubical-quad antenna is an ideal way to start on v.h.f. So come on up and join the fun and save money!

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Reflections

This month, Ron Ham remembers the help given to him from an 'Uncle Elmer' to start off in radio.

This time I have three points to chat about, firstly, the value of an 'Elmer' to guide the young toward the world of radio, secondly, special thanks to the readers mentioned, more about the hazards of lightning and thirdly, (yes again!) the dangers of looking directly at the sun with the naked eye or with optical instruments.

Uncle Elmer

Our worthy editor, Rob Mannion G3XFD, referred to his 'Elmer' in the October 'Keylines' which reminded me of the uncle who encouraged me, at the age of 10, to build a one valve wireless receiver that worked somewhere in the short wave bands. This little 'bread-board' set with its single tuning coil, 120V high tension battery, 2V accumulator and pair of S.G. Brown headphones was my entry into the world of radio.

Briefly, three years later I started part-time work for a cycle and wireless dealer and at the age of 14, I began full-time employment in the industry. That was 50 years ago and the only difference being, that my 'Elmer' showed me not a hobby, but an interesting way to earn my living.

As many of you may know, the subject has never been a hobby to me. My 'Elmer' taught me to use tools and make things, never to be put off by complicated looking gear, "because someone had to make it in the first place", an appreciation of engines, instruments, model aircraft and the dangers of lightning.

By the time I had reached the age of 12, he had given me the 'hands-on' chance to operate cinematographs, ranging from 9.5 to 35mm machines, charge large numbers of accumulators and to see the maintenance and workings of traffic lights. My 'Elmer' enjoyed his life-long work in the 'electronic' world and told me many times not to be 'narrow minded', because, "one day my boy, sets won't need repairing and you won't have a job."

Lightning Experience

The main theme of my October column was thunder and lightning which prompted several of you to tell me about your personal experiences during such storms. Unfortunately I would have required a few more magazine pages to have included all the details you kindly sent.

However, some of what I have used will make your hair stand on end, hi. One evening Wyn Mainwaring (Llandeilo) was walking on the headland by Watchet, "watching some aerial pyrotechnics up country - Hinkley Point way". Suddenly and most vividly, he saw "an orange streak go across the Bristol Channel, hit something around Barry and then streaked back again, 'earthing' its fury on the Quantock Hills." On another occasion while Wyn accompanied a small party of radio enthusiasts from the car-park to the entrance gate of a radio rally on the Isle of Wight, a "large lonely black cloud" drifted by. Although he gave thought to the charge it might contain, the cloud passed by a long-wire antenna without incident. Soon they were in the display area where Wyn was keen to see a genuine crystal set, with a 'cat's

whisker' and crystal detector, working on the counter. This receiver was so broadly tuned that both Radios Solent and Victory were audible. However, as he reached for the 'heavy metal-cased old' headphones they emitted a hefty crack momentarily before "the deafening roar of a lightning strike on a tall tree barely half a mile away was heard." Later, Wyn picked up the "cans" and the crystal set was still working!

Local Colliery Hit

Back in 1959, David Williams (Blaenavon) was a shift electrician at a local colliery when, early one afternoon, the winding gear headframe received a direct hit. "This was a big structure, the wheels at the top being 6m in diameter and 27m off the ground," said David and added that the effect of this strike was "one very frightened electrician", a strong smell of ozone and a hole punched in the side of the 76/406mm thick steel tank of the incoming 11kV oil circuit breaker. The latter was in a building about 100m from the headgear and in addition to the supply going off there was burnt switchgear contacts and carbonised insulating oil.

Damaged Audio

While doing service work, Harry Leeming (Blackburn) had two, expensive, tuner-amplifier units in for repair following thunder-storms. The first had received a direct hit and the second "Just went off" during a storm. The mains and antenna leads of unit one were "strips of copper melted on the wall", the back was blackened and inside, "the short length of coax from the socket at the rear to the tuner head, had unsoldered itself at both ends."

There was not a mark on unit two, but, after an hours examination, Harry found every diode, transistor and f.e.t. that he tested was blown and consequently the equipment was written off. Personally, I think a 'write off' is the best course of action in such circumstances because, if Harry had replaced all the faulty parts and got it working, what would be the life expectancy of the remaining components that survived the strike?

Sad Occasion

My October column reminded a local CB enthusiast, Leon Greenfield about a sad occasion, some years ago, when he went to feed the cows in the morning and found several of them dead under an oak tree that had been struck during an overnight storm.

It seems that the animals were sheltering beneath the branches from the frightening conditions. Furthermore, I am told that lightning also killed some cattle on the South Downs during that violent thunder storm in July 1989 when I took the photographs featured in my October column.

Sudden Thunderclap

"The damage caused is unbelievable", said Maurice Schofield (Broadstairs), who suffered a strike in July this year. Following a sudden thunderclap,



Fig. 1: Lightning arrester on church spire.

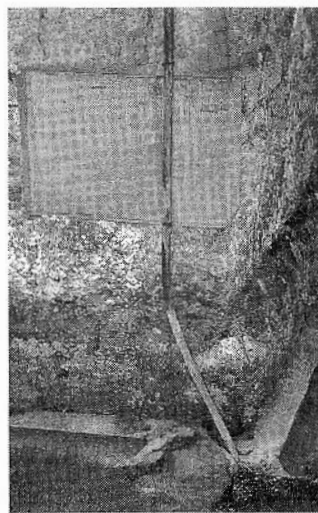


Fig. 2: Lightning conductor entry to earth.

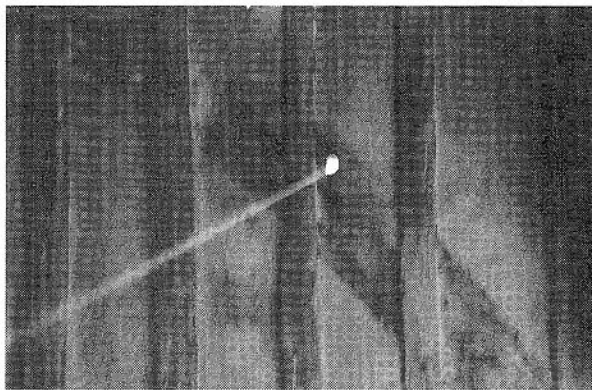


Fig. 3: Beam of sunlight entering a hole in a wooden roof timber.

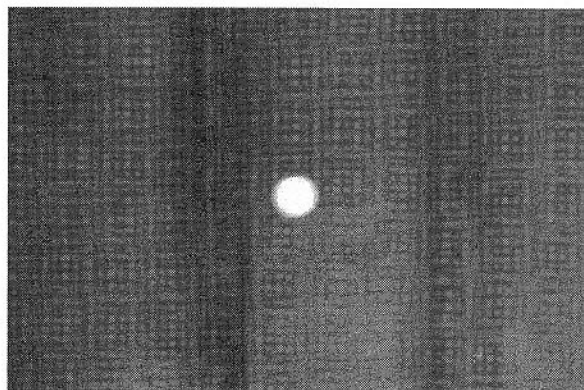


Fig. 4: Unfocussed image of the sun on the opposite wall.

Maurice quickly operated his h.f. antenna switch to earth everything, disconnected his IC251E, but forgot to remove the antenna from his IC490E.

A few minutes later there was a large flash in his garden which brought down his 'W3DZZ'. The lightning flashed over a double pole switch-fuse on his isolating transformer, tripped the m.c.b. on that circuit, blew the interface on his 144 and 432MHz equipment and his masthead pre-amplifiers, damaged the two Icoms and a portable TV in the kitchen and wrote off the p.a. transistor on his 432MHz 60W amplifier. Maurice said the cost was staggering, and added, "I am still not sure how the lightning damaged the 251E as the antenna was disconnected, it must have found its way back via the power supply, which, by the way was also destroyed".

Close Call

Peter Ingram, Steven McDonald and John Sellars had a close call one sunny afternoon while operating a Scout JOTA event from Lapwing Lodge high up above Paisley. As John commented on the large amount of static that was appearing on the bands, the others noticed a spark hop across an unused PL239 connector, and someone remarked on how dark and cloudy it had suddenly become.

They were using a dipole strung between a chimney and a large metal flag pole. Peter told me that while Steven was operating, "he put his hand towards his rig and suddenly there was a large flash as a spark leapt from the rig to his hand!"

Fortunately he was unhurt and there was no damage to the set. They reckon that the lightning struck the 'earthy' side of the dipole and discharged itself through Steven. "The voltage must have been quite massive to jump the large gap (a couple of centimetres) to his hand and then he was, I suppose, lucky not to be actually

holding the metal of his rig," said Peter.

While the storm lasted they saw several discharges from the "now removed plugs" to the metal radiator over which the leads were hung. About the latter Peter wrote, "this could be static building on the antenna during the storm, but is that not the cause of lightning itself? There is the old saying that lightning never strikes twice, but we saw more than one discharge, so could antennas attract lightning?". I wish we knew the answers to that one Peter!

Earthing

In August and September, Joan and I visited a number of village flower shows in East and West Sussex. We used the occasions to take a closer look at the lightning conductors fitted to church spires. They all appear to have similar systems, an ornamental 'arrestor' point at the top and a hefty copper tape-like down lead, Fig. 1. This makes its entry to earth and no doubt some form of ground plate or radials at the bottom, Fig. 2.

George Garden (Edinburgh) remembers his family having an "aerial change-over switch" with one line connected to an angle-iron

bar "dug deeply into the gravel outside the lounge window."

Joan's Suggestion

"What about that for your column", was Joan's suggestion while we were looking at a reconstructed medieval house at the Weald and Downland museum, near Goodwood, on September 15. She had spotted a beam of sunlight entering a hole in a wooden roof timber, Fig. 3, producing an unfocussed image of the sun on the opposite wall, Fig. 4. You may have seen something similar through a crack in the blinds or curtains of a darkened room. Such shafts of light are bright enough but, for example, imagine the injury that would be done to your eyesight and brain if such a beam came through a telescope, amplified and focused to a fine point by the instrument's object glass and eyepiece. Joan further suggested that if we occupied this particular house, the area of wall seen in Fig. 4, could be carefully scribed to make some form of "solar-beam clock".

Solar Observations

Patrick Moore (Selsey) kindly sent a drawing, Fig. 5, of the chain

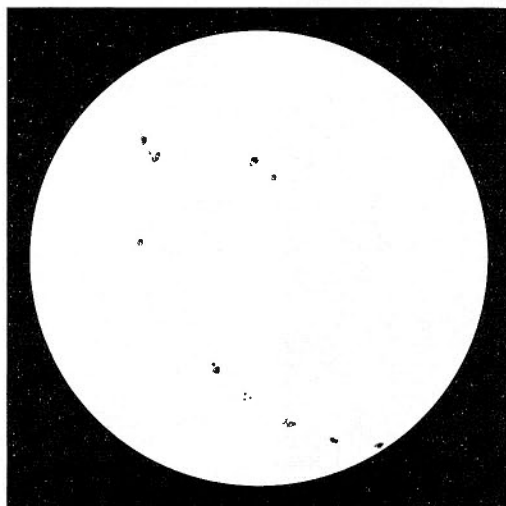


Fig. 5: Chain of sunspots observed by Patrick Moore on September 12.

of sunspots that he observed, by the projection method, at 0815 on September 12 and there is little doubt in my mind that had Fig. 4 been in focus, Joan and I would have seen a similar number.

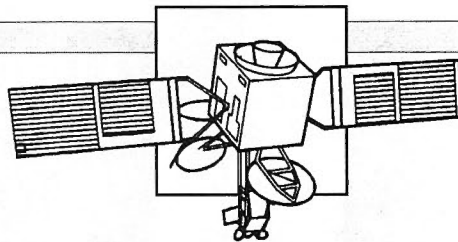
Ted Waring (Bristol) projected the sun's image and counted 22 sunspots on August 26, 20 on September 6 and 15 on the 19th. In Plymouth, **Clive Brook**, using a 60mm refractor, 25mm eye piece and projection screen, observed two sunspot groups on September 4, 5, 6, 7 and 26, three on the 17th, 18th, 20th and 22nd, four on days 8, 9, 10, 21 and 25, five on the 12th and 13th and six on the 15th. Depending on the movement of cloud and the amount of haze, Clive's observation times varied throughout the day

Tropospheric Opening

Weather conditions were right for the tropospheric opening which occurred during the last week-end of August. Friday the 30th was "livened up" for 14-year old **Michael Larsson** (Cheadle) when, between 1010 and 1330 he tuned through Band II (88.75-106MHz) and received signals, both mono and stereo, from stations in Denmark and Germany and a wide variety from England and Wales.

He identified transmissions from Denmark's Radio P1 and P2, Aurich, Deutschlandfunk and Hessischer Rundfunk in Germany and his UK log of BBC and/or ILR stations specifically mentions Hull, Holme-Moss, IOM, Lancashire, Leeds Llangollen, Liverpool, Manchester, Merseyside, Moel-y-Parc, Preston, Stockport, Stoke-on-Trent, Winter-Hill and Wrexham. Between 1500 and 1600 on the 27th, **Roy Patrick** (Macclesfield), using an Audioline 415 portable, heard Century Radio from Dublin and while on holiday in Caister, he logged Belgium's 'BRT2' each day from September 7 to 14 and Hull's Viking Radio on the 9th and 12th.

