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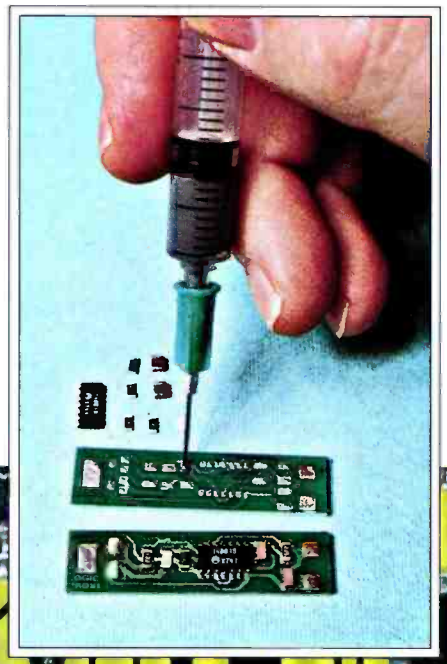

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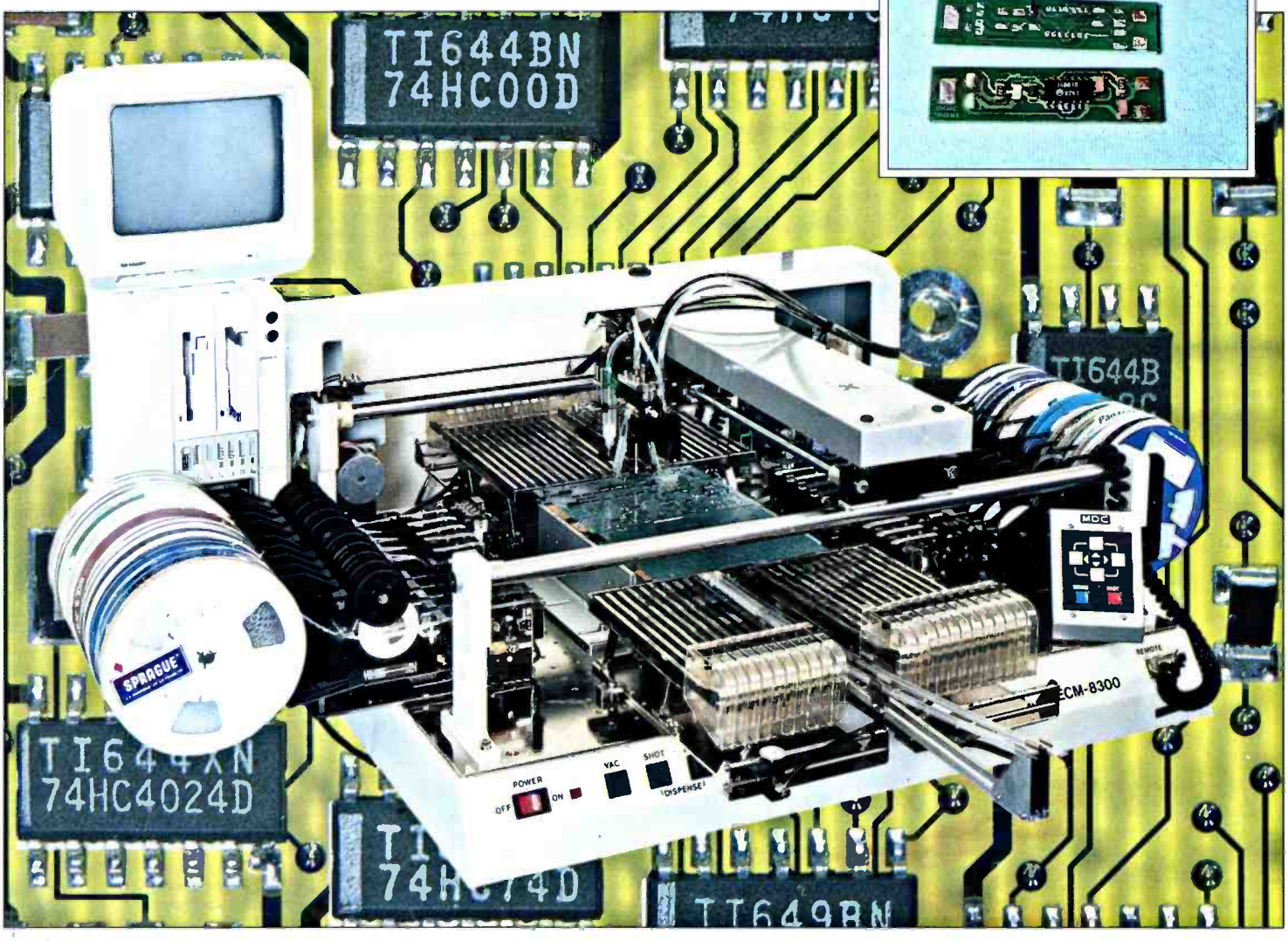

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Feature... *Electrostatic Precautions*

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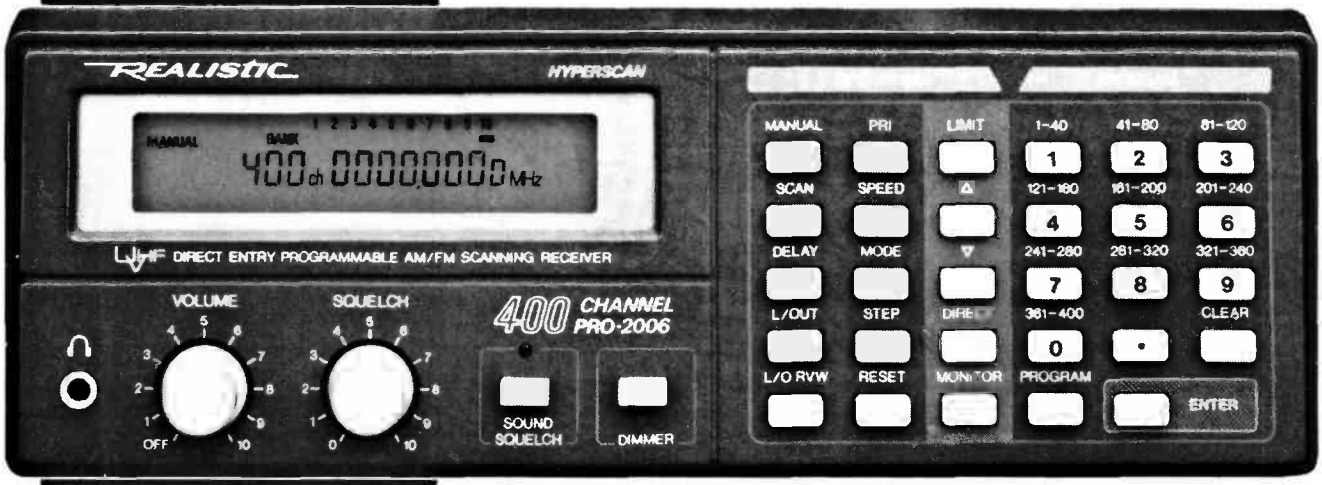

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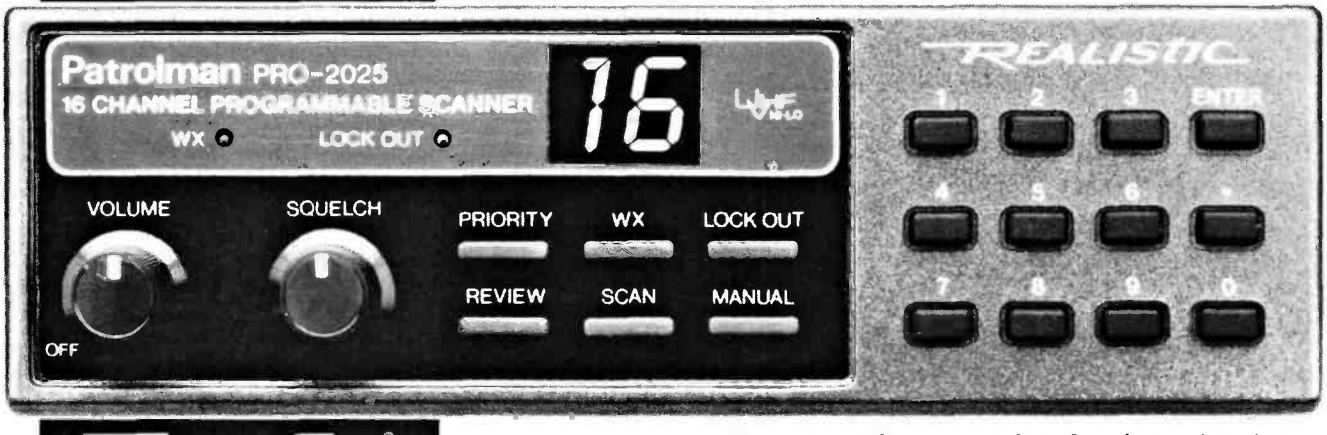

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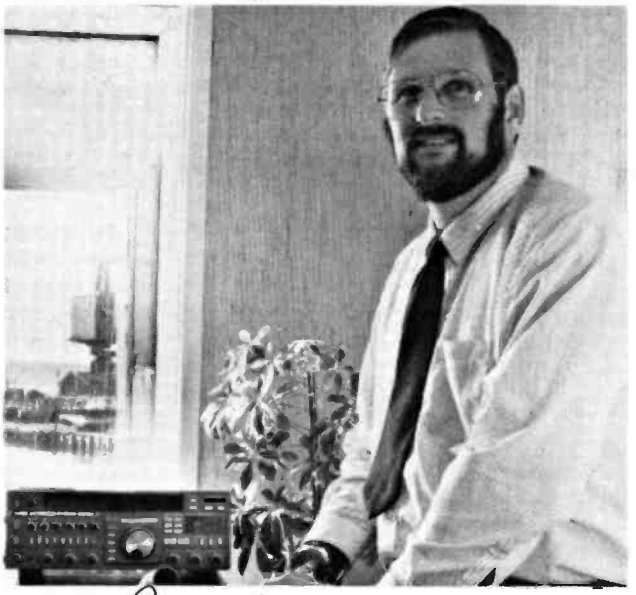


Rob Mannion G3XFD

It's become rather obvious that many of our readers have entered the amateur radio hobby via the 'instant' facility provided by CB. This fact has been clearly pointed out to me by the letters that arrive in the *PW* office every day.

Despite the - often misguided - dislike of the CB facility by established radio amateurs, it's here to stay! I'm no different to many people, in that I find that the pseudo 'American cowboy' accents - adopted by some operators - annoying. Fortunately these characters have mostly (here in the south-west anyway!) wandered back to the cinema where they belong!

However, many of us use CB and it still provides a useful service - and if that's what they want - an introduction to the radio hobby. Now that we have changed the format of 'Backscatter' and Ron Ham's new 'Reflections' column is under way, the time has come to provide the 934MHz and 27MHz CB with their own joint column..

The new 'CB - High & Low' feature, takes over the fertile ground ably prepared by our friend Rick Maybury in 'CB Corner'. The column will look at the 934MHz scene at the 'high' end every month, and then drop down in frequency - so to speak - to see what's on 27MHz.

Our contributor - 'Quaynotes' will be expecting your reports, comments, criticisms and ideas. Keep them coming - if you're to get the planned one and a half pages every month, you'll have to send them direct to 'Quaynotes', c/o *Practical Wireless* at our usual address. As usual - it's up to you!

Where To Now?

I was genuinely surprised when I heard that the RSGB had not won the contract to run the proposed Novice Licence examinations. The Society had set great store by the proposals. In fact the RSGB were very confident that they'd get the contract - and said so! The bad news must have come at a very difficult time especially when the appalling financial state of the society is taken into account.

Obviously the government - via their agents the DTI - considered that either (or both) the tendered costs and City & Guild's experience in the examination field outweighed anything the RSGB could offer. Now that the blow has been struck, I have to be honest and say that I'm in two minds on the subject. In other words - I have doubts in both directions - for and against the RSGB getting the contract.

My worries in one direction are backed up by the doubts of many readers (many of whom are RSGB members) who were concerned that the society would not have been able to cope with the extra work-load. This genuine concern is often 'backed up' by complaints that "I wrote to the RSGB and I've never received a reply", etc.

I tend to agree with people who expressed concern about the extra work-load, and that the society might not have coped at headquarters level. However, I don't fully sympathise with those who say that they didn't like the idea of literally having the Novice Licence scheme under the almost total control of the RSGB.

Still, there's no point in arguing! The decision is taken, we're stuck with it. But, where do we go now? The terse announcement on GB2RS only said that the C&G had won the contract. Unfortunately, I think the real problems are about to begin. The Novice Licence examination - as explained to me and other interested parties at a meeting at RSGB Headquarters, would be an unusual exam in many ways and will need a special approach from the authorities point of view!

No Cheating Needed

Unlike any of the C&G's many other exams, the Novice Licence test itself, was (is?) planned to take place **with the actual licence document** placed in front of the candidate. During the examination (as I understand the process) the examinee would be able to look up the appropriate answer.

The argument behind this approach is that the candidate would be able demonstrate ability to research and interpret the document and thus be able to understand restrictions, the law, and regulations.

Many of you won't agree with this procedure, but I think that in practice it could work - given the right examining body and staff. I've much respect for the C&G. I also have no doubt that there are many readers who've taken the RAE, and the many other examinations run by the organisation, who feel the same way.

Hushed Hall

Despite the respect I have for the organisation, I wonder how the C&G plans to operate the Novice exam? Will it be held in the way that they've run their other exams over the years? If they do, I can just imagine the scene: A 'hushed' hall, invigilators quietly pacing up and down past row upon row of bowed heads. I can also imagine the intimidating effect on the 12 year-old boy in that corner over there - yes, that one - next to the big chap taking the Welding & Metallurgy examination!

Fair enough, I'm joking - but it will be interesting to see just how the C&G do intend to run the exams. You can be sure that this particular exam - bearing in mind the extremely wide range of ages of the people who could be taking it each time - won't fit into the usual C&G format.

Perhaps, remembering the valuable groundwork laid by the RSGB (and despite the confusion we must pay tribute to this) the C&G may be able to call on expert help? At least you can honestly say that radio amateurs do know their hobby. Our national society may not have the organisational, financial or inertial abilities to run the entire scheme but the RSGB and radio amateurs in general MUST be involved somehow!

Orderly House

I'm hopeless at money management. My wife, and anyone else who knows me, will tell you that I could lose a £5 note in a locked, empty room! But I do know my limitations - and avoid any job that entails money-handling. You've probably noticed that at rallies and shows where, for safety's sake I avoid taking money from readers at the *PW* stand!

My family and I now work to a strict budget. Gone are the days where I would buy equipment on a 'whim'. All expenditure is planned now - although I drive the car 'on a wing and a prayer'! So, if I can do it - why can't the RSGB do the same? I think it's time that the society - if it's to survive - must employ a professional 'money manager'. If, as the society itself says, every member counts, then every subscription must be accounted for in a correct, useful and wise way.

Who was it that said that 'A camel was a horse designed by a committee?' Perhaps they were right!

A happy, peaceful Christmas and good New Year to you all, 73 de Rob Mannion G3XFD.

Receiving You...

Send your letters to the Editorial Offices in Poole, the address is on our contents page. Writer of the Star Letter each month will receive a voucher worth £10 to spend on items from our PCB or Book Services, or on *PW* back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.
Letters must be original, and not duplicated to any other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.

★★★★★STAR LETTER★★★★★

Dear Sir

I have just spent a fascinating couple of hours reading a 1937 copy of the *T & R Bulletin (Radcom)*.

Not a lot has changed - apart from prices. Human nature certainly hasn't, even in those days they had more than an average quota of 'wallies' on the bands, and even the odd expletive!

What did take my interest was an advert for *Short Wave Magazine*. The November 1937 issue carried no less than 40 pages of constructional articles, all for the cover price of sixpence - try beating that!

The good old days? - I wonder. Even then, according to readers letters, the 'home-brew versus the commercial equipment' argument was already in full fling, as was the criticism of the 'absolute method of using Morse'.

One thing I do feel sad about is that I have missed - by 53 years - the chance to buy a brand new McElroy bug key for £1.90, and an imported American Communication receiver for just £9.

Ah well, you can't win them all!

N. Kirk G3JDK
Rotherham
Yorkshire

Editor's Comment: We do still try to 'fly the flag' for home construction - but it's up to you, the reader to respond with ideas, comments and projects. Keep 'em coming!

Dear Sir

In two recent 'silent key' sales I attended, the family were surprised and pleased with the cash realised by the sale.

I know that in one case the widow had let the 'dustman' collect the gear. Unfortunately, although a friend rushed to the house - he was just too late!

If you're in the same situation, ask an amateur friend to help dispose of unwanted equipment.

Francis Rose G2DRT
High Wycombe
Buckinghamshire

Editor's Comment: G2DRT is offering sound advice. Many recently bereaved XYLs have 'lost out' in this way. We would be pleased to announce 'silent key' sales in 'Newsdesk '91' and on the 'Wireless-Line' news bulletins, and don't forget to involve your local club whenever possible.

Below is a letter recently received in our offices from a member of the forces based in West Germany, who's writing on behalf of his unit to say a very big thank you to Arrow Radio Ltd in Glasgow.

Strawberries From The Gulf

My unit is preparing to go to the Gulf to assist the United Nations. When I received the orders to go I wrote to two companies and telephoned Arrow Radio Ltd. in Glasgow, asking that they donate a receiver to help with the boredom and the lack of communication with the outside world.

Instantly, Jim GM0AAJ, offered to assist and sent two communications receivers that very day which are now on their way to the Gulf.

I received one letter from the other companies that said "Sorry, but all the best in your endeavours....". The other British company did not reply.

So, I would like to say a very **BIG** thank you to Arrow Radio from all the men of this unit for the donation and the great assistance you have given us.

Why Strawberries I hear you say, well it is the Army term for a pat on the back or do the readers know better?

Any more donations of good h.f. receivers for the men would be gladly received.

Dear Sir

As a regular reader of *Practical Wireless* (and also *Short Wave Magazine*), I was very pleased to see my letter published in the August issue of *PW*.

I wonder how many readers relate their name or hobby in the name of their house or their pets, etc. I note that Ron Ham has named his house 'Faraday'. It would be interesting to find out if there are any others, and in answer to the obvious my house is not called 'Paradise Lost'.

Thanks for the two great magazines!

Peter Milton, Stocksbridge, Sheffield.

Dear Sir

The problem of piracy upon the Amateur bands has been with us for a very long time. The misuse of v.h.f. repeaters is well known and well documented. However, similar illegal transmissions on the h.f. bands do not appear to attract the same level of attention from the relevant authorities. I for one, am not aware of any successful prosecutions of offenders.

Whilst you have to accept that direction finding techniques at v.h.f. are relatively straightforward, I suspect that the failure to apprehend the h.f. offenders is more a result of lack of pressure upon authorities than a lack of the requisite technology.

To determine the measure of the problem, you only have to listen around the DX portion of 3.5MHz, most evenings after 11.30pm, clock time. One or two of these persons can be heard imposing carriers upon the working frequencies, making childish remarks, etc.

Now if this were the sum total of the problem, it could be treated with a measure of good humoured tolerance. However, one of these persons has taken to targeting those operators least able to deal with the situation. I refer to amateurs who have had the misfortune to experience severe illness or disability.

The appalling personal attacks upon one or two such operators are utterly unacceptable. This, together with false allegations of serious criminal activity directed at specific amateurs, has prompted this letter.

In order to prosecute such offenders, they must be located and identified. If the Radiocommunication Agency, for whatever reason, is unable to act, then we must help ourselves. I cannot accept that licensed amateurs and serious short wave listeners would not be aware of illegal activity in their own locality. Signal strength alone could be a first indication.

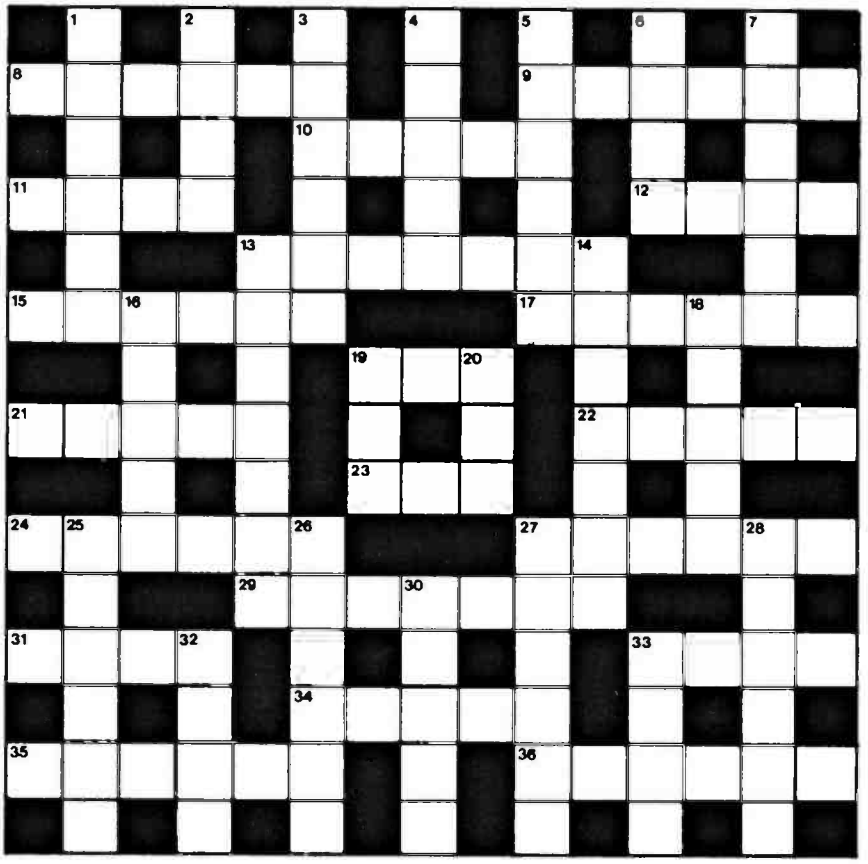
There is strong evidence that one of these pirates is operating in the Wednesbury area. He even boasts of having operated illegally for seven years or more and that he does so with the full knowledge of the local amateur community. If there is ever a grain of truth in this claim, then perhaps it is time for us all to drop any interest in radio and take up a different activity, such as mugging!

Should anyone have knowledge of such illegal operating, please advise the RSGB and the DTI, in order that action can be taken to bring this most offensive form of pirating to an end.

T. Tuite GW0NSR
Penmaenmawr
Gwynedd

Editor's Comment: In the last few weeks the Radiocommunication Agency announced that they have taken action against illegal 6MHz 'pirate' operators in Scotland. However, as I've heard some of the idiots who try to disrupt 'nets' such as the WAB on 3.5MHz, I know we've got a problem. If we don't 'clean up our act' - amateur radio will degenerate into a radio 'slanging match'.

Competition Corner



Across

8	Speedy landing place (6)
9	In coal (anag.) (6)
10	Fight round with R! (5)
11	Enclosed area indicates volume (4)
12	Albert's Xmas introduction in Trafalgar Square (4)
13	(and 29 across) Tracked drawing (7, 7)
15	Further argricultural location (6)
17	Star warehouses on the move! (6)
19	Monthly emergency day (3)
21	Depressed insect underneath (5)
22	I rota contains magnitude (anag.) (5)
23	Right tool for top Welsh (3)
24	Questionable reply (6)
27	Get away from it all (6)
29	See 13 across (7)
31	Spoken song round 6 down (4)
33	Polite archery manoeuvres (4)
34	Large victim for Jack (5)
35	Moving rig hangs around (6)
36	Warning lights on chancy game (6)

Down

1	Sudden stop shortens trousers (6)
2	Exercise with water (4)
3	Greet cross-breed (6)
4	French coin for Spencer (5)
5	Sea above Poland (6)
6	Talent, present at Christmas (4)
7	Regional speech (6)
13	Circus act co-co-ed off! (7)
14	In come the visitors! (7)
16	Sticky situation for Eskimos (5)
18	Additional equipment small acting (5)
19	Paper on location (3)
20	Japanese craving (3)
25	Limited width should go straight (6)
26	Fraudulent manipulation of outfit (6)
27	Planetary lines house foxes (6)
28	Energy or forces work (6)
30	Protection device may change (5)
32	Couple (4)
33	Gossips be noisy! (4)

Complete the crossword, fill in the form and send your entry to PW Publishing Ltd., January 1991 Crossword Competition, Enefco House, The Quay, Poole, Dorset BH15 1PP. Closing date Friday 18 January 1991. The Winner can choose either a years subscription to *PW* or a £20 voucher to spend on the Book Service or other *PW* services. The two runners-up can choose a six month subscription or a £10 voucher. The Editor's decision on the winner is final, no correspondence will be entered into.

❑ Subscription ❑ Voucher (Please tick choice of prize)

Name .....

Address .....

.....

.....

Postcode .....

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 £4.50 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 and FJP KITS, both of 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.

Wireless Line
This is an information service for the radio enthusiast, updated each Friday. Calls cost 44p per minute peak time and 33p per minute off-peak. The number to ring is: (0898) 654632.

Newsdesk '91

Cirkit Catalogue

The latest edition of the Cirkit Electronics Constructors Catalogue is now available. The 184-page catalogue is available from Cirkit and most large newsagents, priced £1.60.

Cirkit Distribution
Park Lane
Broxbourne
Herts EN10 7NQ.
Tel: (0992) 444111 Sales or (0992) 441306 Enquiries.

100MHz Oscilloscope

STC Instrument Services have introduced a 100MHz real-time oscilloscope to its range of Philips 'Smart Scopes'.

A feature of the PM3070, which shares all the main functions of the established PM3065, is its on-screen measurement cursor with an innovative zoom back-up. The zoom capability is ideal for applications where signal detail requires to be enlarged to increase time resolution and can be carried out with the touch of a button.

Other features include triggering up to 150MHz; multiple display modes; an auto-set facility for instant display of a signal; touch switch control of all major functions; and a large l.c.d. display which provides continuous readouts of instrument status and selected settings.

Signal measurements are accomplished simply by positioning the cursors on the waveform and the results are displayed at the top of the c.r.t. Cursors can be used in both of the available timebase modes and enable risetime, amplitude and absolute/relative time measurements.

For further details, contact:

Tony Leach
STC Instrument Services
Edinburgh Way
Harlow
Essex CM20 2DF.
Tel: (0279) 641641.

Scouts Exchange Greetings

Lowe Electronics of Matlock, Derbyshire have helped over a quarter of a million scouts exchange greetings and news with other Scout members throughout the world. Every October, the Scouts take part in an annual event known as Jamboree-On-The-Air and last year the Scouting Association set up their own amateur radio demonstration station. Based at Gilwell Park, near London, the station was equipped with modern radio transmitting and receiving equipment, supplied by Lowe Electronics. The station has given thousands of young people the opportunity to learn about radio communication and talk to people throughout the world.

Transmitter Facilities Available

BBC World Service recently welcomed the decision of the Czechoslovak Federal Government to make available transmitter facilities and frequencies for its programmes in Czechoslovakia, the first such arrangement for the BBC in Eastern Europe. The Government offer is being made on an interim basis pending re-allocation of broadcasting frequencies due when Czechoslovakia's broadcasting bill becomes law early next year.

BBC World Service is proposing a 24-hour station broadcasting on f.m. or m.w. in three languages - Czech, Slovak and English. English language teaching programmes would also be included.

A Must For Exporters

It makes legal and commercial sense to ensure that your exports comply with the technical requirements of your target country, but researching these requirements is never easy. BSI's Technical Help to Exporters department has done all the hard work for you in a new 70-page one volume guide, called *Electrical Equipment USA*.

The guide has been extensively updated to keep pace with one of the most demanding markets in the world.

A wide range of domestic, commercial and industrial electrical equipment is covered, including that used in hazardous locations.

This latest edition identifies US standards, regulations and approval procedures applicable to electrical equipment throughout the USA; it also gives details of organisations responsible for applying and enforcing US regulations; and lists recognised testing and certification bodies. Available from BSI Sales as Ref. TH203457, priced £95.00.

BSI Sales
Linford Wood
Milton Keynes
MK14 6LE.
Tel: (0908) 220022.

The 1991 Youth Skills Olympics

The search is on to find the two best young electronic technicians that Britain can enter for the 1991 Youth Skills Olympics in Amsterdam. They will be part of the Electronics Examination Board's national team, comprised of representatives of 35 trades. One technician will compete for the Consumer Electronic craft awards and the other for the Industrial Electronics Award.

The British Team will enter under the auspices of 'UK Skills', a new management body which operates under the umbrella of the City & Guilds.

The Electronics Examinations Board has agreed to assist in finding, selecting and training competitors in the two electronics trades and welcomes help from any source.

The standard of the competition is high and demands first class skills in fault-finding and the use of tools. The level of theoretical knowledge required equates to HNC level. Competitors must not be more than 22 years old during the year of the competition (1991).

They hope to discover about ten potential competitors in each trade group, who will have support and they hope, sponsorship from their employers. There will be a testing/selection period and the two most promising youngsters in each trade will be selected for further training before they go to Amsterdam as competitor and back-up.

For further details, contact:

Peter Bennet
Examinations Officer
Electronics
Examination Board
Tel: 071-836 3357 Ext 201.

New Bulgin Component Catalogue

Just published, the new A. F. Bulgin Component Catalogue offers design engineers, buyers and specifiers a complete guide to the company's extensive range of electrical and electronic components.

Full technical data for all products - from battery holders to waterproof switches - are presented in easy-reference format throughout the extensively illustrated 215-page publication. Full ordering details, complementary product shots and circuit diagrams enable users to select and design in the appropriate components for their equipment and systems.

Available upon request from:

A. F. Bulgin & Co PLC, Bypass Road
Barking, Essex IG11 0AZ. Tel: 081-594 5588.

Radio Marathon

Two Maltese radio amateurs are organising a radio marathon in aid of the handicapped. The special callsign used for this event is 9H3HTH (Help the Handicapped).

Funds gathered during this 120-hour event depend on the number of QSOs. This station will officially open on 30 December 1990 at 2300 until 3 January 1991 at 2300 (all times GMT). Frequencies to be used are one of the following ranges:

(20m)	14.225-14.275MHz
(15m)	21.225-21.275MHz
(10m)	28.250-28.500MHz on phone, 14.030-14.060MHz c.w.

Operators are Ian 9H1BK and Sergio 9H1BU.

Newsdesk '91

Practical Guide

New ideas, be they the brainchild of innovative individuals or giant corporations, require effective legal protection if they are to be exploited successfully in today's highly competitive - and increasingly international - markets.

Fortunately, help is at hand in the form of an eminently understandable guide to patents and trade marks by leading authority, Laurence Shaw.

The Practical Guide for People With A New Idea (Patent Eye, £9.95), first published in 1982 and now extensively updated, provides step-by-step advice from the initial assessment of how best to protect an idea, to the defence of rights in the event of copying and the licensing of rights for royalty.

Separate sections are devoted to patents, design, trade marks and copyright, and plant breeders rights, with the author explaining how to take advantage of each mechanism.

Available direct from:
The Patent Eye
George House
George Road
Birmingham B15 1PG.
Tel: 021-456 2269.

VHF Communications

KM Publications will, as from 1 January 1991, be publishing *VHF Communications* here in the UK. There will be an increase in the annual subscription rate from the present level of £9.75 to £12.00. This includes all UK and overseas surface postage costs. Air Mail is charged extra.

The World's First

Wordsafe, the world's first desk-top multi-channel voice logging recorder incorporating helical scan technology, was recently unveiled by Racal Recorders Ltd. Wordsafe is the first communications recorder to provide up to 32 channels and more than 24 hours continuous recording on a standard VHS cassette in a compact, easy-to-operate machine.

The use of VHS and helical scan makes Wordsafe a powerful machine and the combination of an interactive display panel, simple controls and easily inserted cassettes ensures that, in day-to-day use, the recorder can be operated accurately and reliably by any member of staff without specialist training or technical knowledge.

Wordsafe is especially suited to general office environments where there is a need to record all the telephone transactions, yet where space is restricted. The high level of security offered, together with the operational simplicity, will also appeal to longer-established users, such as the emergency services and air traffic, harbour and seaway control installations.

Further details from:
Racal Recorders Ltd.
Hardley Industrial Estate, Hythe
Southamton SO4 6ZH.

DADARS 1991 National 144/146MHz Contest

The fifth Derby & District ARS Two Metre Contest will be held on Sunday 10th March 1991 between the hours of 1300 and 1700GMT. A copy of the Rules is available upon receipt of an s.a.e. from the club at **119 Green Lane, Derby DE1 1RZ.**

Stereo Sound For Television

NICAM Digital Stereo was introduced to TVS Television and Channel 4 in parts of Kent and also to Tyne Tees Television and Channel 4 in parts of Northumberland and County Durham from the end of October. This is part of an IBA initiative to bring the new digital audio technology to almost 80% of British viewers by the end of this year.

