CITIZENS BAND

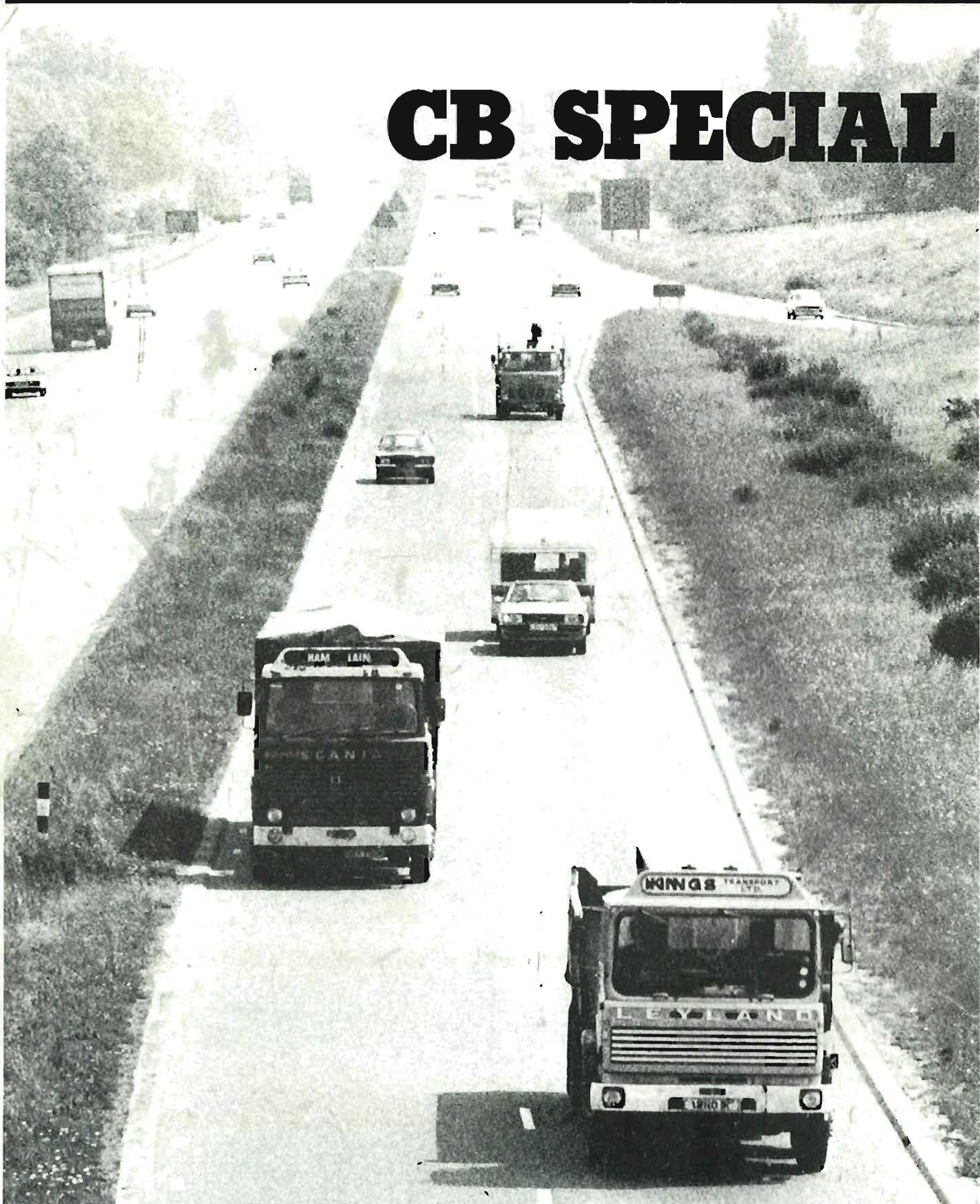
SUMMER '79

75p

A Special from the Publishers of

Hobby Electronics

CB SPECIAL



INTRODUCTION

The special publication by the staff of Hobby Electronics has been brought out very quickly and entirely as the result of the enormous response to our Cover Feature in the June 1979 issue.

From that article we received nearly 500 letters — only one was 'anti' — the only reason we did'nt publish this is because it contained obscenities!

This publication is aimed at those who are supporting the various campaigns to legalise CB in Britain. It is not intended as any form of encouragement to acquire and operate a rig. The present operators are all breaking the law and face heavy fines, confiscation of equipment and theoretically at least, imprisonment. We are saying this not as some legal 'get-out'; in fact we would advise strongly against becoming involved in this activity, not only from a legal point of view but from a practical one. We believe CB will be allowed but probably on quite different frequencies making the smuggled rigs redundant and therefore a waste of money.

Two of HE's staff have operated CB — legally-in other countries (Australia and Canada). Steve Braidwood, our Assistant Publisher, launched and edited CB Australia whilst he was working in Sydney.

We do not know if and when CB will be allowed, or on what frequencies. For that reason alone we mention 27MHz frequently — taken as meaning that we advocate that frequency, only that it is practically the only one that we know about.

Halvor Moorshead — Editor HE

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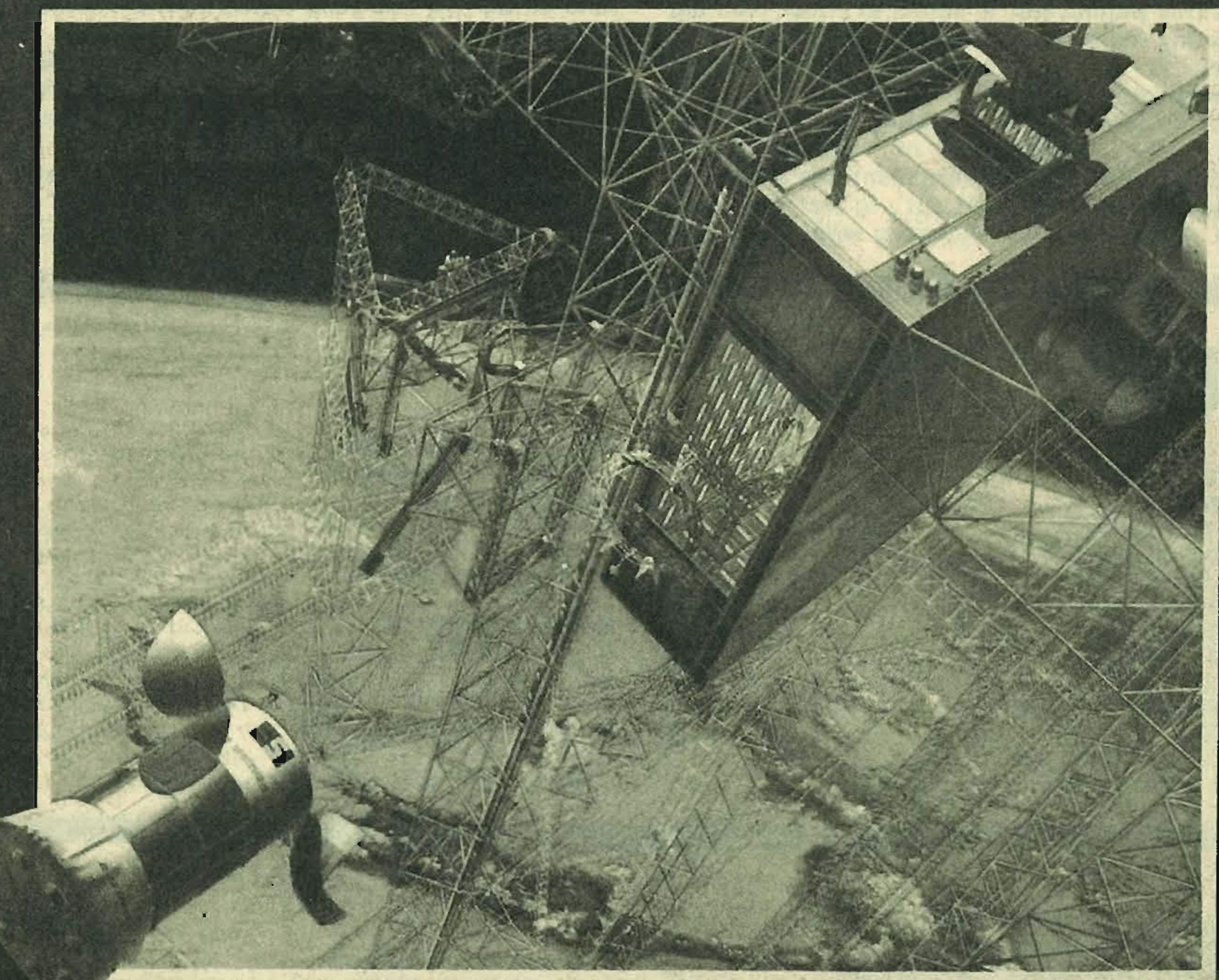
Hobby Electronics

August '79

45p



Constant Volume Amp
Compressed Sound

Burglar Alarm
Preventive Medicine

Tools
Starting A Collection

Variable Resistors
A Potted History

Injector/Tracer
Simple Test Gear

Competition
Two Calscopes To Be Won

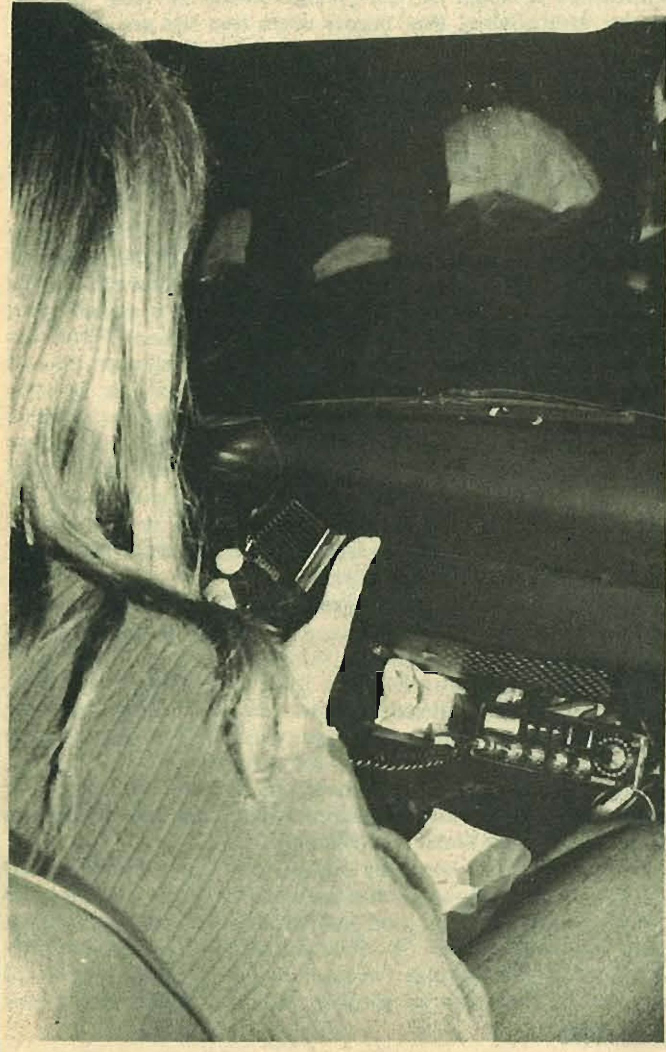
WHAT IS CB?

Citizens Band, CB, Charlie Bravo, the Flip Flop, call it what you will, we think that it's here to stay. Rick Maybury looks at the short history of a subject that is fast becoming a major national issue, CB radio.

On September 11th 1958 in the United States of America Citizens Band was born. The Federal Communications Commission, (FCC) a kind of US Post Office and Home Office rolled into one, set aside a group of high frequency radio channels 'exclusively for short-range, two-way voice communications.'

These channels which are just below the already established amateur (licensed 'Hams') are at a frequency of 27 MHz on the 11 metre band. These channels were designated 'Class D', we today recognise it as Citizens Band.

Female equality? A lady CBer tries her hand at citizens band radio.



It has taken the recent energy crisis and at least one major feature film to really launch Citizens Band on a world wide and more particularly, British basis. Strange as it may seem, the United States, home of CB has only realised the full potential of CB during the last ten years. Up until only a few years ago CB was largely the province of the American lorry drivers or truckers who gave CB what we would now describe as its sub-culture, with their colourful slang and keen eyesight when it came to spotting 'Smokey Bear' or police speed-traps.

Time for a little history, CB as you will have realised originated in America during the fifties, 1958 to be precise. The actual philosophy behind the introduction is a little clouded, it's not clear whether it was actually asked for, or if the government decided the people needed it, one thing, however, is certain the Federal Communications Committee or FCC were given the task of setting the system up and administering the issue and control of licenses, approving and standardising the equipment used.

The FCC themselves are a somewhat intriguing cross between our own Post Office and Home possessing quite dramatic power over all users of the airwaves, their power is such that all CB equipment has to conform to FCC specifications, 'rigs' made in Japan, Hong Kong and even Europe have to display a certificate stating that they conform to FCC standards if they are intended for use in the US. Such is their power and influence they have largely dictated the standards of all CB systems so far.