Reflections



Mars Missions

Further to last months news on the proposed AMSAT-DL MARSAT, it has been learned that a United States presidential panel has recently introduced a programme aiming to land Americans on Mars by the year 2014. The plan included the establishment of a permanent human settlement on the moon and the use of nuclear powered rockets to launch manned interplanetary missions. In addition to providing human explorations of these worlds, the concept included the construction of moon-based solar electric power generating stations that will use lasers and microwaves to beam energy back to Earth. As the Americans, like the Russians, are keen on both the social and technical advantages of having amateur radio on all of their space missions, those of us still around can look forward to some very long distance DX in 23 years time!

AO-13 Operations Update

The OSCAR-13 has been functioning particularly well recently, and

SATELLITE SCENE

by Pat Gowen G3IOR

This month Pat Gowen G3IOR catches up with the latest news of the old favourite OSCAR-13, covers some of the functions of the most recent amateur spacecraft, mentions plans for the future, and provokes some thoughts as to just what does constitute an amateur satellite.

during the solar disturbances of late August and early September was the only 'band' supporting DX. It provided fully effective daily contacts between myself and G3LDI whilst he was with N7ZL in Washington state, when all the h.f. bands failed the attempted schedule.

John Branegan GM4IHJ reports that Oscar-13's perigee had fallen to 771km by 29 August 1991. While this indicates a slight reduction in the steepness of AO-13's Kamikaze dive, it is not as yet very reassuring. The

present descent rate of 1.2km per day will, even if it decreases considerably, bring OSCAR-13 down to the point where though its dash to earth has ceased, the satellite's low altitude susceptibility to drag will prevent it recovering and re-attaining a safe altitude. Some micro software has problems in dealing with high eccentricity orbits, and the original W3IWI iteration loop may fail if AO13's eccentricity gets much higher. Binary substitution is a much safer way to do this calculation, and this is to be recommended in future Phase-III type software.

James Miller G3RUH, explains the future AO-13 operations and the schedule to the end of the year. From September 18 until December 12 when the satellite will have an ideal pointing of 180/0°, and thus provide excellent transponder communications. It will be in Mode B from Mean Anomaly 000 to 095, Mode JL from MA 095 to MA 125, except from November 17 to December 25 when it will be in Mode JL from MA 125 to MA 130 with the B mode transponder turned off. Mode S will appear from MA 130 to MA 140, and Mode B will come on again from MA 140 to MA 256. The omni-directional antennas will be used from MA 230, through perigee until MA 030.

The planned OSCAR-13 re-orientation to Blat/Blon 180/20 was completed on August 15 when the transponder schedule was changed to provide continuous Mode B operation. At this attitude the angle of the sun to the solar panels was 31°, resulting in an effective illumination of 100 x Cosine 31, i.e. 86% of the possible maximum. With the satellite antennas pointing 20° out of the orbit plane, the 'squint' produced gave very poor antenna-to-earth pointing angles indeed. To improve this situation, the attitude latitude was steadily reduced by magnetorquing by just 2° at a time, with the solar cell illumination consequently improving about at some 4% per week. By September 18, when the Sun angle fell to below 30°, Modes JL

and S were able to be restored.

James wrote, "As the attitude latitude was lowered the Sun angle was implicitly worsened, ultimately reaching 43°, or 73% illumination. This is the poorest value at which we have ever operated AO-13. However, tests via the Whole Orbit Data collection facility showed that the battery remained adequately charged (only just!) during the heaviest usage at the weekends".

The implication of these tests is that during future attitude changes over the next two years the out-of-plane ALAT values can be restricted to about +10° instead of the +25° which had been feared, so ensuring continuous good service on Mode B at these times.

James G3RUH is requesting feedback on the feelings of some users who have stated that too much time is devoted to Mode L, a transponder said by some to be used "too little by too few". Peter DB2OS, Graham VK5AGR, James G3RUH and other interested stations in the control and command network would welcome constructive discussion about this, and any suggestions of alternative ways of structuring the schedule are welcomed.

James points out your need to remember the following limitations and constraints that must apply in your considerations of the proposed schedule, viz....

- 1: Modes L and S are only useful when the squint angle is less than 20°.
- 2: The S mode transponder is only on when Mode B is selected, and works far better if Mode Bs passband is off, e.g. no 435 to 145MHz transponder activity.
- 3: Mode S beacon only on when L is on and J is off.
- 4: Mode J can only be on when Mode L is on.

When all the feedback is in by the end of the year the command team will assess the suggestions, and then see how best to reconfigure the flight software to accommodate the ideas received where possible. If no feedback results, then of course no changes will occur, so it is up to the users in the best possible decisive democratic way possible. You can contact James via packet as G3RUH @ GB7DDX, Peter as DB2OS @ DK0MAV and Graham as VK5AGR @ VK5WI. You may write to them QTHR, or send your message via UO-14 or FO-20. Alternatively, you may get messages to them via your local AMSAT representative or national organisation.

Up-to-date details of operations from the AO-13 controllers are always available on OSCAR-13's p.s.k., RTTY and c.w. bulletins. RTTY

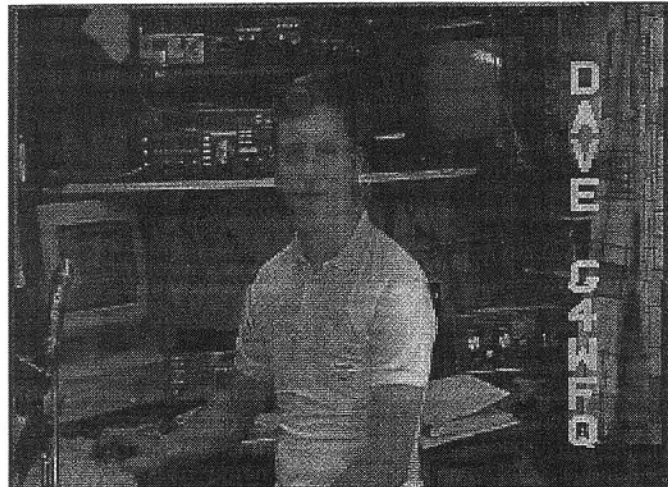


Fig. 1: Dave G4WFO pictured by his own equipment.

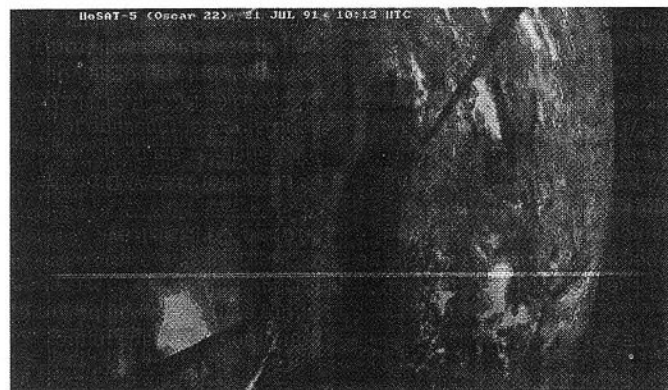


Fig. 2.

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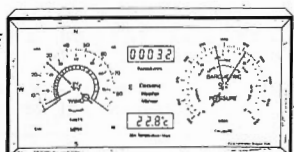
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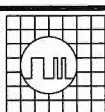
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LINEAR AMPLIFIERS 2.5W in 25W out switched, suit FT290 and FT690. Types TA2S1, TA6S1. BOXED KIT £48.50, BUILT £62.

RECEIVE PREAMPS low noise, 20dB gain adjustable, 100W handling. Types RP2S, RP4S, RP6S, RP10S. BOXED KIT £28.50, BUILT £39.

RECEIVE CONVERTERS add 2, or 4, or 6 metres to receiver tuning 28-30MHz, low noise, 26dB gain. Types RC2-10, RC4-10, RC6-10. Or add 4, or 6, or 10 metres receive to a 2 metre transceiver, low noise, 15dB gain. Types RC4-2, RC6-2, RC10-2. PCB KIT £22.50, PCB BUILT £31.75, BOXED KIT £38.25, BUILT £49.50.

REPEATER TONEBURST 1750Hz auto-toneburst type AT1750, PCB KIT £5, BUILT £7.

10 METRE CONVERSION BOARD for UK81 CB's with LC137 or TC9119P PLL's, SC29 board with fitting instructions £20, state rig type when ordering. We can do the work for £38.50 inc. rig carriage.

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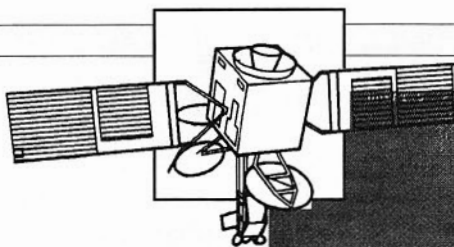


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comes on at 15-20 and 45-50 minutes after each hour, c.w. is at the hour until five minutes after the hour and also from 30-35 minutes after each hour, and p.s.k. for the rest of the time. Frequencies are 145.812MHz whilst on Mode B and 435.656MHz on Mode J or L, plus or minus the normal Doppler shift.

SARA-OSCAR-23

Malcolm G4OFF, has been tracking the 145.955MHz 300 baud ASCII 1200/2200Hz signal from 'SARA' and is very anxious to translate his copy into meaningful values as soon as he receives the telemetry decoding format. He provides us with the following NASA 2-line Keplerian element set which is providing reasonably good tracking.

SARA

1: 21578U 91 50 E
91227.70017922.00002147 00000-0
75784-3 0 143

2: 21578 98.5428 301.2416
0006075 131.8888 228.2786
14.35658602 4259

Malcolm's findings are that he seems to be having problems in getting a strong enough signal, despite tracking with a 7-element vertically polarized 145MHz beam. Whilst he gets a strong signal from both DOVE and UoSAT-2 on 145.825MHz, SARA appears many decibels weaker. The common band and time reported UoSAT-2 telemetry was radiating 265mW, so SO-23's reputed 1W of output ought to be 6dB up on UoSAT 2 and only 5dB down on the powerful DOVE 3.6W signal. It would seem not! G3CQE, G1VSX and G1OOB report similar difficulties, yet Joe Kasser W3/G3ZCZ has no such problem. He claims the signal to be adequate, and has no difficulty in receiving it using his 10-element vertical and horizontal switchable 145MHz Yagi.

To help, GM4IHJ elaborates further on the purpose of 'SARA' that you first read about in our October column. The investigation of the radio emissions from Jupiter at the low frequency 1 to 1000kHz spectrum appears to come from a spot on Jupiter and from the plasma link between Jupiter and its little volcanic moon 'Io'. The second and more interesting short wave spectrum from 2 to 40MHz are already known to come from the plasma in the magnetic doughnut torus which Jupiter's massive magnetic field throws around moon Io. Io's volcanoes are throwing out sulphur, oxygen and several other atoms and molecules at a prodigious rate and this material is magnetically 'bottled' by Jupiter's magnetic field and then ionised. So great is the magnetic field

and ionisation that the natural gyro frequency of the electrons in this torus can reach 40MHz, and it is very strong at around 20MHz. A further as yet unexplained band of signals runs from 75 to 15000MHz.

John explains "Because of the planetary link between Jupiter and Io, and the natural beaming of the signal out into space, the signal bursts keep sidereal time, appearing roughly four minutes earlier each successive day, and it takes about two hours for the beam to swing across the earth. Thus, this shortwave activity is not continuous, but if Jupiter is above your horizon and the ionosphere is thin, say at night, when the burst reaches earth space, the signal can get down through the ionosphere and can be heard on the ground using a quite simple indoor single loop horizontal antenna rigged around the shack ceiling. SO-23, high above the screening ionosphere, with luck, will hear much more and provided SARA's orbit stays in sidereal step with Jupiter it should give uninterrupted observation of Jupiter over many months. If however SARA slips out of sidereal synchronism, the earth will get between it and Jupiter, causing breaks in observation of up to forty minutes per orbit".

If you would like more information about 'SARA' contact ON1KVE @ ON1TRC via the packet network, or write to BELAMSAT asbl, Thier des Crichions 2, B-4032 Chenec, Belgium. All reports of the satellite sent to them will be answered by a special QSL.

SARA AN INTRUDER?

The fact that the IARU space coordinator put out on the packet network, an amazing and hardly believable statement stating that amateur SARA satellite has been declared an intruder in the Radio Amateur 145MHz space band creates a major problem, as the logical basis of this statement is difficult to comprehend. Is an amateur satellite that doesn't carry a transponder an intruder? Are the UoSAT spacecraft to be declared outcasts because they carry scientific equipment and no transponder? Is the new UO-5 spacecraft on shaky ground because it uses frequencies both inside and outside the amateur space band for its function? Whilst I think we would all agree that the BADR-1 Pakistan military UoSAT look-alike using 145.825 and 144.010MHz, wasn't an amateur satellite, especially as the details of its transmissions were never revealed to the amateur radio community to make valuable use of, surely we cannot say this of any other?

Surely an amateur satellite providing such a valuable and rewarding

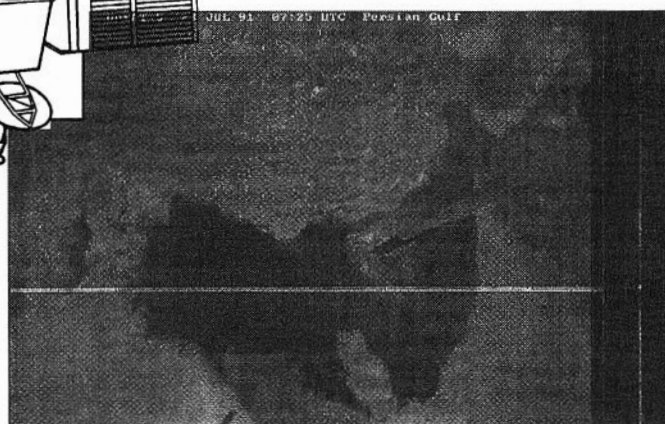


Fig. 3.