NICAM stands for Near-Instantaneously Companded Audio Multiplex. It adds a special digital signal to a standard television transmission to enable reception of stereo sound with quality similar to Compact Disc. The system can also be used to provide a second language soundtrack. Stereo sound adds another dimension to the television viewing experience, especially for music, drama, sport and light entertainment. Most recent feature films have been produced with a stereo soundtrack. The number of stereo programmes and films on ITV and Channel 4 is increasing. Those with digital stereo sound are identified in *TV Times* and on ITV's Oracle and Channel 4's 4-Tel teletext services.

In order to receive NICAM, it is necessary to have a TV set or video cassette recorder (VCR) incorporating a NICAM decoder. In the last year or two, a wide variety of receivers and VCRs have been produced with the option of NICAM sound. Older sets with stereo speakers will probably not be suitably equipped. These were meant for connection to an external stereo source, such as a stereo VCR playing back pre-recorded films. However, it may be possible to 'retro-fit' some of these older 'stereo' sets with a NICAM decoder, or make the necessary connections to a NICAM VCR. Local dealers can advise. Once equipped with the hardware, no special antenna arrangements will normally be needed - if the picture is acceptable the sound should be perfect. NICAM also offers a significant improvement in mono sound.

The introduction of NICAM on a national basis is geared to a major IBA project to replace the original ITV transmitters, installed about 20 years ago. The IBA has already converted the programme distribution networks for ITV and Channel 4 (S4C in Wales) to digital stereo operation. Together with the NICAM transmission system, this provides an all-digital path for the sound channel from the studio right through to the domestic receiver.

NICAM test transmissions, consisting of regular programme sound, have begun from the Dover and Pontop Pike transmitter and dependent relay stations. In the period leading up to official service on October 26, the IBA may have to interrupt the NICAM signal for essential engineering purposes. Existing mono sound will not be affected.

NICAM Digital Stereo was also introduced to Central Television and Channel 4 in parts of Warwickshire, Staffordshire and the West Midlands from the end of November.

Newsdesk '91

Britain to Russia

Co-Channel Electronics, which has bases in Bristol and Newport, was sought out by world-renowned balloonist Don Cameron for his recent attempt at the first-ever hot-air flight from Britain to Russia - a successful attempt given expansive coverage by the national and local media.

The 48-hour flight was carried out in the prevailing spirit of 'Glasnost'. Cameron's co-pilot was Russian Gennadi Oparin, a former Aeroflot pilot.

The pair spent the time in a cramped 1.8m by 1.2m capsule, suspended below a balloon 30m high and containing 1698m³ of non-flammable helium. Both men had to wear special thermal suits as at heights of up to 5490m, temperatures were well below freezing.

Space being at such a premium, much of the equipment supplied by Co-Channel had to be built into the craft, including the radio safety systems that would start transmitting automatically in case of difficulties.

So, why did Cameron choose Co-Channel? "Perfect communications were vital at all times", he explained. "We had to follow precise weather patterns to keep on course, so we had to rely on up-to-the-second data from our operations centres in England and at Leningrad in the Soviet Union. We knew from past experience in rather more 'mundane' operations of our business, that Co-Channel are reliable and efficient - and can always supply the personal touch - in supplying, servicing and advising on any form of radio and electronic communication systems.

Co-Channel Electronics are an established company in the mobile communications field. Their technical and engineering staff install, maintain and repair all makes of mobile communications.

And as Don Cameron's latest record-breaking flight demonstrates, it's not just the individual customer who wants a cellular phone that Co-Channel can deal with. Indeed, the sky's the limit!

Highly Successful

A new version of the highly successful Storehouse instrumentation recorder, which provides a 100% increase in the recording duration of each tape, has been developed by Racal Recorders Ltd, of Hythe, Hampshire.

The new recorder, the Storehouse DD-2 (double density 2MHz), incorporates double-density record and replay heads which enable twice as much data to be recorded on each reel of tape.

The DD-2 is the same compact size as the original Queen's Award-winning Storehouse. The DD-2 retains the rugged portability and fully automatic calibration and equalisation features which have led to its use in military and aerospace-related applications in five continents.

Extended recordings can be made without loss of data bandwith using the DD-2. It provides operational and cost-saving advantages in reducing tape storage space and usage and re-loading times. It will also permit longer duration missions and trials in applications where large volumes of data are collected.

Storehouse has been sold to more than 30 countries throughout the world, where it is used in applications such as front-line gathering of electronic and communications intelligence, and sonar and radar information; vehicle research and development, including train rolling stock and airframes; and missile telemetry and data gathering.

Racal Recorders Ltd.
Hardley Ind Estate
Hythe
Southampton
SO4 6ZH.

Competition Winners

The lucky winner of the November *PW* Dewsbury Electronics Supa-Tuta Competition is Chris Toulson G1UHE who lives in Sheffield. The runners up - each receives a year's subscription to *PW* are: Mrs. M. Murray GM0CMO in Edinburgh, David Tunna from Manchester, Alfred Bowie from Fochabers, Cyril Hutchings G3LCA, Somerset. Winners will be notified by post.

August *PW* 'How Many Words' Competition: The editor will be in contact with entrants to this competition. We were inundated with computer-generated entries which has caused problems in checking answers!

September *PW* Crossword Competition: The winner of the year's subscription is Brian Winger from Whangarei in New Zealand and the two runners-up with six months subscriptions are: R.P. Neave Manningtree Essex, R.F. Hills of Milnthorpe Cumbria.

October *PW* 'Spot The Difference' Competition: The winner of the year's subscription is E.W.P. Jones GW3HAW of Barry, Wales. The runners-up with six month subscriptions are Matthew Moore of Belfast and Ken Thompson in Washington USA.

Internation LMR Exhibition 1991

The International Land Mobile Radio Exhibition, to be held on 21 & 22 May 1991, is a Conference and Exhibition of the latest developments in two-way communications, which is held once every two years, in Johannesburg, South Africa.

The latest events have been of a national level, but next years exhibition is designed to include the international market and to accommodate speakers, exhibitors and visitors from countries such as the USA, Australia, UK, USSR and Hungary.

The Land Mobile Radio Association is the central body for the radio communication industry of South Africa. They will stage the latest developments in the industry through their two-day conference and exhibition. The conference is fully sponsored by the Association, thereby extending a free invitation to all concerned.

The exhibition boosts a very high standard and is housed in a modern exhibition centre, the World Trade Centre, which is fully air-conditioned and carpeted.

Furthermore, overseas visitors will enjoy its close proximity to luxury hotels and the Jan Smuts International Airport. Special rates on hotel accommodation, car hire and other services will be available.

Enquiries for exhibiting, conference attendance, hotel bookings, etc, can be made to:

Strategic
PO Box 3590, Randsburg RSA 2125.
Tel: (2711) 886 3450.

Advance Information

In response to many requests, QuartSLab shall be stocking a range of popular crystals for the 70MHz band from mid-January for both the Pye a.m. and f.m. Westminster transceivers. Price £7.00 per pair or £3.50 each.

QuartSLab Marketing Ltd.
PO Box 19, Erith, Kent DA8 1LH.
Tel: (0322) 330830.

Newsdesk '91

Club News

Wimbledon & District ARS meet on the 2nd & last Friday of each month, 7.30pm in St. Andrews Church Hall, Herbert Rd, London SW19. In 1991, they have New Years Resolutions on January 11, and R(F) Burns Night (Working GM) on the 25th. All enquiries to their recently appointed secretary **Chris Frost G0KEB, 61 Selbourne Avenue, Tolworth, Surrey KT6 7NR. Tel: 081-397 0427.**

Plymouth RC meet Tuesdays, 7.30pm in the Frederick Centre, Plymouth. January 8 is a Construction Club Night. CW Classes with Jack G3GZQ and RAE Classes with Peter G6ZKQ. Further details from **Peter G6ZKQ at 21 Elmbank, Buckfastleigh, Devon TQ11 0DN. Tel: (0364) 43433.**

Kidderminster & District ARS meet every other Tuesday, 8pm at the Queens Head, Wolverly, nr Kidderminster. You don't have to be a radio ham to attend, all welcome. Details from **W. D. Dancock, 75 Aveley Common, Stourport-on-Severn, Worcs DY13 0NG.**

Derby & District ARS meet Wednesdays, 7.30pm at 119 Green Lane, Derby. January 2 is a Junk Sale and the 9th is The Year In Retrospect. More info from **Richard Buckby G3VGW at 20 Eden Bank, Ambergate, Derby DE5 2GG. Tel: (0773) 852475.**

Preston ARS meet Thursdays (fortnightly), 8pm at The Lonsdale Sports & Social Club, Fulwood Hall Lane, Fulwood, Preston. More details from **Eric Eastwood G1WCQ at 56 The Mede, Freckleton, Preston, Lancashire PR4 1JB.**

Sutton & Cheam RS meet 3rd Thursdays, 7.30pm at Downs Lawn Tennis Club, Holland Avenue, Cheam, Surrey. Natter Nights are 1st Mondays in the Downs Bar. December 20 is their Christmas Get-together, January 3 is a Committee Meeting at 35 Great Ellshams, Banstead and the 7th is a Natter Night. Further details from **John Puttock G0BWV at 53 Alexandra Avenue, Sutton.**

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The Christmas fair is on December 15. The first show in 1991 is on February 2 at the New Horticultural Hall, Greycoat & Elverton St, Westminster, London. Whatever computer you use and whatever you use it for, you will save money at the All Formats Computer Fair.

Further details from **John Riding on (0225) 447453.**

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The course - open to all -costs £47 and will take place on Monday evenings. Tuition will be provided by radio amateurs and other specialists on the SBC staff and students will also be able to use the SBC professional training facilities. **Further details from the project organiser Steve Harding G4JGS at: Sony Broadcast & Communications Ltd, Jays Close, Viables, Basingstoke, Hampshire, RG22 4SB. Tel. (0256) 55011 ext. 3454.**

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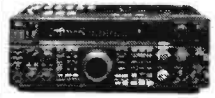

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Electrostatic Precautions for the Amateur Maintainer

Feature

To 'zap', or not to 'zap' the rig. The answer to this question is provided by Stan Crabtree G3OXC.

Perhaps the greatest advantage of present day electronics is the reliability factor. Little or no maintenance is required and with a bit of luck the modern transceiver just goes on and on. This means that the technical boffin of yester-year often feels thwarted. There's little need or reason for him to poke around and adjust this and that, which was often necessary in the valve era. When things do go wrong it's likely that many of us are not really in a position to do anything about it anyway!

The Background

However, some may be tempted to delve into the innards of modern equipment with the idea of perhaps identifying a fault that can be localised to one p.c.b. To these enterprising people a word of warning is necessary. Inadvertently, they may well be causing severe damage to their equipment - by static discharge which could affect electrostatic sensitive devices (e.s.s.d.s).

Unseen Damage

Modern technology is now using semiconductors of the m.o.s. family which have dielectric layers in the order of 0.1 micrometre thick. The devices are becoming very vulnerable to damage by electrostatic discharge. The important point to consider is that this damage cannot be seen, heard or felt - and it may not produce an immediate device failure. The effect could well be a weakening of the dielectric layer which is then further weakened over a period of time by the normal operating currents which are within the device's normal ratings. The overall effect is to reduce the working life of a component which can create a malfunction in a piece of equipment that can be very difficult to identify.

Zapping Problems

Static electricity can be generated in many ways and may often amount to thousands of volts. Moving a chair, walking across the room, even handing some item to someone else. The phenomenon is a permanent feature of our environment and cannot be entirely eliminated. Its effect is increased when man-made materials such as plastics and synthetic fibres are involved. These facts must be considered when you turn over your transceiver and start to unscrew the bottom plate with a plastics-handled screwdriver. If you're wearing a nylon shirt and thick rubber-soled shoes, you are a veritable 'crackle' of static electricity just aching to be discharged!

Safe Handling

So what's to be done? If you're still adamant that you want to delve into the electronics of your very expensive equipment what should you do? Are there any precautions you can take?

The first objective is to attempt to control the static discharge rate. To do this you must establish a safe handling area (s.h.a.) from which to work. This brings you to the same potential as the s.h.a. before starting work. The s.h.a. should be designated by signs shown in **Fig. 1.** the correct door sign for the assigned area.

Table-Top Precautions

A typical antistatic kit for kitchen table work would consist of a bench mat made of compressed, carbon-loaded, rubber and cork composite material with one or more stud connectors fitted to a corner of the mat. A wrist strap must be worn which is connected to the bench mat stud connector via a coiled lead having a resistance of 1MΩ. To be really effective a similar floor mat should also be used and connected to the bench mat by another coiled lead.

Isolated Work Area

You must remain isolated in this s.h.a. whilst working on the equipment. No people or materials producing static should enter the area whilst you are working in these conditions, so in theory you should refuse the offer of coffee, offered in a plastic mug, by your wife!

A small antistatic service kit containing the items mentioned (less the floor mat) can be obtained for around £35. A complete workshop kit will cost over £70.

The principle and problems of e.s.s.d.s are now taken very seriously and the market has produced a range of antistatic associated items such as trays, storage bins and cabinets, chairs and even document holders. A special 13A plug is also now available. The live and neutral pins are used as locating pins only. The back of the plug carries a 10mm stud connector which provides a connection to the ring main earth via a 1MΩ resistor.

Ion Sensing

If you feel the above procedures are perhaps a little cumbersome and fussy you could always invest in a sensing air ioniser unit. A typical unit available is mains powered, non-nuclear, ozone free and e.m.i./r.f.i. protected - what more could you ask for? The ioniser neutralises ambient charges in the area. A sensor first detects the polarity of any existing electrostatic charge and then selectively generates

A safe handling area sign.

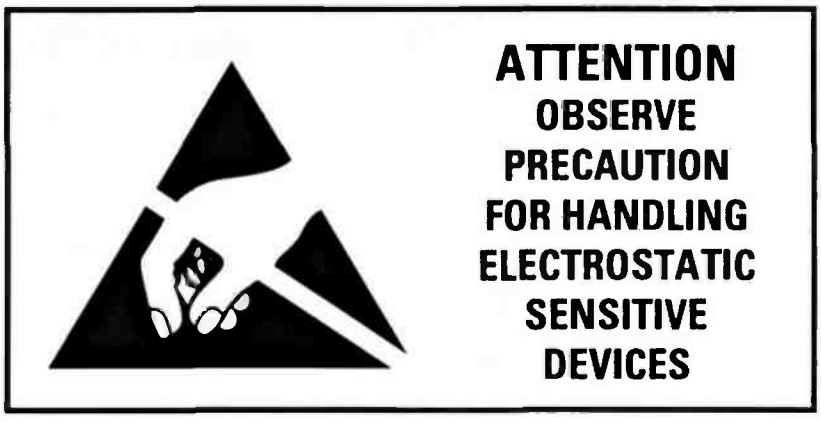


Fig. 2. Metalised component bags carrying this logo are becoming more common. Do you know what it means?

and disperses pulses of oppositely charged ions. The operation is designed to cease once the area has been made neutral. The cost of a typical unit is around £400.

Standards Rule

As might be expected the British Standards Institute have declared recommended standards and rulings on the handling of equipment containing susceptible items in their publication BS5783 *Handling of Electrostatic Sensitive Devices*. The document also describes the design of warning signs and labels which will now be found on the bags and packs of many replacement items. It is essential that components contained in these metalised bags remain packaged until required for use. And they must only be removed from the bag within an s.h.a. These antistatic bags may be recognised by their silvery sheen and the printed sign shown in **Fig. 2.**

Reducing Hazards

Without going to the lengths described above there are certain safeguards you could take which would reduce the hazards mentioned:

1) Before attempting to handle a susceptible module - and certainly after moving into an area near to them - touch both hands to a bare metal, earthed surface. This should discharge any static charge that may have built up.

2) Try to handle a p.c.b. by the edges only - keep fingers clear of any components, tracking or other conductive parts.

3) Avoid carpeted areas and the wearing of silk and nylon clothing.

4) Make sure the soldering iron is earthed.

5) When removing a module, lay it on a conductive circuit which is connected to earth.

Final Warning

So the next time you feel like 'getting stuck in' to a bit of maintenance, have a thought of the implications. The old days are long past when you removed a chassis from its cabinet and liberally squirted switch cleaner in the general direction of the band change switch, while simultaneously rotating the wafer section firmly(!) backwards and forward. Nowadays, the mere prodding of a p.c.b. with an insulated trimming tool might produce disastrous repercussions in the long term.

You've Been Warned!

But don't let it stop you altogether, just remember what you have read here!

PW

Radio Diary

*** Practical Wireless & Short Wave Magazine in attendance.**

January 27: The CLARC & ULARS are holding their rally at Lancaster University. **Mike Sherlock G4ZYN. Tel: (0257) 452287.**

February 3: The South Essex Amateur Radio Society will be holding their 6th mobile rally at Paddocks Long Road, Canvey Island. This will be an all-day event featuring trade stands, Bring & Buy, RSGB Bookstall, Boot Sale and home-made refreshments. Doors open at 10am. There will be extensive free car parking and easy access to The Paddocks. **Dave Speechley G4UVJ. Tel: (0268) 697978.**

February 23: The Rainham Radio Rally will be held at the Parkwood Community Centre, Parkwood Green, off Deanwood Drive, Gillingham, Kent. The entrance fee is £1 and the doors open at 10am. **Mr R. Mullett on (0634) 362154.**

***February 24:** The East Coast Amateur Radio and Computer Rally will be held at the Clacton Leisure Centre.

February 24: The Bideford Bay ARC are holding their 4th Taw and Torridge Rally at Bideford, Devon in the BAAC Halls starting at 10.30am. Talk-in will be on S22. **John Denford G0GFK. Tel: (0237) 476402.**

***March 9/10**: The London Amateur Radio Show will be held in the Picketts Lock Centre, Picketts Lock Lane, Edmonton, London N9 0AS.

***March 17**: The Norbreck Radio, Electronics & Computing Exhibition will be held at the Norbreck Castle Hotel Exhibition Centre, Queens Promenade, North Shore, Blackpool. Admission is £1, OAPs 50p and under 14s free. Free raffle ticket and exhibition plan. **Peter Denton G6CGF. Tel: 051-630 5790.**

March 17: The Wythall Radio Club will be holding their 6th annual radio rally at Wythall Park, Silver Street, Wythall, Worcs., which is on the A435 near junction 3 on the M42 south-west of Birmingham. Doors open 11am. There will be three halls plus a marquee, trade stands, flea market, Bring & Buy, a bar and snacks will be available, talk-in on S22 and admission is 50p. **Chris Pettitt G0EYO. Tel: 021-430 7267.**

March 31: The Centre of England Amateur Radio Rally will be held at the Motorcycle Museum, Bickenhill, near the NEC Birmingham.

April 7: Lough Erne Amateur Radio Club will be holding their 10th annual mobile rally in the Killyhevlin Hotel, Enniskillen. Doors open at 12 noon, talk-in on S21. Special guest Louis Varney G5RV. **Alwyn Magee GI0BFD QTHR. Tel: (0365) 323802.**

April 7: The 5th Launceston Amateur Radio Rally will be held at Launceston College. There will be a large Bring & Buy, well-known traders, hot snacks and a bar. Also official Morse Tests (pre-booked via the RSGB) will be held at the Rally. Doors open at 10.30am with talk-in on S22. **Maggie. Tel: (040921) 219.**

April 27/28: The RSGB will be holding their National Amateur Radio Show at the National Exhibition Centre, Birmingham.

May 12: Yeovil ARC have their 7th QRP Convention at the Preston Centre, Monks Dale, Yeovil. Doors open at 9am, admission is £1.50 which includes programme. All the usual traders, plenty of food and refreshments available. There will be four lectures during the day. **David Bailey at 7 Thatcham Close, Yeovil BA21 3BS.**

May 26: The Maidstone YMCA ARS are holding their biennial rally at the YMCA Sportscentre, Maidstone. As usual the rally will feature trade and special interest groups stands, refreshments and ample free parking. **Alan Judge G0NCW. Tel: Maidstone 750709.**

June 30: The 34th Annual Longleat Rally will be held, as usual, at Longleat House, Warminster, Wilts. **Shaun O' Sullivan G8VPG. Tel: (0225) 873098.**

July 28: Rugby ATS have their annual Car Boot Sale, venue to be advised nearer the time. The event opens at 10am and talk-in will be provided by GB8CBS on S22. **Kevin G8TWH on (0203) 441590.**

July 28: The Scarborough ARS will be holding their annual rally at The Spa, Scarborough.

REVIEW

Palomar Tuner-Tuner

There are many ideas produced to make the setting-up of antenna tuners a simpler task. The Tuner-Tuner from Palomar, adds a new dimension to the technique says Mike Richards G4WNC.

The Tuner-Tuner is a particularly neat device that connects between the transceiver and the a.t.u. The object being to enable the optimum a.t.u. settings to be found without having to transmit a carrier.

The main advantages of this method are a reduced risk of damage to your transceiver p.a. and less QRM on the band. All well worth having! So, lets take a closer look at the Tuner-Tuner.

Obvious Simplicity

The most obvious feature of the Tuner-Tuner is its pure simplicity - just a rotary knob and an l.e.d. on the front panel. Connections to the Tuner-Tuner are also very straightforward. There are just two SO-239 u.h.f. connectors on the rear panel.

The u.h.f. connectors serve to intercept the coaxial lead between the transceiver and the a.t.u. I ought to mention at this point, that the frequency range of the Tuner-Tuner is 1.7MHz through to 30MHz, so covering all the h.f. amateur bands.

As the Tuner-Tuner is an active device, a power source is required. This is simply provided by a PP3 style 9V battery mounted on the rear panel and held in place by a sprung clip.

Although this mounting is slightly unconventional, it does make battery replacement very easy. The current requirement of the review model was 32mA. This, when combined with the normal intermittent operation, should give an extended battery life.

The only instructions supplied with the review Tuner-Tuner is a single publicity sheet. However, the operation of the Tuner-Tuner proved to be so simple, that the single sheet covered everything adequately. Despite this I still felt it would have been useful to have had some background information on the principle of operation and perhaps even a circuit diagram.

Simple Operation

As I've mentioned, operating the unit was simplicity itself. With the Tuner-Tuner connected-up all you have to do is set the transceiver to receive, and then by using the knob on the front panel, turn the unit on. Operation is indicated by a flashing l.e.d. on the front panel.

With the Tuner-Tuner switched on, the received noise level increased to S-9+. The tuning-up procedure is then just a question of adjusting the a.t.u. controls for minimum noise. Once this had been completed, the Tuner-Tuner may be switched off. The switching operation restores the path between the transceiver and the a.t.u.

Looking Inside

Rather than just giving a 'users eye-view' of the Tuner-Tuner, I thought it would be both interesting and informative to have a closer look at how it works.

The basic principle used is that of the r.f. noise bridge. This is based around the characteristics of the Wheatstone Bridge circuit.

A particular feature of this circuit is that it can be used to identify the value of an unknown component. This is done by comparing ratios of known components in the bridge to the unknown one.

The inverse of this method is used in the Tuner-Tuner. In this device, an indication is given when an external component (the antenna plus a.t.u.) equals a pre-determined value (50Ω).

In order to function, a signal source and a measurement system are required. The signal source is an internal r.f. noise generator that provides r.f. noise over the range 1.7MHz to 30MHz. The measurement system is provided by you and is simply your receiver!

The components of the unit are set-up so that the bridge is balanced when the antenna plus a.t.u. presents a 50Ω impedance. This is, of course, also the impedance required by your transceiver for maximum power transfer. So you can see that this simple system provides a clear indication of the optimum matching point, without having to 'fire-up' the transmitter.

Using The Tuner-Tuner

The simplicity of the Tuner-Tuner was a great advantage when I came to install it in my system. It was literally 'up and running' within a few minutes.

Noise output received from the unit, with a mismatched antenna on my Icom IC-720A, was S-9 + 40dB. This reduced to S-1 or less when the a.t.u. was adjusted for the best null. On my antenna system, the notch was extremely sharp and it was easily missed if I tried to adjust the a.t.u. too quickly.

I also found that best results were obtained if the S-meter was a fast-response moving coil type. I did try the Tuner-Tuner with a receiver that used a l.c.d.

S-meter, but the slow response of the display made tuning difficult on some bands.

Useful For The Listener

Although the Tuner-Tuner has been primarily designed with the amateur operator in mind, it could also be useful for the listener. To prove this point, I connected the Tuner-Tuner to a Sony CRF-V21 general coverage receiver.

I used the Sony receiver throughout the specified 1.7MHz to 30MHz. The Tuner-Tuner proved itself to be very useful, although, as mentioned before, due to the l.c.d. S-meter on the CRF-V21, tuning was difficult on some bands.

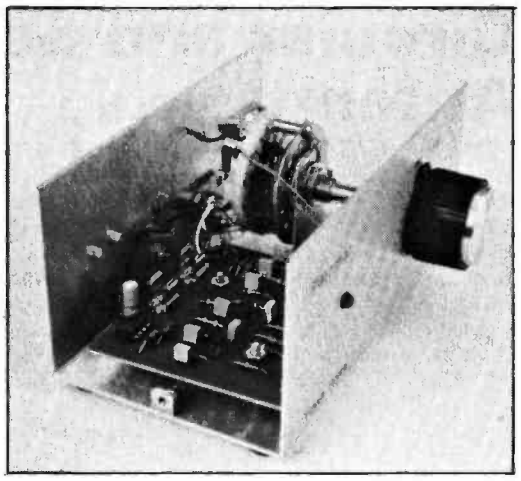
Construction

Palomar have gained a reputation for high quality products and the Tuner-Tuner maintains that tradition. The Off/Tune rotary switch uses a ceramic wafer with silver-plated contacts. This is to minimise the losses and facilitate the high, 3kW, power handling. The remaining electronics were contained on a good quality glass-fibre p.c.b.

One thing that is very easy to do with this type of device, is to accidentally power-up the transceiver while still switched to Tune. I know it's easy because I did it! Fortunately the Tuner-Tuner is well protected with a simple fuse in series with the Wheatstone Bridge transformer.

Summary

Like most of the best ideas, the Palomar Tuner-Tuner is wonderfully simple to use. I found the unit quite invaluable in the shack, enabling very rapid and accurate tune-up.



I can certainly recommend the Tuner-Tuner as a worthwhile addition to any shack.

The Tuner-Tuner currently costs £99.95 and can be obtained from **Bredhurst Electronics Ltd. High St., Handcross, West Sussex RH17 6BW.**

My thanks to Bredhurst's for the loan of the review model. **PW**

REVIEW

Specifications

Frequency Range	1.7MHz to 30MHz
Operating Impedance	50Ω
Connectors	SO-239 u.h.f. type
Power Pass Capacity (Off)	3kW
Power Requirement	9V d.c. at 35mA
Dimensions	150 x 120 x 70mm
Weight	400g

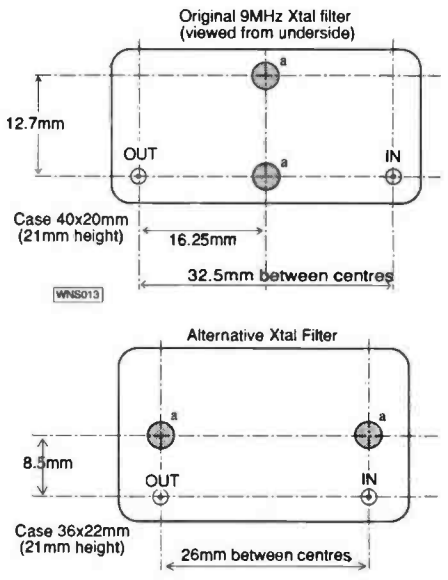
Errors And Updates

PW Marland s.s.b. transmitter September 1990 pages 26-29

Several readers who have begun building the Marland, featured in the July to September issues of *PW* have obtained filters from the author. The filters supplied by George Dobbs G3RJV, differ from the type around which the prototype board layouts were designed. These supplied alternative filters are slightly different physically, but are in all other respects identical to the filters, shown in the drawings and photographs used throughout the article.

You should refer to the drawings showing the two types of filters. Here you can see that some alterations to the holes are necessary to enable the alternative filter to be fitted. This entails cutting back the earth-plane to allow the input and output pins of the filter to be fitted to two new 1.5mm Diameter holes. Two larger holes for the mounting screws also need drilling. On the drawing these mounting holes are marked with an 'a', and are 3mm clearance.

Whilst we could not foresee this problem and it was outside our control we apologise for any inconvenience caused to readers.



Theory

Circular and Square Loop Antennas Part 2

This month, after looking at the theoretical aspects, Fred Judd G2BCX discusses the practical considerations of loop antennas.

When a conducting element carries an accelerating current, the radiated field propagates radially away from the element. In close proximity to the element the electric component of the field can only be perpendicular to it. Otherwise the element itself would short-circuit the electric field, or that component of the electric field parallel to the element. Close to the radiator, the electric component of the field can only be radial to the conductor and not perpendicular to the direction of propagation as required by Maxwell. This is the 'near field' which decreases in strength very rapidly with the distance from the radiator or other conducting (reflecting) surface. The near field more or less vanishes after a distance $R = 2L^2/\lambda$, in which L is the approximate dimension of the radiator, λ = the wavelength and R the distance, see **Fig. 2.1.**

However it remains a fact, that regardless of circumstances and the kind of radiator employed for propagating radio waves, the electric and magnetic components of the propagating electromagnetic (e.m.) field can't be separated, or considered separately, one from the other. The ratio of the electric to magnetic field is: volts/metre to amps/metre, and equals 'ohms'(Ω). Substituting numerical values for the permittivity (electric) and permeability (magnetic) of space gives - E(volts/metre)/H(amps/metre) = 377Ω. This figure is known as impedance of 'free space'.

Receptive Tuned Loops

Small, in comparison with the 'wavelength' of operation, single turn circular loop antennas are particularly useful for direction finding, as well as normal reception. The 'pick-up' pattern is a *figure-of-eight* with two nulls at right angles to the plane of the loop. They can be tuned, with a capacitor, to operate over a narrow frequency band. Also they may be combined with a small vertical, 'sensing' antenna, allowing the pick-up pattern to be changed to only a single null. This single null facilitates easier checking of the signal direction, relative to the receiver (For v.h.f. d.f. loops refer to part 1).

For frequency bands from around 20 to 30MHz, tuned loop antennas may be small enough for convenient handling and operation. An example is shown in the photograph, **Fig. 2.2**. This was designed and constructed by myself to cover the frequency range 26 to 30MHz. It was employed for direction finding on the 27MHz CB band and the 28MHz amateur band. Essential dimensions are given in **Fig. 2.3**. The tuning capacitor is housed in a watertight plastics box at the top of the loop. The cable connection to the loop and gamma line is made within a similar box at the bottom. An attenuator was also included in a similar arrangement to that shown in part 1, Fig. 1.2b.

For frequencies lower than about 7MHz, it is more usual to employ multi-turn tuned loops of much smaller diameter (500mm to 1m). Semi-screened ferrite antennas are also very effective for direction finding at frequencies below about 1.5MHz and down into the l.f. broadcast band.

Transmit & Receive Loops

Self-resonant loops for v.h.f. operation were dealt with in part 1. For the h.f. bands, and particularly those at the lower end, a self-resonant loop would be very large, since the circumference must be directly proportional to wavelength at the operating frequency. For example at 3.5MHz a self-resonant loop half-wave in circumference would have a diameter of approximately 12.7m.

The 'Magnetic' Loop

A more manageable alternative for amateur use, is a single turn loop with a circumference some fraction of the working wavelength, tuned to resonance with a capacitor. Antennas of this nature (vertically polarised radiation), are known as 'Magnetic Loops', which may give the impression that radiation is in some way due only to the magnetic field. This is not so - all antennas, radiate only by virtue of the fact that both electric and magnetic fields are created when currents (at r.f.) flow in a conducting element. This was explained in detail earlier and need not be repeated here.

The general arrangement for a 'compact' or 'magnetic' h.f. band loop antenna is illustrated in

Fig. 2.1: Radiation fields from a conducting element. (Antenna) See text.

Fig. 2.2: DF loop antenna covering a frequency range 26 to 30MHz.

Fig. 2.3: Dimensional details of the DF loop shown in the photo Fig. 2.2.

