practical

Wireless

APRIL 1995 £1.90

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ISSN 0141-0857

THE UK'S BEST SELLING MAGAZINE FOR AMATEUR RADIO ENTHUSIASTS

Modify

THE HANDY FROM TANDY

Budget 50MHz Conversion

Build

THE KEY-7

Milliwatt Transmitter

And

A BAND EDGE FINDER

Features

THREE WATTS FROM A DRAINPIPE

Plus

PW MARTLET - Part 2

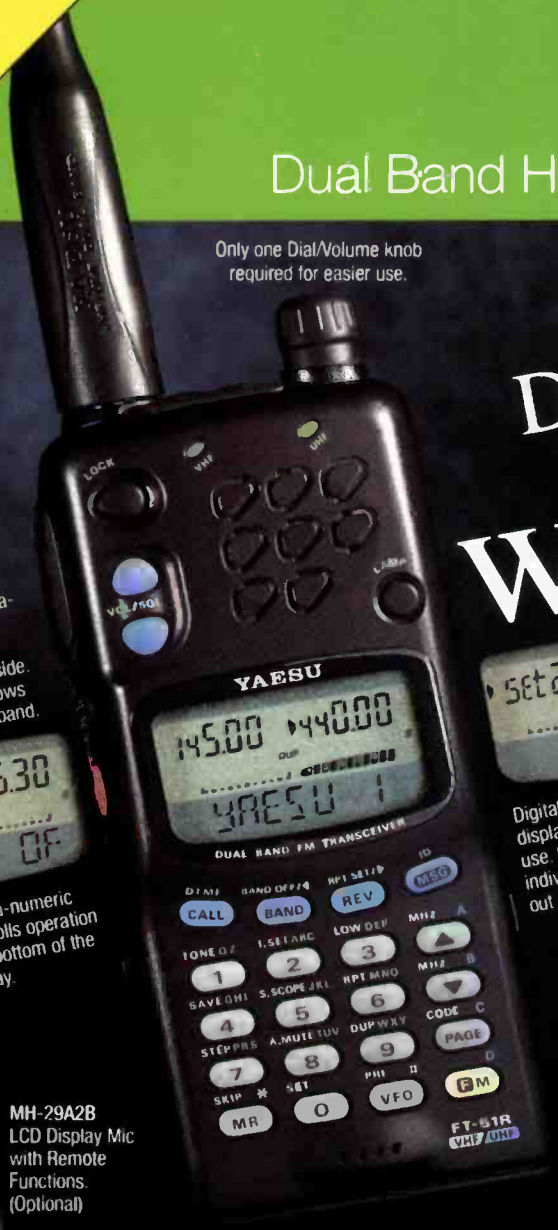
QRP COMMUNICATING WITH LOW POWER SPECIAL

NEW
Dual Band HT

Dual Band Handheld FT-51R

The First Dual Band HT with WINDOWS!

Only one Dial/Volume knob required for easier use.

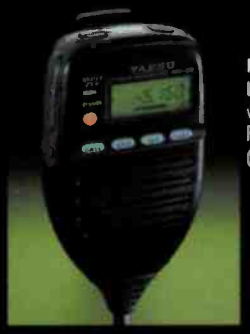


Three dual receive configurations VHF/VHF, UHF/UHF, or VHF/UHF with main band frequency on right or left side. Flexible programming allows transmit on main or sub band.

An 8 character alpha-numeric user help menu scrolls operation instructions in the bottom of the large, backlit display.

Digital battery voltage readout displays condition of battery in use. Scan skip function allows individual memory channel lockout during scanning mode.

Spectrascope™ displays active adjacent frequencies in real time with relative signal strength.



MH-29A2B
LCD Display Mic with Remote Functions. (Optional)

FT-51R
2¼"W x 4¾"H x 1⅛"D
(2 Watt version shown.)

The new FT-51R Dual Band HT is state-of-the-art, and easy to use! So easy, you won't need an operating manual. Its exclusive, scrolling instruction menu located in the large, backlit display "window", guides you through total operation while simultaneously viewing the main display window.

You'll like some of the other new, exclusive features, too. Like Spectrascope.™ This unique feature displays real time, continuous scanning of activity on adjacent frequencies in VFO mode or 8 of your favourite memories. A cloning feature duplicates favourite channels to another FT-51R.

A digital battery voltage display, five power output levels, the largest backlit dual band HT keypad made, Smart Mute,™ two VFOs on both VHF and UHF as well as available 2 Watt and 5 Watt versions, round out the exciting FT-51R. Plus, the optional MH-29A2B Display Microphone allows you to control volume and also access Memory, VFO, Call Channel, Band Selection and scanning functions. All of this in world's smallest dual band HT radio!

See the FT-51R with "windows" at your Yaesu dealer today!

"I can see two frequencies and alpha-numeric all at the same time."

"Scrolling instructions tell me what to do next!"

"I use the Spectrascope to find new contacts faster."

"Yaesu did it again!"

Specifications

- Frequency Coverage
  VHF RX: 110-180 MHz
  TX: 144-146 MHz
  UHF RX: 420-470 MHz
  TX: 430-440 MHz
- Spectrascope™ Display
- Scrolling User Help Menu
- Alpha-Numeric 8 Character Display
- Up/Down Volume/Squelch Controls & Display
- Selectable Sub-Band TX Mute
- Automatic Tone Search (ATS)
- Digital Battery Voltage Display
- AM Aircraft Receive
- Scanning Light System (SLS)
- 120 Memory Channels (80 w/Alpha-Numeric)
- Large Backlit Keypad & Display
- Automatic Repeater Shift (ARS)
- Multiple Scanning Modes
- 3 Selectable Scan Stop Modes with Scan Skip
- User selectable lock function w/15 combinations
- Automatic Power Off (APO)
- TX/RX Battery Savers Built-in
- Handy Cloning Feature
- 5 Selectable Power Output Levels
- Message system with CW ID
- Selectable RX Smart Mute™
- Cross-Band & One-Way Repeat Functions
- DTMF Paging/Coded Squelch Built-in

Accessories
Consult your local dealer.

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Performance without compromise.™

YAESU UK LTD. Unit 2, Maple Grove Business Centre, Lawrence Rd., Hounslow, Middlesex, TW4 6DR

Specifications subject to change without notice. Specifications guaranteed only within amateur bands.
Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

practical Wireless

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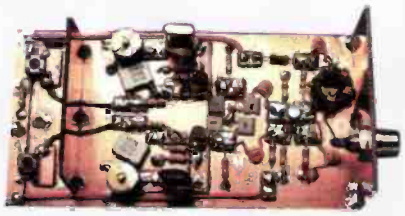
CONTENTS April



COMING NEXT MONTH

Practical Wireless takes at look at how you can put your computer to use in your radio shack, with a Computing In Radio Special, plus we review the new Yaesu FT-51R hand-held transceiver, along with all your favourite regular features and much much more!

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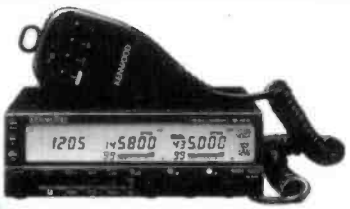

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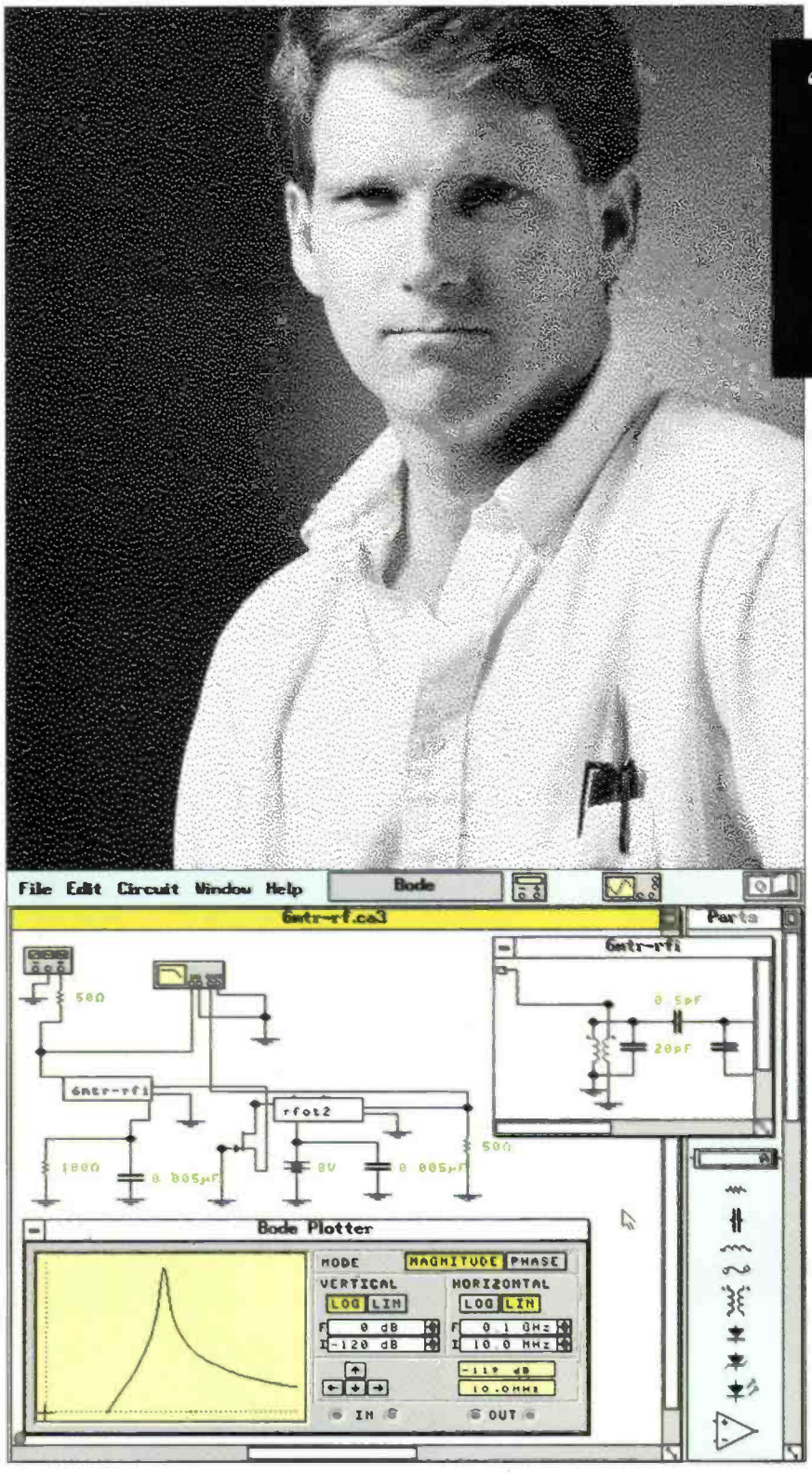

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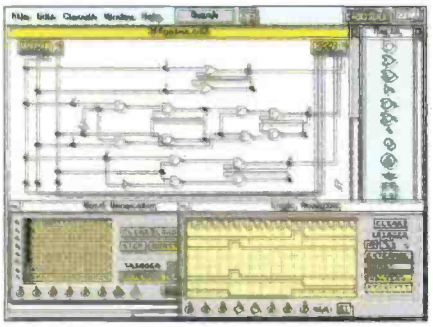

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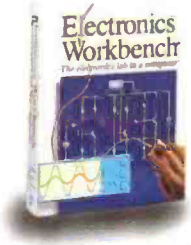

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Mike Devereux G3SED

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YAESU

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FT736R	Save £290	Master Price	**£1499**
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EDITOR'S Keylines

Recently, I was privileged to be present when the Radio Society of Great Britain took a small step on January 14, but at the same time taking great stride towards the future of Amateur Radio in the United Kingdom. It took place in a Hotel in South Wales when Clive Trotman GW4YKL was installed as RSGB President for 1995.

So, what was so great about the ceremony? It takes place every year does it not? And, what's so great about this delightfully friendly and chatty (he describes himself as a "typical talkative Welshman") little chap?

Well, amongst many remarkable facts which lie behind this dedicated radio amateur is the plain fact that he entered our hobby (hold your breath now!) through CB radio! What a turn up for the books, it's just as though at last, the RSGB has acknowledged the existence of CB radio, in its own remarkable way.

I count myself extremely privileged indeed to have been present at Clive's installation. It was a wonderful occasion, marred only by the fact I had to drive straight home afterwards and was not able to continue the experience well into the night, as Clive and many of our friends did!

Dick Ganderton G8VFH, Editor of *Short Wave Magazine*, his wife Peggy, and I enjoyed the company at our table and marvelled at the 'man of 95' installed there in our midst. However, perhaps the proudest person at the ceremony was not Clive, but his young grandson 10 year-old Gareth Jordan who (much to his chagrin) was not able to join Grandad at the 'top table'.

As the important guests made their speeches (including the President of the Irish Radio Transmitters Society, attending for the first time) I felt more privileged than most. I had seen and read Clive's 'Guest Keylines' in the March issue of *PW*, before anyone else. An honour indeed for someone of my lowly status!

Discovered The Delights

In his unfussy, friendly and informative *PW* Editorial, Clive freely admitted (some might say 'confessed') that his introduction to our hobby was via CB. It had him hooked immediately. Why? Because it offered **instant** access to the fascinating world of short wave radio communications.

Clive, like many others, then decided he wanted to develop his interest further and decided to go for his RAE. The rest is history...already I might add!

What would have happened if Clive's friend had not shown him the CB radio? Perhaps, he might have listened on the bands as a s.w.l., seen amateur radio in action at a show, or have seen someone 'on the air' while playing golf (his other 'way of life', and yes, I have worked someone on 144MHz who was mobile in a golf cart!).

But, if Clive had seen Amateur Radio in action in the ways I've suggested...he could not have participated in the instant, informal way which so dramatically introduced him to radio. And, it's this 'instant' aspect of CB radio which we have to thank for the many keen, responsible and remarkably friendly people who have entered our hobby in recent years.

As a member of the RSGB and Editor of *PW*, I'm aware that our hobby was tottering along in its own way, fast becoming an interest inhabited by funny old men (with the occasional lady) playing around with radios, often stuck in the garden shed. However, that's all changed and new young (and not so young!) blood is streaming into amateur radio.

Nowadays, much of the young blood comes directly into Amateur Radio via the truly excellent Novice Licence scheme. And, speaking for myself, I can also say that I was surprised and pleased at the same time, at the number of 'senior' Novice operators who have entered the hobby. I don't think that anyone was quite prepared for the unexpected influx of Novices over the age of 70, but it's proved that there was an obvious need.

Proved Themselves

After a rocky start, the Novice system, the NRAE and the final 'product' has proved themselves to be superb. In particular, the NRAE has showed up the threadbare holes (in the form of the unstructured syllabus and hopelessly impractical examination) of the original RAE itself and how unprepared it leaves successful candidates to actually get on the air.

But before the Novice Licence was introduced, there was only one way to become a radio amateur. I know many readers took the same traditional pathway I did, via s.w.l. and onto the bands with simple gear, but things have changed. Nowadays everyone is in a hurry. You only need to see the growth of 'fast food' outlets to see what I mean.

The much delayed introduction of CB radio into the UK helped to save our hobby. I'm convinced of that! However, if a reluctant Government, afraid for its communications monopoly had introduced a British 'open channel' (one name suggested for the facility) we might have been spared the very worst of the absolutely dreadful imported American type of 'lorry driver' talk.

Fortunately, the inappropriate American CB talk has virtually disappeared from CB. Our own jargon was bad enough, without importing any more. The CB service has proved itself, and still provides an 'instant' introduction to radio communication for newcomers.

The CBer can choose for themselves whether they want to enjoy their hobby as it is, in parallel with other aspects of radio communications or as an introduction to Amateur Radio. The choice is theirs to make, but what a pity that CB licences aren't available 'over the counter' now, to back up the 'instant' facility.

I'm pleased to say I know many radio amateurs who've entered our hobby through CB radio. Our Technical Projects Sub-Editor 'Tex' Swann G1TEX is just one example.

And, to round off this month's column, I'm pleased to announce that we've now got two new radio amateurs on the *PW* and *Short Wave Magazine* Editorial teams. It's my great pleasure to announce that **Donna 'Toad' Vincent**, the *PW* News & Production Editor, is now **G7TZB (G7 Toad Zone's Best)** and **Kevin Nice**, Assistant Editor of *SWM*, is **G7TZC**.

My congratulations go to both Donna and Kevin, although they're both too busy doing their Morse practice to hear what I say!

Rob Mannion G3XFD

RECEIVING You

Please send your letters to the Editorial offices in Broadstone. Reader's letters intended for publication in 'Receiving You' must be original and not be duplicated. Letters are accepted on the understanding that they have only been submitted to *Practical Wireless*. Please ensure that your letter is clearly marked 'for publication in Receiving You' and that it has not been submitted to other magazines. We reserve the right to edit or shorten any letter. The views expressed in letters are not necessarily those of *Practical Wireless*.

The Star Letter will receive a voucher worth **£10** to spend on items from our Book or other services offered by *Practical Wireless*. All other letters will receive a **£5** voucher.

Plugs & John Worthington

Dear Sir

Ref. *PW* December 1994. Plugs? John Worthington in 'Plug On Regardless' on page 36 hasn't told half the story! On the other end of the one metre cable will be a pair of pins, 1.2mm in diameter. The STD BSS fiery plug at the other end is big enough to carry 50A and the pins on the receiver end can only carry about 250mA, and that's not all.

The STD BSS plug is a contact on a rectangular brass bar, 6 x 4mm, **BUT**, this huge chunk contacts a strip of copper 7mm wide and 0.2mm thick, which contacts only along the sides of the brass bar. The 'V' shape of the strip contact area is far less than a 5A round plug, so that it rapidly heats up and oxidises to CuO (which is a good resistor). This gets even hotter and this chars the plastics.

I worked in oilfields for many years and our London office was 'converted' from 2, 5, 25A round plugs and outlets, to the new, modern, BSS 13A plugs and outlets, and we had eight fires.

The new building was all air conditioned but the girls insisted on warming their legs. So the manager provided electric fires. The 13A plugs got hot, charred the wall trunking which burst into flames or at times smouldered after we had gone home.

At home I have converted some back to round pin plugs. The real reason for the 13A plug was to be cheaper than the round pin. The round had to be lathe machined, slit, drilled and tapped and the socket box outlet contact had to be sprung and slit and closed with a steel ring. But it worked and the 13A doesn't. Yet few complained!

I know that a new 'Europlug' is in the future. Will we be asked for advice? No, we won't!

John Berridge
Cardiff

★★★★ STAR LETTER ★★★★

Simon's RAE Achievement

Dear Sir

Having sat the RAE last December, I was delighted to receive the C&G Radio Amateurs Examination Certificate in the post. Although a professional physicist, this pass is a real achievement for me, as I have spent the last four years recovering from severe injuries received in a motorcycle accident in January 1991.

For me, 1991, and indeed this life, started in the Intensive Therapy Unit of the Walsgrave Hospital, Neurosciences Unit in Coventry. Over the next few months the staff of the ITU and Rehabilitation Unit taught me to walk, speak, feed myself and keep myself clean.

There are too many names to list here, but I remember surgeons, nurses, physiotherapists, speech therapists and occupational therapists with considerable respect and gratitude.

After being discharged from hospital, I worked with Louise Peate, a clinical psychologist, who was tragically killed in the 1992 Kathmandu air crash. I know that I was able to recover enough to pass the RAE because of the skill of the people mentioned above and the sensitivity with which they applied it, which allowed me to retain some much needed dignity.

To anybody wishing to take the RAE 'next time round', but not feeling too confident, I would say please go ahead and try. It is not a trivial examination but if I could do it with my recent history, I bet you can too!

Dr. Simon Newstead G7UEQ
Warwickshire

Editor's reply: Congratulations from everyone on the *PW* team Simon. What an achievement! We look forward to hearing you on the air and hope others feel encouraged to try again, to get that coveted RAE pass.

Valve & Vintage Special

Dear Sir

I found the series of articles, Valve & Vintage, in the February issue of *PW* very interesting. Reading the article, 'Baird's Beams' reminded me that 50 years before that, in 1895, a chap called Wilhelm Roentgen was experimenting with a Cathode Ray tube, when he accidentally discovered X-rays.

The tube he was using was called a Crookes Tube. Made by William Crookes in the 1870s, to investigate the properties of cathode rays. This British invention was the forerunner of the modern day cathode ray tube.

I have been a reader of *Practical Wireless* for longer than I care to remember, but I still look forward to it dropping onto the doormat every month. Keep up the good work.

R. S. Hartley G0HDX
Lancashire

Dear Sir

I was delighted to see the 'Valve & Vintage' special in the February edition. It is good to see such growing interest in valved radios. But I have to fly the flag for womankind!

Despite the fact that nearly all collectors of wirelesses are male, I can report that valves will respond just as well to a woman's touch! I have been collecting valved radios for years and I am only 22 years old now.

I have enough confidence in the future of vintage radio to be opening a specialist shop in Bugle. But, although Ron Ham is right in that if you cannot restore them safely, old radios make good ornaments, I would encourage anyone with the required skills to undertake the restoration.

Give a radio a proper restoration and you will give it back its pride. It will reward you with a glowing dial, warm bottles and entertainment from far and wide.

Miss Jo Harris
Cornwall

Editor's reply: The Editorial team are pleased with the response from reader's regarding the 'V&V' special, and we look forward to preparing next year's special. Perhaps Jo would like to send us a photograph of herself and the shop, so we can feature it in 'News '95'.

Frequency Hopping Inteference

Dear Sir
Reference 'Keylines' January 1995 *PW*. I was also concerned about the possible effects of frequency hopping causing r.f.i., as a signals instructor in the Air Training Corps.

I am aware of Ministry of Defence/ATC allocations in the amateur bands. I have, in recent years, acquired a Novice B licence and wishing to keep the amateur bands clean away from MOD frequencies suggest you take certain steps. Record as much of the transmission as possible inside and outside the amateur bands, and take a minimum of five weeks of transmissions for evidence. Log the time, start to finish, in UTC, the frequencies, the date, and very importantly your location in the National Grid 6 figure system.

Then, send a copy of the recordings to the MOD Radiolocation Department who are based in London in the MOD Building in the Whitehall area. Make sure you send a strong letter accompanying your tape recordings so the MOD will be forced to set up an investigation, to see from whom the transmission originally came from. If every amateur who is effected does the same thing, then something will be done about the r.f.i.
Mubdi Choudhury 2EIBXW
Hertfordshire

Defending CB

Dear Sir
After many years of absence, I have just bought the February edition of *Practical Wireless*, and was pleased to see in 'Receiving You', readers defending CBers. Mr Kinder's letter summed it up nicely.

Nowadays CBers have chosen CB for any numbers of reasons. The cost (around £250), will get you the best of everything you need in CB, this would not provide a down payment for an amateur transceiver. Also, there's ease of getting on the air, with no exams or studying. But this doesn't mean that they are stupid.

The sometimes 'unfriendly' reception received from some amateurs puts others off, but then again, I have met a few amateurs and found them very friendly. In my area, we have several who still keep in contact with their CB friends over the airwaves.

As a CBer, may I point out that we have idiots on the air just as the amateurs do. We are not any less intelligent than 'amateurs', and I'll wager that I know one or two CBers who'll put the average 'amateur' to shame with their knowledge of radio repair.

However, this was not the point of writing to you. May I point out that we are **all** amateurs and there are more CB licence holders than there are amateurs. Should we not all band together, showing a united front in defending and promoting the amateur radio hobby?

I firmly believe that if a commercial concern can show enough potential profit to the authorities, then we will **lose** the frequency they want. Finally, I have decided to go for my A licence, but when I get it, I'll still keep in contact with the many CB friends I've made.
Paul Knight
West Sussex

Edwin Armstrong

Dear Sir
The article written by Stephen Poole, featuring Edwin Armstrong (*PW* February '95) stirred up memories of my experiences with f.m. in the British Army during 1941/2. Our remit was to experiment with narrow band f.m. in the h.f. spectrum to see if there was any advantage to be gained over a.m.

The Americans had insisted that f.m. needed v.h.f. wide band channels, so there was a challenge! To cut a long story short, we built our n.b.f.m. senders and receivers and decided that there were advantages, including the insensitivity of an f.m. receiver to pulses of a.m. (e.g. ignition noise).

The day arrived to demonstrate our new system to the Army's top brass. At a remote point (about four miles from base!) one of our f.m. senders was set up, along with an army a.m. sender of equal low power.

Receiving equipment was set up in a room at base, where the brass hats assembled. In this room there was also a noise generator consisting of a vibrator power pack with several feet of wire attached to the vibrator.

First, with the vibrator off, a.m. and f.m. signals were received loud and clear. With the noise machine on, the a.m. signal was totally obliterated, but the f.m. signal remained loud and clear. Only listening with ear to loudspeaker could one detect the faintest of background noise.

In spite of this outstandingly successful demonstration, the top brass were not impressed (too good to be true?), and as far as I know the British Army did not have any f.m. equipment during the Second World War.
Water Farrar G3ESP
Pontefract

Editor's comment: I also found Stephen Poole's article fascinating Walter. However, it seems ironical to me that so many innovators and pioneers had lives full of tragedy and misfortune, especially when they left so much behind them for us to inherit.

Dedicated Reader

Dear Sir
Having been a dedicated and aged reader of *Practical Wireless* since 1932, I feel I must congratulate you on the continuing excellence of your publication. My introduction to this lifelong hobby was via a receiver described in the first year of publication: namely the *Solo Knob Three*, a typical detector and two l.f. receiver of the period.

However, due to my tender years and pecuniary circumstances, I was unable to build this receiver. If memory serves me right, the author was Frank Preston. I wonder how many present day readers remember the old names, F. J. Camm, Barton Chapple, Thermion, W. J. Delaney, A. W. Mann and F. G. Rayer, all who contributed to our wonderful hobby in pre-war, wartime and post-war days.

As I write this letter, I have in front of me *PW* number 433, dated July 1942 in which is described the *Signet Two Valver* originally described in 1936 and then as a blueprint PW76 in 1938.

This reawakened my interest in the old time receiver and still having some of the components of the period, I built the receiver. The results were really quite amazing. Many stations were received and in the parlance of the period, all at good loudspeaker strength.

I had quite forgotten how good were some of the old time receivers. As a matter of interest the original 1936 receiver was built using a five plywood chassis - times have certainly changed!

Since then, I have built several t.r.f. receivers, both valved and solid state. Considering the simplicity and cheapness of the circuitry, they are really quite worthwhile building, and in addition, give a tremendous amount of fun.
Harold Webster G3XTF
Wiltshire

Editor's reply: Thank you for your comments on *PW* Harold, and especially your memories of long ago. I must say that I'm constantly being surprised by readers when I am shown early copies of *PW* (some even have No.1 from 1932) by the original buyers of the magazine, when I attend to give a club talk. Recently, I was shown a complete collection of blueprints that one reader had amassed over the 63 years he's been reading the magazine. And I must say that it's always a real pleasure to meet *PW* supporters such as yourself.

NEWS '95

Send in your news, photographs and product information to Donna Vincent G7TZB at the editorial offices in Broadstone.

Detachable First For Icom

Icom designers have come up with yet another first for the amateur world in the shape of the IC-Z1A, a dual-band, hand-held transceiver.

The IC-Z1A has a control panel, supplied as standard, that is detachable from the main body of the radio. The control panel is described as being better than a speaker-microphone as it provides a fully functional display of all the operating conditions as well as giving the operator complete control of the volume, modes, tuning, scan, band selection, On/Off, and p.t.t.

Features of the IC-Z1A include a total of 104 memories, independent tuning knobs for the 144 and 430MHz bands, simultaneous receive on both bands, full cross-band duplex, adjustable power output and sub-band mute function. The power MOSFET module for the IC-Z1A provides a high power output and the multiple power saver functions together with the 700mAh NiCad battery provides the operator with long operating times. A battery voltage read-out helps you plan ahead.

The recommended retail price for IC-Z1A is expected to be £489 and more information on the radio can be obtained from **Icom (UK) Ltd., Unit 9, Sea Street, Herne Bay, Kent CT6 8LD. Tel: (01227) 741741** or from any Icom approved dealer. *Practical Wireless* hopes to review the IC-Z1A in a future issue.

Calling All Campers & Caravanners

If you enjoy camping and caravanning as well as radio operating then, the Amateur Radio Caravan & Camping Club (RCC) could be just the thing for you. The RCC is an independent RSGB affiliated club that has been enjoying weekend rallies since it was founded in 1979.

The RCC is run by and for amateurs. They organise rallies throughout the year with the aim of offering relaxation, appreciation of the countryside as well as Amateur Radio activities. Weekend rallies start on a Friday evening and finish on a Sunday afternoon, or Monday afternoon on Bank Holidays.

The rallies mostly take place in the Midland counties but this year the RCC will be travelling further south to Dorset for their week long holiday in August. If you would like to get involved with the RCC and their activities you are invited to pay a trial visit to one of the rallies.

More information on booking-in details, etc., can be obtained from **Alan Gard G4LWA, Membership Secretary, 39 Disraeli Crescent, High Wycombe, Bucks HP13 5EL. Tel: (01494) 531755**.

Amateur Radio Caravan & Camping Club Rallies 1995

Month	Date	Destination
April	14 - 17	Amerton, Staffordshire
May	5 - 8	Weston, Northants
	26 - 29	North Scale, Lincolnshire
June	9 - 11	Elvaston, Derbyshire (Full Members only)
	23 - 25	Tutbury, Staffordshire
July	7 - 9	Brooksby Agricultural College, Leicestershire
	28 - Aug 5	Lytchett Matravers, Dorset
August	25 - 28	Stratford-upon-Avon, Warwickshire
September	8 - 10	Lincoln Hamfest
	29 - Oct 1	Thurlaston, Leicestershire
October	13 - 15	Elkington, Nr. Welford, Northants
December	(TBA)	Lincoln Medieval Christmas Market

£50 Winner

The first name pulled out of the *PW* Book Service biscuit tin for the £50 Prize Draw from the February 1995 issue of *PW* was **Colin Brown of Rosyth, Fife**.

Don't forget that for book orders received from this issue, all the customers' names will automatically be entered into the £50 Prize Draw. Just think, **you** could be the next winner, recoup the cost of your order and even make a profit!

Can You Help?

Godfrey Manning G4GLM needs to get hold of the circuit diagram for a National NC-77X valved 'general coverage' communications receiver. All expenses will be paid. If you can help Godfrey please give him a call on **0181-958 5113.**

The photograph below is of the **Ferguson 'Fergusonic' All Transistor 335** radio, which was built around 1959. The owner **Mr J. C. James** would like to know if any *PW* readers can help him find some data on the 335. If you can help, then contact **Mr James at C/O Holmes Lodge Guest House, 72 Claremont Road, Seaford, East Sussex BN25 2RJ.**

Low Power Internet

The G-QRP club has joined many others and become part of the fastly expanding world of Internet. The GQRP-L mailing list has been set-up by the members of the G-QRP club, and it's hoped the 'list' will provide a focus of QRP activity for QRP operators who have access to the Internet both in the UK and further afield.