Fig. 4.

experiment as SARA is of more value to the future of the international amateur radio movement than many other uses to which our bands and spacecraft are put? Isn't this of the very stuff that demonstrates our usefulness and so helps to keep our jealously regarded frequencies from the hands of those who would gladly seize them for commercial or military use? Is DOVE, a non-transponder educational satellite to be labelled an intruder? Are we apt to lose our licenses if we listen to or report a 'non amateur accredited' signal, even if it's on the amateur bands? Perhaps the biggest question of all is who makes this decision as to what constitutes an amateur satellite, and what is and is not required to classify this status?

DOVE PROGRESS

Bob McGwier N4HY, is making slow but steady progress in teaching DOVE to speak. He and his XYL Shann N2HPE, have already uploaded WOD code that will permit the microsat command team to follow the health of DO-17, which is currently excellent. DOVE is putting out some 3.6W during 95% of its orbit, which accounts for the powerful packet signal we hear on 145.825MHz. At the time of writing Bob and Shann are working on tests of the hardware of the voice module. We should be hear-

ing a fully functional 'DOVE' cooing soon now, but, remember that we have been saying this for a year now!

UoSAT-OSCAR-22

UO-22, alias UO-5, nee UoSAT-F has been taking many first class snapshots of the earth from its vantage point in space. By the end of September it had snapped good pictures of Spain and Portugal, the Red Sea, Romania, Bulgaria and Greece, the North American Great Lakes region, East South Africa, the Persian Gulf including one of the smoke plume from the burning oil wells, the clouds and ice of Antarctica, Denmark, Northern Australia, North Africa, the Straits of Hormuz, the Gulf of Mexico, Egypt and the upper Nile, Italy, Djibouti, Yemen and Somalia.

Dave G4WFO, pictured by his own equipment in Fig. 1, has been downloading those images at his station and processing them into a standard image display format. The results of his efforts can be seen on Figs. 2, 3, and 4. The bright line sectioning the captured picture is a product of the printer, and is not present on the original shot.

OSCAR-22 does a whole lot more than taking such high quality pictures, and as space permits, we shall be covering more of its capabilities in later issues. PW

PACKET PANORAMA

This month Roger Cooke G3LDI brings news of a Russian packet station's problems, and how they were overcome.

Let me start this month off by wishing everyone involved in packet, and those thinking of getting involved, a very Happy Christmas and an eventful New Year. Let us hope that 1992 brings about the badly needed, radical changes to all the data bandplans.

Next time, I'll write something about my holiday in the USA with regard to the packet scene there and in Canada. It's quite different to our own packet scene, as some of you doubtless know!

Peter G0GSZ, has been busy again. During the summer Joe Kasser G3ZCZ, paid a visit to the UK and made a point of calling on Peter, to bring along his latest version of Lan-Link. As Peter is a beta-tester for Joe, I asked him to run a comparison between Lan-Link and Paket4.

Due to space considerations, we cannot put the reports in *PW*, but they should be quite useful for anybody looking for that ultimate terminal program. You'll see later how to get a copy of the report. I went along with Pat G3IOR, who kindly took the photograph, **Fig. 1**, of Joe, Peter and myself, in Peter's shack.

Very Important Bug

Rex G0MWH, who has been testing Paket4 on a KAM, has informed me of what appears to be a very important BUG! It seems that Paket4 is incompatible with the French Bulletin Board Software used on some Packet BBSs. This is the software known as FBB v 3.1, but may include other versions.

The problem arises when a packet user calls the sysop of the BBS and he replies. Somewhere in his reply is a bit of code that 'tells' ALL Paket4 systems, monitoring at the time, that they are connected to the BBS (though the TNC doesn't show signs of a

connect). This 'opens up' the LOG (capture to disc) file on each system. They are then left open, and everything that appears on the screen goes into the disk file. This continues until either you notice what's happened, OR your disc becomes FULL.

So if you are running Paket4 and have one of these FBB BBSs in your area, don't leave the system unattended. Failing that of course, you can include the station's call sign in your LCALLS list (with BUdlist OFF). This will stop it from making a connect.

I did ask others about this difficulty, and it would appear that this problem arises regardless of your setup. **YOU HAVE BEEN WARNED.**

I don't know if this is a bug in Paket4 or in the FBB software, it ONLY happens with the Paket4/FBB combination. If you have any ideas, I would be pleased to hear about them.

Moscow Mail

Recently, I watched mail, passing between Bernie N3CBW in Moscow, and a UK station. I was asked to help out with the connection, as the UK station was not too active. During the course of the exchange, Bernie who is a teacher in Moscow, offered to

write about the activities over there. He sent the following, together with the photograph, **Fig. 2**, of the club station UZ3AXD.

"Moscow's population of 10 million is swelled by about 23 000 students attending Moscow State University (MGU) from Russia and other countries. The university is one of the largest academic structures in the world, and home to the amateur radio club station, UZ3AXD.

"High above the city of Moscow, the club not only commands a great view of the city, but is an extraordinary and exciting site for amateur radio operations. The main building towers to over 250m, topped with a gold star. There are four wings to the massive structure, two at each end of the rectangular building. Each wing has its own tower, 23 floors (100m) high.

"The University Radio Club (MGURC) has its station, UZ3AXD, in one of these wings. Only on top of the massive city TV tower, rising to about 530m, or the Kremlin building itself could the location be better.

Home Brew

"Since 1957 the club station has operated with home-brew

or surplus equipment. Some of which is 'large boat' anchor proportions. The club could also qualify as a physical fitness club, when moving equipment up to the tower. Yes there are lifts, but they don't always work, or offer convenient access to where the station is located.

"The club station has good testing, repair and construction facilities. Prior to April this year, the club's equipment mainly consisted of 70/80s vintage home-made, equipment. The packet station is a home-made computer with 32kb of memory, a loaned b/w TV and MFJ 1274 TNC. The antennas consist of dipoles for h.f., a double 9-element beam, a 16-element beam and a vertical ground-plane for 144MHz. For 430MHz they have a four by 14-element beam.

"The club makes the work bench and testing facilities available to all-comers. There's also a samovar and hot-plate for making snacks for members, friends and guests. Morse enthusiasts of the University Telegraph Club (UTC), also share the facilities of UZ3AXD.

"The Telegraph Club operates an independent QSL bureau for USSR. Address to the bureau as: UTC, PO Box 585, 117234 Moscow, USSR. This service is for both incoming and outgoing QSL's.

"Thanks to a generous gift from Kenwood (USA) Corporation and *CQ Magazine* the radio club hopes for increased membership and more active operations from UZ3AXD."

Background

The background to this story is, that preceding a trip to Moscow, Bernie and George Jacobs W3ASK, (propagation editor of *CQ Magazine*) discussed with the Kenwood (USA) Corporation and *CQ*

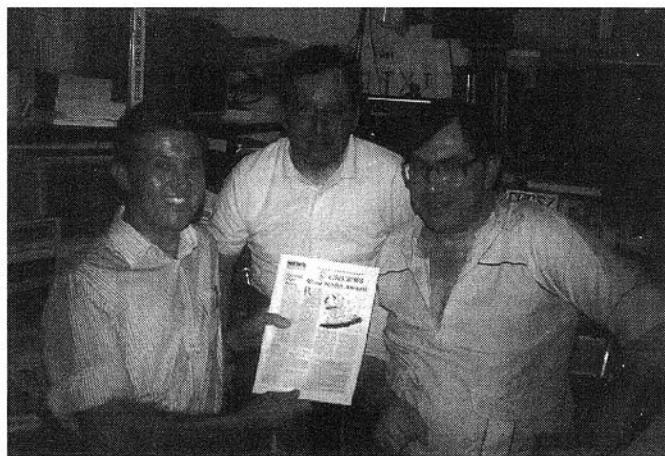


Fig. 1: Pat Gowen G3IOR's photograph of Roger G3LDI, Joe G3ZCZ/W3 and on the right Peter G0GSZ.

PACKET PANORAMA

Magazine, the circumstances of MGURC, in respect of the lack of modern equipment and the difficulty obtaining hard currency to purchase such equipment. Mr Wayne Yoshida of Kenwood and Dick Ross, Publisher of *CQ*, responded with a joint donation of a TS-680 and (220V) PS-430 power supply to UZ3AXD.

At the invitation of the University, Bernie flew to Moscow on March 28 to give lectures and seminars to the Russian Parliament and local councils. He delivered the gifts to UZ3AXD, as well as other pieces of equipment donated by US amateurs for their Soviet amateur colleagues.

Given the reciprocal callsign of UT4U/N3CBW in Kiev and UA3A/N3CBW in Moscow. Here he operated a packet BBS, from his Hotel room, with the help of local amateurs. He was also, of course, the first foreign guest to take advantage of UZ3AXD's 'new' station.

Bernie also added this message from Vyacheslav RW3AA, "Moscow State University attracts the



Fig. 2: The station of UZ3AXO, Vyacheslav RW3AA on the left of the standing group, Bernie N3CBW on the right.

brightest students and has a very active science faculty studying disciplines affecting electronics and radio operations. The lack of modern equipment at the University puts a damper on the contributions these talented people can make to amateur radio. The club hopes to attract and keep, resident 'brain power' for experiments benefitting radio amateurs worldwide.

"Most of the club's members are young scientists studying for their degrees. Their participation in UZ3AXD can only be to the advantage of amateur radio."

One Of The Few

"The University Radio Club operates one of the few packet radio facilities in Russia, and worked through a v.h.f. link with RK3KP, a major h.f. link for Europe, and RS3A. Your GB7LDI has forwarding with RK3KP, while RS3A was the major link to North America, via 4X1RU in Israel. However, with the departure of the station chief RA3AT last June, RS3A closed down its operations. We would like to fill the void in packet operation, created by this shut-down, but don't have the necessary computer

European radio amateur users may register copies of Lan-link, cost £24.00 (Sterling inc VAT etc), and obtain support from: Terry Dansey at ReadyCrest Ltd. PO Box 75, Chatham, Kent ME5 9DL, England. Most credit cards are accepted by ReadyCrest. Tel: (Voice) on 44 (0)634 687168 FAX: 44 (0)634 687178 DATA: (BBS) 44 (0)634 200931

equipment. Perhaps in the future some help will be forthcoming".

Morse Or Packet

"Listen for UZ3AXD on the h.f. bands for s.s.b. or c.w. or send a packet message to UZ3AXD @ RK3KP.SUN.EU and see what response you get! Best wishes to all from Vyacheslav (Slava) Lukin, RW3AA, Station Chief, MGURC".

As usual, news and views to G3LDI @ GB7LDI, QTHR or tel: (0508) 70278, 24-hr answering. HNY and Happy packeting.

For a copy of the Lan-Link /Paket4 review send an A5 stamped s.a.e. to: Paket4/Lan-Link Review, PW Publishing, Enefco House, Poole, Dorset BH15 1PP.

Starting Frame

H-bit: A bit in the SSID of each digipeater address that causes packets to be repeated in the correct digipeater sequence.

Half-duplex: A physical or logical connection between two points over which data may travel in both directions alternately (one direction at a time).

Hang-time: The transmission of an unmodulated carrier by a voice repeater after each transmission, used to indicate that the repeater is functioning; also called squelch tail.

Hardware flow control: Flow control that is controlled by the DCE (TNC) and DTE-originated signals on the serial interface between the two devices.

HDLC: Abbreviation for High-level Data Link Control (see below).

Header: The non-data portion of a packet frame. The header precedes the data portion of the frame.

Hex or Hexadecimal: A base 16 number system that uses the symbols A, B, C, D, E, and F to continue after the numbers 0-9.

High-level Data Link Control (HDLC): An ISO (for ISO see below) standard as defined for the Link-layer of OSI-RM.

I frame: Abbreviation for Information frame (see below).

Immediate command: A command that causes the TNC to perform a task immediately.

Information field: The field in an AX.25 frame that contains the user data.

Information frame (I-frame): An AX.25 frame that contains user data.

Input frequency: The operating frequency of a full-duplex repeater's receiver and a user's transmitter.

Intelligent terminal: A DTE that provides numerous support functions as well as basic input and output functions.

International Organisation for Standardisation (ISO): An international organisation responsible for formulating computer communication and other standards.

ISO-3309: An international standard entitled, "Data communication - High-level data link control procedures - Frame structure."

FOCAL POINT

The World of ATV

Andy Emmerson G8PTH discusses pirate stations, Amiga software and slow-scan TV, before turning to Warsaw Satellite TV and a video aimed at beginners.

Back in the August issue I mentioned the difficulty people were having with unlicensed TV transmissions in Kent. I had a phone call from the DTI's investigation branch who said that thanks to reports received, this pirate had been silenced. A letter of thanks was sent to the Kent Television Group.