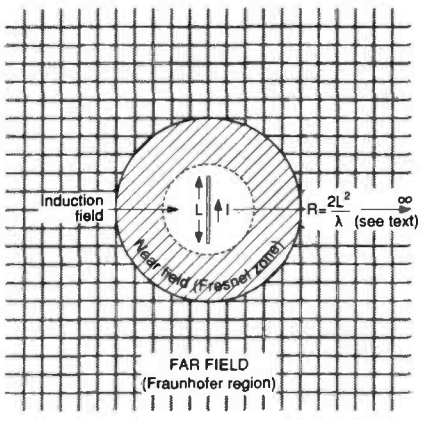


Fig. 2.1

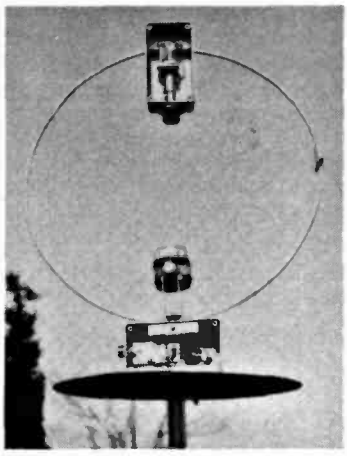


Fig. 2.2

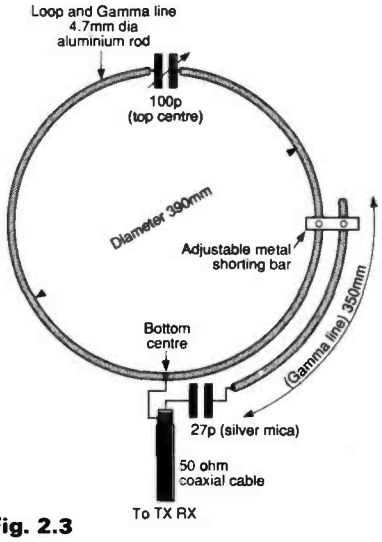


Fig. 2.3

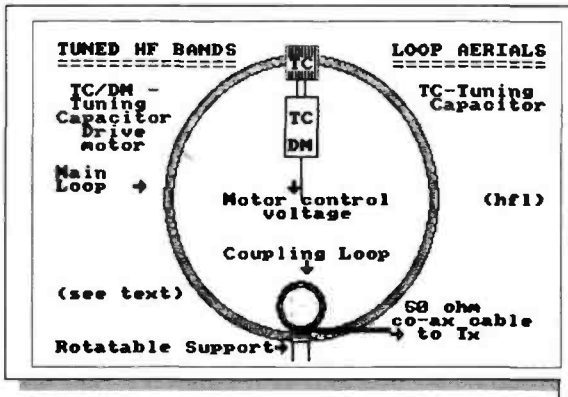


Fig. 2.4

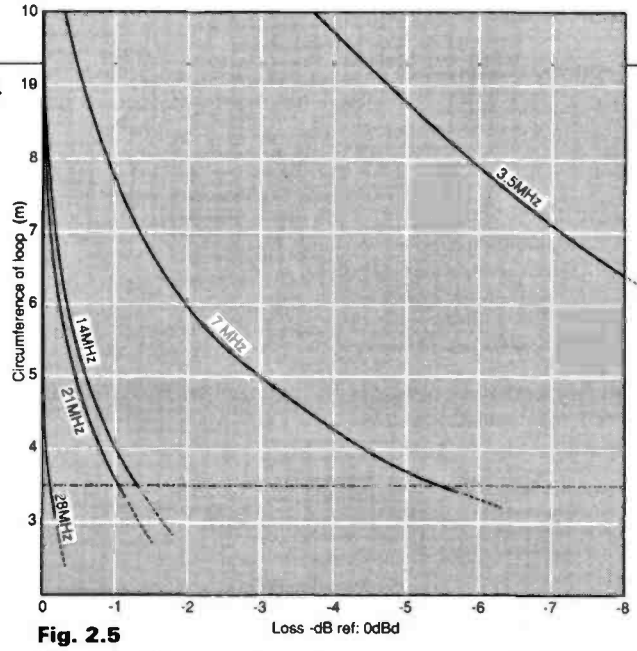


Fig. 2.5

Fig. 2.4: Format of a small tuned loop antenna for transmitting/ receiving on amateur h.f. bands. Note motor driven tuning capacitor.

Fig. 2.5: Loss factor versus tuned h.f. loop circumference for 28, 21, 14, 7 and 3.5MHz.

Fig. 2.4. Whilst the circumference for operation on three or four amateur h.f. bands may be physically constant, it does, in reality, vary inversely to the wavelength of the frequency in use. On the other hand the loop must be large enough to maintain an acceptable degree of efficiency, to minimise the 'loss factor' for each frequency band. This is shown more graphically in **Fig. 2.5**.

Important Requirements

Tuned loop antennas of this nature have a relatively low radiation resistance R_r, which will become very low as the loop size becomes reduced (effectively) at the lower frequency of operation. For example the R_r at 3.5MHz may be only a fraction of an ohm, depending on the diameter of the conductor from which the loop is made. This should be made from copper tube to ensure minimal losses. Even at 28MHz a loop of 3.5m circumference, made with a copper conductor 20mm dia, the R_r will be only a little over 2Ω. So, depending on the power used, the current flowing in the loop will be high or even very high. A further factor, due to the low inductance and high 'Q' of these loops, very high r.f. voltages will exist across the tuning capacitor. This must be of the best quality, with wide spacing between its vanes and having excellent insulation characteristics.

One other point worth noting, the diameter of the copper tube used to make this type of loop antenna for transmitting must be large (20 to 30mm dia) to keep conductor self-losses as low as possible. Power at r.f. will always be divided between the loop R_r and the conductor (ohmic) resistance. If the latter is high, there will be some appreciable loss of radiated power.

Radiation Patterns

Far field antenna radiation patterns are usually calculated in terms of the ratio of linear dimensions to wavelength. Although the axial magnetic field is taken into account, the mathematics for calculating the far field radiation patterns ('e' and 'm') of small tuned loop antennas are too complex to deal with here.

Further information concerning this aspect can be found in the book *Antennas* by Prof. J. D. Kraus, chapter 6 (Loop Antennas).

The far field radiation patterns, computer produced in **Fig. 2.6,** illustrate how the magnitude of radiation varies with differring tuned loop circumferences while being operated at a single (7MHz) frequency. Each pattern is relative to the 'free space' radiation from a dipole having a directivity gain, in each lobe, of 0dB. At this frequency an optimum but still convenient loop circumference would be in the region of 5 to 5.5m

Now have a look at the computer produced radiation patterns in **Fig. 2.7**. This diagram shows the relative directivity for a single loop 5.34m in circumference, but this time operated on a number of amateur h.f. bands. For 14 and 28MHz the directivity gains are almost equal to that from a dipole. At 7MHz the loss factor is only a little over -3dB. This means that a loop antenna this size will operate with quite acceptable efficiency from 7 to 28MHz. Only at 3.5MHz is the loss factor much less acceptable, at -11.35dB. The simple reason is the loop circumference, at this frequency, has become very small in terms of a wavelength. A pint pot that will deliver several full quarts has yet to be invented!

Bandwidth

The tunable bandwidth of small h.f. loop antennas varies with the circumference of the loop and the frequency of operation. For a loop of given circumference the tunable bandwidth becomes wider as the frequency of the operation increases, and vice versa. At the extremes of bandwidth the v.s.w.r. increases, although usually not enough to cause excessive r.f. power loss. However, on the lower h.f. bands the tuneable bandwidth may not match the width of the full band without producing an unacceptable v.s.w.r. The bandwidths, as well as loss factors, for a tuned loop 5.34m in circumference, over a frequency range 3.5 to 28MHz are given in the **Table. 2.1.**

It should be mentioned that the losses of a small loop, three to six metres in circumference and operated on the 1.8MHz band, are quite high and make the antennas very inefficient. To obtain an acceptable loss factor of say -1 to -2dB, the loop would have to be made of 50mm diameter copper tubing with a circumference of nearly 32m, approximately 10m in diameter. The bandwidth would be about 3kHz.

Matching Methods

There are a number of ways in which a large, or small, loop antenna can be matched to a 50Ω coaxial cable transmission line. Two methods were illustrated in part 1. Small circumference tuned h.f. loop antennas can be 'excited' by means of a very small single conductor coupling loop as in **Fig. 2.8(a)**. The use of a shielded or 'Faraday loop' **Fig. 2.8(b),** which could be constructed from (M)UR63 coaxial cable, is considered the most efficient. The

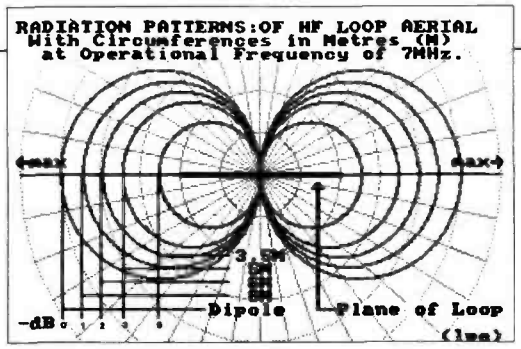


Fig. 2.6: Radiation patterns and relative magnitudes for different tuned loop circumferences and a single operating frequency (7MHz).

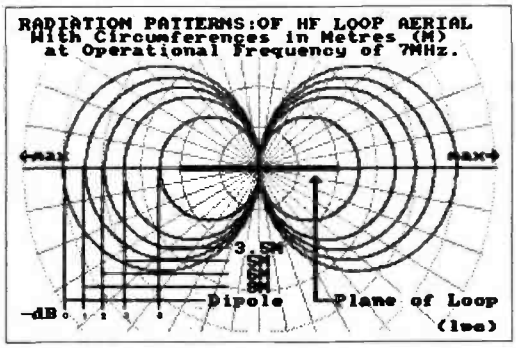


Fig. 2.7: Radiation patterns and relative magnitudes from a tuned loop antenna for amateur h.f. bands 28, 14, 7, and 3.5MHz. Loop circumference 5.34 metres.

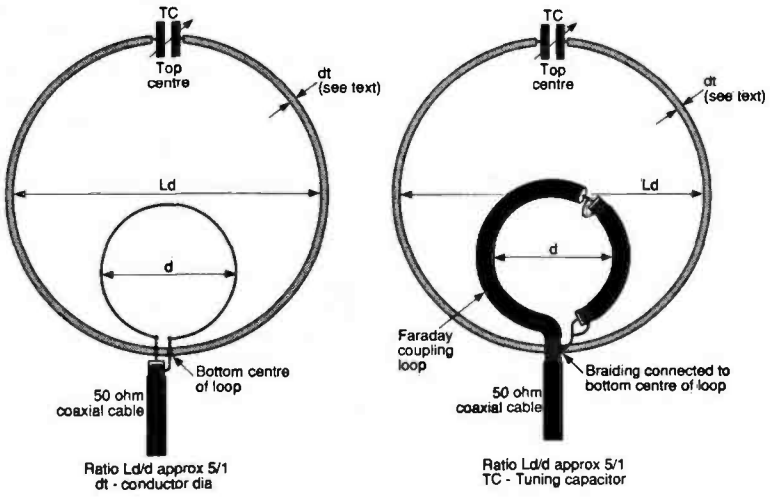


Fig. 2.8: Two methods (a and b) of coupling a small tuned h.f. bands loop antenna 5.34m circumference at frequencies between 3.5 and 28MHz in steps of 3.5MHz. See text for more details.

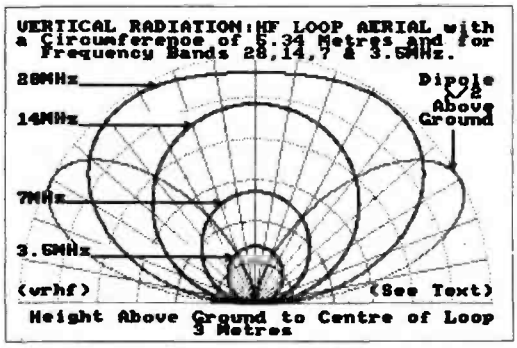


Fig. 2.9: Vertical radiation and relative magnitudes at frequencies indicated for an h.f. bands tuned loop antenna 5.34m circumference with centre of loop 3m above ground. (See text for details of the λ/2 dipole information).

diameter of either coupling loop should be about 15-20% of the main loop diameter.

Freq. MHz	Loss Factor Factor dB	Bandwidth in kHz
3.5	-10.11	2.22
7.0	-2.6	6.31
10.5	-0.79	21.03
14.0	-0.3	59.48
17.5	-0.14	139.90
21.0	-0.08	285.70
24.5	-0.04	525.49
28.0	-0.03	893.08

Table. 2.1: Loss factors and bandwidths for a tuned h.f. loop antenna of 5.34 metres circumference made from 30mm diameter tubing, at frequencies between 3.5 and 28MHz in steps of 3.5MHz

Vertical Angle Radiation

Small h.f. tuned loop antennas have the advantages in that they may be operated near to ground and take up little space. They should however be rotatable because of the bi-directional maximum radiation pattern. The nature of this pattern may be used to advantage. The nulls are quite sharp, while the maxima are wide in angle. By rotation of the loop an interfering signal may be 'dropped' into one of the nulls without reducing the wanted signal too much.

Unlike a horizontal dipole, vertical angle radiation is not greatly modified by proximity to ground. The patterns shown in **Fig. 2.9** are typical for the conditions: height to loop-centre 3m . The lower magnitudes at 7, and especially 3.5MHz, are NOT due to the height of the loop above ground, but to the circumference of the loop relative to the wavelength of operation (compare these to the horizontal radiation patterns in Fig. 1.7). **NOTE**: The vertical radiation for a half-wave dipole, λ/2 above ground, has been included to show vertical radiation patterns for 'normal' antennas above ground. But the magnitude of the pattern is **NOT** related to those of loop antennas.

Summing Up

Apart from reception generally and direction finding, loop antennas offer many possibilities for all frequencies below high v.h.f. Small 'tuned' loops, also known as 'magnetic' loops, for transmissions in the h.f. bands, occupy very little space. They do not have to be mounted above roof level, and can operate with a reasonable degree of efficiency under most circumstances. Various models are in fact available commercially. Loop antennas are particularly good for transmitting at v.h.f. due to their very small size, and comparative insensitivity to local objects.

Chapter 6 (Loop Antennas) in the book *Antennas* by Prof. J. D. Kraus has been the main source of reference for this article. I would also like to thank Les Brown Ph.D G0FFD for advice in connection with the production of some of the computer graphics and, for notes concerned with e.m. radiation.

PW

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High Voltage Regulated PSU

Construction

Are you worried about using transistors for a high voltage regulated power supply? Niel Starkie dispels the doubts and shows that it's really quite easy.

This project grew from three basic requirements. The first came from a need to regulate the unusual voltage required for a valved radio under repair. The second arose from a need to supply power to the *PW* Empire four valve QRP transceiver published in the 1000th issue of *PW* and finally, just to experiment with the idea of a high voltage transistor regulated p.s.u.

Beginnings

The original was used to power a valved receiver which had 'blown' both the original transformer and the (gas-filled) stabiliser valve. For those of you who have not met one of these, they are in effect a neon (and/or other rare-gas) filled valve, which acts in the same way as a Zener diode. The Zener diode shown (D5) in the circuit diagram could have admirably fulfilled this function, as the current requirement was small, about 5mA, in total.

Second Task

The second requirement however, was somewhat more than the Zener diode would have been able to cope with. The *PW* 'Empire' required a maximum current of about 20-25mA under full loading. This would have required a Zener diode of at least 2W dissipation. So I felt some form of active regulator was a better option. A simple voltage buffer (emitter follower) circuit was tried, and rejected the first time I inadvertently shorted the output leads together. Both the transistor and the Zener diode mutually self-destructed and I felt rather foolish.

Clearly some form of current limit was required for the circuit, but a design in which the full rectified voltage could be applied across the regulating transistor without damaging it.

Reference Level

The first two requirements, modified by the third, resulted in the circuit shown in the diagram **Fig. 1**. The Zener diode (D5), has been demoted to merely acting as a reference for the emitter of the difference amplifier TR1. By this means the emitter of TR1 is held at approximately 100V and a portion of the regulated output is fed to the base of this transistor, via limiting resistor R3. Transistor TR2 acts as an emitter follower to the corrected output voltage at the collector of TR1. Both of these transistors have to be able to withstand the whole of the rectified voltage, present across the reservoir capacitor C1. They are both high voltage types. Don't try to use any other types unless the devices you wish to substitute have a V_{CE} of greater than 300V.

Current Limit

The current limiter transistor TR3 has no similar voltage limitations placed upon it and almost any small signal type could be used in its place. The maximum voltage across this is around 1.5V (just prior to limiting), and the maximum current carried would be about 3.5mA under total short circuit conditions.

As the total supply current flows through R4, the voltage across it will start to rise as the load current increases. At the point at which this voltage rises above 0.6V, TR3 comes into conduction, by-passing the base current of TR2 to the output connection. This continues to a point at which the base current of TR2 becomes fixed, allowing only a limited output current to flow.

Table 1 has list of values for R4 at various limiting current levels. I don't recommend that you have limiting currents in excess of 100mA, as 25-30W may be dissipated by TR2 under short circuit conditions at those levels.

Construction

It's advisable to build this project on the designed board available from the *PW* PCB service. The prototype however, was built on perforated matrix board which is just adequate for the purpose. A mistake at these voltages could be expensive (and possibly fatal). The on-board transistor, TR2 is mounted with the metal plate uppermost for heat-sinking purposes. You should take great care that the leads of the transistor don't touch the heatsink. You should also take great care, when the unit is in operation, to avoid touching the heatsink yourself, as it is at 300-350V potential.

Note: If the current limit is set at less than 50mA then only half of the heatsink area is required, but above this level all of the heatsink is needed.

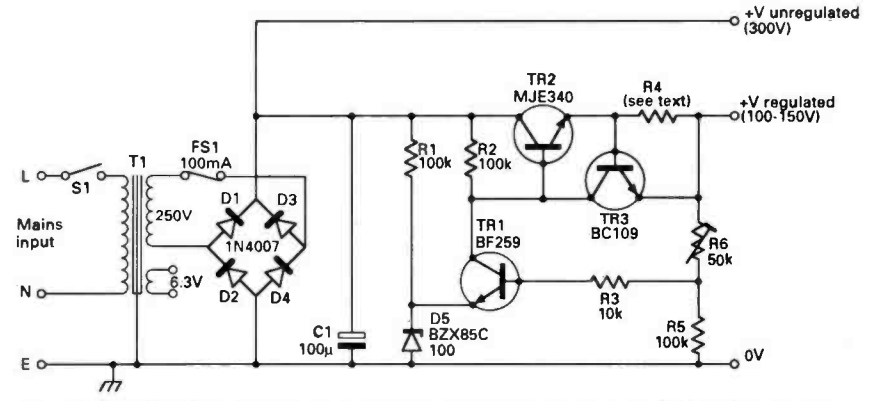
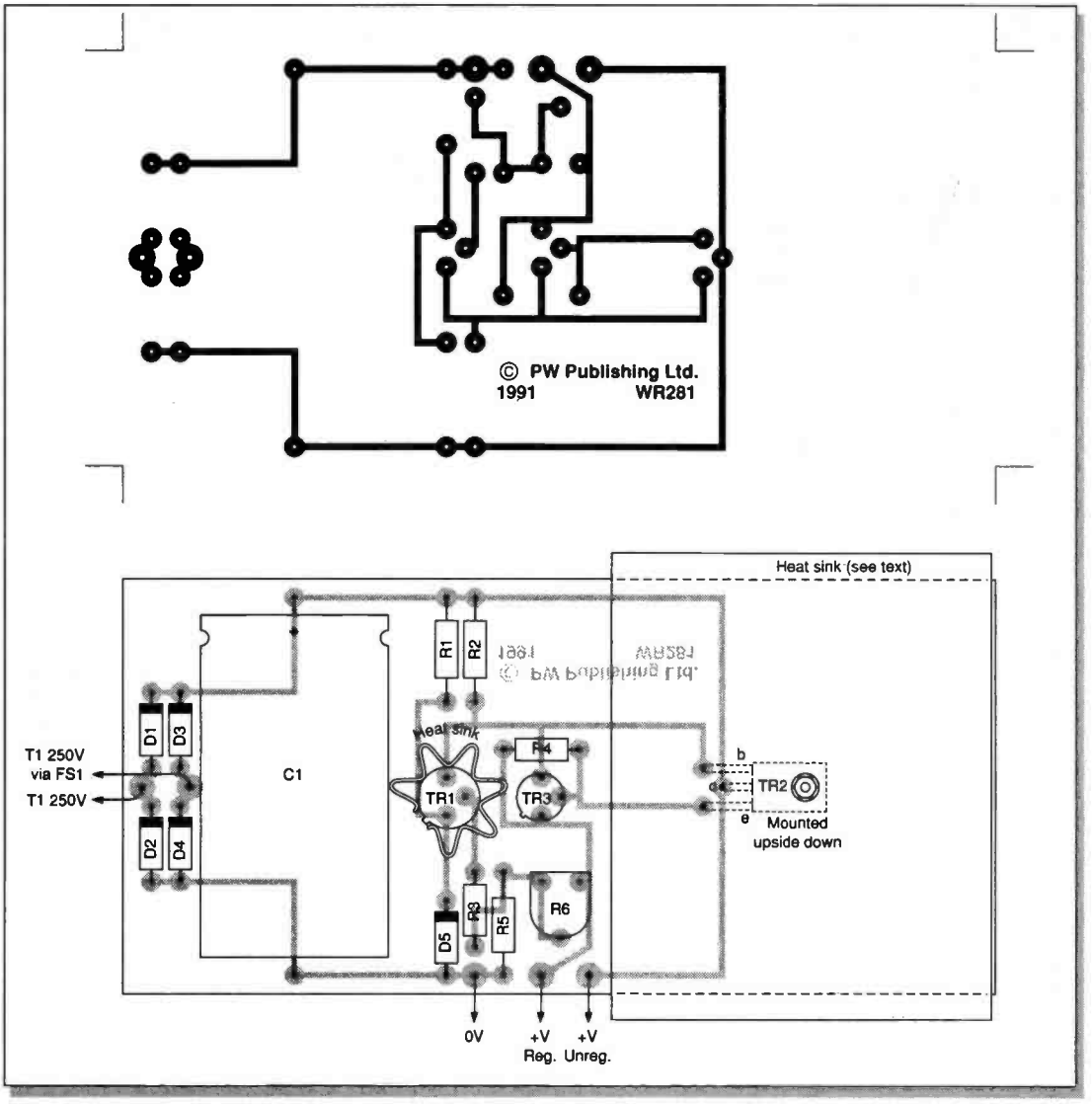


Fig. 1: The circuit diagram of the regulator, note the simplicity, the p.s.u. has only one capacitor.

Table 1

Current Limit	R4 value	load resistor	Min.power rating
5mA	120Ω	27kΩ	1W
10mA	68Ω	15kΩ	1.5W
15mA	47Ω	9.1kΩ	2W
20mA	33Ω	6.8kΩ	2.5W
25mA	27Ω	5.6kΩ	4W
50mA	12Ω	2.7kΩ	7W
75mA	8.2Ω	1.8kΩ	10W
100mA	6.8Ω	1.2kΩ	15W

Fig. 2: The track pattern and overlay diagram of the regulator p.c.b.



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BF259 1 TR1
MJE340 1 TR2

Miscellaneous

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Maplin Electronics., P.O. Box 3, Rayleigh, Essex SS6 8LR. Electromail, P.O. Box 33, Corby, Northants NN17 9EL.

Mount capacitor C1 last after double checking the placing and orientation of all other components. Double-check that capacitor C1 is also correctly placed and orientated. You should bear in mind that it could explode with some violence if wrongly connected.

Testing

If all is well set the preset resistor R6 to about mid-travel position and switch on. A voltage of about 350V should be present at the unregulated output and about 125V at the regulated output. If not, switch off and investigate. The regulated output should be variable between 100-150V aproximately.

Finally you should set the output to 125V. Using a suitable resistor, in both power handling and resistance value, load up the regulated output to just under the limiting value (**Table 1** has values and power handling requirements of this resistor). The output should drop by only one volt or less. The p.s.u. is now ready for use in a suitable surrounding box or case.

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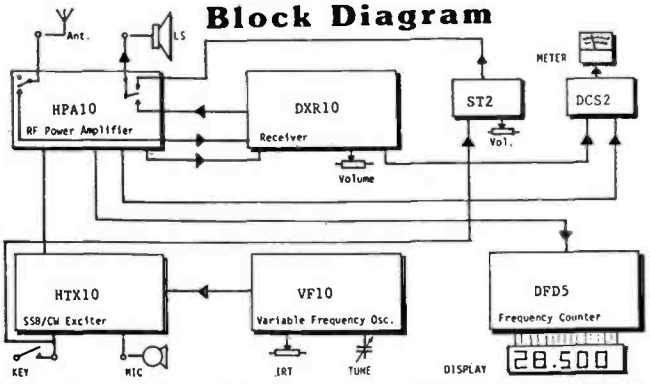

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WHAT A GOOD IDEA

Use an '80' in your antenna for any h.f. band

The next club portable operation was imminent, and I was searching for some bits of plastics material to cut up and use as insulators for the ends and centre of the antenna. Not a lot to be found. Then I hit on the idea of using the letters from an old number plate that I had. I'm sure that many of you will have old number plates lying around from the trailer, or the car you know the one that , 'I'll work on soon dear..'!

Dipole Bits

I looked first at the '0' and 'O', I then found a number '8', these were just the thing. I then found and tried the letter 'S' as a quick disconnect fitting. After some load tests, I found that the number '8' was the strongest and the '0' and the 'O' were the best shape for end-insulators.

To increase the strength of the insulators, find two of the same shape and size, cut the locating lugs off the rear and file the rear faces flat. Apply a coat of contact adhesive to both and, when dry to touch, stick them together. Two '8's used this way, will support over 60kgs, more than adequate to support a 3.5MHz or top band dipole. In addition the '8' may be used for the centre insulator for a dipole. The coaxial cable or feeder can be tie-wrapped to the centre web, see **Fig. 1.** for more details (and to page 33 of *PW* December '90, 'Booting The Weather Out' *Ed*). Small depressions made in the loop ends should stop the antenna wire and the supporting ropes slipping in use. These can be made with a file or the side of a hot soldering iron (although a bit messy when using an iron). More details of this can be seen in **Fig. 2.** where the antenna wire is tied to the insulator

Number One Feeders

For open feeders the characters '1' or 'I', with 10mm cuts in the ends for the feeder wires, fixed in place with a hot-melt glue gun, make good 60mm spacers. Used with 20s.w.g. copper wire, they give a good 600Ω impedance feeder.

The cost of the bits can be kept to the minimum if you go to your local scrap yard, but try not to look too keen (prices rise with 'keen-ness'). Most yards have a pile of old plates, usually made of aluminium, to be weighed in separately from the rest of the scrap. If you remove the figures, you will probably get a large bagful for less than a pound. You're doing him a favour as the plastic numbers must be removed before weighing-in anyway!

PS. The numbers will come off very easily with a small screwdriver. The steel fixing clips will be most likely be badly corroded with contact with the aluminium plate and our salt roads in winter!

Michael Stott G0NEE,
Ovington,
Northumberland.

Innovation Into Investment

We've always been proud of our authors and their work. Now you can join in - and win £25 - by sending circuits and projects to 'What A Good Idea'. It's the ideal solution to the advice often offered by friends who suggest that 'You should publish that!'

Circuits - accompanied by the minimum of text - must be **neatly** and **clearly** drawn in ink. Wherever possible the idea must be original, although your suggestion might be a significant improvement based on another idea. In which case you should always quote the original source. All entries will be acknowledged. Send your entry, with your name and address, to:
'What A Good Idea', Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP.

PLEASE NOTE: that we at *PW* may not have built and tested the circuit, but present it on an 'as-is' basis. We do take the greatest care in preparation of the article, but cannot be held responsible for the suitability of the original suggestion, or for any damage that may occur to property or equipment in implementing this idea.

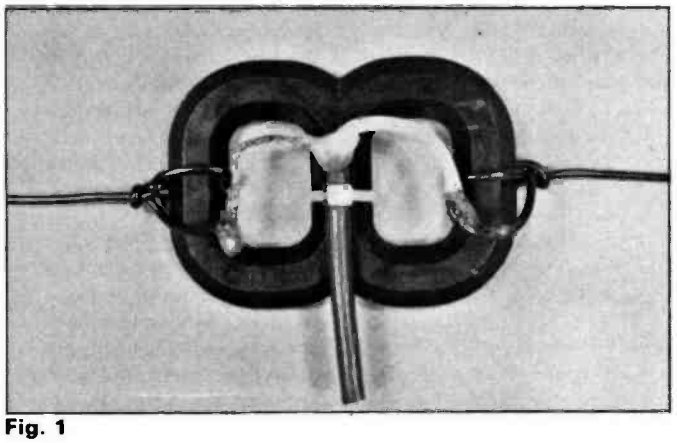


Fig. 1

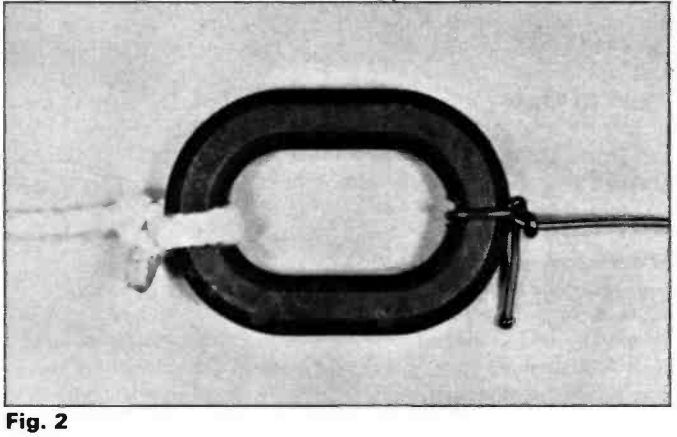


Fig. 2

PACKET PANORAMA

Roger Cook G3LDI takes another look at the Lan-link program with the help of Peter Hunter G0GSZ.

A few months ago I briefly reviewed Lan-link, a comms/ terminal program received from Joe Kasser G3ZCZ. I subsequently passed a copy to Peter G0GSZ, a local amateur, pictured in the photograph. Peter was more than delighted with the program, which runs on most IBM compatible computers, and was kind enough to send me his comments. Perhaps these will help others that might be having problems.

Sophisticated Package

"Some time ago one or two people answered my plea for a packet terminal program that was easy to use, full of features and flexible. What I received, in the form of a program called 'Lan-link' written and supported by Joe Kasser G3ZCZ, was much better than I had hoped for. I actually received versions 1.55 and 1.56, which I used and enjoyed. I was so pleased that I decided to register my copy with G3ZCZ. In return I received the very latest (v1.58) version.

"To call Lan-link a packet terminal program is like calling WordPerfect™ or WordStar™ merely text-editors. Lan-link is a very sophisticated personal digital communications package, which makes full use of your TNC and computer. If you have an all-mode TNC then you will never need new software. Lan-link caters for c.w., RTTY, ASCII and AMTOR as well as packet. It also comes complete with configuration files for just about any TNC you might have.

Ease Of Use

"If you have a PK232 then you can load up Lan-link and change the callsign to your own. If you have any other TNC then you will have to reconfigure the Lan-link system (sys) file. This is a very simple and painless operation, and full instructions on how to do it are given. Lan-link is fully menu-driven, with windows opening up for just about everything and anything. If you have a colour monitor by the way, all of the windows, the text, borders, background colours are user-configurable. You can use it with the very minimal amount of key strokes.Which means the less you have to type, the smaller are the chances of forgetting what to do.

Auto-Logging

"Lan-link has built-in logbook files, (separate files for h.f. and v.h.f.), that are dBase™ compatible. Entries are made to the logbook AUTOMATICALLY when a connection is made, either by you or by someone else. If you are out of the shack when someone connects, an entry will have been made in the appropriate logbook (h.f./v.h.f.). There is also a 'capture to disk' facility. When a connect happens the facility opens a file (which it will name as todays date, if this does not already exist i.e. '901029.RUN' if today is the 29th of October 1990. Everything that takes place during the connect period will be put into this file. Not only do you have the logbook entry, but also a record of what has gone on, and you may not have even pressed a key yourself.

Clear Windows

"All of the menu's are self-explanatory, the windows clear and easy to understand. The whole program is in fact very easy to use and learn, it really is self-teaching. When you set-up the Lan-link 'SYS' file you have a place in which to enter 'scan' words. These are words describing your favourite subjects on the bulletin board. For example, AMSAT, RAYNET, GB2RS, etc. but more about this later. There is another file that Lan-link recognises. This is 'LAN-LINK.DIR', which is a directory (or log) of your most frequently called stations, or ones with the longest path, or both.

Read The Manual

"I must stress at this point how important it is to read the manual. If you have a printer then print it out, I know it is 137 pages long, and you can get the program working without the manual, but you will never get full benefit from it. Nor will you be able to get yourself out of any problems you may get into. Bearing in mind that you will rarely, if ever, need to look at the TNC handbook, it is well worth having the manual on your desk. It's a full user's guide and is easy to understand. The manual is laid out in menu format, rather than a 'how-to-do' style covering each subject in full detail. The manual is on the same disk as all the other files and is called 'LAN-LINK.DOC'.