Much of the current debate in this country regarding the introduction of CB has centered around the suitability of the various frequencies for CB. It's interesting to consider how and why the almost universal 27 MHz band came to be. Again precise details are somewhat sketchy but it's probably fair to say that our old friend the discrete transistor was largely to blame. The gentlemen at the FCC realised that any CB network would need to be basically mobile and that meant serious limitations on power supply, particularly in the case of hand-held or 'Walkie-Talkie' equipment which they envisaged would comprise the majority of transceivers. So it looked like the then recently developed transistor (1948) could be the solution. Valves, although well established were totally unsuitable for compact, reliable and cheap sets. Unfortunately the transistors in those days were barely capable of operating at Short Wave frequencies, 30 MHz was the upper limit for quite some time. To be of any use CB must operate at a relatively high frequency otherwise problems of power output aerial length and interference become prohibitive. 28 MHz was then, as now, used by the amateur radio fraternity or Hams, frequencies below that, 26 MHz were already occupied so 27 MHz was born.

Of course there were other technical reasons as to why 27 MHz was chosen, the main thing however, is, would the US adopt 27 MHz again given the chance again? We suspect not, as you will see.

CB remained largely a minority pastime, the province of small, low powered Walkie Talkies for a good ten years. If you are old enough you may remember the first CB invasion of Britain during the mid-sixties, sets from the Far East costing around £10 flooded our high streets for a couple of years

A Home Base station, the rig is a Sommerkamp, about the best there is, made in Switzerland.

until 1969 when the Post Office stepped in and banned the import of equipment operating on 27 MHz. Strangely enough they didn't prohibit the sale of the sets, just importation and use. Most if not all of those Walkie-Talkies only operated at 25 to 50 milliwatts, little more than toys, you may still have some old sets still laying around.

The scene in the States was pretty much the same at that time, mobile, in-car CB rigs were still something of a rarity until around 1970 CB was still very much the province of the interstate truckers. Over the next couple of years interest, fired by the fuel crisis and nationwide speed restrictions, more and more people started fitting CB rigs into their cars. The oriental setmakers lost no time in getting their set production into the millions. The American market collapsed about two years ago leaving a CB 'population' of about 40 million sets. The Japanese and Hong Kong manufacturers went to concentrate on the other new CB markets that started up at about that time.

With the explosion of interest around the early seventies it soon became clear to the FCC that their original allocation of 23 channels was hardly sufficient. So to increase capacity a further 17 channels were made available making a total of 40 channels. It did'nt stop there. No sooner had they been announced then they were all filled up, more space was needed. By now it had become impossible to increase the band spread any more so the system of Single Side Band (SSB) operation was adopted.

Single Side Band operation has been used by Hams for many years, it involves supressing the carrier wave and half the signal at the transmitter. The missing carrier is re-inserted in the receiver. The use of side band offers two distinct advantages, it is inherently quieter and is effective over much greater distances, especially as the FCC permit a maximum of 12 watts RF power. Because there are two sidebands, upper side band (USB) and lower side band (LSB) there was then the possibility of a further 80 channels, 40 USB plus 40 LSB plus of course the 40 AM making a grand total of 120 channels, even so there's more to come. In recent years there's been a great deal of interest in FM (Frequency Modulation) many current US rigs now offer FM taking the channel total to 240. You'd think that would be enough but some European and to a lesser extent Oriental set makers have seen fit to offer a 'High Band' option, it usually involves switching in a second set of crystals, the set will then operate on the lower part of the amateur (10 meter) band around 28 MHz. That now comes to an almost absurd possible 480 available channels. If you consider that you can now buy in the States combined CB, cassette stereo, AM radio and FM stereo, you can almost imagine the expression on the poor old serviceman's face when confronted with a faulty unit of that nature.

The two most recent innovations, SSB and FM, both greatly reduce the levels of interferance on Short Wave, as any SWL (Short Wave Listener) will testify it's almost impossible to listen to. The greatest source of 'local' trouble is the 'Hetrodying' that occurs when two rigs are operating at the same time on the same channel, the carrier waves 'beat' together to produce an audible harmonic that completely blanks the channel out. The use of FM completely removes the hetrodyne and most of the atmospheric noise that is always present.

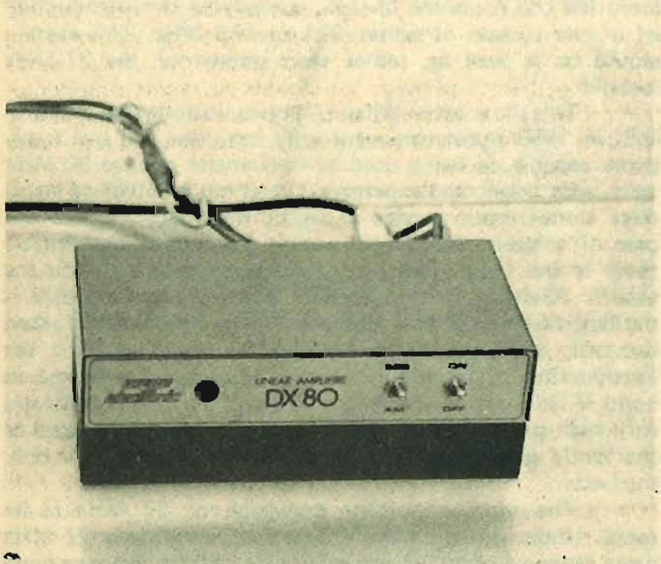
Because of the very strict (though often flouted) regulations regarding maximum power, much emphasis is placed by the purists on the aerials used and the setting up they often require. We will go deeper into the technical aspects of SW aerials in another feature elsewhere in this publication suffice it to say great creedence is placed upon the 'magic' figure of 1:1 SWR, Standing Wave Ratio (or Swar) indicating that the quality of match between rig and antenna is more or less perfect, all these efforts (mostly futile) are designed to gain the maximum range. In practice it is rarely achievable and usually quite meaningless. The only real way to adjust for maximum power is to use a field strength meter, the SWR meters are rarely accurate and are usually designed to calibrate a perfect aerial system (which most are not) exhibiting an impedance of 50 ohms (most will be around the 15-20 ohm mark).

To overcome the limitations of 4 watts some individuals use 'burners or boots' (slang for a linear amplifier) often with power rating of several hundred watts, unfortunately because the 10 metre amateur band is so close linear amplifiers designed for (legal) amateur use are finding their way to our shores. Many of the so-called British 'busts' have involved the use of burners, they really are easy to find. Among the British CBers there are tales of one particular American called 'North Carolina' reputed to run 1000 watts (1 kilowatt!!) of linear amplification.

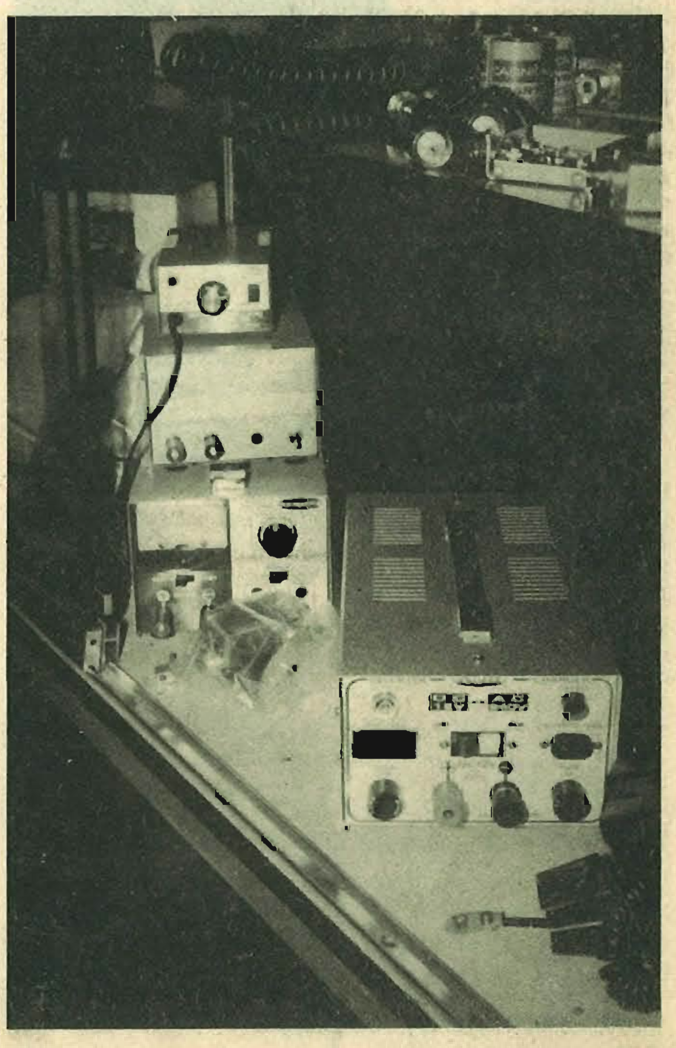
Well, that was only a brief look at the short history of CB, in the following chapters we shall try to outline some of the arguments, for and against and some of the benefits and disadvantages of CB. Rest assured though, we are only producing this special because we do believe that a CB system of one kind or another will be adopted in the very near future.

THE CB STORIES

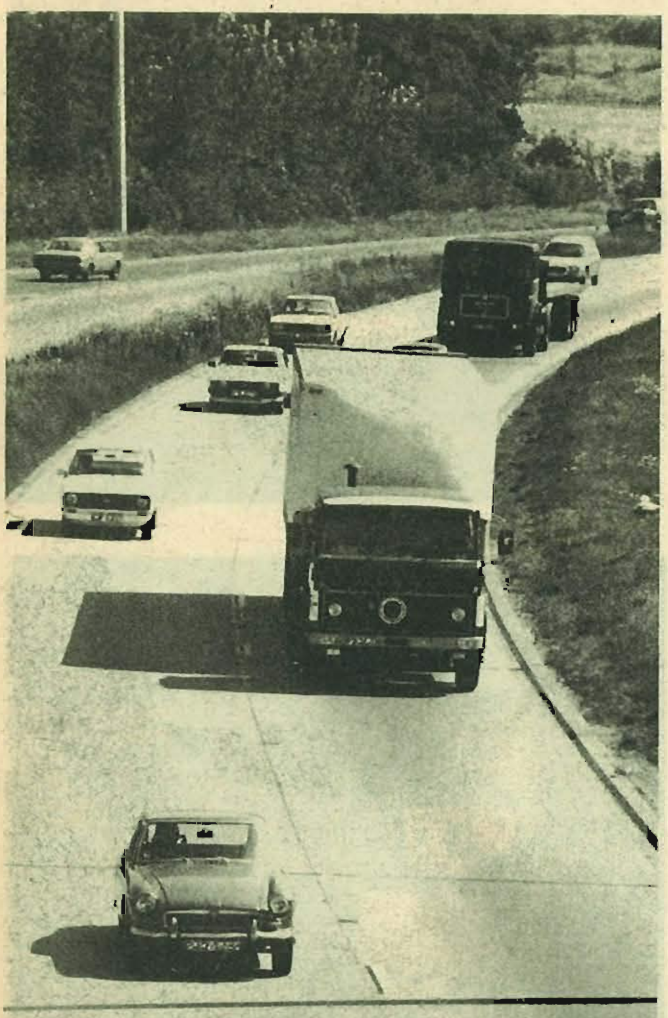
When we decided to start this 'special' it was apparent that in the past no-one had ever tried to get all the interested parties together once and for all. We have had a go, on the following pages we have given carte blanche to the CBA, UKCBC, 10.4 CLUB. A spokesman for the Radio Control modellers, and a CBer. We contacted both the Home Office and Customs and Excise on two occasions but were unable to obtain a comment from either source. It must be said all the other contributors were only too eager to have their say. As far as possible we've only dotted a few I's this is their story as they wrote it.



Above. A 'burner', an RF power amplifier, this model is capable of generating up to 80 Watts RF output.
Right. A selection of accessories, these we must point out are for licences amateurs and are legally on sale in this country.



THE CBA STORY



Citizens Band has never struck me as a particularly good name for a personal radio service since it does'nt conjure up images of the Black Dyke Mill Band in the square of some Northern Town it inevitably reminds me of a band of Transylvanian villagers armed to the teeth with pitchforks and hay knives out after a vampire.

However, it's far too late to change now and Citizens Band (or C.B. for short) it is and we're stuck with it. What we need not be stuck with, though, is the antique technical system which is used for C.B. in most other countries of the World – 27 MHz A.M. So well-rooted is this system that many people, particularly radio modellers, seem to believe that CB means a 27 MHz A.M. system.

This need not be true at all. In Australia there are two CB systems – 27 MHz and 470 MHz (a U.H.F. frequency). The 27 MHz system will be outlawed in 1983 and only the U.H.F. system, which offers impressive advantages in clarity, quality and freedom from "skip" will be allowed. Even the U.S.A., home of C.B., is studying the introduction of a new system at either 224 or 918 MHz. This system would be as well as, rather than instead of, the 27 MHz system.

