

# CB Citizens' Band

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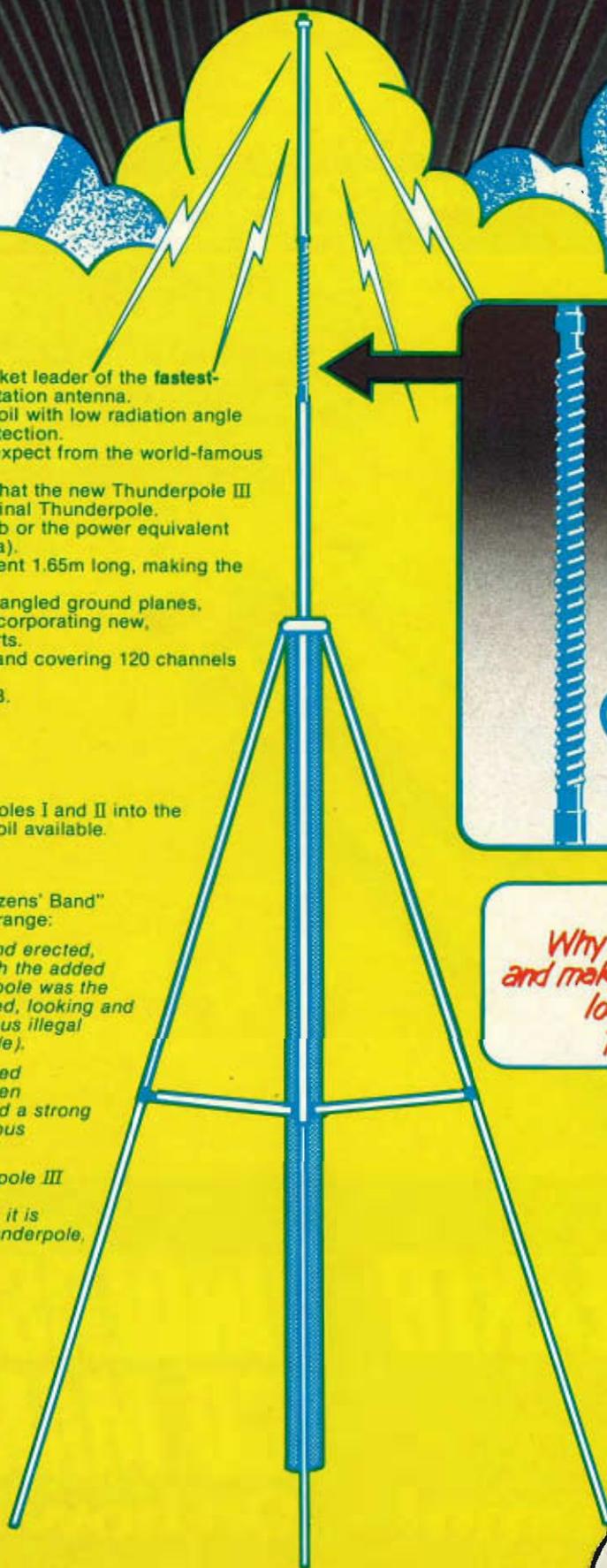
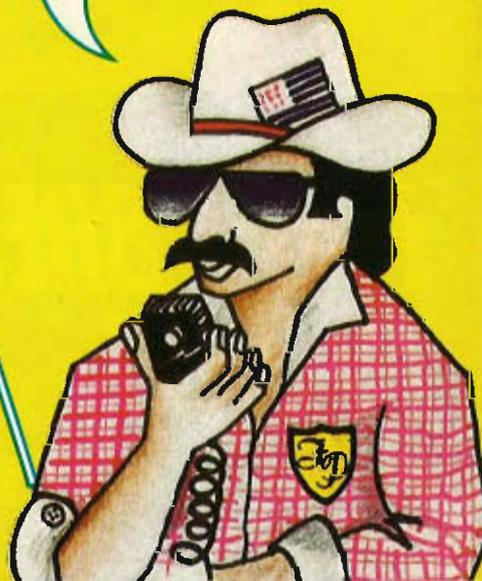
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LOADED  
COIL

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the Rest!

"HI BREAKERS!  
Why don't you jump the skip  
and make the trip with the centre-  
loaded, helically wound  
THUNDERPOLE III"



# CB

# Citizens' Band

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### SEPTEMBER 1986 VOLUME 5 NUMBER 10



#### Inside this month

Paul Coxwell comes up with a simple guide to microphone wiring

Editor ..... Eamonn Percival  
Group Editor ..... Sue Sharp  
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*Prices quoted are those prevailing at press dates and are subject to alteration due to economic conditions. You are advised to telephone prior to ordering or sending money.*

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Mike Davenport

## THE 1986 CATALOGUES



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# UPDATE

## NEWS FROM THE WORLD OF CB NEWS FROM THE WORLD OF CB NEWS FROM THE WORLD

### Editorial

Well, we feel we've packed quite a lot into this month's issue and I am, as you read this, probably slapping myself on the back — probably not, actually, as I am writing this at the beginning of July and you are probably reading it towards the end of August!

Well, as we promised last month, we have started to take a close look around the club scene and, elsewhere in this issue, you will see a 'spotlight' feature on the Fun Makers club in Hemel Hempstead. As I mentioned last month, please feel free to send in any pics of one of *your* fun nights. There's always the chance you'll see your own face staring back at you from these pages. In the

case of lady breakers, the more scantily clad the better!

Antennas feature fairly heavily this month as you will see from Keith Townsend's authoritative article on various aerial designs. There's also a feature on an inexpensive DIY 934 antenna and, of course, a review of the new Pama-Tri 27MHz aerial.

A new, and, we hope, regular, contributor to these pages is one Paul Coxwell who, this month, tells us about the intricacies of CB manual specifications and also provides us with a guide to wiring microphones. We are sure you will find them both entertaining and informative.

Now, last but not least, I would personally like to say

how sorry we all are at losing our esteemed Group Editor, Sue Sharp. As readers of old will know, Sue has been involved with CB for many years now and has always taken a pride in the shaping and contents of this magazine. Alas, Sue is going on to bigger and better things so we thank her for her valuable guidance and wish her all the best for the future. You will find her own personal farewell elsewhere on these pages.

Oh well, you will have to excuse me — the violinists are tuning up and they need a middle C from the office piano!

**Eamonn Percival**

### Farewell, Friends

I came to *Citizens' Band* magazine in August 1983 after five months of unemployment (unless you can count filling little yellow forms via a temp agency as employment — I didn't, and my bank balance wasn't sure, either). I'd left *CB Radio* magazine (you older breakers will remember) when it closed down and I thought it was unlikely that I'd work on another CB magazine — which was more than a minor worry as I knew about CB first and journalism second. I was very surprised to see the editorship of *Citizens' Band* advertised but quickly applied for the job — especially as the alternative was filling in little yellow forms.

They weren't convinced at ASP when I came for the interview — CB had always been edited by a man and

they regarded it as a 'male' subject . . . but I knew CB and they didn't exactly have a lot of people to choose from. So, I started work two days later on what proved to be one of the happiest times in my working life.

Three years later, I still have a great affection for *Citizens' Band* magazine and particularly for CB itself. I have worked on CB magazines for six years, have been involved with CB for eight years and have watched every stage in its development like an anxious mother watching a sometimes-badly-behaved child. Many of the hopes and dreams I had were realised, some dropped by the wayside a long time ago as either too idealistic or just plain impractical. So it is with particular regret that I will be leaving CB and CB magazine publishing behind me when I leave

ASP. For the first time in six years, this particular form of radio communication will not be part of my working life and this will take a bit of getting used to. CB has been good to me — and I hope in my way I have been good for CB.

I leave the magazine with the Editor who has been looking after it so competently for the past two years, Eamonn Percival, and welcome a familiar name back to the title. Chris Adam Smith, who at one time edited the magazine himself, is back on the title as Group Editor — one of the family, in fact.

It's difficult to finish a goodbye note without sounding insincere or soppy — so I'll just say what I really feel — and that's goodbye . . . and thanks.

**Sue Sharp**

### Sugar Mike Radio Club

In last month's Club News section, we carried a letter about the Sugar Mike Radio

Club of Derbyshire. Between the time of our receiving the letter and publishing it, some of the details have changed. The Club now meets on Thursdays at 7pm

and their secretary is Sugar Mike 11. The venue, however, remains the same: Shoulder of Mutton, South Normanton, Derbyshire.

## The Wonder of Wallen

We would like to thank Les Wallen and his team for a wonderful welcome when we popped in to see them in their new premises at Ramsgate. As most of our readers will know, Les Wallen Manufacturing Ltd produce many top-quality antennas such as the Modulator, T-Bolt, and Saturn ranges in addition to various mounts and SWR meters.

Les's factory is no small, backstreet workshop. In fact, the premises, into

which the company moved a few months ago from their former location in Sandwich Kent, is spacious and well designed with an impressive test area, boasting very sophisticated equipment. Sadly, some light-fingered personage took it upon himself to break into the factory and steal some of the much-valued test meters, but with Les's plethora of equipment, it still hasn't halted production.

Thanks for a great day, Les, and we wish you and the rest of the team continued success.



Les Wallen (right) demonstrates some of his test equipment for Citizens' Band editor



Mr Douglas Byrne with a 1932 Eddystone shortwave receiver and a McMichael battery superhet set

## London to Brighton

Monitoring Service of Great Britain successfully marshalled one of the biggest fund-raising cycle events in the country recently. Over 25,000 cyclists set off from Clapham Common and worked their way down through the countryside to the sea-front of Brighton.

Last year, the sponsored

riders raised over £400,000 for the Heart Foundation and they hope to have raised over £1/2million with this year's event. Many celebrities took part including Kenny Lynch, Billy Connolly, Sharon Davies, Steve Jones and John Peel. CB organisations were backed up by RAYNET and the BRCS who supplied First Aid cover.

## Thank You Breakers

We have received a letter from a lady who goes by the handle of Sex Shop which is, unfortunately, much too long to publish. However, we would like to

convey her sentiments in a couple of paragraphs.

Barbara (Sex Shop) has a severe problem with her sight but nevertheless remains keen and cheerful, and she wishes to thank,

## Communications Collection

'Communication Across The Commonwealth' is the theme of an exhibition by the Communications and Electronics Museum on display at the Edinburgh College of Art during July and August 1986.

Co-inciding with the Commonwealth Arts Festival, and the Edinburgh Festival, the exhibition should evoke memories of not-so-distant commercial broadcasting techniques and services of the 1930s. Using photographs and some rare exhibits, Marconi-Reiss Microphone and a McMichael Battery Superhet, the display tells the story of the development of the early BBC Empire Broadcasting Service exemplified by the King's Christmas Day Broadcasts to the Commonwealth.

The Communications and Electronics Museum has been formed by bringing together the

collections of two enthusiasts. Dr. Graham Winbolt, who lives near Bristol, Avon, has collected military electronic material. Mr. Douglas Byrne, from Ryde, the Isle of Wight, has been an enthusiastic collector of commercial radio and communications equipment. With support from Portsmouth City Museum and commercial sponsors, a museum is being established to preserve historical equipment which is being stored in Portsmouth and catalogued and restored by an MSC Community Programme Scheme.

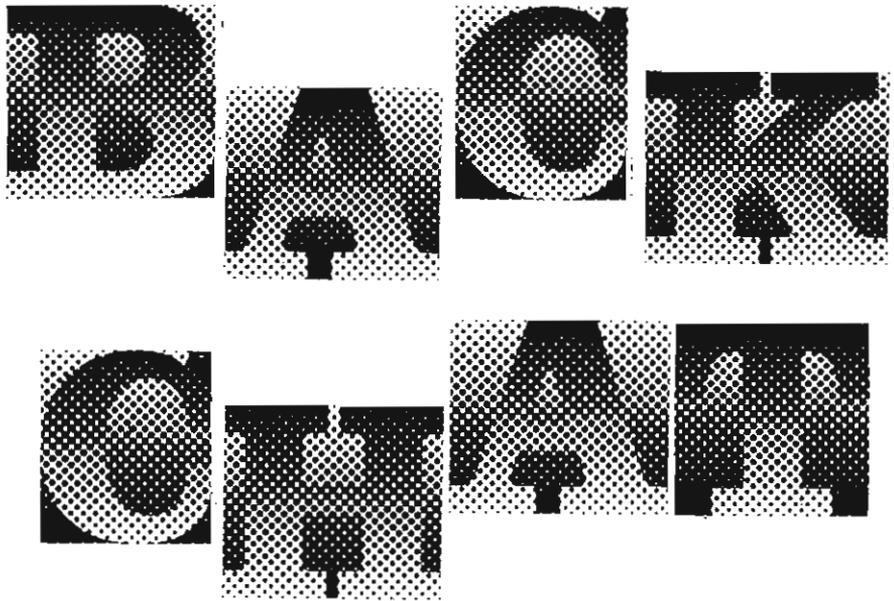
Rank Xerox Ltd invited the Communications and Electronics Museum to mount an exhibition during the two festivals in Edinburgh as part of the company's contribution to the Industry Year '86 initiative.

For further information, contact Mr. D. Byrne on 0983-67665 or Karolin Newman on 01-836 3261.

through these pages, all her breaker friends, most of whom are members of the Sierra Kilo Club of Kedington, Suffolk.

Barbara also included a list of names — again, too

long to publish but we are sure she has included the whole of the club! Sorry we couldn't manage to squeeze your letter in, Barbara, but we hope this will do instead.



### Ban the Big Wheelers

*From Huddersfield, St Bruno wishes to disagree with our trucking correspondent Big T. . .*

Whilst re-reading some back copies of *Citizen's Band*, I came across an article of Big T's in which he makes an absolute ass of himself. I refer to his "pet moan" of caravans on the motorway. This sort of attitude is, sadly, a reflection of most truckers' attitudes whereby they think of themselves as 'kings of the road'.

I happen to be a caravanner and a breaker. I travel many miles on the slab and I often see the truckers deliberately driving too close to a caravan to make it sway. In fact, I've heard truckers on the rig discussing their next scare tactics!

In my opinion, 90% of truckers want their licences burning. Is travelling through contra-flow in the outside lane at 80mph good driving? If you lot didn't spend so much time in choke and puke, you wouldn't have to go so fast. We stick to 50mph — why don't you stick to 60mph? If we are too slow in the granny lane, then pass us and cut us off like you usually do.

The smokies should be pulling you and keeping you off the slab. Better still, bring back British Rail. Come on, Big T, let's have none of this bull and try to respect the caravanner as a driver too.

*Phew, harsh words indeed. What do other readers think?*

### Name Change for the Ham Club

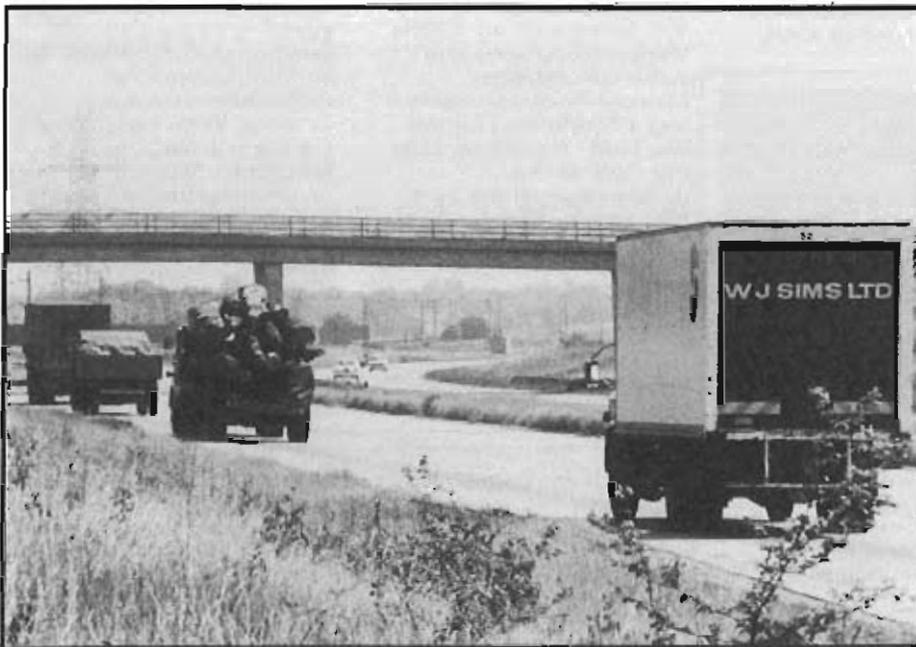
*Martyn Bolt, founder and president of the Ham International Owners Club, has some news. . .*

I would be grateful if you would give mention to the fact that, with an increase of requests from non-Ham International owners, we will be altering the name of the group and will be reprinting stationery etc as, in the future, we will become 'Ham International Radio Club' and welcome all radio users.

We presently have 600 members spread around the world operating on many different bands and modes and it is gratifying to find out how many people are using the callsigns — in fact, a Lebanese member will only acknowledge the HI call!

Regarding your magazine, I hope that, in the future, we may be seeing a regular appearance of the Free Readers Ads. I think they provide an excellent national marketplace for readers.

Finally, on a note of interest to shortwave and scanner monitors, I am working on listings of various services using the spectrum. I have no final



details yet but SAEs are appreciated for information.

*Thanks for the info, Martyn, and we wish the group well. Regarding the Free Readers Ads feature, the reason it does not appear in every issue is purely down to reasons of space. However, we have plans to not only carry it on a regular basis but to also enlarge it.*

## Amateur or CB?

*Colt (GVC KX), of Luton, sounds disillusioned with CB. . .*

I read with great interest the letter from Emperor in July's issue. I was quite amazed at the wide band of topics he managed to cover in one letter, but the section which caused me to put 'finger to key' was his paragraph on amateur radio.

I started working CB radio when it first came into the country, from the old Auntie Mary right up to FM 27/81. I then turned to amateur radio, mainly because of the amount of wallies on CB. Now, Emperor states that ham operators should try and help CB operators who don't know much about transmission and reception problems. Well, for your information, myself and many other ham operators have tried and failed — most people just don't want to know.

The other point which bothered me was where he went on to say "we need a better system". Yes, I agree, we do need a better system, but it will not be achieved by opening up more frequencies. Before you do that, you should campaign for some kind of basic operating licence to be brought into effect. Then at least you would have something to take away the wallies who cause you so much trouble on your overcrowded channels.

Say what you will, dear Emperor, but whose system works best — amateur or CB?

## Let's Educate Newcomers

*Ian Oliver, from the Monitoring Service of Great Britain, offers help and advice. . .*

We, as an emergency monitoring group, are always being asked what can be done about the wallies. As most breakers know, they can come in many different forms but in all cases they are, to say the least, annoying.

Although we cannot offer a solution to all the different types that are around, we feel that one aspect that must be explored is the education of the young breakers. To this end, we are visiting CB clubs for the youngsters and other youth clubs. This is done by contact through the committee or youth leaders and in all cases so far we have been surprised by both the response and the lack of knowledge. It still seems that the youngsters and newcomers think all they have to do is to just 'flick a switch'.

We are, at present, making a short video to help with these visits and if we can assist in any way or if you would like to know more, please contact our group at either 18 Shepherds Way, Seldon, South Croydon, Surrey or 60 Caister Road, Balham, London, SW 12.

## Sponsored Ratchet

*From Maidstone, Sugar Puff has some kind words for fellow breakers. . .*

I would like to thank Blue Man and friends for the sponsored ratchet which took place recently. Blue Man was chairman for the whole 36 hours, during which £400 was raised for the Diabetic Society. The cheque was presented at a disco in Hunton Village hall, which was organised by the Coxheath and District Breakers Club.

It is nice to know that there is a lot of good done by breakers such as those who supported the ratchet and I felt it was time somebody wrote in to show how much people care. It just goes to show there are more serious breakers than wallies on air. Also, it would be nice to hear from others who have raised funds for their local charity.

So, to all the breakers who supported the ratchet, thanks once again from someone whose mother suffers from the complaint.

## Eleven Metre Society

*Harry Tait from York wants you to listen. . .*

I write to ask if there are any readers of your magazine who would be interested in forming an eleven metre radio society — something along the lines of the RSGB — to promote the use of 27MHz CB and to be a voice for the CB users of this country. Here are a few ideas that come to mind:

1. To campaign for the retention of the present UK band when the new frequencies are introduced i.e. an 80-channel system.
2. To campaign for the scrapping of the present aerial restrictions which appear to cause a lot of TVI.
3. To help and advise CB users who are having problems — either technical or legal.
4. To put pressure on the DTI and other bodies to clean up the legal frequencies.
5. As time goes on, to raise the question of SS8 operation — not, may I add, for DX purposes but from a point of view of frequency space. You can get two SSB copies in the space of one FM or AM copy. I have no time for straight AM. Modern communications today are either FM for quality or SSB for space.

If there are enough people interested (and I hope there are), we could get a real voice for CB in this country — which we don't have at the moment. If

you are interested, write to me at 7 Fenwick Street, York YO2. 1JR

## A Better System

*RB01, from Lincolnshire, has some suggestions for a better system. . .*

I have read with some interest and surprise that we are to get the FCC frequencies at long last. I, like many other stations, hope that the brainless idiots who infect the FM stay where they are or disappear altogether.

I campaigned long and hard for the introduction of CB radio and the system has never been the same since it was legalised. It does seem to have been a little better over the past year or so but I would still like to put forward some ideas for a better system.

1. The clubs and individual stations should get away from the "10-4 good buddy" image.
2. Channels 9, 14 and 19 should have legal cover to stop misuse; 9 for emergencies, 14 for home base and 19 for mobile contact only.
3. Recognition by the authorities of the usefulness of CB in the role of disaster response.
4. Nationwide body to monitor the use and abuse of the system.
5. Licence to be issued before a set/sets can be purchased.
6. Better technical specs from manufacturers.
7. Better liaison between CBers and hams to help the stations in built-up areas to keep TVI to a minimum.

These are a few suggestions to give people some idea what is needed to make the new system better for everyone. I will be forwarding these suggestions to the DTI. No doubt, these ideas will get some people's backs up but if it gets the ball rolling, all well and good.

Two things that could help improve the FM system is that home bases needing to contact stations other than mobiles should keep off channel 19 and truckers should be more considerate toward mobile stations which are not on 18 wheels — car users.

Finally keep up the good work, especially as you are now the only non-ham radio magazine on the market. One suggestion for your magazine is to get away from the basics and move to the technical articles to make stations more efficient and clearer.