In Use

"On loading Lan-link, the first thing visible on screen, are the three main windows. The top (narrowest) window contains such information as 'band' and 'power' (i.e. 2 meters 5 Watts), then the program title with your callsign. Underneath this is text telling you what mode and baud rates are in use, and the connect status. To the far right of this window is a software-driven clock showing the current system time.

"The middle window (largest) is the main 'input' window, this is where all the activity on channel appears, beacons, text from other stations when in QSO. The lowest window is for 'outgoing' text and commands, things that you type in at the keyboard. I call these the main windows, as everything about Lan-link is menus and windows as you will see. The very last line has a list of commonly used F(unction) key short-cuts. This shows for instance F5 ='MHlist' etc.

"This is where the fun begins. If you press F5 a window opens on the right of the screen showing a list of your most recently heard stations. You will see the cursor placed in this window. By using the arrow keys to move the cursor onto any one of the callsigns in the window and pressing enter, Lan-link to treat this as a connect command from the keyboard, and connects with the highlighted station

"The top window will show this chosen station's callsign, and when connected an entry will be automatically made to the logbook, and capture-to-disk begins. This is excellent if you have connected to a BBS to read some bulletins, as all you need do is to give the commands to read them, i.e. 'r3357'. You can then immediately disconnect (get off line) and read the captured information at leisure.

Other Methods

"There are several different ways of making a connect. Like me you may prefer to stick to just one method or you may choose to use them all. To make a connect I find the 'ALT+C' method easiest. Pressing 'ALT+C' brings a small oblong window into the centre of the screen requesting a callsign.You can then enter the callsign and press return, or automate it if you have set up the 'LAN-LINK.DIR' file, with lines something like: 'Mick gb7rmn via g4onf'

"If this is the case, when the connect window appears (press 'ALT+C'), type 'Mick'. Lan-link will try to make the connection to GB7RMN Via G4ONF, or whatever route you specified. I keep a list of all of my most-used connects in this file. When I wish to connect with someone, I just type in an abreviation. Simple isn't it?

"One other method is to put in a list of scan calls in your Lan-link system (sys) file when you configure it. Then, when you get the 'Enter a Callsign' window you can just press return and another window opens up with these callsigns in it. Like the 'MH' window you just move the cursor to the one you want and press return.

PACKET PANORAMA

Peter Hunter G0GSZ

"If I had to make a choice as to what I like the best about Lan-link it would have to be the ZAP BBS. This I will explain in stages. Should you want to send some messages or put out some bulletins, you can put these all together in one file. This file carries the name of your local bulletin board. In my case this would be 'GB7LDI.BBS'. Start the file with the command that your BBS would look for, i.e. 'sb all@ww'. The next line would contain the subject heading. Then following on would be the message, ended with your salutation. Finally the last line, on its own, would be the normal '/ex' or '/EX' or, :EOF: Then repeat the same format for the next message and for as many messages as you wish. I always start my first message with the command KM and you will see why later.

"This is how this could all look.

1st line: KM
send command: SP G3ZCZ @ N4QQ
subject: Thanks for 1.58
Hello Joe,

Just to say that I got the disc with v1.58 and it's every bit as good as you said. ....73 de Peter G0GSZ @ GB7LDI
(last line by itself:)
:EOF:
send command: SB ALL @ LOCAL
subject: LAN-LINK 1.58

Hi All. I have just received a shareware copy of Lan-link v1.58, if anyone would like a copy please let me know. ...73 de...
(very last line:)
/ex
send command: SP G3LDI @ GB7LDI
subject: CHAT
Hello Roger, ...73 de Peter
[This can now be left blank as it is the last]

"Now, to send all the messages I press 'ALT+Z' and (that's right, you guessed it) a window opens asking if to connect to GB7LDI. To confirm press return. From here on Lan-link takes over, though you can intervene any time. The logbook entry are made and capture to disk started. The computer issues the command 'RM' to read the mail. If there aren't any don't worry, you'll get the reply 'Not Found' or something like it. The command 'L' will list all the bulletins since you last logged on. Now, this is where your scan words in the configuration file come in. Whilst the bulletins are being listed Lan-link scans the headers for any words that match your word-list. Any matches are noted. When all these have been listed the command 'LM' is issued, allowing you to see what mail is still there.

"Lan-link then searches your (disk) directory for the *.BBS file. Should it find one, the file is read one line at a time as if you were typing at the keyboard. Now you can see why I always start with a 'KM' command. This kills any mail (on the BBS) that was waiting, AFTER down loading it to your disk. When the BBS gets the first '/ex' command it closes the first file and then takes the next one until none are left. If Lan-link found some messages to be read during the listing process then the command to read these, one at a time, is given, i.e. 'r3234', 'r3230',... etc. Finally the the 'B[ye]' command is sent to disconnect, and capture-to-disk is turned off. All this by pressing 'ALT+Z' <cr>.

"If your local (HOME) BBS puts out a beacon showing MAIL: for 'Yourcall' whilst you have the system running, Lan-link is alerted and, without your intervention, transfer begins as described above. Ideal if your time in the shack is limited. When Lan-link has sent the file it will rename it to 'bbs.001' (or 2 or 3 etc) just so it can't be sent again. This is only scratching the surface of what Lan-link can do. I have only been using it for a very short while now but I have no wish to return to an ordinary packet terminal program.

"I do hope that this will help you to decide whether or not to try Lan-Link. As you may have gathered my opinion is that you should try it (No, I am not on commission, I just like it). For those of you already trying Lan-link, one nice point about registering it, is you bannish the shareware screen that greets you each time you run the program.

"My special thanks must go to Joe G3ZCZ for all the hard work he has put into producing this package. I am interested in hearing from anyone using a KAM with Lan-Link, and using other DATA modes. Please contact me for possible ''skeds'' and exchange info, etc. If you don't have Lan-link then problem solved, let me know. 73 de PETER G0GSZ @ GB7LDI

The above is as I received it (bar a little editorial massage to make it fit. *Ed*) from Peter. Has anyone else any thoughts on any other product to do with packet?

73 and happy packeting from Roger G3LDI, @ GB7LDI, QTHR or Tel: (0508) 70278.

PW Special Feature

Surface Mount Technology For The Radio Enthusiast

The very words 'surface mount technology' strike terror into many constructors' hearts. Bill Mooney G3VZU, says there's nothing to fear and much to be gained from s.m.t. and its associated devices.

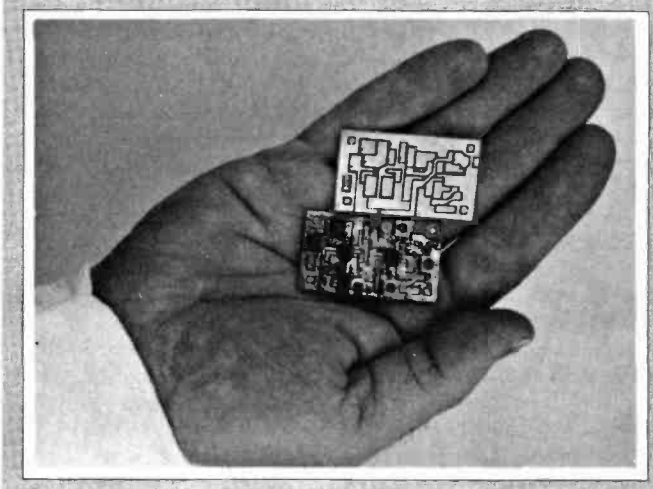


Fig. 1a. The miniature world of the s.m.d.

Nothing remains constant in electronics, whether it's new levels of integration or faster transistors. The art of turning theoretical circuits into real world p.c.b.s is no exception. If we look to the immediate future we can already see many changes under way.

The trusty old p.c.b. with leaded components was the most successful fabrication technique ever developed. This, through-hole technique has been the mainstream method of fabrication for over 30 years. But is rapidly being replaced by Surface Mount Technology (s.m.t.) utilising surface mounted devices (s.m.d.s).

Disappearing Circuitry

Most of the working circuitry on the modern p.c.b. is disappearing into i.c. packages. Increasingly they are available either as general purpose functional blocks like c.p.u.s and memories, or as custom made Application Specific Integrated Circuits (a.s.i.c.s).

The development of s.m.t. was vital for complex circuits such as portable camcorders, compact disc players, cellphones, electronic 'organisers' and 'smart cards'. Despite these applications, it would be quite wrong to think that s.m.t. is only for complex circuits. Amateur radio has already benefited from this technology in as much that even the easiest projects can make use of s.m.t. to great advantage.

Before I go into detail on just how you can get to grips with s.m.d. construction yourself, it's a good idea to see how the 'big boys' use them. After all, s.m.t. chips were developed for large scale manufacture and it is from industry that we get many of our ideas (**Fig.1a**).

Nowadays many readers will be familiar with the principles of surface mount construction as in **Fig.1a**. In this method of construction lead-less components are soldered to the p.c.b. tracks directly. The elimination of holes is a major cost saving to the manufacturer. So, now we know a little bit about the technology, we'll look at the various steps to be used in s.m.t. production by a typical circuit manufacturer.

Step By Step

Firstly blank p.c.b.s are made in the normal way, using CAD (computer-aided-design) systems to produce a single or double-sided board design. After etching, a solder mask is applied to protect tracks and prevent solder bridging across fine pitch i.c. pins.

The next stage is the application of solder paste to component pads. This is done by a precision dispenser which delivers an exact amount of paste, or by screen printing. A small amount of adhesive may also be dispensed.

The adhesive is used because the surface-mounting capacitors and resistors, which are known in s.m.t. as 'chips', must be held in place as the board is inverted. The dispensers can be complex computer-controlled machines operating at high speeds. Now we come to the actual 'pick and place' part of the operation. The. s.m.d. chips are supplied to the 'pick and place' machine from sticks or tapes.

The complex machine picks up a component from a tape using a vacuum pen. It then transports the component to its predetermined position on the board. Machines such as the one in **Fig. 1b,** work with amazing speed and precision. They can place in excess of 25 000 chips per hour at full speed.

The chips are now approaching the stage where they're fixed in place by a heat treatment. The p.c.b. is placed on a conveyor and slowly passed through a 'reflow' oven. The oven exposes the circuit to a very carefully worked out temperature profile. This is done to match the requirements of the adhesive - if used - and the solder paste. Any slight misalignment of the chips is corrected as the solder melts, by the

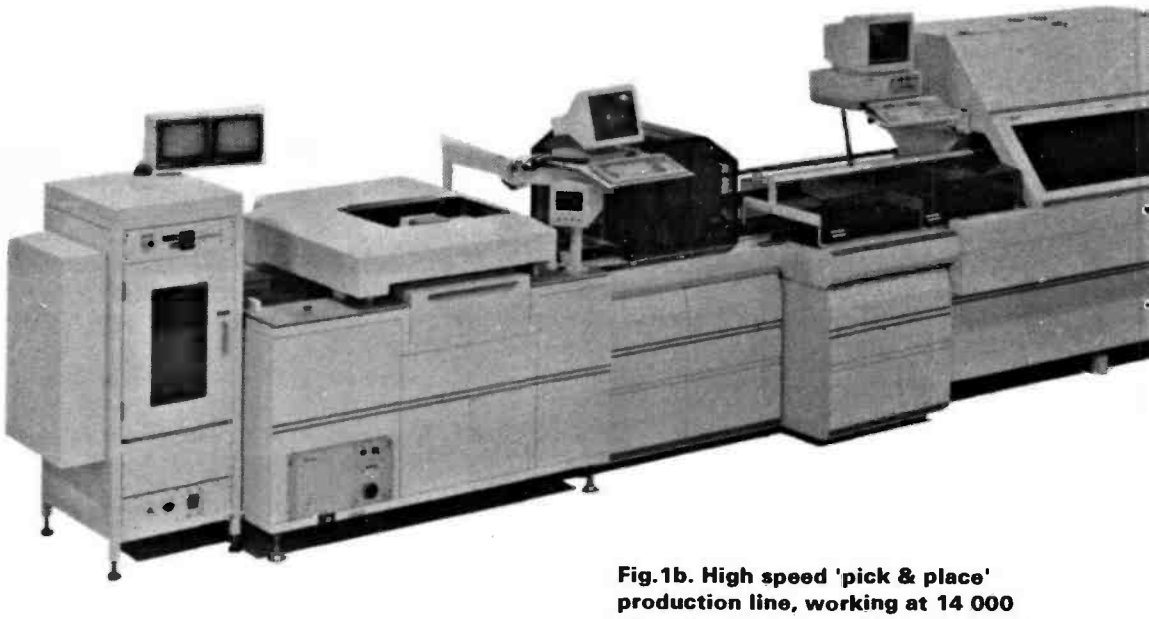


Fig.1b. High speed 'pick & place' production line, working at 14 000 placements per minute.

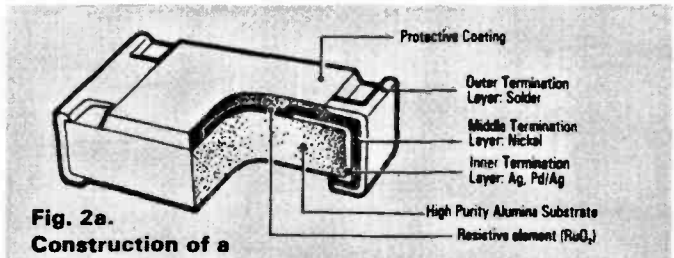


Fig. 2a. Construction of a typical s.m.d resistor.

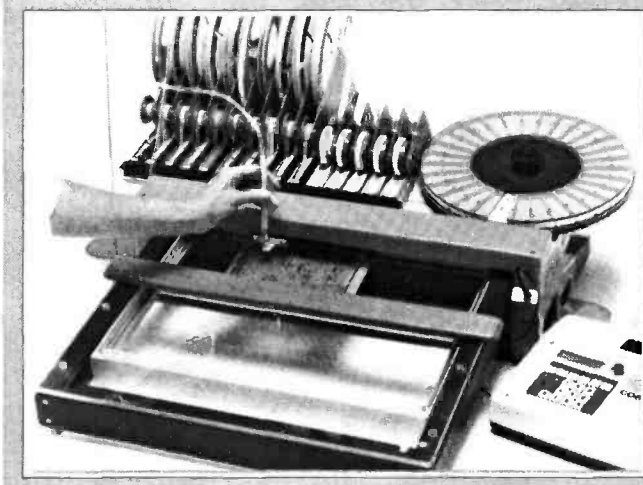


Fig. 2b. An advanced, manual 'pick & place' machine.

Fig. 2c. A fully manual 'pick & place' machine.

surface tension of the liquid material.

It's now time for a bath! Excess flux is removed in a washing process. This is usually required because solder paste contains high levels of flux and other organics in order to control the 'flow' properties required for printing or dispensing. However, 'no-wash' creams are now appearing on the market as a result of environmental pressures to reduce pollution.

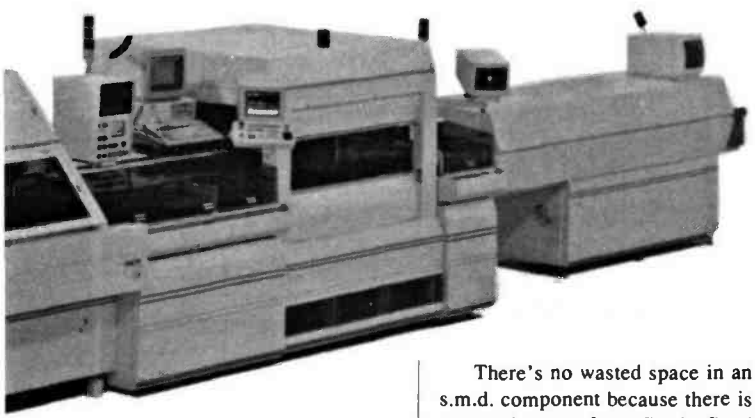
Solder creams are available in many forms to match differing needs. The other main board production 'ingredient' - the all-important adhesives must also fulfil stringent requirements of strength and curing rate.

Most importantly, the s.m.d.s themselves must have perfect 'solderability'. They must remain stable at the soldering temperatures used for solder 'reflow' techniques.

The illustration, **Fig. 2b** shows an advanced, manual, 'pick and place' set-up . Whereas **Fig. 2c**, shows a fully manual 'pick and place' used in smaller scale production.

Pick & Place

Don't dismiss the techniques as beyond the hobbyist. A small 'manual' 'pick and place' set up is not out of the question for the serious experimenter, and certainly not beyond the average club which could easily afford a simple and very basic 'pick and place' installation. But you don't need to start here. If you make your own p.c.b.s, changing to s.m.t. will simplify matters. If you don't do any etching there are many s.m.d. kits on offer to meet your needs.



There's no wasted space in an s.m.d. component because there is no requirement for a firmly fixed lead connection. So let's now look at the basic components in order of appearance, starting with the humble resistor and capacitor.

Chip resistors are made from a tiny slab of alumina with resistive coating of ruthenium oxide, with a contact at each end. These contacts are a composite of platinum, palladium and silver. They also have a nickel barrier layer to prevent leaching of the platinum into the solder. This results in a very rugged, reliable device which meets strict 'solderability' specifications. Although cylindrical types are available, the great majority of chip resistors are of the type shown in **Fig.2a**.

Resistor values are printed with a three digit code where the last digit is the number of zeros. For example: 103 equals 10kΩ. Chip resistors are supplied in a full range of tolerances and values to meet every need. Resistor networks, thermistors and power resistors are also manufactured in s.m.t. packages. Low value power resistors can be wirewound, and thick film, 2W devices are available.

Trimmer resistors for s.m.t. are manufactured in a range of sizes. The very smallest types have a limited 'reset' cycle guarantee. Trimmers can be sealed against wavesoldering, although open element semi-sealed types have a lower profile.

Multi-Layer Devices

Chip capacitors are multi-layer devices made by metallising thin sheets of ceramic material. They're then 'fired' into a single monolithic chip. A complex metal contact is then applied at each end for connecting directly to the p.c.b. 'footprints'.

Multi-layer chip capacitors are made in a choice of dielectric materials. The most stable dielectrics being used for oscillators, filters ,etc., where high stability is required. The construction of a typical multi-layer capacitor is shown in **Fig. 3**.

Chip capacitors are not marked with a value, so don't mix them up! As with resistors, there are more 'beefy' capacitors made in s.m.d. packages to suit most needs. The most common type of capacitors for values over 1μF are, of course, tantalums. Aluminium s.m.d.s are widely used but tantalums offer better characteristics and are usually a first choice. Special dielectrics such as polyester and mica are also made.

For microwave use, porcelain chip capacitors offer the best characteristics. Latest developments are ceramic chip capacitors with a capacity of up to 47μF. These capacitors have a life expectancy in excess of 80 years, compared to 10 or so years for an electrolytic type.

Chip resistors and capacitors are manufactured to a common set of sizes. By far the most popular size for hand working is the '1206' chip. But in electronic mass production the '0805' size predominates. For miniature devices, '0603' and even smaller chips are now favoured. On the larger side we find '1210', '1812' and '2220' sizes. These sizes stretch the values to a couple of μF, which is good for a ceramic capacitor.

The larger sizes are used for capacitors where high working voltages are required. They are also used for resistors with a higher power dissipation. 'But' - I hear you ask - , 'what do all the numbers mean'? Don't worry, it's simple really and you'll soon get the 'hang of it'! Basically the numbers are a four digit code. The first two digits describe the component's nominal length in hundredths of an inch, and the last two refer to its width. The illustration, **Fig. 4**. gives the relevant sizes in millimetres.

Chip inductors are widely used in s.m.t. circuits. As you might expect the types available vary greatly in terms of quality factor (Q), self-

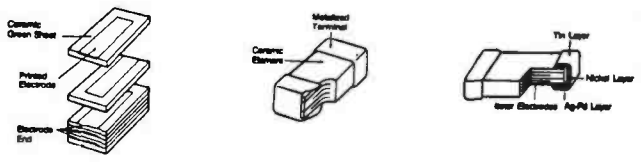


Fig. 3.

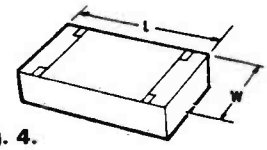


Fig. 4.

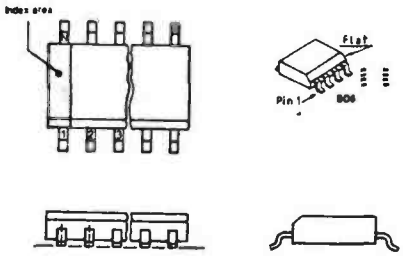


Fig. 5.

Figs 3, 4 and 5. Typical s.m.d. construction details.

resonant frequency and physical size. Ferrite cores are most popular but other core materials are used.

Exciting developments are taking place in '1206' and '0805' sizes of chip inductors, with ferrite or ceramic cores, and even multi-layer types. Variable inductors used, for example, in radio frequency work can be supplied with screening cans. They can have space for a chip capacitor to form a tuned circuit to provide s.m.t. i.f. transformers. A good example is the Toko 5CD range of s.m.t. inductors.

Integrated Circuits

The leading players in the s.m.t. arena are the i.c. packages. Versions of the '74' and '4000' digital series are available. Many linear devices are made for s.m.t. and are shown in **Fig. 5**. which also indicates how to find pin 1. For certain complex functions, such as large capacity memory chips, you'll find a 'wide bodied' version. There are also many other packages and pin configurations made to meet specific needs.

More popular for miniaturised equipment are the gull-wing quad packs. Among these you'll find synthesizers, c.p.u.s, memories and so on. This area will hopefully develop in the amateur field as familiarity with s.m.t. and modern techniques increases.

When you attempt your first p.c.b., begin with the track layout. The layout of the components on the board can be practically identical to the schematic. After the initial design, a certain amount of reworking may be needed, particularly when developing new circuits.

Each of these tasks involve techniques special to s.m.t. work and will be considered separately. There are several choices available to s.m.t. constructors. The choices are: surface mount p.c.b. kits, surface mount 'protoboards', and making your own p.c.b.s.

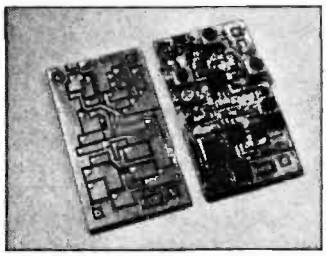


Fig.6. A compact s.m.d. receiver.

Surface Mount Kits

Surface mount kits are designed for hand-working. The kits are a way of getting into s.m.t. without the difficulty of producing a p.c.b. The completed kits provide functional modules which can often be linked together to build up more complex projects. This type of kit is the nearest thing to using a home-made p.c.b. and many 'building block' circuits are available. An example of a roller tinned kit is shown in **Fig. 6**. This is an unusually compact version of a direct-conversion receiver based on the NE602 i.c. It's a good example of what can be achieved.

Chip components are very small and lightweight and must be held in place whilst soldering. The surface tension of molten solder is sufficient to cause a chip resistor or capacitor to stand on end. This is caused by an phenomenon known variously as the 'Manhattan Effect', 'Drawbridging', the 'Stonehenge Effect' but more popularly as 'Tomb-stoning'!

An s.m.d. assembly jig will help by holding the chips in place whilst hand-soldering. More importantly however, it will allow you to apply the solder to the joint at the same time as the iron. A feat which is impossible without the use of the jig to hold the component in place.

Carrying solder to the joint on the iron tip won't work! This is because s.m.d. solder wire contains a low flux level which evaporates in a fraction of a second. Another important rule is to use the minimum possible quantity of solder. An assembly jig is shown in **Fig. 7**.

Solder-masked surface-mount p.c.b. kits can provide high quality results. It's a simple technique involving a p.c.b. coated with a green coloured solder resist. Only the component footprints are exposed for soldering. The resist between the i.c. legs makes solder 'bridging' practically impossible. The s.m.d.s may be soldered to the masked p.c.b. using a fine tipped soldering iron with the aid of an assembly jig.

Solder-masked p.c.b.s are an ideal opportunity to use solder cream. The procedure is simplicity itself. Using a suitable dispenser you should apply a small amount of a suitable solder cream to each component footprint. Then the s.m.d. chips are positioned on the board with a pair of tweezers or a vacuum pen. The solder cream is viscous, and will hold the chips in position.

Several chips may be placed before soldering. You can use the soldering iron to melt the cream one end at a time but the chips must be held down on the board. Soldering can be done another way by applying heat from a suitable blower.

Using this technique the cream

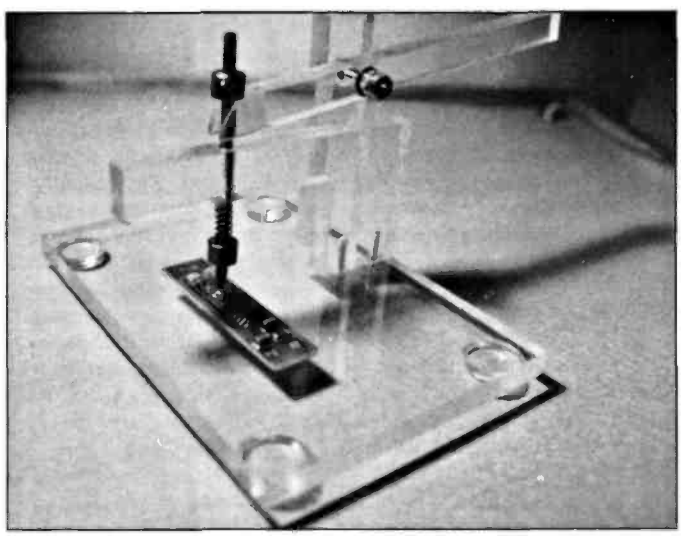


Fig. 7. An assembly jig.

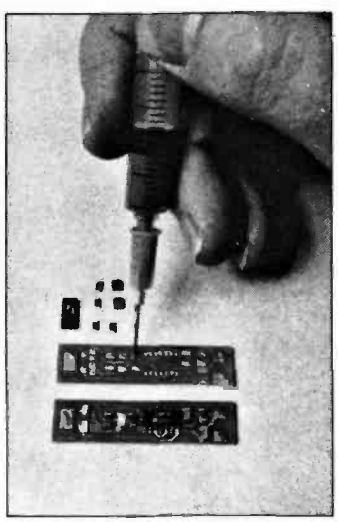


Fig. 8. An example of a roller-tinned p.c.b. kit.

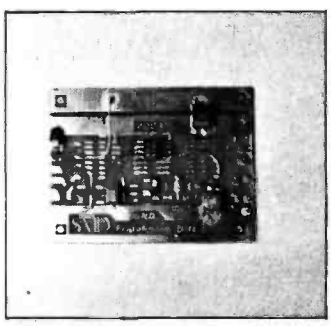


Fig. 9. An s.m.d. protoboard.

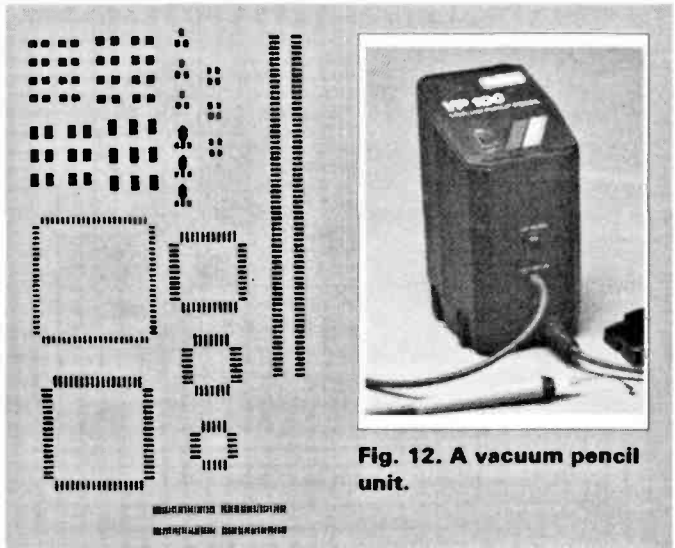


Fig. 10. A full set of typical s.m.d. transfer footprints.

Fig. 12. A vacuum pencil unit.

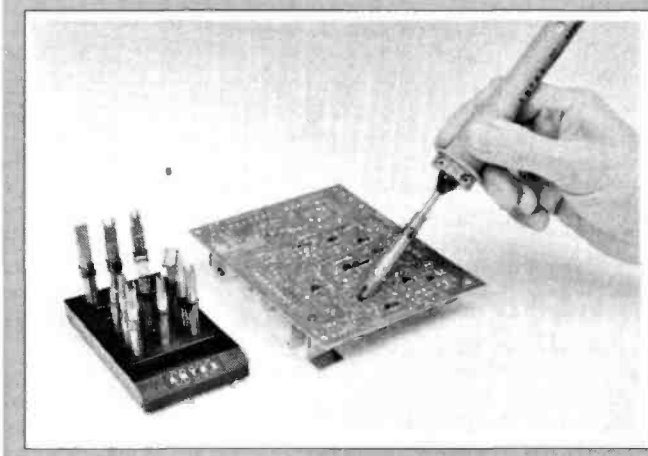


Fig. 11. Re-work tool tips.

at both ends of the chip will be melted at the same time. This is a delightful process with a 'magic' moment, as the chip will suddenly align itself on the pads when the solder flows!

This effect is a great help with i.c.s, and they are practically self-aligning under these circumstances. An example of a neat solder masked p.c.b. before and after placing of components is shown in **Fig. 8.**

The cream contains high levels of organic material and flux, and should be used sparingly. The residues of the flux and material which remains on the soldered joint, may need 'washing off' with a special solvent cleaner.

The simplest way of putting your own circuits together with s.m.d.s is to use a protoboard. This method will give you a working circuit in record time. Results are not as neat as with a 'dedicated' board, but quite complex circuits can be built up using interconnected protoboards. An example of a protoboard is shown in **Fig. 9.** A 35s.w.g. silver-plated wire is ideal for inter-board connections. For insulated runs on a protoboard, or indeed for all s.m. applications, 30AWG (American Wire Gauge) Kynar wire is excellent. The silver plating on the wire ensures perfect 'solderability'. This wire is easily stripped and the insulation won't melt back when soldering.

Home-Brew Boards

A p.c.b. may be produced by using a Dalo resist-pen. But it's well worth doing the job properly as it's much more rewarding. With the right approach it's possible to produce professional quality circuits. Use double sided p.c.b. material whenever possible. This material has much less tendency to warp and the reverse side provides excellent screening.

Producing a practical track layout from a schematic diagram demands a certain amount of practice and skill. Generally speaking - more effort produces better results!

The learning curve is very steep for the beginner and very adequate results can be produced even on a first attempt. There is a danger, on the other hand, of trying to achieve perfection. You should recognise when the design is good enough for the job!

With s.m.t., there's a temptation to go for ever-shrinking circuits! This happens, despite the large reduction in area and profile that's provided by s.m.t. Still, there's no need to worry - suppliers recognise the difficult creative nature of track layout and help is at hand.

A practical method of producing the track artwork is to use conventional p.c.b. drafting equipment. The material used in the technique mainly uses adhesive tapes and dry transfers.

The artwork is often produced four-times the required size for ease and accuracy before being reduced photographically. For the beginner, it's best to work 1:1 or life size. This is done by preparing the layout directly onto ultra-violet transparent drafting film. A full A4 sheet of s.m.d. footprints - as shown in **Fig. 10** - can be purchased on dry transfer sheets. I recommend the film method. Once a design is on film you can run off as many copies as you like.

There is no best method of getting the 1:1 layout and individuals will devise their own preferred way of going about it. A first approach is to lay out the translucent drafting sheet over the schematic (re-drawn to a suitable size), as a guide to component positions and lay down pairs of footprints as required. The footprints can later be joined up using dry transfer lines, or drawing pens. If you want physically smaller finished circuits, another method is to lay out actual chips on drawing paper.

Mark the positions where footprints are required with a 0.3mm pencil, keeping a rubber to hand for changes. The tracks can also be 'pencilled in'. Finally, place the drafting film over your drawing and complete it, putting footprints on first. Drawing pens, such as the Rotring Isograph are very useful. The 0.25mm tip size is suitable for fine work and the 0.35mm version is useful for filling large areas.

With care, a 0.18mm tip will produce some very fine tracks. The black drawing ink is opaque to ultra-violet light and a scalpel blade can be used to scrape off mistakes. Don't forget to check the completed dry 'master' for pin-holes. This should be done by using back-lighting. You can repair any blemishes by 'spotting-in' where it's needed. A final tip is that you should always use as large a footprint as you can. This simple innovation will make hand-soldering easier and more positive.

Simple Exposure

Once you have the master positive the production of the p.c.b. is simply a matter of exposure to ultra-violet light and etching with hot ferric chloride solution. An ultra-violet light exposure unit is a really good investment, it will allow you to produce repeats and to optimise exposure and development until perfect results are obtained.

Pre-coated photo-positive copper is readily available. Its exposure and development requirements will vary a little depending on how old the stock is. A test run is therefore advisable.