The DTI pointed out that any abuse of the amateur spectrum should be reported to them either direct or better, via the Amateur Radio Observation Service (AROS). It is essential that precise details of dates, times, frequencies, modes and the nature of transmissions are given, otherwise the authorities cannot investigate. Reports to AROS should be sent to G3STG (QTHR), marked 'AROS - Confidential'.

News From Kent

The latest KTG newsletter notes that following the recent tests from G4CZJ's QTH at High Halstow, it has been decided to seek a site on the Hoo peninsula. A suitable building 60m a.s.l. has been located, and discussions are under way with the owners. In the meantime the repeater will continue as a manned facility from High Halstow.

Construction of new equipment for the repeater GB3KT, to replace items borrowed to get the project off the ground, is proceeding apace. Nick G8NAV has donated a power supply for the transmitter. The transmitter driver is a Solent unit, with a crystal-controlled p.i.l. unit donated by Ian G4MLY. The receiver is being built by Chris G8GHH, complete with interdigital filter, GaAs-f.e.t. pre-amp and crystal-controlled local oscillator. A Camtech video i.f. board is also being used. The control logic is based around BATC Teletron and Cropredy modules; video and audio switching is being prepared by Brian G6PKS. Further news can be had from G4AYT, G4CZJ or any other members of the Group.

Software Subjects

It's software subject time. Do you remember the plea from Mr Overall G6FTA asking about the Amiga computer package called 'AVT Master'? He was inclined to order it from the States but was told by the American distributor that the US version wouldn't work in the UK. As a result he paid nearly twice the price for the UK version, only to find that (you guessed) it is a raw NTSC product and identical to that sold in the States.

So you - but not G6FTA - can save your pennies by ordering direct from an American retailer (the distributor refused to sell direct). Despite all this, it is a marvellous program by all accounts. G6FTA says the picture quality is breathtaking and the resolution is so good that you have to use the enlarge mode to see all the detail

(zooming in on part of the image). He has now sent off for an Overview board from Florida, which has an interface for picking up microwave weather Fax pictures. He says you should be aware that these programs gobble up the computer's memory and you will probably have to add two megabytes of RAM to make them work.

Finally, he says a fellow Amigan rang him from Scotland and offered some other programs but never got in touch again! So whoever that was, if you're reading this, would you please give G6FTA a ring. That goes for anyone else interested in swapping public domain software for weather, Fax and SSTV applications. His number is (0992) 27166, and if you do get in touch, don't forget to tell us as well!

Narrow Band

I don't get to mention narrow band television here very often, so it is perhaps worthwhile giving them a plug. They deal with systems of narrower bandwidth than slow-scan TV, but it's not all Nipkow discs and the like.

In fact some of the members use state-of-the-art technology to get their picture on the screen. Jeremy Jago of the NBTVA (Narrow Band Television Association) tells me people have even copied broadcast television's sound-in syncs technique.

There is room during the frame

suppression signal for a little bit of toneburst, leading to the development of (wait for it) Morse in syncs! They will, however, strive to avoid being submerged under a flood of naturally incompatible individual modes.

If you'd like to learn more about how much can be achieved with NBTVA, send an s.a.e. to Mr N. Reynolds, Narrow Bandwidth TV Association, 6a Collingbourne Road, London W12 0JQ.

Warsaw Correspondent

Stanislaw Pazur, our regular correspondent from Warsaw, seems to have caught the sun while basking on the shore of the Baltic Sea. However, he has acquired a 1.3m aluminium off-set satellite dish and looks forward to installing this soon.

Stanislaw can already receive Astra 1A, 1B (H polarisation), ECS II F1 and ECS II F2. He says he has also seen transmissions via the ECS I F5 satellite at 21.5° east from Lomja, during the visit to Poland of Pope John Paul II.

Satellite Tape

A new VHS video tape I've just received gives an honest-to-goodness entry-level introduction to satellite television, which can be an absolute minefield for the unwary. Many ATVers may well be considering

branching out into this area but would like a quick rundown on what's involved first. If so, *The Dish Doctor's Guide to Satellite TV* should be of interest.

This guide is different from most tapes you can buy on satellite TV. For a start, it does not tell you how even a Novice can save hundreds of pounds by installing their own system, instead it suggests you leave it to an expert (wise advice for beginners!). Secondly, it's not a stuttery shambles knocked together on a flickery, fuzzy camcorder; this is a professional broadcast-quality job with two cameras and a professional lighting and sound crew (and it shows!).

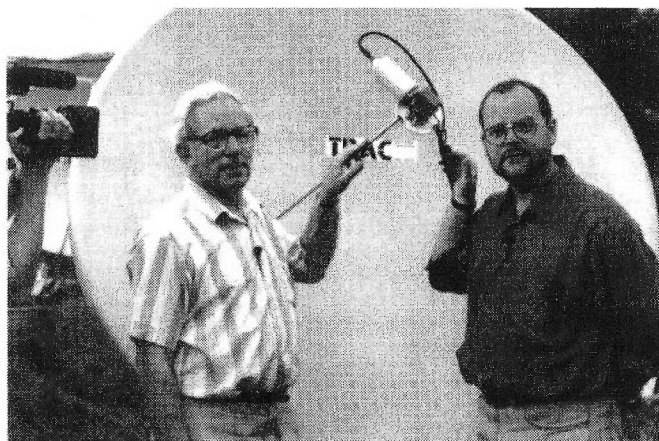
On this 60-minute tape the viewer is taken through the process of having a satellite TV outfit installed in the home, through choosing the best location for the dish to the setting up of the equipment for best picture (and minimum patterning on the TV screen).

Presenters of the the serious content in the tape are the well-known writers Peter Pearson and James Whale. Peter Pearson is the 'Dish Doctor' of *Satellite TV Europe* magazine, who in my opinion consistently writes sane reviews and articles. He comes over very well, and the viewer is also treated to a visit to his dish farm in rather more down-to-earth surroundings than James Whale's pad. All explanations are practical, using melons and hatpins plus computer graphics to illustrate the points!

Altogether, it's an absorbing hour's viewing. Some of the presenters' fluffs are left in and turned into jokes, and the programme loses its authority somewhat when the crew start joining in the interview (but JW upstages them). There are also some rather unsubtle plugs for products and publications, which make you wonder if this was originally intended to be a sponsored video. It's not a freebie, though, and at £14.95 it's fair, but not outstanding value for money. Specialist interest videos can never be as cheap as sell-through films, though, and I suspect you won't regret parting with your cash for this tape.

The Dish Doctor's Guide to Satellite TV - Volume 1, starring Peter Pearson and James Whale, is released on 1 November 1991, price £14.95 plus £2 post and packing. The tape is available by mail order only from 3P Video, 6 Greenhow Park, Burley-in-Wharfedale, ILKLEY, Yorks LS29 7LZ.

Who's that guy on the right? He looks familiar, doesn't he? Of course, it's James Whale and together with 'Dish Doctor' Peter Pearson he presents a video guide to satellite television (details in the article).



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FT290MkII	MkII Super 290 2m Multimode 2.5W	429.00	(6.00)
FT890MkII	MkII 6m M/Mode 2.5W	429.00	(6.00)
FL2025	25W Linear	117.50	(3.00)
FL5025	50W Linear	117.57	(3.00)
FT212RH	NEW 2m 45W FM Mobile	Special 329.00	(6.00)
YHA15	2m Helical	8.68	(2.50)
YHA40	NEW 2m H/Field	12.77	(2.50)
MHB15	Mobile Bracket	14.55	(2.50)
FT790	70cm Multimode	499.00	(6.00)
FL7025	70cm 25m Linear for above	142.02	(4.00)
FT76	P.O.A.	P.O.A.	
FT76	NEW 70cm H/Field	P.O.A.	
FN99	Nicad Battery Pack (23/73)	29.39	(2.50)
FN910	Nicad Battery Pack (23/73)	35.25	(2.50)
FN911	Nicad Battery Pack (23/73)	69.33	(2.50)
NC18C	Charger (23/73)	18.09	(2.50)
SMC28	Charger (23/73) 13A Plug	18.09	(2.50)
NC28	Charger (23/73)	18.09	(2.50)
NC29	Base Charger (23/73)	70.50	(4.00)
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MH12A28	Speaker Mic	31.73	(2.50)
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FR9500M	69-950MHz Scanning RX	570.86	(10.00)
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FR77700	RX ATU	60.28	(3.00)
MH105	Hand 600 Ohm mic	21.46	(3.00)
MD1C8	Desk 600 Ohm mic	30.95	(3.00)
MF1A3B	Boom mobile mic	25.54	(3.00)
YH77	Lightweight phones	20.42	(3.00)
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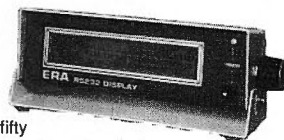
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Back-Scatter

HF Bands

Reports to

Paul Essery GW3KFE

287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

Last time I had important news from the USSR; this time however the big event has been the re-opening of amateur radio in Albania. Since the last ZA activity was more than 20 years ago, and that was an isolated event, I can imagine the size of the pile-ups on the first day.

Alas, it brought out all the worst instincts among Europeans. For the good of the hobby in the long-term it really is about time some licences were withdrawn to encourage better manners among the rest. It's no good us saying any one country is better - or worse - than any other. The plain truth is that amateur radio has a full complement of louts in every country where the hobby is generally established.

Again, we could all ask ourselves whether the biggest pile-up, (or the most prestigious contest) needs spread over thirty or more kHz of the band, plus at least twice that space covered in splatter from overdriven rigs. There's no point in having the latest gear, if you have a signal that makes 20kHz or more unusable to the majority who aren't DX chasers? Do we really need to have our h.f. bands sound like a close relation to a metropolitan 144MHz repeater?

I'll pause while my blood-pressure drops!

The Bands

From your reports, the bands have been difficult at times, but brilliant at others this time around. The sun seems to have 'done its thing' and restructured somewhat, with obligato accompaniment on the A-index, which at times seems to have been well into the sub-storm level. That having been said, let's take a peek at the bands as seen by our various reporters.

The 1.8MHz Band

The 1.8MHz band isn't an area where I've been drowned in reports lately, so I welcome a word from **John G3BDQ** (Guestling) who included a photograph of his outside collection of antennas as 'highlighted' by fresh snow....the only thing that puzzles me is how he avoids the weight of wire crushing the house! And - they call it 'wireless!!' However, 1.8MHz activity produced contacts with Y25CG/P, SV8ZS (Zante Is), UA1ASM and UZ4PWA in one short session.

Angie G0HGA (Stevenage) completed several EU contacts but found more were spoilt by the QRN.

Turning to **Ted G2HKU** (Sheppey), I find Ted contriving to hobnob with a virulent 'flu bug which reduced activity all round, but ON7BW, HB0/HB9NL and UA9XKZ did find their way into the log hereabouts. On a different tack again, Ted notes that he has been playing about with a home-brew 'magnetic' loop, and finds it very worthwhile. For example ON7BW, all

but unworkable on the vertical, becomes Q5 when the loop is switched in. The UA9 was inaudible on either vertical or G5RV, but 100% readable on the loop. Ted notes that Kent used to be known as Cone county, the garden of England but now it grows - motorway cones! Ted is seriously thinking about a helicopter to get to work.

As for the column, not a single entry in the log on Top Band, and precious little elsewhere. However, I had a pleasant natter one day with **G4AKY** (Sevenoaks), who is now up to around the 170 countries mark on the band but comments that activity seems to be a bit down.

The 3.5MHz Band

The 3.5MHz band is often another area ignored by correspondents. However, **Eric G0KRT** in Welling notes that he tried some slow CQs in the Novice portion of the band, but with no reaction; but his 2W of QRP, fired into 25m of wire and a counterpoise, connected with DL3WL/P, DL4YEE, GW8NV, ON500, ON4VM, PA3FUW and 13 Gs. There were two-way QRP contacts with G0AXE, G0NTR, G2DAN, G3KDO, G3MJX, G3NGA, G3YHO, G4VXJ, G4ZXN and ON5AG. Interestingly, when Eric got back from hols, there were no contacts to be had and investigation showed a vine had wound some tendrils round the antenna. By cutting them away, normal service was resumed.

Angie G0HGA raised a string of EUs on the key, and then did a QSY to s.s.b.

to work G4EVI.

Now we turn to c.w. addict **Pat ON7PQ** (Kortrijk) who mentions his contacts with JA1HQT, JR3QAK, HF0POL, KP2A/KP5, VP8GAV, CX3SR, CX4GL, LU2BRG, LU6HGC, PY2NQ, ZS4TX, JJ1VKL/4S7, 4K1AFM, 4K1A, 5H3RA, FG5CW and 6W1QB.

There was just a singleton for John G3BDQ, who used s.s.b. on ZL1RU just to satisfy himself the antenna still worked!

The 7MHz Band

Our local GB50ATC day, on September 28, was it may be recalled 'blessed' with a leak in the cloud cover. However, one of the funniest things I have seen in years was GW3JSV attempting to work 7MHz s.s.b. while right outside the operating tent the band were doing their drums and fife performance. Would the safety valve blow, or would the boiler burst....?

Serious 7MHz activity was the order at Pat ON7PQ, where 8P9AP, KP2A/KP5, XY0RR, 9L1US, JW0CX, C9RAA, S79HX, 9K2ZZ, VP5VEP, Z21HS, HK3CAA/HR1, 4K1AFM, PJ5/N4X0, LU1ICX and ZA1A were all entered in to the computer.