*You have made some interesting suggestions, RB01, although it's doubtful how a couple of them could be 'policed'. Regarding the magazine, we hope you will have noticed more articles of a technical nature appearing recently but there is still a need for the occasional 'basics' feature as newcomers to our hobby tell us.*

**Letters should be  
addressed to: Back Chat,  
Citizens' Band,  
1 Golden Square, London  
W1R 3AB**

# CLUB SPOTLIGHT

The first of an occasional look at an everyday CB club

**W**hen most people are tucked up in their little beds and bleary-eyed TV addicts are glued to the screens watching the late-night horror movie, the silence of the CB airwaves is broken by a strange sound: "Knight to King four". No, it's not a commentary from some modern-day medieval joust, but Mississippi Lady (Pat) making her latest move in a bizarre game of chess with a friend sitting two miles away!

"We usually start about 11.30 when it's nice and quiet on channel", she says. "It's just a bit of fun really, but sometimes we get so engrossed in the game, we don't finish until four in the morning."

It was Pat's sense of fun and her interest in CB that led her and five friends to form the Hemel Hempstead Fun-Makers Club some four years ago. Originally run from the function room of a local hotel in Hemel Hempstead, the club thrived on a membership of 150, which helped to pay the rather exorbitant £45 charge for the hire of the room. That, of course, was at a time when CB was at its most popular and unfortunately as the interest in CB dwindled, so did the club's attendances. Although smatterings of the total membership occasionally visit the club, there is now only a nucleus of 15 regulars. Each meeting is, however, well attended. The numbers are boosted by a large proportion of guests.

The membership is rather surprising really, because, as the same suggests, the FMBC is a fun club. Now run from the Eastern Electricity Social Club, where they meet every Tuesday, the



It's singalong time, folks! Steve and friend strike up a duet, while one punter is taking this betting lark a bit more seriously

FMBC has an endless itinerary of events. With talent nights, fancy dress dances, horse-racing nights, treasure hunts, pop quizzes and a fortnightly disco just a few of the things they get up to, you can see that they really live up to their name.

"Right from the start", says Pat, "our aim was to be more than just a club for CBers to talk about CB. We wanted people to come and enjoy

themselves, and that meant non-CBers as well."

Pat feels that the club belongs to the members — "Without them there is no club". So the subscriptions they pay not only covers the cost of the club house, but also goes towards paying for the many trips organised. Like the day at Alton Towers, ice skating at Queens and the annual jaunt down to Southend.

That the club continues to function with such a small membership is, without doubt, due to the dedication and enthusiasm of Pat and her four other committee members. On the night I visited the club, Steve, the club secretary (otherwise known as 'Fairy Lights' because of the array of lights around the roof of his van) had organised a race night and was frantically shouting the odds, collecting the bets, playing the video and paying the winnings. All this activity was obviously thirsty work for our surrogate bookie, and it wasn't long before his table was full of empty glasses from drinks supplied by lucky punters — and one not-so-lucky CB Magazine reporter, I might add.

At the other end of the hall, the FMBC darts team was losing a closely fought match with Eastern Electricity, while those who weren't gambling away their life savings on the horses were chatting at the bar, playing pool or trying to win a few bob on the fruit



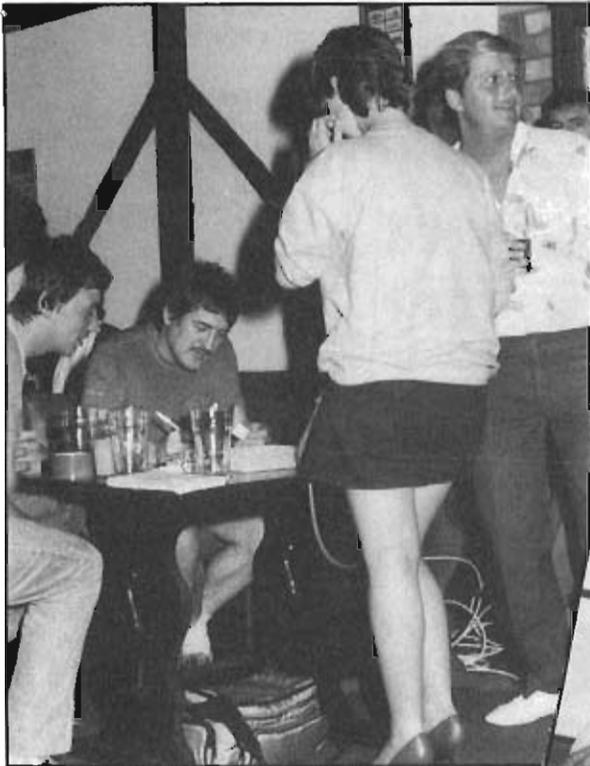
10 Those that weren't betting on the horses could watch a good game of pool — or whatever else took their fancy



The darts teams. Even the losers could raise a smile — well, nearly all of them.



Pat's obviously backed a winner, and poor Steve is wondering how much winnings he's got to pay out



The odds were not the only things getting shorter at the FMBC race night



Chairperson Pat (second from right) with some of her fun-makers



(Left) British pub grub is now so disgusting that diners are forced to cultivate the art of eating with their eyes shut

(Below) 'Fairy Lights', the club secretary, doesn't look too bright here. Or perhaps he's just tired and emotional



The friendly atmosphere of the club even brings mother and daughter together — but you wait 'till they get to Sainsburys

machines.  
As always with organisations of this nature, the FMBC has its fair share of 'characters'. Steve, as if you haven't already guessed, has got a rather outgoing personality, and in his spare time is the manic bass player with a local band called Eve. Anybody who likes good 60's music should get along to see these guys. And there's the lady (who wishes to remain anonymous) who admits to breaking into a rousing chorus of "New York, New York" in the middle of Sainsbury's, much to her daughter's embarrassment!

In my opinion, many breakers in the area are missing out on a good thing. The terrific facilities of the clubhouse (with the added attraction of cheap booze), the full programme of events and the crazy members, all add up to a fun club to be with. So if you're within shouting distance of Hemel Hempstead in Hertfordshire get along to see Pat and her friends on a Tuesday night. New faces are always welcome.



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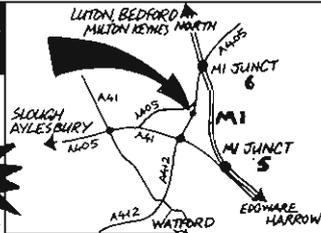
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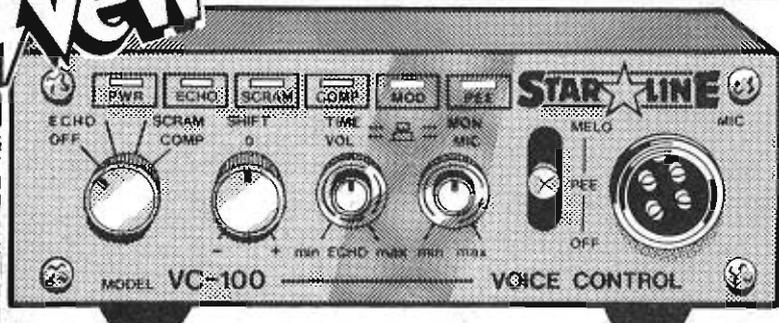
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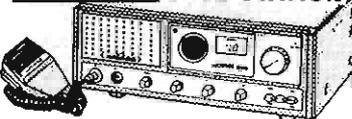
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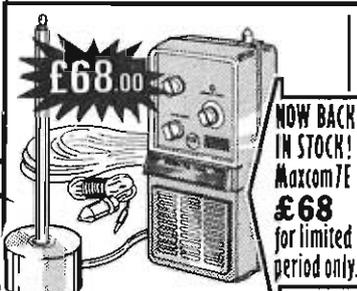
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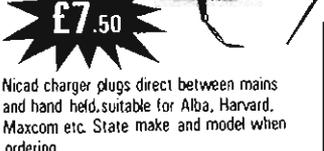
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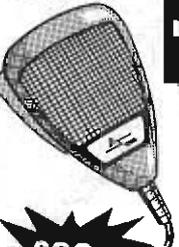
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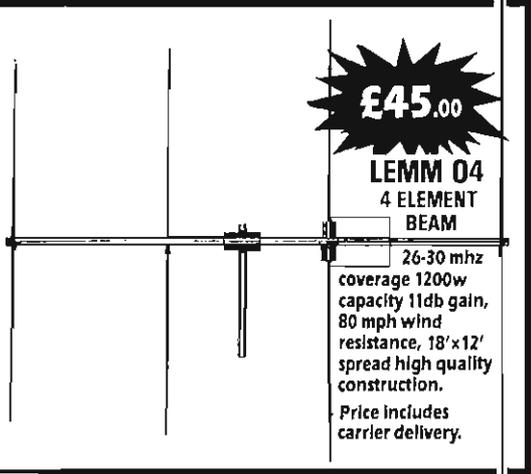
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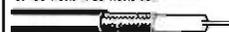
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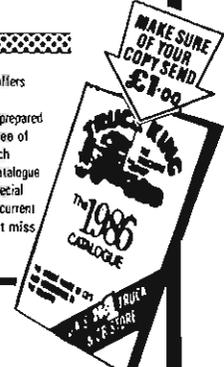
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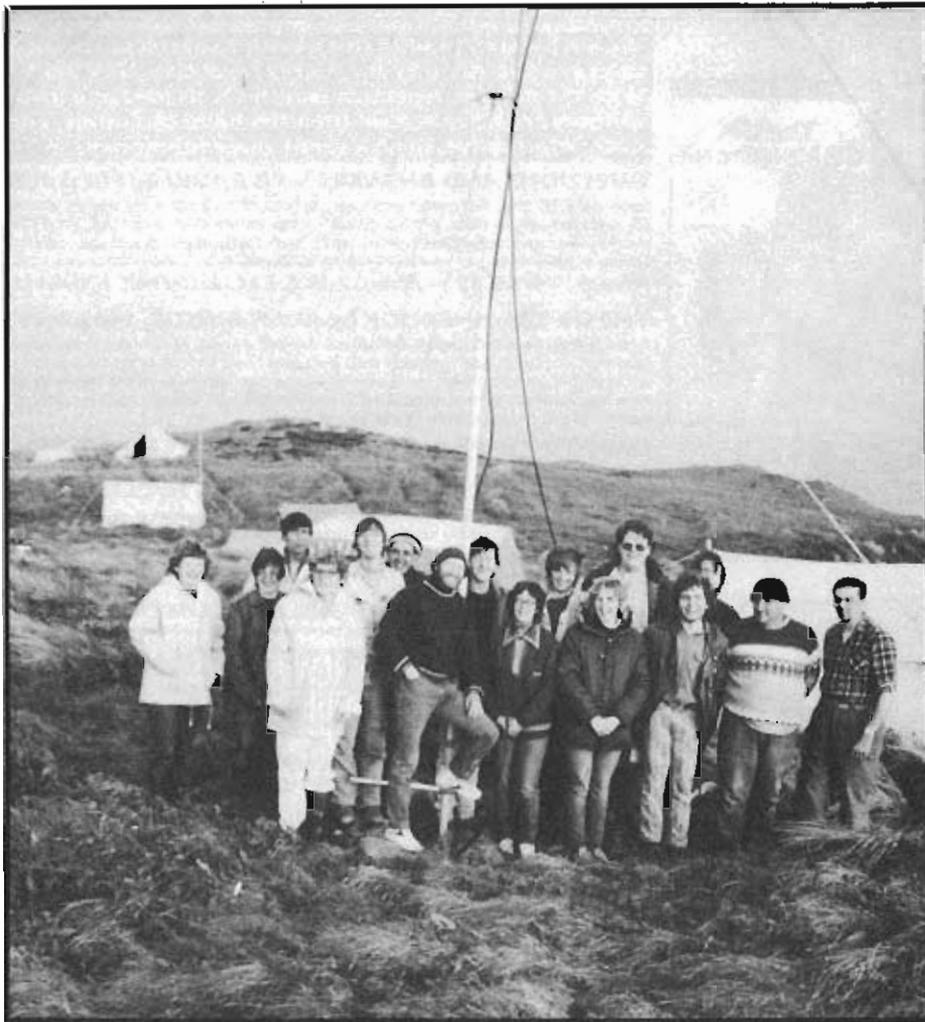
**W**e have heard it said many times that amateur radio operators and CB users have nothing in common and cannot possibly co-exist amicably. Here, in Cornwall, a certain group decided that this was nonsense. After all, what is the difference? We are, in the final analysis, radio users. OK, amateur radio users have to take an approved examination to be allowed to operate on the licenced bands, while CB users can just buy their equipment and a licence and set up their station. OK, you hear bad operators on CB, but I defy any amateur to swear that he has never heard a bad radio amateur.

Seventeen of us decided to set up a special event radio station on an uninhabited island in the Isles of Scilly group. Twelve were men, five were women; nine were radio amateurs, six were CB operators and two had never used a transceiver at all. Quite a mixture — doomed to failure? — read on.

This event was to be run in aid of charity and what better charity could we choose than the RNLI considering our proposed destination? This having been decided, we found we could not just plant ourselves on an off-island without so much as a by-your-leave. No! Permission had to be granted by the Duchy of Cornwall, of which the Isles of Scilly are a part, and by the Nature Conservancy Council, since many of the uninhabited islands are nature reserves. After some time, we finally received permission from both bodies to use the island of Great Ganilly, the most Easterly of the islands.

We now had to decide what we needed to take. Radios and aerials figured high on our list, naturally. What bands did we want to operate? We finally decided we would have three radio tents — one tent for two HF amateur stations, a second for VHF and UHF (2 metres and 70 cms) and, last but not least, one for CB to include 11 metres and 934MHz. We made an inventory of our own personal equipment to see if we could set up all these stations ourselves and we found we could not. For a start, not one of us owned a 934MHz set. Dave Proud of Chatback Communications in Cornwall came up trumps by offering to lend us a radio and a 4-element beam to go with it. We wrote to businesses all over the UK and received an immense amount of help with radios, aerials, power supplies and amplifiers from Thanet Modules, Mutek, BNOS Electronics, Jaybeam, Davtrend, Wood and Douglas and Hatelly Antenna Technology. Reg Ward sponsored us with some much-needed cash and many local firms donated cash, food or raffle prizes.

However, with the best will in the world, none of this will work without some sort of electrical supply. A generator was needed and Easi-Way Hire of Penryn in Cornwall offered us a 5Kva generator free of charge. They did tell us that it would use one gallon of diesel every three hours, so we ordered 35 gallons of diesel to be waiting for us when we docked at St.



Back row, left to right: Jill, Dea, John, Phil, Mike, Keith, Roger, Tony, Phil, Ivor, Mike. Front row, left to right: Helen, Tony, Leila, Helen, Andy

# SCILLY BEGGERS!

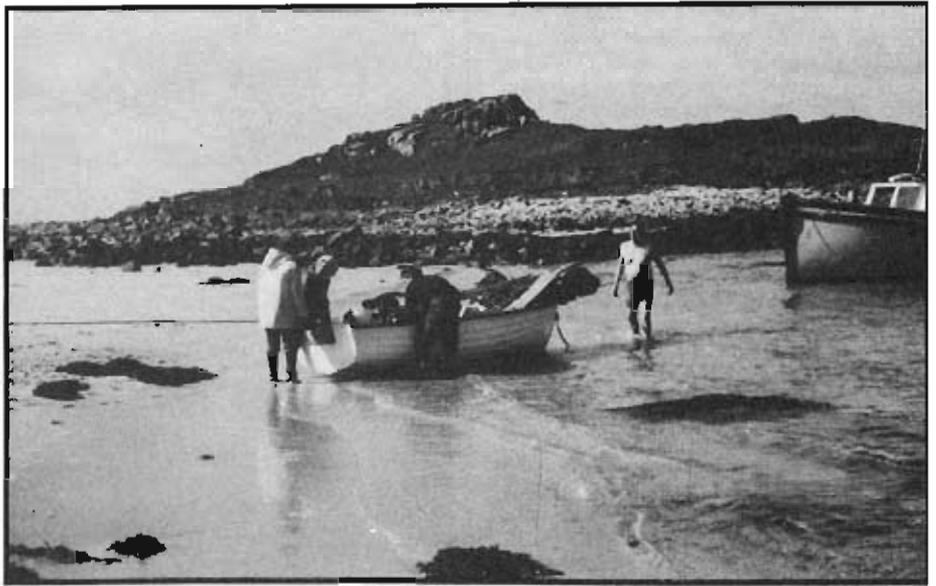
Tony and Leila Bevington tell us of a recent expedition, in aid of charity, to the Scilly Isles

Mary's, the main island in the Isles of Scilly group. We also had to work out how much 17 people would use in the time on Great Ganilly — Friday May 23rd to Monday May 26th. In the event, we had far too much of both — we only used five gallons of diesel and decided that washing was not important! The generator was to be picked up the day before we left. Our PRO picked up the van we have been lent to

transport our gear to Penzance and then drove gaily on to pick up the generator. All the rest of our equipment — tents, poles, radios, food, cooking utensils and so on — were stacked in his garage to be loaded into the van after the generator. He nearly had a heart attack and was reliably informed that he went as white as a sheet when he was told by two young ladies in the shop that they knew

nothing of his borrowing the genny and the boss was not there. It took some moments to gather his wits together to speak, while his mind whirled with the thought of trying to cope without a generator. You see, as PRO, he had done a very good job; magazines had featured the event to give it publicity. In fact, he had done his job so well that the local TV station was sending a crew just to film us. Panic set in, but then the boss came back and another generator was located.

The van was loaded and at 6am on the Friday morning we all set off for Penzance. There the van's contents were placed in a container to go on board the Scillonian and it suddenly hit us how often we were going to handle the two tons of equipment we were taking. We knew the container had to be unloaded at St. Mary's into the smaller boat that would take us to our island and then we would somehow



Left to right: Jill, Helen, David, Mike



Ivor Preston (handle: Bird Man)

have to get onto the beach and up to our camp site. The whole thing would have to be done in reverse on the way home and suddenly it became a very daunting process. Still, many hands make light work and there were plenty of us there.

We had very kindly been offered reduced fares by the Isles of Scilly Steamship Company and they were carrying our freight free. The precious generator together with our gas bottles and the poles that were too long to go into the container went on as deck cargo. We watched with great trepidation as it was craned on board 40 feet over our heads. All was well. We boarded the Scillonian and sat together at first while we were given a pep talk by one of the organisers. Later we dispersed our separate ways, since the journey is about 2½ hours long and strikes different people in different ways. Three currents meet in the water on the trip out, creating an eddy which has dire effects on many people! Thus, most stayed in the fresh air on deck or

curled up in a corner to sleep. A few hardy souls retired to the bar and one of our party did very well for himself. Friends bought a drink and, after one gulp, would hand it to Mike asking if he wanted it, while they dashed hot-foot and green-faced to the deck.

On arrival at St. Mary's we were met by Colin Oakley, the harbour-master, who is also a radio amateur and CBer. He had acted as our link man in the initial stages of planning. He had also arranged tables and chairs from the local Church Hall for us to take with us, as well as our diesel fuel and the collecting of our water. We certainly couldn't have managed without him.

Our small boat was waiting for us and, with horror, we saw it was at the bottom of a steep flight of steps. Oh no, we had to get all our gear down there! Still by forming a human chain from the container to the boat we soon had it safely on board. The TV crew had now joined us and we all clambered aboard and were on our way. All the problems had been solved. We were

on the final leg of the journey. Nothing could go wrong now. How wrong can one be? Within sight of Great Ganilly the boatman told us that the ground swell was too strong to land us and furthermore he might be unable to get us off on the Monday. Did this mean our plans were for nothing? Would we have to give up before we had started? No, apparently there was a solution. We would have to change islands. This could mean disaster, since all our plans were based on Great Ganilly. RNAS Culdrose had sent aerial photos from which we had planned our various sites for tents and aerals. Colin had given us information on the soil conditions. The island suggested was Little Arthur, adjacent to Great Ganilly and a little further inland. However, we could not ignore the advice of the local boatman. It was Little Arthur or nothing. We landed on Little Arthur!

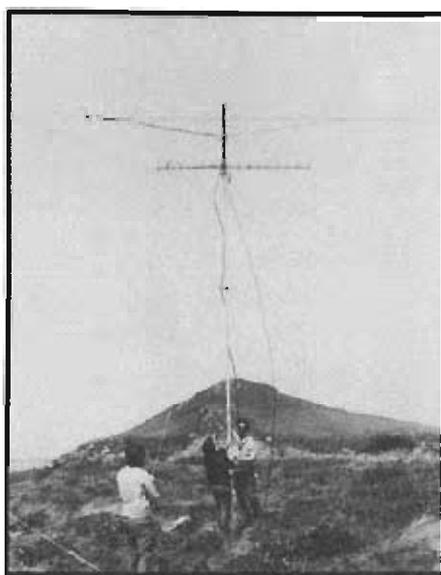
That sounds easy, doesn't it? In fact, the boatman anchored 20 yards from the shore. This was as far as he could go. We looked at the water and then at each other. The TV crew were certainly not happy! Then Mike (does beer give you courage?) stripped down to shorts and leapt overboard. He came up again and told us the water was lovely, but we didn't believe him. Anyway, he towed us and all our gear onto the beach with about eight trips in a dinghy. Others took their trousers off once on the beach to help man-handle things out of the dinghy and then began the task of carrying everything over wet, soft sand and large, loose rocks to the camp site that had been hurriedly chosen. The tide was coming in so it was urgent to move off the beach!

The TV crew film some of this and then wanted a shot of a radio working before they went back to civilisation. We were all exhausted by now and tempers began to fray as the pole and aerial we were hurriedly trying to erect would not behave in the strong wind. Eventually we had a two metre amateur station working and the operator was

filmed making contact into Port Talbot. Then, to our relief, the TV people departed and the pressure was off. We settled down to making our island habitable. The ladies in the party had already put up the cook tent and tea and cake were on offer. Both were gratefully received.

By 5pm everything was working. At first, the CB users were a little disappointed at their lack of contacts, but they despaired too soon. Over the week-end contacts were made on 27MHz to West Germany and Spain and a very interesting one to a light-ship moored about halfway between St. Mary's and the mainland. The operator designated himself M/A for maritime anchored!