You can produce your own photo-positive copper with spray-on resist and it works well, but it is difficult to get an even coating. Always apply minimal film thickness and make certain it is completely dry before use. You can even have a go at making your own solder masked p.c.b. Let's assume we have an etched p.c.b. A roller tinned board is better if it has been 'air knifed'.

'Air knifing' removes small blobs of solder which develop at the ends of p.c.b. tracks. The imperfection is of no consequence for normal s.m.d. use but it prevents the solder-mask from forming a flat laminate. The blobs can be removed individually with solder wick.

However, I think the best way of obtaining a good surface for masking is to use clean, freshly etched copper. Dry film solder mask is probably easier to use than the liquid type. To use the dry film you peel off the release coating to expose the adhesive before sticking it onto the copper. To help it stick, you should press down firmly, using a small rubber roller to ensure there are no air gaps.

Warming the p.c.b. to between 50 and 70°C will help to produce a good laminate. Keep the film in darkness and work in subdued light. To expose the component pads for soldering you need a second transparency with footprints. You can use the original artwork to add footprints from the dry transfer sheet. The mask artwork is then laid over the p.c.b. and exposed to ultra-violet light.

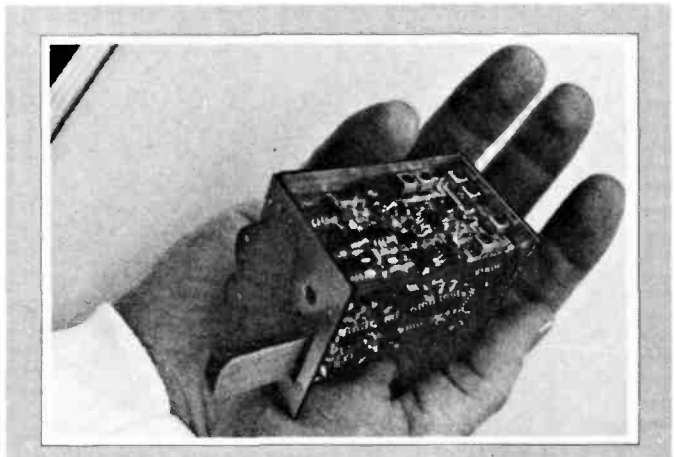


Fig. 13. G4ZQK's s.m.d. transceiver.

On exposure - which takes between 5 and 10 minutes - the areas exposed to the light will become insoluble when placed in the development solution. The areas where the resist was not exposed, due to the transparency's masking effect, will dissolve away leaving bare copper.

This developer is very simple and consists of a 1% solution of potassium carbonate used warm, with agitation at 35°C. The process takes about 30 minutes. Wash the finished p.c.b., and dry with tissue. It's not finished yet, as the film must now be fully cured.

Curing takes place under an ultra-violet source for about 30 minutes. The final step comes with an hour's treatment in an oven at approximately 150°C and after cleaning the board with a mildly abrasive pad - it's finished!

Choosing Tools

Let's now consider what tools are needed for s.m.t. work. As you'll see, there are instruments which are special to s.m.t. A little investment in the right tools for the job, will improve your efficiency and enjoyment. You'll need to develop your own techniques. At this early stage in the game you'll also have to consider which tools to buy and an obvious starting point is the soldering iron.

In choosing a soldering iron, the choice of tip, the power and whether it can be fitted with rework tools are important. The overall size of the iron is not too important, and some operators prefer a larger handle for better control. A fine tip of 0.5mm or less is ideal for most purposes. A high heat capacity is also required. This is particularly important when soldering chips to large areas of copper tracking, as they can act as a very efficient heatsink.

The large heat-capacity is needed to supply sufficient heat to the fine tip. A minimum power of 10W is recommended for efficient and rapid soldering. An 18W iron is adequate, and the 45W temperature-controlled devices are particularly suitable. With these irons the temperature can be adjusted for the low melting-point solder recommended for s.m.d. work.

The soldering iron is not only used for placing components but also plays a part in their removal. Special reworking tips are available for this procedure. This is yet another reason why an iron with plenty of spare heat is advisable. Reworking in this way is very effective.

A good range of low cost rework tips suitable for hobbyist use, are shown in **Fig. 11**. The rework tool heats both ends of the device, or all i.c. pins at the same time. As soon as the solder melts the chip is removed with a vacuum pencil or a pair of tweezers. There are also several makes of s.m.d. solder tweezers on the market which have proved ideal for all levels of rework.

Fine Gauge Solder

Most beginners to s.m.d. work will tend to apply excessive solder. A fine gauge low-melting solder wire such as 26 or 28 AWG is preferred. Low melting solder wire is usually 62% Tin, 36% Lead and 2% Silver and has a melting point of 180°C.

The solder-wires contain low levels of flux and the soldering technique is important. The flux evaporates rapidly and the solder wire must be applied to the joint at the same time as the iron tip. A clean p.c.b. and s.m.t. components with good 'solderability' are essential.

Flux paste is available separately and is useful for reworking. Always avoid handling s.m.d.s as this reduces their 'solderability'. Excess solder may be removed with a fine solder wick. This is useful when cleaning up component footprints in the course of reworking.

Also available are hot air devices which have been developed for s.m.t. work. Hot air blowers come in many shapes and sizes and are used for soldering and reworking.

Two main categories of hot air blower are marketed. The most powerful types of blowers can be fitted with large air guides, and they have sufficient heat output to rework very large i.c.s. Smaller capacity hot air pencils are available. These have nozzle sizes up to 4mm and would be ideal for solder mask p.c.b. kits, using solder cream.

The hot air pencil - shown in **Fig. 12** - is an excellent rework tool, in fact once you have tried one you will consider it to be an essential piece of equipment. Pencils are invaluable for rapid development work and prototyping, although they're not cheap.

Vacuum pencils are also extremely useful. These tools compliment the essential pair of tweezers. The vacuum pencils usually have an assortment of interchangeable tips including sucker attachments.

Used for manipulating and placing of s.m.d.s the pencils vary in cost and sophistication. The range varies from foot-operated systems with rotational facilities, to simple tools where the vacuum is controlled by a simple finger hole in the pencil handle.

A filter is normally used in the pencil's vacuum line, because flux residues sucked in during rework, would otherwise damage the pump.

Hand operated solder-syringes must be used with less viscous selected solder creams. Two broad categories of solder-cream can immediately be defined. The first is for screen printing or stencilling while the others are for dispensing from syringes. Most solder creams are essentially an 88% suspension of spherical solder particles. The particles have a diameter of between 45 and 75 microns.

Surface-mount solder cream is a powder in a 'suspension' to provide the required 'flow' characteristics. Types designed for printing have a higher viscosity than dispensing creams. Flux is the final ingredient and this may be straight rosin, mildly activated or fully activated rosin.

Water soluble fluxes are also possible. Flux content is usually quite low. For hand-soldering, a low melting, non-restrictive silver alloy is preferred. If a fine pitch dispensing type of solder-cream is selected, this will suffice for most amateur work. Solder creams are usually best reflowed at 30 to 40°C above the melting point of the solder.

Solder creams contain lead, in a particularly dangerous, finely dispersed form and should be considered as poisonous. Always wash your hands after using solder or solder creams!

Most solder creams give off copious fumes when heated. For safety and health's sake a small, cheap bench-top fume extractor with an inbuilt filter should be used to draw the fumes away from the operator.

Static Precautions

You should always use anti-static earthing wrist straps and earthed laminate when using c.m.o.s. i.c.s, f.e.t.s and other sensitive components. Don't forget that your soldering iron should also be treated in the same way!

The importance of good eyesight and visual aids will be obvious, when you pick up your first surface mount component! Another most important reason for using a magnifier, is the inspection of solder joints.

Stereoscopic magnifiers can be obtained at reasonable cost. However, large illuminated magnifiers and hand lenses are also useful. Always work in good light. If you feel you need some form of magnifier then use one. Don't strain your eyes unnecessarily.

In some cases the s.m.t. approach has been used already to produce excellent miniature equipment. A good example, the 'Dinky Two', a two-band transceiver by Jack Glennon G4ZQK, shown in **Fig. 13**.

Jack's design produces loudspeaker level output, has a two-pole audio filter for c.w., a Morse keyer, break-in operation, input attenuator, and dual r.f. output filters. All this in a palm-sized rig!

Many constructors are now using s.m.t. as a general method of fabrication rather than going for miniaturisation for its own sake. I'm certain that such forward seeing enthusiasts will help rejuvenate this wonderful hobby of ours by developing s.m.t. for small scale amateur radio use.

PW

STANDARD.

C5608 Dual Bander

Hi! Standard have produced this wonderful new dual band, 144/432MHz, 50 Watt hi tech design, and it takes me two days to sus out where the on/off switch is! I have to be honest, I now have the handbook, and it's almost English, too, so I might attempt to take it off the repeater channel!!

No, seriously, it is one of the most sophisticated pieces of equipment I have played with for some time, it has everything that the now renowned C528 has plus a few extras. I have managed to get some info (not issued by the manufacturer) which, from the keypad will give you receive between 800MHz and 1000MHz, plus, again, keypad programming, listen AM for airband! Haven't had time to try these out yet, only got sample two days ago. I don't think I have to remind you that we are the sole authorised importer for all Standard products, including their commercial and marine products, so I won't. **Norman**

FEATURES

- ★ Handmic with bright LCD frequency readout.
- ★ All functions on keypad microphone.
- ★ DTMF (when optional CDT5608 fitted) programmable two tone only is possible.
- ★ CTCSS (when optional CTN5608 fitted) keyboard programmable.
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- ★ Single band operation
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- ★ Multifunction keypad
- ★ Pageing alert
- ★ Programmable offset
- ★ Dual displays
- ★ Separate volume and squelch controls on both bands
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- ★ Keyboard expandable frequency ranges
- ★ Cellphone receive capability
- ★ Possible to receive AM
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FEATURES

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NORMAN G4THJ

Surface Mount Device Audio Amplifier Kit

REVIEW

The Blue Rose Electronics surface-mount audio amplifier 'Starter Kit' seemed an interesting project. We gave it to experienced constructor Paul Webster to try, and he duly swopped pliers for tweezers and had a go!

During my time in the radio hobby I have built many different 'bits and pieces' of electronic wizardry. I began 'home-brewing' years ago with tin shears, hole cutters, valve holders and large sized-soldering irons.

My interest finally led me through discretely wired transistor circuits on to printed circuit and strip board techniques. So I thought, naturally, that this little project would be 'a breeze'!

Audio Biscuits?

The only sort of biscuit I'd had in my shack before - had accompanied my tea, but now I had the chance of 'enjoying' an audio biscuit. 'What on earth is this guy talking about?' I hear you say - 'What's an audio biscuit?' Well - you're about to find out as I explain how I got involved in the project in the first place!

A friend asked me if it were possible to plug a miniature stereo-cassette player (you know, one of those personal 'ear-bashers') into a pair of speakers. This method would allow him to share the earache with others instead of taking the punishment alone!

I told him that the power output of the average 'personal stereo' is only sufficient to power the headphones provided. "What's wrong with plugging it into the hi-fi?" I asked. "Too big" was the reply and to cut a long story short, I was volunteered to build a pair of small 'active speakers' to do the job for him.

Active Speakers

Active speakers are small acoustic cabinets containing a good quality speaker and a small battery-powered amplifier. They are usually designed to provide enough gain to power the speakers to a 'comfortable' audio level from the output of a 'personal stereo', while maintaining the portability of the complete unit.

Before I started the job I made sure that my friend didn't want the same output level that many commercial 'Disco' amplifiers provide! In the end I decided that half a watt should be sufficient, and that the Blue Rose Electronics kit fitted the bill nicely.

Building The Biscuit

The kit reminded me of the first Sinclair miniature radio kits. At first glance I thought it had a fair chance of providing the builder with severe eyestrain. Still, I thought, with my experience and excellent eyesight - there should no problem.

As supplied, the kit comprises a number of self-seal bags, each containing one or more components. There were a total of seven capacitors, two resistors, an integrated circuit and the printed circuit board.

Blue Rose also provided a booklet of instructions, essential tips on construction and other information. The printed circuit is 30mm square, and of course all the components are surface-mounted on this board.

Surface-mounting components are **small**! Typically, a surface mounted 0.8W resistor is 3.2mm x 1.6mm x 0.6mm and a 100nF 12V capacitor is much the same size. The single-channel amplifier is based around a TDA1015 i.c. which has a working voltage of between 3.6 and 12V.

The i.c. produces 0.5W into 8Ω at 7V with less than 0.5% distortion. Its voltage gain is 53dB and input impedance is 200Ω. All this from a package measuring 4mm x 3mm x 1mm! Quiescent current is 10mA, averaging 60mA at normal volume levels, which makes the amplifier ideal for battery-powered applications.

Instructions First

Since this was my first attempt at surface-mount construction, I read the booklet very carefully. I then examined the components before beginning. My first observation was that the capacitors had no markings whatsoever, and therefore I regarded it as essential that they remained in their packets (which are marked) until required for mounting.

Good Intentions

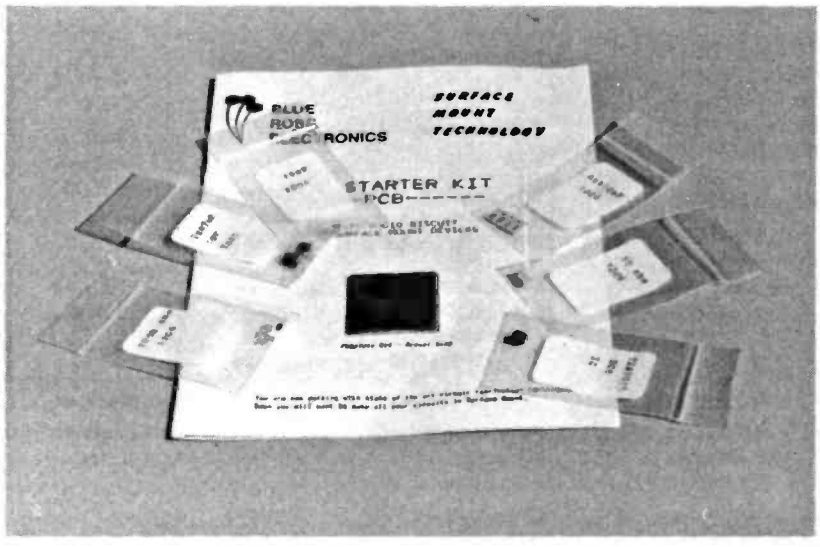
I set out with the intention of taking my time and producing a neat and hopefully reliable amplifier. The instructions suggest alternatives to buying a purpose made assembly jig.

Such jigs cost £16.50. However, a toothpick and non-conducting tweezers are all the tools needed for construction, other than the obvious soldering iron and solder.

Since an 'expert' like me had no need of expensive jigs, I armed myself with a toothpick. I also fitted the smallest bit I could find to my soldering iron.

Now the difficult part started! I decided to begin with the resistors as there were less of them to worry about. Removing the first one from its packet, I thanked my lucky stars for good fingernails. Good nails are essential for removing the seal from the packaging!

I adopted a different - successful - tactic with the



board itself. This was simple and was achieved by fastening the printed circuit to a larger piece of card with some of the removable, non-setting Blu-Tack adhesive. With the board held in this way, the job was much easier.

Toothpick Manoeuvres

Placing the first component on the circuit with my tweezers, I manoeuvred it into place with the toothpick. I wished for another hand to hold it in position as I soldered! Having no assistant 'handy', I transferred a small amount of hot solder to one end of the resistor.

The soldering iron bit, which I had thought would have been fine enough for the job, wasn't. It proved to be enormous when compared with the component to which it was being applied.

However, I had to make do with the tools available. The trick was to make the transfer of solder as quickly as possible, before all the lead and flux had burned off. Once this was achieved, I could concentrate on the other end of the job, using my full complement of 'appendages' to apply iron and solder separately.

This procedure worked well and it was a trivial matter to tidy the first joint with fresh solder. Now I was in business. Only another nine components to go!

Soldering Lessons

All went well until I came to fit C2, one end of which attaches to the same piece of circuit as R1. I found that I had been over generous with solder when placing R1 and I couldn't get C2 to lay flat.

This snag meant heating the solder on one end of R1 and placing C2, while the solder was flowing. It wasn't easy, but I managed it even though it didn't sit straight on the circuit. Ah well, there goes my claim to neatness!

Testing Time

The rest of the components were placed on the board without too many problems. It was time to test. I anxiously attached the remaining wires and connected the amplifier to a variable power supply.

I placed an mA meter in the circuit and connected the speaker. Slowly I brought up the voltage and watched the meter. True to the instructions, the quiescent current levelled off at 12mA at 9V. Just right!

Next, I touched the input lead and was rewarded by a buzz from the speaker. I switched off the power supply and rummaged around for a 5kΩ preset potentiometer to act as a preset volume control. The main volume control is on the cassette player and the preset is used only to predetermine the maximum output level.

With the potentiometer fitted, I attached the cassette player and switched on the power.

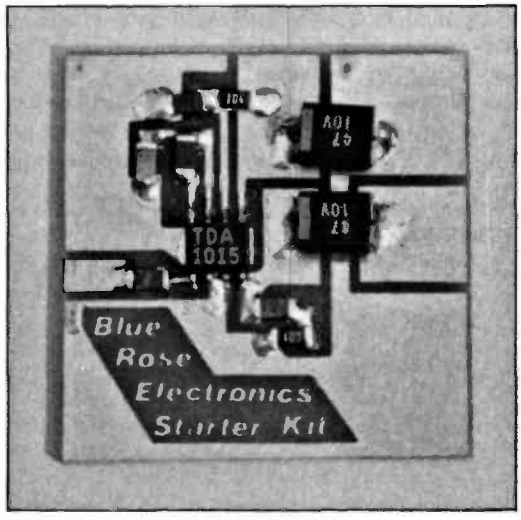
Success

It worked! Furthermore, it worked well. The quality of sound was clean and more than adequate for the purpose. I found that by increasing the volume until clipping started, and then decreasing it slightly, the current consumption peaked at about 105mA, averaging 60mA. The i.c. warmed slightly but not excessively.

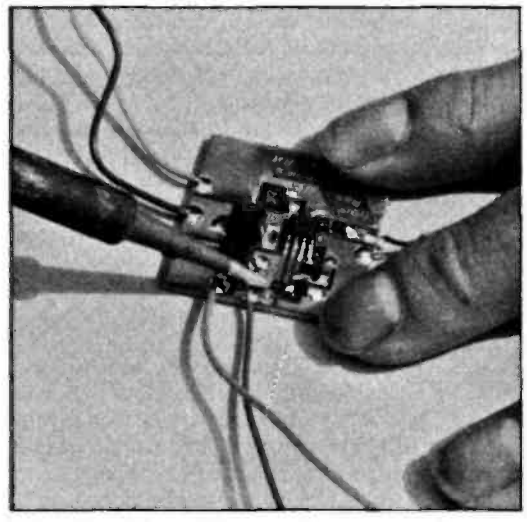
Finally

All that remained was to fit the amplifier into the already constructed speaker cabinet with double sided tape. I adjusted the preset potentiometer again, fitted the switch and battery and it was ready to go. I was then ready to start on the other channel amplifier - after I'd located it on the bench!

PW



The finished article, close-up.



The size of my fingers shows you how small the kit is!

Conclusions

Well - I managed it! As you will see from the illustrations, the components are very small but this kit can be regarded as a good introduction to s.m.d. work for the amateur. All you need is patience, time, good lighting and if you're not to lose the board and components - a tidy bench! Thanks also to **Blue Rose Electronics** who supplied the kit which costs £6.95.

Reflections

Ron Ham welcomes you all to his new column 'Reflections', reminiscing on the past and chatting about most aspects of today's radio and propagation news.

As many of you know, I have written a regular piece for *Practical Wireless* for the past 14 years and between you and me, each time the theme was beginning to write itself. The trusty Amstrads and their key banging predecessors were used to the prevailing style. Successive editors have said, "its time to give our readers a change". Well, I'm all for progress and besides, "he who pays the piper calls the tune", so, I am pleased to **Welcome** you to my new column and, as always, I will be delighted to hear from readers.

Reflections

This new style means that you and me can chat about most aspects of radio without 'himself' pointing out that 'propagation is your bit so kindly stick to it!' In order to give us the necessary elbow room for a natter column I decided on '**Reflections**' for the new title, which means that in future issues I can 'reflect' on the past, talk about your use of computers in radio or converse about the more recent atmospheric disturbances, which I hope many of you will continue to tell me about. Because the 'reflections' of radio-waves, normal or otherwise, are likley to be high on the discussion list, I used the Windows 'Paint' program packed with my Amstrad PC2086DD computer to produce the diagrams in **Fig. 1**. This shows you five different reflectors that are significant to all scientifically minded people, practical or otherwise.

Antennas

Although long-wires or half-wave dipoles are about the most popular general purpose antennas in use, the ideal array for frequencies above 14MHz is a multi-element beam, **Fig. 1 (1)**. This antenna is directional because it has a reflector behind the driven element. In the case of the Yagi, used for domestic v.h.f. radio and u.h.f. television, or by amateur radio enthusiasts on their allocated bands from 14 to 1296MHz, the reflector may be a longer single rod, a grid or a stack of rods. However, in the microwave

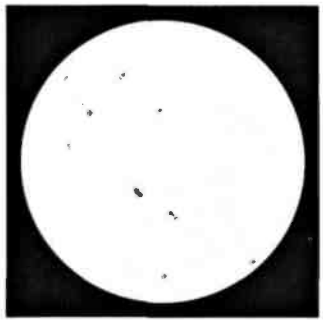


Fig. 2

part of the electro-magnetic spectrum a parabola ('dish'), **Fig. 1 (2)**, is used to reflect the incoming radio waves on to a dipole, horn, waveguide or whatever is fitted precisely at the focal point of the 'dish'. This is similar to the astronomical reflecting telescope, **Fig. 1 (3)** which gathers light from a celestial source with a parabolic mirror and reflects it toward a small flat mirror at its focal point. The starlight is then viewed through an eye piece pointing toward the flat mirror.

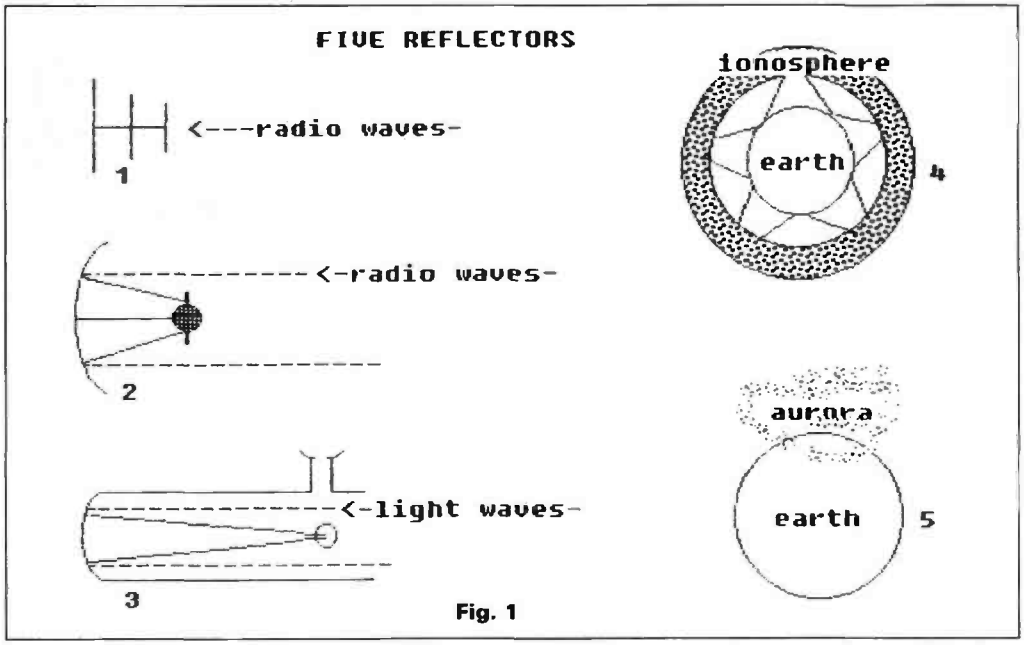


Fig. 1

Astronomy

Many of our readers have a general interest in astronomy and, like me, are members of the British Astronomical Association and know the observational capabilities of a Newtonian reflecting telescope. Those constellations of stars that contain strong radio sources, such as Cassiopeia or Cygnus, can be seen with the naked eye or a good pair of binoculars, but for a detailed study of the night sky then a properly mounted reflector is required. However, if, like me, you are an 'armchair' astronomer and interested in seeing what stars are where during the daylight hours, or visible from other places on earth, then software is available for some of the popular computers. So far, I have tried 'STAR TRACK+', (£19.95), by Discovery Software, 291 Cricklewood Lane, London NW2 2JL, tel: 081-840 5252, designed for the Amstrad PCW 8000 machines. 'The Night Sky' and 'Deep Space' for IBM/PCs from the range of astronomical programs listed by 'The Public Domain Software Library' in Crowborough, tel: (0892) 663298 and of course, I will be interested to hear about others that you know of or have used. Briefly, I found the programs easy to use. This is because their menu requests date, time and geographical co-ordinates before displaying the appropriate stars. This also improves your knowledge of geography and time zones. Both of these subjects are very much allied to radio, in addition to being good teaching aids for astronomy.

Great Swarms

Meteor scatter programs can assist radio enthusiasts who have a special interest in contacting other stations by meteor trail reflection (that word again, hi). It could be advantageous to let your computer show you the position and surroundings of an expected meteor shower

as seen from the locations of each participant in such a QSO.

During its annual orbit around the sun, the earth encounters great swarms of tiny solid particles called meteors which, on collision with our atmosphere, burn up and leave a fading trail of ionised gasses. These swarms are known as 'showers' and although meteor particles only manifest themselves about 100km above us, the name of each shower is derived from the constellation of stars, many light years away, from which the radiants of the meteors appear to come. For example, next year on November 18 you should look towards the constellation of Leo for the peak of the 'Leonids' shower and listen for some fast

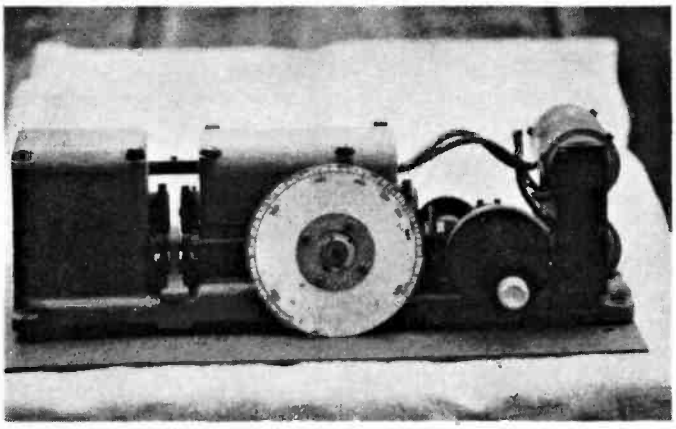


Fig. 3

Morse coded signals in the c.w. sections of the higher h.f. and v.h.f. amateur bands. Other peaks for your diary in 1991 are the 'Quadrantids' on January 4, 'Lyrids' on April 22, 'Perseids' on August 13, 'Orionids' on October 22 and the 'Geminids' and 'Ursids' on December 14 and 23 respectively. Members of the BAA members can refer to page 89 of their 1991 handbook.

Interesting Effects

Another important area of radio signal reflection is the ionosphere, **Fig. 1 (4)** which, broadly speaking, is dependant on radiation from the sun for its general condition and, an aurora, **Fig. 1 (5)**, which often appears around the earth's polar regions following a period of sunspot activity. Disturbance by a solar flare to the calculated bending of terrestrial radio waves by the ionosphere can cause a total radio black-out, rapidly fading signals or an almost mirror image type reflection. On the other hand an aurora, named 'Australis' when seen in the south and 'Borealis' in the north is a natural display of dancing coloured light, but, when it reflects radio-waves it transforms c.w. into a low pitched 'rasp' and s.s.b. transmissions into a 'ghostly' whisper.

In order that we may see a likely cause of a disturbance, **Patrick Moore** (Selsey) observes the sun, weather permitting, and, via his projection apparatus makes frequent drawings of the prevailing sunspots, as on September 20, **Fig. 2.** During September, **Ron Livesey** (Edinburgh), using a 2.5in refractor telescope and a 4in projection screen located active areas on the sun on days 3, 8, 9, 15, 22, 24, 26 and 29. Ron is the auroral co-ordinator for the British Astronomical Association and received reports of 'glows' from observers in parts of Scotland for the overnight hours of September 13, 14, 16, 18, 19, 21, 22, 24, 25 and 28, 'rays' on the 20th and 'active storm' on the 16th. **Doug Smillie** (Wishaw) noted weak auroral reflected signals on 144MHz from the Lerwick beacon (GB3LER) on the 18th. **Neil Clarke G0CAS** (Ferrybridge) reports that in September the solar flux climbed from 154 units on the 6th to 208 units on the 19th and by the 29th had declined to 149 units. Neil further told me that the 'Ap' magnetic index was "mostly unsettled to active with six days when the field was quiet" and added, "the most active days were the 12th and 15th with an 'Ap' index of 24.

Another consistent solar observer is **Cmdr Henry Hatfield** (Sevenoaks) who uses a spectrohelioscope and a radio-telescope. He reports that during October he located 2 sunspot groups on the 1st, 4 on the 4th, 3 on the 12th and 13th, 4 on the 16th and 2, "one with a very long chain of 7 spots", on the 26th. He also recorded periods of continual solar radio noise at 136MHz, warning of sunspot activity, periodically on the 8th and individual bursts of noise at midday on the 17th, 18th and 20th. At 0851 on October 16, **Ern Warwick** (Plymouth) heard a weak auroral warning from the German beacon DK0WCY on 10.144MHz. It is interesting to note that **Simon Hamer** (New Radnor) received 'smeary' television pictures in Band I, via a disturbed 'F2' region of the ionosphere, from Dubai and Iran, on Ch. E2 (48.25MHz) on October 23 and Australia on Ch. A0 (46.25MHz) around 0740 on the 27th.

Reflections Over 50 years

During a tropospheric opening on October 22/23, **Leo Barr** (Sunderland) using his AOR AR-800 scanner on 433MHz, heard a couple of amateurs, through the Newcastle u.h.f. repeater, saying that "both 70cms and 2m were wide-open to western Europe". With this in mind, Leo then checked the domestic v.h.f. Band II (87.5 to 106MHz) with his Matsui MR-4099 and Philips FCD-463 receivers and found "lots of stations from Western Europe, too many to note or identify." Also on the 23rd, Simon Hamer received pictures from Denmark, Norway and Sweden in Band III (175-230MHz) and Denmark and Sweden on several spots in the u.h.f. bands IV (471-608MHz) and V (615-855MHz).

Because it's now so easy, with our 'hi-tec' gear, to talk about hearing, seeing or working DX on the amateur, citizens, or commercial u.h.f. bands, ranging from 450 to 950MHz, I want to refer back 50 years to July 1940, when the second edition of the *Amateur Radio Handbook* was published by the RSGB. Although its Chapter 17, entitled 'Ultra-High Frequency Equipment', has a picture of a "transmitting acorn" valve good to 600MHz, the text is mainly devoted to 56 and 112MHz operation. This is a fascinating book and well ahead of its time. Around that period Hallicrafters built the 'S27' and 'S36' communications receivers for the US Navy which, using acorn valves (954, 955 & 956) in the tuner, had an upper frequency of 140MHz. Before the end of WWII some airborne i.f.f. (identification friend of foe) and Radar sets were working in the 300-500MHz region.

Several years ago I came across an ex-WWII receiver which tuned between 300 and 630MHz. It was so big, heavy and incomplete that I only kept the tuning unit, **Fig. 3.** If you don't believe such a tuner could exist, take a closer look at the well screened antenna filters (right), r.f. amplifier and mixer box (centre), the local oscillator (left) and the mechanical gear train which runs through the unit and is operated from the tuning knob on the right. More of the gears, the inter-section coupling quadrants and the rear of the dial (top) are visible in **Fig. 4.** This is now backwards to **Fig. 3** with the local oscillator box on the right.

When the screening cover was unbolted from the centre section it revealed a pair of triodes (NR88 - which incidently means 'Navy Receiving' type 88) mounted (top left) above silver-plated brass-vaned variable capacitors and what looks like a CS2A diode mixer (top centre right). Each of the two valves required 6.3V at 0.25A for the filament and up to 250V on its anode.