The list exists for the discussion of technical matters, QRP operating, events and other QRP related topics. As it will be UK orientated it's not intended to replace the existing QRP mailing list, netcom.com

If you have access to Internet and wish to 'log-on' to the GQRP-L you'll need to do the following:

To join the list:	**majordomo@insite.parasoft.co.uk** and type **subscribe gqrp-l** in the body of your E-mail message.
To leave the list:	**majordomo@insite.parasoft.co.uk** and type **unsubscribe gqrp-l** in the body of your E-mail message.
To send mail:	**gqrp-l@insite.parasoft.co.uk** will send your mail to everyone on the list
To query the use of the list:	mail **glpjj@topsy.demon.co.uk**
For technical queries:	mail **owner-gqrp-l@insite.parasoft.co.uk**
For full list of facilities:	**majordomo@insite.parasoft.co.uk** and type **HELP** as the first line of your E-mail message.

The general rules for using the GQRP-L list are:

1 No profanities please, this list may be copied to Packet Radio BBS sites.
2 Messages should be of direct interest to QRP operators.
3 Do not over quote when replying, most people on the list pay for their connection to the Internet.
4 Whenever possible reply direct to the sender.
5 Requests sent to the list to unsubscribe will be ignored! Send these requests to ajordomo@insite.parasoft.co.uk.

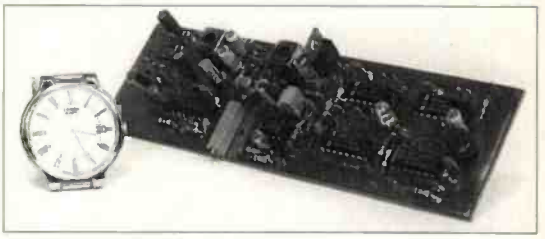
For more information on the G-QRP club you are invited to contact **George Dobbs G3RJV at St. Aidan's Vicarage, 498 Manchester Road, Rochdale, Lancs OL11 3HE. Tel/FAX: (01706) 31812. Internet: g3rjv@gqrp.demon.co.uk**

Diamond Reductions

Many of the products in the Diamond range of antennas, accessories and power meters currently stocked by Waters & Stanton have recently seen a price reduction. Despite the recent price rises on equipment throughout much of the amateur radio world, Waters & Stanton have negotiated new lower suggested prices on their Diamond range of equipment.

To receive a Diamond catalogue and price list just send an A4 size s.a.e. or stamps to the value of 25p to **Waters & Stanton Electronics, 22 Main Road, Hockley, Essex SS5 4QS.**

Timekeeping Reference



Walford Electronics have recently added a new kit to their range which designer Tim Walford G3PCJ says will be of interest to keen home constructors and designers. The **Reference** kit has been designed to provide a range of highly accurate reference frequencies for use in counter timebases with an optional wide bandwidth **Input** h.f. amplifier and u.h.f prescaler. The Reference kit can be used on its own, or with the Walford Electronics two channel Frequency Counter.

The board for the Reference kit contains an a.g.c. controlled r.f. amplifier and p.l.l. which operates at 198kHz and is divided down to provide a range of useful outputs from 1kHz to 0.2Hz. The optional parts for the **Input HF x 10** amplifier are fitted onto the board are intended for use with 'scope type 'divide by ten' probes. The optional **Input Divider** provides a 575MHz ECL 'divide by ten' prescaler with low impedance input and TTL output.

The Reference kit is available for £37 and the Input options for £33. To order this or any of the other kits in the Walford range send an s.a.e. to **Walford Electronics, Upton Bridge Farm, Long Sutton, Langport, Somerset TA10 9NJ.**

Congratulations New Amateurs

The *PW* staff would like to pass on their congratulations to all those who passed December's Radio Amateurs Examination. As a result of the December RAE the Editorial Staff of *Practical Wireless* and our sister publication *Short Wave Magazine* boasts two newly licensed amateurs. **Donna Vincent**, *PW*'s News & Production Editor and **Kevin Nice**, Assistant Editor of *SWM* now hold the callsigns **G7TZB** and **G7TZC** respectively. Donna and Kevin have both said they are now going to get cracking 'on the key' to get their 'A' Licences.

RADIO Diary

*PRACTICAL WIRELESS & SHORT WAVE MAGAZINE IN ATTENDANCE

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

The Editorial staff of *PW* cannot be held responsible for information on Rallies, as this is supplied by the organisers and is published in good faith as a service to readers.

If you have any queries about a particular event, please contact the organisers direct.

***March 11/12:** The London Amateur Radio & Computer Show will be held at Lee Valley Leisure Centre, Picketts Lock Lane, Edmonton, London N9. Doors open at 10am to 5pm each day. There will be a trade show, lectures, Bring & Buy, on-demand Morse tests, facilities for the disabled, bars, restaurants, special interest groups and ample free parking. For further information you can contact **Steve White G3ZVW** on **0181-882 5125.**

March 12: Wythall Radio Club will be holding their annual Radio Rally at Wythall Park, Silver Street, Wythall (near Birmingham, on the A435, just two miles from Junction 3 on the M42). Doors open at 10.30am to 4pm. There will be the usual traders in three halls, a marquee, a bar and refreshments and a Bring & Buy stall, run by the club. Talk-in on S22. Admission only £1. **Chris G0EYO** on **0121-430 7267.**

***March 19:** The Norbreck Radio Rally, Amateur Radio, Electronics & Computing Exhibition is being held at Norbreck Castle Hotel, Exhibition Centre, Queens Promenade, North Shore, Blackpool. There will be extended free car parking and a free shuttle service. Novice Licence details and practical demonstrations, a Bring & Buy stall, talk-in on S22 and lots more. Admission is £1.50, over 65s £1 and under 14s free. Doors open at 11am to 5pm. Disabled entry through ramped entrance, 10.45am. More info from **Peter Denton G6CGF** on **0151-630 5790.**

March 19: The Tiverton South West Radio Club are holding their 1995 Mid Devon Rally at the Pannier Market, Tiverton. Easy access, only minutes from junction 27 on the M5. Excellent free parking, two halls of trade stands, Bring & Buy stall and mobile snack bar. Further displays and full refreshments facilities in the club room bar, which is open throughout the day. Talk-in on S22. Doors open at 10am. Further details from **G4TSW, Mid Devon Rally, PO Box 3, Tiverton, Devon.**

March 26: Bournemouth Radio Society's 8th annual sale will be held at Kinson Community Centre, Pelhams Park, Millhams Road, Kinson, Bournemouth. Doors open at **10.30am** (not 10am as previously published) and close at 4.30pm. There will be a 144MHz talk-in from G1BRS on S22, amateur radio and computer traders, clubs and specialised groups, along with excellent refreshments. Admission is £1 which includes a free raffle. **Malcom G0UCX, QTHR** or **(01202) 747745.**

March 26: The Pontefract & District Amateur Radio Society are holding their 15th annual Components Fair and Spring Rally at the Carleton Community Centre, Carleton, Nr, Pontefract. Doors open at 11am to 4pm (10.30am for disabled visitors). There will be trade stands, a bookstall, Bring & Buy, a licensed bar and restaurant, all at ground level. Morse tests on demand (usual two passport sized photos required). Admission by prize programme, three prizes, plus ladies prize draw. **Colin G0NQE** on **(01977) 677006.**

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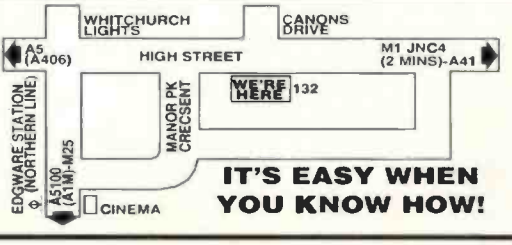


IT'S EASY WHEN YOU KNOW HOW!

This time Elaine Richards G4LFM has replies to some of your queries, advice on better radio reception and 'gets on the key' in 'First Steps'.

NOVICE Natter

For Radio Beginners of all Ages.

Elaine Richards G4LFM, PO Box 1863, Ringwood, Hants BH24 3XD.

Replies

First let me pass on the news I've received in reply to previously asked questions.

Noel Amis asked about RAE centres. I've heard from several people, including **Alan Sammons G0EAG** and **John Selwyn.**

Alan & John report that The Barking Radio & Electronics Society is an authorised centre for the RAE and Novice RAE. Alan Sammons is the Examinations Secretary and can be contacted for more information on **(01708) 557606.**

John Selwyn even went so far as to offer a lift to Noel on Thursday evenings and to introduce him. Many thanks for the kind offer, truly in the spirit of amateur radio.

I've also heard from **Pete Pennington G4EGQ**. He runs Learning by Post The G4EGQ RAE Correspondence Course. He has been running this course now for over 12 years. It comprises of 23 lessons plus an optional one for those whose maths is somewhat rusty!

The course can start at any time and runs at a speed basically dictated by each student. So, those who can't reach RAE centres for the courses week after week for one reason or another, can still study and learn with the extra outside assistance this sort of course allows.

Pete very kindly included lesson 10A in with his letter and I found it very easy to read. It's difficult to say whether it's easy to understand as only a student can tell that.

I already know the subject covered in the lesson so am not the most unbiased judge. I will say though that I think it's well written and all the explanations are well constructed and often with humorous links between subjects.

Please note, I said humorous and not facetious, and these links made the lesson enjoyable and easy reading. If you'd like more details on the course, then contact **Pete Pennington, 6 Highland Close, Golden Valley, Folkestone, Kent CT20 3SA.**

Achievements

Darren Bartlett 2E1BVX has been a novice for about three years now. First he'd like to say a big thank you to G8ZYZ, G0DQI, G4GAN and G3ROO for their help in getting him through the exam.

Based in Dover, Darren has managed to contact other amateurs in France using just 3W on the 430MHz band (70cm). He would like to correspond with other disabled amateurs who use 430MHz. If you're interested in writing to Darren, send your letters to **14 Dalmatia Court, Marjan Close, Dover, Kent CT17 0GB.**

Poor Reception

Joseph Patterson is a newcomer to radio and has been picking up most of his knowledge through reading magazines. However, he's intending to join a local club soon and I'm sure that will be a great help.

One of the problems Joseph's suffering at the moment is poor radio reception in his office at work. Although he works in the centre of London, reception of medium and long wave stations seems to be very poor. With all the advances of modern technology why should this be?

The key lies in the construction of modern buildings and especially in the high rise offices found in city centres. If you watch them being built you will no doubt have noticed that they usually start with a complex steel girder skeleton. It's this steel skeleton that's the cause of the problem.

If you wanted to completely screen all radio frequencies from any structure the most effective way would be to enclose it in a metal screen. It's perhaps not surprising to find that you could replace this solid metal screen with a mesh and still provide some effective screening. The next stage would be to increase the size of the holes in the mesh and see what happens.

As you can imagine, increasing the size of the holes in the mesh gradually decreases the effectiveness of the screening. The result being that higher frequencies will penetrate whilst lower frequencies will be excluded.

You've probably twigged by now that the high rise office block with its steel girders looks and behaves very much like a screen to radio signals. So it's not surprising Joseph has a few problems!

The only real solution is to experiment with the position of the radio and move it as close to the outside as possible. If you don't get any joy by repositioning the radio you will have to rig up some form of separate antenna. It's difficult to give firm advice here as it will depend very much on the building layout and your boss!

You don't have to have a radio with a separate antenna socket, something as simple as a piece of wire loosely wound around the antenna and then draped around the window can have good results. Happy experimenting.

More Pigeon Holes

In the January issue I passed on a few 'tongue-in-cheek' pigeon holes for radio amateurs. Now it's time for a few more.

Cross-banders: Those who are sublimely proficient at saying nothing of any consequence on two bands simultaneously.

Bits & Byters: 'Experts' (those always ready to demonstrate that they know everything about nothing) who can make their IBM PC emulate a Sinclair ZX, Einstein or Dragon 32, or vice versa! Do not confuse with Bites and Bitters who definitely do not need a computer to find the nearest pub at lunch-time!

Hi-De-Hiers: Those who gratuitously use Q-codes and silly jargon, especially hi!, meaning 'I just said something humorous'. Oh yes, they also include the inconsistent d.i.y. phonetics expert - Munich Germany Four Japan Queen Yokohama, Malta Gailpoli, Four, Jamaica Quasimodo Yellow. As if MG4JQY isn't difficult enough. Spare a thought for those poor 'stroke emms' who have become destinated!

Elmer Search 1995

I've already had the first entry for the 1995 Elmer Award. **Raghen Rungapamestry** has written from Mauritius with his story. In 1962 he was working in the Mauritius Gymkhana Club where he met Pierre Martin 3B8AV who invited him to visit his radio station. Raghen was then hooked for life.

However, Raghen had other priorities - his studies and a girlfriend to marry, and eventually a family to raise, etc. Now, how many times have I heard similar tales?

In 1993 Raghen was able to sit the City and Guilds RAE and passed successfully. Now he has the callsign 3B8GE and the next job is putting together a station and going on the air.

Many thanks for that story Raghen, Pierre 3B8AV goes into the draw. So, have you got a story to tell of how you got interested in this crazy hobby? Prizes will be awarded in October to the winners, but each person nominating someone gets a small prize too. So, get writing!

First Steps

Morse Code

Now before you all stop reading, this isn't going to be a forum for the do we or don't we learn Morse argument. So please read on.

To me, amateur radio is a brilliant hobby full of challenges or targets. Some are set by outside agencies - like sitting the RAE, others are self-set - like learning about Packet radio or Slow Scan TV (SSTV). Every one of us has different goals to aim for and Morse can be one of those.

There are so many different ways of communicating, some requiring more effort than others. To set-up a microwave two-way link takes a lot of work, usually a 144MHz link between high points and a pre-arranged contact between two amateurs as well as a lot of time building your own equipment. Setting up a Packet station can be time consuming too.

So, if you set aside the time to learn Morse well enough to pass the test, what use is it? Not a vast amount in my opinion.

There are a few occasions, however, when Morse can be very useful. I can remember during VHF Field Days (usually in the small hours) on 430 or 1296MHz when a faint signal could be heard.

The trouble was either they couldn't hear us clearly or we couldn't hear them well enough. As you need a full set of exchange details to get the points, we tried Morse Code - it usually worked when nothing else did!

Another time where Morse is useful is when the operator at the other end speaks little or no English. Fortunately, the abbreviations used in Morse are universal, so UR meaning your or tnx for thanks or es for and means the same to both operators.

It may not be a very stimulating contact, but you can achieve a very basic QSO. And it could be with a rare country if you're lucky.

Other than that, if you enjoyed learning Morse, why not use it? There are usually amateurs around who don't mind helping newcomers get the hang of it. Just think of it as one of the specialist modes along with packet, SSTV, RTTY, etc.

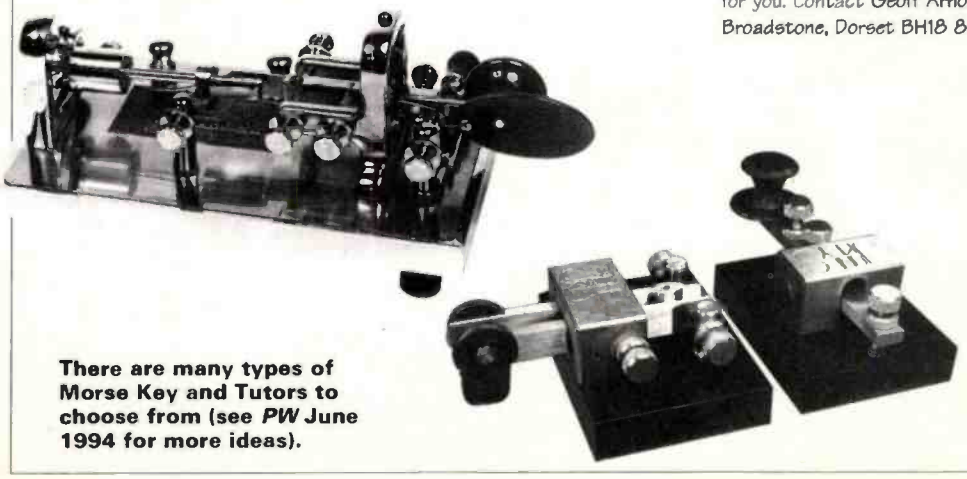
There are no secrets to learning Morse, the only way is practice, practice and more practice. Read the number-plate of the car in front in Morse, translate a poster while you're in a traffic jam and listen to as many tapes as you can.

If you can find someone who will learn with you, so much the better. That way you can encourage each other. Many radio clubs or colleges where they run RAE courses often run Morse courses too, which is a very efficient way of learning. There are also plenty of publications available to give you further advice, such as *Introducing Morse* and *Secret Of Learning Morse Code* both of which are available from the *PW* Book Service.

If you find you get hooked on Morse and want to delve into the history of the mode, learn more about the equipment and so on, then the bi-monthly magazine *Morsum Magnificat* could be for you. Contact Geoff Arnold G3GSR, 9 Wetherby Close, Broadstone, Dorset BH18 8JB for more details.

Russian		Transliteration	Cyrillic Morse Code symbol
Print	Script		
А а	𝒜 𝒶	a	• –
Б б	𝐵 𝒷	b	– •••
В в	𝒱 𝓋	v	• – –
Г г	𝒢 𝓇	g	– – •
Д д	𝒟 𝒹	d	– ••
Е е	ℰ ℯ	ye, e	•
Ж ж	𝒥 𝓀	zh	••• –
З з	𝒵 𝓏,³	z	– – ••
И и	𝒰 𝓊	i	••
Й й	𝓊̆	y	• – – –
К к	𝒦 𝓀	k	– • –
Л л	𝒧 𝓁	l	• – ••
М м	𝑀 𝓂	m	– –
Н н	𝒩 𝓃	n	– •
О о	𝒪 ℴ	o	– – –
П п	𝒫 𝓅	p	• – – •
Р р	𝒫 𝓅	r	• – •
С с	𝒞 𝒸	s	•••
Т т	𝒯 𝓉	t	–
У у	𝒴 𝓎	u	•• –
Ф ф	𝛷 𝜑	f	•• – •
Х х	𝒳 𝓍	kh	••••
Ц ц	𝒸 𝓊	ts	– • – •
Ч ч	𝒸 𝓉	ch	– – – •
Ш ш	𝒲 𝓌	sh	– – – –
Щ щ	𝒲 𝓌	shch	– – • –
Ъ ъ	ъ	"	• – – • – •
Ы ы	𝐼 𝓀	y	– • – –
Ь ь	ь	'	– •• –
Э э	Э э	e	•• – – ••
Ю ю	𝒥𝒪 𝓊	yu	•• – –
Я я	𝒴 𝓍	ya	• – • –

The Cyrillic Morse Alphabet
(reproduced from the RNARS Newsletter Summer '94)



There are many types of Morse Key and Tutors to choose from (see *PW* June 1994 for more ideas).

That's it for another month, keep writing with all your news and hints, as well as any suggestions for topics you'd like covered in 'First Steps'

Elaine G4LFM

Your page - your story! The local Amateur Radio Club is seen by many as being the 'backbone' of our hobby. There are some interesting stories to be told (just look at the 'Horsham History' below for an excellent example!). So, let's hear about your Club history, share the information and you'll probably recruit new members at the same time! Editor.

CLUB Spotlight

Send your information to the 'Club Spotlight' newshounds Donna Vincent G7TZB and Zoë Shortland at the PW Offices.

Martlesham Radio Society

Martlesham Radio Society will be hosting another VHF Roundtable event at the BT Laboratories, near Ipswich, Suffolk on Sunday May 14. The event, which commences at 10am will include roundtable sessions, test facilities and a Bring & Buy.

In keeping with BT Labs security requirements, all access is by advance booking only. For multiple tickets, names and details of all persons attending in a group will be needed.

For tickets (please send an s.a.s.e.) or further information on this event, you can get in contact with **Roy Smith G0RRC, Lykkeboo, The Street, Burstall, Ipswich, Suffolk IP8 3DN.**

Princess Elettra and Prince Guiglielmo at Poldhu Amateur Radio Club.

Royalty At Poldhu

On Sunday January 15 the **Poldhu Amateur Radio Club** had the honour of a visit to their clubhouse by the **Princess Elettra** and **Prince Guiglielmo Marconi**, (daughter and grandson of the great Marconi). They were part of a delegation from Sasso Marconi visiting their twin town of Helston, approximately ten miles from Poldhu.

The Prince and Princess had come to lay wreaths at the memorial to Marconi which is situated on the headland at Poldhu, some 100 metres from the clubhouse. The clubhouse is the location of Marconi's very first trans-Atlantic broadcast on December 12 1901. It was on this date that he sent the first 'S' to Newfoundland, Canada, in Morse code, using radio.

After the wreath laying ceremony, the Prince and Princess were able to talk to amateurs in Bologna and Sasso Marconi, callsigns I4LAU and IK4UNI. The Poldhu Amateur Radio Club would like to express their thanks to another station, PA3FPZ for their assistance in making the contact.

The Prince and Princess were both very friendly people and Princess Elettra seemed genuinely pleased to be able to speak to Italy as her father had done all those years before from the location. The Poldhu Club's historian showed the Prince and Princess the club's museum section and the material that had been collated on the great man himself, some of which was new to them both.

The visit to Poldhu by the Princess marked the beginning of a world tour during which she plans to visit many of the locations associated with her father's pioneer working in the field of radio communication.

To find out more about Poldhu Amateur Radio Club, you can contact **Carolyn Rule G1ZPC**, Secretary, on **(01326) 240144**.

Horsham History

During the 1930s, there were large numbers of radio enthusiasts interested in home construction and it was not surprising that many towns had sufficient people to form clubs. Horsham was such a place and **George Hook G2CIL** was such a person and is a founder member of the original **Horsham Amateur Radio Club** (HARC).

When the club was formed, the annual subscription was 3/6d (17½p), which was quite a lot of money in those days, particularly for the youngsters. It's not known how many people actually belonged to this club, but it is known that the first meetings were held at the *Nelson Arms* in Trafalgar Road.

A Dr. Bradford accepted an invitation to become the club's first President, but he never actually attended a meeting. The Landlord of the Nelson apparently complained that the club members were not drinking enough of his beer! So, the HARC moved to the *Bell Inn*, Park Street and then to the *Alexander Arms* in Brighton Road, which sadly no longer exists.

With the outbreak of war, the club became defunct. Although it was believed that a few meetings were held during hostilities and that various attempts were made to restart the club after the war, none of which were successful.

However, another meeting was held on December 9 1970 which was attended by six people who accepted **G3VPO** as Chairman, **G3PYC** as Secretary, **G3WZT** as Treasurer and **G3WBO, G3TNO** and s.w.l. **Tim Polley** as Committee Members.

M. Healey G3TNO also had the title of Contests Manager, indicating the club's interest in contests which is still alive today, many years later. Soon after the reformation, the Treasurer discovered a bank account in the name of the original club, and that the money on deposit had been accruing interest for over 30 years!

After the necessary formalities, the bank agreed that the newly reconstituted HARC was indeed the legal successor to the original club and transferred all the funds to the new club. It is for this reason that the club regards itself as having been founded in 1938.

The first meetings of the reformed HARC were held in the *Star* Public House in Roffey, but the venue soon changed to the now demolished *Swan* Public House in West Street. This soon changed again in 1972 when meetings began to be held at the present location.

Yet another change of venue occurred in 1974 when the club HQ became the County Council Emergency Centre in Moons Lane. This building had the advantage of a large antenna mast on the roof but had the disadvantage of being incredibly cold, even in the summer.

Some elderly members stopped attending, claiming it to be a health hazard. So, in 1978, the Committee moved to the Parish Room in the Causeway. During this time, the Guide HQ had been refurbished and the club then returned there in 1981. It was also at this time that the club obtained its own callsign **G4HRS**.

The Horsham Amateur Radio Club has many long standing Committee members and the record for this is held by **John Matthews G3WZT** who

Club Logos

When sending in items for inclusion in 'Club Spotlight', if your club has a logo we would also appreciate a copy, so that it can be used when featuring your club. If there is a history behind your Club Logo we'd like to know about that as well.

was on the Committee from 1970 until 1989. He has also served as Chairman, Treasurer and Committee member.

The club has participated in many exhibitions over the years, notably the Lions Galas in the seventies and the Charlwood Festival in 1980. The VHF NFD has always been a firm favourite from the earlier days and the HF SSB Field Day has become a regular September event over the last few years.

In 1982, **John Webb G3VGI** presented the club with a cup which was to be presented annually to the club member deemed to have contributed the most to the hobby over the preceding year. The first holder of the 'Webb Cup' was **Arthur G8KTB**, for having held the office of Secretary for twelve consecutive years, between 1973 and 1985.

Another recipient has been **Bryn G3SWC** for his services in teaching Morse code and running the regular Morse tests in Horsham on behalf of the RSGB. Other holders of the cup have been **Mike G4EFO** for producing the club's Newsletter for many years, **John G4TLS** and **Paul G4TMC** for their work with the Novice course, **Peter G8SUI** as P.R.O. and last but not least **John G3WZT** for his services in various capacities over the years, which have been responsible for much of the club's success.

This brings us to the present day and the end of this potted history of HARC. The club meets on the first Thursday of each month at the Guide HQ, Denne Road, Horsham at 8pm and finishes in time for a swift half at the pub before closing time!

For more details you can contact the club's Secretary **Alister Watt G3ZBU** on **(01403) 253432**.

Subs Club & Reader Offer

Don't Go Flat - Get Charged Up With This Month's *Practical Wireless* Subs Club/Reader Special Offer

The batteries displayed are not necessarily the type that will be supplied.

This month the *PW* Subscribers' Club has come up with the answer to that perennial problem - batteries and battery charging. The NiCad battery is in universal use in amateur radio, and to help you, we are offering a fast charger plus eight NiCad AA cells for a very special price! And this month we are able to extend this offer to non-subscribers as well.

Whereas most chargers can only handle up to four cells at a time the V968 charger will take up to a maximum of eight cells. The charger can fast charge in just two hours or if time allows can trickle charge.

Normally you could expect to pay around £25 or more for both the charger and the NiCad cells! However, PW Subscribers' Club Members can get the V968 Charger plus 8 x 700mAh NiCad AA cells (HP7 size) for only **£19.95 plus £2.50 P&P (UK), £4 P&P (overseas), Rest of World P&P prices on application.** (Normal price £24.95 plus £2.50 P&P UK, £4 P&P overseas).

So, plug into our Special Combined Subscribers' Club/Reader Offer, get switched on and receive your *Practical Wireless* straight to your letterbox every month.

Offer open until April 14 1995 (UK), April 28 1995 (overseas).

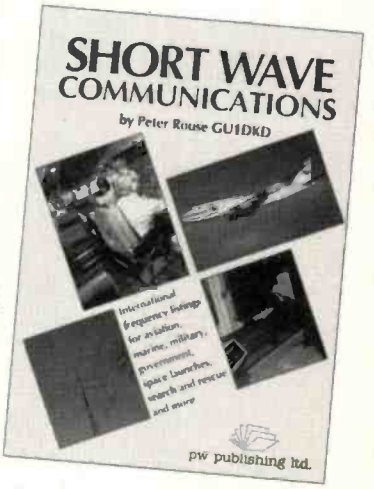
To take advantage of this offer just fill in the details on the order form on **page 60** of this issue. Alternatively call our **Credit Card Hotline** on **(01202) 659930** to place your order.

SPECIAL BOOK OFFER

SHORT WAVE COMMUNICATIONS

by Peter Rouse GU1DKD

HALF PRICE



The 'SSB Utility Listening' column in our sister magazine *Short Wave Magazine* came out of the fertile mind of the late Peter Rouse. Peter had the knack of being able to write books and articles in such a way as to make them very readable and understandable. *Short Wave Communications* is such a book.

With the help of this book you should easily learn how to get the best out of your h.f. receiver. Complicated technological explanations have been purposely avoided and everything has been explained in layman's term. Just enough information to let you listen in to what you want to hear and understand what you are listening to is provided.

Chapters cover such topics as an introduction to radio communications, operating your radio, antennas, international band plans, marine bands, civil aviation, military operations, amateur and Citizens Band radio, international call signs, receivers past and present, accessories and suppliers of equipment.

This book is highly recommended for your bookcase.

NOW ONLY £4.50 + £1.00 P&P UK, £1.75 overseas.

To order, use the form on **page 60** of this issue.

IN TOUCH WITH

If you're coming to Pickett's Lock - visit the Kantronics Packet Village on the Lowe Stand

Kantronics' experts will be on hand to offer expert advice on the Lowe stand as well as providing interesting talks as part of the lecture stream.

Your chance to make sure your views are fed back to the manufacturers.

They'll be demonstrating all the latest products and we'll have the whole lot on working demonstration showing you just what you can achieve with Packet. We'll also be demonstrating the new GTOR mode and you'll find out just what is making GTOR the real mode for h.f. data communications in the 90's, so make sure you come along.

Lowe Electronics is THE place to buy your datacoms gear. We can supply you with everything you'll need from the antenna to the rig to the TNC and everything in between, including all the leads you'll need. Whether you want a simple v.h.f. only Packet station or a full blown h.f. multimode capability, Lowe are the right people. No one else combines our expertise in datacoms products and transceivers.

***P.S.** - There's a new type of 'Packet' on the air. Tune to 131.725MHz a.m. and just listen to the data bursts. Wonder what it is? Well, its called ACARS, and means Aircraft Communications and Reporting System. This is a system that allows airliners and controllers to keep in touch with aircraft in flight and automatically report engineering and flight information, together with the ability to send messages in plain text. Basically, it's Packet radio for planes and you can decode it with **AIRMASTER** - the cheapest way to monitor ACARS. See it in action on the Lowe stand.*

Check Out Our Other Pickett's Lock Goodies!

Lowe Electronics probably has the biggest range of Ham radio equipment and accessories available on the shelf in the whole of the UK, many of which we are the factory appointed distributor - (and we could do AEA too if we wanted!). Here's just a few of the goodies you'll be able to see at the show...

Manson power supplies.... We're really famous for these. Who else gives you a variable voltage supply with separate voltage and current meters rated at 25A continuous for just £99.95. Have you got your's yet?

At Pickett's Lock you'll be able to see and hear just why JPS digital audio filters are the best in the world. We'll have the full range on working demonstration so you'll be able to try them out for yourself.

With spring approaching, you'll need to think about upgrading, improving or just maintaining your antenna system. Talk to Lowe about Butternut, Hygain, Maldol, Vargarda, Tonna and don't forget our rotator range.

If you are just looking for small accessories, make Lowe your number one call at Pickett's Lock. We stock more accessories than any other dealer you will find anywhere, from crystal filters, CCTSS units to voice synthesisers, a.t.u.s to d.c. leads, cases, battery packs, headphones, speakers - just about everything you will ever need!

We've got everything the mobile operator needs from Maldol mobile antennas and a super range of antenna mounts to suit all types of vehicle. We've also got some special d.c. leads ideal for using your hand-held transceiver or scanner in your car and a perfect mobile mount to hold it in place, and if you need a bit more sound, check out our range of extension speakers.

You'll really be able to put Lowe to the test as we are now stocking Kenwood's superb range of test gear, including 'scopes, signal generators and digital meters. This really increases our usual test gear range and makes Lowe Electronics your number one choice for great test gear at affordable prices.

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And if you can't make it to Pickett's Lock, all our show rooms around the country are still open on the Friday and Saturday - unlike some of our friends in the business, we don't need to close up just because there's a show on somewhere!