This is a pity. When America introduced 27 MHz C.B. in 1958 transistors were only ten years old and transistors capable of being used at frequencies of over 30 MHz were both fragile and expensive. It was not practical to introduce a mass radio service at higher frequency because the cost of suitable transceivers would have been prohibitive. (This is the main reason why the predecessor of C.B. the U.H.F. "General Radio Service", never became popular – the equipment was too sophisticated to be cheap). Today, however, with great improvements in transistors and the introduction of integrated circuits, it is quite practical to build V.H.F. radios which are cheap and reliable and have very high performance, and the sooner the C.B. services of the World give up the use of 27 MHz and move to V.H.F. the better.

The most important drawback of 27 MHz is its range. Under ground wave propagation conditions 27 MHz has a range of only a dozen miles or so, which is not as good as V.H.F., but under sky wave or "skip" conditions a 27 MHz signal may be heard thousands of miles away. At first glance his might seem an advantage but in fact it is a nuisance since C.B. is intended to be a personal radio service and operation at ranges of a few miles can be made impossible by signals coming from thousands of miles away. In addition to unintentional long range propagation there is also the danger that users will be tempted to use illegally high powers in the hope of communicating overseas and such high power will cause even more interference to legitimate short-range users. Most countries forbid the use of C.B. for long range communications but there is a large "fringe" of users who try to work long range (DX) stations and frequently use illegally high power to do so.

The other drawback of existing 27 MHz systems is that they all, with the exception of the Netherlands, use amplitude modulation or A.M. Some also use a more advanced version of A.M. called S.S.B.

A.M. and S.S.B. transmitters, even low power ones, can interfere with radio and TV reception and even with audio amplifiers in hi-fi systems, tape recorders and public address. (The story is told of the American preacher who had just told his audience to trust in the Lord who would answer their prayers when the public address system picked up a passing CBer and boomed "You can bet your life on that, Good Buddy – to the amazed congregation).

In the U.K. 27 MHz signals also interfere with radio models. If C.B. were to be legallised here at 27 MHz the modellers would certainly be allocated another frequency but there seems little reason why they should be forced to move when C.B. would be better at VHF in any case.

All in all it seems that a V.H.F. Citizens Band using some modulation technique which does not affect TV and hi-fi would have much to recommend it. Frequency modulation (F.M.) is ideal – it is as easy to build an F.M. receiver as an A.M. receiver and easier to build an F.M. transmitter. F.M. causes little, if any, of the interference which results from the use of A.M. or S.S.B.

The Citizens Band Association has been campaigning for C.B. using V.H.F. F.M. ever since we were formed in mid 1976. At first we actually stated that we would prefer no C.B. to 27 MHz C.B. but this was thought by the authorities to indicate that we were not really serious and so we changed our constitution, saying that while we would accept 27 MHz if there were no alternative we thought that V.H.F. F.M. would give so many advantages that it should be adopted in the U.K. as soon as possible.

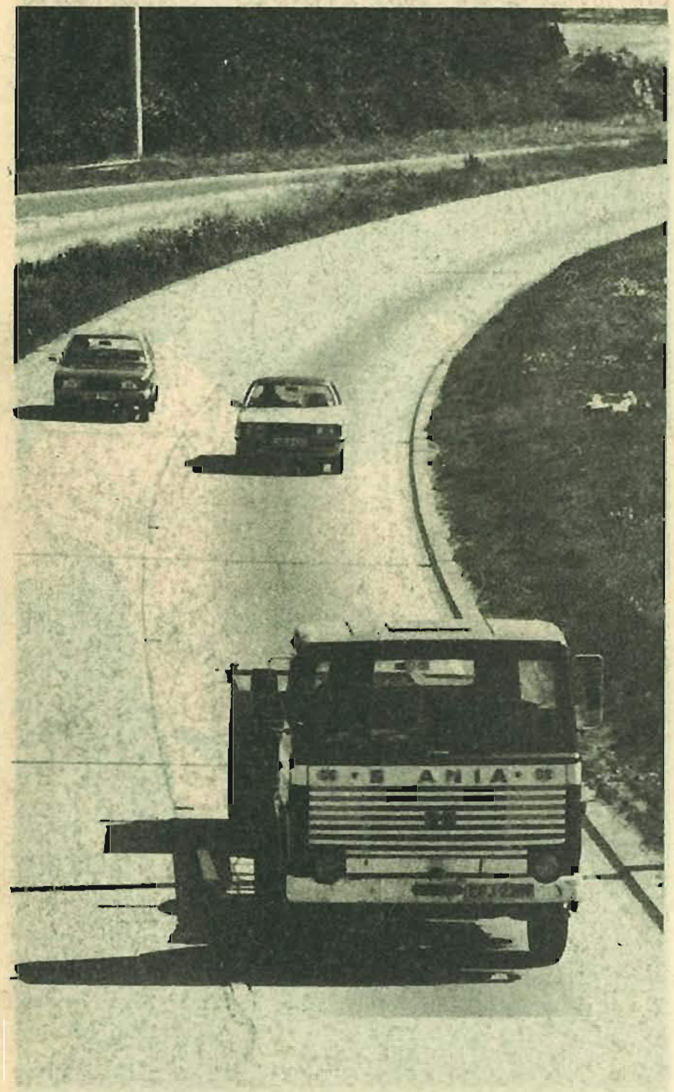
Another, non-technical, reason for using V.H.F. is the source of the sets. 27 MHz C.B. equipment is manufactured in the Far East (Japan, Taiwan, Hong Kong, Singapore, Malaysia and the Phillipines) in vast quantities and a U.K. 27MHz C.B. would certainly use imported sets. If we have our own standard there are at least four British firms ready and eager to manufacture V.H.F. F.M. C.B. equipment for the home market. The cost of such sets would be little more than the cost of imported 27 MHz sets (£60 – £100) and the quality and ease of servicing far better. It is often pointed out that P.M.R. ("taxiphone") equipment costs several times this amount and uses the same type of circuitry but what is overlooked is that P.M.R. equipment is built in small quantities and must be able to be tuned to work on a number of different bands : C.B. equipment is built in huge quantities and every single set operates on the same frequencies – this produces massive savings.

If we are to have V.H.F. C.B. in Britain the Government must act soon. There are over 20,000 27 MHz sets in use here now (illegally) and the number is growing by several thousand a month. In July and August the growth will be even greater as returning holidaymakers bring back sets from abroad. The only thing that can slow this is an announcement by the Government that a V.H.F. C.B. system will soon be available in the U.K. If such an announcement is not made then 27 MHz will become legal, simply because of the number of illegal users, within 18–30 months. This has already happened in Australia, the Netherlands and South Africa and the C.B. systems that they have in those countries are far less efficient than they would have had if their Governments had reacted to demand rather than to illegal pressures. Let us hope that the British Government has more sense.

James M. Bryant.
President, CBA.

The CBA Tee Shirt (below) is a black on white design and comes in three sizes : S, M, L costing £2.30 each, post paid. For your CBA Tee Shirt write to : CBA, 16 Church Road, St. Marks, Cheltenham, Gloucs. GL51 7AN.

THE UKCBC STORY



What Is C.B. Radio?

CB is a cheap, freely available, local 2-way radio facility, designed for those who need communication without any special training in a mobile situation. It is now legal in nearly every civilised country of the world, even some behind the Iron Curtain.

Some Benefits Of C.B.

1) Road Accidents – CB would enable everybody to become the eyes of the emergency services, cutting response times to accidents and fires. An estimated 15,000 lives per year are saved in the U.S.A. by these means.

2) Road Traffic Reports – Advance warnings of fog, ice, snow, accidents, road works etc. enabling advance route changes, hence saving time and fuel.

3) Local Directions – On arrival in a strange town, a C.B. operator wouldn't have to stop a pedestrian or find the Post Office to obtain directions. He simply calls ahead and obtains local information from other operators.

4) Fuel Saving – In the U.S.A. it is estimated that CB'ers make 5–8% fuel saving by use of Road Traffic Reports and local Directions.

5) Assistance to police in the areas of crime detection and traffic control. There have been instances, even in the U.K., where C.B. operators, albeit illegal, have witnessed hit and run incidents and have offered valuable assistance to the police.

6) Community involvement of O.A.P's and housebound. Where base stations at home monitor emergency channels and provide back-up links to emergency services, although police, fire and ambulance services would normally monitor emergency channels.

7) Cheap communication for marshalling outdoor and sports events, mountaineering etc.

8) Civil Defence – It is topical to note that these days a country can be taken over by attacking media transmitting stations and broadcasting whatever one wants the people to know. CB would completely eliminate this possibility by instituting an information network that could not be disrupted by an enemy. This idea is now being exploited in the USA.

As is known, CB is illegal in this country. Realizing the benefits of CB to all, the United Kingdom Citizens Band Campaign was constituted to rally support and petition Government, Home Office and interested parties, with a view to setting up and establishing a Citizens Band service in this country at any power and on any frequency.

C.B. is just as necessary on our roads as it is on Interstate Highways, Autobahns, Autoroutes etc. We still have accidents and if C.B. can prevent accidents or cut down the response time to them, surely this is reason enough to have C.B.

Do the Home Office really believe that only Government Depts., rich commercial concerns and selected hobbyists have the right to communicate further than they can shout. Surely it is time for the beaurocrats to release their stranglehold on the airwaves and allow us the 1 or 2 MHz of the spectrum we need. It is well known that there are large sections of the radio spectrum that, although allocated, are not used. e.g. MOD, BBC.

We would prefer to see C.B. on 27 megs, in line with the rest of the world, although people have thrown up some not insurmountable problems.

1) Radio Control modellers — although they are using 27 megs there is evidence of a gradual shift to 459 megs VHF. Remember that even if we don't use 27 megs, signals from the rest of the world come in on skip and can cause as much trouble as a local station.
2) Hospital paging systems — This is a fallacy. Pagers and bleepers are operated by coded tones, and voice frequencies would not trigger these, although there is a possibility of swamping by a very strong local signal.

An idea has been muted for VHF CB, but we have our doubts. Does this country believe that it can start from scratch and lead the world, have they not heard of another little island called Japan? Even if we institute CB on a different frequency, in order to foster a home-based industry, we can be sure that the Japanese can design, build and market a cheaper compatible set before the ink is dry on the legislation.

There will be revenue enough for government and industry purely on sales, installation and service, although home manufacturers could aim for the quality market; which has always been their forte.

There is a potential of 6 million sets, working on figures from the rest of the world. Allowing around £75.00 for a set a working life of 3 years and a £5.00 per year licence fee we can come up with the following figures :

6,000,000 sets at £75.00	£450,000,000
V.A.T. on above at 15%	£ 67,500,000
3 years licence fees at £5.00 p.a.	£ 90,000,000

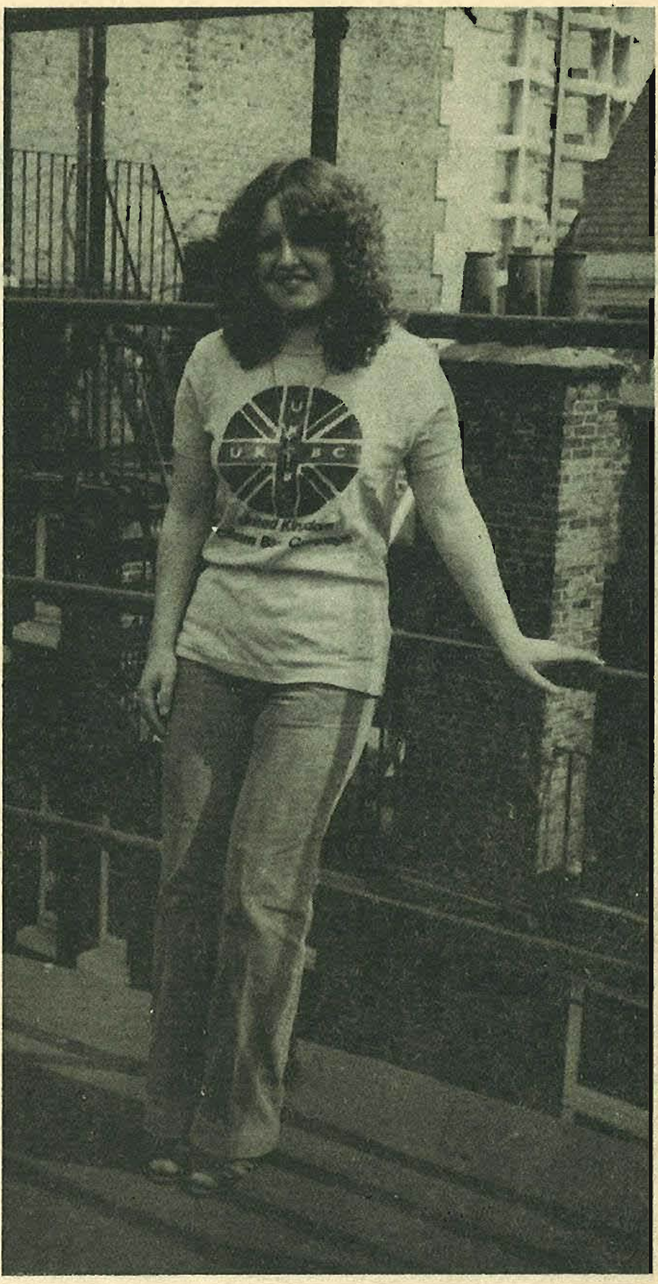
The revenue to the Government from licensing + V.A.T. would be sufficient to finance the creation and running of the feared "small army of regulatory officials" that the Home Office trots out as one reason for not allowing C.B. (The simplest way of ensuring payment of licence fees would be to put the licence fee on the cost of the set, to be returned to the Government with V.A.T.).