While you DXers are still astounded, let's come forward to 1962/1963 when there was so little activity on the 432MHz band that a subsidiary of the G.E.C., 'The M-O Valve Company', set up a beacon transmitter. The beacon was located at their Hammersmith, London, works operating on 431.5MHz with the call sign GB3GEC. This was intended to test propagation and give all of us who were building, and testing converters and antennas a consistent signal to 'play' with. Don't laugh too much readers, but I built a trough-line pre-amp, in an oblong copper box, using a PC88

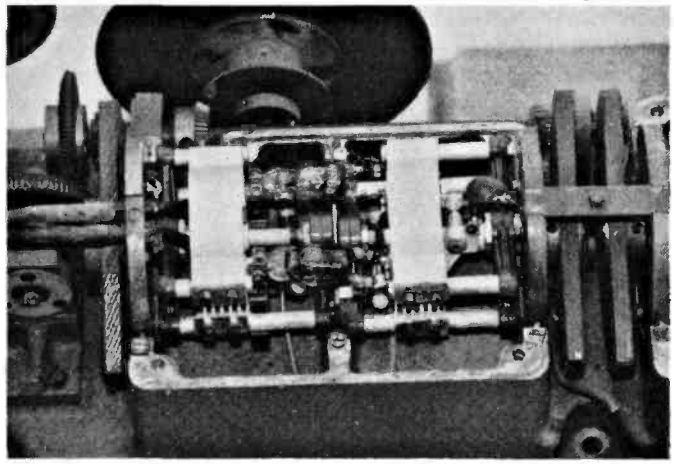


Fig. 4

valve. It had gold-plated pins, mounted in a p.t.f.e. holder at one end and a bolt and washer, acting as a variable capacitor to 'peak it up', along the top centre. It worked! I hold a letter from the technical manager of the M.O.V.C. dated 29 April 1963, confirming my report on their beacon's signal.

Don't forget to write to me at 'Faraday', Greyfriars, Storrington, West Sussex RH20 4HE.

Reflections

Valve Technology & Characteristics Part 5

Theory

We've reached amplification at radio frequencies, and Peter Buchan G3INR talks about the techniques in part five of Valve Technology.

Having seen that a valve could amplify at audio frequencies, we now turn to radio frequencies. The pentode is also very good at h.f. where tuned anode loads are used. The illustration **Fig. 5.1** shows an EF91 pentode amplifier circuit with a tuned anode load. Shown in **Fig. 5.2** are the characteristics for the EF91, you will see that the operating point 'Q' on the upper line has been chosen to lie below the dissipation curve, requiring a bias of about -2.0V. Because the resistance of the tuned circuit coil is very low indeed, there will be practically no voltage drop across it at d.c. Therefore the supply voltage and the anode voltage will be the same, i.e. 250V. The constants for the EF91 are gm 7.6mA/V, r_a 0.5MΩ and μ about 3,800.

Loading Up

As before we determine the load line just touching the $P_{a(max)}$ limit line at the operating voltage shown as the upper line in **Fig. 5.2.** Also from this line it may be seen that to obtain maximum swing without exceeding $P_{a(max)}$, we need a resistance (impedance) of around 25kΩ to swing the anode voltage through say 200V. So where does the 25kΩ come from? In the circuit diagram Fig. **5.1** you will see that there is a tuned circuit in the anode circuit of the valve, and it is from this and the following circuit that we shall get our 25kΩ load.

First we must decide at what frequency the valve circuit is to amplify. Let's say that we want to provide some amplification at one of the QRP frequencies, assume 3.560MHz. Well of course there is a very large number of combinations of L and C that resonate at 3.560MHz, but if we choose a combination that will have a loaded Q (quality figure) of not more than, say 25, then the losses will not be too great, (for a power amplifier, a Q of about 10 is high enough).

The term Q, which is purely numerical, may be determined from the measurement (or predicted) bandwidth of the tuned circuit , using the formula:

$$Q\,Figure = \frac{F_{centre}}{F_{3dB(high)} - F_{3dB(low)}}$$

Let's take the values: L=50μH and C=40pF. This capacitance includes the capacities C_{ak}, and the circuit 'strays' (illustrated in Fig. 4.3 in part four *PW* page 25 Dec. 90). The unloaded Q of this circuit will be high, so much so, that the resonant resistance R_D= L/CR is also very high. The value 'R' referred to is the component 'r' in **Fig 5.1.** This is the a.c. resistance of the coil. I have assumed the r.f. resistance of the coil to be, nominally, about 10Ω. The additional loading required will have to come from the load this stage is to drive. This load may be coupled into the tuned circuit by transformer or link coupling, or RC coupling of some value.

Probably some of you will be asking the question, 'where does the voltage come from when the load line swings above the supply line of 250V? If the supply is fixed at 250V how can the anode voltage rise above it'? Well the additional voltage is developed across the tuned circuit. The answer is, as the energy is changed from charge, in the capacitor, to magnetic in the coil this causes an e.m.f. in the coil. This extra voltage is created by the combination of the L and C, aided by the Q of the circuit. A design feature for tuned circuit is to arrange that the dynamic resistance (R_D), at resonance, is about 10% the r_a of the valve. In our case it is somewhat greater at about 20% of r_a.

$$R_D = \frac{L}{Cr} = \frac{5.0 \times 10^{-5}}{(4.0 \times 10^{-11}) \times 10} = 125k\Omega$$

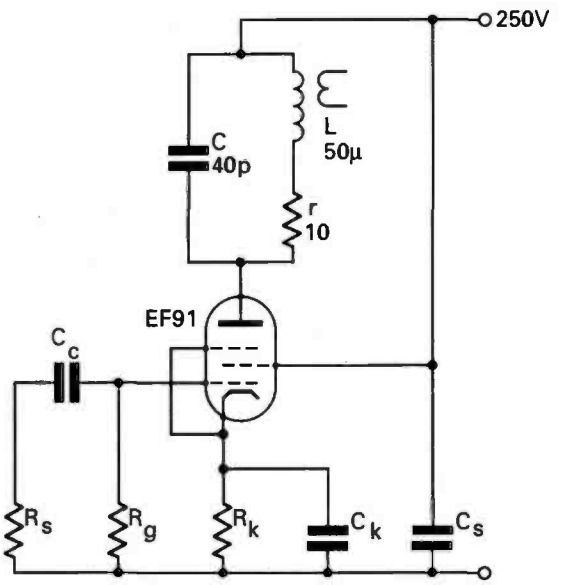


Fig 5.1: Circuit of a tuned amplifier using an EF91 r.f. pentode.

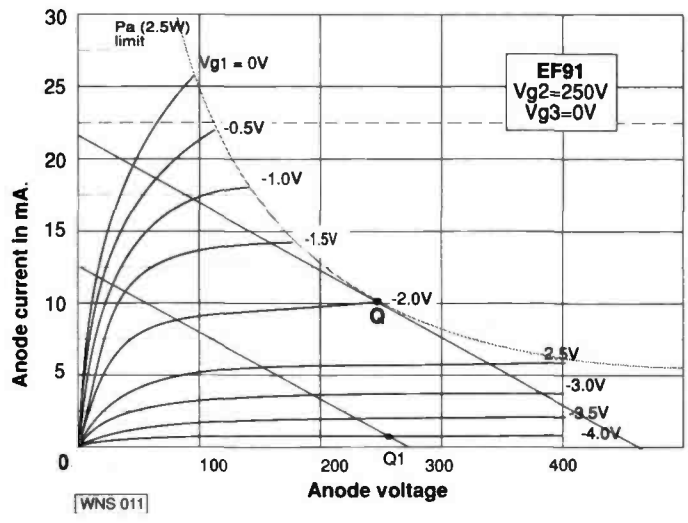


Fig. 5.2: The characteristic of the EF91 biased at -2.0V, this is further explained in the text, but note the lower load-line showing the valve biased at -4V.

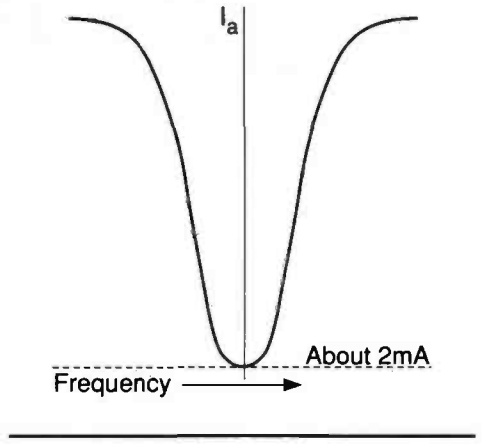


Fig. 5.3: The unloaded anode current as the frequency is swung about the resonance point of the circuit. This shows a distinct fall of i_a to about 2mA at resonance, R_D is about 125kΩ.

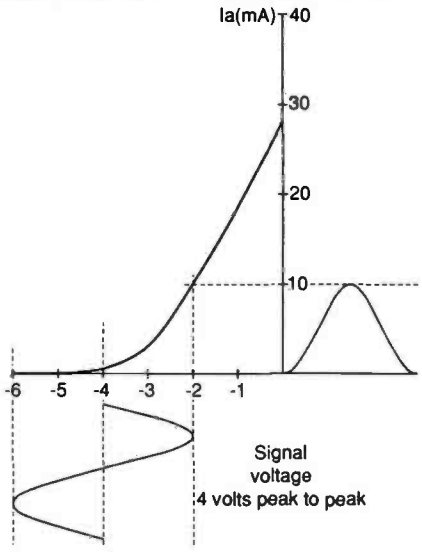


Fig. 5.4: At the new bias level of -4V showing the 'peakiness' of the anode current.

Another point worth noting is that when a signal is applied to the control grid g_1, of the valve the anode dissipation actually goes down. This is due to the fact the anode voltage and current are out of phase, and consequently the average power is less. If the anode load were to be the unloaded R_D of the circuit (125kΩ), then the load line would pass through the 1mA/250V point of the characteristics curves. (to meet the 2mA position of i_a at 0V, this equates to a v_{g1} of -4V)

Lower Dissipation

This increased bias of -4.0V requires an increase in the cathode resistor to 3.9kΩ, other components remaining the same. The immediate effect of this increase in bias is to allow the valve to run much cooler when quiescent. Only 0.25W is dissipated, ten times less than before. The disadvantage is that the circuit can no longer perform the duty of a class A amplifier, and in addition considerably more signal voltage will be required at g_1. This is usually no great problem. The curve shown in Fig. 5.3 is the plot of unloaded i_a (vertical) against frequency (horizontal). Under the grid bias and drive conditions are shown graphically in Fig. 5.4.

A study shows that if the signal voltage were to be made 4V peak to peak, the anode current i_a, on positive peaks, would rise to about 10mA (the original 'Q' point of the circuit). Only half the signal gets through of course, but the 'magic' here is that the tuned circuit, by virtue of its simple harmonic motion, will create a sinusoid out of the positive-going half wave!

More Efficient

With this level of bias the valve is approaching cut-off, that is to say the anode current is nearing a point where it will stop flowing. To reduce anode current to zero a bias voltage of at least -5V would be needed. Valves used with this level of bias would be operating in what is known as class 'B', and used singly would usually have a tuned circuit anode load. Efficiency improves with class 'B' operation because anode current flows only in the presence of a signal. Only a slight modification to the conditions

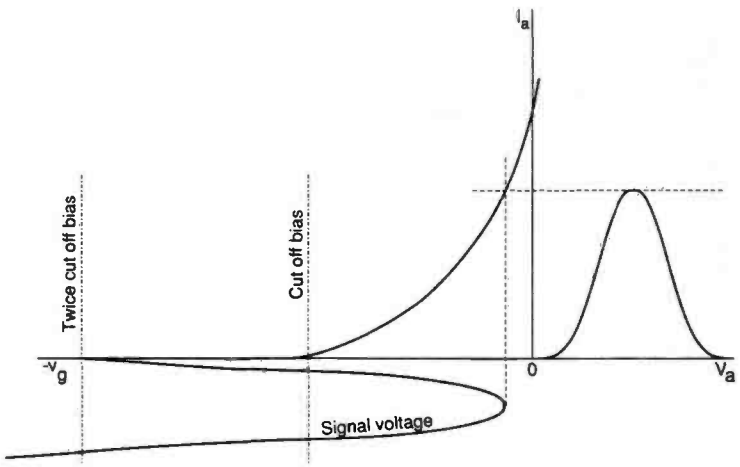


Fig. 5.5: Almost full drive under class 'C' operation showing how the drive voltage has increased.

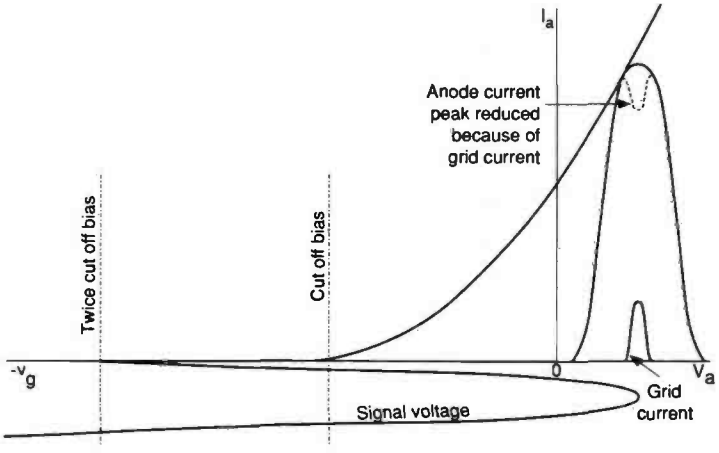


Fig. 5.6: Rather more drive, taking the valve into grid current, and the subsequent slight 'flattening' of the anode current peak.

LOWE LANDS AT HEATHROW!

We are very pleased to announce that you now have a choice of Lowe branches in and around London. You will probably know our first outlet at Eastcote run by Fred G4RJS, but to help those coming in by car or plane we have opened our newest branch right beside the M4 near Heathrow. The map shows how close we are to the motorway, indeed it shows how close we are to the entire motorway network.

Initially it will be run by Barrie Kissack G3MTD and a permanent manager will be appointed within the next six months (a job opportunity here for someone). The Lowe Heathrow branch will be different from our other branches in one major respect. In addition to Kenwood equipment, we will be stocking most of the other well known brands from the market leaders, plus a strong representation of scanners and specialist receivers aimed at the aeronautical enthusiast. In addition the range on offer will be complemented by a selection of communication products for the marine, PMR and HF SSB commercial markets, plus the very latest in high performance communications receivers.

The opening of this branch marks the start of a new series of Lowe Global Communications Centres being set up around the country. They will all offer an unequalled combination of long experience, knowledgeable advice, complete product coverage and the best service in the business.

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TS-950S

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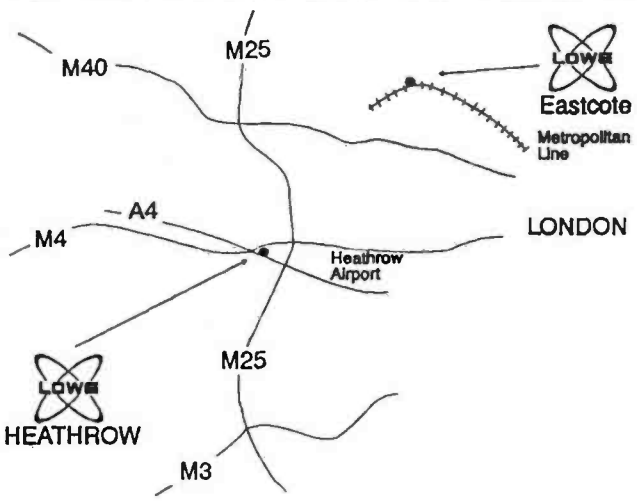
TH-77E TH-27E TH-26E



HOW TO FIND US

The new Lowe shop at Heathrow is located just 50 feet from the main A4, 200 yards from the M4 access roundabout at junction 5.

Leave the M4 at junction 5 and take the A4 from the roundabout towards Heathrow Airport and London. After about 200 yards you will see a gap in the brick wall on the left hand side. We are directly through the gap — next door to a fish and chip shop if you are feeling hungry! You can either pull up on the grass verge and walk through the gap, or alternatively carry on another 300 yards and turn first left at the lights into Sutton Lane then first left again into Trent Road. This will bring you out right in front of the shop, where you can park for free without a yellow line in sight.

LOWE ELECTRONICS LTD

6 CHERWELL CLOSE, LANGLEY, SLOUGH, BERKS SL3 8XB
Telephone: 0753 45255 Fax: 0753 45277

shown graphically in **Fig. 5.4** would be needed.

Doubling the bias to around twice the cut-off value takes the valve into class 'C' operation, and it was this level of operation that featured in the c.w./a.m. transmitters of the days before s.s.b.. See **Fig. 5.5** for an illustration of this. For maximum power out and efficiency, the valve would normally be driven into grid current, which increases the drive power requirements appreciably. Look at **Fig. 5.6** for these details. It also has the side effect of driving the valve further into class 'C' operation due to the rectifying action of the grid current.

The EF91 valve is not suitable for power amplification but it could be used for QRP work and would provide perhaps one or two watts of r.f. power if operated close to cut-off. At this point you must make sure that the signal does not take the g_1 voltage too close to zero. This precaution should prevent g1 drawing grid current, for which it is not designed, and so preventing damage to the valve.

This brief look at a valve circuit with a tuned load is really to introduce the idea, there is so much more that could be said about valves and amplifiers, but space does not permit.

Although this is the last article in this series, should you have any particular queries on the areas covered throughout, then please write in and let us know. Perhaps then we could get Peter to cover it in a little more detail, Ed. **PW**

CB CORNER

Technicalities to the fore this month, as Rick Maybury deliberates on the technicalities and non-sensities of CB.

Until now I've tended to dwell on the wider aspects of CB in this country but perhaps it's time to take a somewhat closer look at the nuts, bolts and sticky tape of this highly addictive, not to say contentious pastime.

Fearful First

I clearly remember opening up my first CB transceiver, purchased surreptitiously on a business trip to Germany in the late seventies. The sight that greeted me was a simple one-piece p.c.b., populated by reassuringly familiar discrete components. I mention this because, delving inside the innards of a new, hot-off-the-line CB rig last week, reminded me how little they've changed in all that time. Indeed, one or two makes appear to be still using a p.c.b. design that dates back almost ten years.

Digital What?

The digital revolution has all but by-passed CB. Features which, on everyday domestic radio equipment, we take for granted, are conspicuous by their absence on CB. Over the years one or two brave manufacturers have dabbled with microprocessor-controlled scanning facilities, push-button controls, l.c.d. channel displays and other 'high-tech' enhancements. However, in spite of these attempts, nine out of ten rigs today still have a mechanically-operated rotary channel selector, moving coil signal strength/r.f. power meter and a two digit l.e.d. display controlled by contacts on the rotary channel switch. This is by no means the most tried and tested portion. The microphone design goes back at least thirty years!

Obvious Reasons

Why should that be? There are two fairly obvious reasons for this state of affairs. The concept of CB has always been about simplicity and economy. Any half-decent 27/81 or CEPT mobile rig will set you back between £50 to £70, (unless you are able to shop around). At that price it's an affordable, entertaining and occasionally very useful addition to the family home or car. Taking inflation into account the real price of CB has remained more or less static since legalisation back in 1981, and would almost certainly have fallen but for the levelling off of demand following the boom in years after that. Fancy digital displays, search systems and high-performance microphones would quickly bump up its price. This would turn a utilitarian product into a luxury object and that's not what CB is about.

Plain Vanilla

There's a lot to be said for sticking with the tried and tested. The old maxim that says 'If it ain't broke, don't fix it', seems to hold true for CB rig designers. Many designs may go back at least ten years but that's far from being a disadvantage. In fact the advantage is that these old techniques have long since had all the wrinkles ironed out. Even when the worst happens, a sick, dying or even dead rig can be brought back to full health by any CB 'doctor' with a modicum of intelligence, a circuit diagram and fairly basic test and repair facilities. Almost all rigs are built using inexpensive off-the-shelf components. Faults are normally simple to trace and correct and apart from one or two chips (synthesizer and audio amplifier) configurations are familiar and easy to understand.

Skin Deep

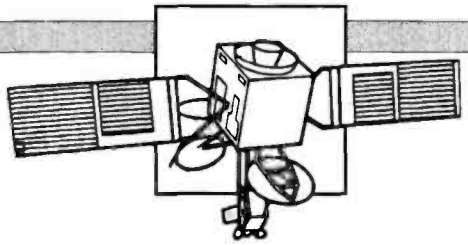
Considering the tight CEPT specification, no matter how much money a manufacturer might spend developing a transceiver there's little they can do to improve the performance of a 4W, 40-channel f.m. rig operating on the 27MHz band. Manufacturers know this, so most of the top-end units that have appeared over the years have exotic displays and control systems. Under the skin they are often little more than eye-catching cosmetic exercises, built around the same old transceiver boards found in rigs costing half as much.

Given that CB is also a fairly classless pursuit and, that CBers never actually meet their fellow-users face to face, there's really not much point lashing out several hundred quid on the latest piece of 'high-tech' wizardry, especially if no-one's ever going to hear, or see the difference!

Modulation Moans

This may go some way towards explaining why some users who have an irritating preoccupation with sound-effects. 'Echo' microphones and other equally annoying 'squawk-boxes' occasionally proliferate in some areas. There seems to be an irrational need in certain types of people wishing to make themselves sound different. The simplest and cheapest way to do that is to fiddle with the audio input of their rig with some kind of add-on box of tricks. 'Echo' microphones get my vote for the daftest accessory yet devised. (Any other suggestions? Answers please, to the Poole office *Ed*). It's not as if the user can actually hear the effect for themselves!

The CB channels can be busy and noisy at the best of times, so why someone should deliberately choose to make themselves even more unintelligible escapes me, but that's CB for you. **PW**



SATELLITE SCENE

by Pat Gowen G3IOR

Pat Gowen G3IOR looks at the latest news on the main operational satellites and manned missions, followed by the latest information about 'amateur radio in orbit'.

Welcome to 'Satellite Scene'! I hope you'll join me as I take a regular look at the fascinating world of AMSAT activity. So, after the welcome - straight into what's happening.

It's confidently expected that Oscar-10, AO-10, will once again receive enough solar 'input' to support a well-charged battery. This will of course help provide Mode B transponder operation and we hope that it'll be 'up and running' by 17 November 1990. With a little luck it will then continue operating until until 9 February 1991 but please check first for the latest operational news on the AMSAT nets.

We're ready for your advice now! Your suggestions on the most useful operating schedule for UoSAT-2, should be sent to UoSAT at the University of Surrey, Department of Electronic and Electrical Engineering, Guildford, Surrey GU2 5XH. Do this as soon as possible, so that they can be taken into account during an operations review which will be taking place soon.

Transponder Schedule

On or near to December 26, a new transponder operational schedule will be programmed into OSCAR-13. Until then, the current plan is for the satellite to be in Mode B from Mean Anomaly 000 to 095, Mode JL from MA 095 to MA 125, Mode LS from MA 125 to MA 130, Mode S from MA 130 to MA 135, Mode BS from MA 135 to MA 140, and back into Mode B again between MA 140 to MA 256.

The omni-directional antennas will be in use from MA 220 through perigee to MA 040. The command stations are attempting to orient the spacecraft to an attitude of BLON=180 and BLAT=0. Once magnetorquing stabilisation has been completed, a more precise attitude and schedule will be published.

The latest estimate at the end of October was ALON 178.6 and ALAT 0.5, producing 90.6% solar cell illumination, with ALON 179.7 and ALAT 3.3 expected on 24 December 1990, when the next change is likely.

There's been a lot of DX activity through AO-13, with the Zimbabwe station being extremely busy. They were so busy that they reported well over 100 QSOs in the first day of operation! Many W, JA and European stations are on, but **G0DLC** was particularly delighted to make a QSO with a really rare station in the form of V73AT on the Marshall Islands.

High Power Dove

The 800km high DO-17 DOVE satellite is now running its AX25 1200 bauds at full power. The satellite provides an excellent signal. It's a rare day when I don't receive a letter asking for details about DOVE from packet fans not familiar with satellites who have come across its powerful 145.825MHz signal. The following telemetry and good news was received by me using just a hand-held 2m receiver on 145.825MHz, well above my computer generated QRM:

"DOVE-1>TIME-1 <UI>:PHT: uptime is 082/08:50:02. Time is Wed Oct 24 10:59:19 1990

DOVE-1>TLM <UI>:00:5A 01:59 02:8A 03:32 04:5A 05:59 06:6E 07:4E 08:6E 09:6B 0A:

2

0B:FC 0C:E8 0D:DC 0E:FF 0F:25 10:DD 11:A5 12:03 13:DF 14:A6 15:B2

16:73 17:6F 18:74 19:74 1A:72 1B:04 1C:77 1D:72 1E:D4 1F:67 20:CF

DOVE-1>TLM <UI>:21:CB 22:7A 23:30 24:2A 25:24 26:02 27:10 28:02 29:01 2A:03 2B:88

2C:02 2D:6D 2E:5A 2F:A2 30:D1 31:A2 32:11 33:CE 34:AA 35:A0 36:A937:AA 38:94

DOVE-1>STATUS <UI>: 80 00 00 84 05 18 BB 02 00 B0 00 00 0A 0C 3C 05 0B 00 04 04

D O V E - 1 > B R A M S T <UI>:GNO4AWWA4ONG

New System

"The new file system will be loaded to PACSAT and BBS operations will commence in the next couple of days. Upon testing file the system there, DOVE will be reloaded. This will occur next week. 73 de BM". (Bob McGwier, information dated Oct.18)

DOVE-1>LSTAT <UI>:I P:0x3000 o:0 l:13081 f:13081, d:0

DOVE-1>WASH <UI>:wash addr:2ec0:0000, edac=0xbd"

Effortless Program

Stan Jackson G4LWM of Preston has developed a program that takes much of the effort out of the manual decoding, as described in our November 1990 column in 'Backscatter'. PW are offering the results of the voltages, currents and powers discovered at 1100UTC on October 11 in return for a s.a.e.

John Branegan GM4IHJ, following the popularity of his *UoSAT-3 Manual*, has now produced an equally excellent book for the DO-17 satellite called the *Dove Operating Manual*. The 27 pages of information, plus 10 more of appendices covers all aspects in a down-to-earth format. It includes an introduction, the hardware, what DOVE is, how to hear it, and what you can hear and read on it. Dove's computer, digital and voice transmissions are explained, how to find and receive them, and the connections needed to the TNC and computer are also covered.

Eight initial experiments are detailed on the telemetry; the sun, eclipse, battery monitoring, the temperatures, Doppler shift, orbit determination and problems. The appendices give the full decode, orbits and predictions, LAP1 Language Arts Project 1, as well as the software and antennas best suited for DOVE.

Good Book

The manual provides all the information you need for using DOVE in clear and unambiguous sections. It's also free of the normal 'hi-tec' complicated jargon. This manual is an absolute 'must' for anyone who plans to use the satellite for space environment research, experimentation and particularly as a tool in education.

The manual is only available from GM4IHJ at 8 Whitehills, Saline, Fife, Scotland KY12 9UJ, for £4.50 by post in the UK. Orders from abroad need extra postage, so you should add at least an extra £1.00. The book production is a non-profit making venture. John says "If any overseas AMSAT group wish to print it, I would revise the graphics for them and let them produce it from my discs".

Webersat Watchers

The current list of stations known to be taking pictures from the WEBERSAT camera are SM5BVF, K8TL, DG3CAN, ZS5NO, I3RUF, VK3DTO, HB9AZQ, PA3DVG, KD8SI, JA1OGZ, G4WFQ, LU8DYF, SV3KH, DL1YDD, DL8NCI, LU7XAC, ON5PV, VS6VU, JA6FTL, N0JVH, DF5DP and OH2SN. If you are active, or know of anyone else who participates, please help to update this listing provided by **Tom K8TL**, QTHR.

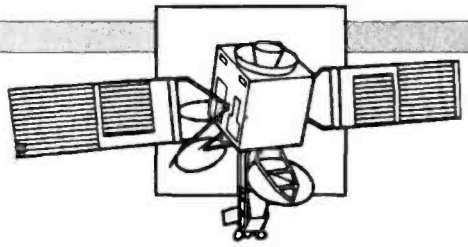
RM-1

Leo Labutin UA3CR, back from a Berlin meeting with DB2OS, reported a delay in the RM-1 launch. It was expected to go aloft either on November 21 or 29 with a pre and post launch on the air launch net on s.s.b. and packet radio to give details and take incoming telemetry. Signals were expected from orbit as soon as it was powered-up, on either 145.822 or 145.948MHz, as it defaults to c.w. telemetry on activation. The TLM beyond the UA command horizon is needed by the command team, and may be fed back by the nets or by packet radio.

G4CUO is greatly looking forward to performing some 'cross-satellite' QSOs by uplinking to RM-1 on 70cm and using RS-10 as a 2m to 10m 'i.f.', so he hopes it will be on Mode B frequently.

BADR-1

Any stations receiving signals from the BADR-1 spacecraft on 145.825MHz and 144.010/028MHz are requested to please send brief details to UoSAT at the University of Surrey QTH supplied. However, the latest Keplerian elements available dictates that by 27 November 1990 the perigee would be reduced to only 129km high. As the critical height for re-entry is generally agreed to be 130km, it is not really expected that BADR-1 will be around for you to hear at this time. This news will undoubtedly delight most 144MHz DX and e.m.e. operators as well as many satellite fans!



SALYUT-7

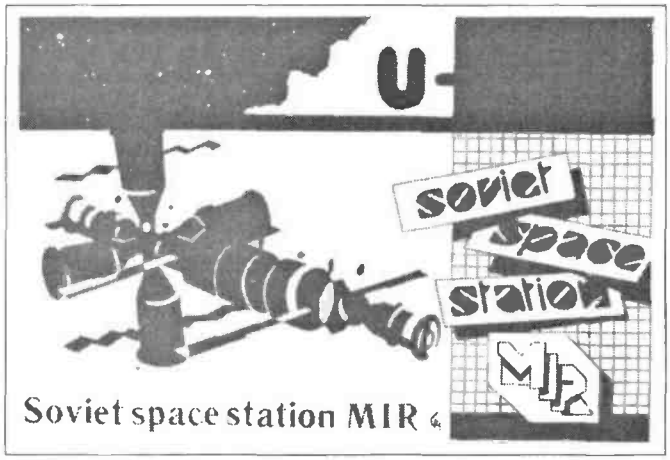
Further to my last month's forecast of the re-entry between late December 1990 and early March 1991 of the large SALYUT-7 space station, **Nico PA0DLO**, reports that SALYUT 7 is definitely coming down. There's no fuel on board the old station. As the Soviets have lost control over the station they've seemingly given it up for lost.

There's an extra module, COSMOS-1686 (frequency 19.955MHz) still docked to SALYUT 7. Because of the big mass of the station, we may certainly expect parts (of up to a few hundred kilograms!) to reach the earth's surface.

Nico also reported that, because of the orbit inclination, this debris can only come down between 51.5° north and 51.5° south latitude. Although the numbers vary a lot, Nico now expects the decay and final re-entry sometime in January 1991.

Fall-Out Competition!

A prize of a handsome selection of Russian space achievement commemoration stamps is offered to that reader who, within a clear week prior to final decay, sends by mail, radio, telephone or packet radio that which calculates or guesses the nearest UTC time and date when SALYUT-7 returns to earth. There's a maximum of three entries each per reader. Send your entries to G3IOR, QTH as given, via the AMSAT Nets, or via packet to G3IOR @ GB7VLS or GB7LDI.



U2MIR QSL Card.

Keplerian Elements

For every one who asks for continuity and even restoration of monthly sets of Keplerian elements, another points out the numerous alternative sources. When we publish the elements we have to cut some news, in order to make space for them. It is quite true to say that alternative sets are to be found on the packet radio network from at least four sources (W3IWI, G1LYH, FC1EBN and G3RWL), on all of the AMSAT nets, in regular data available from AMSAT-UK, and by telephone BBSs.

Practical Wireless are considering offering the latest sets in return for a stamped self-addressed envelope if the need is demonstrated by readers. Really, the source preference is up to you, the readers and users. If you need us to continue to publish them on a regular basis, or if you feel the alternatives offered are sufficient for your needs, so permitting more satellite news, please drop a line QTHR or let me know on packet as G3LDI @ GB7VLS or GB7LDI.

Author Pat Gowen G3IOR.

Christmas Gifts

Christmas is here again! Should you already possess a surfeit of socks, shirts, ties and handkerchiefs, among the recommended good books available which describe how to operate specific satellites are :-

(1) *FUJI Oscar-12* which also holds true for Oscar-20, published by JAMSAT and available from the RSGB, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE.

(2) *OSCAR-13* published and available from AMSAT-UK, G3AAJ QTHR, also from the RSGB.

(3) *UoSAT-3 Oscar-14 Operating Manual* available from GM4IHJ QTHR.

(4) *DOVE Operating Manual* also available from GM4IHJ.

The above single topic books miss out RS-10/11, UoSAT-2, PACSAT, WEBERSAT and LUSAT, but these and all the other satellites, plus Aurora, Meteor Scatter, EME and Microwave satellites, are all covered in a comprehensive RSGB *Space Radio Handbook* due to make its appearance in December.