The 934 Nevada used a 4-element beam and the 11 metre radio was connected to a Thunderpole. By the end of our stay, both CBers and amateurs were delighted with their various contacts and many of our conversations centred on trying to do it again next year. We also felt we ought to go for a week, since a weekend wasn't long enough to do everything we wanted. We could have made many more contacts. The people were there wanting to talk to us. We ran out of time. The boatman had to pick us up at 9am on the Monday. If we left it later the tides would be wrong and we would miss the Scillonian. This meant we had to pack much of our equipment on the Sunday night. We also found that many of our radio contacts on all



One of the aerial masts being erected

**"We came home well pleased with our efforts and itching to go again for longer"**

modes liked to chat to us and hear about the island. This cut down the number of people we could speak to, but we all preferred this to a quick hallo/goodbye with a signal strength report thrown in.

We had deliberately arranged things so that we did not have to talk about the RNLI on the air to raise money. This had been done beforehand by means of a national raffle. Tickets had been sold locally and sent to radio clubs throughout the UK and by this means we raised over £500 for the cause. Raffle prizes had been donated by firms both locally and nationally. The star prize was a free weekend in St. Mary's with Colin Oakley who promised to wine 'em and dine 'em and show them the sights.

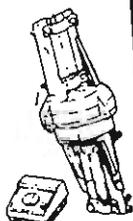
Finally, we would like to say that we came home well-pleased with our efforts and itching to go again for longer. We hope to go at the same time next year, but for the whole Bank Holiday week instead. We are all still the best of friends and have great respect for all modes of radio operation. We feel we can truly say we have broken through a totally unnecessary barrier which some radio users seem determined to erect. The fault lies on both sides. Maybe going to an uninhabited island to tear it down is a bit drastic, but we proved to our satisfaction that it can be done. We can honestly say that we participated in a true Radio weekend and it was great fun, too!

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# Mack Chat

Mack the Hack muses  
about the pleasures of  
working flatside



I've got an "almost" 40-channel 934 rig, and it's legal. Before you start grabbing for the phone and calling up the dealers to find out who's supplying them I'll tell you that you already own one, if of course you have a 20-channel rig. Puzzled? I thought you might be. Just to confuse you more, 20 of the "almost" 40 channels are cellular-phone-interference-free.

For some time now I have been trying to convince you of the advantages of horizontal polarisation for 934. With beams, it is a simple matter of just turning them 90 degrees to put them flatside, as many of us call the horizontal polarisation. Horizontal omnidirectional colinears have been a problem because there haven't been any and, at the time of writing, you still can't buy one. Like many of you, I also own expensive vertical colinears and it is very difficult to pluck up courage to abandon them, but you don't need to. It is so easy to mount the vertical colinears alongside others.

You meet many interesting people on CB, be it 27 or 934 so enter Tony Wood (RO1) from Uxbridge (25 miles from my home QTH). I hooked up with Tony some time ago on 934 and like myself he also could see the advantages of working flatside. But he had gone one stage further than me. Tony had built a colinear for horizontal. At this time I was into building a slot-fed antenna but with not much success so, for the time being, I have laid my design aside and gone for Tony's Omni 'V' design as his is known. You will find a version of this antenna in most books, as the design is not new but Tony has modified it for 934.

The Omni 'V' is a very simple antenna to build and Tony told me that he would make me up a two-element version to try and we arranged that I would pick it up from his works QTH. This I did, and the same evening installed it on my spare external pole. The results were staggering. First, most important, there were no phones, and very little white noise was heard.

At this time, enter Peter (UK921) of Charlton on the scene who has for sometime also been interested in flat-

side working and wanted details of its design. It was then that we realised that we had almost 40 channels, because we found that if a distant station or two were on the channel working vertical we could operate horizontal without any interference from each other. Of course, any stronger vertical stations we can still work, but with reduced 'S' readings. After a few evenings of three-way, uninterrupted by phones or other stations, Tony suggested that I add another two elements taking this antenna up to the legal maximum. With the further two elements and phasing harness supplied by Tony, the four-element Omni 'V' was now mounted, but would the extra gain bring in the phones? No, of course it didn't.

I said earlier that our three-way evening discussions were uninterrupted by other stations. This is true, but it seems that many stations were earwigging on the side as when I flicked through the channels on other occasions I could hear some of these people talking about our activities and wondering what we were doing. Around this time there was an abundance of phone activity. With 22dB of pre-amp, most of the 20 channels are swamped with phone interference using a vertical colinear. Switching to the horizontal colinear, nothing. Not a buzz, tone, or people talking on the twisted pair. A few times I thought that I had heard some interference but, upon further investigation, switching back and forth between both colinears, I found it was 934 breakers.

During the time that we have been playing with the new antenna I have had a couple of other 934 users visit me to inspect the antenna and they leave convinced and with copies of building details. So our flatside group is growing. By now I suppose some of you might be interested in knowing more of the Omni 'V' so I have persuaded Tony to forward an article on the theory and construction details of this antenna which you will find elsewhere in this issue.

Brian Hollins (BH172) suggested some time ago that we 934 users should meet again on Epsom Downs.

The 22nd of June was the date agreed, so around midday I and many others headed for the arranged venue. Directing the lost souls to the Downs but not to the correct car park was John (MB53). Arriving on the downs we were greeted by fog or, rather, low clouds. Visibility was down to around 100 yards and, over the air, stations were crying for instructions to the correct car park. Anyone that has ever visited the Epsom racecourse will know that the area is all car parks. In the end, Ted (TW454), who had arrived earlier managed to talk us in. Thanks once more to you, Ted.

This 934 eyeball was the biggest that I have attended so far with hundreds of people there and, it was great to meet the voices again. On top of the grandstand at Epsom there are cellular antennas so it is not possible to use the radios at times; pre-amps are out. Fortunately, I took the four-element Omni 'V' that I had completed the previous evening to show off to interested persons and, with radio and pre-amp both on and the antenna held on its side (vertical), the phone interference was very evident. Swinging the antenna upright (horizontal) the interference just disappeared. So, yet more people were converted.

Tony was also at this eyeball and he had mounted on his car his two-element Omni 'V' and three-element vertical colinear both mounted on the same boom and gutter mount. There was a lot of interest shown in this antenna and a lot of questions asked. The four-element Omni 'V' which I built is now mounted on my main mast and is performing well. You might be surprised if I told you that the total cost for the materials to build it was £3.23 with enough bits left over to make another two-element version for my mobile.

I have heard rumours from around the country that there are other groups operating flatside. If this is so, I would like to hear from them so other flatside users would know where to point their beams to enable them to hook up with each other. Finally, on the subject for now, a new slogan: '934 users do it better horizontal'.



**David Shepherdson  
comes up with more cards,  
name and addresses**

# COMMUNICATION THE QSL WAY

**T**his time I'll start off with a reminder that as from October, the cost of posting our QSLs once again is on the increase! Within the UK this means that the cost of a first class letter, up to 60 grammes, will be 18p, and second class, which went down some time back, goes back to 13p. Overseas costs will no doubt be increased too so please do watch out for the weight of your packages and don't send overweight or under-stamped packs out; you will either lose them or lose friends!

Now, last month I promised certain details, so I'll be able to fit them all in this time! I recently had a visit from Knut of the Berliner Bear Club of West Germany, very early one Sunday morning! Anyway, Knut had some news which he asked me to pass on about now to the many readers of this fine magazine. A couple of years ago, one of the most successful clubs in Germany went through a bad patch and it ended up really earning its name. It was, as regular readers may well remember, the Super Stinky Club. Although I don't know just what did happen, many people were given cause to complain about the way Harry Hertz ran the club, and indeed dropped the club.

Now, Knut of the very popular and successful Berliner Bear Club has taken over the Super Stinky Club and has put together a super package for both Clubs, with a little extra something that makes him one of a kind! Membership to the Berliner Bear costs £6 and 10 personal signed and dated QSL cards (or picture postcards), as does the new Super Stinky. For your £6 (for either Club) you get an A4-ish colour certificate, ID card and unit number, club stamp, 10 club cards, 10 mini-stickers, exchange QSLs & invites, club pen, free membership for you XYL and a few other items too. If, however, you want to join both Clubs together, then this costs 20 personal cards (as above) and £10, a saving of £21! (These

prices are valid for the UK by the way). Now the "extra something" is that Knut accepts various credit cards! Payment can be in cash (UK sterling/US dollars) or by Access, Visa or Diners Club cards! To pay by credit card, Knut needs your card type and number along with the expiry date and your signature authorising him to debit your account. For info only, drop him a line with a couple of IRCs (from your local Post Office) and please mention you saw the above in the mag.

You will no doubt receive info about the "Bear Cards", a black and white series of collectors cards, similar to the Saxon cards, but of a far superior quality or artwork done on the same type of card as the Poma series! As a rough idea of costs, 1,000 QSL cards with 1,000 eyeball cards, all done to your own design, will cost you a mere £21.00 and includes postage and packing to the UK!

Also as promised last month, I now have some details from the Galaxy Group of Brighthouse which in fact came via Ian (*Nighthawk*) who is the Galaxy Reb for Cumbria as Gordon (Galaxy Pres) has been very busy with family, work and clubs. So, membership to the Galaxy DX Group costs £5 and one personal QSL card. This is because the Galaxy Group caters more for the serious DXer rather than the QSLer, though QSLers are more than welcome to join, of course. As Gordon says, any good DX station should be able to manage to send a personal printed card. The membership package you receive consists of your Galaxy number and ID card, keyring, 30 club QSL, mounted stamp and ink pad, invitations, and should you send between 5 and 10 of your own cards, you will also get some exchange cards for swapping and QSLing. Also, because of the imminent closure of the Zodiac Club of Spain, you get free Zodiac membership, ID card and certificate and even a few Zodiac QSL cards thrown in too! If you want it sending by Registered Post then please add £1. Two-colour (Currie)

Galaxy cards are available at £3 per 100, and now there are also full colour Galaxy cards (in the new Currie series) available. Costs will be sent upon joining, as will a list of personalised card holders. The Group also puts out a newsletter twice a year, and the latest one is sent out with your membership package. Payment should be made either in cash or UK Postal Orders, not cheques, to the club.

Now, Ian's package, which has to be well worth a QSL, holds such delights as personalised Currie FCC Galaxy, Midas Hot Foil, and a further selection of Ian's club and personal cards. If you sent him a good package, then you'll get a *good* one back.

For anyone who is new to QSLing, or is thinking about starting, if you

### QSL CLUB Addresses:-

Berliner Bear QSL DX Group  
Calcaria & District Breakers Club  
County Colour Card Col Club  
Galaxy Radio Group

Super Stinky Int' QSL Club  
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PO Box 102, Canterbury, Kent, CT1 3YN.  
PO Box 14, Brighouse, West Riding of Yorkshire, HD6 2SE.  
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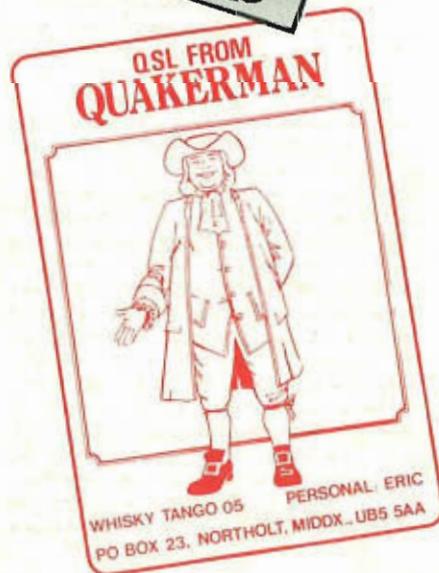
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PO Box 75, Hounslow, TW3 2HZ.  
Ray, PO Box 102, Canterbury, Kent, CT1 3YN  
When writing to any club or QSL firm, always enclose return postage to assist with their reply.

send a single card, then, as like as not, that's all you'll probably get back. It's better to send a selection of your cards, a few extras from other QSLers, perhaps a little local info etc. In other words, send a package you'd be happy to receive. After all, QSLing crosses most frontiers and makes more friends than (say) politics, so be a good ambassador for your country and be a good QSLer! Talking about being a good QSLer/ambassador, don't forget to make sure that your bumper QSL package has sufficient stamps on it; it does not make a good impression if your package arrives at its destination with the postman demanding money before he hands it over! I know, I seem to get more than my fair share of those!

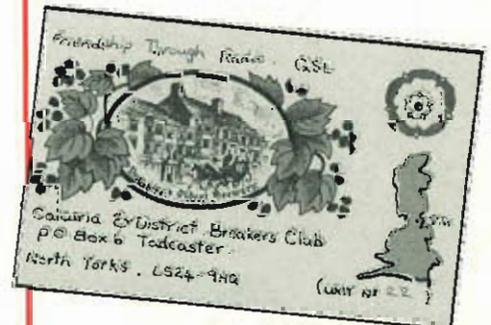
If you write to a QSL/DX Club (or firm) for info, it is polite (often essential too) to include return postage for their reply. Within the UK this need only be a self addressed stamped envelope (SASE), but outside the UK, you'll have to get some IRCs from your local Post Office. These are International Reply Coupons which cost 55p at the time of writing, but they are not worth anything like this when redeemed. In fact, when doing so in the UK, you get 22p worth of stamps. In other words, the minimum postage required for an unregistered letter sent Surface Mail! So, if you want a reply from Europe, a couple of them is really the minimum, while from the US, Australia and else-



where, five or six IRCs should be enough to get a reply via Airmail, though obviously this will depend on the weight of the letter or package.

Calling the 13-11 Club of Bristol, do you still exist? So asks Don (DF36) of Hullbridge who has sent a few letters, with SASE to this Club and as yet has had no reply. If the Club is still going and some official of said Club is reading this, could you please see if you can get in touch with Don? TNX.

Just for a change now, I've had a bundle of cards from a couple of real good ambassadors from New Zealand! From Roly (*The Hunter*) and Shane (*City To City*) comes a terrific bundle of hi-quality personal cards and some impressive view cards sent in a good quality envelope which arrived in as good condition as it left New Zealand a couple of weeks before. That's another thing, if you use poor quality envelopes, do please use a bit of Sellotape to help to keep your package together and a little hint here is don't use too small *nor* too large an envelope. With the former, if the cards are too cramped, they may well force open the envelope, or split it, and as for the pile of cards sliding around in an envelope far too big for them, they can often slit a side of the envelope and end up loose



in the sorting machinery and become lost in the post!

More plastic cards arriving from Raymac Design of Hounslow now, these superb plastic cards cost £20 (for the first 100) and includes a design service and postage. After the making of the block the price does come down, by the way. Contact Ray for details. However for a sample pack, £2

### QSLer Addresses:-

Ian (*Nighthawk*)  
Don (*DF 36*)  
Roly & Shane Lukis  
Andy (*Nighthawk*)  
Ian (*Drayman*)  
Alice (*Blue Eyes*)  
Ivan (*Grass Cutter*)

PO Box 16, Kendal, Cumbria,  
LA9 5EJ.  
36 Cedar Drive, Hullbridge, Essex,  
SS5 6JE.  
PO Box 7006, Te Ngae, Rotorua,  
New Zealand.  
19 Moathouse Drive, Crewe,  
Cheshire, CW2 8LH.  
22 Eastfield Walk, Tadcaster,  
North Riding, LS24 8BD.  
24 Falcon Way, Kenton, Harrow,  
Middlesex, HA3 0TP.  
45 Pentland Court, Chester-le-  
Street, Co Durham, DH2 3DF.

should be sent, for which you get a bumper bundle of samples ranging from QSL cards to badges and stickers, plus a credit note for £4 towards any order you should make. Just as a postscript here, Ray says that his prices have not increased for over five years now!

Some time ago I mentioned that if you wanted to extend either the contents of your own QSL pack or, for clubs, fancied adding a badge to with the club's own design to the package, there was a highly reputable badge firm in Preston. This is A&S Badges and now, in addition to the existing size 55mm circular at prices from £10 for 25, they now do 25mm and 38mm circular badges. These come as cheap



as £7.50 for the 25mm size. One thing though, these prices I've mentioned are for black ink on any colour paper (not black!) and exclude P+P. Send a SASE to Andy or Steve for a current price list and details of quantity discounts and how to order and design sizes.

A change of address now from Andy (*Nighthawk*) whose new address is shown in the table at the end and a request from Ian (*Drayman*) who asks for a mention for his local breakers club, the Calcaria & District of Tadcaster. Ian sends out a superb QSL package as does Alice (*Blue Eyes*), a friend who has not had the best of health of late and wishes to apologise to anyone who has been waiting for a reply from her. Regretfully, she can only reply to some three or four QSLs a day. So if you have QSLed her, please do bear with her, she will reply. An example package of hers holds such goodies such as personal and Club QSL cards, stickers (glitter ones at that), tourist leaflets, beer mats, club forms and even a list of 100% QSLers from all over the world!

### QSL FROM X19

PERSONAL: GARY  
WHISKEY MIKE 38  
OTH BRENTFORD, MIDDX.



PO BOX 23, BRENTFORD, MIDDX..TW8 9NF

Back in May of this year, the Tango Papa (86) Group held a charity Eyeball in aid of a local Hospital's baby unit and the sum raised during the year preceding this event was approximately £2,300. Well done to all concerned! Another change of address now for Ivan (*Grass Cutter*), who has a great little Currie Card. Staying with Currie Cards for a moment, I see that the County Colour Card Collectors Club has changed from POMA Club Cards to a similar designed Currie FCC card. Details of this club's membership costs and rules were given last month, but it costs £7 plus 20 *personal* QSL cards nad has separate sections for DXers QSLers and FCC Collectors.

Well, that's it once again, I just don't know where the space goes, so until next month, if you want a mention drop me a line and I'll see what I can do. If you are organising a "do", then please let me know in plenty of time. If you have a problem and you think I may be able to help, drop a line and we'll see, but if you want a reply, please do not forget to include return postage. Thanks for reading, hope you've enjoyed it, and I'll catch you again next month.

**Dragonrider One**

### FORTHCOMING EVENTS:-

4th September

The Combined Breakers 2nd Royal Iris River Cruise, Eyeball & Evening Dance. Sailing from Seacombe (7.15 pm) and Liverpool (7.45 pm). Full details last month, contact AD; PO Box 13, Southport. Sierra Tango DX Club Eyeball. Contact AD:- PO Box 8, Rhyl, Clwyd, North Wales. (No other details received).

6th September

13th September

Lima Alpha Swap Club "Heart of England" Swap Meet. 10 am 'til 10pm, admission 50p at the door, and is in aid of the Local Childrens' Hospice. Held at Yateley Old Hall, Yardley, Birmingham. Contact AD:- Lima Alpha, PO Box 374, Birmingham, B26 1ST.

3rd-5th October

Solway Pirates Eyeball, held at the Southernness Holiday Village, Southernness, Dumfries, Scotland. Contact AD:- Solway Pirates, PO Box 15, Castle Douglas, Scotland, DG7 1DL for details, reservation forms etc. Costs: £10.50 if you bring your own caravan or tent, else £33 to hire on site Caravan. Atlantic Breakers Eyeball (with other clubs). Held in the Atlantic Social Club, Broadheath, Altrincham, Cheshire. Contact AD:- ABC Club, 14 Priory Rd, Bowden, Cheshire, WA14 3BP.

4th-5th October

4th October

Sunrisers DX Group, Home Farm, Bridgwater all day Eyeball. Admittance £2.50 (Children £1), Contact AD:- Keith (I SR 14), PO Box 7, Bridgwater, Somerset.

22nd-23rd November

Waterlooville Breakers Club International Swap Meet. Held at the Mary Rose Hotel, Southsea, Portsmouth, admittance 50p per day. Contact AD:- YF3, PO Box 2, Portsmouth, Hants, PO7 5SL.

**M**any of the problems breakers experience with their CB installation is due to a fault outside the rig itself. This may come in the form of loose connections in the antenna system or microphone. The wiring of CB mikes is easy to understand with only a little thought, and a great many faults can be corrected as they occur if you have a few basic tools.

Let's take a look at a standard microphone as used on most sets. Fig. 1 is the schematic diagram. The four wires labelled A through D are those in the curly connecting cord, and the actual colours used vary from manufacturer to manufacturer. D is the common return or ground connection and, when plugged-in to the rig, this line is connected to the ground in the set. This line can always be easily found in the cord because it will be the shield or screen wrapped around another wire (A). When the PTT (Push-To-Talk) switch is pressed the microphone element itself (M) is connected between ground and the A wire. The voltage on this wire is very low and keeping it within a grounded conductor helps prevent it picking up stray signals that would cause interference. Some mikes don't have a switch in this audio line and leave the microphone permanently connected. The second section of the switch is used to select receive or transmit in the rig. On receive, line B is connected to ground (D), on transmit line C is grounded. Some rigs only require the C (transmit) line, but most modern microphones have provision for both. If your rig works alright on receive without the mike plugged-in then you don't need the B (receive) line.

So what actually happens in the rig when you press the PTT switch? Well, the ground on C causes transistors in the set to turn off the receiver section, turn on the transmitter and connect the audio from your microphone to the transmitter to modulate it. Breaking the circuit to B leaves one side of the speaker disconnected to leave the rig silenced on transmit. Sets which don't need the B wire either manage this with some other circuitry or arrange that no signal reaches the speaker.

Fig. 2 shows a microphone with slightly different wiring to that already examined. The operation is the same, but the common side of the PTT switch is via a separate wire rather than being joined to the audio ground. With modern sets you'll usually find that D and E are linked to the same pin in the mike plug, so effectively this circuit is no different to that described.