From these points we have set out, we believe that a cast-iron case exists for the establishment of a C.B. radio facility. We can see no tangible reason for the Home Office to continue its present stand, and we hope that the Conservative Party will live up to its pre-election promises of allowing freedom of information and the facility for self-help and allow the C.B. radio facility as soon as possible.

Remember!! No where is CB compulsory, it is purely a 'cult', like TV or motoring. If you don't want one don't have one, but surely we should be entitled to choice. The motto of the International Telecommunications Union is "NATION SHALL SPEAK UNTO NATION", surely then in this enlightened technological age "PERSON SHOULD BE ABLE TO SPEAK UNTO PERSON." ???

Bernie Murray — UKCBC

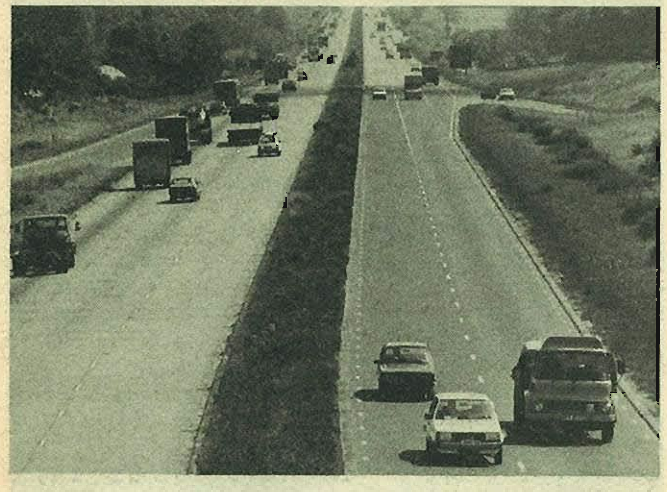
For membership of U.K.C.B.C. please write to U.K.C.B.C., 32, Downbank Avenue, Barnehurst, Kent.



The UKCBC Tee Shirt (above) is modelled by our delectable 'Wonder-Girl' Loraine Radmore who spent at least one sleepless night helping to get this special ready for Press.

The UKCBC offer a wide choice of sizes, and two background colours, white or blue. The sizes are: XL at £3.00, L — £2.75, M — £2.50, SW — £2.25 and childrens, 24 or 28 inch at £1.75 and £2.00. They can be bought from : UKCBC, 32 Downbank Avenue, Barnehurst, Kent.

THE 10.4 CLUB STORY



The 10.4 Club was initially formed as a local club for people who have an interest in the legalisation of CB in the UK. We meet every two weeks to discuss ways we can fight for what we believe is a basic freedom. (We do have a quick drink, and it is a very pleasant social occasion too). England, we're told IS A FREE THINKING COUNTRY so why can't we have CB?

A possibility that the British Government has at last seen the light could be the reason for the setting up of an all party committee to look at the workings of CB in good old Britain, (whom we are led to believe wants to have the same rights and priviledges as the rest of Europe), but it would seem we have lagged in this particular field, unlike Germany, Italy, Spain, Portugal, Norway, Sweden, USA etc. etc., and many other countries who permit their citizens to operate CB on, I might add, 27 MHz. This is the frequency we would suggest for Britain, although we believe there are some problems to be overcome on and around these frequencies.

A point was made by an American police officer on a recent BBC2 programme 'Top Gear', he stated, 'the use of CB in America has saved a considerable number of lives, many of whom owe their lives solely to CB'.

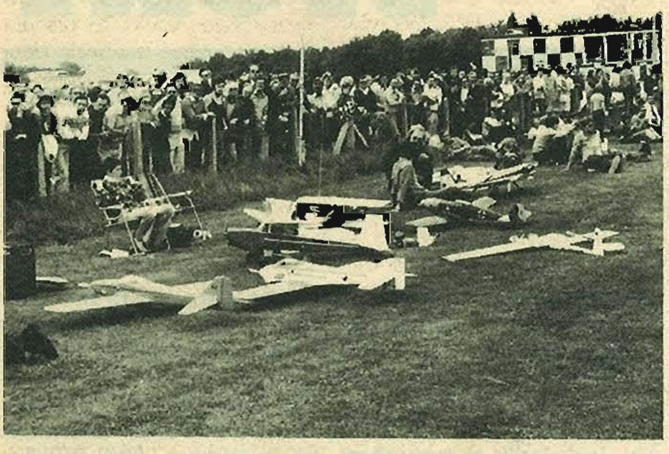
CB, although illegal in the UK, has helped in a couple of incidents here in London. On one occasion a CBer was present at the scene of a hit-and-run incident resulting in a middle aged woman being seriously injured. His prompt action in summoning assistance and passing on the cars registration number to other nearby CBers enabled the police to apprehend and detain the suspect. (All the GOOD NUMBERS to those CBers concerned).

I would like to go back to the program Top Gear and comment on the interview with the gentleman from the CBA. We feel he did not give a true view of the majority of interested parties in the UK. I would estimate that out of the 20,000 or so active CBers only a small handful actually want a VHF system on 230 MHz. We have heard that one or two large electronics manufacturers are already capable of producing large quantities of CB 'type' equipment at very short notice. Could there be something in the air?

Anyway less of the politics and back to the club. The 10.4 club has received very little publicity, (apart from HE that is), so our existance has been only spread via word of mouth. In the five or so weeks we've been going we have already got over 200 members, just in the East London area. We hope that in the very near future we can start branches in other cities and towns throughout the UK. As well as regular talks we are also in the throes of organising a disco-dance for the end of the summer plus some other festivities that we hope will bring a smile to the members faces, (and boost the club's funds). So if you are interested in joining the club, or indeed starting a branch in your own area, please drop me a line at: 10.4 Club, c/o 85 Essex Close, Walthamstow, E.17. We look forward to hearing from you. RODGER DODGE.

Ray Threadwell, Chairman 10.4 Club

THE R/C MODELLERS STORY



We are the model flyer's National Body, The Society of Model Aeronautical Engineers — representing the vast majority of the current 60,000 UK model control licensees.

A great deal has been said about CB and a lot of it is very emotional stuff. This Society would not be so presumptuous as to "oppose" or "support" the concept of CB — from our viewpoint it is a perfectly legitimate thing to pursue and all power to those elbows that are doing the pursuing. BUT (yes, it had to come!) keep out of our hair!

The HE article was grossly in error on the 27 MHz channels in use for model control and it grossly misled your readers in not examining further the effects already being caused by illegal CB pirates.

Our channels span the whole spectrum from 26.97 — 27.28 MHz with a mixture of 50 kHz, 25 kHz, 20 kHz and 10 kHz. RF band width equipments. We have six basic 50 kHz channel spot frequencies plus interleaved spots for the narrower band equipment. At any R/C site you will find at least the six 50 kHz spots in use at any session and frequently many of the interleaved channels as well. At the numerous contest events it is quite common to have 12 frequencies in operation throughout the day.

Whichever way you look at it we use the whole 300 kHz of allocation regularly and, may I say, legally.

Sharing with CB is just not on. Model flying operations are particularly susceptible to interference — or, more correctly, the airborne receiver (which can easily be at 1,000 feet above the ground) is in line of sight of the ground up to above 30 miles and thus the model has a far larger "capture area" than most people appreciate.

Secondly, the operator has no means of effectively monitoring from the ground what is happening on his channel in the air — apart from the all-too-frequent hard way — because ground-range is very much restricted. Thirdly, power-levels are a problem. We are limited by the terms of our licence to 1.5 watt e.r.p. A CB rig with boots makes mincemeat of us and even a straight rig outguns us. Fourthly, don't make me laugh about "quite a strict code of practice among CBers". We have heard on our 27 mHz monitors illegal CBers talking on our channels about the effect they have just witnessed on the models. i.e. they were watching the models and seeing what was happening and talking to each other about it! OK, so maybe they were your "idiot fringe" but that's no help to us. Modern radio-controlled model aircraft normally fly at 60-80 mph — some up to 140 mph — and normally weigh around 6-8 lbs. We only need one person operating illegally and the result can easily be, at best, an expensive pile of balsa wood, fibreglass, metal and radio gear (certainly not less than £100) and, at worst, all this plus blood.

Don't think for one moment that I am succumbing to the emotive bit also — I'm still talking facts. It has actually happened already: a spectator was badly injured at a display in 1977 due to illegal CB type equipment causing the model to crash.

What really annoys us about all this is that when it occurs it is model flying that gets the blame! "Unsafe", "shouldn't be allowed if it's prone to interference" — not one word about the fact that the interference is illegal!

I'm copying this letter to the CBA because we have already been in contact over the years and we know each others position fairly well. There's no argument between the SMAE and CBA on CB as a principle — but CB on 27 mHz is dangerous.

R.A.Favre, Chairman SMAE.

THE CBERS STORY

One of our letters published in the July 79 edition of Hobby Electronics produced a quite dramatic response, it was from a CBer called Mack The Hack. Unfortunately he did not supply us with an address. So when we decided to start this special we let it be known via our contacts that we would like him (or her) to write a short piece on how he sees the CB scene. Here it is.

I am a criminal, I have not murdered anyone neither have I mugged any old people, I do not rape women, rob banks or pass dud cheques. Shoplifting or driving off in other peoples cars is not what I am guilty of. My crime is that I talk to people: yes, I talk to people over the air, yet many other people converse with each other as I do in other civilised countries, yet when I do so I am breaking the law. I have a lonely job, so when I can I like to be sociable and at times I enjoy talking to people. I am fascinated by the magic or science of radio when I converse with other people from other parts of this world who share the same interest as I. We all have kind words and good intentions to one another. When I DX I find a quiet spot away from houses or other buildings and my SWR is low so I do not emit any harmonics or spurious emmissions from my transmitter. So can anyone tell me what harm am I doing to mankind or his environment.

Even when I chat to my good buddies on channel in this country I know it is good clean enjoyment without harm to man or beast. Some police officers I know tell me that CB could only be an asset to them as in other countries where it is legal, and would like to see it legalised. Some of the unlucky handles that have been busted tell me that the authorities do so with sympathy. I have spoken to some of our members of Parliament that would like to see CB in this country, but say it is the Home Office that objects, and their objections are trivial.

I shall not list the advantages of a CB in a mobile but there are many amateur radio operators, or hams, that are invalid and their radios have made new lives for them. Just stop and think what a CB Base station could do for the many house-bound that do not have the ability to pass the current Radio Amateur exam. We would have emergency Base stations all around this country.

I would like to endorse what another good buddy said about CB. 'It is at the present a game. The rules are not to get caught, so with one eye on the road and the other on the rear view mirror, looking for the Bad Guys'. Although illegal some CBer's have formed emergency channels in some areas, and although their results have not been publicised some have found stolen cars with the culprits still in the vehicle.

MACK THE HACK – LONDON

THE LEGAL STORY

By a member of the legal profession.

This brief note is intended to alert you to the main statutory provisions covering radio communication whether on 27 MHz or elsewhere between two (or more) unlicensed stations, mobile or static and the installation of such stations, which I shall refer to hereon as wireless telegraphy apparatus, or w/t. The main provisions are contained in two Acts of Parliament, *The Wireless Telegraphy Acts of 1949 and 1967*, and in a *Statutory Instrument* made under S.7 of the first Act, *No. 61 of 1968.*

The effect of these provisions is to give the Postmaster General (his successor now, the Secretary of State for Home Affairs alias the Home Secretary) complete authority over who may use what part of the electromagnetic spectrum for any transmission or reception.

The Wireless Telegraphy Acts S.1 WTA 1967 provides that, further to this, the Home Secretary can exempt from licences any equipment he likes, issue them subject to any terms he thinks fit, including purposes of use, place of installation and people by whom it may be used *(S.1 (2)).* (Interestingly, *(S.1(6)* provides that any purely receptive devices licence cannot include a right of entry of any private dwelling-house, but specifically excludes apparatus "designed or adapted for emission". So, if you got a licenced CB set, the licence under *S.1 can* include a right of entry! *S.3* goes on to spell it out, in a section dealing with regulations which may be made for w/t licences).