Great New Wire Antenna Systems From CHELCOM Aerials

Chelcom's CAHFV1 h.f. vertical antenna (see last month's ad) has become the fastest selling h.f. vertical in the UK, with over 250 happy users. Hot on the heels of this wonderful antenna, Chelcom have now produced a superb range of new wire aerial systems and components. Once again they've chosen to use only the highest quality components, from specially designed balun cases and dipole centres to the wonderful new FlexWeave™ antenna wire. Just wait 'till you see FlexWeave™ - a multi standard wire so flexible you can tie knots in it and undo it time and time again. It is used in all their ready to hang antennas and also available on its own for those who like to roll their own!

Chelcom Windoms - Ready To Hang!

Two Windom antennas, one covering 80 to 10m and 133 feet long and a shorter version just 66 feet long covering 40 to 10m for those with smaller gardens! Both made from the same high quality components including FlexWeave™ antenna wire and a 4:1 balun. Supplied ready to hang. Both antennas will let you loose with a whole 1000W p.e.p.!
CA80W for 80m is just £65.00 and the CA40W for 40m is just **£55.00**.

Chelcom G5RV's

These G5RV's really need to be seen to be appreciated. You really need to check out the quality compared to other cheaper varieties - there is no comparison! Again the components used are of the highest quality, specially designed for heavy duty use and built to last. For most people, erecting antennas is a major problem - better to do it just once! Chelcom offer the largest range of G5RV's catering for most installation requirements.

CAG5RVH Quality half size G5RV using FlexWeave™ and 300 Ohm slotted ribbon feeder. Supplied ready to hang at just **£35.00**.
CAG5RVF Quality full size G5RV FlexWeave™ and 300 Ohm slotted ribbon feeder. Supplied ready to hang at just **£45.00**.
CAG5RVHP Quality half size G5RV with FlexWeave™ balun and 450 twin feeder. Supplied ready to hang at just **£65.00**.
CAG5RVFP Quality full size G5RV with FlexWeave™ balun and 450 twin feeder. Supplied ready to hang at just **£75.00**.

End-Fed Antenna. For those that like the simple life or don't like feeders hanging about, the Chelcom end-fed design offers a simple, unobtrusive solution. Just 66 feet long, the CA66EF will fit nicely into many smaller gardens and costs just **£55.00**, ready to hang.
Chelcom MultiSystem Aerial Components For DIY Aerial Systems

CABALUN11 1 to 1 balun.....**£30.00**
CABALUN41 4 to 1 balun.....**£30.00**
CAINS Insulator (pair).....**£1.50**
CABALUN51 5 to 1 balun.....**£30.00**
CADIPOLE Dipole centre.....**£3.95**
CAFLEX FlexWeave multistranded antenna wire 20m pack.....**£16.00**

Plus
CAHFV1 HF vertical antenna resonant on 80m.....**£119.00**

Lowe also stock a wide range of books covering all aspects of antenna design and construction. A full range can be seen in all of our branches. We also stock a superb range of quality test equipment that anyone building antennas really needs to have, including Diamond power and s.w.r. metres, MFJ antenna, s.w.r. analysers and AEA analysers.
Just send us four first class stamps for our complete Antenna Fact Pack which includes Chelcom's MultiSystem components and verticals, Hygain, Butternut, Vargarda and the full range of rotators from Hygain, Yaesu and Emotator.

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Jack Ballard Hum G5UM 1910-1995.

Jack Hum G5UM - An Appreciation

The history shelves of Amateur Radio are stacked with the contributions and achievements of many individuals. Rob Mannion G3XFD pays tribute to Jack Hum G5UM who died in January 1995, and who must surely rank as one of the leading amateur radio v.h.f./u.h.f. pioneers in the United Kingdom.

Radio amateurs are often said not to have a sense of humour. However, I can say with certainty that you could never accuse Jack Hum G5UM of being humourless, even when *PW* inadvertently referred to the 'Late Jack Hum G5UM' in a letter that was published in the March 1993 issue!

Fortunately, Jack took the incident in good part, and although his telephone didn't stop ringing for weeks afterwards...he repeated the classic phrase "The rumours of my death are somewhat exaggerated" when he called me at the *PW* office.

And, to make matters worse, Jack pointed out that I had actually worked him on 70MHz **after** the original letter saying he was a silent key (published in 'Receiving You') had appeared in the office! But, unfortunately, two years or so later I find myself writing this tribute to one of the foremost v.h.f./u.h.f. amateur radio pioneers in the United Kingdom.

It will seem strange whenever I'm driving in Leicestershire, Derbyshire, Cambridgeshire, into Nottinghamshire and even to the far corners of Lincolnshire, not to hear G5UM's potent signal on 70MHz. In fact, perched up on the Leicester Wolds at Houghton-on-the-Hill, Jack provided me with four to five hour QSOs on the band as I drove to see authors or to visit radio clubs. I will miss him as he was a great friend of *PW*, of amateur radio and everyone he met on air and in person.

Short Wave Magazine

Jack Hum's connection with our sister publication *Short Wave Magazine* goes back to just after the Second World War. And, although many will remember his famous receiver design using the versatile Mullard EF50 valve, published in August 1946, his other work pre-dates this milestone event.

First licensed in 1927, Jack worked on some 'self oscillating crystal' experiments in conjunction with Louis Varney G5RV of antenna fame. Jack said in later years he often thought (with benefit of hindsight) they had probably stumbled on the transistor without ever realising it!

During the 1930s Jack was kept busy in his chosen career as a specialist technical journalist and it was a time of great discoveries and developments on v.h.f. and u.h.f. Like many others, Jack was drawn to experimental work on 5 and later 2.5 metres, having first been attracted by the mysterious goings on from the BBC's Alexandra Palace on 7 metres.

In those days, so he reminded me during one of our QSOs on 70MHz, valves had to be de-based. Jack said that it often meant soaking the valve in methylated spirits or something else to dissolve the adhesive.

Once removed from their 'lossy' bases, valves could work at much higher frequencies. And, this pioneering work on v.h.f. was to help him in the near future, as the Second World War approached.

Coastal Command Radar

During the Second World War, Jack G5UM found himself busy with the RAF Coastal Command's radar. It was a very different world to pre-war amateur radio.

Jack told me that the tremendous strides made in technology made pre-war amateur radio efforts look 'amateurish'! But, there was one spin-off from wartime radar that had tremendous benefits for radio amateurs (and incidentally made the G5UM callsign famous around the world) and that was the EF50 valve.

Wonder Valve

The EF50 'wonder valve' was found everywhere in wartime equipment. It could work well up into the v.h.f. frequencies, so Jack G5UM designed an h.f. receiver, using t.r.f. techniques using just the famous 'Red Can' valves.

First published in our sister publication *Short Wave Magazine* in August 1946. The EF50 design soon proved popular around the world. Often, the circuit was published by other magazines without reference or acknowledgement to G5UM or *Short Wave Magazine*!

New Bands

Amateur radio quickly regained its stride after the Second World War, and Jack G5UM was in the forefront of v.h.f. and u.h.f. work. He promoted and operated widely on all the v.h.f. bands and, appropriately enough it was on 70MHz I first worked him in the late 1960s.

Jack, with the support of others helped the RSGB to acknowledge v.h.f./u.h.f. work and soon a VHF Field Day was up and running. The now traditional VHF Convention started up and there were special awards for v.h.f. and u.h.f. operating. *The RSGB Bulletin* (now *Radio Communications*) also started a v.h.f./u.h.f. feature.

Vice President

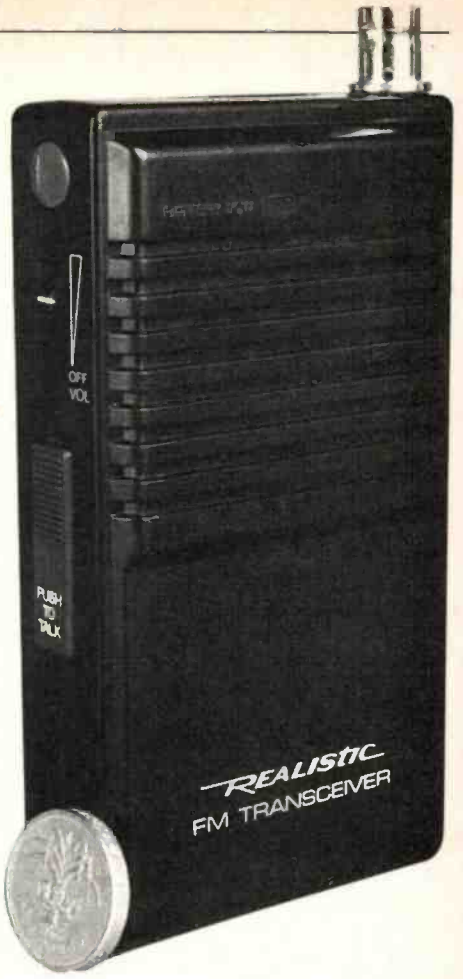
In 1974, Jack G5UM was elected an RSGB Vice President, but the onset of heart problems meant he had to hand over some of his many jobs to worthy successors. Both Jack and his wife, Grace were very proud of the honour, which was bestowed in recognition of his v.h.f. work.

In retirement from his delightfully situated village home in Houghton-on-the-Hill, the G5UM callsign could be heard over a over wide area. And although he never quite (jokingly) forgave me for his premature 'obituary' which appeared in *PW*, Jack always insisted, when I worked him on 70MHz, that I provided "a decent job" when the proper time came!

Now the time has come, I hope I have done a 'proper job' for Jack G5UM. He'll be missed on the bands and everyone on *PW* wish his widow Grace good health and our condolences.

I've really got to leave the last words to Jack (from his 'Radio Personality' feature in October 1993) aimed to encourage us all: "Relax from the pleasure of life, go into your shack and indulge in a little radiotherapy. It'll do you the power of good". **PW**

HANDY from TANDY - A 49 to 50MHz Transceiver Modification



Peter Julian G7PRO describes how you can modify an inexpensive Tandy 49MHz f.m. transceiver for use on the 50MHz amateur radio band.

A short while ago the regulations regarding the 50MHz band were relaxed. Restrictions were eased to allow not only the use of vertical antennas, but also mobile operation.

However, small portable 50MHz sets are not readily available. Fortunately, the reasonably priced 49MHz licence exempt 'walkie-talkies' seem to be ideal for conversion to 50MHz.

The licence exempt MPT1336 type approved devices fall into two main groups. They include 'toys' which have cheap a.m. super-regenerative receivers, and the more serious f.m. units having superhet receivers.

The latter group contains such devices as baby alarms, radio microphones and walkie-talkies. There are a number of different 49MHz hand-held sets produced by manufacturers such as Tandy, Maxon and Jesan.

Suitable For Conversion

A quick review of the available units will show which transceivers are the most suitable for conversion. First of all, let's take a brief look at the MPT1336 specification.

Any class of emission may be used with MPT1336, but the maximum effective radiated power (e.r.p.) is restricted to 10mW. Antennas must also be an integral part of the unit, with no provision for an external antenna.

Ancillary inputs may be used but cable lengths must not exceed 1.5 metres in length. Unlike the Citizen Band, there are no mandatory channels and the permitted range of operating frequencies are 49.82 to 49.98MHz.

However, due to American FCC regulations for the 49MHz band (all units appear to be imported and originally designed for the US market), 15kHz channel spacing seems to have been generally adopted by default.

The MPT1336 'walkie-talkies' are either single channel, three channel or five channel. All f.m. units have dual conversion receivers.

The single and three channel units are crystal controlled. Recrystalling these is relatively simple but the five channel sets are synthesised using a dedicated synthesiser (as with CB) and unfortunately do not lend themselves to conversion.

Baby alarms seem to be either single or two channel while radio microphones can have anything from one to three channels. The transmitters for these are designed for continual operation and are of course separate from the receivers.

The baby alarm receivers, although f.m. are only single conversion and not very sensitive. This may explain why, although manufacturers usually quote a 100 metre range, they can often be received up to at least half a mile away! Radio microphone receivers are generally dual conversion.

Simplest To Convert

For our purposes, the simplest radio to convert is the Tandy 'Realistic' TRC-501 single channel transceiver. This is the model I'm featuring, although the more expensive Jesan three channel unit is also well worth considering.

The modifications are in four sections **1:** Change frequency by replacing the crystals and retuning the receiver front end and transmitter stages. **2:** Increase transmitter output. **3:** Improve receiver selectivity and sensitivity by replacing the 10.7MHz ceramic filter with a two pole crystal filter. **4:** Add circuitry to allow connection of a 50Ω antenna.

Tandy supply a schematic diagram at the back of the TRC-501 owner's manual. This is very helpful when making modifications, but it's so small that most people will need a magnifying glass to read it. Unfortunately, this information has been discontinued for the later TRC-505.

The Crystals

To replace the crystals, the circuit board will have to be removed from the case. To do this, the belt clip must be removed from the back, revealing a cross-headed screw.

After removing the screw, gently prise off the back. The circuit board is held in place by one more cross head screw at the top of the board, see **Fig. 1** and **2**.

Take care not to break the wires connecting the electret microphone and the speaker as the board is lifted out. The transmit and receive crystals can now be unsoldered.

You'll notice that the transmit crystal leads are long, allowing the can to lay on top of other components. When replacing this crystal a small holder of the type used in radio control receivers will have to be wired in to allow the same flexibility.

As the original crystals are wire ended, two

pin holes have to be drilled larger, to accommodate the new receive crystal. I attempted to use two cage jacks but these held the crystal too high up, so the crystal either should be soldered directly onto the p.c.b. or some means of gripping the pins must be soldered beneath the p.c.b.

I dismantled an old crystal holder, discarded the plastics support and soldered the small clips directly onto the underside of the board. A spot of Araldite epoxy resin adhesive helped to give added support to prevent them tearing loose when changing crystals.

Bandplan Allocated

The bandplan for 50MHz has 51.41 - 51.83MHz allocated for the f.m. simplex channels at 20kHz spacing. The f.m. calling channel is 51.51MHz.

When choosing which channel to use, it's probably best to avoid 51.53MHz which is used by GB2RS news and also for slow Morse transmissions. Both crystals are fundamental, series resonance.

The frequency to which each crystal is cut is as follows:- receive crystal is RX frequency -10.7MHz and the transmit crystal is f/3.

Once the 50MHz crystals have been installed, the receiver front end needs to be retuned (see the photograph in **Fig. 1**.) There's only one transformer (L2) to peak with a plastics trimming tool. A metal screwdriver should **not** be used, apart from upsetting the tuning, there's serious danger of breaking the iron dust core.

To tune up the transmitter, a field strength meter and a digital frequency meter will be required. And using the frequency meter, check L7, which needs to be adjusted to the exact frequency.

Note: Remember that the oscillator will be operating at **one third** of the transmit frequency and any frequency measurement at the oscillator will give a reading in the 17MHz range. Then Adjust L6 in the frequency tripler stage for maximum output and then do the same with L5 and finally L1.

For convenience, a flexible antenna, as used on portable telephones, can be clipped onto the telescopic whip. However, if a longer telescopic antenna is fitted, L1 will need to be readjusted for maximum output.

Increase Power

The next stage is to increase transmitter power. With the original antenna, the effective radiated power (e.r.p.) is still 100mW or -20dBW. With a longer antenna this will of course be higher.

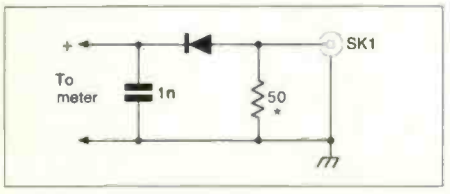


Fig. 3: SImple circuit for measuring r.f. output from modified 50MHz QRP transceiver (see text).

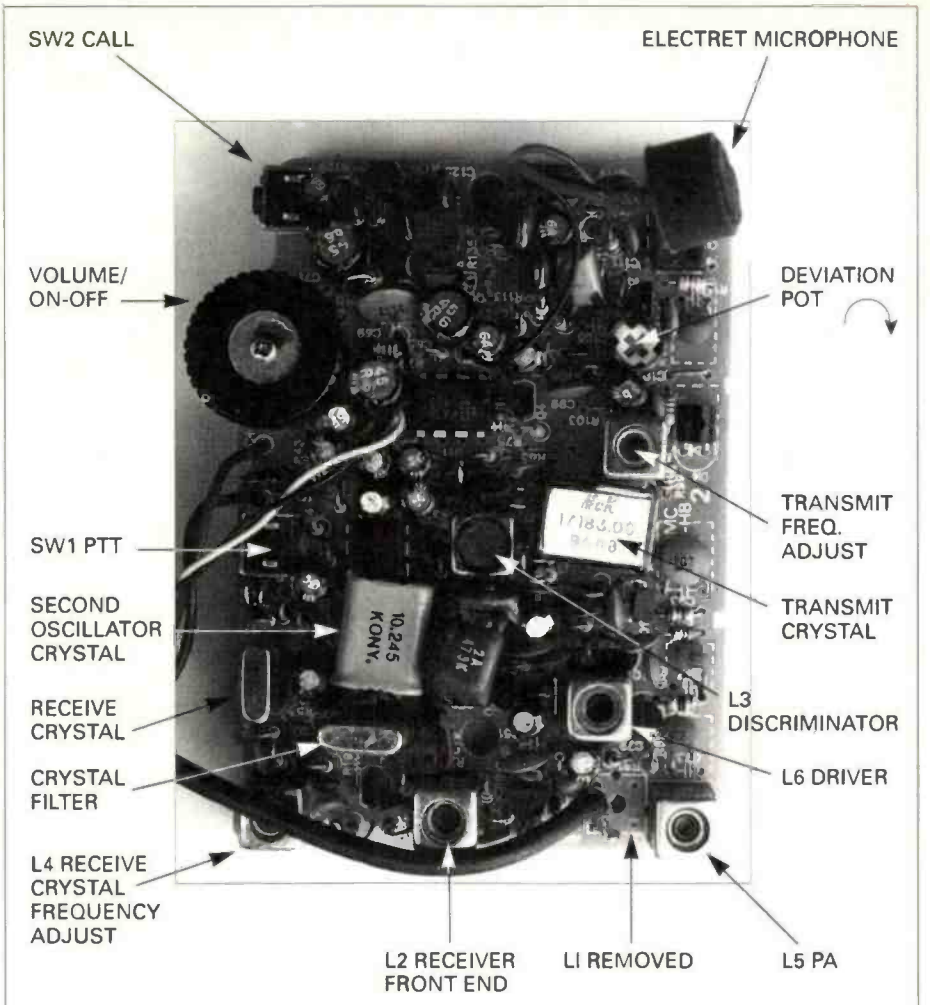


Fig. 1: The main transceiver p.c.b. removed from its case. (See text for details on the 49 to 50MHz conversion process). Annotations show major components involved in modifications. The coaxial cable (see G4SLU's text) connected in place of L1, is the antenna input/output.

To increase actual transmitter output power, replace R81 (220Ω) with a wire link, replace C79 (33pF) with a 200pF disc capacitor and finally remove C77 (0.0047µF) and R85 (56Ω) and connect the emitter of transistor Q9 directly to ground (i.e. shorting out C77 and R85).

Crystal Filter

The next job is to fit a crystal filter (see **Fig. 1** for location). This is required because a10.7 first i.f. ceramic type which is fitted as standard, not only has a wide bandwidth but also has an appropriate 6dB insertion loss.

A 10MO7AC two-pole crystal filter on the other hand has a much narrower bandwidth and the insertion loss is only 1.5dB. This modification is therefore quite an attractive proposition.

However, the crystal filter is physically larger than the original ceramic one and so a little extra space has to be found. To help, C27, a 2.2µF should be replaced with another capacitor which has longer leads. This is so it can be positioned on top of adjacent components thus providing the needed space.

A piece of insulation tape should also be placed between the crystal filter and the legs of the MC3357 i.f. chip (IC1). This is to prevent a short circuit.

Although the impedances of the two filters are different (ceramic = 470Ω/crystal = 1k8Ω), I didn't think it seemed necessary to change any components in order to match the crystal filter into the circuit. In fact, R19 can be by-passed if desired or even changed for a 1000pF capacitor.

The modification will alter the white noise level which is used to trigger the squelch and so the squelch is liable to stay open. However, changing R21 (33kΩ) to a value of 39kΩ should overcome any problem.

The receiver mixer is a bipolar transistor and there's only one tuned r.f. stage. Because of this the receiver is unlikely to perform well under strong signal conditions if the transceiver is connected to a high gain antenna.

Some operators may intend to boost transmitter output using a power amplifier. If so, it may be necessary to include further filtering to reduce harmonics, but I haven't checked this out.

External Antenna

For amateur radio use it's possible to connect an external antenna. I made a Pi-network to match the transceiver to 50Ω. ***Editorial note: See G4SLU's comments.***

A simple circuit which will be a help when tuning the 50Ω output stage is shown in **Fig. 3.** A BNC chassis socket can also be fitted into the case.

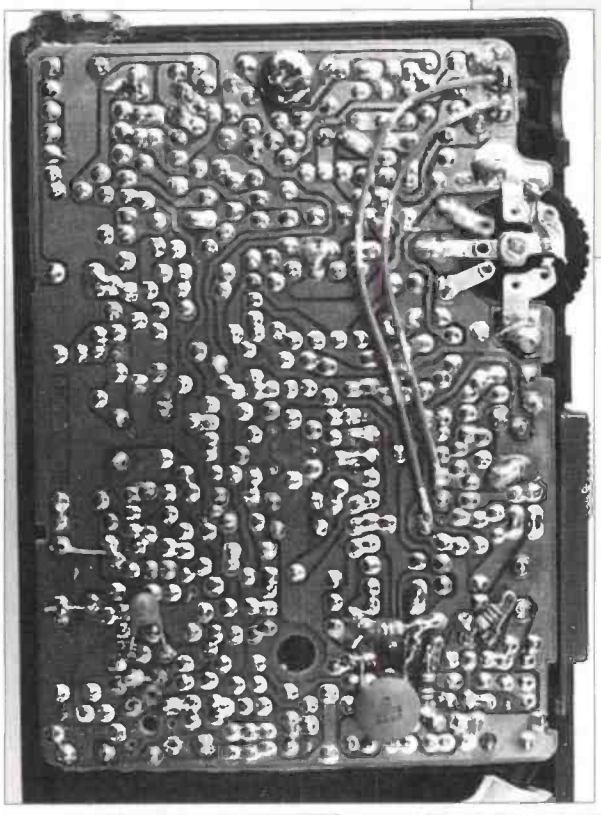
I enlarged the hole where the telescopic antenna went through the case with a hot soldering iron! This opens up the possibility of experimenting with different antenna.

Personally, I would recommend trying the magnetic loop for 50MHz as described by G6VNT in the 1991 February issue of *PW*. Another possibility for portable use is the telescopic antenna for hand-held scanners and walkie-talkies sold by Tandy, catalogue number 20-006.

The instructions with the 20-006 antenna state that, when used for transmitting, it can only be used as a λ/4 from 130 through to 535MHz. It also states that the loading coil must always be shortened by collapsing the section located just above it, but for our purposes the loading coil **must** be left in the circuit.

The instructions with the antenna concerning v.h.f. low band adjustment should be ignored. With the lower section collapsed and the top section extended to approximately 250mm from the top of the loading coil, the antenna will tune to 50MHz.

Fig. 2: Underside of p.c.b. when removed from case (take care with electret microphone connections). The two wires are G4SLU's modifications to provide 'squelch defeat' in place of 'call' button (see text). The screw, top centre, holds the p.c.b. in the case.



Clive Hardy G4SLU tried out the conversion procedure suggested by G7PRO and here's what he thinks:

Take note! You should be aware that any modification to the sets will invalidate the guarantee. Changing the transceiver's performance when operating on their original frequency is also illegal, as it takes them outside the MPT1336 regulation. **Editorial note:** ***We approached the Radiocommunications Agency on this point, and they have written to us in reply raising no objections to any of our readers holding an amateur radio licence, modifying, converting and using the transceivers on the 50MHz amateur band.*** **G3XFD.**

I used wire ended crystals. They were obtained from McKnight to the specification shown here: TX crystal 17.183MHz (series resonant), holder style J. RX crystal 40.850MHz (30pF), holder style J.

The transmit crystal is mounted above other components. It's advisable to secure it with adhesive. Make sure the metal case of the transmit crystal doesn't touch any leads around transistor Q13.

There are very slight differences between the boards currently used in the sets and those converted by Peter. This only really affects the 10.7MHz filter if it's to be replaced. On the latest Tandy boards there isn't quite enough room to fit a crystal filter in the space vacated by the ceramic filter. Fortunately, the space can be found by fitting R23, R53, R19, and C17 under the board.

I only fitted one of the radios with a crystal filter, but could not really detect much difference in sensitivity between the modified unit and the transceiver with the original ceramic filter. By-passing R19 ahead of the filter had no discernible effect on sensitivity either.

I converted the **Call** button to a squelch defeat. The conversion is done by cutting the tracks to the **Call** button and fitting wires from the contacts to either side of R21. Squelch defeat is useful when trying to copy weak signals that keep dropping below the threshold level, and also as a confidence function to check the radio is still operating.

The workshop manual supplied by Tandy, shows that the transmitter output is at 50Ω. This means that if a 50Ω output is required it can be taken directly from the secondary of L5. Simply remove L1 and connect the coaxial cable as in **Fig. 1.** (Inner cable to hole farthest from p.c.b. edge, screening 'outer' to hole nearest p.c.b. edge).

Whilst on the subject of antennas, I found that there isn't really the room inside the case for the fixing nut of a BNC socket. So I fixed the socket in place with Araldite epoxy resin adhesive. **Sandpiper Communications, Unit 5 Enterprise House, Cwmbach Industrial Estate, Aberdare, Mid Glamorgan CF44 0AE. Tel: (01685) 870425),** make a 50MHz 'rubber duck' type of antenna which is suitable.

Next, I tackled the power and tuning up stages. And, to this end using all the modifications suggested by Peter to increase the output power the transmitter, produced about 30mW into 50Ω. For a real power increase I shorted out R81, the 220Ω resistor in the collector of the p.a. transistor. This produced a power output of at least 50mW. I then turned the f.m. deviation pre-set potentiometer fully clockwise for maximum deviation.

From the trials I carried out with the help of Phil G3XBZ, I would put the minimum range in town at 300 to 400 metres (between transceivers, using set top antennas). I think these little transceivers are ideal for very local communications, particularly in the open. **Finally, I'm very grateful to Ahmed Parekh, Technical Buyer of Tandy UK, at Tandy Centre, Leamore Lane, Bloxwich, Walsall, West Midlands WS2 7PS, for his help on this project. The TRC-501 transceiver for modification is available at Tandy shops priced at £24.95.**

G4SLU

Compact Transceiver

The TRC-501 is a compact transceiver, so it's not really feasible to make further alterations. It would be useful to fit extra channels, a manual squelch and power sockets, etc., but to do this it would be necessary to remove the board and fit it into a larger case.

Fitting the transceiver into a larger case would, of course, make possible the fitting of a small transmit p.a. as well as receiver front end improvements. Nevertheless, as it stands, a small, single channel transceiver should find many uses.

The transceiver may be useful for Novices for QRP 'cross town' QSOs. They could also perhaps be an alternative to 144MHz for rally control.

Finally, I must express my thanks to Jonathan G4RLM who helped me run some on-air tests with the converted sets. I hope you enjoy converting and using your 'Handy from Tandy' on 50MHz as much as I did.

PW

Crystals: The crystals were obtained from: McKnight Fordahl Ltd., Hardley Industrial Estate, Hythe, Southampton SO4 6ZY (contact Anne Rees for Amateur Radio specification crystals). Tel: (01703) 848961.

THE WELSH QRP CLUB

Three Watts From A Drainpipe!

Leighton Smart GW0LBI gives an insight into how the Welsh QRP operator deals with lack of antenna space, hills and valleys and still manages to work intercontinental DX!

Let me begin this article by offering a brief description of my own entry into low power (QRP) operation on the h.f. amateur bands. Licensed in early 1989, I threw myself into radio operating and in particular DX operating with great vigour, deriving much enjoyment from both casual rag chewing and intense DX hunting.

However, 12 months later, to my great dismay, I had lost all interest in the hobby. In retrospect, I realise that I'd totally immersed myself in the hobby and had suffered 'burn out'. Subsequently, the radio was left to gather dust, and I seriously considered closing my station and going QRT for good.

Rare Listening

Thankfully, during one of my extremely rare listening periods, I received a YO station who was operating with 2W single side band (s.s.b.) on 14MHz. This caught my interest, and after calling the station and making contact, I reduced my power output step-by-step, until I was running a single watt, while still maintaining good copy.

The QRP was a turning point for me. A newly awakened interest in amateur radio suddenly emerged! I then sold the QRO FT-101E, and replaced it with a modified FT-747, which runs a massive 5W at full power!

These days, working a station just 400km distant is DX for me. And more importantly it leaves me with a sense of fulfilment which itself makes amateur radio operating worthwhile - better than going QRT I guess!

However, I still receive comments from amateurs such as 'QRP is only any use into a beam on top a 50ft tower' or 'QRP is fine if you like an empty logbook'. Fortunately, such comments are exposed as fallacy by the numerous QRPers who have worked DXCC - QRP with less than 5W into simple dipoles!

The GW QRP Club

The GW QRP club was formed in mid 1994 by myself and **Dave Griffiths GW0JUJ**, with the aim of encouraging interest in low power operation amongst the 4000 plus amateurs in Wales.

Discussions took place in the spring of 1994 between Dave and myself on the possible formation of a Welsh QRP club, and during our on-air discussions interest was shown by a number of local stations on the subject. It was decided to go ahead and form the club.

However, as facilities were, and still are, thin on the ground it was agreed that the club take the form of an 'informal grouping' of Welsh QRP operators, rather than a fully structured organisation with all the costs and administrative difficulties a formal club would have to face. This was at least until the club was on a secure footing.

Gerald Ashford GW0RQP soon joined us, and offered to produce the four club awards free of charge on his desktop publishing equipment. For which he was rewarded by being duly appointed Awards Manager! More recently we have been able to issue a modest newsheet and have welcomed amongst others our first Novice members, in the form of **Eileen 2W1BPS, Gareth 2W1CSI** and **Peter 2W1DIK.**

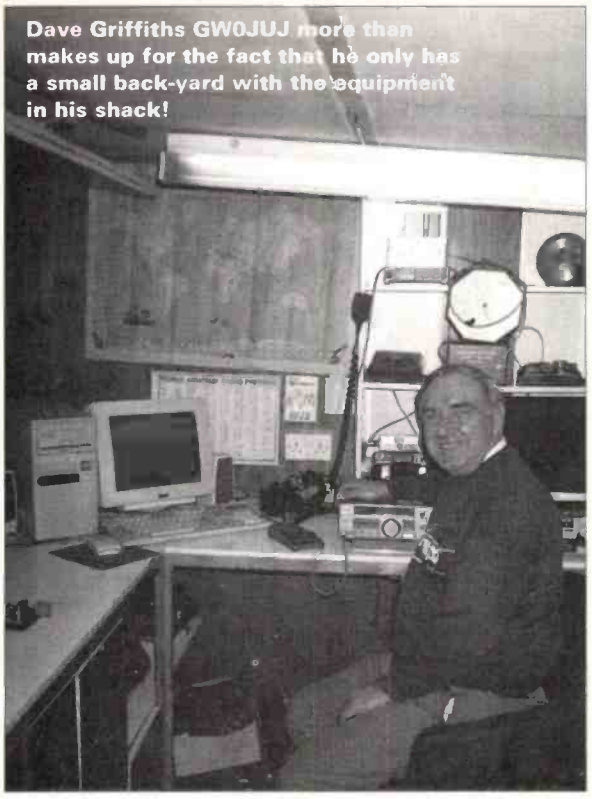
The club also intend to produce a quarterly newsheet, *GW QRP News*, and to increase the number of awards available to five, including a 'Worked GW QRP Members Award'.