A common fault with microphones is broken wires where the cord has been pulled and stretched and caused stress. The usual places for a break are at the connector or where the cord enters the base of the mike. Still referring to Fig. 1, let's see what happens when a wire becomes disconnected from its tag. What if A breaks? The receiver will still work fine, as there is still a circuit from B through D. Pressing the PTT switch will still cause the rig to transmit, as

# WIRED FOR SOUND

Paul Coxwell looks at the age-old problem of wiring different mikes to different rigs, and comes up with a simple guide to wiring

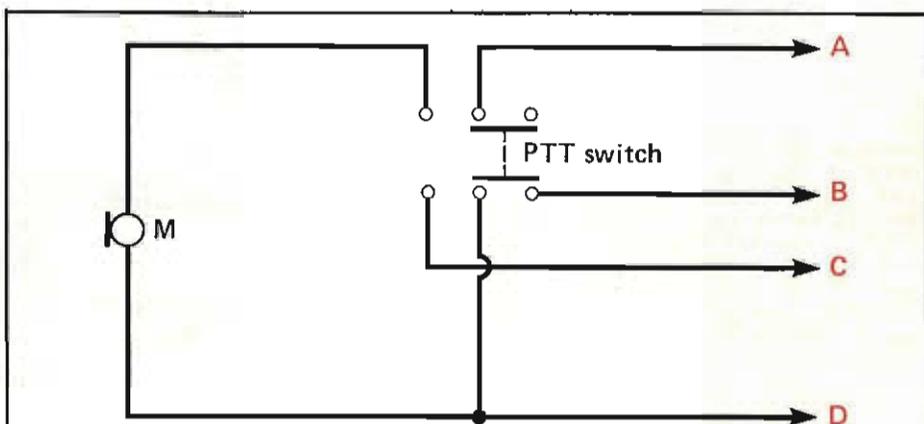


Figure 1. Standard microphone

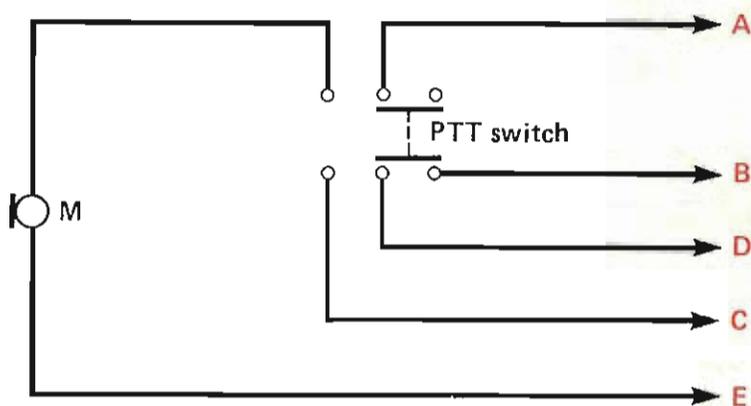


Figure 2. Alternative scheme for standard microphone

the C-D circuit is alright. However, because there is now no path from the microphone to the set, there will be no modulation, i.e. all anyone will get from you is a blank carrier. If B becomes open-circuit the transmitter will still function correctly, but on receive you won't be able to hear anything. The meter will still move up and down and the rig is still receiving — you just can't hear it. If this wire is open and your set doesn't use a receive line, then you'll still be able to hear everything perfectly

on receive. If C goes open, the receiver will still work perfectly alright, but you won't be able to transmit, not even a carrier. Disconnecting B causes the set to go quiet, but because there is no circuit from C to D to activate the transmitter, the set will stay in receive mode.

That leaves us with D, the ground or common wire. This one is not so likely to break because it is slightly thicker than the others, but if it does it can sometimes produce interesting

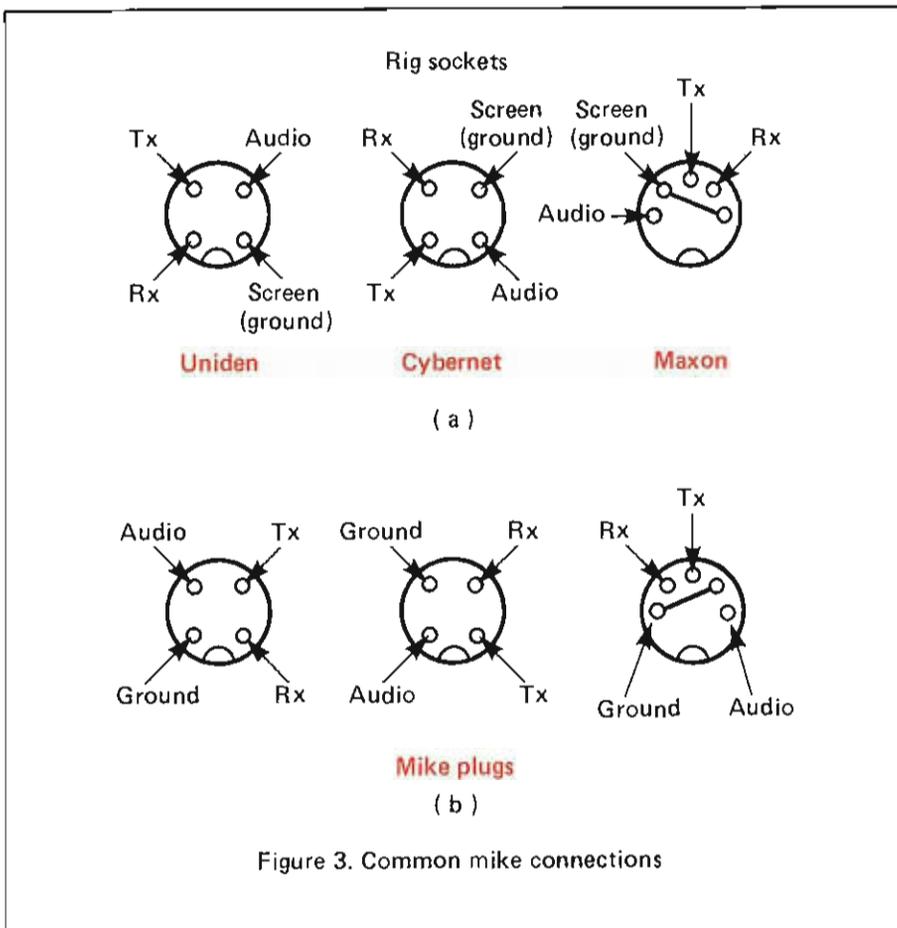


Figure 3. Common mike connections

tag, strands of wire come loose and touching other pins and wires that may short to the casing of the plug. Fix any of these problems by resoldering the offending joint. In some cases it may be best to cut an inch or so off the mike cord and completely remake all the connections.

If this quick check fails to reveal any obvious dodgy connections, then further detective work is needed. One of the very cheap pocket multimeters is perfectly alright for checking out mike connections. Switch your meter to a resistance range and zero the meter as detailed in the instruction booklet. Unplug the microphone from the rig and refer to Fig. 3. This shows three common pin connections that cover a large number of rigs. At (A) we are looking at the pins on the socket on the rig; at (B) we are looking at the plug with its pins toward us. The Uniden connections apply to Uniden boarded rigs such as Uniace, Audioline, Cobra 148GTL-DX, Stalker 9 etc. The Cybernet connections are applicable to Rotel, Mustang, Midland, Amstrad, Nato, HyGain, Ham International and so on. Maxon connections include sets such as the Maxcom series, Colt 295 and Commtron CB40F.

Many other brand names also fall into one of these categories, but a few do not. Assuming for the moment that one of the three pin-outs is the correct one for the mike in question, connect your testmeter across the ground and RX pins. Check for a short-circuit when

results. Certainly the receiver audio won't be heard. On switching to transmit one of a few things may happen depending on the exact wiring of your rig. In many cases the set just won't transmit at all, but if it does you may be sending out either very low level audio or a squeal or similar. The reason this can happen is because there is a circuit from A to C via the microphone. Open circuit ground connections usually produce rather weird results because various parts of circuitry can then react with each other.

If two wires become shorted, or a wire breaks and touches another wire then all sorts of interactions can take place. If you find any of the following faults check the microphone before worrying about the rig itself.

1. No audio on receive
2. No transmit.
3. Transmitter working but no modulation.
4. Rig does not appear to be switching from receive to transmit properly.
5. Squeaks, whistles on receive and/or transmit.
6. Noise with your transmitted audio.

### Checking a Mike

With the set on both transmit and receive, try flexing the mike cable where it enters the base of the mike itself and the connector on the rig. If operation is erratic this is a sure sign of a wiring problem somewhere here. If the plug end appears to be at fault, unplug the mike and open up the plug. Look for wires come adrift from their

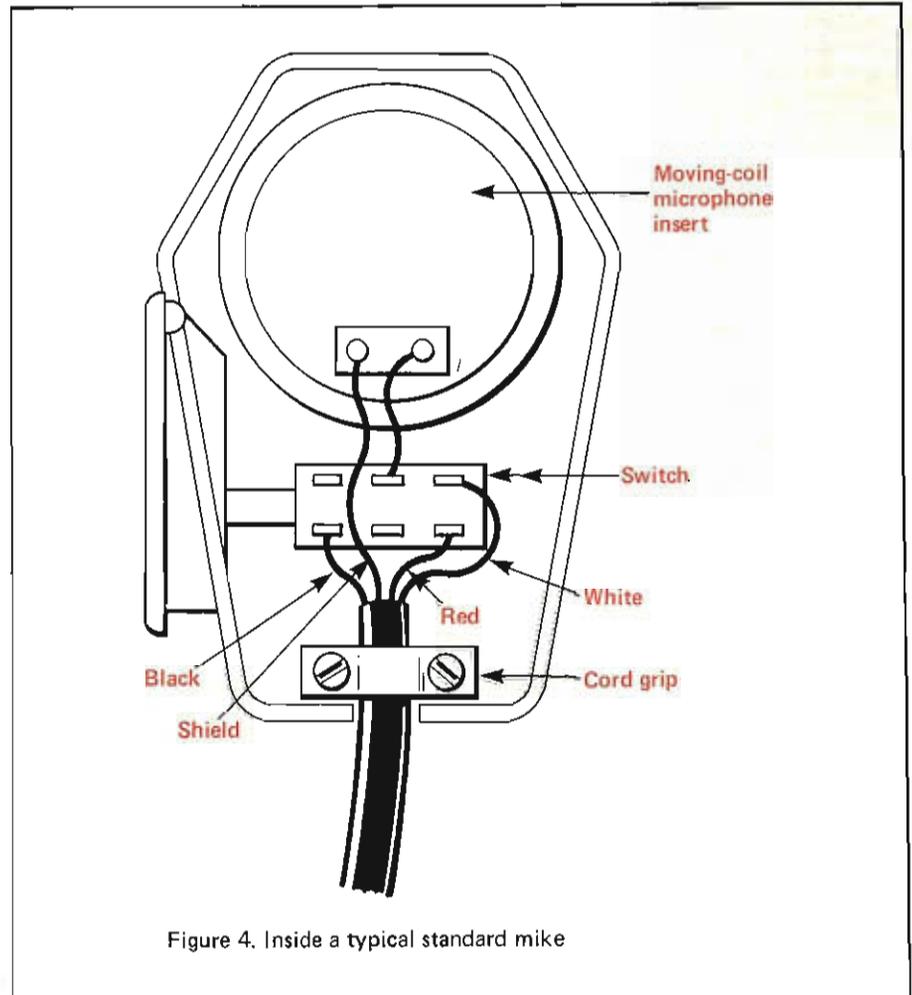


Figure 4. Inside a typical standard mike

the PTT bar is released and an open-circuit when it is pressed. Transfer one meter lead from the RX pin to the TX pin. Now check for an open-circuit when the PTT is released and a short-circuit when it is pressed. Finally, measure the resistance from ground to the audio line. With the PTT bar pressed, you should have a reading of a few hundred ohms and it is quite likely that you'll hear a slight click from the mike itself. On most modern mikes the resistance should rise to infinity (open-circuit) when the bar is released, but in some cases the mike resistance will still be present. On anything other than a standard mike (i.e. power mikes, echo mikes etc) the reading will quite possibly be considerably higher than a few hundred ohms but this is alright. Depending on the resistance range(s) provided on your meter you may not even be able to see a resistance there.

If no faulty connections can be found at the plug end, you will need to open up the microphone itself to check inside. What is what should be fairly obvious from the information already given and Fig. 4 shows a typical standard mike. The switches usually used have six lugs arranged as shown. Each centre tag is connected to the left-hand tag when the switch is released and to the right-hand tag when it is pressed. Compare this diagram with Fig. 1. The colours shown in Fig. 4 will vary from set to set but show one scheme that is used in practice. Any broken wires should be fairly obvious, and similar techniques apply here to those for the plug. Repair any connections where loose strands of wire may short to adjacent lugs or other bare wires (such as the shield). Use your meter to check the switch by connecting the test leads straight on to the lugs. Test the mike insert across its tags on the back. If the connections in the plug and mike seem to be alright and the switch and mike insert are working correctly the fault must be in the cord. Use your meter between the two points at the plug and in the mike that should be connected by a wire in the flexible cable. If there is not a circuit between these two points, or the circuit is intermittent (move the cord about a little) the cord must either be shortened to remove the damaged section or completely replaced. Make sure everything is put back as it was and the cord grip in both plug and mike are tight. This will prevent undue strain being put on the soldered connections.

### Finding Unknown Pin Connections

So far we've looked at three commonly found microphone connections for Uniden, Cybernet and Maxon based rigs. It is quite likely however that you'll come across other more obscure connections as this is one area where there is no standardisation. Let's start by looking at an unknown microphone, then we'll move onto tracing the connections in an unknown rig so that you can wire a mike for it.

One of the simplest ways to trace mike connections that doesn't even require a testmeter is to remove the

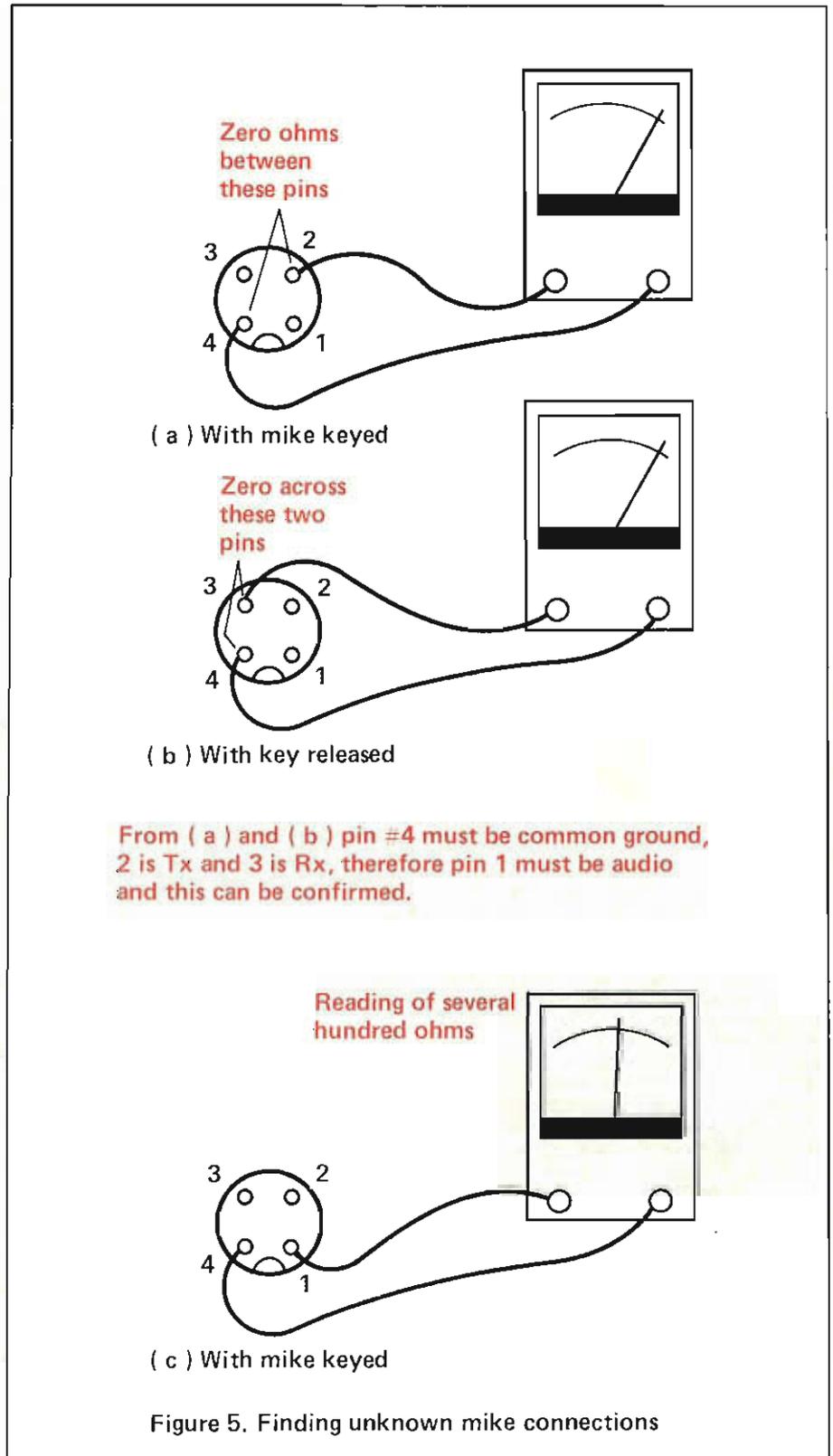


Figure 5. Finding unknown mike connections

back cover and the plug cover and see which wire connects where. It is however very simple to find the correct connections with your ohm-meter. With the microphone PTT bar pushed-in (you may need three hands for this, but after a while you manage to get by with two!) try your meter across various pins on the plug until you find two that give a short-circuit reading. Make a note of these two pins on a convenient scrap of paper. Now do the same thing with the PTT released. Mark these two

pins will be the same. This is the common return or ground. The pin that showed a circuit with the bar pushed-in is the TX (transmit) line, the other is the RX (receive) line. If there is only a 4-pin plug, the remaining connection must be for audio, but if there is more than one pin left you must proceed further.

Leave the mike keyed (a rubber band comes in very useful) and put one testmeter lead to the ground pin. Now move the other lead around the remaining pins until you have a reading

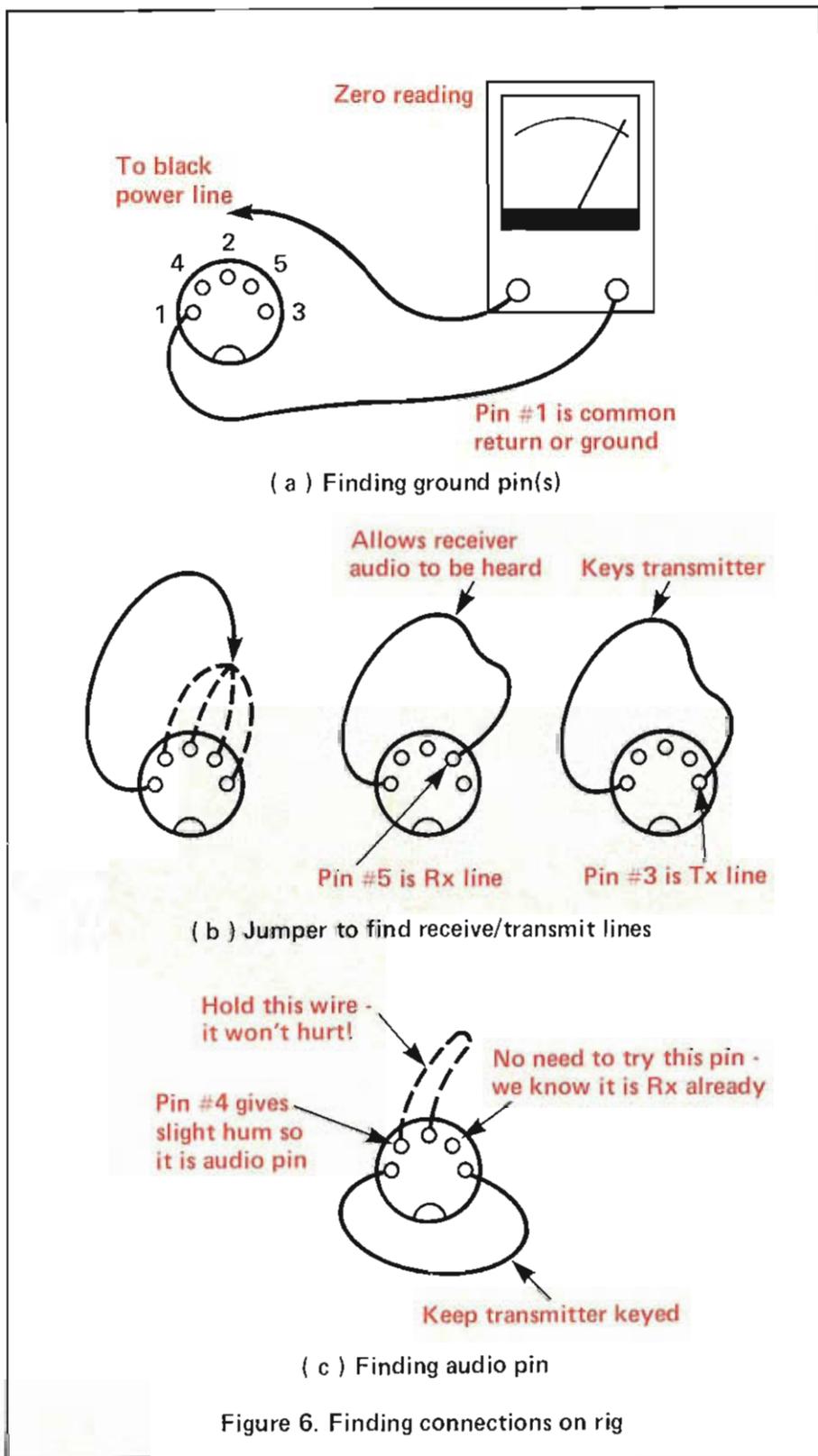


Figure 6. Finding connections on rig

of a few hundred ohms and you hear the mike click slightly. This is the audio pin. On power mikes you'll probably get a higher reading, but you should still be able to tell the correct connection. See Fig. 5 for an example. This covers most wiring used on modern rigs, but it is just possible you may find a different wiring scheme. If the above tests don't help any, it is probably easiest to find out the visual way by removing the covers on mike and plug.

Right, so what if you've picked up a

rig and found that the mike from your other set doesn't work and you don't know which pin is which on the mike socket? It is possible to trace the wiring by removing the rig's cover but, unless you know fairly well what to look for, you won't get very far. So start off with the rig unplugged and connect one of your ohm-meter leads to the negative (black) power line. Now try each pin of the socket in turn until you find one that gives a zero reading (short-circuit). Once again write it down on a piece of paper. Keep going

in case there is more than one common ground pin as is sometimes the case. This way you'll know which pins can't be anything else!

Now disconnect your meter and power-up the rig. Take a short piece of wire stripped at both ends and put one end to the common pin you found just a moment ago. With the standard 4-pin locking connectors clip to clip leads are very handy for this purpose. For the 5-pin DIN sockets you'll need to push a bare end of wire into the hole. Now turn back your squelch, set the volume control a little way up to see what can be heard. If there is no audio then your rig needs a circuit for the speaker as was mentioned earlier. Briefly touch the other end of that wire onto each pin in turn that isn't already marked on your notepaper. On one you should instantly get the receiver working. This is the RX pin. Now try the others until the set switches to transmit mode — either look at the LED indicator lights or watch the power meter. Now you've found the TX pin. If only one pin without something marked against it remains then this must obviously be for mike audio. Otherwise you have one more step to perform so connect that wire back on the transmit pin to get your transmitter keyed-up.