S.5 makes it an offence (amongst other things) to use w/t with intent to obtain information as to the contents etc of any message transmitted on an unauthorised w/t. So listening to CB is an offence. *Ss 4 and 7* deal with experimental licences and exams for hams.

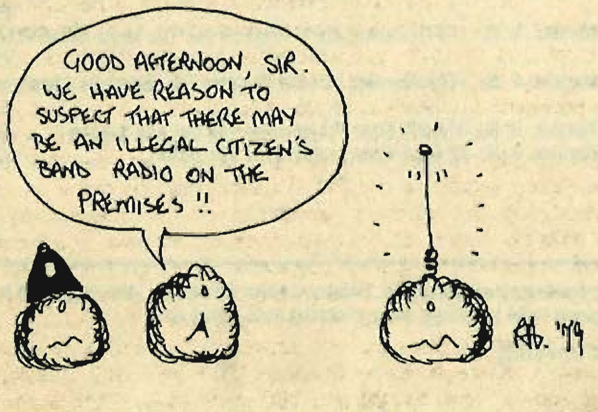
The *1967 W.T. Act, Part II* has a bearing directly upon applying the 1949 Act to CB ; *S.7* enables the Home Secretary (again as the PM-G's successor) to make an order specifying the class of apparatus to be covered by the prohibition under S.7 of manufacture, for sale or otherwise, and importation of such apparatus. Such an Order was laid before Parliament in 1968 in the form of a *Statutory Instrument, No. 61* of 1968, which went ahead to prohibit specifically w/t apparatus, it's manufacture and importation, capable of transmitting between 26.1 and 29.7 megacycles per second, and for 88 and 108 mc/s, even if the apparatus is also capable of transmission on other frequencies. So CB gear imported or manufactured, constructed or adapted (see *S.7 (7))* for 27MHz use is, by *(S.7 (5)* "prohibited goods" and liable to forfeiture under the *Customs & Excise Act 1952*. Anybody contravening this section (and therefore the Order) is committing an offence under the 1949 Act as well as being liable for a Customs and Excise Act offence. *S.7 (7)* is a catch-all"..."manufacture" includes construction by any method and the assembly of component parts" So, another offence if you put the crystals in yourself. *S.7(5)* is good — the burden of proving the apparatus to be legally imported, or not of the prohibited type, to the satisfaction of the Commissioners of Customs and Excise falls on you.

S.8 is good for all mobile CBers. The *1962 Vehicles (Excise) Act* has provision for regulations to be made about declaration of any W/T equipment installed in the vehicle *don't* declare it under the relevant regulation, (which, to be honest, has not been examined in the course of preparation of this article, or whether you *are* asked to declare it), he doesn't have to give you a licence, and by SS(2) you have committed another offence under the 1949 Act. Check your excise licence application.There you are, illegal from the putting the crystals in right through to connecting it up to the power and turning it on. Legal opinion as to the meaning of "installation" is divided. The safest answer is, probably, that connection to power and for connection to antenna is sufficient. "Use" includes the mere act of turning the set on. What can they do about it?

1. *Convictions.* Despite the unclear phrasing of the learned editors of *Stone's Justices Manual* 1979, at p4574, I am of the opinion that there is no different penalty for transmission on apparatus covered by *S.1.(1)* (eg. CB) as opposed to unlicenced, but lawful when licensed, apparatus transmission. "Transmission" is I believe covered by *S.1*, and therefore *installation and use both carry fines of up to £200.* Those *other offences* mentioned above in this article carry up to *£400 fine and/or 3 months imprisonment (S.14 of the 1949 Act*, as amended).

Companies and their directors are liable *(S.14 (2))* the latter personally unless they can prove otherwise. Whilst it is generally true to say that there is no "tariff" for such offences and the actual fines they carry, a general figure of between £25 and £75 per summons (offence alleged and prosecuted) seems to be common in North London.

2. *Forfeiture.* We have already seen that the Customs man can forfeit your rig (take it) if you can't prove it's legality to his satisfaction, at any time. *(S.7 (5) 1949 Act)*. On conviction, the apparatus is forfeit to the Home Secretary (in effect, to the Post Office as his agents) by *S.14 (3)*. Either way you lose it. Note that the police may not automatically seize your rig under these Acts, but he may under the Customs & Excise Act and the Customs, or a person authorised on behalf of the Home Secretary (the Postmaster-General again) in a search warrant under *S.15* of the 1949 Act. (He *may* turn out to be a police officer, but he will normally be a Post Office or Home Office employee). Note also that if your gear is not constructed, designed, manufactured or adapted for emission, it is *not* forfeit : *S.11 (3)* 1967 Act. The rig may be forfeit even if it's not yours (the offenders) *S.11 (4)* 1967 Act; and if you don't hand it over on conviction within 48 hours, that's another offence *S.11 (5)*.



The Enforcers and their Powers.

As is probably clear by now, there are 3 agencies involved — the police, the Customs and Excise and the Home Office/ Post Office. As with all matters, their powers are different, and limited. The general presumption is that a search warrant is always necessary for entry of a vehicle, home or vessel; *S.15* of the 1949 Act gives a special power to obtain a warrant for the search for w/t apparatus to the Post Office/ Home Office people; the police need a warrant too, if w/t is their sole reason for entry (but see below); but the Customs and Excise powers of search and seizure are phenomenal. *S.296* of the *Customs & Excise Act, 1952* provides that "..where there are reasonable grounds to suspect that anything liable to forfeiture under the C + E Acts is kept in any building or place, any office. . .may enter. . .day or night. . . search for, seize and detain or remove any such thing and may. . .break open any door window or container. . .and that's your home"

If they come by night they must bring a constable *S.296(2)*

(1). . .where there are reasonable grounds to suspect that *any vehicle*. . .is or may be carrying any goods which are

(a) chargeable with any duty which has not been paid. . .or

(b) . . . or??

(c) otherwise liable to forfeiture under the Customs & Excise Acts.

any officer or constable. . .may stop and search that vehicle. . .

(2) If, when so required by any such officer, constable. . . the person in charge of such vehicle refuses to stop or to permit the vehicle to be searched, he shall be liable to a penalty of £100.

So a police officer *can* search your car *if* he suspects you have goods liable to Customs forfeiture.

And by *S.304*, any person can be "detained" by a policeman pending the arrival of a Customs Officer, who can then detain that person himself! And if you refuse to assist, in effect, that's a £100 fine.

CONCLUSIONS

1. If your 27 mhz w/t apparatus is illegally imported, it's subject, in effect, to summary seizure. *Customs & Excise Act 1952.*
2. If it's connected, that's another offence. *S.1 (1).*
3. If you turn it on, that's another offence. *S.1 (1).*
4. If you transmit, each time you "use" it that's another offence. *S.1 (1).*
5. Rights? That complicated area of the law must wait until another time.

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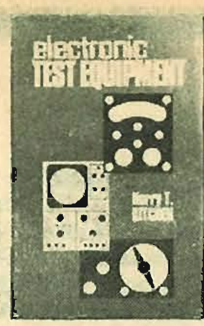

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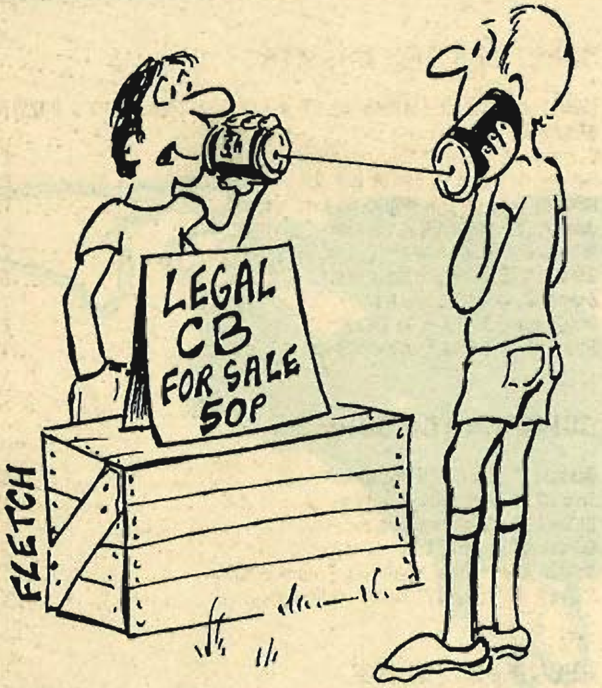
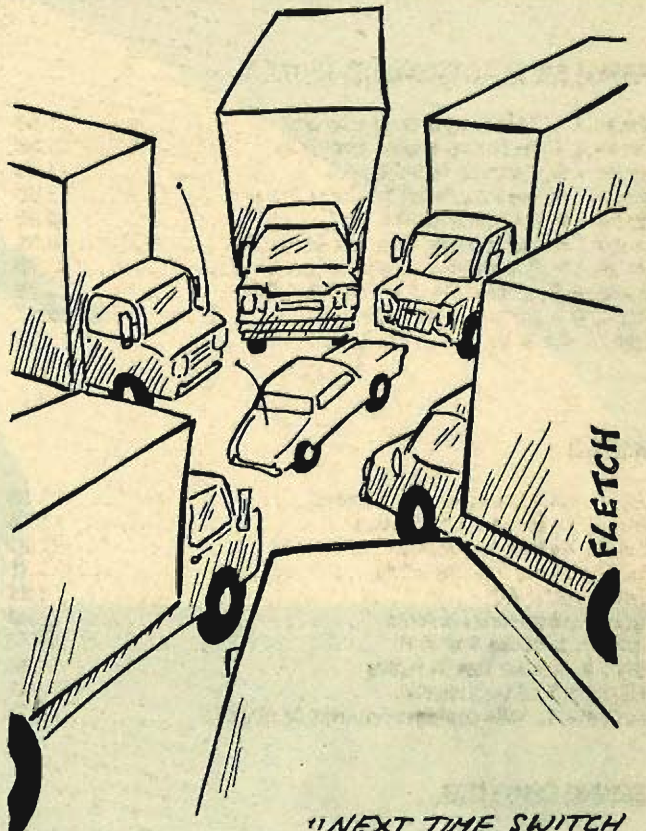


"RIGHT - THERE'S YER DEMONSTRATION, NOW WHERE'S ME 50 PENCE?"

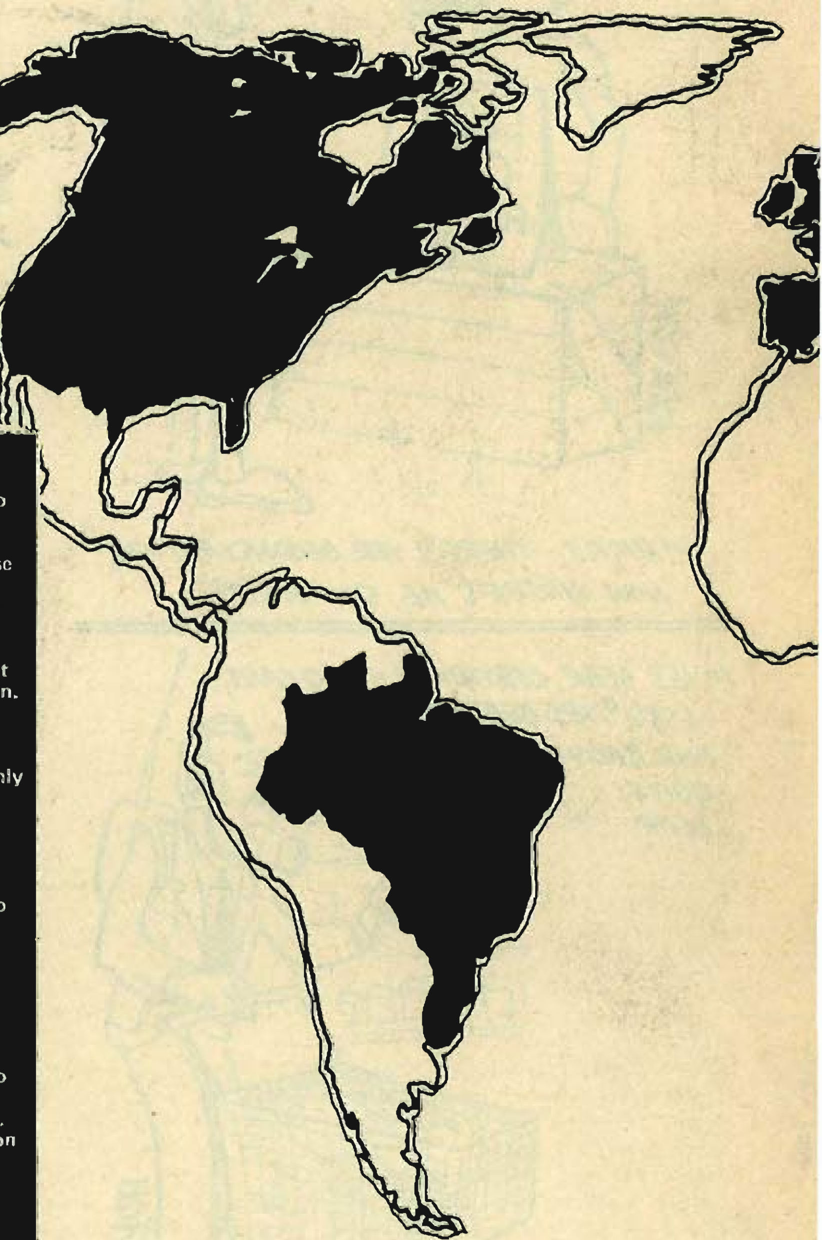


"NEXT TIME SWITCH OFF BEFORE YOU START CALLING THEM NAMES."