The GW QRP club is of course in the stages of infancy, and operated only through the assistance of its members who provide their own mailing costs, etc. Membership currently stands at 35, with members from all parts of Wales. So, it appears that the interest in low power operating is on the increase, which can only be good news for QRP generally.

Operators' Difficulties

One of the difficulties faced by many QRP operators in Wales is the frustrating lack of space available for erecting suitable and effective antennas for low power operating. How on earth do you radiate your 2W of r.f. when you only have a 20ft garden, or worse, a back-yard to 'play antennas' in?

In common with other parts of the UK, Wales is festooned with row upon row, village upon village of terraced housing, with small narrow gardens. Unfortunately, 19th century industrialists thought very little of the need for their workers to have room to raise their



Dave Griffiths GW0JUJ more than makes up for the fact that he only has a small back-yard with the equipment in his shack!

How on earth do you radiate 2W of r.f. when you only have a 20ft garden, or worse, only a minute back-yard to 'play antennas' in?

families, nor indeed for the 20th century radio amateurs' need for room to raise effective QRP antennas!

Nevertheless, QRPers, being a canny breed find many ways of getting on the air. Even if it isn't conventional!

Martin Williams GW0OUV for instance, when faced with no other alternative, used his wife's washing line as an antenna on the 1.8 and 3.5MHz bands, working around the UK with it regularly. Of course, his XYL was understandably unimpressed, especially when he complained that his tuner could not handle the modified impedance when wet clothes were hung out to dry!

Another 'low profile' QRPer is **Dennis GW0ONU**. He is currently using an 'end loaded' wire, which comprises a single wire running vertically up the rear wall of his house to a loading coil situated in the loft.

Dennis runs 5W c.w. via an a.t.u. on the l.f. and h.f. bands and has been quite pleased with the results. He's even worked intercontinental DX with it!

At the moment I am testing an 'antenna' which requires no space whatsoever. Feeding my metal rain guttering with a single wire feed at its centre, I loaded it up with the station tuner on 7MHz.

It tunes up a treat, and so far, three hours operating time has produced contacts with F, DL, EA3, ON, and best DX so far T99W, all with 5W. A low profile antenna by anybody's standards. It's ideal for those with very strict local planning officers perhaps!

Of course, the examples mentioned are all extremes of amateur inventiveness when faced with restrictive settings. The more common antennas for use in restricted space are bent G5RVs, verticals, and long wires run out over some friendly neighbour's property.

But, faced with the situation where even these common antenna methods are not practicable, my only suggestion is to find some metal which is not connected to ground, clip a wire to it, and via your a.t.u. pump in your QRP!

Hills And Valleys

Another attribute particular to Wales is its more than fair allocation of hills and valleys. These can pose a great difficulty to the QRP operator who lives on the valley floor (a common Welsh habit!).

In some of the deeper valleys, such as the Rhondda and Cynon valleys the, QRPer is faced with 'windows' to the north and south. There are reasonable physical openings for low angle r.f., but steep hills to the east and west rising extremely sharply to literally hundreds of feet.

The hills are a great obstacle to the QRP operator, particularly on the higher frequency bands. In this situation, whereas a high power station is in with a chance at working at least some stations in these directions, albeit at much reduced signal strengths, all the QRPer can do is to get the antenna as high as practicable and work whatever he or she can.

Living in the valleys normally means working via north and south paths. My own QTH has a very poor take-off in the general direction of South America due to the same type of local geography, and as a consequence QRP contacts in that direction have been very few and far between. And although QRPers have, it has been said, been known for many outstanding achievements, but alas, moving mountains is not one of them - yet!

Others are however, more fortunate, and live on the hills, and don't therefore suffer the problem of natural r.f. barriers. They must surely be amongst the luckiest amateur radio operators. Imagine a QTH 300m a.s.l. with good take-off in all directions, and no neighbours to complain about 'ugly antennas'. Bliss!

Not General

In conclusion, what I've described in this article should not be read as a general description of QRP amateur radio in Wales. Situations vary from place-to-place, and from station-to-station. Many amateurs are fortunate enough to have room if not for antenna 'farms' then for antenna 'allotments'.

What I have tried to describe are perhaps the most difficult radio locations, where QRP operators find themselves in what could be described as 'no-win' situations. Yet from my experience, many do overcome the obstacles before them and continue to enjoy low power operating despite potentially insurmountable difficulties.

So, remember, the next time you hear a very weak 'CQ QRP' from GW-land, give that station a call. He may be at the bottom of a deep valley running 3W into a drainpipe and will be very pleased to work you! **PW**

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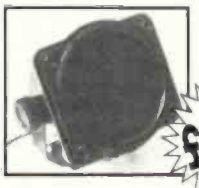

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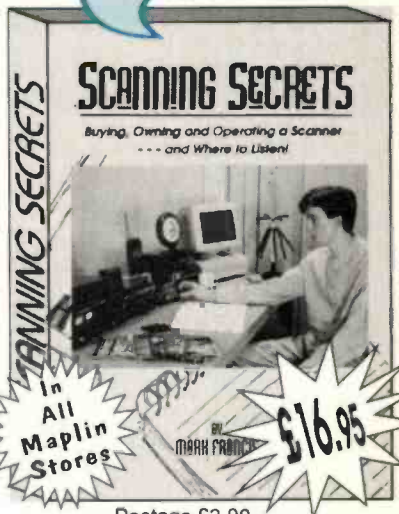

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The Key 7 - Opening The Door To Milliwatting

Steve Ortmayer G4RAW describes his very low power (100mW) transmitter for 7MHz built onto a single p.c.b., forming a combined transmitter and Morse key. It's ideal for QRP operations or local c.w. training purposes.

Personally, I've never felt the need for more than a few watts output since I obtained my call in 1983. But I had never tried less than about 1W.

Would it be possible to make contacts with 100mW? I had read in *Sprat*, the journal of the G-QRP Club, that QSOs has been made with very low power but they may have had some good high gain antennas.

My antennas are very simple wires strung between the chimneys of my house. During one 3.5MHz QSO I mentioned to the other station that my antenna was a half wave inverted V on the chimney, and he came back asking 'Is it a mill chimney'?

Apparentley, he had thought I said a half wave vertical! Well, most of the mill chimneys have gone now in Halifax. "Good thing too"! say the generation who slaved in them.

The Circuit

The circuit, **Fig. 1**, for the transmitter is a simple one transistor oscillator and it comes from Doug DeMaw *W1FB's Design Notebook*. I made two versions of the transmitter, and one used my well known drawing pin method, on a wood base with a strip of p.c.b. material as a Morse key.

The version I'm describing this time is the other one I made, using a p.c.b. With this method the board is extended to form the key as in my original PW Speedbrush Morse key project.

If you would like to try the drawing pin version a wood base is prepared and the pins pushed pushed in, following the circuit layout. The pins are tinned with solder first, but take care not to overheat them, a crocodile clip can be used on the leads as a heat sink.

When all the components are in place, check the wiring and apply 12V, not forgetting that a dummy load 50Ω resistor should be across the output. The output can then be measured with a diode probe.

Adjust C6 for max output which should be about 100mW. If the transmitter does not work, check the crystal and if this is in order, try changing C4 (100pF) for 120pF.

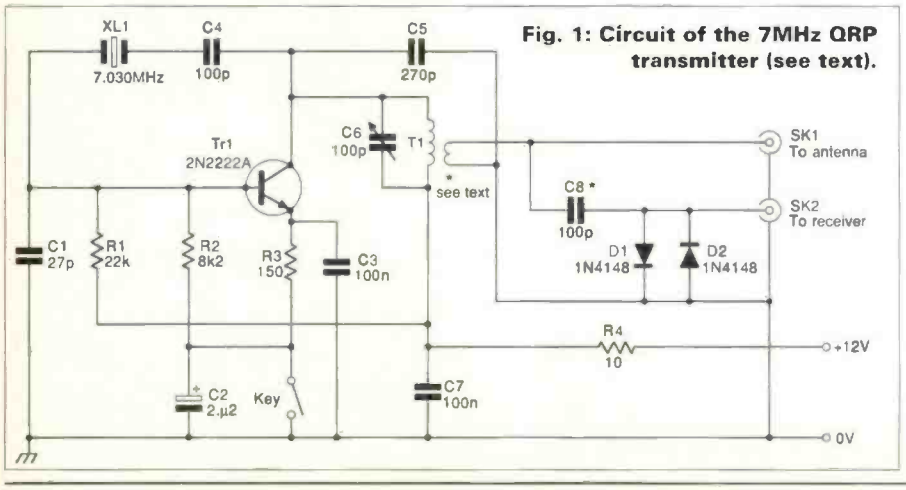


Fig. 1: Circuit of the 7MHz QRP transmitter (see text).

The PCB Version

You can make the p.c.b. version in the usual way by copying the layout onto a bit of copper laminate board. Glass fibre board (this is the material which the appropriate *PW* PCB Service boards are made from) is best. This is because it has more 'springyness' for use as a Morse key.

If you're making your own board, first etch and drill the board and solder in the components. If you've got the ready-made p.c.b., drop the components into place, using **Fig. 2**, the p.c.b. layout and component overlay as a guide.

The p.c.b. is then bolted onto a wooden base with a small plastics knob to form a Morse key. The transmitter is then ready for testing.

Tried And Tested

I tried and tested a 2N4400 transistor which gave about 100mW and a 2N2222A which gave about 50mW. The transmitter was connected to the receiver with a C8 (100pF).

The diodes, D1 and D2, 'clip' the r.f. to the receiver. The capacitor C8 can be adjusted to give full output of weak signals, but too much

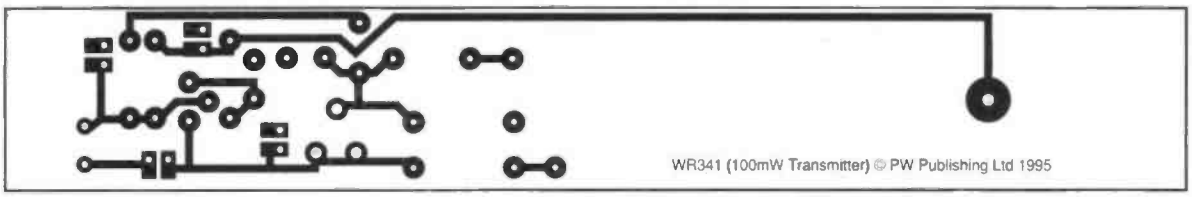
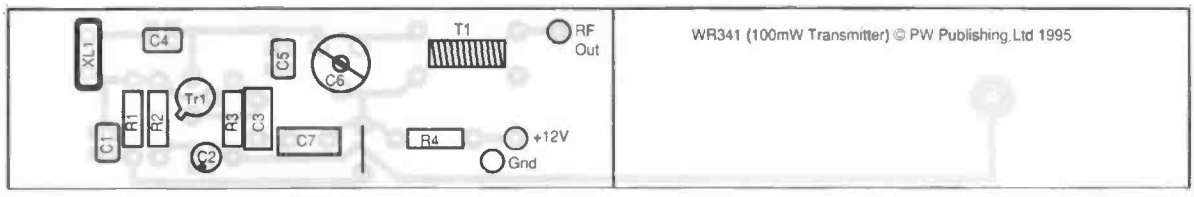


Fig. 2: The p.c.b. and associated component overlay for the Key-7 transmitter.



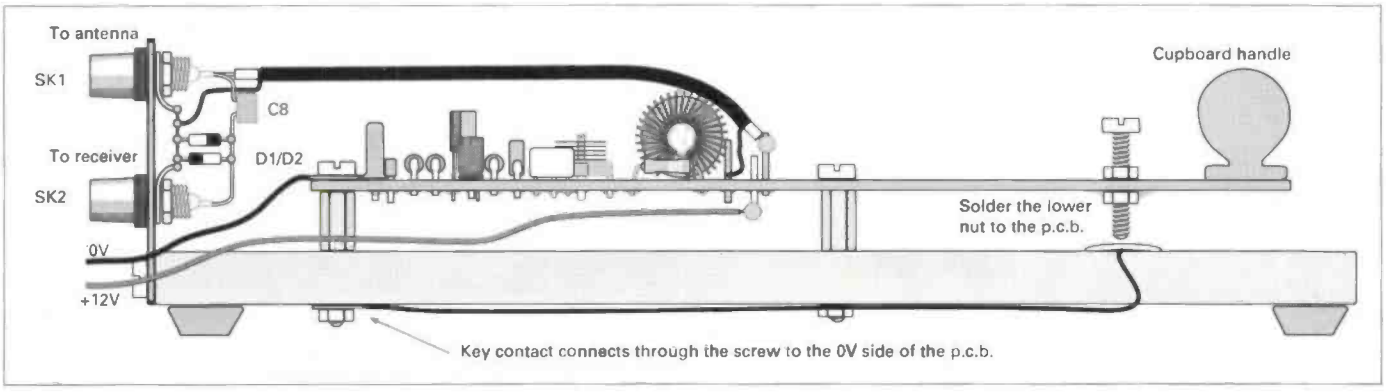


Fig. 3: Diagram illustrating the finished Key-7 transmitter. The 'free' end of the p.c.b. acts as the arm of the Morse key (see p.c.b. overlay for track details). The 'return' for the key contact is via a contact mounted on baseboard (large brass drawing pin suitable).

will make the receiver 'thump' during transmitting.

Personally, I think it's a big help to be able to listen to the signal as it indicates all is well with the transmitter. The 100pF capacitor at C8 worked well with my simple home-made receiver.

On The Air

How did the little transmitter work on the air? Well, I'm pleased to say I've got some QSL cards which are interesting. Working from my QTH in Yorkshire I had comments like: 'No problem copying your 100mW' from Tony G0KPB (Derbyshire). And another saying "Very pleased to work your 100mW station" said G6NA (Dorset) who was using a Solar powered 500mW!

The 50mW version bought a 579 reports from G0FPV in Essex. So, milliwatting does work...have a go and enjoy yourself!

PW

Shopping List

Resistors

Metal film minature 0.25W 5%

10Ω	1	R4
150Ω	1	R3
8.2kΩ	1	R2
22kΩ	1	R1

Capacitors

Miniature ceramic disc

27pF	1	C1
100pF	2	C4, 8
270pF	1	C5
100nF	2	C3, 7

Minature electrolytic or tantalum bead 25V working

2.2μF	1	C2

Miniature foil trimmer

100pF	1	C6

Semiconductors

2N2222A	1	Tr1 (see text)
1N4148	2	D1, 2

Inductors

T1	24t e.c.w. on T37-6 (for primary)
T1	5t *e.c.w. over T1 (for secondary) using

2N2222 (*orginally 3 turns, modified to 5 subsequently).

Miscellaneous

Crystal 7.030MHz fundamental, crystal holder, p.c.b. (from *PW* PCB Service), suitable wooden base (for either version of project), drawing pins (for baseboard-and-pin version), knob for Morse key, wiring, antenna sockets (phono types suitable for 7MHz).

Clive Hardy G4SLU built the *PW* Key-7 prototype, and provides some comments and advice on the project: Of the build options for this transmitter I chose the p.c.b. version. To me, it seemed the more interesting. It certainly takes up less space than the drawing pin type. Whilst the circuit is the same as the original, the layout is not exactly the same as the published p.c.b. pattern. This is because when building the transmitter I only had the rough draft p.c.b. drawings to work from. Fortunately, at 7MHz component positioning doesn't matter too much, within reason.

I used the more readily available 2N2222A transistor and got the same 50mW that Steve did with the device. By increasing the number of turns on T1 secondary from three to five turns I obtained just over 100mW output from the 2N2222A into 50Ω. No doubt with the appropriate number of turns for the link winding 100mW could be obtained from most small signal transistors.

Finally, in Steve's instructions he states the secondary of T1 should be wound near the 12V end of the winding T1. I didn't think winding position was that critical with a toroid, other than it should be evenly spaced. My link winding is reasonably close to the 12V end of the main winding, but when I was experimenting with the number of turns the results were the same wherever the turns were.

Band Edge & QRP Finder

Tony Lymer GM0DHD provides a novel circuit to pick out both lower band edges and the QRP frequencies.

Accurate frequency setting is important for QRP operators wishing to make as many contacts as possible. With home-brewed equipment, it's often difficult to obtain the necessary dial resolution and accuracy to set the frequency to within say 500Hz of a desired point.

Many operators use a crystal frequency marker giving 'pips' at, say, 10kHz (or even 1kHz) spacing to achieve accurate frequency setting. The circuit shown here, **Fig. 1**, provides an interesting and simple alternative to the more usual crystal oscillator and divider chain, and uses only three transistors.

The circuit provides the band edge marker at 3.5, 7.0, 14.0, 21.0 and 28.0MHz. It also provides marker 'pips' at the internationally defined QRP frequencies on the 3.5, 7, 14, 21 and 28MHz bands.

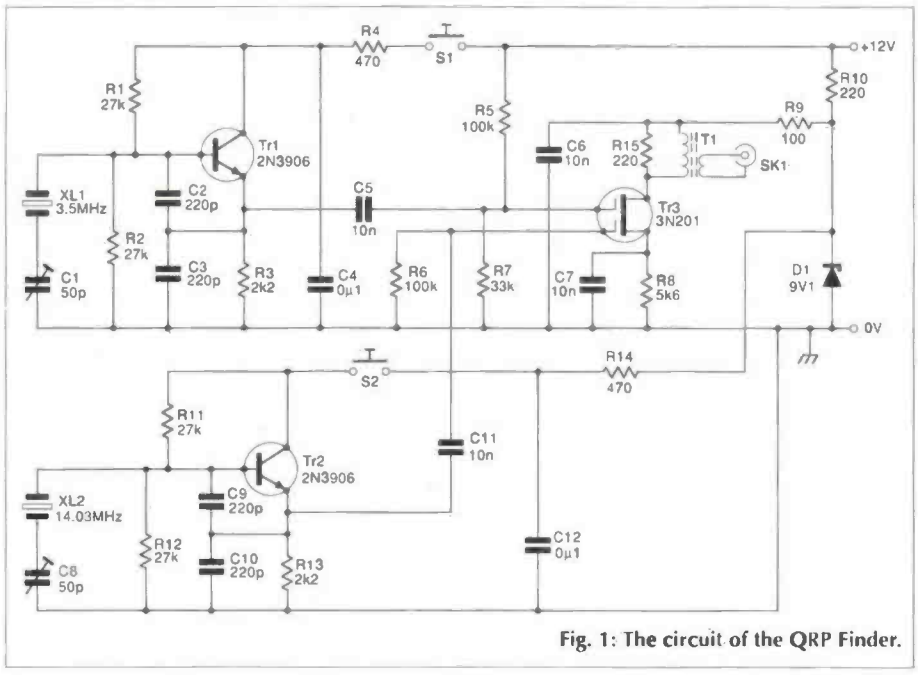


Fig. 1: The circuit of the QRP Finder.

Marker Oscillator

It's possible to produce a marker oscillator so you get 'pips' on the main QRP operating frequencies. This may be done with any crystal oscillator that can be divided down to give a 10kHz output frequency.

The 'normal' method in the marker oscillator is to use a 1MHz crystal divided by 100 with decimal dividers to produce the 'pips'. If using a 1MHz crystal and two divide by 10 circuits then you can get 10kHz 'pips' as well.

In *PW*, George Dobbs wrote a series called 'Getting Started The Practical Way' and in the July/August 1992 issues, produced a simple marker oscillator. The amateur band edges can also be identified with this arrangement.

However, on some older receivers, the 10kHz spacing is too close. It can be difficult to unambiguously identify the correct harmonic.

I've used the marker oscillator method, but found it tedious counting three or six 'pips' up from the band edge. The QRP frequencies are all 30 or 60kHz up from the lower band edge, (10.105MHz excepted), so you might think it possible to use a 30kHz fundamental frequency marker.

However, not all of the QRP frequencies fall on multiples of 30kHz. For instance 7030kHz is 234.333 times 30kHz.

Spare Crystals

Having built several QRP transmitters, I had several 'spare' crystals such as 14.030 and 14.060MHz in my junk box. So, I tried mixing 14.060 and 3.5MHz together to produce 21.060MHz.

The second harmonic of 3.5MHz is 7.0MHz. Add 14.060MHz and you have 21.060MHz.

My idea worked fine! It also produced 28.060 and 3.560MHz as a bonus. If only I could generate 7.030MHz as well. I would then have a calibrator for the all the harmonically related bands and their QRP frequencies.

Eventually I realised that if the 14.060MHz crystal was replaced by a 14.030MHz crystal then that goal would be realised.

The Circuit

The circuit consists of two individual crystal oscillators separately switchable connected to a mixer. The first oscillator's frequency is 3.5MHz and the circuitry around Tr1 generates the signal. This oscillator produces the band-edge markers.

The second oscillator is at 14.03MHz, comprising Tr2 and associated components. These two signals can be mixed, in Tr3, to produce additional output frequencies. The mixer also acts as a buffer to reduce the effects of changes in loading on the oscillator frequencies.

When two frequencies, F1 and F2 are applied to a mixer, the output consists of many frequencies at (n*F1)±(m*F2), where n and m are whole numbers. The actual output spectrum and levels depend on many things. they depend on the design of the mixer, the level of the input signals and on the values of n and m.

In my project, the mixer is driven hard, and is intended to produce many intermodulation products. This is the exact opposite of the usual intention when designing high quality receiver mixers!

The result of the mixer being driven hard is that a family of 'sprogs' appear at 3.5MHz intervals, each one consisting of a comb of frequencies 30kHz apart. The frequency table **Table 1**, shows the values of m and n for the main frequencies of interest.

The circuit will produce all of the above frequencies except 7.030 if a 14.060MHz crystal is used instead of the 14.030MHz unit. The 3.5MHz crystal I used was a surplus microprocessor clock crystal.

Simplification Possible

Some simplification of the mixer circuit is possible. I've used a pair of back-to-back diodes capacitively coupled to the oscillators with some success. But I prefer some output buffering, and the dual-gate f.e.t. mixer provides excellent performance in that respect.

With the dual-gate f.e.t. I could detect only minute (1Hz) change in frequency when the load impedance changed from a short circuit to an open circuit from its nominal 50Ω value.

Construction

The method of construction is not critical, although, as with all r.f. circuits, wires should be kept to the minimum convenient length. A printed circuit board produces a professional looking result, but isn't necessary for a circuit of this complexity. The 'Ugly' method of construction, or matrix board will suffice, as long as the components are rigidly mounted.

However you must house the completed circuit in a metal die-cast box to eliminate any minor hand capacity effects. The r.f. connector

Table 1

Frequency (MHz)	n* 3.5MHz	m *14.03MHz
3.5	1	0
3.560	7	2
7.0	2	0
7.030	2	1
14.0	4	0
21.0	6	0
14.060	4	2
21.060	2	2
28.0	8	0
28.060	0	2

should be chosen to connect conveniently to the rest of your equipment.

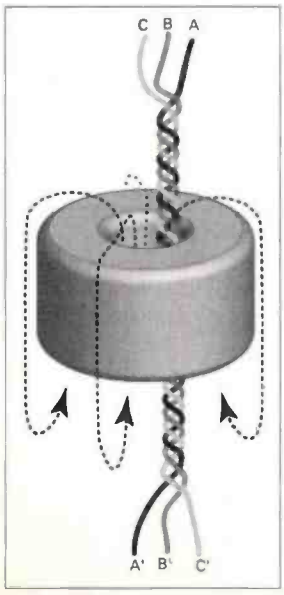
As the mixer stage provides some isolation, even a single wire antenna could be used as this will not de-tune the oscillators. It might perhaps be twisted around an existing non-screened receiver antenna lead to provide capacitive coupling without having to disconnect the receiver antenna.

Frequency Counter

The alignment is easily done with a frequency counter. Connect the counter to the output and then select each oscillator in turn and adjust the appropriate trimmer for the correct frequency.

As the output level of the 14.030MHz oscillator is lower than the 3.5MHz oscillator, it may be necessary with some frequency counters, to couple the counter loosely via a small value capacitor to the R13/C11 junction.

If you have to couple directly to the oscillator, use a receiver to check that the frequency of the oscillator does not change when the counter is removed. If it changes, tune the receiver to zero beat (with the counter connected) on the correct oscillator frequency. Then remove the counter and tune the oscillator back to zero beat listening on the receiver.



Shopping List

Resistors
Carbon film 0.25W 5%

100Ω	1	R9
220Ω	2	R10, 15
470Ω	2	R4, 14
2.2kΩ	2	R3, 13
5.6k	1	R8
27kΩ	4	R1, 2, 11, 12
33kΩ	1	R7
100kΩ	2	R5, 6

Capacitors

Low voltage ceramic (NPO)		
220pF	4	C2, 3, 9, 10
Low voltage ceramic		
0.01µF	4	C5, 6, 7, 11
0.1µF	2	C4, 12
Variable foil trimmer type		
50pf	2	C1, 8

Semiconductors

2N3906	2	Tr1, Tr2
3N201	1	Tr3 (or 40673 or 3N200, etc.)
C9V1	1	D1

Miscellaneous
Two crystals, 14.030 and 3.5MHz, two push-to-make switches, a Fair-Rite type 2643006302 core (Cirkit) or comparable type 43 ferrite core, some 0.71mm (22s.w.g.) enamelled wire, a suitable die-cast box to house the finished project, and two coaxial connecters, some hook up wire, power connector to suit.

In Use

In use you connect the unit to a 12V (13.8V) source, capable of supplying about 30mA. Then couple the output of the unit loosely to the antenna input of the short wave receiver. Next Press S1.

The unit will produce a 3.5MHz signal and harmonics. The receiver can now be tuned unambiguously to the lower band edge at 3.5, 7, 14, 21 or 28MHz.

The band-edge signal should be fairly strong. But S1 can be keyed on and off if identification is a problem.

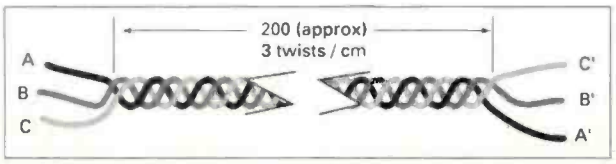
Now, hold S1 closed and press S2 as well. Tune the receiver up in frequency until another 'pip' is heard.

Again, S2 can be keyed on and off if necessary. These frequencies are at 3.530, 7.030, 14.030, 21.030 or 28.030MHz.

Tuning up in frequency again to the next 'pip' gives 3.560, 7.060, 14.060, 21.060 or 28.060MHz (further pips 90 and 120kHz up from band-edge can also be detected). Release S1 and S2 and the receiver is accurately tuned to the QRP frequency of your choice.

PW

Fig. 2: Showing the stages in making T1, the turns are spread around the toroid as illustrated. Connections are as follows: A' to Tr3 drain and bottom of R15, A to B', B to R9/R15/C6/D1 junction, C' and C go to chassis and the output respectively.



Clive Hardy G4SLU built the *PW* prototype and comments.

"I built a prototype to an open plan style using the p.c.b. island technique. It's a very quick and reliable method of building circuits. In circuits like this one, where the layout isn't critical, the components can be fitted to the board in a similar layout to the circuit diagram.

Instead of fitting the converter into a box, I have attached a small screen between the oscillators and the operating buttons to minimise hand capacitance effects. Some of the components I have used are different from those used by GM0DHD. The 2N3906s were replaced by BC548s and the 3N200 by a 3N201. This was because I had them readily to hand, and probably any similar components would do the job.

The toroid I used is of unknown origin from my junk box. However, the dimensions of the core suggest that it could be a Fair-Rite 59-61001101. This is also available from Cirkit (Stock no. 55-01101). The important point is that it appears not to be particularly critical what sort of ferrite core is used.

Unlike GM0DHD I couldn't find anyone who stocked crystals of the frequencies required, so I had to have them specially made. This obviously pushed the cost up a bit. The calibrator produces output on the 3.5, 7, 14, 21, & 28MHz bands at the lower band edge, and in 30kHz steps upwards through and beyond the c.w. portion of the band."

G4SLU

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6CM		
5 ELE FIXED	10.0db	£59.95
23CM		
23 ELE FIXED	18.1db	£39.95

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D3WS 10/18/24	£169.00

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PHF-15 You guessed it, the same but on 15m	£19.95
PHF-10 I'll give you one guess	£19.95
AB-5 5 bander 10-80 in one antenna. It works!	£89.95
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LET FLY ON FOUR

The PW Martlet 70MHz FM Transceiver Part 2

Mike Rowe G8JVE describes the major constructional stages of his versatile synthesiser controlled low power f.m. transceiver design. Mike also provides the shopping list for the project

This month I'm going to describe the constructional side of the project. And to help you, (especially if you've gone ahead and built the project from the circuits already published) the PW Martlet may be constructed in sections, each being fully tested before going onto the next.

Once you have bought or made the necessary p.c.b.s (they will be available from the PW PCB Service) the best place to start is to get the synthesiser and voltage controlled oscillators (v.c.o.s) working. Begin by carefully fitting i.c. sockets for IC5, 6, 7 and 8 (**Do not fit these i.c.s yet**) followed by the regulators IC2, 4, 9, and 10. (Don't forget to solder the centre pin to the earth plane and get them round the right way!)

Now fit Tr4, 5, 6, 7 and 8 and all their associated components. These are followed by all the components associated with IC6, 7 and 8.

You should double-check each component to make sure everything is in place. This is particularly important with the polarity of diodes and polarised capacitors.

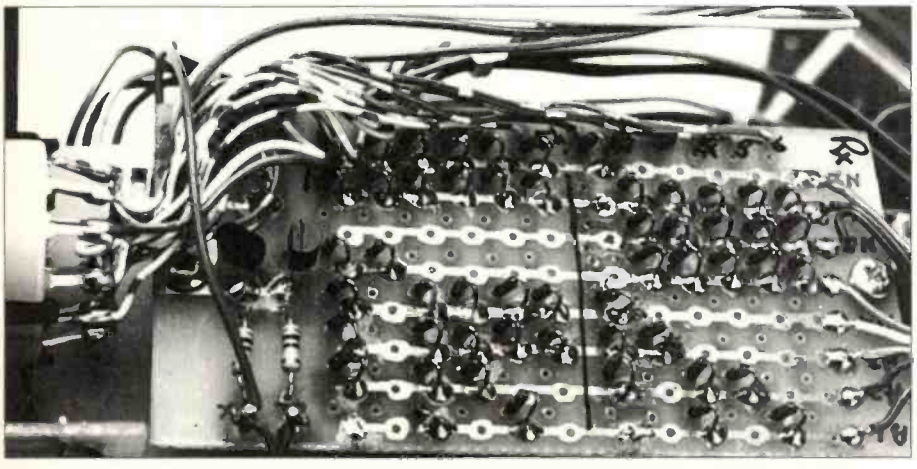
Next, you should fit a 16-way pin header to the synthesiser input pins alongside IC6. At this stage you should check for any short circuits on the supply lines to each section of the synthesiser.