## Crackle

Now listen on another set switched to the same channel and touch each pin in turn with your finger (use a screwdriver or another piece of wire if necessary) until you hear a crackle or faint hum. This is the audio pin. Another way is to switch the rig to PA, plug in the speaker and try the same approach. If this technique fails to reveal the mike audio pin then you'll have to remove the rig's cover and look inside. Be careful when removing covers that you don't pull wires off the back of the speaker. Carefully get to the mike socket and try not to disturb anything. You should already know which pins are ground, receive and transmit so just look at the other pins to see which has a wire going off into the circuitry. Ignore any other components that go from each pin to chassis — these are for something else. Fig. 6. shows in diagram form, how to find these connections — those shown happen to be connections for UK Realistic rigs TRC2000 and 2001.

With any luck you can now fix many of the problems that crop up with CBs, in a lot of cases without having to even take the cover off your set. You should be able to wire any mike to almost any radio and tell your friends what needs to be done to use that mike from a Rotel on their Audio-line and so on. Hopefully you can avoid that trip to the local rig doctor and save yourself a few pounds in doing so — I have repaired many sets where only the mike was at fault. Of course there will always be the problem deep in the circuitry somewhere that needs more expert experience but at least you can check one of the easy parts yourself first.

# UNDERSTANDING

**T**ake any rig's instruction booklet and at some point inside you're likely to find a page full of specifications, with watts, kilocycles and decibels all over the place.

To most breakers these are just meaningless phrases and figures with little significance, but to the keen enthusiast or technician they are one of the most important parts of the book. To fully appreciate some of the figures requires a fairly detailed knowledge of the way circuitry in the rig works, but there is no reason why you should not have at least a basic idea of what these figures mean and how they affect operation. If you look at each specification in turn, rather than look at a whole page of technical bumph together, the task is far less daunting.

Before you can begin to under-

stand specifications you must be able to follow the various units used for measurement. For those who do not already know, or as a refresher for those who do, any basic unit such as the volt, amp, ohm etc may have any one of a number of prefixes before it:

k=kilo	1M=	1,000
M=Mega	1M=	1,000,000
m=milli	1m=	0.001
$\mu$ =micro	1 $\mu$ =	0.000001
n=nano	1n=	0.000000001

There are other prefixes used, but these are the common ones you are likely to see in CB specifications. Once you can remember the order of kilo, mega going upward and milli, micro, nano going downward, all you need do is multiply or divide by 1000 each time. 1000=1k, 1000k=1M and 1000n=1 $\mu$ , 1000 $\mu$ =1m, 1000m=1.



Note the small 'm' for milli and capital 'M' for mega. Quite often you will see 'M' used instead of 'm' for milli, but in most cases it should be fairly obvious which prefix is intended. For example, if you see something such as 25MA it's a safe bet it means 25 milliamps — you won't find 25 million amps in CB circuits! (Not unless your antenna's hit by lightning anyway.) If you do your sums right, you should figure that 25mA is 0.025 amps. The basic units you're likely to see used in specifications are:

V=Volts used to measure voltage  
A=Amps used to measure current  
 $\Omega$ =Ohms used to measure resistance  
W=Watts used to measure power  
Hz=Hertz used to measure frequency  
dB=Decibels used to measure ratios

The decibel is not, strictly speaking, a basic unit. Deci refers to one tenth of the unit in question, so the basic unit is actually the Bel, but this unit is too large to be of much practical use in

electronics, so you will always see decibels used. (1 Bel=10dB). Decibels are something that many people just don't seem to be able to grasp properly so some further explanation would be in order, but to finish rounding-up the units you'll see one other abbreviation requires some attention. You may see the term 'c/s' in some specifications, which stands for cycles per second, and is exactly the same as Hertz. So 2500c/s=2500Hz. That little symbol for micro by the way, is the Greek letter mu, although a small 'u' is often used where a ' $\mu$ ' can't be printed.

On to that mystical beast the decibel. It wasn't introduced just to let the mathematicians have a good time with logarithms and fancy equations — it was to simplify some calculations. A great many sums in electronics are not concerned so much with actual absolute values such as 2 watts, 3.5 volts etc, but with one value relative to another, such as signal A must be a tenth of the value of signal B, or that a certain signal must be increased to 200 times its initial level, the actual level being unimportant. With signals being compared that are a thousandth, a millionth or more relative to each other, expressing the sum as a straight forward ratio you'd soon end up with awkward figures and lots of zeros. Imagine you

# GC B MANUALS

Paul Coxwell gives us a maths lesson to help us understand the complexity of CB manuals

were comparing a  $1\mu\text{W}$  (microwatt) signal to a 10 watt signal. The ratio would be:-

$$0.000001 \div 10 = 0.0000001$$

Now imagine you take that figure to use somewhere else in another part of the calculation, where you multiply it by, say, 0.00002. You can see you'd soon end up with unwieldy numbers. You could use scientific notation where numbers such as 239,800,000,000 become  $2.398 \times 10^{11}$  but the result is nearly as bad. So in come logarithms. With modern pocket calculators finding the logarithm of a number takes every bit of five seconds, so it's not difficult; just take that ratio you got by dividing one power by the other and find the common log of it. That's the button marked 'log', don't use '1 n' if you have it. The answer you get is in Bels, so as we prefer to work with decibels, multiply by ten and there you have it. For the above example of comparing  $1\mu\text{W}$  to 10 watts you have:-

$$\log(0.000001 \div 10) = -7 \text{ Bels} = -70 \text{ dB}$$

This is telling you that the first signal ( $1\mu\text{W}$ ) is 70dB less than the second (10W). If you put  $10\text{W} \div 1\mu$  you'd end up with +70dB, telling you that 10W is 70dB more than  $1\mu\text{W}$ . Having converted all amplification and attenuation figures to decibels, it is an easy matter to add and subtract them to give the overall gain or loss. If you can't remember which way round to put the figures to divide, it doesn't matter — put them either way round, ignore a negative symbol in the answer and remember that if you are increasing the signal it is going to be +X dB and if you are decreasing the signal it will be -X dB. You can use the formula in other ways too, for example to find out what happens to a 5W signal if you reduce it by 16dB. (The answer is 0.125W or 125mW if you prefer.)

If you can remember two simple facts, you can easily approximate without having to use a calculator or log tables.

10dB represents X10 or +10  
3dB represents X2 or +2 (approx.)

From these two representations you can get a rough figure from any decibel ratio, remembering that decibels only need be added or subtracted to get overall values e.g. what is the result of increasing a 2W signal by 23dB? 10dB is times 10, so 20dB is times 100 (10

X 10), and the 3dB is times two, which gives an overall figure of X200. So that 2 watts ends up as 400 watts. A decrease of 46dB would represent dividing by 40,000. (40dB is  $10 \times 10 \times 10 \times 10 = 10,000$ , 6dB is  $2 \times 2 = 4$ , so the result is  $4 \times 10,000 = 40,000$ ). The best way to get used to these calculations is to try some.

So far, we've looked at ratios of two powers, but decibels are often used to express the ratio of two voltages. The basic principle is the same as already described, but you must remember to *double* the figure you end up with. For example a 4V signal to an 8V signal gives:

$$\log(8 \div 4) \approx 0.3$$

Multiply by 10 to get 3.

If we were comparing an 8W and a 4W signal this would be the answer (3dB) which you now know to be true. But for 8V and 4V we must double this figure to give 6dB. Doubling a power is an increase of 3dB; doubling a voltage is an increase of 6dB. Why? Decibels express in logarithmic form the relationship between two powers. Power is equal to the voltage multiplied by the current, and doubling the voltage also causes the current to be doubled. Hence the power is quadrupled, and if you think back to those two figures to remember, you'll realise that a 6dB increase is in fact four times the power. An example may help. You have a 4V signal and let us assume a power of 4W. This means that the current is 1A (Watts = volts X amps, therefore amps = watts  $\div$  volts). Now increase the voltage to 8V. This doubling of voltage also causes a doubling of current to 2A. We now have 8V multiplied by 2A which is 16W, four times the power we started with, or a 6dB increase. Try a few to get used to the idea.

## General Specifications

The first section of the specifications usually gives general information such as the frequencies the rig works on, its power requirements and so on. Refer to the typical list in Fig. 1. The first line tells us the rig is equipped with 40 channels (no surprises so far), and that they are PLL synthesized. All UK 40 channel rigs are PLL synthesized — they use a clever little circuit called a Phase-Locked Loop which generates all the different frequencies needed for each channel. The exact workings of the PLL are too complex to go into here. Synthesized means that the

frequencies we want are not generated directly, but made-up (synthesized) from others by mixing them together. If you have a 2 or 3-channel portable unit, you may see the term "crystal controlled". These units usually generate the required frequencies directly by using a separate crystal for each frequency. As a different frequency signal is needed for reception and transmission, two crystals per channel are required, which is fine for a few channels but not for many. Before the appearance of 40 channel rigs in America back in 76/77, American breakers had (officially) 23 channels. To fit 46 crystals to a set would use a lot of space inside and could cost more than the rest of the rig put together, so another scheme was devised where mixing two different signals together gives the required frequency, which reduces the number of crystals needed. Even so, a dozen or more are required which still adds to the cost substantially. These rigs may be referred to as "crystal synthesized". The later 23-channel sets and 40-channel sets use PLL synthesizers, which allow all the frequencies needed to be generated with just one or two crystals.

The next line in our sample specifies the frequency range of the radio, the example shown being for UK channels. Here, 27.60125MHz is the frequency of channel 1, 27.99125MHz is channel 40. You may also see at this point things such as "27 to 28MHz, operable 27.60125MHz to 27.99125 in 10kHz steps". This is saying that the circuitry is designed to work in the general range of 27 to 28MHz, but only the actual "operable" frequencies can be obtained. 10kHz steps is just the step from one channel to the next, so channel 2 is 27.61125MHz, channel 3 is 27.62125 and so on. Virtually everywhere except Britain uses the standard American channels which have a few places where the channels jump 20kHz, but the overall spacing is still considered to be 10kHz. The slots in between channels were allocated for things like radio-control garage doors etc. The frequency range for 40-channel American sets is 26.965 to 27.405MHz.

Frequency tolerance and frequency stability are not the same thing. Frequency tolerance is the limits within which the rig may operate. So, on UK channel 14 for example, the set must work on  $27.73125\text{MHz} \pm 0.005\%$  or whatever the figure happens to be. Drift has always been one of those problems in electronics that will make designers disappear into a corner

mumbling to themselves at the mere mention of it. As components warm up their characteristics change very slightly and as a result the frequency slowly drifts. The problem is nowhere near so prevalent with modern solid-state circuits, but the rig in an average car is going to be subjected to sub-freezing temperatures during a long winter night and over 100 degrees when parked in the open on a hot summer day. This is frequency stability. So a rig may always be 0.002% high in frequency say, but it will only vary by  $\pm 0.001\%$  because of temperature, humidity etc. Most rigs are specified as being within the limit of 0.005% but you may come across a better figure such as 0.002%. You're not likely to notice this though, and even though a rig is listed as  $\pm 0.005\%$  it's probably going to be well within that limit.

The operating temperature range is closely related to the previous discussion of frequency stability. Using the rig outside these temperature limits may cause poor operating and sometimes even failure to work on some or all channels. Many rigs are fitted under the dash in the center of the car, right underneath the heater outlet. This is not the best of positions from temperature considerations, as going from freezing to 90 or 100 degrees as you switch on the heater and drive off does little to improve the reliability of circuits.

The listings of power requirements are fairly straight-forward. Most rigs are designed for a nominal 13.2 or 13.8V supply, which is the output of standard power supplies. Below the minimum voltage stated it is quite likely the rig's output power will drop sharply, distortion will be heard and at some point the set will just stop working altogether. Above the maximum value you run the risk of overloading transistors and other components, and if you don't destroy them immediately these overloads can weaken parts so they will suddenly fail at some other time. Some sets have the negative power line joined directly to the metal casing, so you'll have problems if fitting it to a positive-ground vehicle, but many rigs don't have a direct link from either power-line to chassis so they can be used "positive or negative ground". Another term used is "reversible ground". The current ratings given are usual absolute maximum values, so if you connect a meter in the circuit you'll often find the values are much lower than those stated. Switching in the attenuator to drop your output power will cause a drop in current consumption on transmit.

One other line that may appear in the general section is "Type of emission". This is just the mode — AM, FM etc. It's possible you'll see "F3" under this item, which is just another (newer) symbol meaning FM.

## Transmitter Section

A typical transmitter specification of a UK rig is shown in Fig. 2. R.F. output power is easy enough, and requires little explanation. Specifications sometimes include a line giving the output on low-power or may just say "10dB attenuator included". From all that

decibel work you should be able to figure that 4W-10dB is 0.4W or 400mW. These power figures are the limits set in British regulations, and most rigs come out of the factory putting-out a little less than 4W on full-power. Don't worry if your transmitter only delivers 3.7W instead of 4W — nobody at the receiving end is going to notice. That 300mW may make a difference if you took it away from 400mW, but not from 4W.

Deviation is a term applied only to FM rigs. Talking on an FM transmitter causes the signal to vary either side of the nominal channel frequency in time with your voice. The maximum deviation is the point furthest away from this center frequency that the transmission can reach. Regulations give a maximum of  $\pm 2.5\text{kHz}$ , which means your signal can deviate on channel 14 for example, from 27.73125MHz—2.5kHz = 27.72875MHz up to 27.73125MHz + 2.5kHz = 27.73375MHz. The ideal is to approach the maximum value without exceeding it. This description of FM is very simplified, as there are



Some extension speakers are designed to cut higher or lower frequencies, so the best advice is try and see if you like it

other signals radiated beyond this 2.5kHz point, but a full explanation would get fairly involved, and this brief outline should suffice for now. On the subject of exceeding the 2.5kHz limit there are literally hundreds of rigs in use that are well over this limit, and not just slightly either, people are using deviations of 5kHz, 10kHz and even more. Don't go turning up things unless you know what you're doing!

Next we come to the section dealing with spurious emissions. These are nothing more than signals that you don't want transmitted, that are a by-product of all that amplifying and mixing in the rig. There are various filters built-in to the set to keep these signals down to a suitably-low level, and in most cases any spurious output that does result is not of sufficient strength to cause any significant interference. (TVI is often *not* due to spurious emission but direct overload.) The levels may be specified as actual

powers, as is the case in the example here, or may be shown in decibels e.g. 0.25 $\mu\text{W}$  works out as -72dB. Remember that -72dB is a *relative* value, compared to a reference (4W in this case). If the transmitter in question had a rated output of say, 40W, then to specify the same level for the spurious signals would require a figure of -82dB. You might come across a slightly different way of giving these levels, involving 'dBm'. This is decibels relative to 1mW, so 0dBm = 1mW. On this scale 0.25 $\mu\text{W}$  works out as -36dBm. Where dBs have a reference included such as this, they give an actual, absolute value, so you can say a signal is -36dBm, whereas to say a signal is just -36dB is meaningless unless you specify your reference level. Occasionally you may see dBW, which is (surprise) decibels relative to 1 watt (0dBW = 1W).

Audio frequency response is the range of audio frequencies the circuitry in the rig will handle for transmission. The rig doesn't just cut-off above and below the frequencies shown, but the response rolls-off slowly at these extremes. Increasing the low-end response brings up the bass and depth in your voice, decreasing it makes you sound thin and tinny — like small transistor radios. The bass and treble controls on your hi-fi just increase and decrease the low and high frequencies in this way. The example here gives 350-3000Hz +3/-6dB, meaning that between 350Hz and 3kHz the level may rise 3dB or fall 6dB, but will stay within these limits. A range of 9dB may seem a little large, but for communications quality speech is perfectly adequate — your hi-fi is quite likely to have a response something like 20Hz to 20kHz  $\pm 2\text{dB}$ .

Another item that sometimes appears here is something along the lines of "12dB/octave". This is the response of a filter that rolls-off high or low frequencies so that each time you double or halve the frequency (an octave) the level will be 12dB lower. So if the specification says "350-3000Hz high-pass filter 10dB/octave", at 175Hz ( $350 \div 2$ ) the signal is 10dB down, at 87.5Hz ( $175 \div 2$ ) the signal is another 10dB down, or 20dB overall. Whilst these high and low frequencies may be nice to hear on your stereo set-up, they add little to effective communications and the high-frequencies use up extra space on the air that could be put to better use. The different responses of various rigs and microphones is one reason why that mike your friend raves over sounds terrible on your rig and the one he wouldn't touch with a bargepole may be just what you were looking for.

AM rigs may specify a maximum modulation level, typically 95%. SSB sets may also specify "unwanted sideband suppression" and "carrier suppression", usually in decibels. With SSB one of the two sidebands is suppressed, along with the carrier, and these figures indicate the amount of attenuation provided for this. Figures around 40 to 50dB are common, so anything over this is doing quite well for CB sets, but by professional standards these levels are not fantastic.

### FIG. 1 Typical General Specifications

Channels : 40 PLL Synthesized  
Frequency range : 27.60125 to 27.991MHz  
Freq. tolerance : 0.005%  
Freq. stability : 0.001%  
Temp. range : -5 to 45°C  
Power requirements : 13.8V nominal  
(11.7 min/15.9 max)  
Current : 300mA receive  
          : 900mA transmit

### FIG. 3. Typical Receiver Specifications

Receiver type : Dual conversion superhet  
Intermediate Freq. : 10.695MHz and 455MHz  
Sensitivity : 0.5µV for 20dB S/N  
Image rejection : >55dB  
Adjacent ch rej. : >50dB  
Squelch threshold : 0.2µV  
                  tight : 50µV  
Audio response : 450-2500Hz -6dB  
Spurious emission : <20nW  
Audio output : 2W to 8Ω (1kHz @ 10% THD)

## Receiver Specifications

The quality of the receiver section in a particular set is very dependant on the manufacturer. Most of the regulations cover the transmitter, to prevent it causing interference to other radio services, and there are no minimum standards set for the receiver side. A set will get approval if the receiver is only going to pick up your next door neighbour, or will be wiped out by someone 10 channels and 2 miles away. Just so long as the thing doesn't cause interference or operate on modes or channels it shouldn't. So manufacturers have to spend money on getting the transmitter to perform to at least the standards laid down by the authorities, but when it comes to the receiver they can work on the principle of "build it cheap". The result — rather poor receive sections in many rigs. Checking the specifications of the receiver is likely to reveal how much effort has been spent getting it to perform to a reasonable standard. Refer to Fig. 3.

The first line sounds impressive doesn't it? Let's take that "superhet" part first, which is actually an abbreviation of superheterodyne. It is possible to take 27MHz signal coming in of your antenna, amplify it and convert it straight into audio. This method does have its problems however, and almost all receivers these days (including AM/FM broadcast radio, television etc) convert the incoming signal to a lower frequency first. This is done by mixing or "heterodyning" with another signal at a different frequency. The bulk of the amplification required is then applied at this lower frequency

before converting into audio. Superhet receivers do create problems of their own, but the advantages far outweigh the disadvantages. Now the choice of this intermediate frequency (IF) is usually a compromise, as some requirements demand a high IF and others demand a lower IF, so this is where the dual conversion part comes in. The 27MHz is first converted down to a fairly high IF, and then further on converted again to the lower IF — this let's us have the best of both worlds. The next line in the receiver specifications tell us the actual frequencies used — 10.695MHz and 455kHz are common values and are used in a large number of rigs. If you're wondering why these values are used it's quite probably because there was already a vast number of parts around for these frequencies, as 455kHz is a standard IF in AM broadcast radios, 10.7MHz in FM. Some older single conversion CBs may use IFs such as 7.8MHz and many dual conversion multimode sets only use the first (10.7MHz) IF when switched to SSB.

The sensitivity figure tells you how well the set is going to do at picking up weak signals. 0.5µV for 20dB S/N is a fairly common sort of value for UK rigs. What this actually means is that with the incoming signal at a level of 0.5µV, you'll hear it with the noise 20dB below the signal (100 times). This represents a reasonably noise-free signal, so with careful listening you should be able to make out signals much lower than that. The term quieting is sometimes used where FM is concerned, and something such as 0.3µV for 20dB quieting means that 0.3µV signal is required to reduce the level of background noise normally heard by 20dB. (0dB being the level of noise present on FM when there is no signal). Be careful when comparing the sensitivity figures of two different rigs, as 20dB is not always used and 0.5µV

### FIG. 2 Typical Transmitter Specification

RF output power : 4W  
Deviation (@ 1kHz) : ±2.3kHz max  
Spurious emission :  
80-85MHz  
87.5-118MHz  
135-136MHz  
174-230MHz  
470-862MHz <50nW  
Other freqs. : <0.25µW  
Audio response : 350-3500Hz +3/-6dB

for 10dB S/N is not as good as 0.5µV for 20dB S/N.

Image rejection is one of those problems caused by using a superhet receiver. Let's take a single-conversion receiver with a 455kHz IF. To get the IF, the incoming signal is mixed with another signal either 455kHz higher or lower in frequency — let's assume lower for now. So the required signal is now 455kHz higher than our locally generated signal. If another signal comes along that is 455kHz below our local signal it can also produce 455kHz, so the result is that you hear a signal that sounds as if it is on a particular channel when it is really 910kHz away (2 × 455). This is one of the requirements for a high IF mentioned earlier. Using a 10.695MHz first IF means the image would be 21.39MHz away, and this is much easier to get rid of before mixing than a signal 910kHz away. The figure for image rejection is how well the receiver rejects these unwanted image signals, and 55dB is typical of UK sets. Some rigs manage >65dB and these are doing well compared to most, though high-quality communications receivers will easily exceed these figures.

Adjacent channel selectivity is measured in a similar way to image rejection, but refers to the rig's ability to cut-out signals 10kHz away on the next channel up or down. Again, around 55dB is a typical sort of figure; some of the better rigs manage 65dB, and the not so good ones may drop to 45dB or even less. This is one requirement for a low IF mentioned earlier.

The next two figures apply to the squelch circuit. The threshold sensitivity of 0.2µV means that when the squelch control is set to just eliminate the background with no signal present, a 0.2µV signal is needed to open the squelch. The tight sensitivity figure means a 50µV signal is needed to open the squelch with the control turned up full. Squelch circuits vary from very good to almost useless, depending on the rig and the users requirements. If your threshold sensitivity is something like 0.5µV and the sensitivity of the rig is say, 0.5µV for 20dB quieting, then with the squelch set to cut-out the background noise you're going to miss a lot of weaker signals that would be perfectly readable if the squelch was open. If you like to keep your squelch well up and just hear nearby calls this is fine, but if

you're a breaker who doesn't like to miss anything but can't stand putting up with that terrible noise all the time you need a better squelch circuit than this. So if you like listening out for weak signals but don't want to be driven crazy with noise look for a low threshold sensitivity figure.