"...YES DEAR, CERTAINLY - TWO CANS, -EGGS? YES DEAR OF COURSE AND BACON- QUITE, DEAR..."

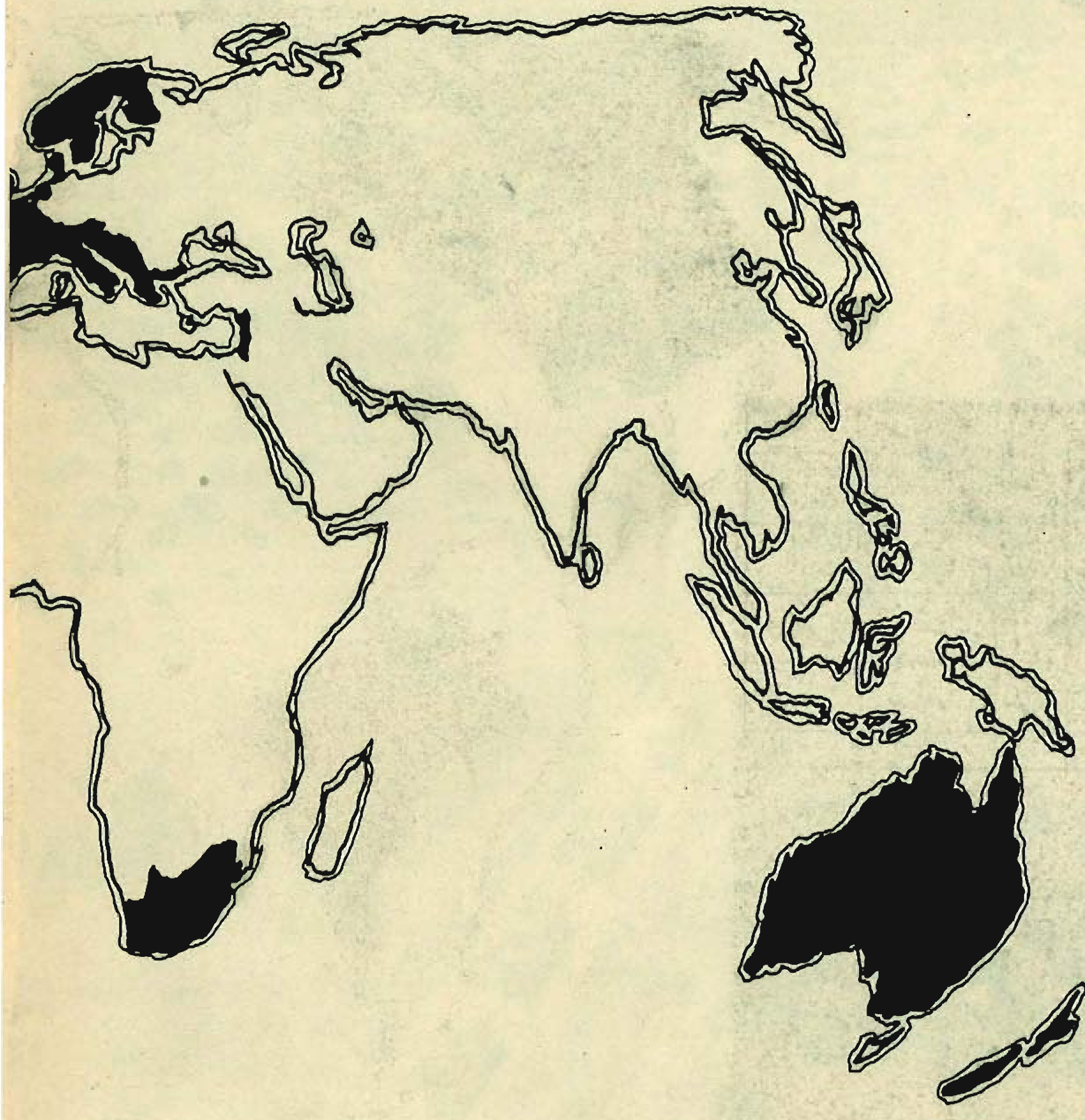
"IT'S MY NEW INVENTION- B.C. RADIO"

WHO'S GOT IT:

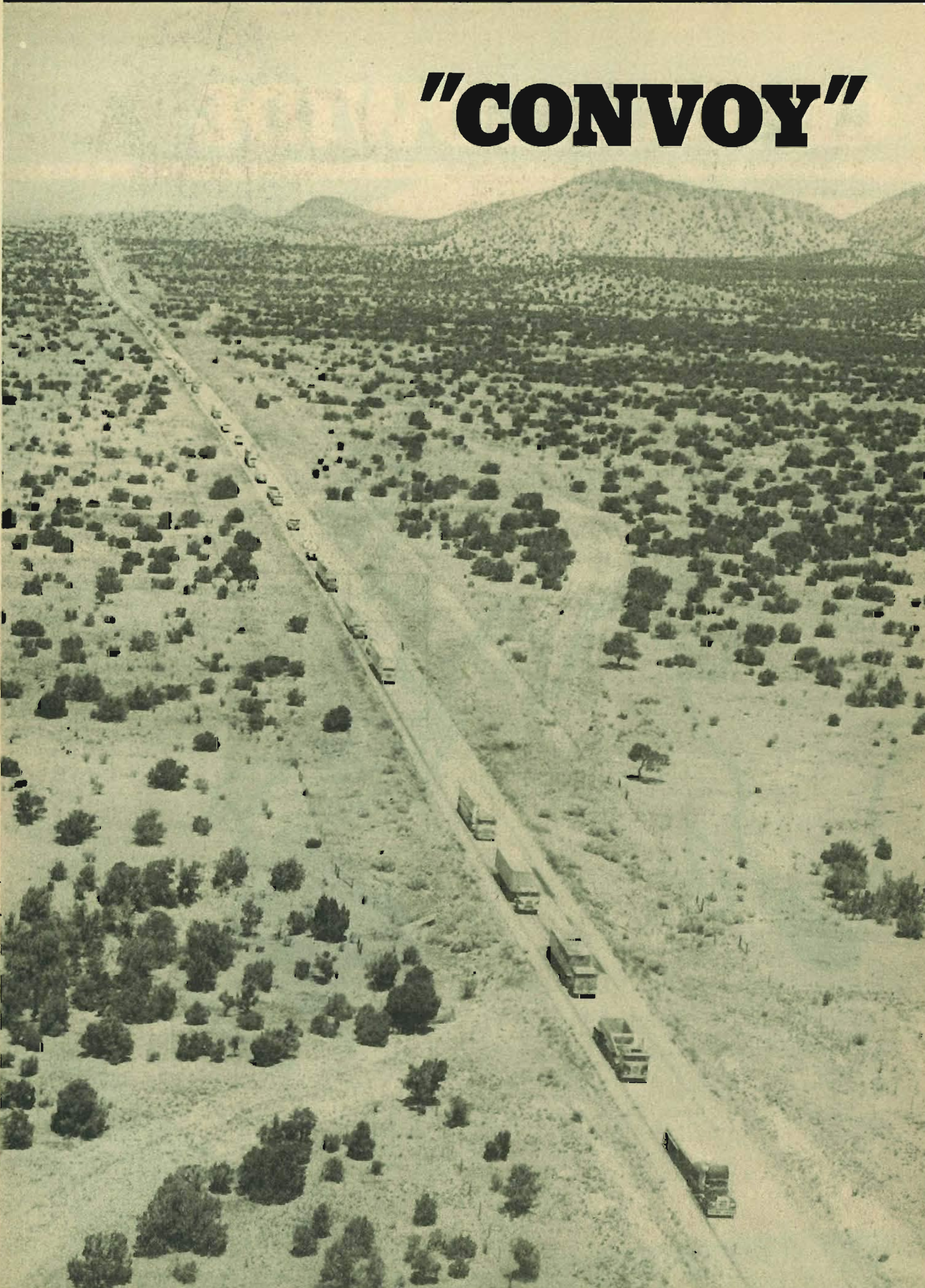


COUNTRY	FREQ	CH	PWR	NOTES
AUSTRALIA	27MHz	18	5,12W	Also 40 CH UHF
AUSTRIA	27MHz	12	0.5W	Channels allotted to public service organisations.
BELGIUM	27MHz	–		Not CB, business use only.
BRAZIL	27MHz	40	4,W	Similar to USA. No precise legislation.
CANADA	27MHz	40	4,W	Similar to USA.
CYPRUS	–	–	–	System operates but no precise legislation.
DENMARK	27MHz	22	4,12,W	Similar to USA.
FINLAND	27MHz	22	5,W	Some social use.
FRANCE	26-27MHz	22	5-100mW	Unlicensed walkie talkie type equip.only
GREECE	27MHz			Similar to USA, no precise legislation.
HOLLAND				To be leglised 1980 27MHz 22 channel.
IRELAND				Same as UK
ISRAEL	27MHz			System operates, no precise legislation.
ITALY	27MHz	22	1W	Law relatively imprecise.
MONACO	27MHz	22	5-100mW	No license reqd, walkie talkie only.
NEW ZEALAND	26-27MHz	14	0.5W	Mostly hand held equipment.
NORWAY	27MHz	26	5W	Channels allotted to various sporting & social organisations.
PORTUGAL	27MHz			No precise legislation similar to USA.
SOUTH AFRICA	27,29MHz	19	100mW-20W	Information value.
SPAIN	27MHz			Similar to USA no precise legislation.
SWEDEN	27MHz	22	0.5-5W	Mostly social use.
SWITZERLAND	27MHz	12	0.1W	Walkie talkie type only.
UNITED KINGDOM				Legislation forbids import and use of 27 MHz equipment.
USA	27MHz	40	4W(AM)5W(SSB)	UHF, 12W(SSB)
YUGOSLAVIA	27MHz			No precise legislation.