If all is well, you should provide a temporary link between the 13.8V input and the RX +13.8V line. Next, in the socket for IC7, temporarily connect two 10kΩ resistors in series between pin 7 and ground, connecting the junction of these to pin 6. (This will provide 4V to the varicap diodes for the purpose of setting the v.c.o.s).

Now apply 13.8V and loosely connect a frequency counter to the output of the receive v.c.o. Then adjust L7 until the counter reads approximately 80.95MHz.

Synthesiser Chips

Don't worry at this stage if the frequency drifts, this is because the synthesiser chips are not yet in place. And to continue, you should now remove the link from the RX 13.8V line and connect to the TX +13.8V input.



Close-up view of the (prototype) diode matrix board. Mike Rowe G8JVE will provide more information on diode matrix programming techniques in Part 3.

Connect the counter to the TX output and adjust L8 until the frequency is approximately 70.25MHz. Then, using a diode probe, check that there's at least 600mV of r.f. at the input pin to IC8, the prescaler (pin 5). The v.c.o.s should now be approximately on tune.

Next, remove the 2 x 10kΩ resistors from IC7's socket and check that there's 5V on both the prescaler and synthesiser chips. If this is correct, disconnect all power and carefully fit IC6, 7 and 8 (**Double-check these are the right way round, as mistakes will be very costly!**). Finally, make-up a couple of dummy header plugs to fit onto the synthesiser input connector.

For the receive side, connect the following pins to 0V: N9, N7, N6, N5, N2, A4, A3, A2, A1 and A0.

For the transmit side, connect the following pins to 0V: N9, N7, N5, N4, N3, N2, N1, A5, A4, A3, A2, A1 and A0.

These 'dummy headers' will lock the synthesiser to 80.95MHz on receive and 70.25MHz on transmit.

Now reconnect power with both the receive dummy header and the 8V jumper in place. If all is well, the 'lock' light emitting diode (l.e.d.) D12 should be extinguished. If this is the case, measure the voltage on pin 6 of IC7. This should be in the range 1.5 - 6.5V. Now adjust the core of L7 to give a reading of 4V.

Next, remove the header and jumper, and reconnect both the TX 8V and TX dummy header. Adjust L8 for a similar 4V reading.

Connect a frequency counter to the transmit output and adjust C52 to give exactly 70.250MHz. It may be necessary to fit C53 if C52 is fully meshed and the frequency is not correct. Start with 22pF and work upwards until C52 is approximately half meshed.

The synthesiser is now aligned, and apart from minor adjustments (when it's fitted into

the case due to stray capacitance) no further adjustments should be necessary.

Start On Receiver

Now that the synthesiser is working I suggest that you start on the receiver. It's on the same board, and when completed you will have a fully working unit.

Start by fitting all the components taking note of the following: The correct positioning of L2 and L10. In each case L1 and L9 are single turns of thin pvc covered wire wound around the S18 green coils and soldered through the holes provided in the p.c.b.

Capacitor C7 is made from four to five twists of thin pvc covered wire and inserted in the holes provided. Then check that all semiconductors are correctly orientated and all polarised capacitors are correctly placed.

When all the components are fitted, check for short circuits on the supply rails. If everything is in order, connect up the volume control and loudspeaker on temporary wires. Then apply 13.8V to both the synthesiser 13.8V and RX 13.8V pins on the p.c.b.

Next, link the mute defeat switch pin (junction of R73/D11) to 0V. If all is well, noise should now be heard from the loudspeaker. Now you should measure the r.f. voltage on the source of Tr2 (A suitable probe is featured in the October 94 issue of *PW*) and tune L10 for maximum reading.

The next job is to connect a signal generator tuned to 70.250MHz (or get a local amateur to provide a signal source) adjusting L2, L3, L4, T1 and T2 for best signal-to-noise ratio.

Finally, remove the link from the mute defeat pin and check that the squelch control works. The receiver construction stage is now complete.

Building The Transmitter

Now you can start building the transmitter. And I suggest you start off by assembling the transmit driver.

When you wind the coils, use a 5mm drill as a former for the air wound inductors, winding in a clockwise direction. The coil L15 is centre tapped, (the collector of Tr12 is connected with a wire link).

The ferrite cores are wound using 28s.w.g. enamelled copper wire. (Each turn is counted as the wire passes through the centre of the core).

Now you should remove the receiver wiring from the synthesiser board and reconfigure as when you tested the transmitter synthesiser. Next, connect a 50Ω load resistor to the output of the driver board and a coaxial link from the synthesiser board to the input pin.

Moving on, you should apply 13.8V to both boards and tune L11, C101 and 102 on the driver board for maximum power (about

Continued on page 39

Shopping List

Resistors

Carbon film 5% 0.4W

4.7Ω	1	R81
5.1Ω	1	R27
10Ω	1	R3
12Ω	1	R82
33Ω	1	R4
39Ω	5	R5, 6, 11, 69, 78
47Ω	2	R61, 67
100Ω	2	R41, 62
150Ω	5	R12, 51, 59, 68, 72
220Ω	6	R26, 48, 52, 56, 60, 80
470Ω	4	R47, 55, 66, 74, 75
1.0kΩ	3	R20, 34, 77
1.5kΩ	1	R31
2.2kΩ	3	R22, 84, 86
1.8kΩ	2	R13, 16
3.3kΩ	2	R10, 79
3.9kΩ	1	R7
4.7kΩ	2	R88, 89
10kΩ	15	R14, 15, 17, 23, 24, 35, 36, 37, 38, 50, 58, 65, 71, 73, 76
22kΩ	6	R30, 32, 42, 43, 44, 64
33kΩ	8	R1, 2, 8, 45, 49, 53, 57, 70
47kΩ	7	R9, 18, 39, 40, 46, 54, 85
100kΩ	1	R83
220k	1	R19
680kΩ	1	R29

Variable panel mounting

10kΩ	2	R21, 25

Variable miniature preset

500Ω	1	R63
1kΩ	2	R28, 87
4.7kΩ	1	R33 (or use 5kΩ)

Capacitors

Miniature disc ceramic

3.9pF	1	C72
8.2pF	2	C65, 74
18pF	2	C66, 75,
22pF	6	C2, 4, 9, 23, 50, 121
27pF	2	C93, 117
33pF	1	C17
47pF	5	C94, 105, 113, 115, 116
56pF	1	C18
150pF	1	C24
220pF	2	C64, 71
470pF	2	C68, 77
1nF	13	C27, 28, 41, 46, 51, 57, 58, 61, 70, 79, 80, 92, 99
10nF	21	C1, 10, 11, 13, 15, 47, 63, 69, 73, 78, 81, 83, 88, 90, 97, 100, 107, 118, 119, 122, 123

Miniature Polyester

4.7nF	1	C91
47nF	3	C31, 54, 55
0.1µF	24	C6, 14, 16, 20, 21, 22, 25, 29, 37, 38, 40, 49, 67, 76, 82, 84, 85, 86, 89, 95, 98, 108, 110, 120
0.22µF	1	C30

Miniature electrolytic 16/35V working

10µ F	4	C42, 43, 45, 124
100µF	2	C34, 111
220µF	2	C35, 36
470µF	1	C87

Tantalum Electrolytic 16/35V working.

1µF	11	C19, 32, 33, 39, 44, 48, 56, 59, 60, 62, 96
4.7µF	3	C26, 103, 109

Variable

2-25pF	1	C52 (or use a 2-22pF)
6-60pF	6	C101, 102, 104, 106, 112, 114

Capacitors C8 and C12 are contained in the KACS1506A i.f. transformers

Continued on page 39

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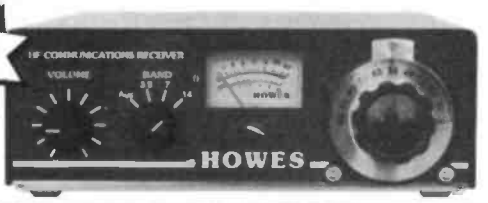

MULTI-BAND SSB/CW RECEIVER

The new **DXR20** covers 20, 40 & 80M bands plus any other HF frequency with optional plug-in modules. The photo shows the receiver built with **DXR20** and **DCS2** ("S meter") kits and **HA20R** hardware pack (case etc.). Excellent performance and compatible with many of our transmitter and accessory kits. Optional bands include 160, 30, 15 & 10 Meters. DXR20 electronics kit: **£39.90**. HA20R hardware pack: **£28.90**

SOME OTHER KIT PROJECTS

Please send an SAE for a catalogue/data sheet or give us a ring to discuss the details of the kits and optional hardware packs. Kits are also available as assembled and tested modules at extra cost. Not all kits are listed!

ACTIVE ANTENNA KITS

AA2	150kHz to 30MHz	£8.90
AA4	25 to 1300MHz Compact	£19.90
AB118	High Performance VHF Airband	£18.80
SPA4	Scanner Pre-amp, 4 to 1300MHz	£15.90

RECEIVER KITS

MW1	Medium Wave + 160M inc. H/W	£29.90
DXR10	10, 12 & 15M SSB/CW	£27.50
TRF3	5.7 to 17MHz TRF	£15.50

TRANSMITTER KITS

CTX40	40M QRP CW inc. crystal	£15.50
CTX80	80M QRP CW inc. crystal	£15.50
AT160	80 & 160M AM/DSB/CW	£39.90
MTX20	20M 10W CW Inc. crystal	£29.90
HTX10	10 & 15M SSB Exciter 50mW	£49.90
HPA10	10 & 15M 10W Power Amp	£39.90

TX TYPE ATU KITS

CTU30	30W HF & 6M with balun	£39.90
CTU150	150W 1.8 to 30MHz	£49.90

ACCESSORY KITS

AP3	Auto Speech Processor	£16.80
MA4	Mic Amp with active filter	£6.20
CM2	Electret Mic with VOGAD	£13.50
CSL4	SSB & CW Filter for DcRx etc.	£10.50
CV100	HF Converter for VHF scanner	£27.50
DCS2	"S Meter" for DC receivers	£10.90
DFD4	Add-on Digital Readout	£49.90
DFD5	Digital Frequency Counter	£54.90
ST2	Side-tone/Practice Oscillator	£9.80
SWB30	SWR/Power indicator/load	£13.90
XM1	Crystal Calibrator LF to UHF	£16.90

HARDWARE PACKS

CA4M	Houses DFD4 and PMB4	£24.90
CA5M	Houses DFD5 and CBA2	£28.90
CA10M	10 & 15M Transceiver H/W	£34.90
CA30M	Houses CTU30/SWB30/ST2	£34.90
CA80M	Houses CW Transceiver	£34.90
HA10R	Houses DXR10 Receiver	£25.90
HA11R	Houses XM1 Crystal Calibrator	£11.90
HA12R	Houses ST2 Side-tone	£10.10
HA30R	Houses CTU30 ATU	£17.90
HA33R	Houses TRF3 SW Receiver	£25.90
HA150R	Houses CTU150 ATU	£16.90

Top Value SWL ATU

The new **HOWES CTU8** SWL ATU covers medium and shortwave bands (500kHz to 30MHz). Increases wanted signals by providing impedance matching, and at the same time reduces spurious signals and interference with "front end" selectivity for the receiver. Kit contains case and all parts. Top value general coverage receiving Antenna Tuning Unit.

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PLEASE ADD £4.00 P&P, or £1.50 P&P for electronics only kits.

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73 from Dave G4KQH, Technical Manager.

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DXR10	10/12/15m DC Rx	£27.50
DXR20	80/40/20m DC Rx	£39.90
DCS2	S Meter for DC receivers	£10.90
TRF3	Shortwave Broadcast Rx	£15.50
MW1	160m & MW TRF Rx	£29.90
ASL5	Rx Audio Filter	£15.90
CTU8	SWL Antenna Tuning Unit	£29.90

Transmitters

CTX	QRP CW Tx for 80 or 40m	£15.50
MTX20	10W 20m CW Tx	£29.90
CVF	VFO for 80/40 or 20m	£11.90
HTX10	SSB/CW exciter 10/15m	£49.90
VF10	VFO for HTX10	£17.90
HPA10	10W PA 20-30MHz	£39.90
AT160	160+80m AM/DSB/CW Tx	£39.90
VF160	VFO for AT160	£17.90
CTU30	HF ATU 30w	£39.90

Antennae

AA2	HF Active Antenna	£8.90
AA4	25-1300Mhz Active Ant.	£19.90
AB118	Active Air Band Antenna	£18.80
SPA4	Rx Pre-amp 4-1300MHz	£15.90

Microphones

AP3	Auto. Speech Processor	£16.80
CM2	Microphone+VOGAD	£13.50
MA4	Mic. Amp + Filter	£6.20

Accessories

ST2	Sidetone/Morse AF Osc.	£9.80
XM1	Crystal Calibrator	£16.90
DFD4	Digital Readout for Rxs	£49.90
DFD5	Digital Freq. Counter	£54.90
CBA2	Buffer for Counters	£5.90

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Yaesu FT7	10W SSB/CW	£275
Mizuho MX3.5	2W SSB/CW	£170
Ten-Tec Argo	515	£275
Mizuho SB2X	144MHz SSB/CW	£125
Ten-Tec Corsair II	+ PSU	£495

Wood and Douglas

FM2T3	Single channel FM Tx 1.5W for 50/70 or 144MHz (no xtal supplied)	£42.30
70FM05T5	Single channel FM Tx 0.5W for 433MHz (no xtal supplied)	£44.95
BPF	Band pass filter 144 or 432	£4.70
PS	PIN RF switch 144 or 432	£14.10
PA4/S	Rx Pre-amp, switched, for 50/70 or 144MHz	£22.95
70PA2/S	Rx Pre-amp, switched, for 432MHz	£25.85
144LIN25B	25W 144MHz linear	£50.53
70LIN3/10E	10W 432MHz linear	£58.25
TB2	1750Hz Toneburst	£5.30
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CWF1	CW Audio Filter	£7.50
SWR1	144/432 SWR detector	£9.99

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WM1 QRP in-line directional Wattmeter. 10W, 1W & 100mW ranges £89.95

KEY1 Curtis 8044ABM Keyer £33.95

Keyer excepted, all Oak Hills kits are complete (Coils wound, boxes drilled and lettered)

Ask for full details of these kits.

LET FLY ON FOUR

Continued from page 37

300 - 600mW). If a power meter is not available, a reading of about 5V with the r.f. probe.

You should be able to adjust the power level using R63 on the synthesiser board. Now disconnect the power.

Return now to the synthesiser board and fit all the components around IC5. Again, take care over polarity and orientation where necessary.

Set R28 (microphone gain) to approximately two thirds rotation and R33 (deviation) to approximately one third rotation. Apply power again and if a monitor receiver is available you should now be able to roughly set the deviation.

Power Amplifier

Finally, you can assemble the transmit power amplifier. The p.a. transistor, Tr13, is mounted on the underside of the p.c.b. But before soldering this in place make the links between the emitter pads and the upper ground plane, soldering both sides.

When soldering the p.a. transistor in place, make sure that the mounting stud is perfectly at right angles to the p.c.b. This avoids any stress when you fit it into the box.

The p.a. stage cannot be tested outside the box. This is because the p.a. transistor needs to have its heatsink attached.

Now make up a screening plate of thin aluminium and drill a 6mm hole in the centre. Next, fit a grommet (to take the p.a. wiring) and drill a similar hole in one end of the p.a. stage box. Then, using the p.c.b.s as templates, drill 3mm holes for the mounting pillars and a suitable hole for the p.a. transistor stud.

There's a little bit of simple 'metal bashing' required now! Begin this stage by making up a rectangular plate of thick (12s.w.g.) aluminium (the same size as the p.a. board) and drill the mounting holes. This should be fitted between the p.a. and the box, using heatsink compound between the plate and the box, forming an additional heatsink for the p.a. transistor.

Next, mount the driver and p.a. boards in the box (the internal screen plate is secured under the driver fixing screws). Take care when tightening the p.a. transistor securing nut not to overtighten it.

Now you should drill a suitable hole for the antenna socket alongside the p.a. board. Fit the socket and wire up, using a short jumper of 22s.w.g. wire.

Continued on page 43

Shopping List (continued)

Semiconductors

1N4001	1	D13
1N4148	10+	D2, 3, 4, 11, 14, 15, 16, 17, 18, 19 (+ those for the diode matrix)
1N5401	1	D8
2N4427	1	Tr12
2N5990	1	TR13
3N201	4	Tr1, 3, 4, 7
7805	1	IC9
7808	3	IC2, 4, 10
BB405	3	D5, 6, 7,
BC108	2	Tr14, 15
BC547	3	Tr10, 16, 17
BF244	1	Tr2
BSX20	5	Tr5, 6, 8, 9, 11
MC3357	1	IC1
MC145152-2	1	IC6
SL6270	1	IC5
SP8793	1	IC8
TDA2002	1	IC3
TL071	1	IC7
l.e.d.s	3	D9, 10, 12

Inductors

100µ H	1	L5
33mH	1	L6
Toko Coils		
MC107 Blue	2	L7, 8
S18 Yellow	1	L10
S18 Green	6	L1, 2, 3, 4, 10, 11
KACS1506A	2	T1, 2

Other inductors

L12, 13, 16, 18, 20, 21, 22 are all 4t of 0.25mm enamelled copper wire (e.c.w.) on FX1115 ferrite beads.

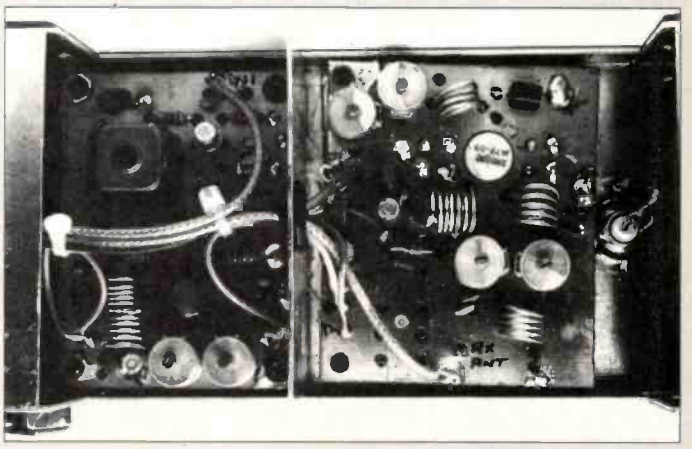
L14, 19	2	4.5 turns 0.5mm e.c.w. close wound on 5mm internal diameter (i.d.)
L15	1	10.5 turns 0.5mm e.c.w. on 5mm i.d. tapped 5t from the 'top end'
L17	1	3.5 turns 0.5mm e.c.w. close wound on 5mm i.d.

Crystals And Filters

455kHz	1	XL2 (ceramic resonator as an alternative)
10.245MHz	1	XL1
12.8MHz	1	XL3
10M15	1	F1 (first i.f. filter)
CFW455G	1	F2 (second i.f. filter)
D455	1	XL2 (455kHz resonator)

Miscellaneous

Ferrite beads (FX1115), small heatsink for IC3, two boxes AB15 and AB9 types (from Maplin Electronics),2.5in 8Ω 1W loudspeaker, microphone, coaxial cable, hookup wire, enamelled copper wire as needed, nuts bolts washers, plugs and sockets as required. One double pole 6-way (Lorlin type) switch, fuse (2A) and holder, and 1N4148 diodes as required for the programming matrix.



Details of driver and p.a. stages in their screened compartment (see text).

In the second part of his look at Electromagnetic Compatibility problems and mobile amateur radio, Richard Ayley G6AKG describes some practical precautions.

The Mobile Menace - Part 2

When the subject of mobile suppression techniques last appeared in *PW* (April 1981), things were very different! It was different both in the equipment fitted to vehicles and the range of suppression components available.

I soon found how much had changed since 1981 in my initial research. When I went to automobile electrical suppliers I found (to my dismay) that there was a very reduced selection of suppression components available.

Not All Bad

However, I'm glad to report that not all is bad news! The mass appeal of in-car Hi-Fi and cellular telephones has led to many changes in EMC standards.

Nowadays, suppression components aren't in such demand because vehicle manufacturers are now supplying cars with a much higher standard of interference suppression. So, the need for specialised suppression components has dried up, (well that's what I was told!).

However, the suppression requirements of our hobby, are in some cases still very demanding. Even with the higher suppression standard on new vehicles.

Help At Hand

Fortunately, help is at hand because if you're willing to connect a few short flying leads (with crimp on connectors) the inductors now stocked by Farnell Electronic Components can be used.

On the other hand, the range of automotive type capacitors is still quite large. The 1, 2 and 3µF value capacitors are readily available from most motor factor suppliers and Electromail.

No Longer Required

Line and the plug cap type of h.t. suppressors are no longer required. This is because of the modern high stability glass fibre carbon impregnated leads and direct replacement resistive spark plugs.

Resistive turret suppressors once fitted on top of distributors are now very difficult to obtain. To some extent they're now obsolete, being replaced with high specification h.t. leads.

A screen installed around the distributor cap can often reduce interference, as can a rotor arm with an integral suppressor fitted. Distributor screens are already fitted on some cars.

However, a screen may be made out of a suitable diameter tin can as shown in **Fig. 1**. Attach it with a hose clip or the mounting lugs shown in the diagram (bent back on themselves) up the inside of the screen to provide a spring fit on the distributor cap.

The screen should then be earthed via a heavy duty earth strap run to the engine block or vehicle chassis. Use which ever route is shorter.

Earthing Straps

Earthing straps are available but expensive. But you can make them by stripping UR67 coaxial cable and then removing the inner conductor.

To make a temporary earth strap for remedial work, add a large crocodile clip to each end of a 300mm length of braid. Large crocodile clips are available from most component suppliers.

Alternator Whine

Alternator whine is the second most common form of interference. This can be reduced to an acceptable level by connecting a 3µF capacitor between the alternator chassis and the large heavy current output terminal of the machine. **Do not attempt to connect it to any other terminals.**

Permanent Magnet Motors

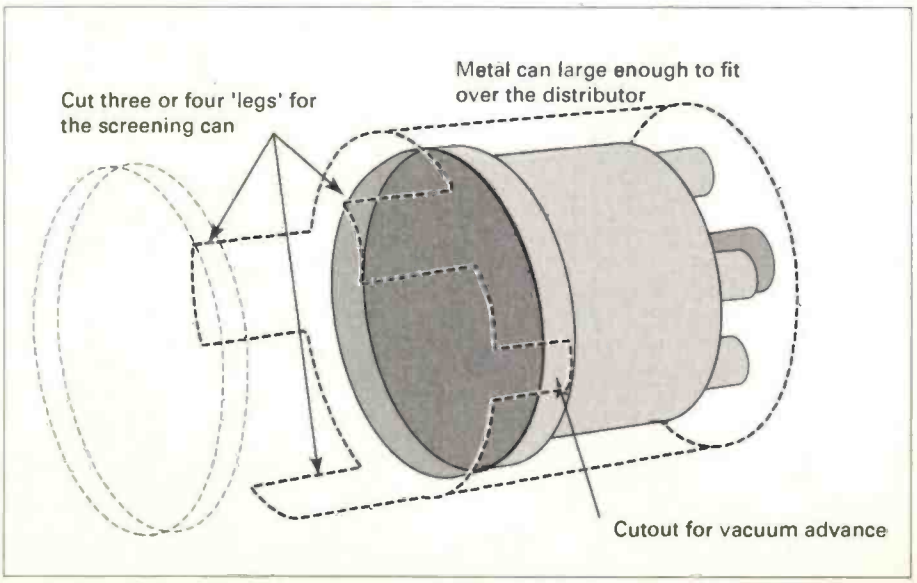
Permanent magnet d.c. motors are used in all manner of accessories including pumps, fans and wipers, to mention only a few. Their suppression is very easy as shown in **Figs. 2** and **3**.

All suppression components should be mounted as close as possible to the motor with short interconnecting leads. The earth connections should be made to bare metal surfaces under existing fixing bolts.

Wiper motor suppression is a little more involved, particularly if they're a dual speed type. This motor interference is characterised by a rhythmic whining noise punctuated with a sharp crack (caused by the back contacts in the mechanism, used for regenerative braking).

All the wiper motor supply leads should be fitted with an 8A 47µH inductor. With the

Fig. 1: Making an electrical screen for a car ignition system (see text).



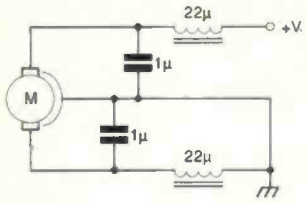


Fig. 2: Interference suppression for permanent magnet accessory motor (see text).

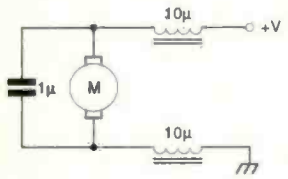


Fig. 3: Alternative circuit for interference suppression (see text).

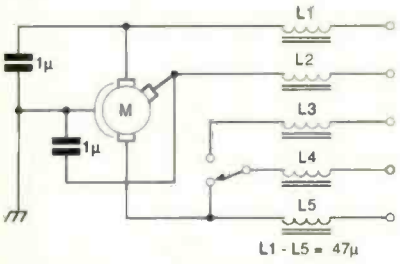


Fig. 4: Supression circuit for windscreen wiper motor interference (see text).

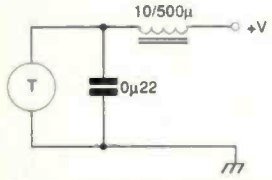


Fig. 5: Supression circuit for fuel tank transducer (see text).

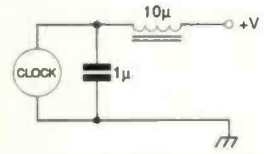


Fig. 6: Circuit for vehicle clocks, suitable for analogue or digital types (see text).

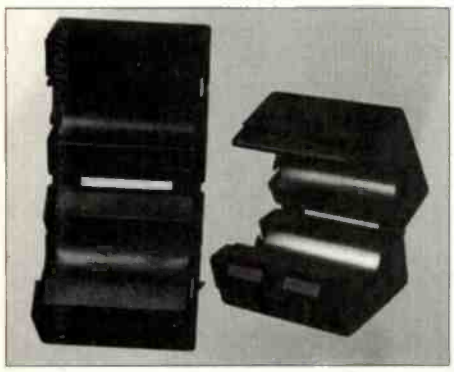


Fig. 7: Typical 'clip on' type of ferrite bead, suitable for interference suppression above 70MHz (see text).

dual speed types, five inductors are needed, as shown in **Fig. 4. Note that most accessory motors will be on vibration mounts, so an earth braid will need to be connected between the motor body and the vehicle chassis.**

Brake Lights

Brake light switches often generate interference. However, this can easily be cured by connecting a 1µF capacitor, close up to the switch, between its supply side and the vehicle chassis.

The brake (or 'stop' light) switches are often located near the foot pedal assembly or just under the braking hydraulic reservoir in the engine compartment.

Transducer Problems

The fuel tank transducer, and those employed for temperature instrumentation can be a source of problems. Tank transducer noise is often most noticeable when the vehicle is moving over an uneven surface. Fortunately, both types of transducer may be suppressed as shown in **Fig. 5**.

Car Clocks

Car clocks come in two types, digital and analogue. Both are constant noise sources with the ignition switched off and can be suppressed as shown in **Fig. 6**. The suppression components should be mounted as close as possible to the instrument supply input terminals.

Static Discharge

Static discharge is caused by the build up of static electricity on the external surface of the vehicle. This produces an irregular ticking noise as a discharge occurs to the road via the tyres.

Usually, the discharge will only be noted during long dry spells. However, most problems can be overcome by fitting a trailing earth tape, like those sold to (supposedly!) help with travel sickness.

The trailing earth only works if the tape is mounted directly to an electrically conductive section of the chassis. The alternative is to pulverise a graphite artist's stick, adding the powder to the interior of the tyre when it's being fitted.

Older Devices

You'll have realised that I have deliberately left out some of the older devices. These include electromechanical trafficator units (the old 'semaphore' type) voltage stabiliser and dynamo regulators, which must be quite rare now.

However, if you require suppression information regarding the older devices, you should refer to the 'Mobile Operating' chapter in (Volume 2) of the RSGB's *Radio Communication Handbook*, 5th Edition.

Although now out of print, the 5th Edition still provides an excellent reference work on vehicle suppression. Fortunately it can still be found in many local reference libraries.

Several years ago I reviewed one of the new generation high powered dual-band mobile transceivers. It had 50 and 45W outputs respectively on 144 and 430MHz. That's when I realised how susceptible my vehicle was to stray radiated r.f. fields!

During transmissions the indicators stopped flashing and the engine temperature and fuel gauges over-read. Fortunately my vehicle has a conventional ignition system with mechanical 'points', so nothing more serious happened.

The antenna I was using was as well matched as it could be, being an 'on glass type'. However, a 'sniff' round with a wavemeter soon revealed a large radiated field from the antenna feeder.

Courses of Action

When you're faced with r.f. immunity problems there are several courses of action that you can take. And as I've already mentioned, to start the process it's imperative that your antenna is well matched to the transmitter and has a good ground plane.

The location of the antenna and its feeder is usually dictated by the physical layout of the vehicle. It usually doesn't leave much room for experimentation, but it may be worth trying.

If you find adjusting the antenna installation doesn't help, you might try reducing the output power of the transceiver. Although this may not be acceptable if you bought the rig for its high power transmitter specification!

Last Option

The last option is to try and r.f. 'harden' the effected equipment. I've deliberately left this option to last because the subject is entangled with problems to do with warranty, safety and insurance. So, before you start modifications I suggest that you contact the vehicle manufacturer.

Main dealers are often aware of some problems. They may be able to recommended a manufacturer's approved modification or even an r.f. hardened replacement component.

Most electronic packages in vehicles are in a semi-screened or unscreened plastics enclosure. So it may be possible that a direct r.f. field is effecting the equipment.

It's unlikely however, that improving the screening around the affected equipment will help on its own. That's because much of the effecting r.f. field may be carried (to some extent) up the wiring harness connecting the equipment package to the vehicle.

The unwanted r.f. energy must be effectively blocked on both radiated and

conducted routes, at the periphery of the equipment. If it's not, then neither technique will provide a significant improvement in immunity.

Screening And Blocking

You can improve equipment screening, and blocking of conducted r.f. energy with clip-on ferrite beads, as in **Fig. 7**. And in fact, this is the only type of modification that I would personally recommend.

The 'clip on' approach does not involve modifying any of the actual electronics. Unfortunately however, due to low inductance the technique is only suitable for frequencies above 70MHz.

Screening covers may be constructed in several ways. You can use either cardboard covered with cooking foil glued with contact adhesive, or from tinplate recycled from a large coffee tin (**take care in cutting the 'tinplate', as it can have very sharp edges**).

If the electronics package is bulkhead mounted, the screening can could be earthed via suitable lugs using the mounting bolts. However, if this is not possible a connection between the can and vehicle chassis should be made via a short length of braid.

Ferrite Beads

Clip-on ferrite beads are available from Maplin Electronics. They're primarily sold for attenuating v.h.f. conducted emissions on external computer wiring.

However, for our purpose ferrite beads may be used to good effect by clipping them on the cable looms close up to any r.f. sensitive electronic equipment. The combination of an overall screen and clip-on ferrites, will in most cases help to increase the r.f. immunity of the equipment.