The next line in our example gives the audio response of the receiver and can be compared to the equivalent transmitter specification for an explanation.

You may wonder what spurious emissions have to do with the receiver, but there is a perfectly good reason. Remember the receiver uses oscillators to generate different frequencies to mix with the incoming signal? Well, it is possible for these signals to find their way back up the coax to your antenna, and if on the right frequency can cause interference. Fortunately these signals are generally much easier to stop than those originating from the transmitter, so there is usually no difficulty.

The last line shown here is the audio output available from the rig to your speaker. The test frequency is shown (often 1kHz) and the THD or Total Harmonic Distortion. Don't worry about this one too much, as the output of rigs is generally measured at this level, and whilst 10% distortion in you hi-fi may sound terrible, it is acceptable in communications equipment of this quality. The power itself is shown as 2W into 8Ω. The 8Ω part is the

impedance of the speaker, and this line means that the set will deliver 2W when connected to an 8Ω speaker. Most modern output stages will drive any higher impedance speaker than that shown with a slight loss of power, but you shouldn't try any speaker with a lower impedance than any minimum shown as this will overload the output. The figure of 2W is not of great significance really, as 2W into one speaker may sound just the same volume as 4W into another or 1W into another. Whilst on the subject of speakers, it is worth remembering that the speaker built-in most rigs is not very good, and enclosed in a metal casing it sounds even worse, so an extension speaker may make all the difference. The same matching of speaker to rig applies here as microphone to rig did for the transmitter. Some extension speakers are designed to cut higher or lower frequencies, so the best advice here is try it and see if you like it. Different people prefer different sounds anyway.

Other lines you may come across in the specifications sometimes include things like "Meter sensitivity: 100μV for S9". This means a 100μV signal should show 9 on your signal meter — fairly obvious that one. The range of the RF gain control may be shown as something such as 40dB. This means turning the control right back reduces the level of incoming signals by 40dB, or to put it another way turning back the gain will have the same effect as if

the signal was 10,000 times (40dB) lower in power. If you come across any other items in specifications not looked at here a little thought and logic may well give you an idea as to what it means.

With a basic knowledge of the specification shown here you should be able to compare two rigs and at least tell which is better in some respects than the other. Remember to take all factors into consideration — a rig with 90dB adjacent channel rejection is great for getting rid of the guy up the road three channels away, but this will be useless if you're picking up Radio Outer Mongolia because the image rejection is so bad. If you look at the figures for signal meter calibration on different rigs you may start to see why asking someone what you're hitting them on their dial is of little help. Add to different S9 levels the fact that S9 down to S7 on some sets may be 3dB and on others say 8dB and you'll see what I mean. Then think of the number of people who adjust the meters so they fly off the top of the scale, or barely move at all. These readings are only any good for seeing if a signal is stronger or weaker than something else. The guy you've never spoken to before telling you you're coming in 2 pounds on his meter means absolutely nothing! So compare specifications carefully and remember that whilst the numbers give a good idea of what to expect there is no substitute for trying a set in the intended location.

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**Our roving reporter  
Roundhead brings us  
more news of his travels**

I have been concerned about the number of breakers who make serious CB communication difficult in London through their lack of consideration and a persistence in spoiling it for those who want to have interesting and informative "copies". Therefore, I am delighted to report that, in recent weeks, there has been a wind of change. Sensible breakers are now asserting themselves — perhaps they always tried — to the extent that it has been a pleasure to listen to, and take part in, some of the networks. Despite fluctuating skip conditions there has been some good long-distance working for CBers in the provinces. And I believe that if those in the London area could enjoy better conditions they would not vent their frustrations on anyone who happens to annoy them. Still, I have noticed an improvement, which must be good.

The lady breaker Brown Eyes at Hollesley in Suffolk whom I mentioned recently, made contact with Denmark and also the North of Scotland which made me thoroughly envious until I picked up Guernsey. The quality was excellent and came in loud and clear, and I have a QSL card to prove it. Not bad from near Lowestoft.

The Italians have been booming in and dozens of sidebanders heard. One could be having a quiet chat with a

# ROUNDHEAD'S RAMBLINGS

neighbour just up the road and suddenly the mod would be taken over by a voice identifying itself from Northern Italy! Great fun if you like long-distance DXing but annoying if you can't speak to your friend.

Back to earth from this rarified DXing on 4 watts I was sitting square-wheeled at Pakefield (Lowestoft) and spoke with Country Girl at Campsey Ash near the Wickham Market by-pass together with Lancashire Lass at Metfield and Devil Woman Peasenhall, three delightful lady breakers. In London, mobile in Regent's Park, I made contact with Somerset Lady at Bounds Green on Channel 22 and Sweeney Todd at Barnet. Conditions were so good I could hear sausages sizzling on the stove in the background as I conversed with Somerset Lady and I would have loved an invitation to tea. I'll listen out again.

During the summer months the working conditions for breakers have been quite chaotic. I found myself frequently shouting: "Am I getting out?" For suddenly on Channel 19 and, in fact, on all channels, there would be a tremendous load of noise. Then, quite as swiftly, everything would be back to normal. On my travels I noted that a lot of breakers were waiting until they reached the brow of a hill before trying for a long-distance copy. Or, in East Anglia, the top of the Orwell Bridge on the A45 was a supervantage point. But, in London, local copies are the norm and while at Hampstead I heard a new breaker, Alpha Mike chatting briefly from nearby Oxford Circus. I was happy to talk with another new CBER, Wild Rover, from the Primrose Hill 20. Wild Rover was in touch with Green Giant mobile at New Cross, Ten 1, Brockley, Country Girl, Brockley, Baby Face, Catford, Storm Rider and Light Meter, London SE3, and Huggy Bear, Highbury. I was particularly pleased to hear the breakers giving Wild Rover excellent advice as to how he can identify the channels — he is blind — and some sound suggestions on operating his rig. That is what CB is all about.

I had some informative contacts while square-wheeled at Holland Park — all on Channel 26. Whisky Mike 36, Southall-Greenford border; Bank Manager, Neasden; Boatman, Kingsbury; Silvester, Hendon; Cloudburst, Burnt Oak; Gearknob, Orpington and, coming through loud and clear from

Epsom Downs, Skyliner. A night or two later, on Channel 15, returning to London from Cranbrook, Kent, I spoke with Kingfisher, Matfield and Big John, Maidstone.

It is interesting to note that where one person functions as chairman or co-ordinator, there is a flow of conversation and everyone gets a chance. Otherwise there is a free-for-all and nobody gets heard. Bronze Beam from Kessingland, near Lowestoft, makes a very good chairman, ensuring that all breakers participating are happy. Mark you, he doesn't tolerate nonsense and wallies are put firmly in their place. If you are interested in fishing and in the area, listen out for Bronze Beam, Camping Boy or Osprey.

If my information is correct, more police vehicles are now fitted with CB radios in Suffolk and I think that is a good thing. There is a good rapport between the CB emergency monitors and the police and it is encouraging and reassuring to know that if they are needed urgently it is possible to give them a call on Channel 9 or Channel 19. I have had personal experience of this and the police were on hand almost immediately.

I mentioned Huggy Bear from Highbury; I picked up another Huggy Bear mobile in the Beccles 20 and now learn there is one with the same handle in Norwich. There is yet another Huggy Bear in London's Hammersmith running a CB shop in King Street, W6. He is a jovial, affable fellow answering to the personal, Mike.

It is encouraging to note a number of CB groups utilise their social activities to help charities. The Waveney CB Emergency Service, for example, supports the Beccles Gateway Club for the Mentally Handicapped. They have a Barbecue and Dance on September 13 at Sotterley Pavilion, (enquiries Brampton 691.)

Finally, spare a thought for Sea Hawk, also out of the Beccles 20. He spent a year making up his mind to get a rig, saved up his hard-earned pennies and now has a mobile outfit in his car. Trouble is, he is too shy to use it! So come on you friendly Waveney breakers, give Sea Hawk a shout and make him feel thoroughly at home. If we are not careful, it will be a further year before he's on the air and that won't do at all.

**ROUNDHEAD**

# DIY 934 ANTENNA

Tony Wood describes the pros, cons and construction of a DIY 934 'flatside' antenna

**H**aving parted with an arm and a leg in exchange for a 934MHz set up, I was suitably impressed with the absence of background noise and the high standard of channel discipline. It didn't take me long to find out that all of the currently available rigs appear to be slightly deaf; that is to say they transmit further than they can receive. This is due, in part, to the aperture of the antenna which, put simply, means that at 934MHz antennas are so small that they don't present much of a target to an incoming signal and therefore not much power can be extracted from it.

The best way to remedy this situation is to use bigger and better antennas. This, however, on our chosen frequency is illegal, so we resort to the next best thing which is the receive pre-amp. Now the pre-amps on the market today are fine if they're not being used in a hostile environment, by which I mean no strong signals on nearby frequencies.

## Enter Cellular Telephones

These rascals couldn't get much closer to our frequency if they tried, I'm sure you will know of them even if you haven't actually heard them. The cellular phone companies have divided the country into cells and each of these has its own transmitter — obviously the larger the town the more cells there are. The chances are therefore that whatever your QTH you are not far from a transmitter. If you don't know where your local one is, I suggest you find the highest tower block in town and if it has an ugly colinear array which looks as if it could possibly be made of Meccano, then you've found it. These transmitters radiate a massive vertically polarised signal (I've tried finding out just how massive but got stonewalled), which is by far the most powerful signal in the 900-1000MHz band.

If a pre-amp is used in the presence

of this signal it will mash the front end selectivity of the rig to pieces, and in my own case it was not uncommon to have all 20 channels full up with the disjointed phone conversations. I did find a partial cure, by making the gain of my pre-amp variable, which enabled me to hold the gain just below the threshold of the phones. I could then hear distant stations but they couldn't hear me due to the phone problem at their end! At this point I turned my thoughts to 27MHz and the similarity between a deadkeyer using a large linear and the 934MHz problem with the phones. A few years ago, we foiled the rabid attempts of the local wally by knocking up horizontal "vee" antennas out of wire, and during our evening network we smiled with satisfaction as he strained his one remaining brain cell trying to work out why he was having no effect on us.

For those interested in such things, a horizontal antenna is 20dB or 100 times less sensitive to vertically polarised signals than it is to signals of its own polarisation. Armed with this knowledge, I turned my beam through 90 degrees to try using it flatside. This instantly cured the problem but there were only a few other stations using this mode. It seems the main objection to working flatside is the lack of any commercially available omnidirectional antennas for both homebase or mobile working.

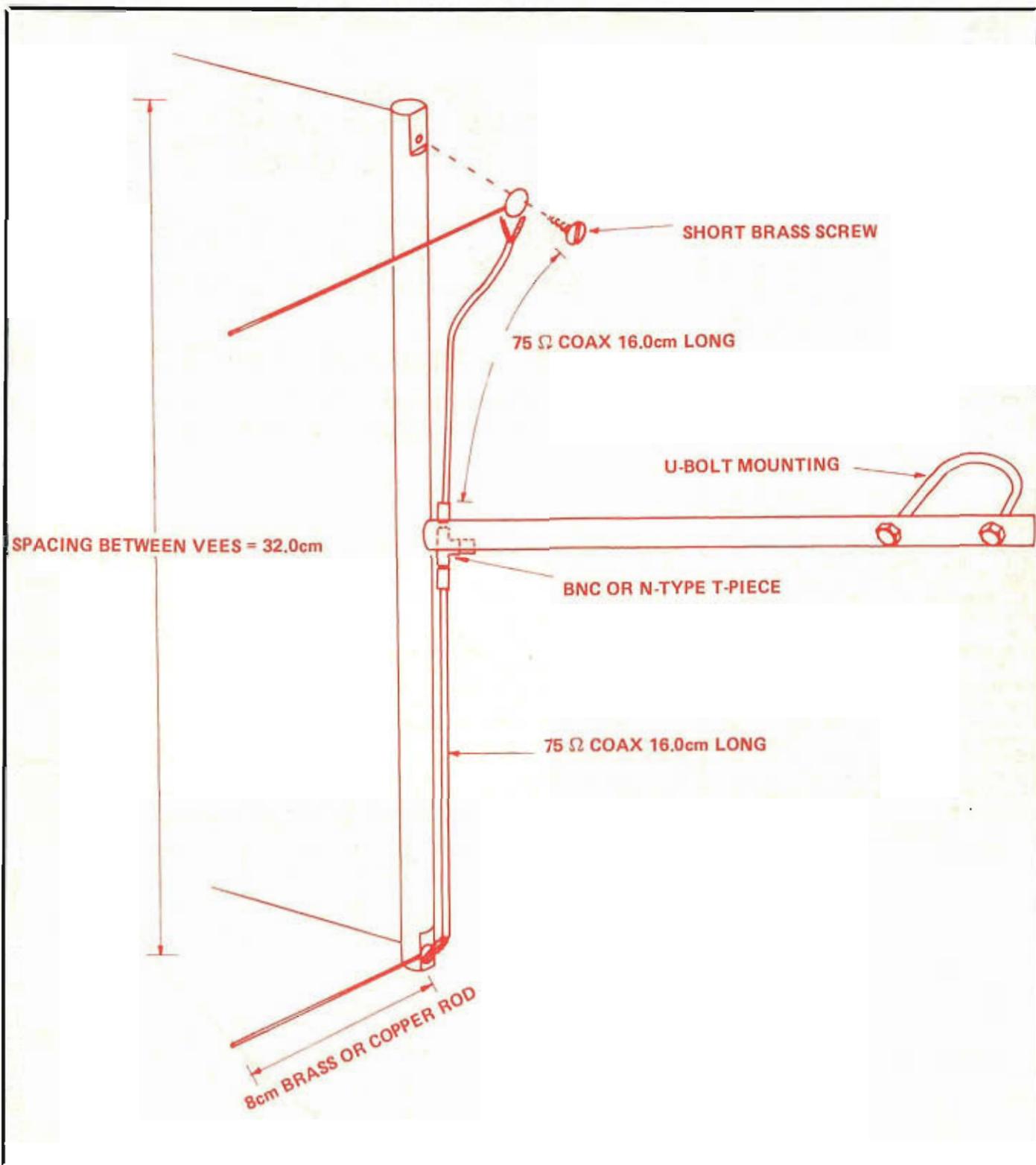
I shall now describe an antenna that solves this objection, which is easy to build using "bits and bobs" that most of us have in our junk boxes. The only skills needed are the abilities to measure and solder reasonably well. As you can see from the diagram, the backbone of the antenna is a lazy "T" made from either plastic tube or wooden dowelling. At the top and bottom of the vertical boom is a "vee" made from welding rod or something similar. I suggest you use something strong enough to support the largest wood pigeon in your area.

To make the elements, cut four pieces of rod about 12cms long and bend to form an eye at one end of each piece large enough for the screws that will hold them to the boom. A word of warning here is called for: don't use screws that are so long that they touch when screwed into the boom from opposite sides. If you are using round dowelling for your boom, file two flats at both ends to form right-angles. The right-angles should be in line vertically. The vertical and horizontal booms can now be glued and screwed together. When dry, the four elements can be screwed into position using short brass screws.

## Wiring it up

Ideally the phasing harness between the upper and lower vee's should be made of 75 ohm coax, not the TV downlead type but that which is sometimes used in Ham radio. Mack the Hack has built one of these antennas and found this cable difficult to obtain, so I built one using the readily obtainable 50 ohm coax and the results were surprisingly good. The SWR crept up a little but that was about all. Whichever cable you decide to use, cut two 16cm lengths and terminate one end of each with a "BNC" or "N" type connector. Bare approximately 1cm at the other end of each, and twist the braid to make a tail ensuring that no strands can short against the centre conductor. Apply a small amount of solder to the ends of the cables and the heads of the brass screws.

The cables can now be carefully soldered to the brass screws, but ensure that if you solder the braid to the left element on the top vee you do likewise on the bottom vee. If you don't, the two halves of the antenna will be in antiphase and some reduction in power will occur. When the above is completed, connect the "T" piece, and carefully stick the coax to the boom using Superglue. This is to provide a



strain relief for the soldered joints.

Now measure from the point where the coax is stripped to a position 8cm down each element and make a cut at this point. If this sounds strange it is because when you divide coax in this way it ceases to be feeder and becomes part of the elements and, as such, must be taken into account if a high SWR is to be avoided. On the subject of SWR I suggest, at this point, you mount the antenna a few feet up the mast, connect the length of feeder that you will be using in the final installation and check the SWR. You should obtain a reading of 1.5 to 1. If the reading is

much higher, snip a couple of mm from each element and check again. Should this fail, shorten the coax feeder by about 12mm and try again; it may be necessary to repeat this operation two or three times, but you should get there in the end. All that remains to be done is to waterproof the assembly. If you use dowelling, then varnish it and cover the open end of the coax with silicon rubber compound.

If you build the antenna for mobile use you don't need the horizontal boom, I stripped off an old glassfibre Firestik and mounted the vee's on it using nylon nuts and bolts. The per-

formance? Well Mack (MTH) in North East London, Peter (UK921) in South East London and myself (RO1) in West London tested the antenna practically every night for three weeks. The maximum distance was between Mack and myself. The 23 mile copy was R5 with no trace of telephones, something we couldn't possibly claim whilst using vertical antennas. We were all impressed by the lack of background noise during flatside operation.

I must extend my thanks to both Mack and Peter for their help in testing and improving the design.

**A**rguably the most important part of any radio station is its antenna system. You can go out and get the best rig that money can buy but without a really efficient antenna system you will have wasted your money. Neither is it enough to simply buy the biggest antenna you can find, in the hope that it will deliver the fattest signal because unless it is properly matched to the transceiver much of the transmitted energy will be wasted in overcoming the mismatch and, since the object of the exercise is to transmit the strongest possible signal it is imperative that in setting up a station we devote at least as much attention to the antenna and its peripherals as we do to the rig itself.

### Resonant Length

In order to understand the workings of any radio antenna we must first examine the relationship between the frequency at which a signal is being transmitted and the corresponding wavelength of the signal. The simple formula by which the relationship may be determined is to divide the frequency, MHz, into the speed of light (300,000,000 metres per second). By this means we can see that the wavelength of a 27MHz signal is roughly 11 metres, whilst that of a 934MHz signal is only about 32 cms. (Fig 1).

Since the first requirement of most CB stations is to be able to transmit and receive equally well in all directions the easy answer is to make use of a vertical, omnidirectional antenna but although it may be possible to receive a reasonable signal on almost any old length of wire, effective transmission

# ANTENNA ADVICE

The choice of antenna can make or break your CB setup. Here, Keith Townsend gives us a few helpful pointers

demands that the antenna be cut to a length corresponding to a given fraction of the wavelength of the signal to be transmitted. Since what leaves the antenna is a form of electrical energy, when considering the correct length of antenna for any specific application it is necessary to distinguish between physical and electrical length. For example, although the 27MHz specifications restrict physical antenna length to no more than 1.65 metres, dividing 11 metres by four shows us that a quarter-wave antenna needs to be around 2.75 metres long. Hence the use of a loading coil, into which the

excess electrical length is wound.

### Characteristic Impedance

As you will have noted from the literature supplied with your rig, it is described as having an impedance of 50 Ohms, which means that it gives of its best when delivering energy into a "load" showing a 50 Ohm impedance, so that it is important to ensure that your antenna exhibits the same impedance within certain tolerances. Despite the blind faith of many in VSWR readings, antenna impedance is not an easy thing to measure. A centre-fed, half-wave dipole, for

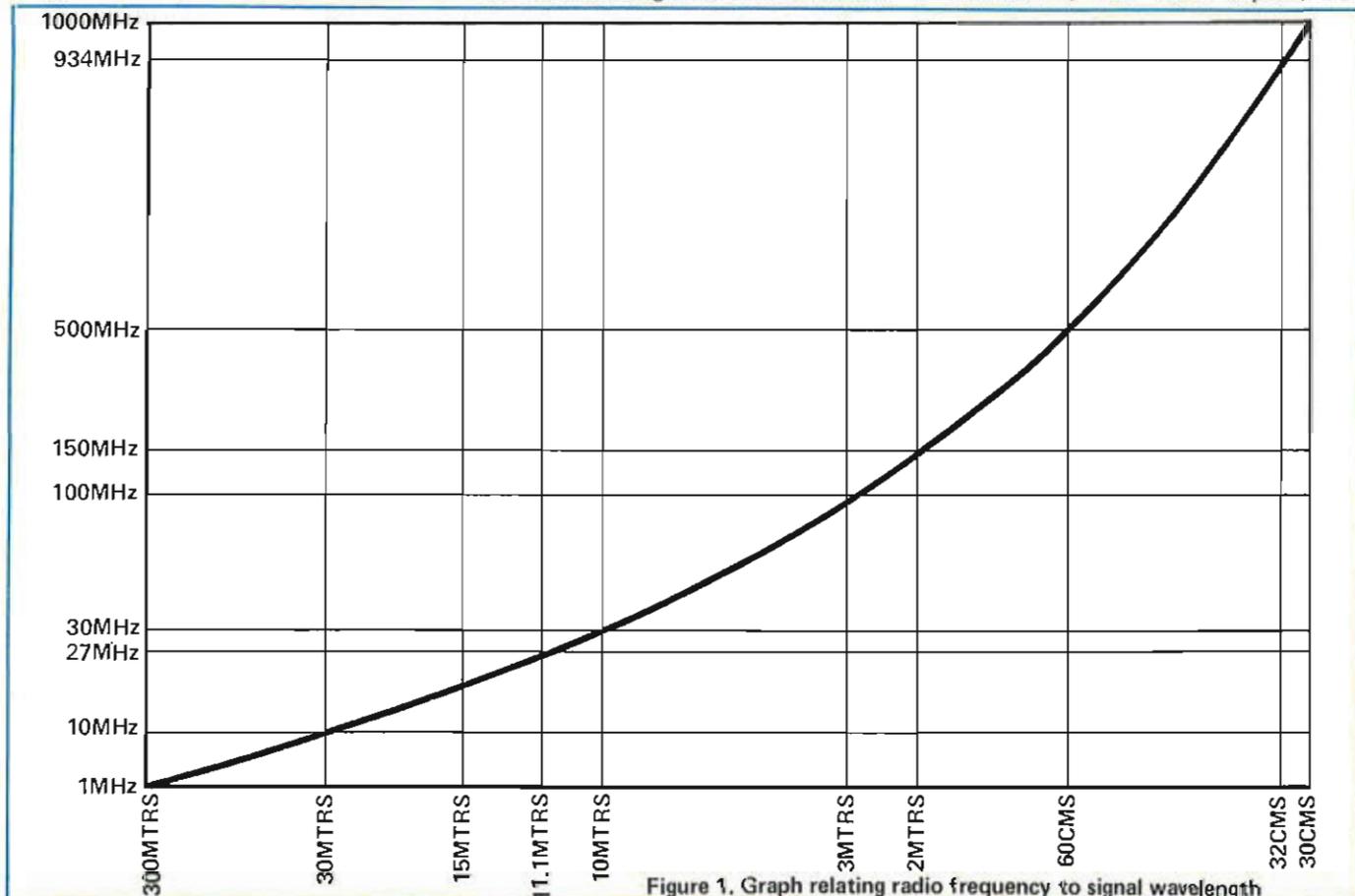


Figure 1. Graph relating radio frequency to signal wavelength

example, although cut to a proper fraction of the wavelength in use, might have a characteristic impedance of around 72 Ohms, which, although not dramatically different, might result in some degree of television interference, as its efficiency would be impaired unless some form of impedance transformer were inserted between the antenna and its feeder. Other drawbacks associated with dipoles are the fact that their performance can be badly affected by their distance from the ground and by the proximity of metallic or conductive objects, so that one operator might get excellent result, whilst another finds a dipole far less effective than he might have hoped.