For Angie G0HGA the big one was ZA1A, but she also raised a string of East coast Ws, UA9YS and lots of Scandinavians in the daytime. Coming down to just 20W, she made it to UA9CDV, UA9CLB, EA9GK, NU1T/EA8 and ZX3RF, who said he was in Moldavia. We reserve judgement on this one for the moment, since no-one

else reports a similar one.

Now, to another offering from **Eric G3LPS** (Blackburn), all 7MHz c.w. Eric says he will put his T1154 back on the air this winter to complete a 7MHz WAC with it, but alas every time he uses it he gets letters asking for modification data! The E-W path has been more in evidence this time, and a rare 0400 foray upon the band paid off with contacts to Swaziland and S. Africa. CW contacts were completed with C07MF, T77Z, 4K1B, UA70XWV, PU1LOG, VK5FE, CX3EU, HF0POL, UY7U, UJ1K, VS6WY for a Gotaway, ER50PQ, PY6ML, PT7VJD, both these being QRP, HB0/Y81XH, 9H8F, UA0WB, UF6FAL, YC0UNC, 4K1ADQ, 3DA0BK, ZS1QD, ZS1AAX, LU2XR, IA5/IK4DCT (IOTA Eu 28), JW0GB (YL Laila), RY0B/UB5BAX, DK7VW/5B4 who was using QRP at 2W, UJ8JMM, UA0QFC, UA0QE, U0AG, UM8NC, JW/DJ5PA, JE1CGC, UA0ABB, UL7FCG, 9K2ZZ, UA2/RC2ARK, RK9UIF, R420A, UA9ACQ, UI8IZ (Samarkand), CT0B (QSL via CT1CW7), TF3CW, OH3GZ/OF0, UI8BAA, JA7SN, UA0QFL, SV/W7SW, C9RAA, and P21AP.

John G3BDQ managed to work up a little enthusiasm for the band, so that he keyed with 4X6KK, JA6CPD and ZA1A. The latter were listening up over about 50kHz or more, while on the transmit frequency people were sending 'pirate', jamming with strings of dots or key down, and the rest. But during a brief window, while the jammer rested his tired fingers, John managed to nip in and complete a QSO.

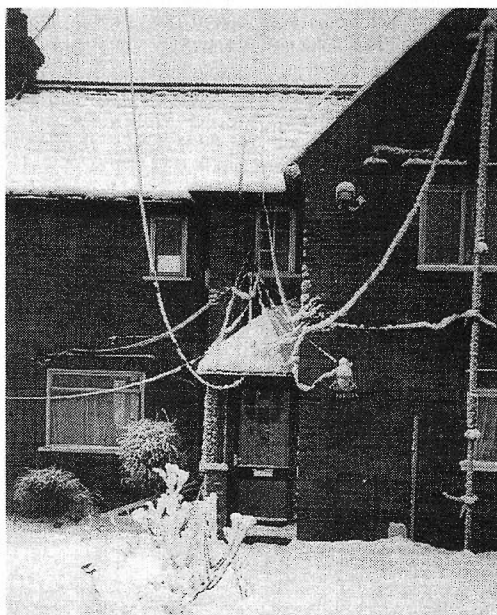
The WARC Bands

A new reporter to start us off on the WARC bands is **G0K0Z** (Thirsk), who has inverted-vee antennas for 10 and 18MHz. Most operation is on 10MHz, where the c.w. sorted out ZL2AGY, ZL4HB, VK3VJ, JA3REK, HC5AI, FM5WD, JW0CX, HF0POL, YS1AG, 4K20IL (Franz Josef), H18A, WA6VNR, AA6PG, strings of East Coast Ws, UA0JH, and OK4DWJ/MM of the coast of Peru who dished out a report of RS7599 plus ten. As for 18MHz we find ZD8LII, ZD8WD, KH6AFS, JA8LP, UG6GAK, H18A, PT7AQ, KP2A/KP5, V85FC, 5H3RA, HF0POL, UA0FZ, TF3CW, DX7XG/TP8 and JA4ICZ/MM off the west coast of VK.

Vince 9H1IP went on 24MHz to raise 9K2ZZ, 3X0HNU, RJ4X, OY0FF, UI8DX, HC8GR (Galapagos), VP5VEQ, YL2AG, VP9MN, VP2MR, V63AO, UF6FL, Z21IS, 5H3RA, and 4J3GM; while on 18MHz the tally of scalps was OD5ZZ, UL7ACI, 9M2HB, 9K2ZZ, 4S7EA, LY1BY, YV5DEH, HK4EB, UF6FL, VP8GAV, 3C1EA, and VP8CFM (S. Orkney).

Next we return to Ted G2HKU who looked on 10MHz and found TK/DL8NBH, OY7ML, HB0/HB9NL and K3SEW. For 18MHz the score was U0AL, and on 24MHz TA2AO was worked - all c.w.

Mary G0NZA (Kirkby-in-Ashfield)



John G3BDQ's outside collection of antennas, as 'highlighted' by fresh snow!

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stuck to s.s.b. to raise VU2RX, VU2XYL and TA2AK.

The letter from Don G3NOF (Yeovil) mentions side-band contacts with A45ZZ, EN50PQ, Z21CS, ZS6AIP/7P8, 5H3RA, 5N0CEP and 9M2HB for 18MHz. On 24MHz we find Don entering A25AA, JA1WPX, R040A, XY0RR and YB0MCA into his log.

John G3BDQ only tried 10MHz where he made it on c.w. to JA1UQP.

We start the ON7PQ list on 24MHz, where Pat made it out to 5W1JU, FY5FA, A45N, VP2EXX, FR5EL, JT/K5VT, 9Y4KB, XY0RR, ZD8WD, 5H3RA, 8P9FF, JT1CD, VK2DXI/9M2, 4K1A, U18DX, V63WW, V85FC, and C9RAA. For 18MHz the tally included U28FO, UM8MBA, KL7KJ, KP2A/KP5, 4K1ADQ, VS6WV, GU3MBS, XY0RR, KC6WW, JW/J5PA, 7P8FE, VU2FWW, TF3CW, FY5FA, V63WW, C06CG, ZK10Q, 9K2ZZ, 4K1A, 3B8FE, V85FC, ZD8LI, 7P8RQ, FG/F6DGT, C9RAA, S79HX, JT1CD, KH6AQ, HC5AI, C21NQ, 3C1EA, and FW/AA7AF. Down to 10MHz now, for N16T, KP2A/KP5, VP8GAV, J3/AE6I, ZP6CW, XY0RR, 7Q7TA, JW0CX, V85FC, C9RAA, SV/W7SW, 9K2ZZ, 4X4MU, VK6HD, FR5FI, 4K1AEI, JJ1VKL/4S7, KP2A, PJ8AD, 9Y4SD, PZ1DV, C06CG, YS1AG, HC5AI, ZD8LI, UF6FEI, UD850DZ, VS6BI, HF0POL and KC6WW.

Contests

Early warning of the CQ WW 160 Meter Contest. The c.w. leg is over the weekend of 24-26 January 1992, and the sideband one February 21-23, between 2200GMT on the Friday to 1600GMT on the Sunday. Use of packet, a spotting net, or a logging assistant makes you a multi-op; use of a computer in the station does not. Log sheets to be 40 contacts to the page, ruled columned for date, GMT, RS(T) each way, multiplier claimed, and points claimed. Dupe/check sheets required if more than 200 contacts, or the entry is used as a checklog only. Include a summary sheet and signed declaration, printed name and mailing address. If a computer log, you must include a legible print-out. Score two points for a QSO in own country, five points same continent, 10 points other continent. The multiplier is the sum of each USA state, VE area (13), DX Country, and maritime mobile. Final score is QSO points total times sum of the multipliers. Canada and USA as such do NOT count as a multiplier. Unacknowledged duplicates or unverifiable contacts may each be penalised by three con-

tacts, a second multiplier may also be lost for each one so removed. If the corrected score shrinks by 3% or more, disqualification may be considered, also for violation of license regulations. Mailing deadlines, for the c.w. contest February 28, for the s.s.b. leg March 31. Address Donald McClenon N4IN, 3075 Florida Avenue, Melbourne, FL 32904, USA. Please indicate c.w. or s.s.b. on the envelope.

We're too late on the shelves to remind you of the CQ WW DX Contest Phone leg, October 26/27, but November 23/24 is the time for the c.w. leg. One-hundred watt stations are in the QRP class, while QRP operators below 5W r.f. output go in a separate QRP listing. Categories, single-op single or multi-band (one operator, no assistance from any form of DX alerting assistance, only one signal at a time); Single-operator assisted permits use of DX spotting aids. In either case all functions in the station performed by one operator. Multi-operator, (a) single transmitter, all band only. Multi-multi, (b) with only one signal and running station during the same period defined as 10 minutes. Multi-multi with all transmitters located within a 500m diameter circle OR within the property limits if greater. All antennas must be physically connected by wires to transmitters and receivers. Team contesting: a group any five operators in the single-op category. A station can only be on one team per mode. Exchange RST plus CQ Zone number. Score one point for each country in own continent, three for different continent. Multiplier one for each different zone contacted on each band plus one for each different country. No QSO points for a contact in your own country

but such contacts may count for multiplier credit. Final score equals total of QSO points times the sum of your zone and country multipliers. Logs at 80 contacts per sheet, clearly showing dupes. QRP and QRP/p stations to show this on the summary sheet, as well as the usual details and declaration. Usual disqualification rules. Logs to be postmarked by January 15, addressed to CQ Magazine, 76 North Broadway, Hicksville NY 11801. Indicate phone or c.w. on the envelope.

The 14/21/28MHz Bands

I've already over-run our space, so....!

Firstly a voice from the past is Chris G4LDS (Burnham-on-Crouch) who used to write from Chelmsford a decade or so ago. Now he has an FT-707 and a home-brew 3.5-28MHz trap dipole in the loft. Thus Chris misses his beam! On 14MHz s.s.b. he managed to raise ZA1QA (QSL to Box 5 Komoro, Hungary 4622) and on 28MHz ZS6AIS/P/7P8, EA6/DL6RDE, 9L1US, CX4GL, 5B4SA, SV3AQN, FR5DX, W1-0, CN8EC, VP8CDL, LU1CF and ZA1QA again.

On 14MHz c.w., Ted G2HKU gave UF6FJ, VK2APD, KA4IFF, VK2AYD, LU1AO, 4S7WP, VK2ALG, VK8AV, VK5CGB, GM4CXM/YO9, VE3AX, 9K2ZZ, YN/SM00IG, SV/W7SW (Corfu) and PZ1DY; S79MX was raised on 21MHz and on 28MHz the tally was K16SV, TA2DA, 8P9AP, KB5OG, 4Z4UW, LU5DOF, UH8BBU and 4K1A (Molodetzhnaya Base, Antarctica).

Now Mary G0NZA, who on s.s.b. found VK7GK, VP2EXX, 5B4SA, HF0POL, KP4SF, VK4AEI/P (Fraser Island), ZA1A, D44BC and ZL3VK on 14MHz, while the 28MHz crop adds

5H3RSA, VP8CGH, TT8SA, HL1XP, 9K2NG, 7Q7JWL, TA3PB, UZ9XWG and JA1SGX.

For Pat ON7PQ, 28MHz managed ZD9BV, XY0RR, KH0/JA1SLS, 3B9FR, 4K1B, C9RAA, 3B8CF/3B7, ZA1A, YN/SM00IG, C08RL, G4AAL/8R1, Z21HS, OD5SK, ZD8WD, S79HX, 4K1A, FM4FZ, KP2J, ZD8LI, 5Z4FM and ZC4ZC. The 21MHz band accounted for A22GH, 8P9AP, UA0X/EK250RA, XY0RR, 3B8CF/3B7, FW/AA7AF, EZ0Z, C9RAA, RV9CBF/UA0K (IOTA As 61), HR1LW, TL8CP, HI8A, OK3CLA/5N0, 9K2ZZ, 3B9FR, TF3CW, 9X5HG, 7Q7LA, ZK10Q(N. Cooks), ZA1A, A71ND and 4S7WP. Finally on 14MHz we note C9RZZ, XY0RR, EK0I, ZA1A, C9RAA, S79HX, 3W/4K20T, 4K1B, 4K1A, U100C, YN/SM00IG and TL8DJ - all c.w. of course.

Don G3NOF chose the s.s.b. mode; 14MHz for JT1BG, JY3ZH, P29DX, VKs, VU2PEP, VU2TDZ, XX9AW (QSLs to KU9C), XY0RR, ZA1A, ZA1QA, 3B8FU, 3B8CF/3B7, 3B9FR, 3DA0AY, 4K4BG, 5H3DC and 9M8AJ. On 21MHz there were BY5RY, CP1FF, CP6RW, DU3RCM, ES1QD/0, FF0XX, HL9AA, OA4ANR, P29AS, P29DX, RO6/RB5FF, TI2MEN, UA0FF (Zone 19), VKs, VK2DXI/9M2, VP2VER, VP9WS, WPAZT, XW8KPL, XY0RR, YE7T, ZA1A, ZL4AAG, 3D2AXV (Rotuma), 4J4GDN and 9M8FH. That leaves 28MHz, where Don booked in BY5QW, HR1RMG, JT1BG, KH0AC, KP2V, XY0RR, YC1FCC, ZA1A and 3B9FR.