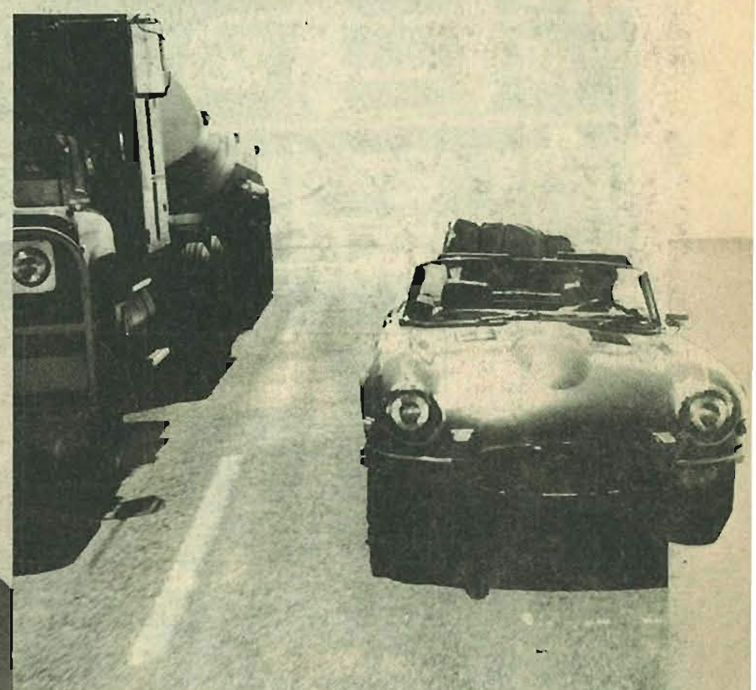
CB WORLDWIDE

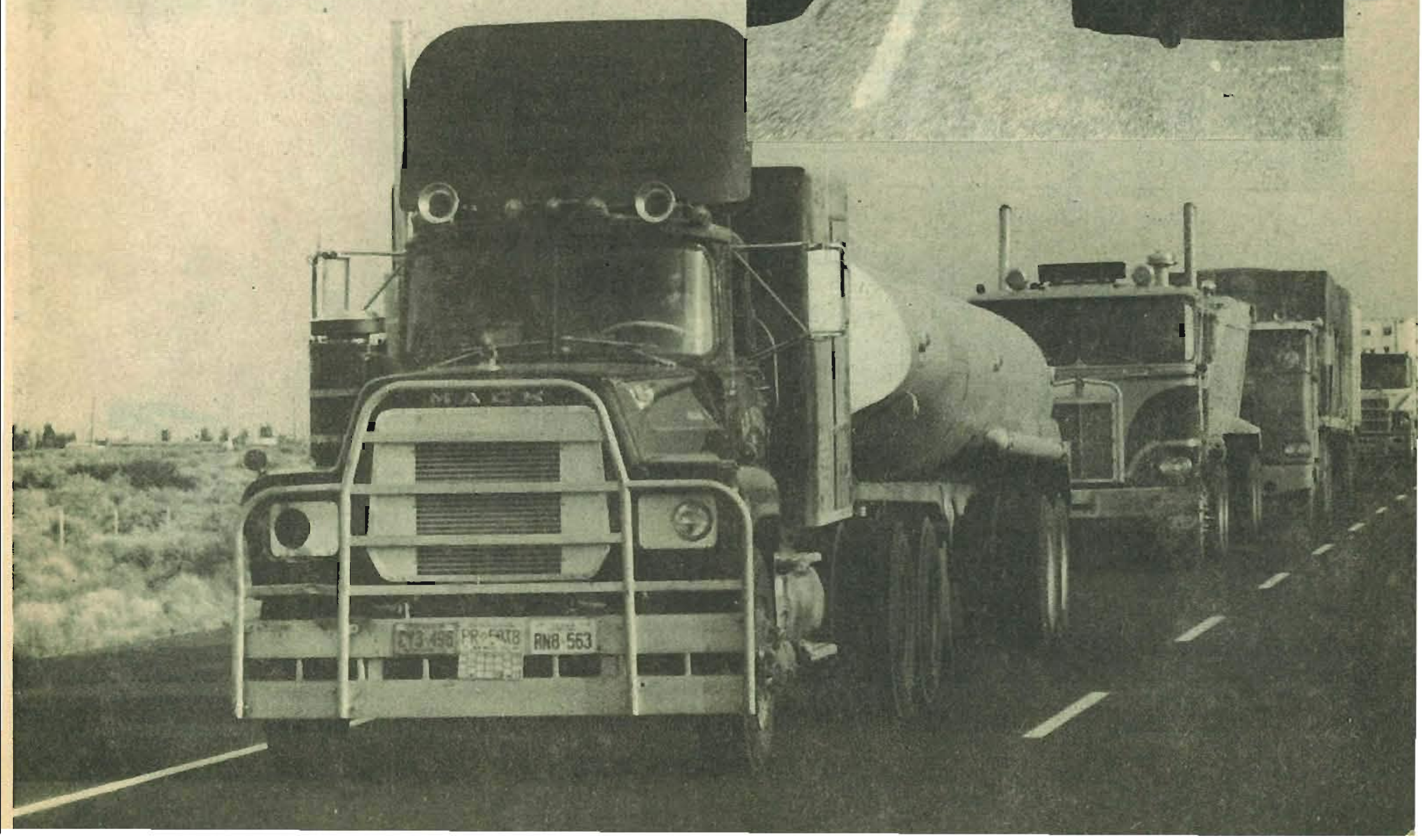


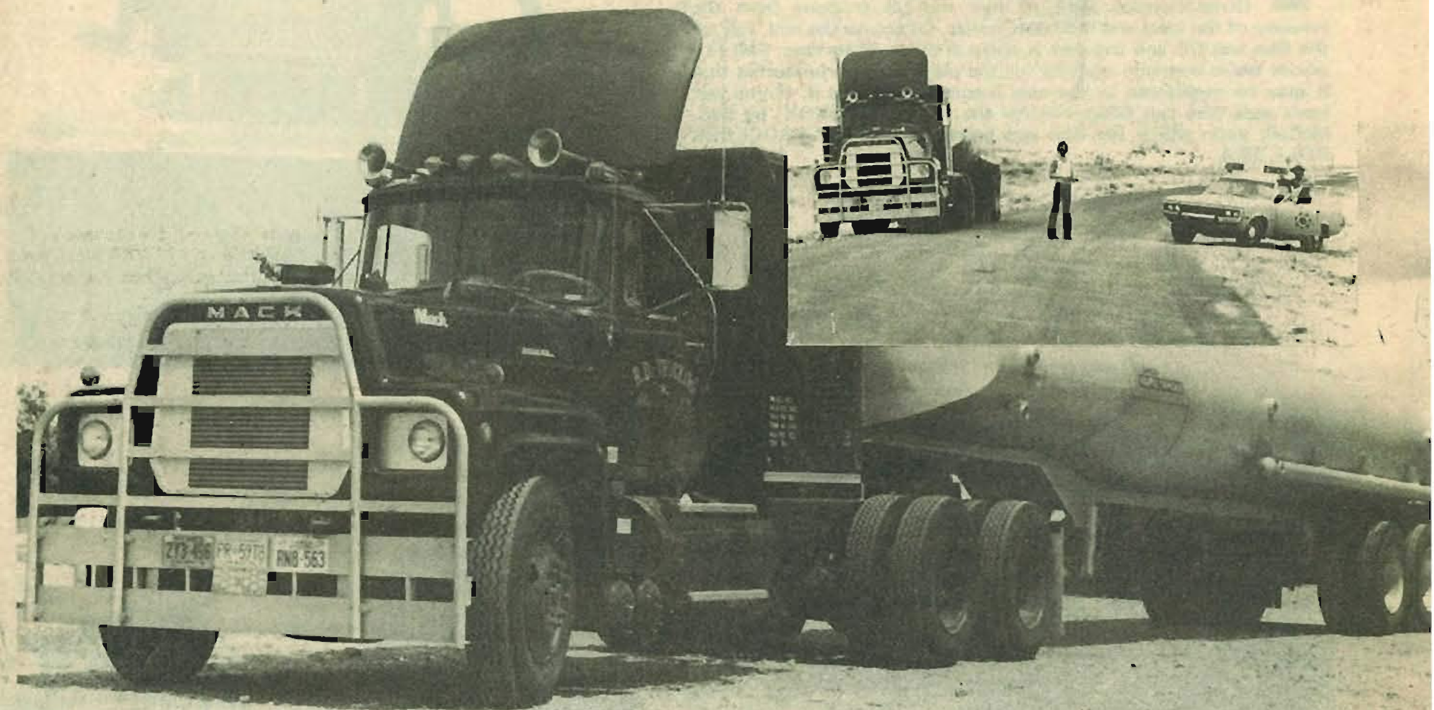
"CONVOY"

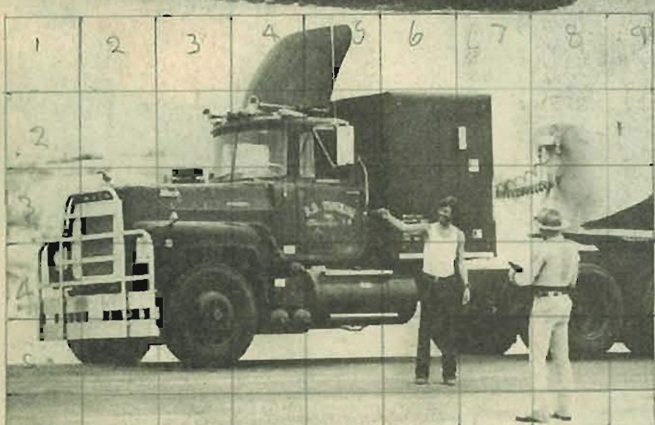


This is where it all started, at least in the UK. The film 'CONVOY', starring Kris Kristofferson and Ali McGraw. The film revolved around the 'RUBBER DUCKS' (Kristofferson) fight to free the US truckers from the tyranny of the local and interstate police. Of course the real 'star' of the film was CB and the part it plays in the truckers lives. EMI (To whom we're eternally grateful for the pictures) are rumouring that it may be re-released in the near future. Don't miss it. If you just can't wait why not listen out for the record 'CONVOY' by W.C. McCall, upon which the film was based. LET THEM TRUCKERS ROLL 10.4.






MACK




CAUTION
ATCH FOR
TER IN DIPS
XT 7 MILES

No apologies for showing the American 'MACKS', JIMMIES and PETERBILT trucks, they just ooze CB. Again scenes from the film 'CONVOY'.
All pictures courtesy EMI FILMS LTD and thanks to John Troke for his speedy and timely help in obtaining the pictures.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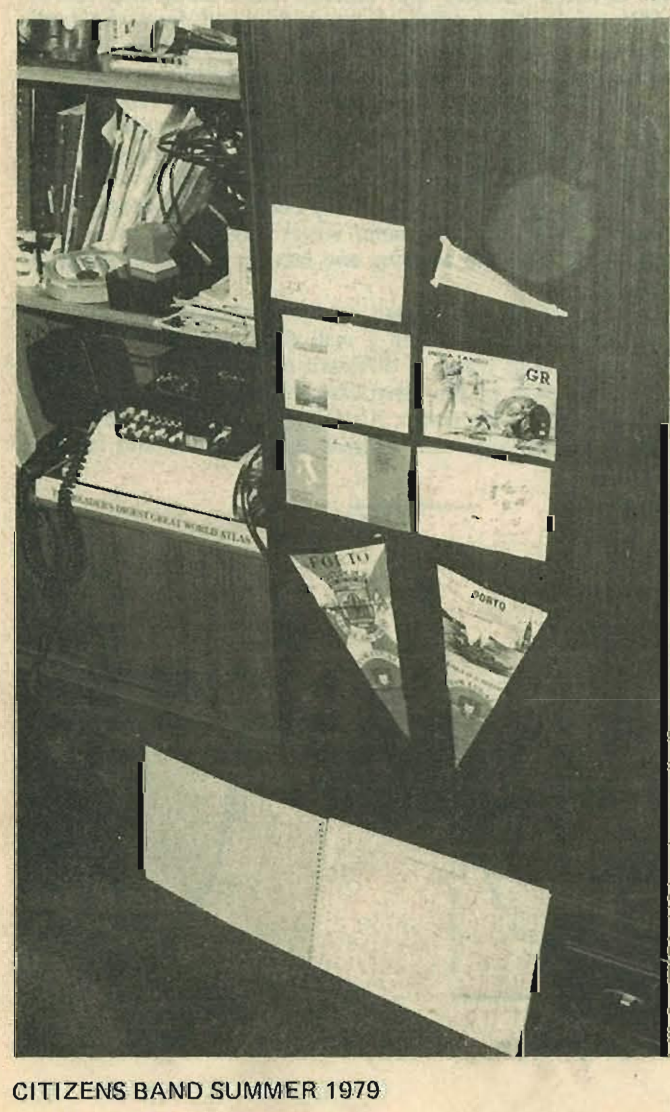
CB IN AUSTRALIA

We make no apologies for re-printing a series of articles from our Sister magazine ETI's Australian edition. As you may well know public opinion forced the Australian government to legalise CB a couple of years ago.
Unlike the US the Australians take their CB very seriously, paying great attention to the technical side of CB, it is (we're told) sometimes quite difficult to distinguish between licensed Hams' and CB'ers. It's unlikely that an English CB system (should it ever be legalised) would progress that far, rather it would evolve into a social pastime etc. So for all the budding 'technical CBers' find out how to operate a SWR meter, how a PLL synthesizer works, or where to mount your antenna for best results.
We must emphasize these articles are not intended to encourage the illegal use of CB but to give people a taste of what is possible if sufficient interest exists. For these reasons we have edited any technical information regarding 27 MHz that could be seen to be encouraging its usage.



A GUIDE TO CB ANTENNAS

REPRINT FROM CB AUSTRALIA
Our Australian correspondant discusses radiation pattern, standing wave ratio, polarization radiation angle and gain to give a basic idea of the operation of an antenna. Many people do not realize the importance of an antenna as the most critical component between transmitter and receiver.

The most important component in any transceiver installation is the antenna system. The power available from 27 MHz transceivers is quite low, around 600-700 mW for most hand-held transceivers and generally 3 W to 4 W for most AM mobiles and base stations, and thus a lot of reliance is placed on the antenna system for best communications and coverage.

In this article we will discuss a little of the theory of antennas in order to help you understand something of how they work, as well as what various terms mean. Apart from the fact that a lot of rubbish is often expounded by 'instant experts', general know-alls.

Waves and Wavelength

An antenna radiates and receives electromagnetic energy, radio waves. This energy is carried to and from the transceiver via a cable called the feed-line. Antennas have the same basic characteristics for both transmission and reception.

You can get some idea of radio waves radiating out from an antenna by analogy with waves created on the surface of water when a stone is dropped into the water. The waves of water travel outwards, expanding in rings. The further the waves are from where the stone was dropped, the weaker the waves. The radio waves radiated by an antenna are strong near the antenna and weaker at further distances from it.