Important warning: Please remember, that when you're working on vehicle electrics - disconnect the battery. This is because one short circuit could write off the whole wiring loom and if a fire breaks out, the whole vehicle!

The Diagnosis

I have left the diagnosis of immunity problems to you. This is because each make of vehicle is so different in its physical layout of the electronic equipment although in modern cars most of the engine systems will be in one box in the engine compartment.

The accessories electronics including timers, indicators and alike will be located in the driving compartment. And the instrument voltage regulators (which if effected) may cause gauges to over or under-read, will in some cases be mounted behind the instrument panel.

Final Advice

My final advice to you on the matter of equipment location and system identification is to buy a Haynes workshop manual on the vehicle in question. The section on electrical systems and the fitting of in-car entertainment equipment will prove a very useful guide. (Incidentally, most electronic equipment controllers are shown in automobile circuit diagrams as a box with a transistor symbol in it).

Well, there you have it - the G6AKG approach to taming EMC problems. I wish you good hunting and the best of luck in tracking down and defeating the 'mobile menace'!

PW

Suppliers Who Can Help

Farnell Electronic Components, Canal Road, Leeds, West Yorkshire LS12 2TU. Tel: (01532) 636311.

Electromail, PO Box 33, Corby, Northamptonshire NN17 9EL. Tel: (01536) 204555.

Maplin Electronic Supplies, PO Box 777, Rayleigh, Essex SS6 8LU. Tel: (01702) 554171.

Lucas Automotive Ltd. for: Lucas Silicone Speedleads, and Factored HT leads for all makes of vehicle. See your local telephone area Yellow Pages for your nearest branch.

LET FLY ON FOUR

Continued from page 43

Wiring Up Transmit

You can now start wiring up the transmit assembly using miniature coaxial cable for the TX input and RX antenna leads. Connect a power meter to the antenna socket and tune C104, 106, 112, and 114 for maximum power.

The whole p.a. stage unit may now be fitted into the rear of the main case. It's necessary that clearance holes are drilled around the antenna socket, p.a. stud and board mounting screws.

The p.a. unit is secured using two small self-tapping screws. Using this method allows the p.a. stage to be removed intact should future work on it be necessary.

Main Box Assembly

The main box assembly should now be tackled. Drill the front panel and make up the loudspeaker bezel, the front controls, microphone socket and loudspeaker can be fitted.

Using the p.c.b. as a template, mount the synthesiser board into the main box as far forward as possible. This is to allow the p.a. to be removed if necessary.

Next, wire up the p.a. to the main board and the leads from the front panel to the main board. You should now have a fully operationable 70MHz transceiver (albeit still on 70.250MHz!).

Matrix Board

The diode matrix board should be tackled next, providing the Martlet with six channels on transmit and receive. And to start, fit the components shown, leaving the actual matrix blank for the time being.

When you've decided upon your channels, fit the programming diodes. In each case the anode of the diode goes to the p.c.b. track going to the address lines on the synthesiser.

The whole diode matrix unit may now be wired (externally) to the main p.c.b. But make sure that the TX and RX 'commons' go to the correct connections on the p.c.b. (On the prototype I used a 16-way socket on the end of the address line wiring, so that the unit may be removed if required as a whole.

The following pins on the socket should be connected to 0V:- N9, N7, N5, A0. This should leave N8 open circuit (the internal pull up resistor will ensure this pin is high).

To Finish Off

When you're ready to finish off the construction stages, melt some candle wax around the oscillator section of the voltage controlled oscillators (v.c.o.s). This will prevent any microphony which may be present due to the slight movement of the components with respect to the ground plane.

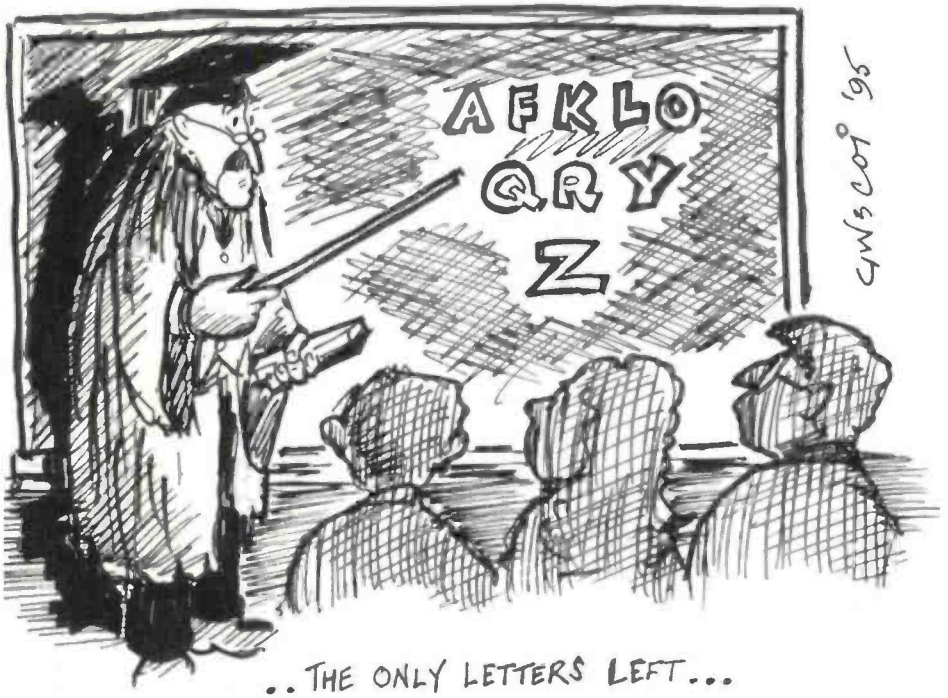
Finally, you'll be able to insert the components into the d.c. input and front panel l.e.d. stages and wire up to the main board. That will then complete the main construction stage.

To round off this time, I've provided the shopping list so you can order what's needed. Next time, I will be providing the major p.c.b. designs and associated component overlays.

PW

A Further Touch o

Patrick Allely GW3KJW delves deep once again to unravel the mysteries of amateur licence callsigns.



Do you realise that due to our wonderful allocation of callsign prefixes, the only letters left in the alphabet are A, F, K, L, O, Q, R, Y and Z? This leaves just nine letters out of 26. So, what has happened to the other 17, and how could so many be used?

As previously explained in my article 'A Touch Of Class' (Feb '94 *PW*), with Class A and B licences, the first letter of the prefix which is G, signifies the United Kingdom. And the individual country within the UK is indicated by the second letter, with the exception of England which, for some unaccountable reason, is missing a second letter. (I'll bet somebody in England is saying, 'Why should G stations have a second letter?'). We have now used D, G, I, J, M, U and W.

At one time, the second letter C was used to signify all of the Channel Islands, but this was changed to differentiate between Jersey - J, and the others - U.

So far this makes some sort of sense, if not logic. But the mandarins in the DTI have worked other wonders. The letter B is allocated to Special Stations, which are used as Repeaters, Beacons, official RSGB Broadcast stations (GB2RS), official slow Morse transmissions (GB2CW), data repeaters and data mailboxes (GB7). And of course, the many Special Event Stations which delight in making an acronym out of their callsign. So, the letter B has now been used.

Silver Jubilee

In June 1977, to celebrate the Queen's Silver Jubilee, all UK amateurs were granted the prefix GE for that month, but the E has subsequently been re-allocated. From June 30 to July 8 1979, the prefix GT was used in place of GD to commemorate the Millennium of the Isle of Man. The letter T has now been re-allocated as part of a club prefix for that island.

We as amateurs are nothing if not subtle. In May 1985 to commemorate Victory in Europe in 1945, we were allowed to use the prefix GV for a few days. This prefix was subject to a Notice of Variation of callsign and did not prove to be popular among UK amateurs. I do not think that certain of our NATO allies were enamoured with the concept. So, farewell to E, T and V.

The next manipulation of callsign prefixes came with the introduction of Club Callsigns. These provided a means whereby a club could operate a special event without a time restriction and without the need to pay a fee. Naturally the second letter of the prefix had to be changed, though why I don't know, and so came the letters, C - Wales, H - Jersey, N - Northern Ireland, P - Guernsey, S - Scotland, T - Isle of Man and X - England, (they couldn't get away with it this time!)

Why these particular letters were allocated is a mystery to me, but someone must have had the task of sorting it out. I bet they did it as an afterthought, the day following the office party! So, there goes C, H, N, P, S and X.

Novice Licence

'What about Novices?' I hear you ask. Well, this posed a problem. There was a great misconception that a Novice licence was a new thing, unique to these shores, and another way of getting on the air.

Let me enlighten you. For a start I do not like the word 'Novice'. My dictionary defines a Novice as an inexperienced beginner, which begs the question, what is the term for an experienced beginner?

Be that as it may, I repeat, the Novice system is not a new idea. In the first days of radio, experimenters went on the air without callsigns and no legislation existed to control or regulate them.

But quickly the experimenters were forced to take up callsigns which had to contain the letter X to denote experimental, and to differentiate them from the commercial stations. So you would have a callsign like 2DX, an experimenter (or newcomer), as opposed to 2LO, a proper commercial station.

Prior to the Second World War, a system of Novice licensing existed whereby, certain non-fully qualified radio amateurs were only allowed to transmit into artificial antennas (dummy loads). This practice continued until the outbreak of war when all transmitting was banned, but these 'aa' licensees were issued with full licences when amateur radio resumed after the war.

f Class

Next Class

It was after the war that the next class of Novice licence was introduced. This form of licensing was more discreet, and it was impossible to tell if a person had a full licence or not simply by the callsign.

The system worked this way. A person passed the RAE and the c.w. exam, applied for, and was granted a licence which allowed operation on all the amateur bands, **BUT** the power input was limited to 25W and stipulated c.w. only for the first 12 months.

The purpose of the restriction was, to quote the correspondence I received at the time, 'The types of emission are restricted to those shown in the schedule to the licence. The object of the restriction, which will apply for an initial period of at least twelve months, is to ensure that you maintain proficiency in Morse telegraphy and become familiar with amateur operating procedure before other types of emission are authorised, so as to minimise the possibility of causing interference to the working of fellow amateurs and other wireless stations.

If, towards the end of the probationary period of 12 months, (say two weeks before the licence renewal date), you wish to apply for permission to use telephony on all frequencies, you should submit with your application your station log as evidence that you have gained experience by regularly working with other amateur stations on telegraphy. In the absence of evidence of working experience, use of telephony on all frequencies cannot be authorised'.

The restrictions were lifted in the late 1950s, and some may think that it should have remained. I for one do not think that it was such a bad idea.

Restricted Operating

I suppose that the introduction of Class B licences in 1964, was a form of Novice Licence, initially restricting such amateurs to operate on 430MHz and above, in fact giving them the allocation they had requested when the idea was first suggested.

But I doubt these days, if Class B operators can be termed Novice. And I am certain that they rightly do not consider themselves as such.

The term, Novice, is now used exclusively about the new breed of radio amateurs who came into force in 1991. These are radio amateurs who have studied for and passed the Amateur Radio (Novice) Licence A or B.

The authorities, in this case the Radio Communications Agency, influenced by well meaning radio amateurs, muddled through a 'mish-mash' idea to bring new, and hopefully young persons into the world of amateur radio. That the scheme took off and was accepted is a triumph of enthusiasm over logic, **BUT** how were callsigns to be allocated?

It's my belief that a committee thought up the callsign system, no one man (or woman) could be solely responsible for what happened. For a start, Novices were split into two groups, dependent on passing a c.w. exam.

Class A Novices would have a callsign beginning with the number 2, followed by a character dependent on country of residence, followed by the number 0, followed by three letters.

A Class B Novice callsign begins with the number 2, followed by a character followed by the number 1, followed by three letters. Nothing could be easier could it?

The secondary regional locators are identical to those of the full series with the exception of England, which for the Novice is the letter E. (Why is it different for the English?). So, the hypothetical callsign 2E0NOV would signify a Novice Class A licensee based in England. Whilst the callsign 2M1MAC would indicate a Novice Class B licensee based in Scotland. 'Another fine mess you've got me into Stanley', seems to be the quotation I was seeking!

Callsign Sequence

The next sequence of callsigns has already been decided, in the case of full Class B licences. The G5 plus three letters will be used, and for full Class A licences, the M series will be used.

The Novice series should last for years to come. But with the proliferation of peculiar and one-off callsigns heard around the bands, especially during h.f. contests, I feel that I might have many more unusual UK prefixes to consider and to delight my fevered imagination!

PW

Specifications – The Mysteries Explained

Ian Poole G3YWX continues with his look at the effects of strong signals on receivers.

Over the last couple of months I have been taking a look at some of the effects that strong signals can have on receivers. This month I am going to investigate two more. The first of these is known as blocking.

What Is Blocking?

From its name, blocking, it's possible to imagine that a very strong signal can 'block' the front-end of the receiver preventing other signals from getting through. The effect can be heard when a nearby transmitter comes on the air.

Blocking is likely to be particularly noticeable at rallies where there are many people wandering around with hand-held transceivers and some who may be transmitting only a few yards away. At other times it may be noticed when a local radio amateur with a very strong signal comes up on the air and his transmission causes your receiver to become less sensitive. Even the noise level will fall when he transmits.

Blocking occurs as a very strong signal enters the receiver front-end and causes the amplifier to run into compression. When this happens, it has the effect of reducing the levels of all the other signals passing through the receiver, **Fig. 1**.

The action of blocking is exactly the same as the capture effect which is associated with f.m. signals. As the i.f stages or demodulator are run into compression, **Fig. 2.** to remove any amplitude noise, it's found that the strongest signal will 'capture' the receiver by (in effect) over-riding weaker signals.

Other signals that are on channel will be reduced or not heard. This can be very valuable because it helps reduce interference from other signals which are on channel.

It normally takes a very strong signal to cause any noticeable level of blocking on a receiver and should not be experienced under most conditions. However, when it does occur it can be very annoying.

Dependent Factors

The amount of blocking that occurs is dependent upon a number of factors. The first and most obvious is the level of the incoming signal.

Another factor is the frequency offset from the channel which is being monitored. The further away, in frequency, the strong signal is, the less its effect. This is because the selectivity, particularly in the front-end stages, will reduce the level of the strong signal more if it's further away from the wanted channel.

In view of the variables, blocking is generally specified as the level of the unwanted signal at a given offset (normally 20kHz), which gives a 3dB reduction in gain. A good receiver should be able to withstand signals of more than about 10mW before this starts to happen.

Cross Modulation

Another effect which can be noticed when there are strong signals on the band is cross modulation. Although this specification is not quoted as much as it used to be, it is nevertheless still important in many circumstances.

When cross modulation occurs it's found that modulation from a strong signal can be heard on other signals close by. In fact it's particularly noticeable when a.m. signals are being received

Cross modulation is a third order effect and is usually caused by poor front-end or mixer performance. It's also found that a receiver with a good third order intercept point is likely to have a good cross modulation performance.

To specify the cross modulation performance the effect of a strong a.m. carrier with a known level of modulation is noted on the smaller wanted signal. The specification may appear rather complicated as a number of figures are involved.

First the level and amount of modulation of the strong signal must be known. Also the level of the wanted signal and the frequency difference must be known. The frequency difference is important because the level of cross modulation will fall as the frequency difference increases and the front-end selectivity reduces the level of the strong signal seen by the amplifiers.

Generally the level of a strong carrier with 30% modulation needed to produce an output 20dB below that produced by the wanted signal. The wanted signal level also has to be specified and 1mV or -53dBm (i.e. a signal 53dB below 1mW) is often taken as standard, together with an offset frequency of 20kHz.

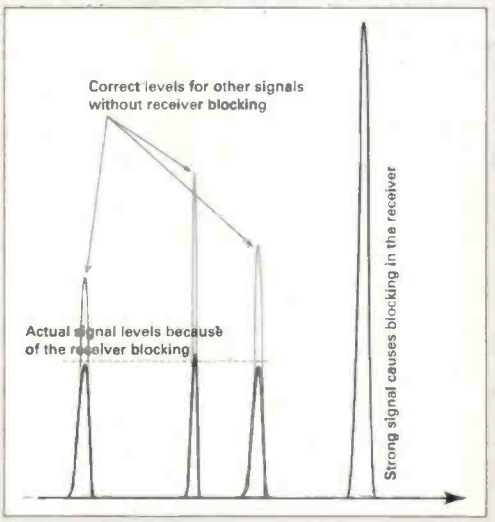


Fig. 1: Spectrum of amplifier output illustrating the dramatic effect of a strong signal on other signals (nearby in frequency terms). The De-Sensitising effect is one of the most noticeable results of 'Blocking' (see text).

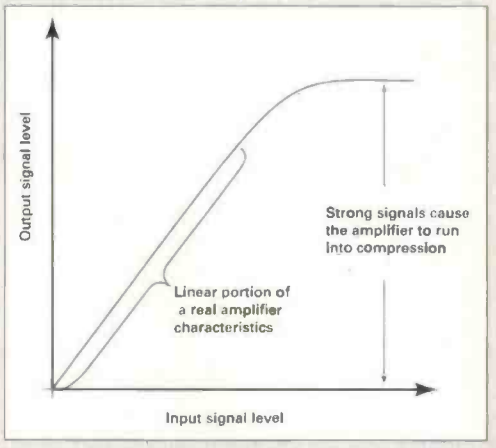


Fig. 2: Illustrating the 'Capture' effect (see text).

That's all for this month, so until next time, cheerio and please keep sending in your mysteries for me to try and solve.

Antenna Wo

In Spring a young man's (and hopefully woman's) fancy turns to thoughts of antennas. So here are some ideas to play with.

My last excursion in this column praised the virtues of using open wire feeders for home-made antennas. Since then, I have been pleased to read the words of Jim Thompson W4THU, of the antenna manufacturing company, 'The Radio Works'.

Jim W4THU said "Switching to open-wire or ladder-line can not only reduce system losses but can also give you multi-band performance from most antennas". (From *Low Power Communications Volume 2*, Editor Richard Arland K7YHA).

Spreaders Available

Commercially made spreaders for open wire feeders and slotted twin feeders are both available from W. Westlake, and some other companies. But I think the true radio amateur should really do things for him, or herself.

Making open wire feed-line is quite easy. It only requires a lot of cheap, pvc covered, stranded wire and some spreaders to space the wires. The spreaders can be of any lightweight material with good insulation properties.

One of my favourites for making reliable, long lasting, open feeders is the use of slide binder spines. The 'V'-shaped slide-on spines, normally used for binding small collections of papers. The spines are available, in reasonably priced boxes of 50 or 100, at most stationery suppliers. They may be cut very easily, with a small hacksaw, into pieces approximately 50mm long.

The cut to length pieces should have holes, some 40mm, apart drilled near the ends. The distance I've suggested isn't very critical: see how many you can get out of one spine.

The completed appearance of the feeder line is shown in **Fig. 1**. The wires are fed through the holes and can be secured with a spot of general purpose glue. The number of spacers required depends upon the 'run' of the feeder line.

When running in a straight line, one spacer every 300mm is enough. If the line has to be curved around bends, extra spacers will be required to keep the wires reasonably parallel.

I ran a long open wire feeder based on this system for over five years without any problems. A couple of hours work was sufficient to provide a long lasting, low loss antenna feed system. Not a bad investment in time!

Designed For Unbalanced

Most antenna tuning units are designed for unbalanced input and output. This is not a problem if feeding either a coaxial line, or an end fed wire loaded against ground.

However, what's required is some way of transforming the unbalanced input into a balanced line output with a special transformer. In short, this **bal**anced to **un**balanced transformer system is usually called a balun.

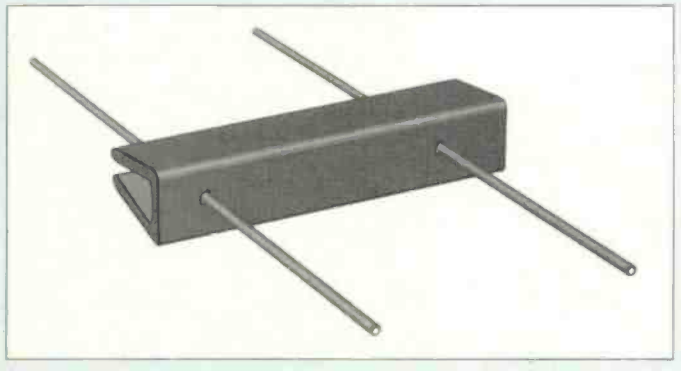


Fig. 1: A spacer made from a section of spine binder (see text).

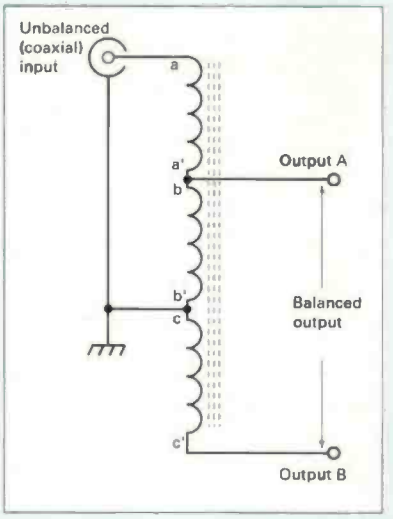


Fig. 2: The theoretical circuit of a balun with equal input and output impedances.

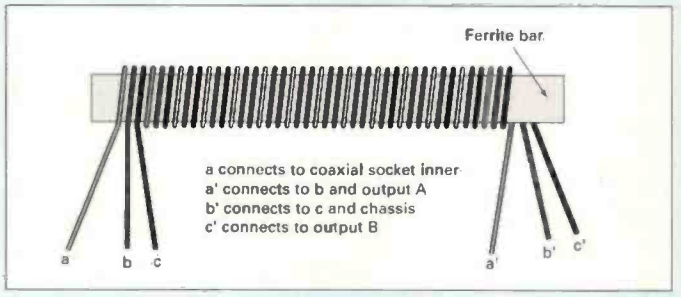


Fig. 3: One implementation of the circuit shown in Fig. 2.

Baluns are about the cheapest, and easiest, amateur radio accessory to make. There are many designs around, but the circuit, **Fig. 2**, shows a version that I have used for many years to connect open wire feeders to the unbalanced output of an a.t.u. Using scrap materials they take about five minutes to make.

The drawing, **Fig. 3**, shows the trifiliar wound transformer that is so easy to make. There is nothing complicated about such transformers, the constructor just has to avoid 'getting the ends mixed up'.

Baluns may be wound on toroidal cores. However, this makes them more difficult to wind. My version uses a piece of scrap ferrite rod taken from an old transistor radio. The diameter and length of the rod are not very critical.

A length of about 80mm is more than adequate. If the rod is too long, I've found a good and easy way to cleanly break them. To start, all you do is file a notch in the rod at the right distance from the end.

Next put the notch in the rod over the corner of a bench, and press firmly down on the rod while it's on the bench. A smart tap downwards on the free end of the rod, with your hand or a soft faced hammer, should result in a clean break at the notch.

Wire Gauge

The wire gauge used in the windings isn't critical. But try to use a wire with 0.5mm, or greater, diameter.

Cut three pieces of the wire about 500mm long. The windings, shown side-by-side are wound onto the rod as if they are one piece of (flat) wire.

Another refinement is to twist the wires together before winding them onto the ferrite rod. Place the wires together, wrap three of the ends together with pvc tape and then twist the wires.

rkshop

The Rev. George Dobbs G3RJV says as it's spring, here's his suggestions what to do.....giving more simple practical antenna advice.

Aim to get about three to four twists per centimetre along the length of the wires. When finished, it looks a little like a thin barley sugar stick - or perhaps you don't remember barley sugar sticks!

The windings on the ferrite rod may be secured with model makers cement. I prefer to use beeswax melted on a soldering iron tip and wiped across the turns.

The connections for the wires are shown as a-a', b-b' and c-c' (important: see **Figs. 2** and **3** for designation) representing the beginnings and endings of each winding. Check these with the ohms range on a multimeter and take care to connect them as shown.

The completed balun ought to be supported away from any metal case on the a.t.u. In practice it's probably best mounted in a small plastics box with suitable connectors.

The keen open wire feeder antenna user will probably want to use an antenna tuner specifically designed for the purpose. Adding a balun adds losses to the system. And the last time you joined me in my 'Antenna Workshop', I suggested the Z-Match a.t.u. for this purpose.

Simple Tuner

Another simple open feeder antenna tuner is shown in **Fig. 4.** This is an old idea, of which there have been many versions. My favourite is the 'Classic Tuner' suggested by C.F. Rockey W9SCH.

Band (MHz)	Turns L1a	Turns L1	Diameter of former
1.8	5	50	55mm
3.5	3	25	55mm
7/10	2	10	55mm
21	2	5	55mm
24/28	1	5	15mm

Table 1: Suitable start points for the coils for the balanced a.t.u. shown in Fig. 2. Some experimentation may be needed for best results.

The 'Classic Tuner' requires plug-in coils for the various h.f. bands. Its other delight is that it can be built entirely from scrap materials.

The tuner uses two variable capacitors, C1 and C2, which are old airspaced capacitors taken from surplus valved radios. These 'rescued' capacitors usually have a maximum value of 200 - 500pF.

The larger coils may be wound on offcuts of plastics plumbing pipes. The smaller coils may be wound on plastics electrical conduit pipe. Switch S1 is a large double pole, change-over, toggle switch.

The coils are wound using pvc covered single strand, hook-up wire. There's not much that's very critical about this tuner, so some experimentation with the numbers of turns is in order.

You may find one coil covers more than one band. But the link winding, L2, must be wound over the centre of L1. See **Table 1** for more information about the coils.

In my version I use 4mm plugs on the end of each wire fitting into sockets mounted on a wooden base. To me it looks like amateur radio!

Note that C1 is not connected to ground and has live r.f. on both sides, including the metal control shaft. So don't connect it directly to a metal case, mount it on a plastics or wood base.

Put a piece of tape, or blob of wax over the grub screw in the knob on C1. Or (preferably) you should use an insulating extension shaft.

The tuner I've assembled, offers series or parallel tuning to cover a range of antennas. If the antenna is of low impedance (tens of ohms or less) use the series position.

If the antenna has a high impedance (hundreds of ohms) use the parallel position. If you don't know - try them both to see which works.

The best rule of thumb tune up is to set C1 about half way out and peak C2 for the strongest received signals. You then adjust C1 and C2 for best transmitting results.

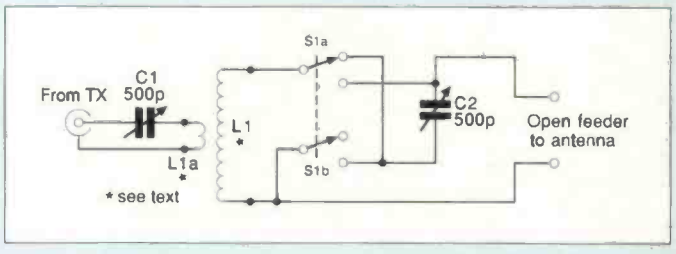


Fig. 4: The circuit of an a.t.u. with a balanced output. Details of the coils are given in Table 1.

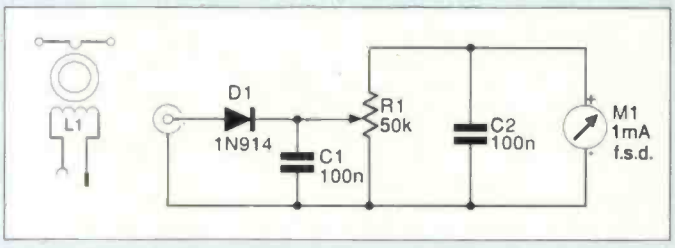


Fig. 5: A variable sensitivity meter. The 'sniffer' head is shown inset. The primary of the transformer is just the feeder wire passing through the centre of the toroid making a single turn.

There are far more complex open feeder tuners, with the best types tuning each feed line. They can have four tuning controls and inductors for every band. The complex models are better, and to say the least, fun to use. But the simple little tuner I've described gives a good account of itself in almost every application in which open feeders are used.

Tuning Aid

Most radio amateurs use an s.w.r. meter (or more correctly v.s.w.r. meter) as a tuning aid for their antennas. And I think that the amateur radio world is full of truth, half truth and mythology about s.w.r. ratios and antenna matching!

In earlier days, most amateurs just tuned for 'maximum smoke up the stack'. Very often this involved connecting a light bulb in the antenna feed line and tuning for the maximum brightness.

The maximum smoke method was nice and simple, but sadly, precious r.f. power was lost lighting the bulb. Another way to detect maximum output is to have an r.f. 'sniffer' which can detect signals in the feeder.

Such a 'sniffer' circuit is shown in **Fig. 5.** An inductor transformer picks up the r.f. current in the feeder line. A diode, D1, produces a d.c. voltage fed via R1 to M1. The resistor R1 is made adjustable to allow for a range of power and versions of L1. The two capacitors C1 and C2 decouple stray r.f. signal.

The single turn primary current transformer is open to experimentation. For about 5W output power, I use about 8-10 turns of insulated wire on a ferrite toroid of about 10-15mm diameter.

Surplus toroids are usually fine for this application as most of them are ferrite. If you have to buy a toroid then the FT50-61 or the FT37-61 serve the purpose well. The winding can use pvc covered single strand wire, or for smaller toroids, enamelled wire.

Again, there's not much critical here and what a splendid little tune-up aid it makes! Have fun with your open wire feeder system!

PW

Valve & Vintage

Fig. 1: The Canadian 52 set receiver section owned by John Hoare G8PKN (see text).

Ron Ham welcomes you into the warmth of the 'V&V' wireless 'shop' where he's discussing war surplus, military equipment and the famous series of 'Red' valves produced by Mullard.

Last year we remembered D-Day and this year we commemorate the 50th anniversary of VE (Victory Europe) and VJ (Victory Japan) Days.

In other words, 1945 saw the end of the Second World War and the mass-production of wireless equipment for the armed forces. And, very soon after the war, the surplus equipment was sold for scrap.

Much of the wide range of transmitters, receivers and accessories, which had been specifically built for all three services sold as surplus. Many were purchased by radio enthusiasts.

In fact many of us in those days looked forward to the next issue of *Practical Wireless* and *Wireless World* to see what the advertisers had to offer. Very soon the magazine editors were running articles about modifying ex-government radio gear for civilian use.

It was then that we first met the EF50, a Mullard Red-E valve under its RAF number VR91. This very important valve, used in radar and v.h.f. sets, appeared in the front-end and i.f. stages of the early post-war television receivers.

New Designs

Toward the end of hostilities new designs of radio communications equipment were being introduced to the army. Among them were the Canadian WS52 and the British WS62.

Both the well known 52 and 62 sets are transmitters and receivers. The 52 is large and was used for base-station work while the 62 was intended for mobile or field work.

Judging by the cradle on top of the case, the 62 could be back-packed. Two of our readers, **John Hoare G8PKN** (Wantage, Berkshire) and **Chris Rees G3TUX** (Haslemere, Surrey) kindly sent photographs of these sets in their collections.

Fig. 2: Chris Rees G3TUX (left) with his friend Horst Lange DF8TK, with 62 set in background (see text).

John has the receiver section only of the 52, **Fig. 1**, and Chris has a 62 which, in **Fig. 2**, he is showing to **Horst Lange DF8TK**. Horst (seated right) comes from Haslemere's twin-town, Horb, on the fringes of the Black Forest.