Finally John G3BDQ, who looked on 14MHz c.w. to raise US8R, UJ8AH, UL8VWE, BV2DA, TJ16G, JT1/KCTV, XY0RR, V58AA and ZA1A, while 21MHz c.w. made it to UA70XWW, HI8Z, FH5EL and OH0PQ.

Value

Finally a note to mention the passing of Frank Parkhurst BR510663 of Yeovil, at 79. Frank was a founder member of the Yeovil club, who was a keen s.w.l. and constructor of receivers in the 1920s, and more recently had turned to HAB, with some 4020 heard out of the 4052 possible. The Yeovil crowd all mourn his passing.

Next Time

That's yer lot for now. Apologies to all those whose lists were heavily pruned. Deadlines for coming issues are November 20 at the latest, then 10 December 1991 and 20 January 1992.

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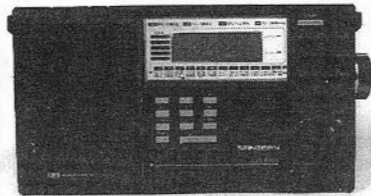
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ABBREVIATIONS

RAD Radio
MTV Mono TV
Turn Turntable
Svc Service
Man Manual
Port Portable
CTV colour TV
T/T Teletext
Dir/drv Direct Drive
Sys System
CTR Cassette Tape Recorder

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Solar Data for September 1991

Between September 1-8, the quiet side of the sun was facing us and, although there were a number of flares during this period, little came of them. The magnetic indices were very unsettled, being at a sub storm level of 30 units on September 2. During the period, September 9-15, very little activity occurred apart from a sudden storm commencement starting on September 9 producing some weak auroral activity on the v.h.f. bands. This storm gave rise to a further period of unsettled geomagnetic activity, the A index reaching 30 units on September 10.

Despite the noisy side of the sun looking our way from September 16, very little solar activity was recorded. There was only one M type flare in the week up to September 22 and consequently the solar flux levels declined, averaging 177 units. However, between September 23-29, the geomagnetic activity increased considerably with many flares being recorded and as a result a number of small scale auroral events took place on the v.h.f. bands.

On September 26 the geomagnetic A index was at a sub storm level of 36 units. Despite all this activity, it is now obvious that the sun has started to settle down after some massive restructuring. By the end of September there was an active and quiet region on each side of the sun, with two peaks of magnetic activity spaced either side of one of the more active regions.

Season Forecast

Many of the seasoned 50MHz DX-ers are saying that this Winter's season is going to be excellent and, despite November 1990 being a bit of a flop, I have no reason to doubt them. During November and early December, check the 50MHz band, between 1130-1400UTC, for Caribbean and North American DX. If conditions are really good, then this path might stay open through to January.

Auroral Events

There were a number of minor auroral events during September, and although none of them were especially large, they are still worth mentioning. On September 25, I caught the tail end of an event, at 1640UTC, and worked LA2AB (JO59) on 144.040MHz, 52A 53A. Does anyone have any further details of this opening?

You should all note that this propagation mode has provided good DX opportunities every month of this year and this situation is unlikely to change for some time. Therefore, you should get into the habit of checking the v.h.f. bands, during the late afternoon, for any auroral activity.

Excellent Tropo

Many operators have written in reporting the excellent tropo conditions which effected the v.h.f. and u.h.f. bands during late August and early September.

Terry Chaplin G1UGH (JO02), favourably located on the east coast, made the most of the North Sea ducts by working many Scandinavian stations on the 144MHz band. On August 29, the contacts included DK2UJ (JO44), OZ/DB4LL (JO47), OZ1BEF (JO46) and OZ7RD (JO56). He also heard SM6KJX (JO67). Propagation was best to the north on August 31, s.s.b. contacts being made with GM1VLA/P (IO85), GM4BAP/P (IO87), GM4CAQ (IP90) running 10W to an HB9CV antenna and a nice wet one with G0PDE/MM located in JO09. On September 3, the prevailing path was to Scandinavia again, contacting many OZ stations, LA6HL (JO28), LA8AK (JO38), LA9RAA (JO28), SK4KR (JO79), SK4RPP (JO79), SK6EI (JO68), SM6BWQ (JO68), SM6JMJ (JO66) and

SM7AED (JO66). By September 6, the propagation had swung over to eastern Europe with many Czechoslovakian stations being heard.

Ralph Sachs G2CZS (JO01) reports working two new countries and 10 new squares on the 144MHz band during September. On the 3rd he worked his first Norwegian station, LA8AK, following that up by contacting three OZs and four SMs. Although Ralph had worked Sweden back in the 1950's, this was his first opening to that country since again becoming active on s.s.b. Other contacts during September included, OK1JKT/P on the 6th and HE7PMF/P (JN46) and LX/ON4AOI (JN29) on the 7th. On September 22, G7BPH/P (IN79) on the Lizard, Cornwall, found a place in the log.

Ela Martyr G6HKM (JO01) missed the Scandinavian event on September 3, but soon made up for it the next day. On the 144MHz band, she worked many DLs, DZ6OL (JO65), SP1EOL and SP1HLE (JO73), SP3RBF (JO71) and SP2BDR, SP2MKO and SP3EPX all in JD83. Moving up to the 430MHz band, Ela worked DF1AS and DL0USB (JO52), SP3RBF and, for her best ever DX on the band, SP2DDV (JO93). Up on the 1296MHz band, Ela made s.s.b. contacts with DC9YC (JO31), DF1AS (JO52), DF9QX (JO42), DL3YEE (JO42), PE1BNK (JO21), PA0AGD (JO32), PA0BAT (JO31), PA0HRK (JO21) and PE0RKI (JO32). A really good day! Conditions were just as good on September 6 with QSOs on 144MHz being made with strings of Germans and OK1FYW/P, OK1IBL, OK1JAS/P, OK1JKT/P, OK1OA/P and OK1UGF/P, all in JO60.

Later in the evening, DE/PA3CNX (JN77) was contacted for a new locator square. Although there were some DX stations still audible during the morning of September 7, they had all disappeared by the time the IARU contest

started at 1400UTC. Even so, Ela managed a very creditable 404 QSOs. Just imagine what the scores would have been if the band had stayed open!

Dare I mention what John Regnault G4SWX (JO02) worked, on September 3, on the 144MHz band? Only a total of five LAs, 20 OZs and 38 SMs! On September 4, he finished off with SP1CWL, SP2FAV, SP2NJI, SP3BLR, SP3EPX, SP3RBF, SP3SLK and SP3VBE. It must be the sea path that does it!

Even with an array of four 5-element Yagis, Peter Atkins G4DOL (IO80) could only just detect the DX stations being worked by the east coast operators. As with most tropo openings, it always comes to he who waits, and for a brief time during the morning of September 7 the 144MHz band was open to southern France and Switzerland. By 1000UTC, all the DX had disappeared but later in the day, from 1400UTC, a path had opened up in a southerly direction to Spain. Using a 4CX250B amplifier running 300W, Peter worked EA1BFZ (IN81), EA1DVY/P (IN81), EA1EBJ/P (IN73), EA1TA (IN53), EA1WZ (IN53), EB1CFK (IN73), EB1DMS/P (IN73), EB1EUW/P (IN82), EA2AZW/P (IN82) and EA2LU/P (IN93). On September 12, he worked his first Polish station, SP1MVG/MM. It was a pity that he was located in the English Channel. Better luck next time Peter!

In the opinion of Jim Smith G0OFE (IO90) this was his best 144MHz tropo opening since 1989. Like everyone else he also managed to work the DLs, OZs and SMs but couldn't crack the pile up of stations in IO91 and JO01 working LA8AK. Jim reports that the last time he worked an LA was back in 1985! The IARU contest weekend, September 7-8, found EA2LU/P, FF6KNB/P (IN92), HE7S/P (JN36) and best of all, a new country, LX/PA3FPS/P (JO30).

Living on the foothills of the Black Mountains in Herefordshire (IO81), I am unable to take any advantage of coastal ducting that frequently effects those in IO90, JO01 and JO02. It was not until September 6-7 that I was able

Annual c.w. ladder

Station	50	70	144	430	Points
G4ASR	48	49	335	—	432
G4OUT	—	40	142	—	182
G0FYD	10	—	37	—	47
G0EVT	15	—	11	—	26
GW4VX	—	—	11	—	11
GM4CXP	1	6	—	—	7

Number of different stations worked since 1 January 1991

Annual v.h.f./u.h.f. table January to December 1991

Station	50MHz		70MHz		144MHz		430MHz		1296MHz		Points
	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	
G8HKM	60	49	—	—	71	22	40	10	32	7	291
G0NFH	44	25	30	7	61	17	43	11	13	2	253
G4FCD	13	19	—	—	82	13	54	12	30	5	228
G8ESB	7	6	20	5	85	14	45	8	14	5	209
G8ASR	1	52	50	9	55	28	—	—	—	—	195
G4LDR	24	19	10	2	51	12	35	5	—	—	158
G8PYP	15	36	1	1	43	19	19	5	—	—	139
G0EVT	13	10	—	—	32	16	11	3	—	—	85
GW7EVG	—	—	—	—	47	8	—	—	—	—	55
G1THG	8	11	—	—	23	9	—	—	—	—	51
G7CLY	—	—	—	—	38	10	—	—	—	—	48
GM4CXP	2	1	2	2	22	3	—	—	—	—	32

Fig. 1: ARRL e.m.e. contest - moon tracking data.

SATURDAY NOVEMBER 23

UTC	Az	E1	H2
0530	268	33	-201
0600	273	28	-211
0630	279	24	-218
0700	284	20	-221
0730	290	16	-220
0800	295	12	-215
0830	300	08	-206
0900	306	04	-194
0930	311	01	-178
1730	51	02	+243
1800	57	06	+258
1830	62	09	+268
1900	68	13	+275
1930	73	17	+278
2000	78	22	+277
2030	84	26	+273
2100	89	30	+264
2130	95	35	+251

SUNDAY NOVEMBER 24

UTC	Az	E1	H2
0630	266	33	-213
0700	272	28	-224
0730	278	24	-231
0800	283	19	-235
0830	288	15	-235
0900	294	11	-230
0930	299	07	-222
1000	305	04	-210
1030	310	00	-194
1830	52	00	+232
1900	57	04	+247
1930	63	08	+258
2000	68	12	+265
2030	74	16	+269
2100	79	20	+268
2130	85	24	+264
2200	90	28	+255
2230	96	33	+243

to work some of the better DX available on the 144MHz band. During the evening of September 6, I managed to work OE/PA3CNX on s.s.b. at 52 bothways but conditions were much better on September 7, between 0730-0900UTC, when s.s.b. contacts were made with FC1AYE (JN36), FC1HUP (JN36), FC1JRX (JN25), F6IRF (JN35), HB9BNI (JN37), HB9DBM (JN47), HB9DFG (JN37), HB9DKM (JN37), HB9RCI (JN47) and HE7ULF (JN47).

Jon Acton G0NFH (IO81), located near Bristol, mentions a good contact he made on August 29 with DN5UI (JO11) on both the 430MHz and 1296MHz bands. On September 3, coinciding with the 144MHz Scandinavian activity contest, Jon worked 12 OZs and one SM station.

Derek Moore G1THG (IO81) mentions that he always seems to miss the DX but he did manage to pick up one new country, Alderney, and six new counties during September.

"I switched on the 144MHz f.m. equipment and heard G10CAH in Co. Fermanagh" reports **Gary Nicholas GW7EVG** (IO83), this contact, on August 30, giving him a new one for the log. On September 4, Gary worked his best ever DX by contacting GM4CCC/P (IO97) on s.s.b. Contests are a great way of picking up new ones and the event on September 7-8 provided Gary with GU4APA/P on Alderney, F10LW/P (JO00) and TW1C/P (JN09), the first time he had worked into France via tropo.

Meteor Showers

The following data, concerning meteor showers occurring in the next few weeks, will help you determine in which direction to beam at specific times and when the shower is below the horizon.

The Leonids meteor shower will be encountered between November 13-19, peaking on Monday 18th. Between 0100 to 0300UTC beam north or south, 0300 to 0400UTC beam north-east or south-west, 0400 to 0800UTC beam east or west, 0800 to 1100UTC beam south-east or north-west. The usefulness of the shower for radio communication purposes is not very good from 1100UTC onwards, and between 1700 to 2300UTC the radiant of the shower is below the horizon.

The Geminids shower lasts from December 6-14, with maximum activity occurring on Friday 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. One unusual feature of this shower is that it has been observed, that the long duration meteor bursts occur about three hours later than the main peak, around 0300UTC.

Michael Theiss LA5SAA is inter-



Fig. 2: Nick G4KUX and David G4ASR with a gift from the SM7 6M Group! Photo by G4VXE.

ested in c.w. skeds on the 50MHz band from either his home QTH (JO29XB) or from his weekend cottage (JO39AB). He uses a TS680S, 10W and a cubical-quad antenna. Anyone interested should send the normal information plus telephone number. Contact Mike at Raunev.1, 4120 Tau, Norway.

Moonbounce Contest

For those that wish to participate, the second leg of the ARRL e.m.e. 'moonbounce' contest is being held on November 23-24. Fig. 1 gives details of moon rise and moon set times to enable those of you with fixed Yagis to hear signals off the moon.

I have based the calculations on central England and have also included the amount of doppler shift to be expected on the 144MHz band. You never know, you might hear VK3AMZ (QF22). He is now QRV with a pair of 250s and four, 15-element DL6WU Yagis.