### Ground Plane Antennae

Most antennae for use at 27MHz are of the "ground plane" variety, in which the radiating element acts as the positive part of the electrical circuit whilst the overall ground plane should be earth. Thus the centre core of the coaxial feeder cable is connected to the radiating element, with the outer braid connected to the ground plane, which, in turn, must be isolated from the radiator. For optimum performance the overall ground plane should be fractionally larger than  $\frac{1}{2}$  wavelength in diameter, in order to develop the best possible waveform, though, as countless mobile stations have demonstrated, reasonable performance may be obtained using any large surface, such as the roof of a car. The real problem here is the fact that in most mobile operation it is impossible to site the antenna so that it has an even amount of ground plane in every direc-

tion, which means that a stronger signal will be generated in some directions than in others.

However, it is not necessary to make use of a solid ground plane element, as a mesh or a number of radial arms will perform equally well. For base station operation it is often most practical to use radial arms as a ground plane and, here again, performance is dictated by their length. We have all heard of the DV27 on top of a biscuit tin but it should be stressed that this is a most inefficient configuration, simply because the biscuit tin provides only a fraction of the required ground plane. In discussing ground planes we must return, for a moment, to the matter of impedance. In most such antennae the correct impedance is obtained by slanting the radials downwards, at an angle of about 120 degrees to the radiator. Increasing that angle will result in a corresponding increase in impedance and bringing them nearer to the horizontal plane will reduce the impedance.

Although less than totally efficient, this type of antenna offers a number of advantages. It can be erected at almost any height above ground, subject only to the need to keep it well clear of drainpipes and other metallic objects, without its performance being significantly affected, so that it may be sited on the roof of a house or shed without the need for large support masts. It can also be connected directly to any length of 50 Ohm coaxial cable without the need for an antenna tuning unit, the insertion of which might otherwise reduce the amount of power being delivered to the antenna. Perhaps almost as important in an era of red tape, it is less unsightly than many

larger antennae, with the result that less objections are likely to be raised by its presence.

### Propagation and Radiation Angles

Transmission range at 27MHz is largely governed by two factors, the curvature of the Earth and an atmospheric layer known as the ionosphere. (Fig. 2). In all HF transmissions some percentage of the signal (ground wave) is radiated at a low angle whilst the rest (sky wave) goes racing off into the atmosphere. Since radio waves, like light, travel in a straight line, ground wave range is limited by their inability to follow the Earth's curvature and so effective range is limited. Sky wave, on the other hand, is subject to the vagaries of the sun. During periods of low sunspot activity most of the radiation at all frequencies above 14MHz tends to pass straight through the atmosphere, to be lost in space. When sunspot activity is high the ionosphere tends to act as a mirror, reflecting signals back to Earth over surprisingly long distances. Sunspot peaks and troughs occur in roughly eleven-year cycles, though they cannot be predicted with any accuracy but even when the sun's activity is low a condition known as "sporadic E" may occur from time to time, in which signals are reflected for short periods from the E layer of the atmosphere, with some pretty spectacular short duration DX becoming possible.

Since ground wave range depends, to some extent, on the distance to the horizon, raising the antenna will increase working range but if good

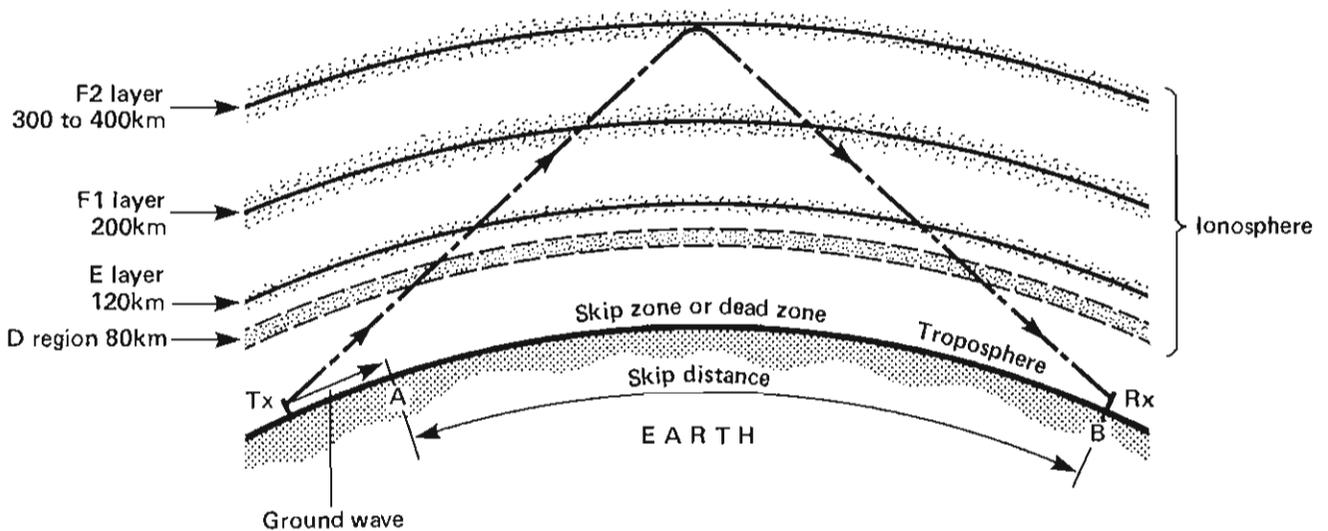


Figure 2. Reflection of radio waves by ionized layers

signal strength is desired then it becomes important to direct as much of the signal as possible away from the ionosphere in the direction of your intended contact. Here again, the loading coil plays a significant part. Because a base-loaded antenna has a relatively high angle of radiation it will deliver less of its output in a straight line than will a centre loaded one exhibiting a lower angle of radiation. Even better in this respect is a top-loaded antenna, which has the lowest radiation angle of all.

Another factor over which we have no control but which can offer impressive short term improvements in range is the good old British weather. I have often recorded copies of up to 40 miles, using only 0.4 Watts, in misty conditions, when the radiation from my antenna has become trapped between the two layers of air of different temperatures, where it is obliged to bounce around until it reaches the end of the "duct" and makes contact with the first available receiving antenna.

### Directional and Multi-element Antennae

Although only single-element antennae are permitted at 27MHz, the situation is quite different at 934MHz, where the use of up to four elements is allowed. In mobile stations these usually take the form of "colinear" antennae, in which two or more resonant elements of differing lengths, often  $\frac{1}{4}$  and  $\frac{1}{2}$  wavelength are connected together to

increase the antenna's efficiency. Since at this frequency a  $\frac{1}{2}$  wavelength element is only about 16 cms long, it is possible to stack elements in this way and still have a very short overall length. In this form the elements are electrically connected positive to negative, negative to positive and omni-directional base antennae utilising the full four elements are similarly constructed.

One distinct advantage of multi-element antennae is their ability to direct most of their radiation in a given direction, thus increasing signal intelligibility in that direction and reducing it in all others. Usually mounted on some form of rotator so as to facilitate all-round coverage, beam antennae consist of a  $\frac{1}{2}$  wavelength radiating element, to which is connected the inner core of the feeder cable. The outer braid is then connected to a boom, from which the radiating element must be isolated. Fixed to the boom and sited behind the radiator is a slightly longer element, known as the reflector. Ahead of the radiator may be positioned any number of directors, though at 934MHz only two are permitted by the terms of the licence.

With a beam, both impedance and radiation beamwidth are governed by the total number of elements. The more it contains, the lower will be the impedance and the narrower the width of signal coverage area and perhaps this is the right point to discuss our old friend, "gain".

For any claim to gain to have any meaning it must have a reference point against which to be measured, the most common and most practical being the  $\frac{1}{2}$  wave dipole. Admittedly, many manufacturers publish impressive "gain" figures for commonplace 27MHz antennae but these are measured against an "isotropic radiator", which is a theoretical antenna hanging, unattached, in free space. A good trick if they can do it! For our purpose, let's stick with the reference dipole, over which no legal 27MHz antenna can possibly exhibit any degree of gain.

Only in a multi-element antenna can real gain exist and, again, it depends on the number of elements used. A good quality three element beam will exhibit up to about 6dB gain in the direction of maximum radiation, the directors being used, as their name suggests, to direct the signal. Whilst, at the back, the reflector helps to reduce rearward radiation by turning some of the signal back in the direction in which it is wanted. Increasing the number of elements will increase gain but the equation is logarithmic, rather than linear and there comes a point at which any further increase is not worth the effort.

As with many aspects of radio communication, the study of antennae and their characteristics cannot be completely covered in a single article. I have deliberately avoided discussion of SWR, about which we must talk soon, if only to dispel some of the common myths.

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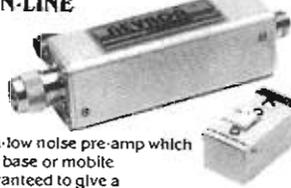


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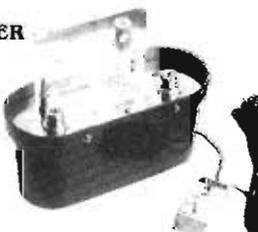


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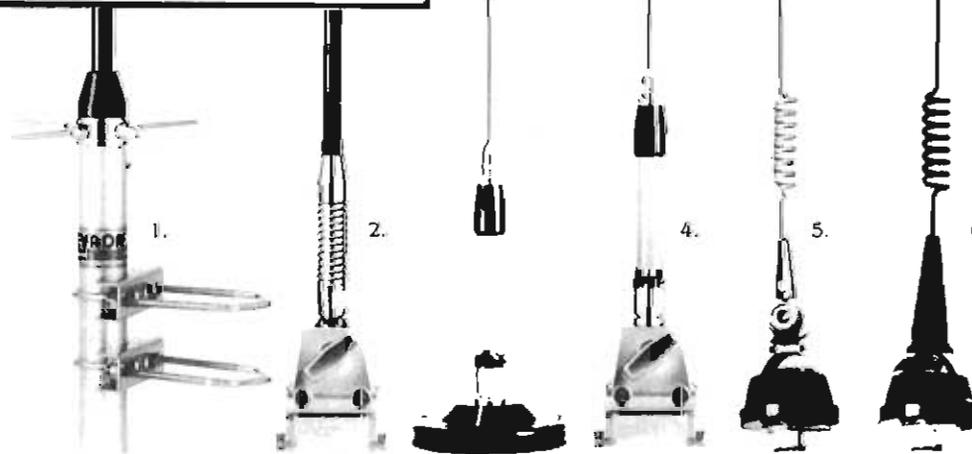
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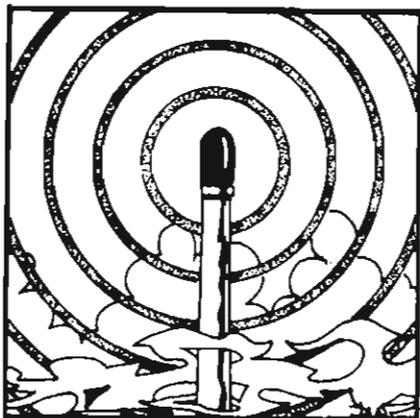
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# Antenna Review



A slightly bemused Gordon Blackwell checks out a double — or is it triple — loaded antenna

# TRIPLE TWIG

It had to happen, I suppose. It was only a matter of time before things started appearing on antennas. Things that didn't really actually do anything for the performance of the aerial but were there purely to make it look good. Yes I know that the appearance of an aerial is important. I mean, if you're going to have something sticking out of the gleaming paintwork of your pride and joy (the ol' jam-jar), it's not unfair or stupid to want it to look good.

The manufacturers aren't daft either. They are very much aware of this vanity within us all. If they weren't and there wasn't, we'd all be driving around with coathangers stuck to our cars. No matter how good a particular aerial was, if it didn't look good, you can bet your life it wouldn't sell.

So the manufacturers tart them up. Lots of shiny chrome bits with chunky black coils. Colourful, bold stickers and even impressive sounding names — you know the ones I mean. Well of course all this is accepted, in fact

sceptical: 'are these guys trying to fool people into thinking this is something special'. There was no literature with the aerial and therefore no explanation of the three coils or why the middle one was blank, so a bloke has to draw his own conclusions.

Well, no-one's perfect. I was wrong. Not completely though. Yes, the middle coil is a blank and no it doesn't do anything to improve the performance of the aerial. However, the suppliers are quite open about it. It's purely cosmetic, I was told. Fair enough, but my suspicions had been aroused and I was not totally satisfied about their motives, so let's take a closer look at the aerial.

Ignoring the blank 'coil', the idea of having two coils is basically a good one. The theory is, the closer you get to producing the effective length of a natural full-wave aerial, the better. This one has got an actual physical length of 1.48m — just under 5ft — so with the two coils, its electrical length must be pretty close (if not spot-on) to that of a ¼-wave aerial, and that can't

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**"The first thing I noticed when I started using it, was the clarity of reception"**

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demand, by the CB-buying public. And you wouldn't have it any other way, would you?

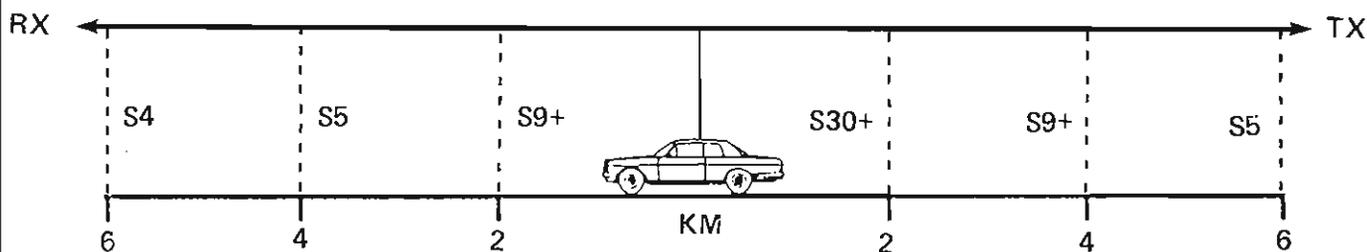
So far, however, all this tarting up has been within reason. It's there just for decorative purposes and the manufacturers have not tried to disguise this fact by pretending that it is something else — something that might be construed as a performance improver.

You can imagine my surprise then when I recently received an aerial for review with not one, not two, but three coils! Hang on though. What's this? The little one in the middle is blank. My immediate reaction was rather

be bad.

Now that you're beginning to get the idea that this triple-loaded aerial, which is really only twin-loaded, is not, perhaps, just a load (excuse the pun) of hokum, I can tell you what it's called without prejudicing its reputation. It's called the Pama-Tri and yes, it's from Pama & Co. If you read the back pages of CB Magazine, you'll know that Pama are not, however, manufacturers, but wholesalers, supplying a complete range of CB equipment. Is this another trick? I hear you ask. No, not really. It's just that this particular aerial is specially manufactured for Pama. Oh, by the

# ANTENNA REVIEW DATA PANEL



## SPECIFICATIONS

Model PAMA-TRI  
 Type ¼ WAVE MOBILE  
 Length 1.48 METRES  
 Frequency Range 27MHZ  
 Max Power Handling 500W  
 Impedance 50 ohms  
 Cable Supplied N/A  
 Mounting ¾ THREAD  
 Supplier PAMA & CO  
 Typical Price £11.99 — £14.99

## REVIEW VERDICT

Performance XXXX  
 SWR adjustment XXXXX  
 Construction XXXX

Installation —  
 Instructions —  
 Value XXXX

We rate our samples on a scale of one to five. Five crosses is the highest rating, three and four stars are average to good and one and two crosses mean it's not doing so well.

## THE TESTS

We have used our standard test procedure to assess the efficiency of this antenna. To bring new readers up to date, this is what we do: in the case of a mobile antenna, we perform a static and a mobile test. Our test sample is fitted to a stationary mobile and a second mobile follows a pre-arranged route that orbits the stationary test vehicle, sending and receiving signal reports at measured intervals. This then repeated with the test antenna on the mobile test vehicle and the signals are sent and received between a stationary vehicle. In the case of a homebase antenna, obviously only one vehicle is used. A standard rig and antenna are used in all tests. The antenna is also subjected to a series of 'lab' tests to assess their durability, quality and construction, and finally we hand it over to a panel of CBers for comment.

way, it's British designed and British made, so I don't care if you don't want another aerial, you just get down to your local CB shop and buy one of these Pama-Tri's, alright!... Oh, er, sorry. My patriotism running away with me there.

Apparently, the reason that Pama took on this aerial was because they were so impressed with the SWR adjustment, or rather the lack of it — the Pama-Tri is one of these pre-tuned jobs. As we all know, an SWR of 1:1 is the ideal, but the chances of obtaining this are just about nil, despite what the manufacturers say. This is especially true of the so-called pre-tuned aerials. They never quite achieve what they're supposed to. Pama are obviously a cautious bunch, because they only claim a reading of 1.1:1. Once again, with their exhaustive tests and technical expertise, CB Magazine proves the manufacturers wrong! The bloody needle never even flickered. Even on channel 40 it only just moved up to 1.1:1.

The construction of the Pama-Tri is quite basic really. Starting from the bottom, it is fitted with a standard ½in thread connecting bolt to suit a host of mounting possibilities. Giving the twig some strength and rigidity is a shaft of ½in diameter stainless steel 14in long. The top of this shaft is where we find

the first of the two operating coils, which are separated by just under 5in of stainless steel twig — and the third 'coil'. This is simply a 1¼in chrome capsule with a piece of black shrink-wrap around its middle to make it look like a coil. If desired, this 'coil' can be taken off, but I think the aerial would then look strange. Purely cosmetic it may be, but it finishes off the aerial rather nicely, and, it could be said, adds rigidity to the twig between the real coils. A further 32in of stainless steel rod, with a stainless steel cap, completes the arrangement.

The aerial is supplied in two sections in shrink-wrap packing. Once you've fought your way through the packaging, assembly is simply a case of slipping the top whip into the coil and tightening the grub screw with a screwdriver — no need for stupid allen keys.

After my initial anti reaction to the Pama-Tri, the more I got to know it, the more I warmed to its capabilities. The first thing I noticed when I started using it, was the clarity of reception. At relatively close range (up to 2 miles) it was as if the person I was talking to was sitting in the passenger seat beside me, and even weak signals down to S3 were coming out very clear. No straining of the lug-holes needed here.

As you can see from our diagram, the Pama-Tri performed quite well on

our test, and it is worth mentioning that in notorious bad spots where a copy would normally disappear, communication was maintained at all times, albeit at a low level.

I have talked before about how ambient conditions can affect the communicating range of an aerial. Not least is the surrounding terrain and the aerial elevation, and by elevation I mean its relative height with respect to the receiving antenna and not its height above ground. So when making comments about a particular aerial, I have to take an overall look at its performance rather than rely on the results of our standard test.

I have now been using the Pama-Tri for the past two weeks and can quite safely say that, gimmicks apart, it's a good performer. The RX was always slightly lower than the TX but not enough to have an adverse effect on communication. My only real criticism is its length, which makes handling difficult and a bit of a problem with low-level obstacles, but then if you want optimum performance, you've got to put up with these little annoyances.

The Pama-Tri is available from most CB shops or you can it direct from Pama & Co at 433 Wilmslow Road, Withington, Manchester M20 9AF. Tel: 061-445 8918. Our thanks to them for supplying the sample.

**A**re you one of the hundreds of breakers who, having realised the fascination of remote communication, would like more? More range, more bands, more transmitter power, more varied modes of operation. You have probably considered the amateur bands, may even have gained some insight into their potential from visiting someone who already holds the licence and seeing at first-hand the paraphernalia which goes to make up the average amateur station. Perhaps you have even come away with a slight tinge of jealousy and the feeling that the whole world could be your oyster. If only it were not for that damned exam! Look into the world of amateur radio these days and, although some are less than eager to admit it, an ever-growing number of licensees gained their first experience of radio on 27MHz. In fact many are still to be found down there, either because old loyalties often die hard or because they are simply unwilling to lose contact with friends who do not have amateur licences. Neither is this trend confined to those with a technical background or previous experience of electronics, as truckers, housewives and people from every other walk of life find that a whole new vista of communications can be theirs, just for taking the trouble to pass an examination which many once thought beyond them.

Agreed, it requires a modicum of effort and a great deal of will to succeed in order to gain a licence, especially if, like me, you start out not knowing the difference between a diode and a plate of fish and chips but the exam is not designed to make a physics professor out of you and there is absolutely no reason why anyone with a genuine interest cannot succeed. The rewards, not to mention the sense of personal achievement, far outweigh the effort expended.

Although it has now been more than five years since I took the plunge, I still have vivid memories of the sense of elation which accompanied the knowledge that I had passed the dreaded

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# FROM BREAKER TO HAM

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**At some point, many breakers wonder about moving into ham radio. Here Keith Townsend looks at the advantages of getting over the hurdle of the test**

exam and, although 27 will never lose its fascination, I still find constant amazement in the wide variety of contacts which my amateur licence permits.