Horst and Chris have regular skeds on the amateur bands. Chris is a member of the Military Wireless Amateur Radio Society. Last May, Chris tells me that his 62 set featured in a D-Day exhibition staged by the Milford-on-Sea Historical Society.

Rare Teleprinter

I wonder if Horst is familiar with the Wehrmacht teleprinter, **Fig. 3**, which I saw displayed at the Vintage Wireless Day (Amberley Museum) by **Richard Brett-Knowles** (Havant, Hampshire) last September.

The Feldfernschreiber pictured was built in 1943 and runs from a 12V d.c. supply. A pair of communications lines are connected to the terminals at the top right and the 12V supply is plugged in to the socket lower down.

The paper tape reader is below the motor-generator at the bottom left of the cabinet. The machine's typewriter style keyboard is next to it on the right.

The plate on the motor is inscribed 12/180V and 4.5/0.025A. This suggests to me that the input current to the motor is 4.5A and the generated output (like a dynamo) is 180V at 0.025A for the teleprinter's h.t. requirements. Finally, I think the large numbered dial above the motor is to regulate the speed to 3600 revolutions per minute (r.p.m.).

Morse Sounders

Electromechanical signalling dates back to the 19th century. For many years Morse coded messages were read by operators listening to the 'click-clack' of sounders, as in **Fig. 4**. The sounders were used by the military, press, post office, railways and telegraph networks.

Some years ago, an ex-newspaper telegraph operator once told me that he could read a sounder over the 'hubbub' of a busy newsroom. The base of the sounder in **Fig. 4** is stamped G.P.O. and it has been beautifully restored by **Bob Smallbone** of **Bognor** (West Sussex).

The sounder's line terminals are on the right in the picture. Precession adjustment to the mechanism is carried out by four large knurled nuts and lock-nuts and a bolt in the top centre left of the moving bar.

Receiver Coverage

Now let's turn back to the 52 set and look at the receiver coverage. It tunes from 1.75 to 16MHz in three bands and is fitted with a switchable 10, 100 and 1MHz crystal calibrator, top left of **Figs. 1** and **5**.

The calibrator unit uses three octal-based valves and each one has blue paint on the bottom of its spigot. This means that the valve has been 'aged'.

A valve that's been 'aged' has been through a process of running them before use so that they are already 'stable' when the calibrator is switched on. Brand new valves are likely to drift during the first few hours of use. Broadly speaking, this is only critical in oscillator circuits.

Mullard Red Valves

Mullard's Red-E series of valves were used extensively for many years by a number of set-makers. Personally, I thought they were an attractive looking valve with their red metallised coating.

The majority of domestic superhets had a frequency-changer, i.f. amplifier, double-diode-triode, output valve and a rectifier. Some of the more expensive models incorporated a 'magic-eye' tuning indicator usually mounted on or near the set's dial assembly.

Briefly, the 'magic eye' is a valve fitted with a round screen, about 1in in diameter, set back in the top of a valve envelope which provides a green flourescent display. The 'filling' of the screen with a green shadow varies with the strength of the incoming signal.

Editorial note: Readers interested in the 'magic eye' valve may like to take another another look at the constructional project 'Testing - In The Wink Of An Eye' in the February '95 PW 'Valve & Vintage' special issue.

Heaters Red

Excluding the output valve and rectifier, the heaters of the popular Red-Es, including the tuning indicator, require 6.3V at 0.2A. They were used in a.c. only and a.c./d.c. receivers.

For a.c. operation the Red valves, plus a 6.3V output valve, are wired in parallel and connected to the heater winding on the mains transformer inside the set. In this case the rectifier has its own heater winding on the transformer.

In a.c./d.c. receivers all the valve heaters are usually wired in series. They're then connected, via a hefty wire-wound resistance, across the mains.

As I've mentioned in this column before, this hefty power resistance is usually known as the 'mains-dropper' or 'ballast'. And, I can remember that for many years Philips used a ballast-lamp for the heater chain.

Output valves and rectifiers, with high heater voltages, are mainly used when wired in series with the other valves. Please note the following:

1: That a.c./d.c. receivers normally have a 'live' chassis.
2: Always check valves and their voltages with the service manual.
3: Never mix heater currents in a series chain.
4: Make sure that replacement pilot bulbs are of the correct voltage and current because these are usually also wired into the heater circuit.

Valve Bases

Apart from the EF50 which has a octal base, there are only two types of valve bases for the Red-E valves. First came the side-contact and later the international octal valve base.

For example, the ECH3 (frequency-changer), EF9 (i.f. amplifier), EBC3 (double diode triode) and EM4 ('magic-eye') have side-contact bases. The octal-based versions are the ECH35, EF39, EBC33 and EM34 respectively.

A 'pair' of half wave rectifiers, with 20V/0.2A heaters for a.c./d.c. sets are the CY1 (side-contact) and the CY1C which has the British 5-pin base.

Another example is the 'pair' of double-diode output pentodes, with 6.3V heaters for parallel chains, are the side-contact EBL1 and the octal EBL31 valves. The double-diode pentodes, like the CBL1 (side-contact base) and the CBL31 (octal base) have 44V/0.2A heaters designed for the series chains.

Bush Receivers

In the months to come I plan to devote a 'Valve & Vintage' to the DAC10 and DAC90 Bush mains portable receivers. The first issue of these popular sets used RED-E valves.

David Hamilton (Cumnock, Scotland) has been given a working DAC10 which is labelled 'British Wireless For The Blind Fund'. And, in answer to your question David, I think there were two reasons why this was one of the sets chosen for blind people.

Firstly the DAC10 was chosen for its performance and secondly, for the five push buttons on the top for station selection. But more about this in a future issue.

Fig. 3: Second World War Wermacht (German Army) field teleprinter belonging to Richard Brett-Knowles, photographed at the Amberley Chalk Pits Wireless Museum's 'Vintage Wireless Day' in September 1994 (see text).

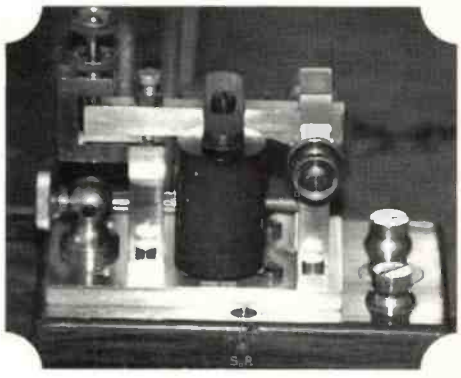


Fig. 4: A typical (this is a GPO model) Morse 'Sounder' (see text).

Philips Receiver

Late in the war Philips produced a special superheterodyne receiver called the PCR (Philips Communications Receiver). And this also used Red-E valves.

The rear view of the PCR in **Fig. 6**, shows EF39s being employed as r.f. and i.f. amplifiers, (top left and lower left and centre). The receiver also used an ECH35 (centre left under can) and EBC33 (lower right) in the mixer and double-diode-triode stages respectively.

Well, time to close up the shop for this month. Don't forget to keep writing to me at 'Faraday', Greyfriars, Storrington, West Sussex RH20 4HE. I look forward to hearing from you!

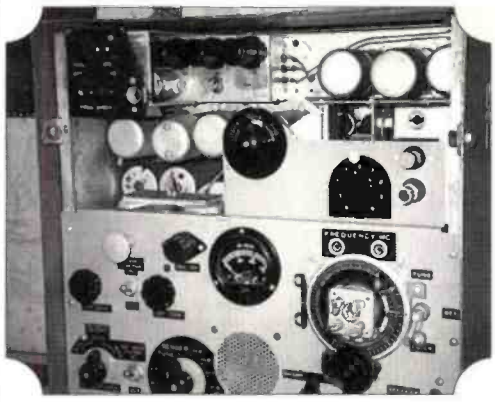


Fig. 5: Close-up view of 52 set, showing crystal calibrator unit (top left).

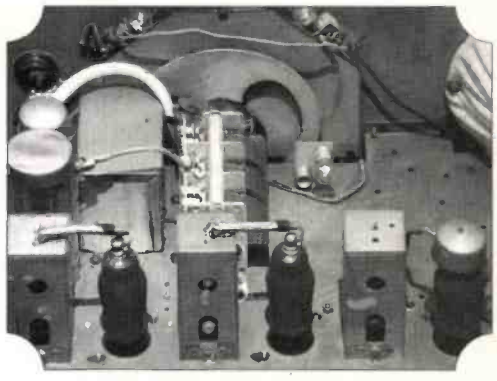


Fig. 6: The well-known Philips PCR receiver used the attractive looking series of Mullard 'Red' valves (see text).

MIKE RICHARDS G4WNC

BITS & BYTES

The Computer in Your Shack

This time Mike Richards G4WNC provides an update on Internet, details on a new TNC terminal program and summarises the 'Bits & Bytes' special offers.

One of the problems I've recently hit is a difficulty in accessing the Internet due to severe congestion. At the time of writing, I've just changed over from Demon to the BBC Networking Club for my Internet access in an attempt to overcome the problem. However, it appears that just when my patience has run out, the Demon service is starting to improve!

As a result of changing my supplier, my Internet E-mail address has also changed.

Many of you have also sent me details of good sites for radio software. The following is a summary of the best so far.

File Transfer Protocol (FTP) Sites:

FTP. demon.co.uk/pub/ham
FTP.ucsd.edu/hamradio
wb3ffv1.sed.csc.com/
scitsc.wlv.ac.uk/pub/hamradio
(Wolverhampton University)
World Wide Web (WWW) Sites:
http://itre.uncecs.edu/radio/
(shortwave radio catalogue)
http://www.mcc.ac.uk/OtherPages/AmateurRadio.hmtl

If you know of any other good sites please E-mail me the details.

Internet Help

I know many of you are contemplating joining the Internet. Well, help is on the way, as I'm currently finishing off a new FactPack designed to give some plain language guidance on how to get started and what's available when you get there.

For details of how to get your copy, see the special offers section at the end of this column.

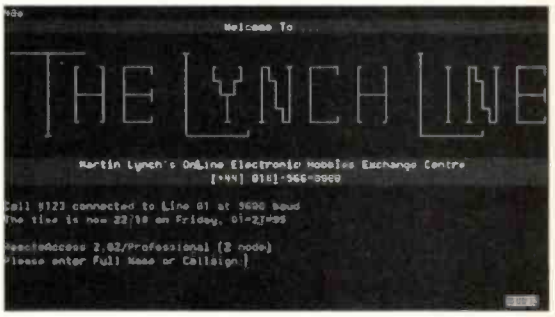
Lynch Line

Martin Lynch has just opened-up a brand new service for his customers in the form of an on-line Bulletin Board System (BBS). The new service is designed to give customers the very latest information on both new products and second-hand equipment.

In addition to full product details, Martin will be including equipment reviews to give customers all the information they need to make the right choice.

There will also be a messaging system for passing feedback and information requests to Martin's sales and support teams. The service details are: **Telephone Number: 0181-566 0000, Bit rate: 1200-28800bits/s, Data format: 8 bit, no parity, 1 stop bit**

Although you can access the BBS with the simplest of terminal emulations (e.g. TTY), using ANSI emulation produces much better results. To take advantage of this you will need to select ANSI emulation in your communications program.



The 'log-on' screen of the Lynch Line Bulletin Board System.

UltraPak

Tim Kearsley has sent me a copy of a particularly interesting new TNC terminal program for Windows users. The demo version of UltraPak 1.0 is being distributed as shareware and has all the features of the full program except for a 30 minute time limit. After this time has expired the program stops and you have to restart it.

The program was supplied on a single HD 3.5in disk with a set-up file to handle all the loading including creation of the destination directory. As with many modern PC based programs the system requirements were fairly stringent.

What you need is a 386 or better processor with sufficient memory (4Mb) to run Windows 3.1 (or Windows for Workgroups) effectively. Once installed, the program and support files occupy around 1Mb of disk space.

Tim has certainly made very good use of the Windows environment and the UltraPak program looks and feels very professional. The very large receive window features the standard drop down Windows menus plus a well thought out range of push buttons.

The push buttons cover a wide range of features including direct jumps to the program manager, print manager and DOS shell. Just below the push-buttons was the first status bar that gave details of many of the systems settings such as COM port, data rate and bit length. A nice touch was the provision of direct setting of any of these parameters just by clicking the mouse on the one to be changed.

Below the receive screen was a second status bar that provided details of the connection and logging status. If you get stuck there is excellent on-line help which includes a summary description of all the standard TNC-2 family commands.

For the serious user there's a built-in message preparation facility with basic word processing features. Standard file transfer is also supported through the YAPP protocol. Once you're connected you can capture all data to disk, printer or both at the touch of a button.

Overall, UltraPak appears to be an excellent new TNC driver for those running a suitable Windows-based PC. The full registered version includes E-mail support and a full A4 operation and reference manual.

Tim has agreed to let me supply copies of the new Version 2 through this column (see the special offers below for ordering details). This new version supports multiple connect windows and an even better on-line help system. My thanks to Tim for supplying the review copy.

Special Offers

Here's a summary of the latest special offers for 'Bits & Bytes' readers. I try to turn orders around in a week or two, **but please allow up to two weeks for delivery.**

1. **JVFAX 7.0** - FAX & SSTV transceive for IBM compatible computers.
2. **HAMCOMM 3.0** - RTTY, CW & AMTOR transceive also for IBM compatible computers.
3. **NuMorse** - Comprehensive Morse tutor for Windows 3.1 users.
4. **UltraPak 2.0** - TNC-2 driver for Windows 3.1 users.
5. **FactPack 1 Interference** - Help with those difficult computer interference problems.
6. **FactPack 4 JVFAX and HAMCOMM Primer** - Receiving your first FAX and RTTY signals.
7. **FactPack 5 On the Air with JVFAX and HAMCOMM** - preparing for that first transmission.
8. **FactPack 6 Internet Starter** - Basic guidance to get you started on The Internet.

To receive any of the special offers just send a self addressed sticky label plus 50p per item (£1.50 for four or all eight for £3.00). If you're ordering JVFAX/HAMCOM/NuMorse/UltraPak you will also need to send a blank, formatted 3.5in 720k disk for each program or just two 1.44Mb high density disks.

Space has caught up with me again so until next time keep those letters coming to me, Mike Richards G4WNC, 'Bits & Bytes', PO Box 1863, Ringwood, Hants BH24 3XD. NB: New Internet address & I missed out the last digit of my CompuServe address on the last two issues! CompuServe: 100411,3444 or Internet: mike.richards@bbcnc.org.uk

E N D

D A V I D B U T L E R G 4 A S R

This month David Butler G4ASR discusses propagation conditions and the possibilities of transatlantic Sp-E contacts on 144MHz.

VHF Report

In the January issue of *PW* I mentioned that Tony Allen EI4DIB had claimed to receive f.m. signals from North America on the 144MHz band. He had heard VO1OR on 145.965MHz the up-link frequency for the Fuji Oscar-20 satellite.

I had my doubts about EI4DB's claim, but Bill Fry VO1OR confirmed that he was in fact transmitting on 145.965MHz at the time. Despite this I still believe that it's impossible to hear a low power f.m. signal over this great distance.

However, I'm not saying that EI4DIB didn't hear VO1OR. I'm just very sceptical that it was via normal terrestrial means.

No Sign

Records show that on May 13 1994 there was no sign of Sp-E propagation in Europe. The weather maps also indicated that conditions were not suitable for long distance tropospheric propagation.

My personal theory is that two OSCAR satellites were involved. One received the signal from VO1OR and re-transmitted it on the 430MHz band. The other satellite simply picked up the 430MHz signal and EI4DIB heard its downlink on the 144MHz band. But of course it may not have been as simple as that!

However, **Andy Nicholls G3VMZ**, doesn't agree with my suggestions of a double-hop link between two satellites. He mentions that there is sufficient debris floating around in space which could theoretically provide an adequate reflecting surface.

If propagation was via Andy's suggested reflective path, then Doppler shift caused by the orbital motion would occur. Similarly, some spin modulation or fading may also be noticed.

Andy quite rightly observes that the reception of an f.m. signal does not instantly convey the propagation characteristics involved. This is because of the threshold effect of an f.m. demodulator, the received signal levels have to be much greater than for c.w. or s.s.b. reception.

In very simplistic terms the effect could be likened to digital transmission. It's either all or nothing! Therefore only the strong peaks of the signal are heard. A receiver designed for c.w. or s.s.b. however, can listen to the signal right down to the noise floor.

Continuing, Andy said that if VO1OR had been using s.s.b. it might have enabled an educated guess at what factors in the atmosphere or ionosphere were influencing the path.

Answer In Time

Andy believes the answer to this episode lies in the time of day and when in the year it occurred. He notes that in the reported case, VO1OR was heard at 2325UTC in the middle of May and it's well known that the period from late May through to July is the peak for mid-latitude Sp-E propagation.

Some spectacular DX can be worked on the 144MHz band via single-hop or double-hop modes. Contacts in excess of 3000km have already been made from the UK. For example, I recall that G3VYF (JO01) worked 4X1IF in Israel and a number of UK stations have contacted the Canary Islands (EA8) in recent years.

Based on practical results taken from the 'Top-List' in the *Dubus* magazine the probable maximum two-hop range will be around 3500km. This distance is not dissimilar to the EI-VO path.

However, Andy points out that in the UK the Sp-E tends to peak around 1800UTC for south-easterly paths from the UK. Across the Atlantic the W1, VE1, VO1 area will see their path to the east peak about five hours later, around 2300UTC.

If stations in the UK beamed west at around 2300UTC it's possible that a transatlantic QSO could occur via multi-hop Sp-E. Interestingly, this is exactly what happens on the 50MHz band virtually every summer.

On the 50MHz the upper distance limit for single-hop Sp-E is essentially the same as for the 144MHz band. This is because it is determined by the geometry of the path. Sp-E occurs at a height of around 90-120km and this factor doesn't alter.

However, the minimum skip distances at 50MHz is reduced by the higher refraction for a given ionisation density. The diagram, **Fig. 1**, shows the relationship between the Sp-E maximum usable frequency (m.u.f.) and path length.

The Sp-E cloud shown has an m.u.f. of 144MHz giving a maximum single-hop distance of around 2200km. As the frequency is decreased from the m.u.f. the path distance shortens.

Path Length

At 50MHz (for example) the path length will be about 600km. At a particular frequency, called the critical frequency, (0.188 x m.u.f.), the path distance decreases to zero. Therefore a signal transmitted straight up will be reflected straight down. In the example given it will be 27MHz.

The points are important to a v.h.f. DXer, so I'll go over them again. The highest frequency reflected back to the surface of the earth is the m.u.f. This can vary from approximately 20MHz to at least 220MHz.

At the m.u.f. the angle of reflection is greatest, the single-hop is longest and the signal strengths are greatest. As the signal frequency departs from the m.u.f. the angle of reflection reduces, the signal path gets shorter and the signal strength decreases.

To the DXer the reduction in path length at 50MHz is a clear indication that the m.u.f. is rising. However, there is a problem when using this observation to deduce when the 144MHz band will open.

Let's look at the problem by imagining that you hear stations on the 50MHz band about 600km away. For example, GM operators hear stations in southern UK or stations in the Midlands hear DLs in locator square JO30.

"Great" you think - "the 144MHz band will be open for DX". Well it will be, but the problem is that the Sp-E cloud is too close to you!

For example the Sp-E could be located 100km above the North Sea. Therefore, EI stations will be working into OE on the 144MHz band - but you won't hear anything!

What you need to do is notice when the skip distance is decreasing at the mid-point of the normal 144MHz single-hop distance. As previously explained, this is around 2200km, so the mid-point will be about 1100km from your QTH. Finding out what's happening to the skip distance in southern Germany could be a problem of course!

Ionisation Widespread

Since usable Sp-E ionisation is much more widespread for lower frequencies, multiple hops can extend the range to many thousands of kilometres. Enough to span the Atlantic Ocean on the 50MHz band.

During 1994, multi-hop or Spread-E openings on the 50MHz band to North America occurred on June 15, 19 and 25. The first of these, a multi-hop Sp-E event, on June 15 started at 2200UTC and lasted two

hours. Contacts were made with stations in VE1 and K0SN/CY9 (FN97) was also contacted.

The next opening, on June 19, seemed to be more of an E-layer enhancement rather than multi-hop Sp-E. It commenced around 1930UTC and lasted until 2215UTC. Stations from call areas W1, 2, 3, 4, 8 and VE3 were worked. The station of FP5EK (St. Pierre and Miquelon) was also worked from the UK.

Final Opening

The final transatlantic opening of 1994 was on June 25 between 1630 to 2330UTC. Stations throughout Europe seemed to have a pipe-line to W4 although other areas were worked.

At my QTH, a total of 21 North American stations were worked. The station of WB4NFS/VP9 was also contacted.

I've kept records of transatlantic openings on the 50MHz band since 1984. Contacts have been made every year except in 1986 when no stations were heard.

My data indicates that the best conditions during this period occurred in the summers of 1987 and 1988. Between 1984-1994 a total of 15 openings were observed in the month of June but only six during July.

Although the openings I recorded occurred at a relatively low frequency, it does show that the UK-North America path does open up fairly regularly.

However, records at **G3VMZ** show that a 3500km path on the 144MHz band is very probable on several days during late May and early June. He says that further research is needed to correlate all other factors such as weather patterns, geomagnetic A/K indices, etc., before this theory can be proved.

Andy concludes that a listening watch must be made, beaming towards VO1, VE1 and W1, between 1800-0100UTC during late May through to the month of June. He further suggests that a tape-recorder must be on hand to provide evidence of any DX signals heard.

Transatlantic Tests

One operator who has already been carrying out transatlantic tests on the 144MHz band since 1989 is **Derek Hilleard G4CQM**. (I mentioned these in the November 1994 issue of *PW*).

As an aid to propagation Derek also monitors Band II, the 88-108MHz f.m. broadcast band. He uses a Sony receiver and a 5-element Yagi on a beam-heading of 290°.

On June 15 between 2314-2319UTC Derek heard identifiable signals from CBC, Sydney, Nova Scotia on 95.9MHz. (According to the station of VE1KG this local broadcast station only runs 500W effective radiated power (e.r.p.). The station was heard again on June 22 between 2148-2158UTC.

These results on both the 50MHz and 88-108MHz bands are very encouraging. However, there's a world of difference between these frequencies and 144MHz! So, will someone ever make that elusive transatlantic QSO on the 144MHz band?

Contacts on the 50MHz band via three or four hop Sp-E are common enough to be no longer surprising and broadcast stations at 100MHz have been heard up to 6000km away. Within Europe a number of stations have made Sp-E contacts over 3500km on the 144MHz band.

In the USA a few operators have made contacts as high as the 220MHz band. So, on balance therefore, I would say that it's very likely that someone will achieve a 144MHz transatlantic QSO fairly soon.

I'm planning to do some listening on Band II this summer. And if conditions are right I hope to make some tests on the 144MHz band.

Although I am reluctant to make predictions, it's possible that Sp-E propagation on both the 50 and 144MHz bands could be very good this summer. This is based on the well known fact that Sp-E is more prevalent during sun spot minimum.

Although 1995 is probably not the minimum of this solar cycle (possibly in 1996), the effects could be very similar. Further indications of good conditions during this summer are also based on evidence of this winter's Sp-E season in Europe and the summer season (at the same time of course) in Australia.

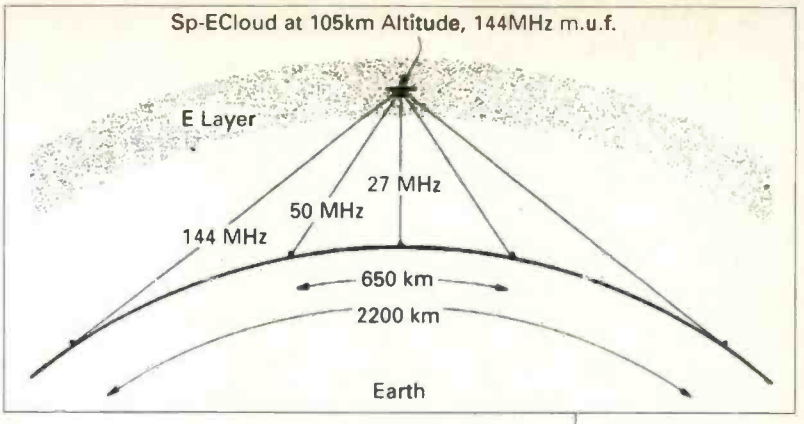


Fig. 1: Diagram showing relationship between Sp-E maximum usable frequency (m.u.f.) and path length (see text).

Minor Peak

It's normally expected that a minor peak in Sp-E activity will occur during the months of December and January. This winter it exceeded all expectations in terms of duration and the number of openings.

The first recorded opening on the 50MHz band was on December 26 and the last was on January 20. Between these dates there were 12 days when the 50MHz band was open via Sp-E propagation.

The events I've mentioned don't sound spectacular but believe me it's considerably better than recent years! According to the packet radio DX Cluster a total of 18 countries outside of the UK were worked during this period. These stations were up to 2000km away. This is the normal single-hop distance that can be expected.

Good Indicator

Another good indicator of what's going to happen in Europe this summer can be gauged by results from 'down under'. The reason for this is because Australasia experiences their main summer Sp-E season during our winter.

So, in theory, if it's good for Australasia in January, then it will be good for Europe in June. And, I'm pleased to report that conditions have been excellent on the 50MHz band so far this year!

On January 13 a beacon at the station of VK0IX (OC53) Casey Base, Antarctica was heard over large areas of the Australian continent. The low power beacon running 10W into a resistive wire V-beam was initially copied by VK3OT at 4000kms. The VK0IX signal was also heard by VK2APG at 5000km and VK4AFL at 6000km.

On the following day **Darin VK0IX** contacted a total of 13 stations between 4000-6000km away. He was using an Icom IC-575 running 100W into the fixed V-beam.

Also on January 14 the station of VK2MZ heard a South African f.m. broadcast station on 100MHz. This was over 6000km away!

The 144MHz band was also in good shape with VK4 stations making 2000km contacts with other stations in southern Australia. These early results add much support to the thinking that 1995 could be a bumper year for DX on the v.h.f. bands.

Deadline Time

It's deadline time again and that's all I have for you this month. Let's hope the article has fired up your imagination!

If you're interested in the transatlantic project please contact me. In future issues I'll be giving further updates on propagation conditions in Australia. I also plan to include more details about Sp-E propagation and how to make the first transatlantic QSO on the 144MHz band!

In the meantime, if you've any comments please send them to me at **Yew Tree Cottage, Lower Maescoed, Herefordshire HR2 0HP** or via packet radio @ GB7MAD or the DX Cluster system. Alternatively you can telephone me on **(01873) 87679**.

E N D

HF BANDS Report

PAUL ESSERY GW3KFE

This month Paul Essery GW3KFE brings you news of some excellent DX on 1.8MHz and his regular monthly report of your activities on the h.f. bands.

'Top Band', 1.8MHz, was the place to be in December! **Gavin G3MOU** was in a s.s.b. net on the evening of December 9 with DJ0IA, G3NSI and G0FBW when he heard someone breaking in.

The breaker turned out to be **Bill VK6AS** at 59. And he then worked DJ0IA as well as G3MOU; the other two Gs in the north-east had no copy. The contact was repeated on December 10 with reports 59+10, and on the 11th the peak was 59+20, around 2028UTC.

Subsequent evenings weren't quite so good but contacts were maintained until December 18. Since then G3MOU notes that VK6APZ has again been working into the UK.

Now it's time to hear from s.w.l. **Geoff Crowley** in Aberdeen. Geoff reports that at 0745 on December 7, he heard ZL2JR. Geoff's antenna incidentally, was a half-sized G5RV.

Down in Hastings, at around 1900 on December 31, **John G3BOQ** got VK5FGK back to a CQ, albeit only at 449. John comments on the 'oddness' of conditions on the band.

John says that compared with 11 years ago, the US propagation in the mornings seems to have shifted. It is now if anything easier to work Colorado than New York. For example five from that state plus K0HA(Nebraska), W7SE in Wyoming, W0EKS in Minnesota, and W0RI and KJ5H both Missouri. Rarest of all, VE8WE (North West Territory).

A bit more mundane maybe, but **Ted G2HKU** on the Isle of Sheppey managed RA1AFD/MM in the North Sea. Ted also worked DL3AF, F5SYC, and OY3QN, just to show he's on the mend!

The 3.5MHz Band

For the 3.5MHz band report G2HKU stayed with his low power rig, G5RV and c.w. The haul included RA0FM/MM in the North Sea and bound for Newcastle, UT1PB and around 13 others in nine countries.

Also on 3.5MHz, **Don G3NOF** in Yeovil says he has found the band open frequently to USA around 2300.

The 7MHz Band

Nice to hear again from **Eric G0KRT** in Worcester Park (Surrey). Eric only gets on when his studies permit; over Christmas his Lake DTR7 was fed into a W3EDP top and quarter-wave counterpoise.

Eric worked about 20 Europeans with the 2W output, the best being EU3FT and R3BAC. The best two-way QRP was to EI6IJ in Limerick. There was a noticeable absence of German stations.

On the Isle of Sheppey, G2HKU keyed with YI9CW, TU4VIR, XX9TJZ at full power. However, while CU2BJ (San Miguel Island) fell to Ted's QRP.

Meanwhile, at G3BDQ, John knocked off a brace of VK3 stations and XX9TJZ.

Take Note

Take note - 3C0N/D2SA - is akin to a 'nine-bob note'! 3V/F5HV/M, and 5A/F5HV/M were also noted about a week ago (when I was preparing this piece in late January).

The latter is highly unlikely to have paperwork to satisfy the DXCC needs. Hence, throwing doubt also on the former.

The special call OS50USA commemorates the 1944 Battle of the Bulge. For Islands On The Air Collectors there's IJ/IK7MJC for IOTA EU-073, J68BU, 7X2BK and 9K2MU.

The WARC Bands

Working on the WARC bands, 10MHz yielded 7P8GG for G2HKU. While a whirl on 18MHz produced some15 contacts with the rare ones on the key.

'Try sideband on 18MHz' says Don G3NOF, who used the mode to work C53HG, ET3BN, N3SIY/HH2, TU4EX, V27A. He also worked VS6CT (who will have closed down by the time this comes to be read), XX9GD, 4S7EA and 4U1UN. Turning to 24MHz Don got to FY5FY.

Talking of XX9, a letter in *DX/NS* from Martti Laine OH2BH/VR2BH/XX9T indicates the difficulties of getting licences for Macau. However, Martti indicates they will be able to be active in the ARRL DX CW and SSB contests, and the CQ WW WPX SSB and CW contests.

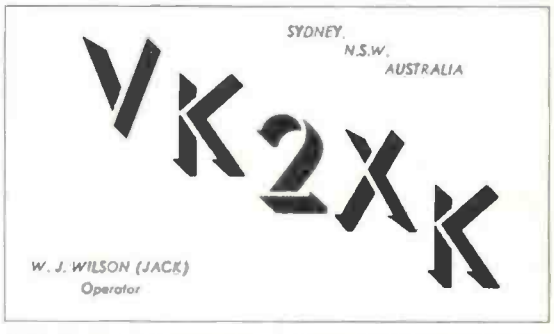
The 14MHz Band

Up on the 14MHz band, s.s.b. provided G3BDQ his contact with UU1JD, and on the key TU5CL. For his report Ted G2HKU bagged K1AR/50, VE1BN, A71EZ, VK6WT and EW6CF.