Franco Giorgi I2FAK is again active on e.m.e. following a rebuild of the antenna system. He is now using 1618-element, 5.5 WL long yagis and is looking for schedules on either m.s. or e.m.e. especially with single Yagi stations running 200-300W. You can send your sked requests to Via

Priv.Zavattarello 24, I-27043 Broni PV, Italy.

The 50MHz Band

The 50MHz band conditions during September were surprisingly good with a number of openings into Australia, Africa and South America. I mentioned last month that we stood a good chance of an opening to VK during October. Well, I was only three days out! On September 28, from around 0900UTC and lasting for less than 30 minutes, VK6JQ and VK8ZLX were both worked from southern England. Conditions were still favourable on September 29, and from 0905UTC, VK6JQ was again worked by a number of stations in the south.

A good opening to South America took place on September 1, from 1745UTC, with CX4HS, CX8BE, CX9TP, LU7FA, LU8DIO, LU9AEA, PY5CC and PZ1AV being worked by many stations around the UK. During the first week of October, the band was again open to Argentina and a number of stations also reported hearing the FY7THF beacon.

Most of the DX traffic during September, however, was over the African path with A22BW, CN8BC, CN8ST,

TR8CA, TU2EW, TU20J, TU4DH, V51DM, V51E, ZS4S, ZS6s, ZS9A, ZS9H, 3DA0BK, 5V7JG, 7Q7RM, 9J2HN, 9L1US, 9Q5EE and 9Q5TE featuring in many DXers logs. It's worth noting that 9Q5TE (J175IQ) is crystal controlled on 50.114MHz or 50.152MHz.

During the first week of October, the group that opened up Albania to amateur radio became QRV on 50MHz. The best propagation path from ZA at that time was to the south and a number of ZS6 stations were heard working this new DXCC country. Chris Gare G3WOS was the only UK operator reported to have worked ZA1A (JN91).

Paul Redman GW7HEC is looking to make data contacts via packet radio, RTTY or AMTOR with any interested stations. He uses an Icom IC-726 running 10W into a 4-element Yagi and monitors 50.600MHz from 5pm during the week days and at all times during the weekends.

The 70MHz Band

On the 70MHz band, **Ken Eastly G3LVP** (IO81) made good use of the RSGB Trophy contest held on September 29. Running 15W into a 3-element Yagi, fixed to the north because of a faulty rotator, he worked on s.s.b. EI9FK/P (IO62) Arklow, G14TVV/P (IO74) Co. Down, GM3TCU/P (IO75) Isle of Arran and GM4BVV/P (IO85) near Moffatt. Ken has just finished building the 70MHz PW Meon transverter, getting about 6W output.

At my QTH, the Trophy contest produced very similar results to that of G3LVP, my best DX being GM4ZUK/P (IO86) near Montrose, at a distance of 552km.

The 430MHz Band

John Hill G7CLY (IO93) is now QRV on the 430MHz band, using a Micro-wave Modules transverter, 30W amplifier and a 21-element Yagi at 10m a.g.l.

Graham Taylor G4JZF has written in following my recent remarks about mobile operation on the 50MHz band. He also reports that he has been operating mobile on 430MHz s.s.b. since 1983. He uses an Icom IC402, 25W amplifier and a 5/8 over 5/8 WL antenna but rarely gets any replies to his calls although he has worked a few other mobiles on the band. When he is stationary, the antenna is flipped over into a horizontal position making it act like a beam. With this configuration, Graham has worked 15 countries and 55 locator squares, the best DX being OK1KKH/P (JN79) at 1228km.

Weinheim Convention

During September I was fortunate to visit what must be undeniably the largest v.h.f. convention in Europe. Organised by the Weinheim amateur radio club OLOWH, it is held annually,



Fig. 3: LA6HL/TF - operating from Iceland.

Back-Scatter

near Mannheim, over a three day period. For me, it wasn't the trade show and flea market, which are of gigantic proportions, nor was it the sheer size of the operation, handling upwards of 10000 enthusiasts or indeed the varied lecture programme that made this such a success. It was because this is THE ONLY place to meet all the real European DXers that you've worked via meteor scatter, aurora or moonbounce. During the proceedings I managed to speak to DXers from 23 countries, including three v.h.f. operators from Rostov-on-Don in UA6. The social events, lasting all night, are something else and definitely not for the faint hearted! The photograph Fig. 2, shows Nick Peckett G4KUX and myself wondering what to do with the gift received from the Swedish 6M Group! Tnx SM7SCJ.

Icelandic Operation

I gave details, in last months column, of the e.m.e. contacts made by Johannes Baardsen LA6HL/TF during his Icelandic operation earlier this year. To complete the picture, this month I will concentrate on the results made via Sp-E, Au-E and m.s. on the 50 and 144MHz bands. Within a day of arriving in Iceland, Johannes, had a good Sp-E opening to the UK on the 50MHz band. Between 1107-1135UTC on July 5 he worked G3BJD, G3CJ, G3KX, G3KPT, G4CCZ, G4IGO, G0HVQ and GW0MDQ.

Unfortunately, this was the only opening on 50MHz which Johannes observed. Another one-off propagation event, this time on the 144MHz band, occurred on July 8. From 2200UTC, and lasting for some hours, contacts could be made via Auroral-E. Signals were fairly weak but more importantly, T9, via this field-aligned propagation mode.

Contacts, lasting for nearly two hours, were made with GM4IPK and GM4YXI but despite many calls being made on c.w. no other stations were heard. Because of its geographical location, the only successful way to make contacts from Iceland, apart from using e.m.e. is via meteor scatter, reflecting v.h.f. signals from ionised meteor trails. A number of QSOs were made via this mode, GM4YXI managing to work LA6HL/TF in five locator squares, HP94, IP14, IP15, IP24 and IP35. Johannes also completed with PA3BIY, PA3BZL, PA3DZL, PA3FOC and PA0RDY. All meteor scatter QSOs were made with an FT225RD and 160W. The picture Fig. 3, shows LA6HL/TF assembling the 15-element Cue Dee Yagi, for an evenings m.s. operation from IP94.

DXpedition Update

Paul Duncan GW7KES provides a DXpedition update and says he will be operating maritime mobile from the Royal Research Ship *Challenger* between December 4-20. The ship is



A 'cluster' of amateurs helped John G4PDQ, sysop of the GB7DXC DXCluster, celebrate his marriage to Pauline G8MZV on September 14.

Back Row Left to Right:

Andy G0JXM, Evan G3CJ, Tim G4VXE, Terry G3JFH, Derek G3NKS and Maurice G3XKD.

Seated:

Pauline G8MZV and John G4PDQ.

scheduled to sail from Troon on the west coast of Scotland to a working area in the North Sea. The final day or so will be spent sailing to Barry, South Wales. Paul is uncertain which squares he will sail through and at what times of the day he will manage to get on the radio, but thinks it likely that he will be QRV most evenings and early in the morning. He will use a TR-751E, 25W amplifier into an 8-element Yagi and will operate on 144.250MHz.

Kim Bjoern OZ1EYE gives his DXpedition update and says he is also planning to operate from some wet North Sea squares, activating JO25, JO26, JO35 and JO36. The expedition will take place between December 10-14, with most activity being on meteor scatter but this will be ceased if there are good tropo or auroral conditions. He will be QRV on 144.217MHz for s.s.b. and 144.117MHz for c.w. QSOs.

If you want a sked, you must leave your name, call sign, address and telephone number as Kim will contact you in the week before the expedition. He can be contacted via packet radio, OZ1EYE @ OZ8BOX or direct at Skelvangsvej 149 3th, DK-8900, Randers, Denmark.

UB5V, operating on 144.097MHz from KN58XA and UB5Q operating on 144.104MHz from KN76RX, will both be active between December 11-14 for the BCC meteor scatter contest. Both groups will be operating random, transmitting during the first 2.5 minute period at 200 w.p.m.

Beacon And Repeater News

Following successful on-air testing, the beacon 4N3SIX, operating on 50.014MHz, has been moved to a permanent location, JN76HD, near Ljubljana. It runs 10W into a 5-element Yagi beaming towards the UK.

In order to comply with the French 50MHz band plan, which only begins at 50.200MHz, the beacon FX4SIX has

been moved up in frequency to 50.315MHz. Located near Poitiers, JN06CQ, it runs 50W e.r.p. from a pair of crossed dipoles.

Other beacons, high up in the band, include ZS5SIX on 50.321MHz, 5B4CY on 50.500MHz, and the CU beacon, located in the Azores, on 50.877MHz.

The 1.3GHz beacon/repeater GB3CP, located in Crawley, is now back on the air. When not being used as a repeater, it transmits continuously, on 1297.075MHz, to act as a beacon. In common with all 1.3GHz repeaters, the input frequency is 6MHz lower than its output, in this case 1291.075MHz. Reports would be welcomed by the Secretary of the Sussex Repeater Group, Mike Mundy G0GNV.

Wider Coverage

In some parts of the UK, it may be advantageous to link repeater units together to give a wider coverage area. For example, your chances of making a mobile QSO in northern Scotland may be greatly increased if two v.h.f. repeaters are connected together, thus giving two separate coverage areas. The linking may be done on another frequency band, direct on the same band or hard wired, in the case of v.h.f. and u.h.f. units located on the same site.

Recently, the Radio communications Agency has agreed to linking proposals for three separate pairs of repeaters for an 18 month experimental period. The units are GB3BD and GB3BL, both u.h.f. repeaters in Bedfordshire, the v.h.f. repeater GB3AR and the u.h.f. repeater GB3AN, both located in Caernarfon, and the Scottish v.h.f. repeaters GB3AY and GB3DG.

QRZ Contest!

The 144MHz fixed station contest, organised by the RSGB v.h.f. contests committee, will be held on Sunday

December 1 between 0900-1700UTC. This popular contest always generates a great deal of activity and is your last chance during 1991 to pick up those rare counties. Although aimed at the single operator, fixed station, the contest also features a section for club members affiliated to the RSGB. Teams, of up to five members, can participate. Stations exchange RST, serial number and locator.

The RSGB 430MHz cumulative contests have been arranged to run on November 17 and December 3, between 1930-2200UTC. Microwave cumulatives, for the 1.3 and 2.3GHz bands, will be held on November 25 and December 10, also between 1930-2200UTC.

A Scandinavian microwave activity contest will be held on November 19 between 1800-2200UTC. The 50MHz section will be held on November 26, the 144MHz section on December 3 and the 430MHz section on December 10.

Deadlines

Please send your letters to reach me by the end of the month. I always write up the column in the first few days of the following month. Don't forget that I can also receive messages via packet radio at my mailbox GB7TCM.

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 can all be returned if you want them back.

144MHz QRB Table

Top distances (km)		
Tropo	3160	GM4YXI
Aurora	2029	G4ASR
Sp-E	3080	G0EVT
Meteor	3100	GW4CQT

BARGAIN BASEMENT

Write out your advertisement in BLOCK CAPITALS - up to a maximum of 30 words plus 12 words for your address - and send it together with your payment of £2.35, and corner flash or subscriber dispatch label to: **Donna Vincent, PW Bargain Basement, Enefco House, The Quay, Poole, Dorset BH15 1PP.**

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Advertisements from traders, apparent traders or for equipment which it is illegal to possess, use or which cannot be licensed in the UK, will not be accepted.

No responsibility will be taken for errors.

For Sale Trio TS711E 144MHz multi-mode, £600 o.n.o., also Cap.Co SPC 3000D a.t.u., £210 o.n.o. Dudley Taylor, 6 Broadlands Way, Osprey, Shropshire SY11 2TD. Tel: (0691) 657696.

Wanted Hallicrafters SX-28 or SX-28A h.f. receiver (550kHz-42MHz) preferably in good condition. Will collect. Peter Jarrett, 7 Pinecroft, Marlow, Bucks SL7 3BJ. Tel: (0628) 485671.

For Sale 934MHz Commel mast-head pre-amp, mast-head mobile pre-amp, 2 x 16 ele co-phased beams, collinear, rotator, co-axial, cables, plus much more, £300. Will split or swap for h.f. ham gear. Ken GOORH, 4 Park Avenue, Thatcham, Newbury, Berkshire. Tel: (0635) 66881.

For Sale Tektronix 561A oscilloscope complete with trolley, manuals and probes. Very good condition, £220 o.n.o. Also have various HRT magazines 1986-1988 free to whoever wants them. Paul. Tel: (0235) 530940.

For Sale Bush type SUG 26 receiver; Kolster Brandes type KB 830, Pye type p76; HMV radiogram 5315A; any offers? Mr Barcis, 88 Manfield, Skelmersdale, Lancs. Tel: (0695) 29357.

Wanted Military wireless equipment any age, condition immaterial within reason p.s.u. for DST 100. Any parts

for DST 100. Control unit for C13, will collect, pay carriage, make interesting swaps. Tel: Somerset (0278) 784205.

Exchange Yaesu FT-209 Mk1, case, NiCads, charger, never mobile, plus 25W 50MHz TVTR little used, for h.f. TVTR. Also Practika outfit for tranzmatch/Morse reader. Granville G1FGA. Tel: (0254) 394177 after 6pm.

Wanted Manuals for Jasonkit Scope 04-10, Heathkit r.f. signal generator r.f.-IV Codar preselector PR40. Andy. Tel: (0473) 212891.