AMSAT-UK have a booklet devoted to starting on amateur satellites and numerous other publications available. A request with s.a.s.e. to G3AAJ will get you a list of those available. You can also write to me at:

17 Heath Crescent, Hellesdon, Norwich, Norfolk, NR6 6DX.

Finally - I'd like to wish a happy Christmas and new year to you all!

Wanna Swap!

Have AR800E complete with discone antenna, a.c. adapter/charger. Plus Matsui MR-4099 World Band receiver complete with. p.s.u. Would exchange both for an FT-690 MkII, dual-band hand-held, or 934MHz CB radio. Cash adjustment or haggle. **Tel:** Ian G1HQK on 081-517 8277.

Have JVC TV CX-60GB multi-synch system, with 130mm tube, cost about £300, any offers w.h.y? Also wanted any *PW* magazines pre-1976, also any Eddystone magazines or *Popular Communications*. I am also looking for information, no matter how little on the NRD-505, costs paid. Replies please to: Mike Evans, 120 Loughton Way, Buckhurst Hill, Essex IG9 6AR.

Have Yaesu FT-747GX transceiver, in good condition, about 12 months old. Would exchange for a good receiver from such makes as Yaesu, Kenwood or Trio of similar age and condition and value **Tel:** Martyn on 051-924 5643.

Have the cabinet/chassis work for the G2DAF MkII s.s.b. transmitter, GEC rack mounted l.f. oscillator (50Hz-16kHz). A linear L50 amplifier, a TV screen magnifier. Also various parts for T1154, and an Emidicta dictating machine, an Eddystone 400 chassis and cabinet. Would exchange for Eddystone equipment or accessories w.h.y? **Tel:** Andrew Humphriss on (0926) 400876.

Have PC software Ashton-Tate dBaseIII+ and Lotus Freelance. Would exchange for a good short wave receiver capable of receiving s.s.b. **Tel:** Mike on (0625) 527187.

Wanted a memory unit for a Yaesu FRG-7700, I am unable to find one and they are apparently no longer made. Help! **Tel:** John on Leeds 707964.

Have Eddystone speaker type S688/A. Would exchange for National table model speaker (v.g.c.). I am also looking for a HRO receiver for spares. **Tel:** Bill on 041-649 4345.

Have six-band Eddystone v.h.f. receiver with very large dial. Would exchange for a Hallicrafter or other valved h.f. all-band set. **Tel:** F. Walker on Cambridge (0223) 241088.

Have Matsui MR-4099 all-band receiver and JVC stereo tuner-amplifier both in as new. Would exchange for an FRG-7 receiver, Midi gear or w.h.y. **Tel:** Seon Smyth on (0436) 71181.

Have Yaesu FT-290R MkI all-mode with microphone, NiCads, flexible and telescopic antennas. Valued at about £225. Would exchange for a synthesised 430MHz mobile rig with a minimum of 10W output. **Tel:** Kevin on (0782) 314383.

Have AR950 100 channel scanning receiver, less than one year old. Would exchange for an h.f. portable scanner or w.h.y. **Tel:** Alan on (0223) 412236.

Have Icom R-100 receiver 0.5-1800MHz a.m./f.m./s.s.b. Has 100 memories and built-in pre-amplifier. Would exchange for NRD-515/525, Icom R-71 or Lowe HF225. **Tel:** Ian on Derby (0332) 668272.

FOCAL POINT

The World of ATV

Andy Emmerson G8PTH welcomes you to the new format ATV column with the second part of a fascinating story.....

Dave Woodhall ZS6BNT/G3ZGZ from South Africa concludes his fascinating tale of ATV aloft in a balloon carrying amateur radio (BACAR). We left him last time prepared to call off the flight if a better transmitter could not be found.

"Right, it's now Friday, the day before the launch, and everything's been checked out on the bench but the package has not been finally integrated, as the builder of the switch-mode power supply will only deliver the p.s.u. this evening. Just in case this didn't work I had built up a 12V regulator using a low-volt-drop three-terminal device. This would work but may give us a shorter operational life. The package had been put together with only the power supply missing and, had been running on dummy loads for about 24 hours. The camera was mounted at the bottom of the package and was giving good pictures back to the TV set in the house. The telemetry was running well and giving good data back to the computer in the shack. Perhaps the antennas should be connected and the package left running? When this was done the TV picture in the house disappeared and was replaced with herringbone patterns. It turned out that the RTTY downlink transmitter was getting into the video transmitter, not the modulator or camera. This was cured by replacing the transmitter with another unit on a different frequency and the picture in the house returned.

Night Before Launch

"The camera performed perfectly until late on the Friday night before launch. One of the pre-flight tests is to check the package for loose connections by giving it a vibration test. During this test the camera failed and no video was available! The package was stripped down to find out that a connector within the camera had worked loose. Much relief was felt as the connector was put back in place and the camera worked correctly.

"The problems encountered before launch have not all been identified yet! I equipped my car with v.h.f. and h.f. transceivers in order to maintain communications with the control station. When the h.f. rig was installed in the car the 'mike' cord was found to be intermittent - of course it had worked fine for the last three months or more when used in the shack! When this was sorted out, the h.f. antenna was checked to see that the s.w.r. was acceptable, and that the antenna was adjusted correctly. The rig appeared not to be putting out power but, just before the screwdriver and hammer were used on the rig, the s.w.r. meter was checked. Again, this has worked for many years but you guessed it - it had failed between the shack and the car. After a diode had been replaced the s.w.r. was checked and found to be good.

"Surely all the problems have been found? Well not quite all. On the Friday before launch the car was equipped with all the rigs, antennas and other goodies needed to launch, check and track BACAR. This Friday the rain was 'hissing' down and the car was loaded in the garage. It's difficult to check the Doppler d.f. equipment in the garage. As I live in a cul-de-sac the best thing to do is to tune to a repeater, then drive round the end of the road in a circle.

"Well, when the garage door is not opened fully it is about 30mm lower than the top of the Doppler antennas. If you drive out of the garage under these circumstances you will find one or more antenna rods on the floor! This time it was two that had to be replaced!

Things Were Improving!

"After all these problems, it's a wonder that we even bothered going to the launch point at Irene on the Saturday! The weather the previous week had been low cloud, wind and overcast so we expected the same for the Saturday launch date. Well, it was not to be! Saturday the 10th saw perfect conditions for the launch of BACAR. Clear blue skies with very light surface winds are something that we have definitely not come to associate with a BACAR launch. This is the weather we were greeted with on the launch day. Things were improving!

"All the equipment was laid out, connected together and checked. Every step was correct and completed slightly before the time allocated. The filling of the balloons proceeded faster than normal and we decided to launch as soon as we could because the wind speed was very low. Air traffic control was contacted and permission to launch between 0645 and 0700 was obtained.

All Systems Go

"All systems were go and the package was launched at 0653. The launch was perfect as the package gained height at the rate of about 150m per minute. Much excitement was caused as the portable televisions at the Irene launch point were displaying the downlink video. During the first 45 minutes of flight pictures were seen of the cars parked at Irene, the Jan Smuts freeway and the Reitvlei dam. The quality of pictures was superb and everyone was very pleased with the results.

"The release automatically triggered at about 0830, whereupon the package started its descent. A number of stations recorded the video which showed the rapid descent before the parachute deployed fully. Data was available from the Irene weather bureau regarding height, temperature and humidity, together with navigation information. This allowed the team located at ZS6TJ (our clubhouse) to accurately plot the package progress and also confirm the release of the balloons.

"Recovery teams were dispatched to the expected landing areas well before the balloon had started moving off, after pre-flight predictions had been computed by myself. **Jeff ZS6TS** was able to get a visual on the package as it came into land and video-recorded the landing, which took place about 25m from where he was parked.

"The package finally came to rest near Phoenix Colliery, about 20km south of Witbank, where security staff quickly came to see what was happening. **Norman ZR6AJD** convinced them that it was harmless but should be left until the other mobiles arrived. The other recovery teams were talked into the landing zone and were able to see that the package had landed very gently without any damage.

A Great Success

"The package landed at 0919 after a flight lasting almost two and a half hours, with an ascent of one and a half hours. Every module on the package performed to expectations and overall the mission was a great success. As March 10th was 'Red Nose Day' (a local charity appeal in aid of under-privileged children) the recovery beacon was equipped with a red nose! This caused several comments, most of which cannot be repeated.

"The flight covered a straight line distance of about 110km, reached a height of over 20 000m, encountered temperatures of minus 75°C, and used up many metres of video tape on ground stations. After all the problems and setbacks over the previous few weeks, it was very encouraging to hear the comments of stations who were watching a domestic TV picking up an amateur transmission on Channel 35, from a balloon hovering at more than 16 000m.

"We have been able to get several video tapes recorded by the ground stations and are in the process of getting them edited in a professional video studio. The downlink pictures were picked up by stations as far away as Pietersburg (about 375km). The quality was good enough for stations on the ground to identify that the package was over a power station when it was close to the ground on the descent. This turned out to be about 1300m above the ground and at a radio distance of 110km.

Reasons

"I hope this is useful to you as feedback on what we are doing in South Africa as ground work for our own satellite. Perhaps I should have mentioned this before, but the Balloon Carrying Amateur Radio (BACAR) project was conceived five years ago in order to gain experience in designing, building and operating equipment and software for use on a satellite. The other two reasons for this project were to bring together the radio clubs throughout South Africa for a common project under the arm of SA AMSAT and to have FUN. All three criteria have been met as SA AMSAT are currently taking part in the Phase 3D flight by building a transponder that will be flown soon. We are also going to be building a South African Microsat in the near future.

Intend Flying Again

"We intend flying again soon and will use exactly the same equipment, but will test out methods of stabilising the platform to stop the picture spinning around. We would also like to try and build some sort of monochrome frame store unit, that would allow the camera to grab a frame and then send the same picture for a short period. I think that something that digitises the picture, with a resolution of say 255 pixels across, by 312 down, by 8 luminance steps, would be OK for our purposes (more grey scale resolution would be better so long as the current consumption is not too high)."

We look forward to the next exciting instalment! Don't forget to write to me with your ATV news, comments and interests. All pictures will be acknowledged.

See you in the March issue.

73s Andy G8PTH, QTHR, 71 Falcutt Way, Northampton NN2 8PH.

Back-Scatter

HF Bands

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

At the time of writing most of us are busy re-erecting antennas dropped in the face of gale warnings which didn't result in gales. Better that way than picking up the pieces, though!

Conditions

Not bad, by and large. Obviously there is no lack of sunspots, the bad conditions occur when the geomagnetic influences go against us. So, on one day when the solar flux is X, conditions are fb and on another when the flux is also X, conditions are awful!

So, things being as they are, let's tour the bands and see what has been going on, with of course our thanks to all and sundry for inputs; your letters of course, The DX Mag*azine*, *DX News Sheet*, *The DX Bulletin of VP2ML*, K1AR's Contest Calendar written for *CQ Magazine*, CARF's, The Canadian Amateur, and snippets whispered in the 'KFE ear by various kind folk. But of course, we can always use your information!

1.8MHz

Now here is a band where everyone keeps quiet about their doings. Certainly there are several people who can look at scores of 200 or more countries confirmed both in Europe and elsewhere.

G2HKU writes from the Isle of Sheppey to note that the summer S-8 level of static seems at the time of his letter to be continuing, making life quite difficult; though to be sure he managed to complete contacts on s.s.b. with ON7BW and on c.w. with HB9ANJ. Ted says he can hear UA9s and UL7s, in-between bursts of static, so at least the activity is there.

The pity with this band is that for so many of the early post WWII years it carried the majority of the inter-G traffic thanks to the TVI problem, but nowadays there seems to be very little of this sort of thing happening.

3.5MHz

First G2HKU, Ted mentions just the one c.w. contact on this band, that with LX/PA3EBT.

However, **G0KRJ** (Welling) has 25m of wire, end-fed, into which he puts some two watts of keyed r.f. During the month Eric made it out to GD3FXN for a new one at any power level, a two-way QRP contact with ON5AG, plus DH3IAT, DL2IAD, ON4AVA, G0CZD, G0DLQ, G0FTO, G3RJF, G3SES, G3ZJJ, G3YHO, G4OGF, G4UIQ, G4WZV and G8IB. c.w. of course.

Another one who uses low power is **G0HGA** (Stevenage), who puts her few watts into an 18.3m wire through a tuner arrangement. Angie found c.w. signals to work from G4RFS, G0DMN, Y3YLL, G2BB, G3IRW, G4SPY, Y21PO, PA3CCF and ON7EL.

Over the sea now, to **ON7PQ** (Kortrijk), yet again a c.w. operator. Pat found KX2A, W8JGU, KA8ZPF and ZM1AIZ.

GB4RSL was operated by the Royal Signals ARS at Llandudno Rally, and operated on the 3.5, 7 and 14MHz bands. On 3.5 and 7MHz they found the band crammed with JOTA stations, says **GW4XKE** who reported; this in practice reduced the number of contacts made, so the number of old friends worked was a mite down. They had some help from **GM0EXN**, who came down to GW from his hideaway on Dunnet Head, up north of John O'Groats.

So, one wonders where the Phone ops on this band have got to?

7MHz

To a large extent, the usefulness of this band, and indeed 3.5MHz too, depends on the calibre of both the station receiver and its operator. Those who tune across a wall of noise so seldom seem to think of inserting attenuation, or turning back the r.f. gain control, which would reveal all sorts of good things just waiting to be worked.

G2HKU mentions his c.w. contacts with HI8A, 4S7WP, W9XR and 6W1QB.

Angela at G0HGA manages to push 30 watts into her end-fed on this band, and at that level she made it on the key to NS8T, EA8VBP, TF1MM, W3NZ, K1ZZI, W1OX, W4BQF, W3HVQ and the usual crop of European stations.

GM3JDR (Aukengill) suffered a 'corker' of a gale three weeks before he wrote, which resulted in various boats being wrecked all around the north coast of Scotland. Closer to home, Don's beam survived the gale, but next day when the winds had dropped to around 35kn, one half of the tribander reflector broke off close to the U-bolt, thanks as Don put it to "all the waggling up down and sideways"! However, all is not lost as the beast is repairable, so by the time of writing GM3JDR should be back in business. On 7MHz Don stuck to the key, and thus made entries in the log for JA4DND, JR1ATQ, JR1SSH, JA5RH, JA6IEF, UA0ABB, RA0AA, UA0UBT, UA0QFC, U0AL, UJ8JKK, CN2BB, VK8AV, TA7A/2, 4N90M, FK8GJ, VK3MR, YN1CC and 7Q7KG.

It's c.w. all the way (his favourite mode) for ON7PQ, so Pat tackled this band to the tune of HI8A, ZL150A, 1A0KM, 8Q7JP, ZM1AIZ and GW3YDX/VP9.

Events

If you have a DXCC application in, you will be 'pleased' to know that they are, as at October 26, working on applications from mid-April! So, be patient.

Also with DXCC, I understand that decisions will be made soon on the 7O, DL/Y2, and Penguin Is. I also understand the documentation is not only in, but accepted for the 7O effort; the problem is rather tougher, namely to decide which country it counts for!

Those useful beacons on 14.100MHz, set up by NCDXF now have added usages. After the second minute of the ten-minute sequence, W6WX/BCN in Stanford CA will QSY for a minute and then up to 28.200MHz for a minute. I understand that this is part of a plan to similarly deal with all the nine beacons in the world-wide NCDXF set-up.

The UBA contest this year was won by G5LP (c.w.) and GW4UZL (s.s.b.) - congratulations! For 1991, due to the clash with the REF affair, it has been decided to split things up. The s.s.b. leg is January 26/27, and c.w. 23-24 February 1991 each to 1300GMT Saturday to 1300GMT Sunday. UBA have printed a little booklet which covers the Contest Rules, includes log and declaration sheets, gives some interesting breakdowns of past contests and also gives details of the 'European 1992 Community Award. We suggest you apply for a copy to: U8A HF CONTEST COMMITTEE, Galicia Jan ON6JG, Oude Gendarmeriestraat 62, B-3100 Heist op Den Berg, BELGIUM. This is also the address for logs, which are to be postmarked not later than 30 days after the event.

The Edgware club crew must be mightily amused to find, after years of their popular 'Straight Key Evening' sessions that the ARRL have re-invented the wheel by way of a Straight Key Night. Not a contest, just come on between noon and noon GMT December 29 and 30, about 60-80kHz up from the band-edges on 3.5, 7 and 14MHz and instead of RST use 'SKN' to alert others. Not a contest, so other chat quite acceptable. Report, mentioning 'Best Fist' and 'Most Interesting QSO', to ARRL SKN, 225 Main Street, Newington, CT 06111 by January 10.

G4ZZG mentions having a long chat with RB5FF, in which they discussed the problem of QSLing Russian stations, since Charles managed R-100-O. He was asking about the poor returns he has had on direct QSLs to Russian stations enclosing IRCs. Apparently, according to RB5FF, much of the incoming mail is opened by the time he gets it and only about one letter in ten is received with the contents intact. RB5FF now uses a DL station as his QSL Manager.

A letter which was delayed at the Poole office, thanks to an errant paperclip, came from **G0IAS** (Elkesley). Allan wrote in to say that the 7Q7 stations had QSL information as follows: 7Q7JM, operator Bill, via NK2T; 7Q7RM, operator Ron, via K6KII; 7Q7LA, operator Les, via Allan Hickman G0IAS, The Conifers, High Street, Elkesley, Retford Nottingham DN22 8AJ. Another station noted in the letter was 7Q7JA, a Japanese operator only active with a wire dipole and 2W on 28MHz of whose QSL details Allan was unsure.

We received news of the TOPS Activity Contest, over December 1-2 just too late for inclusion; however, we can say that TOPS is a c.w. club founded as far back as 1946, and details are obtainable from Phil Evans GW8WJ, 2 Ffordd Ty Newydd, Prestatyn, Clywd, Wales LL19 8BP.

WARC Bands

After years of neglect these seem to be everyone's favourites nowadays! I've been making sporadic attempts to persuade something or other to load up on these bands! First **ON7PQ**, who offers KL7U, 4S7WP, G3WQV/4U on 10MHz, CT0B, JH1QDB/JD1, 7Q7JA, FK8FS, A35XK on 18MHz; and on 24MHz PA0GAM/ST2, V47MXX, FH5EJ, CR7CWT, 3B8CF, LX2PA, UM9MYN and 4K3BB.

G2HKU starts on 10MHz with KL7U and SV9ADH on 10MHz, with 18MHz being represented by YU3AG/MM of Rabat, N2DAN, VE7SR, K3DMG; that left 24MHz reserved for KC1RG.

A new reporter now - welcome aboard! In the shape of GW4WZN (Anglesey) who runs an FT102 into a three-element mono-bander on 18MHz plus a CB vertical conversion for 28MHz. On 18MHz this combo netted Tony C6AFW, ZS1VW, Z21CSS, 8P6CC, PY2WZ, lots of VKs and ZLs, VE2-3-6-7, W1-2-3-4-5-6-7, a bucketful of JAs and a long-path LU9DM.

The 10MHz c.w. from **GM3JDR** netted Don ZM7AMO, TI2PZ, NI6T, VK5LU, OH2AQ/OJ0, JA3EMU, JA4MRL, JA0BWX, 7K1SPD, UA9CM, and SV9/DL4EBN/P. Turning to 18MHz, he worked JH1QDB/JD1, VK4NL, KL7KJ, PV8ADI, 4X3BB, ZC4CZ, VE7SR, UA0FDD, 8R1J, HL1CG, UW9TB, YN1CC, NL7G, KH6US, K9EL/VS6, RV0YF, ZK1XK, UA0AU, V44KJ, VK6HD, EA9KD, VE6UM, HI8A, KP2A, 5B4QG, PT7SY, VP2E/KT8Y, KE2FB/DU3, VE7SR, ZL1GQ, ZM1HV, 7K1SPD, YB0USJ, J28HE, V63AN, JT1CO, 4K4QQ, ZL3GQ, VK2TB, FH5EJ and heaps of JAs. That left 24MHz, where Don tabled EA9KD, 3B8CF, TA2AO, VK4RF, ZL3GQ, VS6WU, ZL1HY, U0AG, VK4NJ, VK3VJ, UA9CF, CU2AR, ZL2ANT, VK2OI, VK5MD, YN/SM0OIG, SV9ADH, VK4SS, HL1CG, FH5EJ, AH3C, VK4NJ, KL7U, OA4ZV, 4K3ABB, 3B8FE, HI8A and another shoal of JAs. When a mike was applied, Don raked in 3D2AG, V73BN, UI8QU, PT7BZ, DU1KK, 3B8CF, 6W1QJ, CE3GEI, HL1CG, ZL1HY, VK6HD, VU2NUD, A92BE, CU1AC, ZL1GQ, VK5MV, PJ6/KV4AD and yet more JAs.

A late letter from G4ZZG (Mansfield) notes that he has a mini-beam on a home-brew telescopic mast. This normally sits at 5m, is generally used at 7m but is rarely taken up to the full height of 10m. In addition, there is a quarter wave antenna for 18MHz - the favourite band - on one gable end, and on the other a ground-plane with which to listen to what Charles describes as the 'two-metre drivel'! The GW3KFE piece on antennas recently provoked Charles into putting up an additional 7MHz dipole having one leg along the ridge and the other coming down towards the ground. What this demonstrated has been mentioned elsewhere in this piece, but as Charles says, at least one reader has been provoked into thinking about getting on other bands,

so I'm truly satisfied with my work! The 18MHz bookings this time incidentally included on c.w., VP5P, VE7SR, SV1CU, CY9CF, CN8VV, ZB2/WA6CDR, WB2KKI, W2FCC, K3DOL, UT5WX, UOAL and UV3EH, plus s.s.b. contacts with ED2NCE (a 'special' to commemorate 900 years of the town of Estella, QSLs via EA2CCG), JP5DX, 4K3BB (Novaya Zemlya), J37AJ, VK2IP, SP1MHV, OE6HPD, DJ3NC/P and RB5FF.

28MHz

I never cease to be amazed at this band! Despite all the DX beacons audible a couple of evenings ago, there wasn't a solitary thing DX or otherwise audible anywhere else on the band!

Of course, the thing to do in such a case is to try a longish CQ - it's quite surprising what such a call will scare up.

ON7PQ mentions A43DX/A, V47NXX, K1EFI/VP9, 4K0ADS, BY5RA, ZD8CUE, V31SW, KH6IJ, JT1CO, CP8/DJ4SN, HI8A, TI7SS, 8Q7JP, GW3YDX/VP9 and 7Q7JA.

Turning to G2HKU, he worked K7UOT (Utah), K7WK (Arizona), W7LR (Montana), JF5HVI and YV1AD. All c.w. - I suspect Ted's lost his mike!

G0HGA (Stevenage) has just ten watts on this band, and to this she owes her c.w. contacts out to K4TP, WA8G, WA1OIH, W7FID, KZ1H, WB3GOC, HD4EH, XM3AT, PT7NN, RM7M, RA3UU, UB5ZFQ, UA3WER, and of course the more local EUs like LZ, OH3SS and LA3FL.

GW4WZN mentions FR5CY, JAs, UL7QBB, XU8DX, CO2RX, CX1VP, CX4SB, K1-2-3-4-7 and VKs.

In the intervals of repairing his beam, GM3JDR did find time to come on 28MHz and raise TR8BY, 5H0QL, J28NU/P, A47RS, HL2DDK, BY7KT, BY5RA, VP5A, RL0PIJ and some JAs.

G4ZZG worked FY5FE, UA9KCJ, HK1HHK, YU3AG/MM off Mauretania, VK6WT, V47NXX, PY6XO, and VK2BJ.

21MHz

Yours truly tripped over the RSGB contest on the evening of October 14, and in a half-hour managed a string of Europeans plus three W7 stations; just getting nicely into the swing of it when the telephone brought things to an abrupt halt!

G4ZZG tried the band out and managed CX8DR, a QRP signal from CX3EU and PY2FIT.

Up there at GM3JDR the s.s.b. on this band yielded him VK4BGG, HL0Y, P29SC, UA0WV, HS0AC and JAs. His c.w. produced UZ0ALW, OH0BT, HZ1AB, AT0T, J8/FG5ED, R0AIM, R0AJB, R0ARS, Y90ANT, VK3ELB, UZ0QXU, 4K0ADS, 3C1EA, JT1BR, WL7BUD, JT1CD and many JAs.

G0HGA's ten watts managed to raise NU1W, KC4BEM, WD3S, K7QQ, UA9MD, UA9MCM, UA0AO, LY2BZ, 9H1GI, RY8B/RB5BA and W1-2-3-4 in the contest.

Turning to G2HKU, we find Ted on the key to VE2BCB, 9H1GI, XM1RJ, CP6AA and HK3RQ.

Now we go over the water to ON7PQ, who raised BY5RSA, 7Z1AB, HR1LW, 3D2AG, 4K3BB, ZL150A, HL0B, A35XK and FR5AI/J.

14MHz

Firstly, GM3JDR who mentions c.w. contacts with OH0BT, R1SO (Solowki Is), UA9G/W7YS, 4K4QQ, VK1AAQ, JU750CS, JA0BWX, 4K2BDU, KC6EE, YV5BHI, JT1KAA, 7Q7RM, EX7M and the usual crop of JAs.

Her 20W on this band raised OH3BI, LA7TQ, DL6ZBA, RB4GA and UB4FWW for G0HGA.

Now G2HKU, who offers RA0/UV3DA, ZC4HMS, HI8DMX, UL7LD, HC2TI and CO8LY.

GB4RSL at the Llandudno Rally managed to raise VK6NS, VK3CDR, OE6PN, CT5CRP and others on this band - on s.s.b. we assume.

That leaves ON7PQ to wind the story up with 4K4/EK0AK, ZL7TZ, FP/G3LMD, ZL150A, 8Q7JP, ZX8CW, A35XK and GW3YDX/VP9.

Finale

As I mentioned earlier, I really could do with more reports. Suddenly 'HF Bands' seems to have developed a bias in favour of c.w., so out you come you s.s.b. types, and tell us what you've worked!

Please send your news to me at the address at the head of the article, to reach me by 1 January 1991. Meantime, enjoy your Christmas and New Year, and may 1991 bring you all you wish yourselves!

COME ON YOU 'PHONE FANS - SEND YOUR REPORTS TO PAUL NOW!

Back-Scatter

VHF Up

Reports to
David Butler G4ASR
Yew Tree Cottage
Lower Maescoed, Herefordshire HR2 0HP

Solar Data for October 1990

The quiet side of the sun was looking our way during the last week of September and in consequence there was very little solar input. This state continued through the first week of October, 10 quiet regions being reported on the sun's disc on October 7. The sunspot count moved slowly up from 169 on October 1 to 215 by the 7th. By contrast the two week period, October 8-19, saw some very disturbed conditions. On October 9, a magnetic storm commencing around midday, reached sub-storm level.

This was the prelude to a number of sudden ionospheric disturbances which occurred over the next few days. Scottish-type auroral activity was noted on October 10-11, activity being most intense in the far north. The sunspot count rose during this period, peaking at 386 on October 15. Solar flux levels also rose, being measured at 179 units on October 8 and peaking at 232 units on October 15.

The geomagnetic A index see-sawed throughout the period, being 3 units on October 8, at a sub-storm level of 36 units on October 10, falling to 13 units by October 14 but back up to storm level of 32 units on October 15. The major storming on the 15th was possibly due to effects from several disappearing filaments.

With the quiet side of the sun having rotated around again, the two week period from October 20 through to the end of the month saw a decline in solar activity. The sunspot count dropped from the 220 mark on October 22 down to 97 by November 1. Solar flux levels dropped similarly, down to 152 units on October 28. The geomagnetic A index was quiet for this period, except for October 24 when a level of 22 units was recorded. There is now very little doubt that the peak of Cycle 22 has already been reached and it is unlikely that there will be solar activity of sufficient magnitude to change the cycle maximum from that of July 1989. If this is correct, and it certainly looks likely, then Cycle 22 will go on record as the shortest rise to solar maximum ever recorded.

The 50MHz Band

Despite a number of readers reporting that conditions were very poor during October, the band was in fact open for DX on more occasions than was realised. Snag was, of course, that these openings only occurred on isolated days and were fairly brief. It also meant that much monitoring of white noise had to be done to get the most out of the band.

In the November issue of *PW*, I wrote that the months of October and November were the most likely for an opening to Australia and, that if conditions were right, the band would be open around 0730-0930UTC. Fortunately this proved correct and I am pleased that a number of *PW* readers got in amongst the action. The initial sign that propagation exists to the far east is usually given by the reception of video signals around 49MHz. The first report I have of this was on October 7 when signals were heard in central Europe. It was 10 days later that the first UK station detected anything from Australia. Around 0900UTC on October 17, **Geoff Brown GJ4ICD** (JER) copied VK video signals on 46.172MHz. On October 18 at 0815UTC, **OH2TI** worked 4F3BAA, the new prefix for the Philippines and between 0900-0930UTC he heard and worked VK8ZLX (PG66). Around the same time, stations in Greece were working into Hawaii. By now the more observant stations in the UK had sat up and noticed what was happening and were ready and waiting the next day, October 19, for the DX. Between 0850-0903UTC, **VK4BRG (QG48)** worked a number of stations including G3ZSS, G3WOS, G4AHN, G6HKM and GJ4ICD. At the same time, **Peter VK8ZLX** had propagation into Holland and Sweden, working a number of stations. Nothing

VK8ZLX

Zone 29 Alice Springs PG66

TIME	MHz	RADIO	HIS RST	MY RST	2 WAY	QSL
0902 G.M.T.	50	G4ASR	5-3	5-6	Yes	# TNX ~~Bureau~~ Direct

Date. 12-10-1989
Txcvr. Ic 575A
Antenna. 8el.
Amplifier. 100W

SSB RTTY F.M. AMTOR C.W. E.M.E.. 73 de OP.....

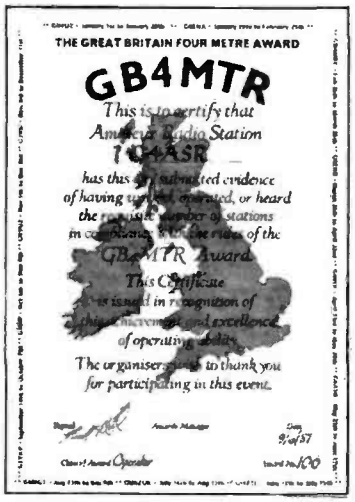
PETER SUMNER
PO Box 3242
Alice Springs
N.T. 0871
Australia

Back-Scatter

appeared to have been worked from the UK on October 20-21 but **VK4FNQ** contacted stations in DL, OZ, SM, SV and 9H on the 21st. **Arne Nilsson SM7AED** (JO65) reports that he worked, between 0840-0940UTC, VK4ABW, VK4ALM(QG56), VK4FNQ, VK4FP (QH30), VK4JH (QH30), VK4VV (QH22), KG6UH/DU1 and KE0SC/DU3 (PK04). Another opening to western Australia occurred on October 27 between 0925-1000UTC with **PA0HIP** hearing VK6JQ (PH12) and VK6YU (OF77). Stations in DL and G also worked the VK6's. This state continued through to the next morning with PA0HIP hearing VK6JQ from 0915-1115UTC and SM7CMV (JO75) working KG6DH/DU1, KE0SC/DU3 and KJ6WO/DU3 between 0950-1017UTC. Apparently, a few G stations managed to work into Australia around these times but I have not as yet received any confirmation of this. **Byron Fletcher G6HCV** (SFD) reports a number of VK6 stations heard around 0958UTC on October 31. PA0HIP was a bit more specific mentioning that he worked VK6HK (OF78), VK6RO (OF77), VK6YU and VK6JQ, all between 0925-1115UTC. **Gareth Jones GW6ARL** (GDD), using an FT-690R and 3-element Yagi, reports that he worked VK6TM and is now aiming for DXCC, 100 countries on 50MHz. Congratulations to all those stations that managed to work down under. I suspect that those of you that didn't are going to have to wait another 10 years or so for conditions to be right again. Arrange to have your holidays around October 2000. Don't say you haven't been warned!

The band was also good for DX in other directions apart from the far east. **Ela Martyr G6HKM** (ESX) found OH1LEU (KP01), OH6NRJ (KP32), OH8AXN (KP23) and SM2DME (JO89) on September 30. An opening to southern Africa, on October 15, gave a QSO with ZS6WB. There was a minor aurora on October 20, resulting in a contact with GM0GEI (IO77). A number of stations were heard on the 22nd, including OZ1ELF, TR8CA, ZS6WB, 3X1SG and 9H5AB. It was even better on October 23, with HC2FG, HC5K, TR8CA, V51E, ZS6AXT, ZS6SS, ZS6WB all heard and 9L1US worked for a new country and square.