Down in Yeovil G3NOF reports that he worked VP8SGP(South Georgia), BV4AS, BZ5HAN, HL5BDD and P29DY, who seemed to have been his pick, all on side-band.

Eric Masters G0KRT only manages to get on the air when he's home from his studies, but his QRP 2W of r.f. travels well.

You too could work Australia....on 'Top Band' (see text).



The 21MHz Band

For his 21MHz band log, a single contact, with S0RASD was G3NOF's report. However, G2HKU by contrast keyed with HC5AI, LU5XQ, and N4SU.

Finally, G3BDQ found conditions mostly poor. However, he did speak to A45ZZ, 4X1ZB, VK7PBC, and V2/VE3ODC.

QSL Addresses

My thanks go to G2HKU who mentions the QSL addresses of: TU4SR, via OH8SR; 8Q7BX via I4ALU; A71EZ, via PO Box 12170, Dohar, Qatar; 8P9EM via G3VBL; 9Q5IY via LA1K(direct only); and ET3BN via DL1JRC.

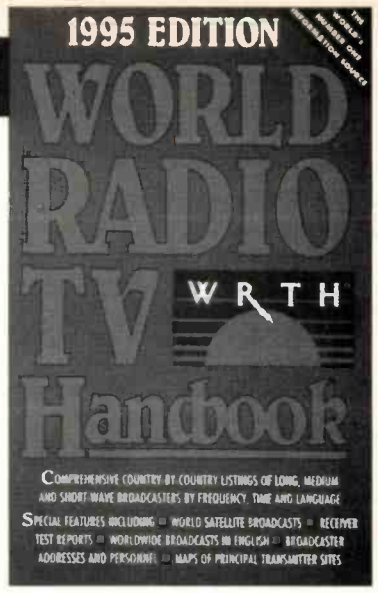
That's it for this time; space has run out. Letters, photos and comments please, by the middle of the month as usual, to **PO Box 4 Newtown, Powys SY16 1ZZ.**

E N D

BROADCAST Round-up

PETER SHORE

Peter Shore has details of a new short wave station, previews the new World Radio TV Handbook, and provides a round-up of the news from the broadcasting world.



Peter recommends the latest edition of the *World Radio TV Handbook*, described as the definitive guide to radio and TV broadcasters around the world.

I'll start this month's column with a letter from **Bernard Tyers** in Tramore, County Waterford in the Republic of Ireland. Bernard is a secondary school student and has been listening to the short wave bands for about the last 10 months, using a Grundig Yacht Boy 400 receiver.

He reads *PW* regularly, and says he enjoys 'Broadcast Round-Up'. Thanks, Bernard! He asks whether anyone has heard a new short wave station called Radio Metropolis, Prague.

Bernard has picked up the Prague station on 6.20MHz, with an SIO ranging from 555 down to 332. Announcements received suggest that the station was testing when caught by Bernard at the beginning of January, prior to opening officially on January 15.

Radio Metropolis is the first commercial short wave station to operate in the Czech Republic, licenced by the authorities for international broadcasting. Three 250kW transmitters are used, and the studios are located in a former army underground bunker in the suburbs of Prague. The address of this new station is **Radio Metropolis, Ucineova-38, 130 000 Prague 3, Czech Republic**.

So recent is the addition of Radio Metropolis to the international broadcasting community that it does not feature in the brand new edition of the annual *World Radio TV Handbook*, which landed on my desk a couple of days ago. Despite this, the *WRTH*, which is now 49 years old, is the definitive guide to radio and TV broadcasters around the world.

The *WRTH* includes a country-by-country listing of every public and private station, together with frequencies, times of operation, transmitter power and location and details of different language services of international stations. There is also a complete listing of stations by frequency across the short wave bands, and a guide to broadcasts in English.

Details of short wave and DX clubs in every continent are included, and there is a do-it-yourself propagation forecast to help you see which are the best bands to monitor throughout 1995. The *WRTH* is invaluable, and is to be recommended to anyone who wants to know what's on the air, when, and how. **The book retails at £15.95 plus £1 P&P (UK), £1.75 (overseas) and is available from the *PW* Book Service.**

Improved Voice

Look out for improved reception of the Voice of Turkey as the station brings five new 500kW transmitters on stream. The station wants to hear from listeners in Europe and North America about time and frequencies that would be suitable for its operations. Contact **Semrun Erun, head of the English service at PO Box 333, 06443 Ankara, or FAX +90 312 435 3816**.

Netherlands Received

Radio Netherlands (RN) is now better received in Britain following the introduction of relays from Deutsche Welle's transmitters at Nauen. This former Radio Berlin International site is on the air with English at 1130-1325UTC on 7.13MHz, in parallel with 6.045MHz out of Flevo.

At 2130, you can tune to the RN station on 1.386MHz, medium wave, which is from a Russian transmitter at Kaliningrad. At 1930UTC, there is a service to Central and West Africa from Bonaire on 17.605 and 15.315MHz, and from Madagascar on 11.655 and 9.605MHz, and from Flevo on 9.895, 9.86 and 6.02MHz. The weekly communications programme *Media Network*, hosted by Jonathan Marks, is broadcast at 1150 and 1950UTC.

Broadcast News

World Radio Network (WRN), is the compilation service offered to listeners via the Astra satellite. Radio Prague's English service is to be included on WRN from the Spring, and the organisation is investigating putting its output onto the Internet, live in parallel with the existing satellite services. More news as it develops.

Cuts threatened at the Voice of Israel for the end of 1994 were postponed. The station is still on the air, but it's likely that it will be pruned during this year.

The beginning of 1995 marked the end of medium and long wave broadcasting in parts of Europe, and for short wave out of one country. Austrian Radio closed all its m.f. transmitters on December 31, stating that its f.m. transmission network now provides sufficiently good coverage across the mountainous country.

Norwegian Broadcasting has decided to stop using its last long wave transmitter on 216kHz. It will now rely on its medium wave transmitter on 1.314MHz to reach the country's extensive fishing and maritime fleets. And Radio Luxembourg has finally stopped using 6.09MHz, which was heard until the beginning of this year carrying the station's 24 hour French service.

Radio Prague is now reliant entirely on transmitters within the Czech Republic, according to a report on WWCR's *World of Radio* programme. It is using just the transmitters at Litomysl - where there are only two 100kW senders - and no longer has access to the higher powered transmitters in Slovakia.

The Italian state broadcaster RAI is now hiring time on the BBC's Far Eastern Relay at Singapore, in addition to the Atlantic Relay Station on Ascension Island as reported last year. Italian broadcasts are beamed from Singapore to Asia on 11.85MHz at 1000UTC for an hour.

Ascension transmits Italian to the Americas at 0130 on 11.765 and 6.11MHz, in parallel with 9.645 and 9.575 direct from Italy. There is also a transmission in Italian at 1700 on 15.32MHz from the Atlantic island, in parallel with 21.71, 17.87, 15.23, 9.71 and 7.235MHz, all beamed to the Middle East and Africa. English is heard at 1935UTC on 11.905 and 9.575MHz beamed to Europe.

Radio Bangladesh has English to Europe at 1815 for 45 minutes on 9.65 and 7.19MHz, followed by half an hour of the Voice of Islam. Listeners' letters are answered in Friday's *From Us to You* programme.

Radio Pakistan has English for European audiences at 0800 on 17.90 and 15.625MHz, and dictation-speed news in the 1100UTC transmission on the same frequencies. English is broadcast again at 1700 on 11.57 and 7.485MHz.

That's all for this month. If you tune into anything unusual, please drop me a line at the *PW* Editorial Office in Broadstone. Until the next edition, 73s.

E N D

FOCAL POINT

The World of ATV

In this edition of his bi-monthly column Andy Emmerson G8PTH investigates television from outer space and whether or not man really landed on the moon.

In my column in the February issue of *PW* I discussed television from outer space. Reader John Berridge posed the question of how the pictures of the US Apollo moon landings were transmitted from the moon to the earth. He also quoted a book which claimed that the whole affair was a fake.

Pre-empting my own research, *PW* reader **John Burtenshaw G1HOK** from Moordown, near Bournemouth, sent a welcome and detailed letter. John's letter reads: "I thought I'd respond to the question of whether the Apollo 11 landing was a Hollywood 'stunt' and if not, how did they get television pictures from the Moon.

Firstly I would like to direct John Berridge to the two programmes broadcast over the Christmas Holiday, which were concerned with the Moon landings. In an interview with Neil Armstrong he was asked why there was such a big drop to the Moon's surface (if you watch the film of his first step he leaps down from the ladder of the Lunar Excursion Module or LEM).

Neil replied that the conventional thinking at the time was that the surface of the Moon was covered with deep dust and that the weight of the LEM would cause it to sink several feet, in fact there was only a thin covering of dust. The ladder itself stopped several feet from the foot of the LEM, hence the leap.

As to why there was little dust kicked up, I can only say that there was dust kicked up by the LEM's engine and also it covered the astronaut's boots and lower parts of their Moonsuits. This can be seen in some still photographs.

As far as lighting for the televised pictures is concerned the Sun provided all that was necessary, the Moon does not suffer from cloudy weather! This fact can be substantiated by the deep shadows and harsh lighting seen in all the Apollo pictures".

Lunar Comms

John's letter continues: "Now to the actual communications from the Moon. A communication system provided voice, television, telemetry and ranging and tracking facilities between Earth and the Apollo spacecraft.

The communication system also provided the link from the Moon's surface. The equipment used consisted of two v.h.f/a.m. transceivers; a unified S-band (1550 - 5200MHz) system for transponder tracking, f.m. voice and a S-band power amplifier.

A v.h.f. rescue beacon for Earth recovery operations was also included. There was also an X-band transponder for radar tracking and rendezvous between the two craft.

Then NASA adopted the term 'unified S-band' as they replaced the old system of using separate frequencies for data, voice and television.

Instead they decided that all were data and therefore could use a single radio link. Data was transferred at a rate of 12.8 kilobits per second.

On the rear of the Service Module (this contained the oxygen, fuel, etc., for the Apollo spacecraft) was an array of four 31in diameter high-gain dishes with a central 11in reflector. These were deployed when Apollo separated from the third-stage of the Saturn V rocket and were automatically kept facing the Earth.

For close-range communications (up to 10,000 miles) NASA used a network of stations (using 30ft diameter dishes) based on land and onboard special ships which formed a chain around the Earth. Once outside the range of these stations a long-range system took over. This system was based on 85ft diameter dishes roughly 120° apart around the Earth thereby giving continual coverage.

The network of sites were at Goldstone, USA; Madrid, Spain; and Canberra, Australia. They were linked by dedicated land lines or satellite links to the Goddard Space Flight Centre which acted as a switching centre before passing it onto Mission Control, Houston".

Masterpiece

John also points out that: "The television camera itself was a masterpiece of 1960s technology. It weighed 7.25 pounds and was small enough to be stored inside the descent stage of the LEM. As Armstrong stood at the top of the ladder he pulled a lanyard which deployed and switched on the camera so that his historic step could be transmitted live. Later he moved it onto a stand so that both he and Aldrin could be seen on the Moon.

Due to the narrow bandwidth available for television transmissions only 10 frames per second were sent. A conversion process on Earth, using frame storage techniques, changed this slow rate into 25 frames per second for Britain and 30 frames per second for the USA, this conversion resulted in the ghostly effect that can be seen on the pictures. More advanced television transmissions enabled colour pictures to be sent without the 'ghosting' effect on later missions.

If NASA was faking the landing they had two occasions to leave the camera off the flight. Quite a simple explanation and all done without the need of a Hollywood film crew"!

John concludes: "If it was a US Government stunt, as is implied by the book mentioned by Mr Berridge, I would think that the Soviet Union, who were monitoring transmissions from the flight, would have discovered the deception and made political capital out of it. After all it was a race between the USA and USSR which had little to do with scientific discovery and more to do with Cold-War prestige".

John's letter is an admirable summary, but you may wish to read more on the subject. Digging in my files, I see that Brian Dance wrote a series of articles on 'Deep Space and Space Shuttle Communications' in *Practical Wireless* in April, May, October and November 1982. He also penned a detailed description of the antennas used in the June 1984 issue of the trade magazine *Communications International*.

A detailed description of the camera used can be found in the November 1994 issue of *The Old Timer's Bulletin*, the magazine of the Antique Wireless Association of the USA. This says the normal scanning rate was 320 lines with 10 frames a second, whilst for scientific purposes the camera had a slow-scan mode of 5/8 frames per second with 1,280 lines.

After reception on earth these signals were converted to normal 525-line, 60 frames pictures. Four interchangeable lenses were used but otherwise the camera had no user controls.

Swindle

The book *We Never Went to the Moon* by Bill Kaysing claims we have all beeen dupes of a 25 billion dollar swindle perpetrated NASA. And back in 1982 Bill Brian wrote a similar accusation called *Moongate*.

The latest work on the subject is called *Was It Only a Paper Moon?* by Ralph René and of course a Hollywood film in 1978, *Capricorn One*, told the story of a staged flight to Mars. The same theme was the subject of a documentary by our own Anglia Television on June 20 1977 (but this contained a production date of April 1).

All these issues and more are discussed in a long feature in *Wired* (the September 1994 edition). But the final decision whether it was all a hoax must be yours!

Back down to earth next time!... keep those letters coming. Send your letters and reports to 71 Falcutt Way, Northampton NN2 8PH.

E N D

ARCADE

The *PW* Shopping Arcade

Welcome to the *Practical Wireless* 'Arcade'. In this section of the magazine, you'll be able to find all those important services 'under one roof' - just like the shopping arcades you see in the High Street.

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Station Approach,
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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 problem adequately, with as much detail as you can possibly supply.
5: Only one problem per letter please.

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Limited stocks of many issues of *PW* for past years are available at £2.00 each including post and packing. If the issue you want is not available, we can photocopy a specific article at a cost of £1.50 per article or part of article. Over the years, *PW* has reviewed many items of radio related equipment. A list of all the available reviews and their cost can be obtained from the Editorial Offices at Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW for a large stamped self-addressed envelope.

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Send all orders to PW Publishing Ltd., FREEPOST, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW.

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Components for *PW* projects are usually readily available from component suppliers. For unusual or specialised components, a source or sources will be quoted.
Each constructional project is given a rating to guide readers as to the complexity.
Beginner: A project that can be tackled by a beginner who is able to identify components and handle a soldering iron.
Intermediate: A fair degree of experience of building radio or electronic projects is assumed, but only basic test equipment will be needed to complete any tests and adjustments.
Advanced: A project likely to appeal to the experienced constructor. Access to workshop facilities and test equipment will often be required. Definitely not for the beginner to attempt without assistance.

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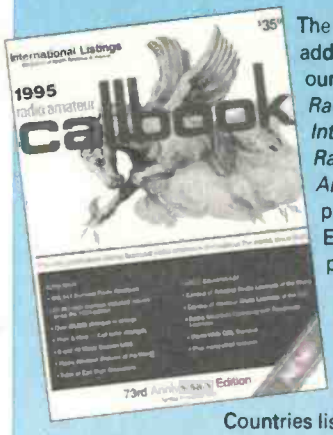
NEW BOOKS

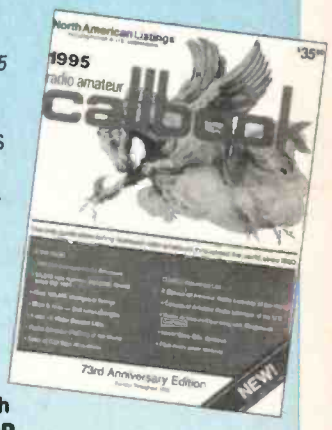
THIS MONTH WE HAVE NEWS OF SOME NEW EDITIONS OF POPULAR TITLES THAT HAVE JUST BEEN ADDED TO THE *PW* BOOK SERVICE.



The first two of the new editions to be added to the wide range of books in our Book Service are the ever popular *Radio Amateur Callbook - International Listings 1995* and the *Radio Amateur Callbook - North American Listings 1995*. Both publications are now in their 73rd Edition and both have over 1400 pages.

The *International Listings 1995* not only contains a list of licensed amateurs throughout the world but also has invaluable information such as a DXCC Countries list, address details of QSL Bureaus world-wide, radio amateurs operating with reciprocal licenses, beacon lists, standard time chart and much more.

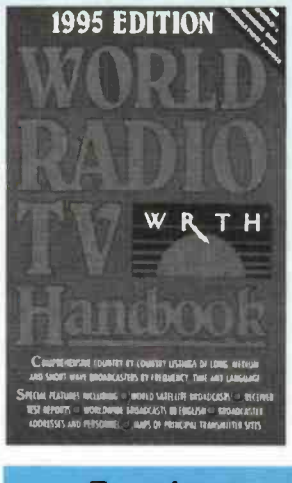
The *North American Listings 1995* contains similar information to the *International Listings* callbook as well as a comprehensive list of 704 056 US amateur callsigns including Hawaii, prefixes of the world and world maps etc.



If you are keen on working DX then these new 1995 editions of the *International Listings* and *North American Listings* callbooks should be a must for your shack bookshelf. Both books are available **now** from the *PW* Book Service for **£20.95 each plus £1 (UK), £1.75 (overseas) P&P.**

If you enjoy listening to broadcast stations when not working the bands, you'll be pleased to find that the new 1995 edition of the *World Radio TV Handbook* has just arrived in the *PW* Book Service department. The *WRTH* gives a comprehensive country-by-country listing of long, medium and short wave broadcasters by frequency, time and language.

Special features in the *WRTH* include world satellite broadcasts, receiver test reports, world-wide broadcasts in English, maps of principal transmitter sites and broadcaster addresses and personnel. Armed with your receiver and this latest copy of the *WRTH* you will be able to tune into broadcasts from all over the world and identify stations that you have not come across before.



Peter Shore, *PW*'s 'Broadcast Round-Up' columnist highly recommends the *WRTH* and says that it's an invaluable guide to anyone who wants to know what's on the air, when and how.

The *World Radio TV Handbook* 1995 is available for **£15.95 plus £1 (UK), £1.75 (overseas) P&P** from the *PW* Book Service.

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Advertisements from traders, or for equipment that is illegal to possess, use or which cannot be licensed in the UK, will not be accepted. No responsibility will be taken for errors.

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144MHz f.m. base/mobile Navico AMR1000S, 13.8V d.c., pristine condition, no mods, not abused, c/w manual, £200. Morse Talker MMS1 Microwave Modules Ltd., £40. P&P extra. Phil Brouder G3ZJH, North Avon. Tel: 0117-969 1025.

Argosy c.w. audio filter model 224, £15. Steinel Volt Check super tester, 4.5 - 450V a.c.- d.c., new, £2. Coaxial switch, 3-way, new, £7. Octal relay 12V, 10A, 2P c/o new, £2 plus postage. Tel: Kent (01795) 873100.

B40 Navy general coverage receiver, £65. Tel: Essex (01702) 522929.

Bereavement forces electrical shop stock sale: resistors, capacitors, c.r.t.s, transistors, tuners, hundreds of i.c.s, valve characteristic meter, TV pattern generator, type 55 Rankbush, TV alignment pattern generator model 1320, etc. Stefan Croft-Bednarski, Aberdeen. Tel: (01224) 732219 or Andrew Croft (01472) 603378.

Complete radio station consisting of Yaesu FT-747 with power supply, MFJ MkII tuner, all in mint condition with Yaesu rotator and Altron wall mounted mast, bargain at £500. Please no offers. Ritchie, Lincs. Tel: (01780) 51693.

Cossor 1950 472UX five valve, bandspread, superhet, export receiver, full working order. Offers? J. V. Buckland, 28 Deeside Avenue, Fishbourne, West Sussex PO19 3QF.

Drake TR7/PS7 four filters, FA7 cooling fan, desk mic. 7077, £675 o.n.o. Remote VFO RV7, £95 o.n.o. Collins R390 general coverage receiver, 500kHz to 32MHz, £325 o.n.o. Tel: Cheshire 0161-962 7577.

Eddystone 770R & 770 U/2, £75 each. Frequency oscillator, AP100 386 adapter receiver, frequency shift receiver, old radio magazines, Espey 1 72 J signal generator. Tel: Surrey 0181-654 8544.

Eddystone amateur band RX EA12, good condition (not mint), sell or exchange, £120 with manual. Fred, 19 Grange Park Avenue, Bedlington Station, Northumberland NE22 7EF. Tel: (01670) 827741.

Eddystone EA12, £80. APR4, £80. Set of 1950s *Wireless Worlds*, £40. APS13 radar and tester, £50. Mr Bristow, Berkshire. Tel: (01344) 751269.

FT-290RII multi-mode with NiCads and mobile antenna, boxed, as new, less than 12 months old, job abroad forces sale, hence, £350 o.n.o. Andrew Craven G1PQL, 115 Lillands Lane, Brighouse, West Yorkshire. Tel: (01484) 711619.

FT-790 MkI, carry case, NiCads, charger, case damaged by previous owner, fitting mobile mount. I have never used it mobile, works very well, £200. Tel: Strathclyde (01236) 451665, (answermachine).

Genuine Potter and Brumfield heavy duty relay, 24V d.c., 24A contacts as specified in **ARRL Handbook**, soft start system for linear amplifiers, brand new, £10 plus post, lists s.a.e. Trowell, Hamlyn, Saxon Avenue, Minster, Sheerness, Kent ME12 2RP. Tel: (01795) 873100.

Icom IC-04E 430MHz hand-held, excellent condition with NiCads, charger, spare battery, box, case, earpiece, original box and manual, £140 inc. post and insurance. Roy G0EWC, QTHR. Tel: Bristol 0117-977 6891.

Icom IC-761 h.f. all-band transceiver, general coverage receiver, mint with Icom HM-12 mic., fitted up/down buttons, instruction and service manuals, £1100. Ken G3RDG, London. Tel: 0181-455 8831 anytime.

PC/XT IBM clone, 20Mb h/d, 3.5in and 5.25in floppy drives. Hercules green monitor, 102 keyboard, amateur software including packet programs, Pacterm, Baycom, Paket5, TPK. Buyer collects, £90. John, Bath. Tel: (01761) 432248.

Phillips oscilloscope PM3207 15MHz dual beam with two probes (X10) and (X10, X2 - switchable), good working order (case has slight damage), £90 o.n.o. Tel: Berkshire (01344) 303334.

RCA AR77 six band receiver, good band spread, manual, some spare valves, £70. Class 'C' wave meter, cased, chart, spare valve (ARTP1), £25. John, Prestwick. Tel: (01292) 477384.

RGD radiogram model 700AC, appears complete but not tested, offers? Very large and heavy, also R107 for spares or repair. Wanted B40 or B41. Tel: Dyfed (01970) 880325 (not Sundays please).

Silent key sale. Kenwood Trio TS-520SE transceiver mic., spare valves, boxed, £300. Ring for details. Various other things, a.t.u., electronic keyer, vertical antenna, etc., ex GW3YXC. GW4XKE, South Glamorgan. Tel: (01222) 512959.

Sony TR-305 video recorder, less than one hour's use, absolutely immaculate, boxed with case/accessories, list, £900 (Dec '94). Consider exchange for good brand name amateur TX/RX, similar value and immaculate condition. G2FZU, Notts. Tel: (01636) 813847.

TenTec Argosy 2 and matching p.s.u., £375. Racal 9520 frequency meter, £30. SE Labs oscilloscope SM111 2 x 25MHz, £70. Marconi m.f./h.f. signal generator TF2002B, £90. Steve, Lancs. Tel: (01254) 775637.

Trio TS-130V, good condition, narrow c.w. filter, p.s.u. included, £350. Ford Zephyr valve type car radio, £20. Peter Pan model 473 mains radio, not working, £10. Tel: Sheffield 0114-247 5524 after 6pm.

Yaesu FRG100 general coverage receiver, £350. Alinco D410 430MHz 3/35W, £175. Spectrum +3 computer plus games. Colin G0VDL, Essex. Tel: (01375) 384179.

Yaesu FT-990DC, new, two years guaranteed, mint condition, good reason for sale. Tel: Sheffield 0114-245 4579 for details.

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Bendix TA12 TX, Marconi T1154, any condition. R109 receiver, complete. Require info. on Racal TR15A transceiver, all costs paid. Ken Jones G3PSZ, Ockton House, 24 Station Road, Okehampton, Devon EX20 1EA. Tel: (01837) 53021.

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Eddystone 770U, MkI or MkII in v.g.c., or Turret switch for same (MkII) in g.c. Mike G1BBS, Croydon. Tel: (01689) 842016.

Eddystone receivers EC10 series, EB35 series, 960, 870, 870A, speakers 688, 652, Clarke & Smith and wartime civilian receivers, mains version for cash, collection possible. Peter Lepino, Surrey. Tel: (01374) 128170/(01372) 454381 or FAX: (01372) 454381 anytime.

Ferrite rod antennas, must be half inch in diameter, no more or less. Must be six inches long or more. Peter Tankard, Sheffield. Tel: 0114-234 3030 anytime.

KW Vespa TX, 1.8-28MHz, also Eddystone Pan adaptor for 770R, still looking for Japan radio NRD93, your price, must be good. Also Trio 9R59DS 0-30, swap, sell R1155 AR88D. John, Staffs. Tel: (01538) 385735 anytime.

Marconi Apollo s/w receiver. D. Rackham, The Chimes, Coventry Road, Long Lawford, Nr. Rugby, Warwickshire CV23 9BN. Tel: (01788) 574099.

Racal MA350B synthesised in g.w.o., also spares or 'non runner' for MA350B, also Racal MA89, MA90, MA91 and MA92, test rigs. Rob Filby G0HJR, N. Yorkshire. Tel: (01723) 581472.

Racal TX/RX Minical TRA6929, also Racal Squadcal TRA906, all late Racal TX/RX considered, cash waiting. Clansman TX/RX also wanted, will collect or pay post. Some Racal TX/RX for sale, exchange. Phill, Herefordshire. Tel: (01568) 720378.

Standard AX700 receiver, unmodified, in good condition with manuals, etc. Mike Yorkie, Surrey. Tel: (01276) 65876.

Valve Hi-Fi equipment, Leak, Quad, Radford and more obscure types, working or broken, spares, valves, data books, etc., equipment collected, cash paid. Tel: Birmingham 0121-784 8765.

Wireless World Vol 31 (July - December 1932) and Vol. 46 (1940). Terry G4TZB, Manchester. Tel: 0161-643 6116.

Yaesu FT-780R 430MHz multimode transceiver, must be in v.g.c., and g.w.o., no mods. Also MC-50 desk microphone for Kenwood TS-520SE, must be in good condition and g.w.o. Peter G0OMH, Orpington. Tel: (01689) 890227 after 6pm.

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Ferrograph series five, tape recorder working - exchange for Eddystone receiver, series 750, 940 or similar, working. Tel: Lincs (01205) 369177.

R109B receiver, all knobs, terminals, etc., complete cover stamped HHC & Co Ltd., 1943, working conditions unknown, what have you? Bob, Northumberland. Tel: (01670) 790296.

Bargain Basement April 1995

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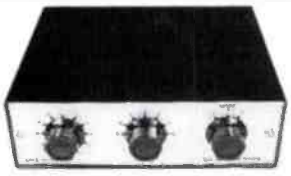

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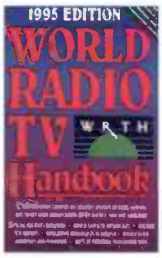

SATELLITES

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Derek Stephenson
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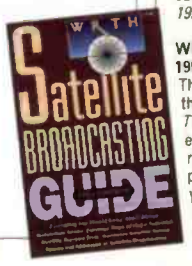

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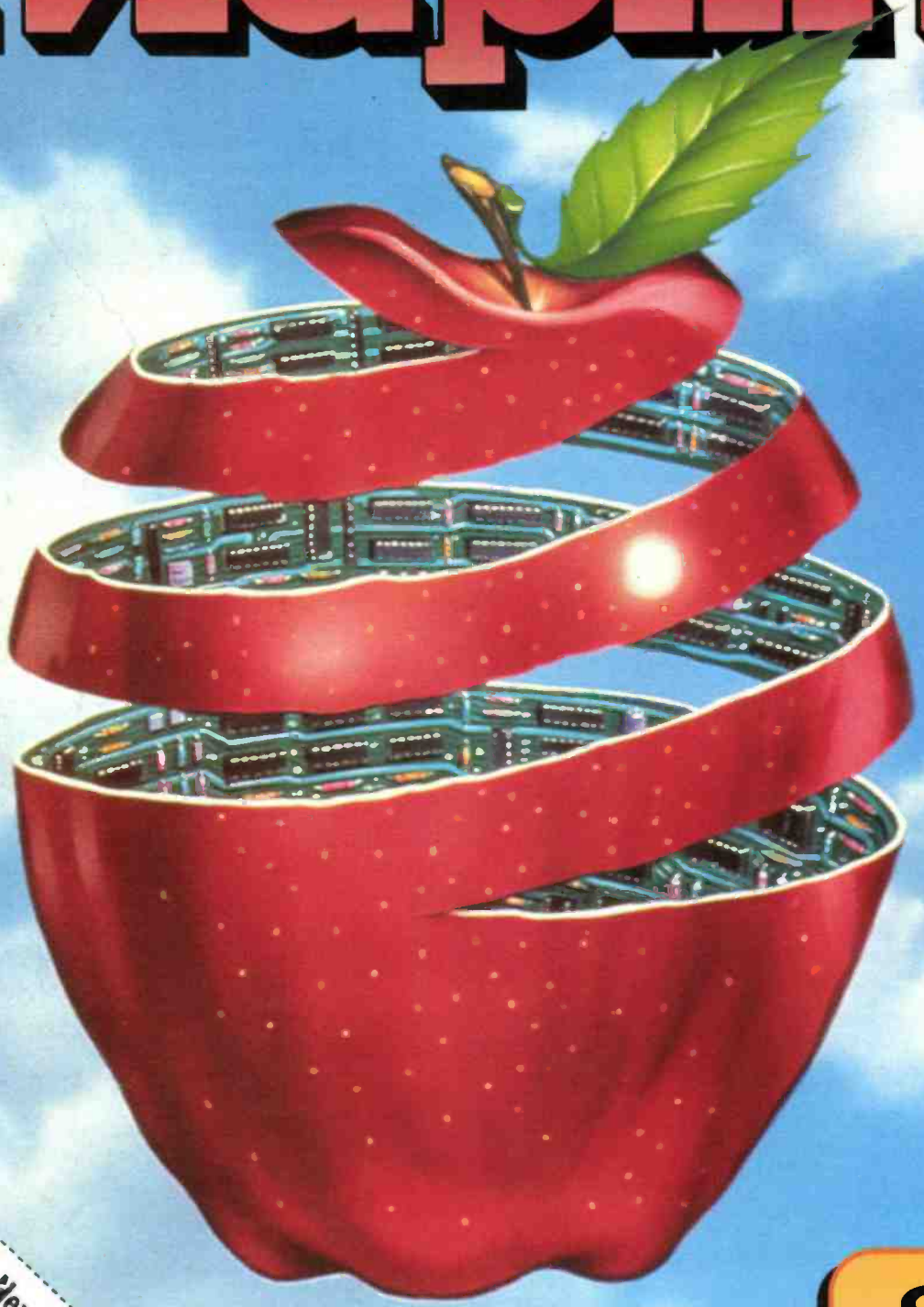

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