Once over the hurdle of the exam, designed to test your understanding of licence conditions and regulations, transmitter interference and a little of what makes the whole works tick, the class B licence to which you are now entitled offers immediate access to a much wider slice of the spectrum than you have previously experienced. The most widely used band is that between 144MHz and 145.999MHz, within which repeaters are provided in order to increase the range of mobile transmission and where simplex mobile

ranges using FM can be roughly compared with 27MHz, though reception quality is far better. Base station FM operation at these frequencies is considerably improved, for a number of reasons. Firstly there is no restriction on the type or size of antenna you may use (subject, of course, to planning permission) and multi-element beams offering a high level of gain (often as high as 12 to 15dB) in a specific direction are commonplace. The maximum permitted transmitter output power is also far higher and far less of the signal is likely to be lost to the atmosphere, with the result that quite spectacular working range can be achieved.

It is difficult to offer a direct com-

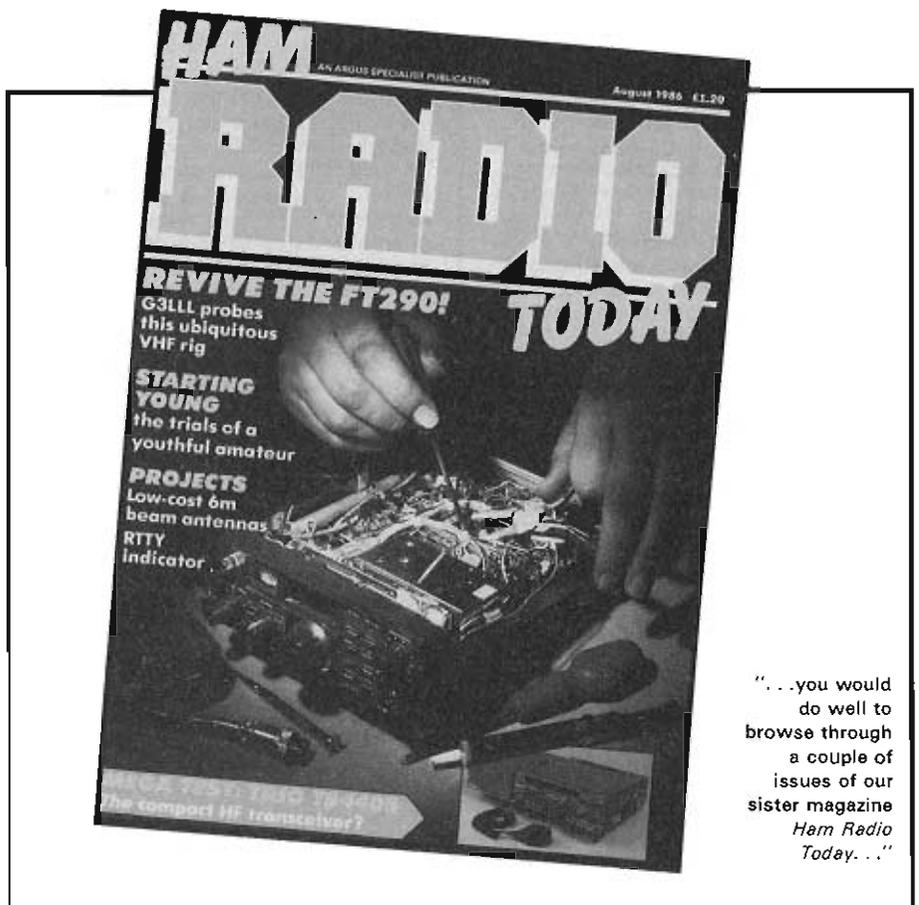
**A rather tasty looking Yaesu amateur radio setup**



parison between 27MHz and the VHF band because although part of the band is channelised, channel spacing is wider, at 25kHz, dramatically reducing the likelihood of adjacent channel interference, whilst certain channels are allocated to services such as the repeaters which I have already mentioned, beacons which may be monitored in order to ascertain band conditions and, right at the top of the band, transmissions via satellite. Television pictures and radio teletype (RTTY) account for a few more channels, whilst the lower quarter of the band, where apart from certain designated calling frequencies you may operate on any frequency, may be used for SSB and Morse code (CW) transmissions. This latter facility, until recently restricted to those whose class A licence demonstrated that they had also passed a Morse test, has now become available to all licensees and is proving most popular with those studying for the Morse qualification, without which they may not use any amateur band below 144MHz.

Slightly less well populated than the VHF bands, perhaps because of their comparatively higher cost, the UHF allocation falls between 432 and 440MHz and is commonly referred to as 70cms. Largely an enthusiast's band, it offers all the facilities of the 2m band but, because signal attenuation is far higher at these frequencies, only the highest degree of station efficiency will offer more than local copies, with the majority of mobile traffic confined to the repeater frequencies in which transmissions on a particular channel are picked up at a remote site and relayed beyond their original range on another. This is not to say that 70cms cannot provide worthwhile results, as international contacts are regularly reported and most amateur television pictures take place within this band, often with an accompanying voice contact at 2M.

Between them, these two bands have so much to offer that around half of the fifty odd thousand licensed amateurs never venture beyond them and although you can spend colossal sums on developing your station, particularly if you opt to run both bands, starting out in amateur radio need not be particularly expensive. A new multi-mode transceiver for 2M can cost between five and seven hundred pounds but a good quality used rig with an output of between 10 and 25 Watts can be bought for around £250, whilst most dealers are able to offer a fairly wide choice of second hand FM rigs from as little as £100. Antenna systems are likely to cost as much or as little as you are prepared to spend and many amateurs prefer to build their own. A simple dipole can cost as little to build as a few pence, whilst a really good beam from one of the specialist manufacturers can vary between, say £20 and as much as £100, depending on the number of elements it contains and the degree of gain it exhibits. Power amplifiers, banned at 27MHz but in common use within the amateur bands, can also be constructed fairly cheaply, either from kits or, by following the DIY projects regularly featured in



magazines such as our sister publication, *Ham Radio Today*, from basic components.

The slightly more adventurous might like to consider trying for the class A licence. Although totally unintelligible at first, Morse code is nothing more or less than another way to spell and, once fully explained does not take long to master. To many candidates, the required 12 words per minute seems like a mountain at first but I have lost count of the number who, having once protested that they would never reach that speed, now regularly work at far higher speeds. The class A licence requires no more technical qualifications than the class B and, once through the Morse test you are really motoring. Now you have access to a number of LF and HF bands, ranging from as low a frequency as 1.8MHz, through 3.5, 7, 14 and 21, right up to 28/29MHz, with an additional VHF allocation at 50MHz. With the exception of 21MHz, where only Morse transmissions are permitted, all modes of transmission are in use and, although straight AM has just about fallen into disuse SSB signals can reach the furthest corners of the world, providing that conditions are right and you choose the right time of day. For example, point your beam in the right direction in the early morning and you need not be surprised to find yourself in contact with Australia and New Zealand. A little later and a slight change in direction will link you to South Africa, with Canada and the USA coming in from the west a little later, though it pays to remember that there can be as much as a seven hour time difference between you and the station you are working. Russian and European contacts are as plentiful as grass in a meadow.

The most popular HF bands for

regular DX are those below 20MHz, where the effects of the sunspot cycle are less likely to be felt but the experienced operator tends to change bands as the day progresses and conditions alter. At the lowest available frequencies, between 1.8 and 2MHz, known perversely as "top" band, the most massive antennae are required, yet a visit to an amateur rally will show you at least one or two intrepid operators who use this band from their cars. The evidence is there for all to see, in the form of colossal base-loaded whips, often bigger than the car on which they stand and guyed to the four corners of the roof. As you come higher in frequency so the size of antenna diminishes until a mobile antenna for 10M (28/29MHz) is virtually indistinguishable from you own CB antenna. On the other hand, there are a number of beams available which cater for as many as five bands at once. Look back a few lines at the list of available bands and you will see that they fall into a very neat pattern, each harmonically related to the others. It is this progression which enables a single antenna to work efficiently on more than one band, removing the need for a large and expensive aerial farm if you want to use all of the bands. Even so, setting up an HF station is no cheap affair. You can achieve reasonable results using 80 metres of wire for an antenna but this will require a good quality ATU and even the most modest second hand HF rig will set you back between three and four hundred quid, unless of course you decide to build your own. Should you opt for a beam antenna, you can expect little change from around £150, with perhaps another £100 going on the means of rotating it through the points of the compass. A RTTY terminal and printer need not cost a fortune but if you are thinking of





Filly experiences the darker, and worrying, side of life

# LADY BREAKERS

**T**here are times when Citizens Band can be company, when it can be fun, and when it can be useful. There are also times when it can be a downright liability, not because of what it is, but because of the kind of people who sometimes, unfortunately, use it.

I was zipping up the big slab the other day, keeping an ear open for trouble ahead but otherwise innocently enjoying the day, when a beaten up Ford Cortina with assorted football fans, draped in scarves and hanging shouting out of the windows, zoomed past, antenna flying.

Maybe I should have thought to myself, nice to see a bunch of lively lads out enjoying themselves. Being cynical, I wondered which football match in the Midlands or the North they were off to disrupt, then thought no more about it. They were quickly out of sight.

A minute or so later, a voice interrupted the conversations on the channel.

"Hey darlin", it said, "The crumpet in the red mini, driving up the slab. Are you out there? Are you listenin' in?"

Well, I was in a red Mini, I was travelling up the motorway, and as far as I'm aware I'm certainly female. But there was a lot of traffic about, reception was good, and I didn't leap to the conclusion that the voice meant me. I can't say I'm in the habit of thinking of myself as 'crumpet'.

Then a down-to-earth Brummie voice told him to get off the channel unless he had road information, and again I thought no more of it. But a few minutes later, there was the voice again.

"Hey, blondie in the red Mini, licence ONY something. C'mon give a guy a break. Are you out there?"

That settled it. It was obviously me. Someone had got an eyeball on me. I had a look round but none of the vehicles in my immediate vicinity looked particularly suspicious — not that I knew what I was looking for. Unless it was that giant truck a few hundred yards or so behind... but truckies aren't into sexual harassment these days, at least not in my experience.

I had no intention of answering the voice, of course — whoever it was was obviously trying to provoke a response.

Then when the voice said bad-temperedly: "You bloody cow, where are you, then?" I judged it time to change channels.

That put a stop to the unwelcome voice, but I felt a bit unsettled. Was I being watched? Who by? What for? I kept staring in the mirror, too often for safety. Had the voice given up on the travelling channel? Was it even now hunting me across the airwaves? On that unpleasant thought I switched the rig off altogether.

That helped. I felt as if I had broken any link between us — but was he still watching?

After about ten minutes, I passed the battered Ford Cortina, now crawling along in the slow lane. Jeers and catcalls followed me as I passed, and I wondered if it could have been them. For the next quarter of an hour or so, they were always in sight behind me, about four cars back, however fast I went.

By this time, I had had enough, my nerves were in shreds, so I pulled into the next services. And behind me, in the mirror, I saw the Ford Cortina turn off too...

Pause for effect. What would you have done? I drove into the car park, stopped near an estate car that had people in it, and waited. The Cortina entered the car park, parked some

## Nerves

rows away, and four youths got out, jostling each other and chanting. They approached... walked past... went into the cafe without seeing me. I sat there, and imagined myself walking into the cafe. Would they be there, looking for 'blondie'? Would they come out and try to spot the Mini in the car park? Would they watch and see who came out to it?

Or was I being a neurotic idiot imagining the whole thing?

I'm ashamed to say I bottled out. I drove off while they were still inside and left the motorway at the next exit, choosing another (much slower) route to my destination. No one seemed to be following me and eventually I was able to relax and enjoy the journey again.

I shall never know if it was the football fans or not — maybe I'm just prejudiced. Maybe it was all done for a laugh. But at the time, I for one wasn't laughing.



Who's done what to the VHF channels? Captain Sparx looks at the background to CB and community radio

# CAPTAIN SPARX ON THE WAVELENGTHS

**T**here was a time when the continent (of Europe that is) was considered the home of freedom and delight, regarding radio. Indeed, the French socialist party fought an election on the ticket of liberalizing the airwaves. True, that the desire to open a pirate radio station eclipsed the legendary Gallic aspect of *l'amour*. Today, though, a wave of privatization is sweeping through the French broadcasting set-up, whilst the high hopes of legalized local 'people's radio' have somewhat evaporated. This summer — recognised by passing hailstorms — has seen something like a quick back-step regarding community radio in Britain, too. Could it be that our Wisers and Betters are more pre-occupied with the Butter Mountain, than with offering a decent mike to citizens?

Like ladies getting the vote, Britain's move towards a more open radio set-up has been much delayed. Back in the mid 1970s, a new alternative radio magazine, 'Wavelength' did what it could to push for CB. In February 1977, *Wavelength* (editor, Ms Nik Oakley — and hello, if you're out there, Ms N.O.!) launched its campaign, 'Give Britain a People's Band'. The practical benefits of CB radio were reviewed by a certain 'Kentucky Popsicle' who noted that 'truck drivers are the most common users of CB, for warning other drivers about road and weather conditions, traffic jams, police patrols, and radar traps. There are many examples of CB preventing drivers from falling asleep at the wheel, and of women being rescued from rape. Many housewives have radios at home so that they can chat with each other, or call up their husbands on their way home from work, to remind them to call in at the supermarket for some peanut butter.' This is somewhat quaint. Much as we love the stuff, experience in this radio hut suggests that peanut butter sandwiches tends to discourage talk on the rig, and in too generous proportions acts as a Jaw Clamp. On the other hand, that may be why Ma called up the old man to remind him to get some.

The February 1977 epic reviewed

the kind of equipment available in the USA, noting the FCC's plan to expand the existing 23 channel system on 27MHz AM, to something nearer two hundred. Interesting, too, was the reference to our government's favourite topic, Law and Order: 'the police in many states (USA) keep a constant listening watch on Citizens' Band. They would rather let a truck driver tell another that a 'smokey' is 'taking pictures' so that the second truck slows down, and they don't have to give him either a bear bite or a Christmas Card (speeding ticket).'

The *Wavelength* article showed an Electronic Radar Trap Detector, with the apt brand name of 'Bearfinder', though did not refer to the legal brouhaha pertaining to sale and use of this fiendish gadgetry. Also a Regency rig (to US FCC specifications) was illustrated, as an example of the kind of goodies likely to come to Britain.

## Europe

The December issue of *Wavelength* had a more detailed article on CB, as it might develop in Europe. Thomas Garvig wrote a very useful piece which referred to the proposed CB rules from CEPT (Commission Européenne de Poste). In reference to the then hot-blooded arguments relating to AM versus FM, Mr Garvig noted that possible interference from CB to nearby TV receivers or hi-fi equipment could be avoided by appropriate rules for spurious emissions etc. Here, the possibilities of the soon-redundant VHF TV channels were raised. It seemed unlikely that the ITU would be much impressed by that proposal. A strongly ionized E Cloud might bounce a low-power signal over wide areas of Europe, interfering with channels within VHF TV systems. Thomas Garvig thoughtfully raised the possibility of an alternative to 27MHz 'well up in the UHF band, if any space could be found there'.

Of course, it was true that back in 1977, hardly anyone outside the hobby radio fraternity had heard of CB. In March of that year, *Wavelength* began to run features on its campaign, 'Give Britain a People's Band', the description

being changed to Citizens' Band in due course. Arguments for possible use of redundant VHF TV frequencies were continued: "In 1979, transmissions of television programmes on 405-line VHF are due to end" reported a *Wavelength* feature in 1977. "Fifteen years ago, television transmissions on 625-line commenced, in UHF bands 4 and 5. The channels used in the UK (21 to 69) basically fall between 471.25MHz and 855.25MHz. There has been talk of allocating at least one channel for local community radio, but one or more of others could be allocated to a People's (Citizens') Band. The VHF bands used by 405-line television cover 45 to 66.76MHz (Channels 1 to 5, Band 1) and 179.75 to 219.75MHz (Channels 6 to 14, Band 111). The bandwidth of just one television is 5MHz, which would be equivalent to 500 People's Band (CB) channels, as for speech modulation a spacing of 10KHz or less, per channel, is required."

It has to be said that *Wavelength* magazine showed a lot more brains than some of the governmental aspects of launching CB. Back in March 1977, the magazine stated: "one important reason for choosing a band such as these television channels is that the British market will not immediately be flooded with thousands of cheap 27MHz sets imported from Japan or the USA. It will be a tremendous boost for ailing domestic manufacturers who would be able to produce equipment

**"... Britain's move towards a more open radio set-up has been much delayed"**

to the Home Office specifications." In the end we got a 27MHz system, which all but ensured imports, plus a lack of rules and effective guidelines which all but doomed CB in Britain to an early demise. We might have learned some lessons from Australia, where an alternative 477MHz UHF system gave option for a more intelligent use of CB, plus good business for Australian companies. Philips TMC, in Australia, launched some fine equipment on 477MHz UHF and also earned much kudos from its initiative. Sawtron, another Australian company, got into the act business-wise and it was some time before Japanese equipment came onto the market.

How come that *Wavelength's* bright thoughts on community radio, using some of the redundant frequency possibility (after close-down of VHF

TV) had so little impact? Some would argue that the long delayed launch of community radio owed much to the illegal initiatives by various groups, including ethnic, local populations who wanted radio in their own language and cultural frameworks' which, on present formats, neither ILR or BBC radio can provide — though the noble Beeb does some good work here, like a few ILR shops. Another factor is certainly financing, since advertising revenue for community stations would no doubt be shifted from ILR stations who are already finding that there is no crock of gold under the floorboards. Back in 1977, it certainly looked as though some form of community radio — public access, people making their own programmes etc would be around long before the mid 1980s. My own views are that, with any further delays, local community radio will become an issue at the forthcoming general election. Without becoming over-political, I will merely say that the Radio Millennium will not arrive even so, given the problems that France has shown in radio liberalization. In the long run, a certain restraint is vital. Still, with so many people without paid employment — and a young population mightily interested in electronics — can we wait that long? Is it intended that the new prisons will be filled with persons who moved into pirate radio after the authorities passed the buck like *true* people's radio?

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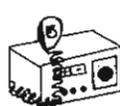
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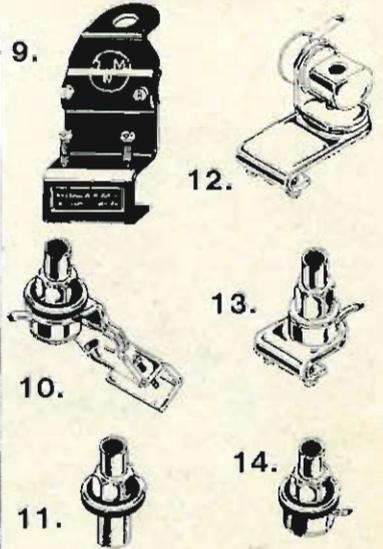
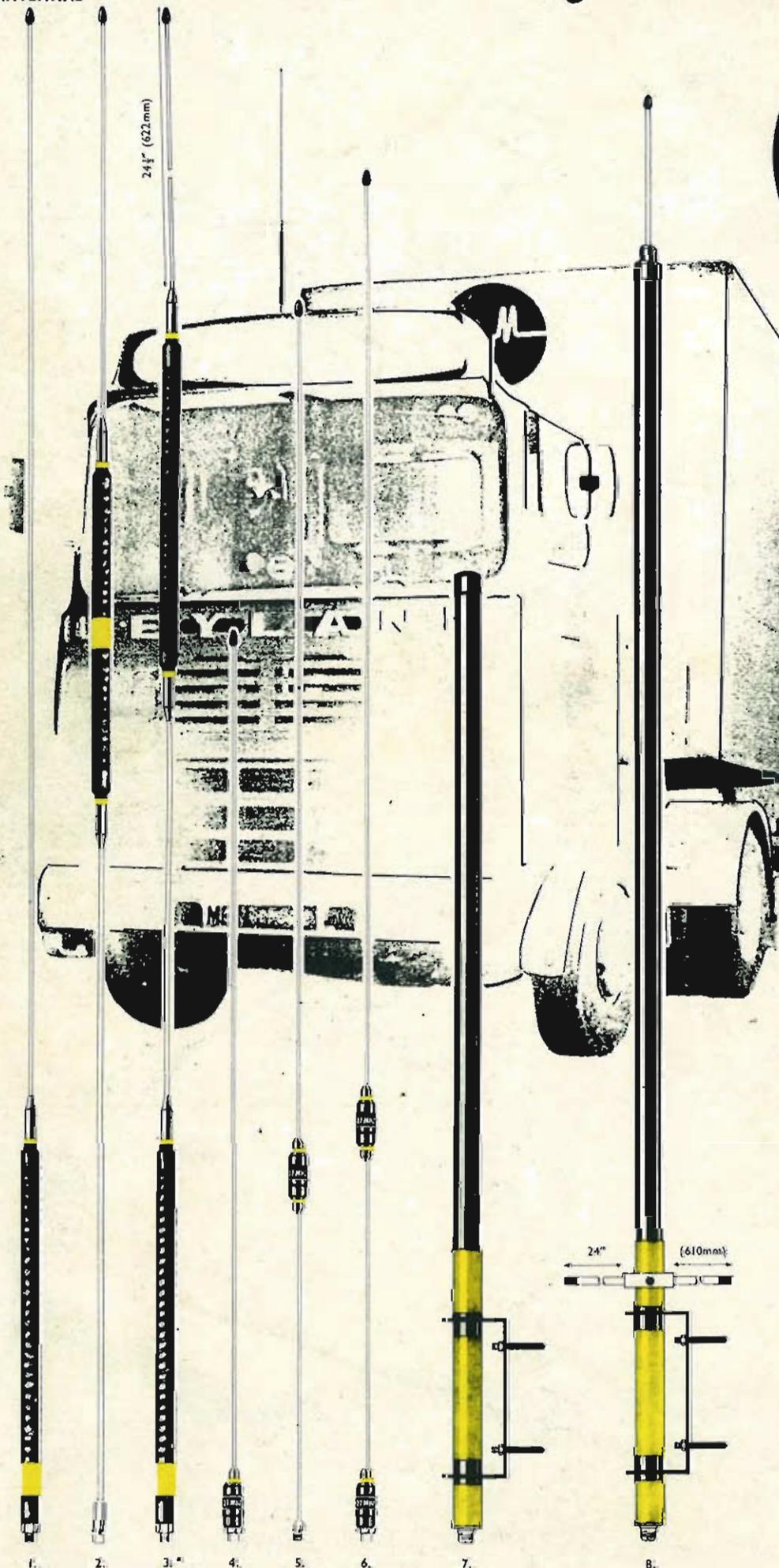
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