Ted Collins G4UPS (DVN) passes on the news that N4EJW heard the GB3SIX beacon at 1127UTC on October 8 and that K1JRW was heard in the London area around midday but no QSOs resulted. Later in the day, at 1505UTC, Ted heard 9L1US working into G, DL, PA and SV. On October 9, he heard the CT0WW beacon at 1320UTC via Sp-E and at 1500UTC, V51E and V51VHF. There was more Sp-E propagation on October 10, allowing contacts with CT1LN, OE6DGG and SM7CMV. The 15th was a good day, starting early at 0938UTC, by working SM7AED. The OZ7IGY beacon was heard at the same time. At 1222UTC, the ZS6WB keyer was heard for 20 minutes, followed by the V51VHF and 9L1US beacons. A few hours later A22BW, ZS6AXT, ZS6LN and ZS6WB were all pounding in with very strong signals. On October 21, Ted worked OZ1EIP and heard TU2EW, TU4DH, V51E, V51VHF, ZD8VHF and 3X1SG. It was very much the same on the 22nd, with EA4CGN via crossband, V51E, ZS6WB and 3X1SG appearing in the log. Also heard were FY7THF, HC1FG, HC2FG, TR8CA, ZB0T, ZS6AXT and ZS9A.


THE GREAT BRITAIN FOUR METRE AWARD

GB4MTR

This is to certify that
Amateur Radio Station
G4ASR
has this day submitted evidence
of having worked, operated, or heard
the requisite number of stations
in compliance with the rules of the
GB4MTR Award.
This Certificate
is issued in recognition of
achievement and excellence
of operating ability.
The organisers wish to thank you
for participating in this event.

At my QTH, the only sign of DX was via the southerly t.e.p. path to Africa. On October 1, between 1810-1835UTC, V51E was heard in beacon mode on 50.102MHz peaking 559. It was heard again on October 15 at 1600UTC. At 1625UTC, a quick c.w. exchange was made with ZS6LN (KG46) at a distance of 8950km. Signals were fairly weak, 539 bothways. One week later, on October 22, the V51E beacon was heard between 1600-1730UTC. In this case it appeared that E-layer propagation was linking into a t.e.p. path which existed to the south. At 1650UTC, ZB0T (IM76) was heard putting a very strong signal into the UK. The other Namibian beacon, V51VHF (JG87) on 50.018MHz was heard peaking 559 between 1716-1730UTC. It runs 50W into a ground plane antenna. The rare DXCC country, Walvis Bay, was heard at 1737UTC when ZS9A (JG77) popped up briefly on 50.111MHz. Listen out for this station when the V51 beacons are audible. He normally operates on c.w. A similar propagation path existed on October 31. From 1700UTC, many Italian stations were heard around 50.160MHz at S-9+. Between 1738-1815UTC, a number of African stations were heard including ZS5OM (KG50), ZS6LN and Z23JO. Towards the end of the opening, around 1835UTC, a number of s.s.b. stations on Malta were copied, including 9H1AW. This latter station is better known as Alan Wright GW3LDH who was on holiday at the time.

Finally, to put us all firmly in our place, here is a sample of DX worked or heard by **GJ4ICD** during October, CT, DL, F, GM, I, LA, OE, OH, ON, OZ, PA, SM, SV, 9H, A22BW, CN2CW, FR5SIX, FY7THF, JA6IE, HC2FG, PZ1AP, TR8CA, TU4DH, VK4BRG, V51SW, ZD8VHF, ZS6PJS, 3DA0BK, 3X1SG and 9L1US. It may not surprise you that Geoff notched up his 99th country, on October 28 at 1137UTC, by working CN2CW via Sp-E.

The 70MHz Band

Tropo conditions on this band during October were pretty dismal. Even the c.w. contest on the 21st failed to generate much activity.

At my QTH, the four hour c.w. event only produced 25 contacts. Unfortunately, 20 of those QSOs were made in the first two hours, leaving ample time to work the other five stations! The only portable stations heard out on the hills were EI9FK/P and GM4ZUK/P.

Colin Redwood G6MXL (DOR) found conditions during the 70MHz Trophy contest on August 16 to be excellent. He worked G1SWH (MCH), GM4UJS/P (DGL) and GM8TFI/P (SCD) for new counties.

Martin Andrews GM6VXB (GRN) reports that he is the only fixed station operating from IO97 square. He operates on all modes with an FT101B, transverter and amplifier into a 6-element Yagi. Being located in a northerly latitude, visible auroras are quite common but they do not often result in radio propagation. However, when work loads permit, and conditions are right, he can often be found via this mode.

Another station operating from a rare locator is **Robert Ibbotson G0DVY**. He is located in JO03 (LCN) and despite being situated very close to sea level, is capable of putting out a very good signal.

Gordon Smith GW6TEO (DFD) in locator IO71, is a new station on the band, making his first QSO on November 11. He is using an IC290E into a Microwave Modules transverter and a BNOS amplifier giving about 80W into a 4-element Yagi at 10m above ground level.

Dave Hilton-Jones G4YTL (OFE) has been active on the band for some years with 25W from a home-brew transceiver into a 3-element Yagi. Very recently he completed a 4CX250B amplifier and replaced his old antenna with a 4-element Yagi.

QSB, the Four Metre Newsletter edited by G4WND, mentions a number of stations active on the f.m. mode. **Andy Dunham G6OHM** (CBE) uses a Pye Westminster and HB9CV antenna and although his QTH is badly shielded to the south he still manages to work many locals including G0CFD, G0FHM, G1PSO, G6PSE, G8GIN and G8SAN.

A few miles further south, **Clive Asquith G4ENB** (BFD) reports much f.m. activity from the Dunstable and Luton area. The Dunstable Downs Radio Club now has over a dozen members running mainly modified Westminsters but also the odd Europa and Whitehall p.m.r. rig.

In 1986, **Jerry Russell G4SEU** founded the idea of promoting activity on 70MHz by having 13 different stations throughout the UK operating the special event callsign GB4MTR, each for a 28 day period. In 1991 the same idea will be resurrected with the help of **Roger Banks G4WND**. Permission has again been granted by the RSGB for GB4MTR to be operated by 13 different stations, all of whom will have multiband capability to enhance the promotion of 70MHz on other frequencies. A special QSL card will be produced and an award scheme will operate with a certificate available to successful applicants. The first station to operate GB4MTR, from January 1-28, will be G4WND (SFD) located in Tamworth. I will give further information in next month's column regarding the rules of the award scheme.

The 144MHz Band

The autumnal tropo season came and went with hardly a whisper of DX. There were a number of minor openings during October, mainly restricted to stations located close to coastal paths. Oh well, maybe next year!

On October 11, stations in south-east England were able to work into Eastern German and Czechoslovakia via tropo. A duct also existed over the top of the UK allowing **EI6GF** (Co Wexford) to work a number of stations also in DL and OK. **G8PYP**, located on the south coast, worked DD2VA and DB8KJ whilst over in Essex, G6HKM found DB3TH/P, DC6HQ/P, DD1UA, DD4VK, DH3IAD, DK9WB, DL4EAU/P, DL8OAR, FC1GWT, FC1OET, LX1RR and OK1FFV/P (JN69). In the GDR contest, at the beginning of October, Ela worked Y25JI/P and Y46CI/P, both in locator JO51. She also made contact with DL5UZ (JN49) giving him his first contact with the UK.

Graham Peyman G0KON (DOR) has written for the first time to the column, detailing contacts made on the band over the summer period. Using a Trio 9130 giving 25W into a 15-element Yagi, four Sp-E contacts were made in 1990 including EA6PS (JM19) and EA7PZ (IM67). Being located on the south coast, Graham is able to take advantage of tropo paths that exist frequently to Spain. On August 4-5 he worked EA1WZ (IN53), EA1CJT/P (IN63), EA2BFM/P (IN81), EA2BWA/P (IN93) and EB1CFK (IN73). A rare wet square, EA2AWD/MM in IN74, was worked on August 12. The QSO had started on tropo but floundered because of QSB but thanks to a large meteor burst, from the Perseids shower, was quickly completed.

Graham mentions that his main mode of operation is c.w. and that he wishes more operators would use the mode for local QSOs instead of using it just for DX chasing.

Derrick Dance GM4CXP (BDS) prefers, however, to use the mode mainly for DXing. On the other hand, it is possible that stations in the far flung north don't have many locals to talk to anyway. Whatever way you look at it, the use of c.w. should be encouraged on the v.h.f. bands.

Ron Wilson G4NZU (NOT) certainly agrees with this but is worried at the apparent lack of activity with the mode. He looked back at his old log books to find the date on which his 100th c.w. station was worked each year. During the years 1985-1988, the 100 was reached by early or middle March. In 1989, this had slipped to early May and in 1990 it was pushed back to the end of June. It is difficult to base statistics on this method but the trend may be correct. I would like to know what type of propagation mode Ron made most of his

Back-Scatter

Deadlines

Please send your letters to reach me by the end of December. 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.

Annual v.h.f./u.h.f. table January to December 1990

Station	50MHz Counties	50MHz Countries	70MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Points
G1SWH	46	33	54	7	85	20	45	8	15	5	317
G6HKM	53	37			65	23	34	13	28	11	264
G0IMG	49	31	44	4	52	13	32	4	—	—	229
G4ASR	27	36	59	8	55	31					216
G6MXL	14	22	26	5	41	9	24	8	13	4	166
G0NFH	40	20	21	3	48	9	11	2	2	2	158
G0FYD	20	24	1	1	75	20	11	4	—	—	156
G8PYP	27	31	2	1	49	18	21	6			155
GD4XTT	31	18			73	17	10	4			153
G8ESB	9	5	18	3	48	7	36	5	15	4	150
G0EVT	21	23			36	14	5	1			100
GW4HBK	2	12	39	7			29	4			93
GM4CXP	9	6	7	3	53	13			—	—	91
G4ZTR	—	—	—	—	59	19	—	—	—	—	78
GW1MVL	2	2			43	10	11	2	—	—	70
G7CLY	—	—	—	—	60	9	—	—	—	—	69
G4SEU			62	6	—	—	—	—	—	—	68
GW7EVG			—	—	37	6	—	—	—	—	43
G7CFK	18	12									30
GM1ZVJ	1	9			2	1					13

QSOs by. If a good aurora occurred on January 1, I might possibly work 100+ c.w. stations on the first day of the year. Perhaps c.w. activity is proportional to the sunspot cycle?

A hastily scribbled note was received from **Ian Wright GW1MVL** (CWD). Something about getting married and moving QTH! Before the big day he found time to work FC1ARR (IN98), GJ3XBY/P, GM6LJE and GW4GFX/P, all during the September IARU contest.

Gary Nicholas GW7EVG (CWD) has been going through a painful learning curve recently. The red lead should really have gone to the positive terminal! So his 144MHz score for 1990 remains static at 37 counties and 6 countries. That is, until the IC202 comes back from the menders!

The first leg of the annual ARRL e.m.e. contest was held over the weekend of October 13-14. I tried listening with a single 18-element Yagi on a 10m boom, fixed horizontally. This size of Yagi allowed me to copy signals off the moon for just under two hours, but with moonrise occurring around 3am, I was only inclined to try listening during both moonset periods. On October 13, at 1329UTC, a QSO was made with W5UN, the moon being at 16° above the horizon. The next moonset period, on October 14, found W5UN, AF9Y, WA1JXN/7 and SM2CEW, the latter station being worked at 1348UTC, again when the moon was at 16° elevation.

GJ4ICD was also using a single Yagi, a 19-element in his case. Around 1400UTC on October 13, Geoff worked W5UN and heard I2FAK, OH7PI and ON7RB.

In last month's *PW*, I reported that **David Law G0LBK** (YSS) had not, as yet, been able to work OZ1HNE, a two Yagi station. During the contest on October 13, Dave succeeded in working him in 22 minutes. Other contacts made with the four 9-element Yagi array included DL8DAT, I2FAK, OZ4MM, SM2CEW, SM5FRH and W5UN. A total of 20 others stations were heard on random. Prior to the contest, on October 6-7, Dave worked DL5MAE, I1TXD, N5BLZ and VE7BQH.

The 430MHz Band

As with the lower v.h.f. bands, tropo conditions have been virtually non-existent. Even the u.h.f./s.h.f. contest on October 6-7 failed to find much support from the UK.

GJ4ICD didn't hear any UK stations on 430MHz during the contest but mentions that over 20 French stations were worked as far away as the Spanish border. Contacts were made with stations in IN93, 94, 97, 98, JN05, 06, 09 and JN28 but nothing from the east or north.

G6MXL reports that PE0MAR/P was the highlight of the contest, so conditions must have been very poor indeed.

G6HKM took part in the cumulative contest on October 17 but tropo conditions were rock bottom. Best DX during October was FD1JRX (JN25).

Rik Royall G8ESB (YSN) mentions that he has skeds, most weekday evenings at 7pm local time, with G6JQV (DYS) and GM0DNH (TYS). They call initially on 432.200MHz, moving to 432.210MHz when contact has been established. Anyone is welcome to call in.

Ian White G3SEK (OFE) reports that he has shut down his 430MHz e.m.e. station for the winter, while he replaces the entire antenna system. He would have preferred to have replaced his old 8 Yagi array with something like a 6m dish but thinks it wouldn't suit his neighbours who have become acclimatised to Yagis. The new system will consist of 16 Yagis, rear mounted and able to rotate in polarisation to overcome the cross-polarisation problems that arise from Faraday rotation and inter-continental longitude differences. Ian was fortunate to have attended the 'International 430MHz & Above EME Conference' in Trenton, New Jersey, last August in which the opportunity was taken to review e.m.e. procedures. As a consequence the operating procedures for 430MHz and up have been changed, particularly necessary now that more DXpedition stations are starting to include 430MHz e.m.e. in their plans. Copies of these procedures are available from myself on receipt of an s.a.e.

The Microwave Bands

Conditions on the 1296MHz band were quite good on September 28 allowing **G6HKM** to have QSOs with GUBIRF, ON4ABJ (JO21) and PA3DYS (JO21) who had only 200mW. The tropo opening, on October 11, which caused good propagation on the 144MHz band also extended up to 1296MHz giving contacts for Ela with DC6HQ/P and DF6IY, both in JN48. **John Hunter G3IMV** (BKS) worked several DL stations on 1296MHz during this opening, many over 600km.

Annual c.w. ladder

Station	Band (MHz) 50	70	144	430	Points
G4ASR	59	31	170	—	260
G4OUT		48	138	—	186
G4NZU	18	5	159	—	182
GD0ELY	12	—	144		156
GM4CXP	11	7	78	—	96
G0FYD	31		62	1	94
G0DJA	17		10		27
GW4VVX	3		9	—	12

Number of different stations worked since 1 January 1990

VHF News

Stewart Howarth GM0GTU/MM sent in a report from the Drill Rig *Ocean Victory* located in the northern area of the North Sea. Because of the nature of the work he is unable to be specific about when he is on board but is hopeful that his contract will continue through this winter. Accommodation space is limited on the drill rig and there are problems concerning the siting of antennas and electrical interference this may cause. Apart from that, Stewart is active on both 144MHz and 430MHz whenever he can find free time. He is able to work into southern Norway or eastern Scotland at any time on tropo and can even access the R0 repeater GB3SS. Most of his DX contacts have been made on c.w. via aurora. His only complaint is the bad manners from operators during these openings. Several QSOs have been lost because of other stations calling, particularly those who ignore 'KN' sent at the end of each over. Stewart thinks he could work two to three times as many stations if everyone waits for each contact to be fully completed. He is determined not to disappoint anyone by having the QSO cut short by bad mannered operators. I think we'll agree with that.

Dxpedition Update

Jan-Martin LA8AK passes on the news that QSL cards for his expeditions to JO37 and JO38 will soon be confirmed. Over 500 cards have been waiting to be processed since 1987.

Beacon and Repeater News

Since suffering from storm damage in early 1990, the Belgian beacon ON4VHF on 144.984MHz has been operating at a power level of only 200mW. It has recently been taken out of service for general updating but will be back using microprocessor control together with other beacons on 430, 1296 and 2320MHz.

For some time there has only been one v.h.f. beacon in Poland, SP9VHF on 144.900MHz. SP5CCC passes on the news that in December 1990 four more beacons became operational. These are SP5VHF on 144.872MHz and SP5UHF on 432.872MHz, both located in KO02PC and similar units located in KO11GF, SP8VHF on 144.922MHz and SP8UHF on 432.922MHz. They all run under 5W into crossed dipoles.

The v.h.f. repeater GB3BI, operating on channel R5 is off the air for a system overhaul. Contact GM4UMA for further details.

Four u.h.f. repeater units, GB3GR near Grantham on RB11, GB3NN in Wells on RB2, GB3OS in Stourbridge on RB2 and GB3YL in Lowestoft on RB14, are now back on the air.

The 1.3GHz f.m. TV repeater GB3GT on RT2 is off the air for maintenance. More details can be obtained from GM0GIB.

The Cambridge packet repeater GB7PX now has a 1.3GHz port. This should speed up the linking to other nodes. Another new 1.3GHz linking station is GB7AM located in Islington, Devon.

Meteor Showers

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

The Quadrantids meteor shower will be encountered between January 2-6 peaking sharply on Friday 4th. Between 0000-0400UTC beam south-east or north-west, 0400 to 0600UTC beam north or south, 0700 to 1000UTC beam east or west, 1200 to 1700UTC beam north-east or south-west. The shower radiant is low between the hours of 1700-0000UTC and is therefore not usable for meteor scatter. I have always found this shower to be particularly good to Scandinavia in mid afternoon.

QRZ Contest!

Additions have been made to the monthly Nordic activity contest to reflect the introduction of the 50MHz band throughout Europe.

In addition, changes have been made to the days on which these activity periods are held. The band sections will now run as follows: 144MHz on the first Tuesday of each month, 430MHz on the second Tuesday, Microwaves on the third Tuesday and 50MHz on the fourth Tuesday of the month. All sections will run from 1800-2200UTC during the winter and 1700-2100UTC during the summer. Contacts must be made with stations located in Denmark, Finland, Norway or Sweden. Monthly and yearly results are available, the yearly winner from each European country being awarded a contest Diploma. The full set of rules can be obtained from myself on receipt of an s.a.e.

Dates for the first of the Scandinavian activity contests in 1991 are as follows: 144MHz activity on January 1, 430MHz on January 8, Microwaves on January 15 and 50MHz activity on January 22.

If fast or slow scan television is your game, you should tune in to the first of the BATC Winter Cumulatives being held on January 3 and January 11. Each session lasts from 1900-2400UTC and is held on any band for which these modes are allowed.

Back-Scatter

Broadcast Round-up

Reports to Peter Shore via the *PW* Editorial Office

At the time of writing, the Gulf Crisis had subsided into continuing rhetoric by President Saddam and the Western powers, whilst on the international radio front, a war of frequencies has broken out. Several frequencies used by Iraqi Radio (both from Iraq and the transmitters in Kuwait annexed by Iraq) have been jumped on by other Arab broadcasters who are attempting almost, one might think, to jam Iraq. Some details appear in the African and Middle Eastern news section.

Jamming of BBC Arabic language transmissions by Iraq ended during October, and the additional frequencies given to the Arabic service were taken off during November.

BBC World Service celebrated two victories in November - the Czech authorities agreed to allow World Service programmes to be broadcast on transmitters within Czechoslovakia and BBC World Service in English, Czech and Slovak, together with English by Radio, will be available to listeners who will no longer have to rely on short wave.

The Chancellor's autumn statement brought good cheer, with the news that funding for the next three years is to be increased by around 6% in real terms. The increase in the Grant-in-Aid, provided from the coffers of the Foreign and Commonwealth Office, will allow increased investment in news and current affairs areas, in particular enabling increased news coverage for Eastern Europe and parts of the Far East. In addition, the construction of a new relay station in Thailand has been authorised and will commence in the next two years at a cost of around £20 million.

Interestingly the Dutch government announced the preceding week that it was not prepared to meet the cost of a joint BBC/Radio Netherlands station in Thailand. Radio Netherlands plans to lobby the government to reverse the decision, and will no doubt be aided by the British decision. The World Service station is planned to have two senders, but this would be increased in the event of Radio Netherlands joining the project.

In the Pacific KVOH, a religious station operated by the High Adventure Ministries, which currently operates from California principally directed to Cuba, announced plans to build a transmitting site on Guam. This would broadcast Mandarin and Cantonese to Asia, with Japanese and Korean added later. It is expected that the new site will operate with the callsign KHVN.

Radio Netherlands is to introduce more single side-band transmissions in its schedules, the station announced during November. With new transmitters in place on Bonaire, s.s.b. tests will start in the new year to evaluate the performance of the new senders. In an interview on *Media Network* the head of the station's frequency bureau, Jan Willem Drexhage, cited the Final Acts of the World Administrative Radio Conference (WARC) for HFBC (high frequency broadcasting) in 1987 which resolved that all d.s.b. transmissions should cease at the end of 2015, subject to the review of a future WARC. The problem is that most of the world's short wave listeners do not have receivers capable of s.s.b. reception, and many short wave broadcast transmitters are not capable of s.s.b. transmissions. It is a chicken and egg situation to a certain extent, with broadcasters unwilling to change to s.s.b. whilst only a tiny proportion of listeners possess suitable receivers, and manufacturers not prepared to invest in the production of cheap s.s.b. receivers until broadcasters start using the mode.

The Soviet Union has made further reductions in its language services, and the October Revolution parade in Moscow, usually a good indication of what the station is up to, suffering from vastly reduced coverage on all networks. Radio Moscow's Russian World Service joined the domestic Mayak service only briefly for the event on November 7, and no live relays were heard on any foreign language service, including English. Meanwhile Polish from Moscow has been reduced by half, and Mongolian Radio relays of Radio Moscow's Mongolian service have been cut to just 30 minutes. It is interesting to note that whilst Moscow has systematically reduced many of its language services in terms of number of hours broadcast, its overall position in terms of daily frequency hours has remained fairly static. Emphasis has been placed on English, with more than a third of all frequency hours devoted to Radio Moscow's English World Service.

European Stations
All times UTC(=GMT)

English from Radio Austria at 0730 appears to have moved from 0730 to 0530, with the weekend 1030 to Australasia disappearing all together. The 1630 English to Africa broadcast has been retimed to 1730, with frequency changes from 21.49 and 11.78MHz both replaced by 12.01 and 6.155MHz.

Radio Finland's present schedule of English programmes is now:

0000-0025 on 11.755, 9.645MHz, 963, 558 & 252kHz
0730-0745 on 11.755, 9.56, 6.12MHz, 963, 558 & 252kHz
0900-0930 on 21.55 & 17.80MHz
0930-0955 on 17.80 (usb) & 15.245MHz
1150-1215 on 21.55 & 15.40MHz (Mon-Fri only)
1400-1425 on 21.55 & 15.40MHz (to 1445 on Sunday)
1500-1530 on 15.185, 11.85, 11.755, 9.64, 6.12MHz, 963, 558 & 252kHz
1930-1955 on 11.755, 9.55, 6.12MHz, 963, 558 & 252kHz
2200-2225 on 11.755, 6.12MHz, 963, 558 & 252kHz

Radio France international now runs two French services, noted as RFI1 and RFI2 at some times of the day, notably 0530, 0600, 1230 and 1800. RFI2 can be heard on the regular European frequency of 6.175MHz for all but the first two broadcasts.

The early morning English bulletin has now been dropped, but English continues at:

1230-1300 on 21.645, 21.635, 17.65, 15.195, 15.155, 11.67 & 9.805MHz
1400-1500 on 21.77 & 7.125MHz
1600-1700 on 17.85, 17.845, 17.795, 17.62, 15.36, 12.015, 11.705 & 6.175MHz

Radio Norway International has half-hour English broadcasts on Saturday and Sunday:

1200 on 25.73 & 21.695MHz
1300 on 9.59 & 9.585MHz
1600 on 21.73 & 15.225MHz
1700 on 17.76 & 9.655MHz
1800 on 15.31MHz
1900 on 21.705, 17.73 & 15.22MHz
2100 on 11.85 & 7.21MHz
0100 on 11.925 & 9.615MHz
0200 on 11.925 & 9.615MHz

Radio Sweden has some bad news for followers of its regular communications magazine, *Sweden Calling DXers*. In November, the programme was cut from its weekly slot and given just two placings a month on the first and third Tuesdays. In addition the programme is now shorter, and will concentrate on Nordic media news. English to Europe is now:

1800 on 11.90, 9.655, 6065 & 1.179MHz
1930 on 7.265 & 6.065MHz
2200 on 6.065 & 1.179MHz
2330 on 1.179MHz
0100 on 1.179MHz

English programmes from that occasional broadcaster, the Red Cross Broadcasting Service based in Geneva are lined up for:

0310-0327 on 1, 4, 29 Jan; 1, 29 Feb; 1 Mar on 12.035, 9.885, 9.65 & 6.135MHz
0740-0757 on 31 Dec, 3, 28, 31 Jan; 25, 28 Feb on 21.695, 17.67, 13.685 & 9.56MHz
1040-1057 (dates as for 0740 transmission) on 21.77, 17.83, 15.57, 13.635 & 7.48MHz (China)
1100-1240 on 30 Dec; 27 Jan; 24 Feb on 7.21MHz
1310-1327 (dates as for 0740 transmission) on 21.695, 17.83, 15.57 & 13.635MHz
1700-1840 on 31 Dec, 28 Jan, 25 Feb on 7.21MHz
1710-1727 on same dates on 21.77, 17.83, 15.525, 11.955 & 9.885MHz

RCBS broadcasts on 7.21MHz during the day suffer from QRM in Europe from BBC World Service transmissions which use the same frequency.

Vatican Radio has dropped the frequency of 7.25MHz for English at 1445-1500. The programme is now heard on 11.74, 9.645 and 6.248MHz. At 2050-2110, English is heard on 7.25 and 6.248MHz. At 0600 the transmission remains on 6.248 and 6.185MHz. The medium wave channel of 1.53MHz remains in parallel for all European programmes.

Radio Vilnius from November has been broadcasting at 2230 on 9.675, 6.10, 1.557MHz and 666kHz and at 2300 on 17.69, 17.665, 15.18, 11.79, 11.67 and 6.10MHz.

Radio Yugoslavia transmits in English to Europe:

1930-2000 on 17.84, 15.165, 7.165 & 6.165MHz
2200-2245 on 15.165, 6.10 & 5.955MHz

Middle East and African Stations

Iraq's Voice of Peace has been using 21.675MHz from 1000 until 1200, 11.99 and 6.055MHz between 1600 and 1800 and at 2000 until 2200 is on 21.675MHz.

The Riyadh General Service from Saudi Arabia has been noted on 11.99MHz, a Radio Kuwait frequency used to carry Radio Baghdad since the invasion of the Emirate.

Roy Merrall, a regular correspondent to this column, sent the Radio RSA vernacular schedule which was effective to the end of December (this column was written during November!) I've included it as some frequencies will doubtless be valid beyond the New Year.

0400-0700 French on 15.22, 15.365 & 17.745MHz
0430-0530 Portuguese on 5.96 & 7.23MHz
0900-1000 Tsong (Sat/Sun only) on 9.585MHz
1400-1700 Swahili on 15.365MHz
1500-1800 Lozi on 11.90MHz
1600-1800 Chi-chewa on 5.96MHz
1800-1900 Portuguese on 7.23MHz
1800-2000 French on 15.365 & 17.745MHz
1900-2100 Portuguese on 11.95 & 15.22MHz

Roy says that the Lozi and Chi-chewa have been heard regularly after 1700, whilst Chi-chewa particularly has been giving good reception with RSA idents, sometimes in English. There is adjacent channel QRM from Radio Netherlands between 1630 and 1725 and VoA in Albanian, but after 1725 there is usually no trouble in identifying the station.

Roy goes on to say that the station QSLs quite quickly, but that he does include an IRC (international reply coupon) to oil the wheels.

I wonder whether the station will hire out spare capacity at its transmitters before

Back-Scatter

too long - regular listeners will recall that Radio RSA had an extensive overseas service until some months ago which was disbanded to allow the station's limited resources to be concentrated on African coverage.

Asian and Pacific Stations

Comments from Roy on Radio Australia who takes issue with the station's current schedule and the English transmission on 13.605MHz from 2200 until 0100. In fact, Roy observes, this seems to be a Chinese version of *Oz by Radio*, heard very clearly. There's also a clearly heard Oriental language service on 13.705MHz from 2300 to just before 0000 - unidentified so far!

KSDA the Adventist World Radio station on Guam is now in English at 2300 and 0000 on 15.61MHz, a move from 15.125MHz.

Radio Korea transmits from Seoul, in the southern part of the divided country, to Europe in English at 0800 on 13.67 and 7.555MHz; at 1800 on 15.575MHz and at 2030 on 15.575 and 6.48MHz.

Radio New Zealand is using 9.695MHz from 0900 until beyond 1500, with 9.855MHz also heard during the morning.

The Sri Lanka Broadcasting Corporation, SLBC, noted on 15.12MHz by Roy Merrall with 9.72MHz in parallel.

The Americas

Radio Nacional da Amazonia from Brazil is noted well in Europe on 15.445MHz.

Radio Canada International's media programme the *SWL Digest* is now heard to Africa on Sundays at 1835 on 17.82, 15.26 and 13.67MHz and to Europe, also on Sunday, at 2135 on 17.875 and 15.325MHz.

WCSN in Boston has English during the European day:

0600-1000 on 9.84MHz
1000-1200 on 13.595 (Sat/Sun only) on 13.76, 9.495 & 9.455MHz (to America)
1200-1400 on 21.70 (Sat/Sun only) on 13.625 & 9.53MHz (to America)
1600-2000 on 21.64MHz (Africa)
1800-2000 on 13.625 & 11.65MHz
2000-2200 on 17.555, 15.61 & 13.77MHz
2200-2400 on 17.555 & 9.465MHz

WWCR, Worldwide Christian Radio based in Nashville has been heard with German at 2300 for thirty minutes on 15.69MHz.

Heard something interesting? Write to Peter via the *PW* office. You can also leave a message on the answering machine after working hours.

Special Book Offer

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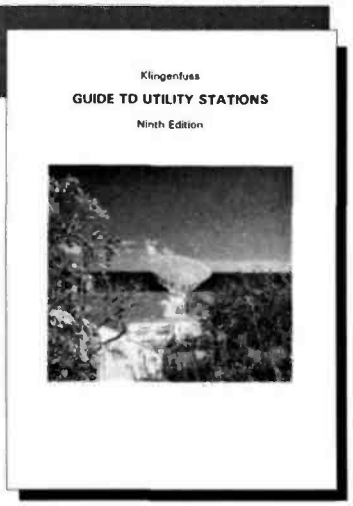

This is the latest version of the annually updated book. It covers all types of utility stations between v.l.f. and 30MHz. For those of you who want even more up-to-date information, there is a supplement service available, which gives you updates in April and August. The range of information included in this book is truly amazing, making it the short wave utility listeners 'bible'.

The beginning of the book deals with frequency allocations and covers the entire spectrum from d.c. to 150MHz. As well as the usual tabular representation of the spectrum, extracts from the international radio regulations are published which give the full technical definition of each allocation.

The main frequency list takes up most of the book and lists over 15 000 frequencies between 9kHz and 30MHz. The format used for the display of the data is the frequency followed by the callsign, location including country, mode and any operational notes. As the list also includes voice transmissions, these utility stations are highlighted by employing bold type.

A very comprehensive callsign list comes next which is very well presented in that against each callsign is the station name and location followed by all the frequencies used by that call. This is very useful for identifying new stations when all you have is the callsign. Another chapter gives a selection of the regulations regarding the construction and use of callsigns, which is interesting.

Press stations are given a special mention, starting with an alphabetical list of countries and their press agencies. This list also gives the transmission times and frequencies of all the stations mentioned. The next list that proves invaluable is the one that comprises a chronological list of press services. In order to find an active press station all you have to do is check against this list for the required time of day and you can instantly see which stations and frequencies are in use. Then it is the turn of the FAX operator with a list of transmission schedules and frequencies for all the main FAX stations.

The final schedule concerns the NAVTEX navigational and meteorological warning service. Listed here are all the active stations along with their individual times and identification details. The remaining chapters cover the complete Q, Z and signal reporting codes, along with a host of definitions and regulations. There are even two fold-out maps showing the world and regional air route areas.

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Complete both coupons in ink, giving your name and address clearly in block capitals. Coupon (2) will be used as the address label to despatch your book to you. Send the coupons with your cheque to: *Practical Wireless*, Book Offer (January), FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP. If you wish to pay by credit card (Access, Mastercard, Eurocard or Visa only), please fill in your card details and sign the coupon where indicated. Available to readers of *PW* in England, Scotland, Wales, N. Ireland, the Channel Islands and the Isle of Man only. Orders are normally despatched within 28 days, but please allow time for carriage.

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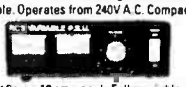

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