HRO Would Mr Ireland from Scotland who telephoned following my advertisement in October PW offering HRO technical data please write or phone. **Wanted** HRO coils - all bands spread and general coverage for frequencies above 14MHz. John Teague, Perrotts, Lydford on Fosse, Somerton, Somerset TA11 7HA. Tel: (0963) 24319.

For Sale Welz diamond f/glass x50 144MHz collinear new, £37. Daiwa CN650 23cm p.w.r/s.w.r. meter, £67. Tokyo Hy-power HL160V 144MHz linear, £205 2W/160W also HL110U, £295. Paul G4XHF. Tel: (0293) 515201 evenings.

For Sale Psion LZ64 128K & 16K Datapaks, 32K RAMPACK, Commslink, Mains p.s.u., boxed in excellent condition. Cost new around £380, £145 o.n.o. Please write giving evening phone number. Peter Crossland, 12 Hamber Lea, Bishop's Lydeard, Taunton TA4 3NJ.

Wanted Yaesu FC-901 a.t.u. and or FV101 DM to match my 101ZD. Goff GW4VWY. Tel: (0443) 772387 anytime.

For Sale Eimac tube 8873 for the Heathkit SB230 linear-amp. G2DRT, QTHR. Tel: (0494) 814240.

For Sale FT-707 g.w.o. case scratched, £350. FT-107R 144MHz, 50MHz modules. 144MHz only 2W output hence, £110. FT-290 working OK but fault on scan, £120 with NiCads. Brian G4SDL, 6 Knowsley Avenue, Davyhulme, Manchester. Tel: 061-748 4010 or (0831) 127011.

For Sale Pye Westminster (2), both modified for single 70cm with crystals but one (at least) badly trimmed (core damage). Both with mic and LS. First reasonable offer accepted. Bill Jarvis GM8APX, 6 Peggy's Mill Road, Edinburgh EH4 6JY.

Wanted DST 100 receiver and/or parts for refurbishing aged RX. Tom Bartlett. Tel: (0508) 20657.

For Sale Realistic PRO 35 hand-held scanner, £125 o.n.o. Yaesu FRG-7000 h.f. receiver, £250. Amstrad 2086/30 32Mb 14inch VGA hi res colour monitor, 5 1/4 drive, 3 1/2 drive, £650. Tel: (0732) 366704.

For Sale FT-757 GXMKII with 13.8V 20A p.s.u., £750. RN 50MHz transverter wired for use with above rig, £150 or both together, £880. FT-290R Mk1 MuTek board fitted 2 months ago, complete with 2.2AH NiCads, charger, 1/4 wave wip and manuals all boxed, £230 as new. Terry G4OXD. Tel: (0462) 435248 after 6pm or leave message.

For Sale Yaesu FRG-7700 all-mode receiver 150kHz-30MHz with FRT-7700 a.t.u. Original box and manual v.g.c. £225. Tel: (0843) 63445.

For Sale mint boxed, Hameg oscilloscope HM1005 100MHz, £500. 1GHz frequency counter, £100. Sweep generator, £90. Dual 0-30V 3A p.s.u., £140. Signal generator 100kHz-150MHz, £50. Ray. Tel: (0282) 842124 anytime.

For Sale Yaesu FT-One general coverage h.f. transceiver (base station) f.m. boards fitted, boxed with manual, £825 o.n.o. (May consider exchange for mobile transceiver with cash adjustment). Please contact Mr B. Williams, Bradford, Yorkshire. Tel: (0274) 880895.

Wanted TL-120 linear for my TS-130 and if possible the MB-100 mobile mount. Peter G3ELH, 3 Buckmore Avenue, Petersfield, Hants GU32 2EF.

For Sale Diamond D-130 Discone 25-1300MHz. All stainless, one month old 'boxed as new' plus 4m length of UR67 cable, £55. Tel: (0425) 620413.

Free Ancient gear and junk: 1944 vintage battleship radio 1-20MHz. Homelab signal generator 100Hz-140MHz. Airmec oscillator 3Hz-30kHz. All working plus allsorts. The lot free to good home, collect. Dave, Crawley, Sussex. Tel: (0293) 883510.

Exchange complete camera outfit. Rollei 35s, black, 2.8 sonnar, l/hood, 2 filters, h/book, mint. Sunpack electronic flash, mint. Voigtlander acc/shoe rangfinder (col. item) plus other accessories in small gadget bag for Trio 600 receiver in v.g.c. Tel: Tyne & Wear 091-526 7902.

Exchange Fullerscopes 'Export' 6 1/4 in Newtonian reflecting telescope. Heavy equatorial mount, mains driven RA, three eyepieces, cost £800. For Martelec graphstore or other advanced framstore plus adjustment if needed. Paul. Tel: Blackpool (0253) 826535.

For Sale Yaesu FRG-9600 all-mode scanner 60-905MHz, mint condition, with free h.f. adapter, £300. Graham G6SUQ, 42 David Close, Harlington, Middlesex. Tel: (0494) 424227 during office hours.

For Sale FRG-8800 with converter and active antenna, £525 o.n.o. Tel: (0963) 251304.

For Sale Early 1950s valved SAS 'spy' type hand-held miniature RX 500kHz-18MHz, with battery box (collectors item), £50. Legal 28MHz multi-mode converted CB radio, 15W s.s.b., a.m., f.m., with DTI cert., £70. National Panasonic MW/SW car radio-stereo cassette player, model No. CQ-707EW. Radio covers 500kHz to 1.6MHz, 3-7MHz and 9-16MHz, £70 o.n.o. G3XFD c/o PW office.

For Sale Trio R1000 h.f. receiver excellent condition, n.b.f.m. board fitted, £230. I. Clarke. Tel: Beconsfield (0494) 676391.

Wanted Mature s.w.l./constructor/collector seeks Eddystone EC10 MkII, Heathkit Mohican GC1U, Lowe SRX-30 and AR88 with a view to a long term caring relationship. Tel: West Sussex (0243) 512329.

For Sale Trio R2000 h.f. receiver, little used and boxed with accessories, £325 for quick sale. Tel: Derbyshire (0773) 746385. Buyer collects.

For Sale BBC Computer, RTTY, AMTOR, FAX, SSTV, 128K, sideways RAM 80/40t double drive, high res colour monitor, plenty of software, manuals, etc, £300. Details Tel: Bucks. (0240) 27531.

Wanted Eddystone receiver, especially older models such as 750 or 640, in good or poor condition. Tel: (0226) 288718.

Have Create 730V-1 dipole 7-28MHz, unused. AVO test gear - valve tester, signal generator, l.c. bridge, all stored but believed OK. **Swap** for astronomical telescope, home-brewed considered if good. R. W. Sharp, 77 Cloche Way, Swindon SN2 6JN. Tel: (0793) 826325 evenings after 7pm.

For Sale Icom 2GE 144MHz f.m. hand-held TCVR with CM7 battery pack (7W) and Icom mic. boxed, mint, £185. Mizuho 14MHz QRP hand-held with mic., antenna, d.c./d.c. unit, £150, mint. Tel: (0444) 241567.

For Sale FRG-7 h.f. receiver 0-30MHz u.s.b.-l.s.b., good condition, £110 will deliver reasonable distance. Tel: Skelmersdale (0695) 22573 evenings.

ARMY RADIO type C.42. Freq 36/60 Megs FM for 24V DC with P.U no leads AFV type set £95. **ARC-44 T/Rx** compact airborne unit freq 24/51.9 MHz in 100 kHz chan FM nom 8 watts into 50Ω for use on 24V DC supplied with control box dynamotor units circe etc £38 or with 8ft whip & coupler unit £54 **STR 37 VHF A/C Radio** freq range 116 to 135.95MHz in 50kHz chan for use on 24V DC with Fol & Sq controls small unit supplied tested on Rx with connec £68 Tech info £9.50 **MORSE KEYS.** Army general purpose adjustable keys £8.50 **WATTMETERS RF** Mil type CT443 low power 50Ω absorption wattmeter to 1GHz as 3 ranges 100/300mW & 1.5 watt as direct cal 3.5 dia meter in inst case size 7x8x7" with BNC connec tested £45. **OPTICAL ACCS** mixed selection of lenses, eyepieces, mirrors, prisms etc mostly new about 12 items £23. **ALARM UNITS** Racal type IR747L Infra Red Heat sensors range 15m at 90° to sensor reqs 12V DC 25mA as contacts to work ext relay & local LED Ind with inst leaflet £16.50. **ACCEPTOR UNITS** Pre Selector unit part of Army R.234 Rx equipment tunes 2/27 Mes in 4 bands direct cal with 10.1 slow motion dial as 75Ω I/P & O/P circes, with double tuned high Q coils on 19" panel no pwr req with circ etc £32.

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73 from Dave G4KQH, Technical Manager

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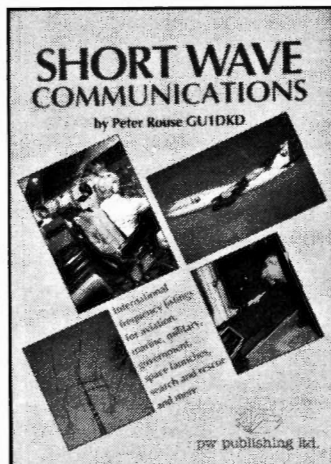
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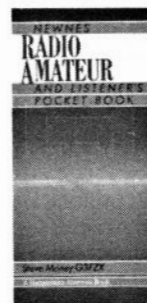


Short Wave Communications
Peter Rouse GU1DKD
PW Publishing Ltd.
ISBN: 1-874110-00X
187 pages, price £8.95

Available from PW Book Service, £1 post and packing.

Newly published, this book, as its name suggests covers a very wide area and as such provides an ideal introduction to the hobby of radio communication. Logically laid out chapters take the reader through basic radio propagation, how to work your radio, and what the controls do. One chapter deals specifically with antennas, and another with band plans. There are many pages of useful information of where and when to listen on the bands, so you can successfully receive the service or transmissions that interest you. Using simple, understandable language throughout, the author has managed to make this book a good basic, very readable introduction to a complex subject. Newcomers to the hobby will be delighted to find a copy in their stocking.

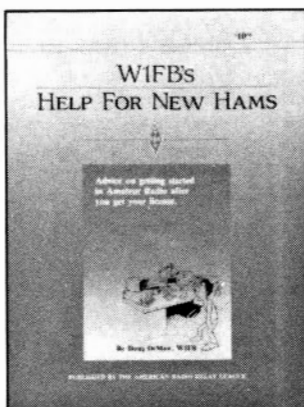
Radio Amateur And Listener's Pocket Book
Steve Money G3FZX
Heinemann Newnes
ISBN: 0-434-91259X
160 pages, price £9.95
Available from PW Book Service, £1 post and packing.



There aren't many books in our hobby that can be truly called 'pocket books'. This however, is one that really does fall into that category. It's a slim volume, packed with information and no doubt could easily fit into many stockings at Christmas, and equally well into coat pockets too. Covering topics ranging from radio frequencies, amateur radio and onto digital communications, this miniature manual, for that's what it is, provides an excellent reference work. There are many offices where the information provided has proved invaluable and the PW office is no exception. An excellent little gift for any radio enthusiast, whether beginner, s.w.l. or transmitting amateur.

W1FB's Help For New Hams
Doug DeMaw W1FB
American Radio Relay League
ISBN: 0-87259-287-1
155 pages, price £6.95
Available from PW Book Service, £1 post and packing.

We have reviewed this book before, and have no hesitation in recommending it once again. Here in the UK the Novice licence and its practical approach to helping newcomers to go on the air is proving successful. In the USA, Doug DeMaw W1FB has been practising what he preaches for a long time. Covering topics in 'notebook' style such as 'The Newly Licenced Amateur' right through to TVI and BCI, on the air conduct and safety, this book comes packed with useful tips, advice and information. It is highly recommended for any radio amateur, let alone the newcomer.



Radio / Tech Modifications (Number 3)
Artsci Inc.
PO Box 1848 Burbank
California USA CA91507
160 pages, price £9.95
Available from PW Book Service, £1 post and packing.

If you are either involved with the servicing of amateur radio equipment or specialised receiving gear, this simply produced book will prove invaluable on your workbench. Clearly laid out and designed with an index, the reader is provided with a quick guide to what equipment is covered in the book. All the diagrams and modifications are clear and concise and the book contains information on Alinco, Icom, Kenwood, Yaesu, and most of the well-known makes of equipment. A good buy for anyone interested in modifying equipment in an informed way.

Simple, Low Cost Wire Antennas For Radio Amateurs
William I. Orr W6SAI and Stuart D. Cowan W2LX
Radio Publications Inc.
Lake Bluff IL 60044 USA
ISBN: 0-933616-02-3
190 pages, price £7.50

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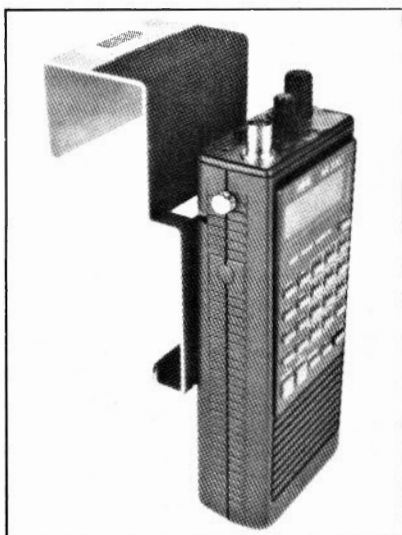
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