If the waves created on the surface of the water, by the dropped stone, meet a wall they bounce off it – are reflected – and travel in different directions, some radiating across the path of the other waves causing 'peaks' and 'nulls' in the height of the waves. A similar thing happens with radio waves. Reflection from objects causes peaks and nulls in

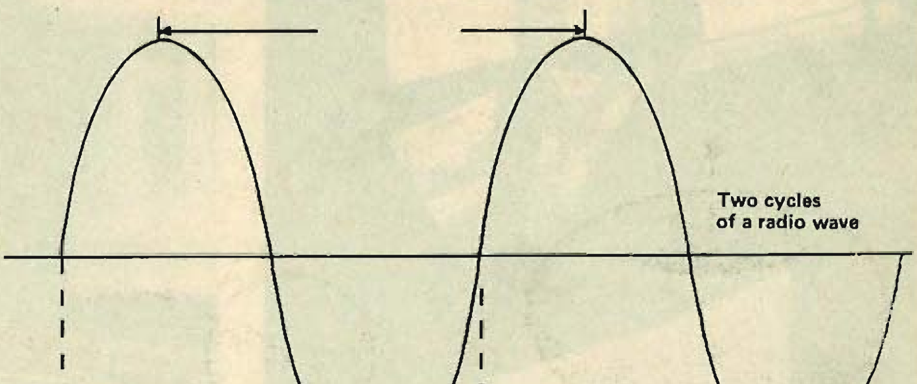


Fig. 1. Illustrating the definition of wavelength.

signal strength at certain positions. This effect is particularly noticeable when the transceiver is mobile.

When you look at the waves in the water you can see that they have a peak and a trough followed by another peak, etc. The distance from one peak to another (or one trough to another) is called the wavelength. In the same way, radio waves have wavelength. The wavelength is related to the frequency transmitted or received. The wavelength of a radio signal on a frequency of 10 MHz is 30 metres. The wavelength of a 30 MHz signal is 10 metres. Thus, as the frequency increases, the wavelength decreases. Signals on, or close to, 27 MHz have a wavelength of about 11 metres.

The number of waves that occur in a period of one second is called the frequency. The waves repeat themselves over and over, and are thus called cycles. One complete wave is one cycle. But, frequency is referred to by the term hertz in honour of Heinrich Hertz, one of the pioneers of radio science. One cycle per second is referred to as one hertz, fifty cycles per second is referred to as fifty hertz. In writing this down, hertz is abbreviated to 'Hz'. Thus, fifty hertz is written 50 Hz. Higher frequencies are referred to by the terms 'kilohertz' meaning one thousand hertz, and 'megahertz' meaning one million hertz. Thus, 3000 Hz is called three kilohertz or written 3 kHz. Similarly, 7,000,000 Hz is called seven megahertz and written 7 MHz. It may sometimes be referred to as 7000 kHz.

A group of frequencies having specified upper and lower frequency limits is referred to as a band. A number of different channels may be specified within the band, each is on a separate frequency, but all are within the specified frequency band. Thus we have the 27 MHz band and there are a number of channels in this band, each on a different frequency. The American citizen's band extends from 26.96 MHz to 27.41 MHz.

Radiation

For the sort of short range communications required by 27 MHz band users, an antenna that radiates and receives signals towards all directions of the horizon, providing general coverage, is desirable; radiating or receiving little energy from directions generally overhead or below. This is referred to as omnidirectional radiation and antennas that provide this sort of pattern are called omnidirectional antennas. The radiation pattern can be imagined as a sort of doughnut shape, with the antenna at the centre, as illustrated in Figure 2(a). The strongest signals are received or radiated from a range of directions more or less at right angles to the line of the antenna, weakest straight up and down, in line with the axis of the antenna.

If you imagine looking straight down on top of the antenna, the directions in which it best radiates will appear as a circle, as shown in Figure 2(b). If you imagine looking directly at the antenna from the side, from any direction, the directions and strength of its radiation would appear as in Figure 2(c).

The patterns illustrated in Figure 2 are termed radiation patterns. The radiation pattern of an antenna describes its radiation characteristics and two antennas can be compared for certain applications by comparing their radiation patterns.

In practical situations, most antennas work in close proximity to the ground or require a groundplane, a system of radial elements at the antenna base or a large area of metal such as a vehicle body, in order to work properly. For practical antennas, the radiation pattern, when looking from the side (as in Figure 2(c)) will be more like that in Figure 3. This is referred to as the vertical radiation pattern (as it is in the vertical plane). If you look down on top of the antenna (as in Figure 2(c)) then the pattern is referred to as the horizontal radiation pattern as it is depicted in the horizontal plane.

In Figure 3, note that the best directions of radiation is slightly above ground, and not directly along it. The angle above ground is called the radiation angle. The lower this is for the best radiation from the antenna the stronger the signal transmitted to or received from the horizon. Of course, the signal strength does not vary a great deal over a range of angles above and below the direction specified, but it decreases very rapidly as the angle gets very close to ground and very high angles.

Polarization

Radio waves are polarized according to the manner in which they are radiated. A whip antenna, commonly used in CB installations, radiates vertically polarized radio waves. For the reason that whip antennas and other simple types have omnidirectional radiation, vertical polarization is commonly used for CB. The TV stations in the UK have horizontally

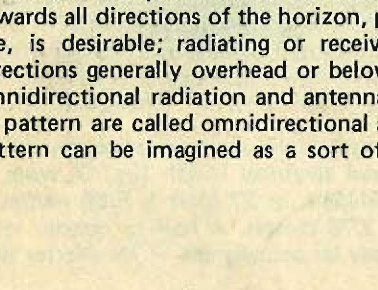


Fig. 2 (a). How an omnidirectional antenna radiates and receives signals. The doughnut shape represents the directions and signal strength in which the antenna best radiates or receives; strongest in all directions at right angles to the antenna, weakest from directions straight up or down.

Fig. 2 (b). Looking down on top of the antenna, it is seen that it radiates equally in all directions in the plane of this page.

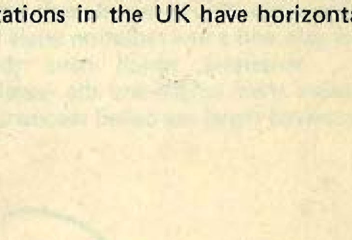


Fig. 2 (c). Looking at th antenna from the side, from any direction, the radiation is best straight out from the antenna, decreasing in directions up or down from this.

polarized antennas radiating their transmission. TV receiver antennas to pick up these signals are consequently horizontally polarized. Some country TV stations radiate waves that are vertically polarized and viewers in their service area have vertically polarized antennas.

Gain

Some antennas are designed so that they receive and radiate signals over a narrower range of angles than that shown in Figure 3, the signal decreasing in strength more rapidly at higher angles particularly. Generally, the radiation angle is lowered as well.

The effect of this is to put more of your signal power where you want it, as well as providing a similar improvement on received signals. Such antennas are said to have gain. The gain must be referred to something and it is usually to a theoretical antenna called an isotropic antenna, or simply referred to isotropic. This is an imaginary antenna that radiates equally in all directions – the radiation pattern would represent a sphere, a circle no matter which particular direction you looked at the antenna. Sometimes antenna gain is referred to a dipole – which radiates as illustrated in Figure 2. A dipole is a practical antenna and allows gain to be actually measured directly.

The gain of antenna is expressed in decibels – a convenient way of comparing quantities on a logarithmic scale. A power gain of two times is equal to three decibels – written 3 dB. If a station you were listening to doubled his power output, you would only be just able to discern this. Quadrupling the power gives a gain of 6 dB – which is generally considered a worthwhile increase. However, antenna gain generally results in somewhat improved coverage, particularly if gain antennas are used at each end of a communications path. Gain antennas generally give a worthwhile improvement in communications largely because they have a low radiation angle, rather than because they provide actual power gain.

Antenna Length

An antenna is most efficient when its length has some definite relationship to the wavelength of the radio signal being transmitted or received. For practical reasons, especially with simple whip antennas and other types used on CB, most antennas are ¼ or ½ wavelength long. One antenna that provides gain and a low radiation angle is the 5/8 wave vertical.

Antennas which have this definite relationship between their length and the wavelength of the transmitted or received signal are called resonant antennas.

The physical length of the antennas is actually a little shorter than its required electrical length (i.e.: ¼ wave, ½ wave etc). A half wavelength at 27 MHz is 5.56 metres, a quarter wavelength is 2.78 metres. A half or quarter wave antenna for 27 MHz may be actually 5% – 7% shorter than

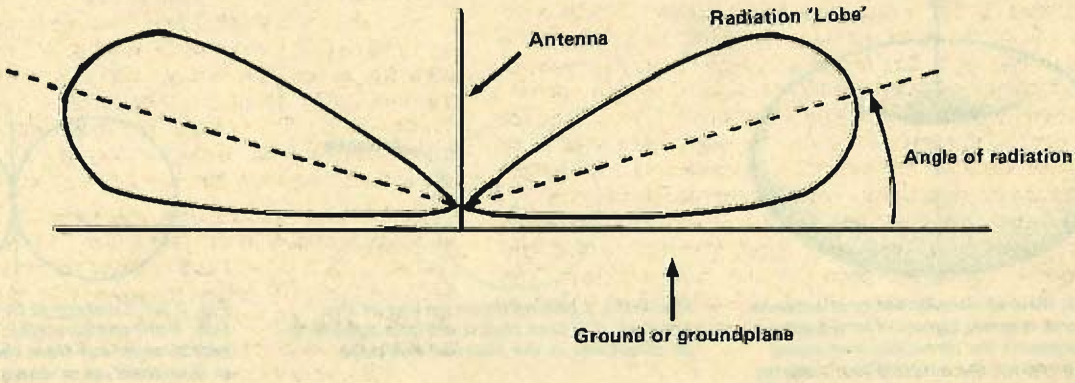


Fig. 3. Typical radiation pattern of a practical antenna working near ground or against a ground plane.

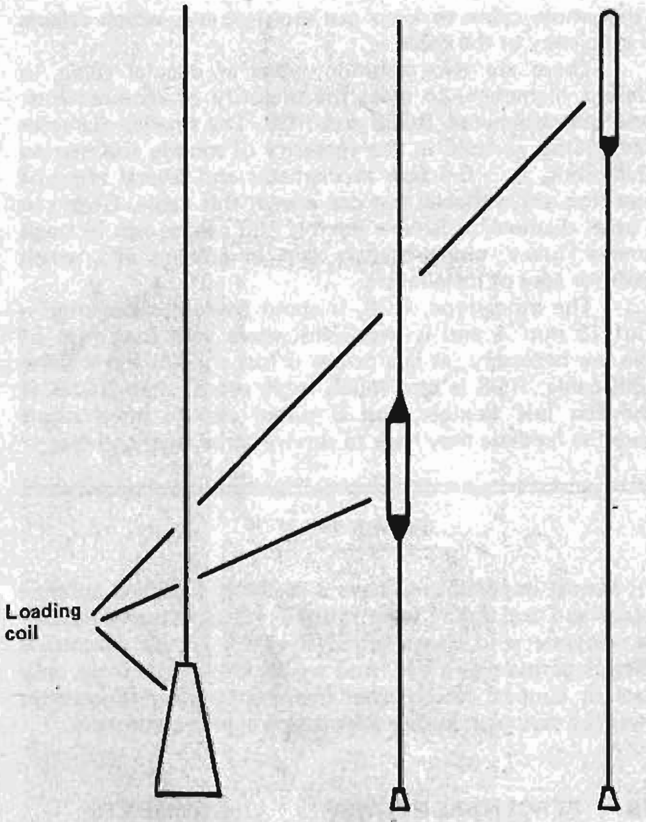


Fig.4. Typical examples of bottom loader, centre-loaded and top load whip-antennas. The loading coil is placed in the antenna element to physically shorten the antenna while maintain its electrical length.

Left. A typical SWR Bridge, note the Forward and Reflected switch. When set on Forward the sensitivity control is adjusted to give FSD. Then, still transmitting switch to REF and read the SWR.

this due to factors in the construction which necessitate shortening the antenna so that it resonates at 27 MHz.

A quarter wave whip for 27 MHz is quite large – 259 cm (102") and may be inconvenient. For this reason, mobile whips are often electrically 'loaded' which results in a physically shorter antenna that is still resonant. The most common form of loading is a coil placed as part of the antenna, usually either at the base, somewhere near the middle or at the top of the antenna element. Typical examples are illustrated in Figure 4. The length of loaded antennas depends on the amount of loading used and their intended application. Generally they are between 90 cm and 112 cm long for those intended for mounting on the body of a vehicle or boat. Those intended for mounting on a vehicle roof guttergrip types are much shorter – usually around 45 cm long.

Loaded antennas are not as efficient as full-sized resonant antennas of the same type, the top loaded and centre-loaded types are generally the most efficient. The shorter a loaded antennas – the more loading used – the less efficient it is compared to a full-sized antenna.

Antenna Impedance and Matching
The connection point of an antenna is called the feedpoint and its electrical characteristic is called its impedance. The impedance is measured in units called ohms.

The feedline and transceiver antenna connection also have a characteristic impedance and manufacturers have generally standardised on a value for this impedance of '50 ohms'. This is often quoted in specifications and literature relating to antennas, feedlines, etc. Most manufacturers construct their antennas so that the feedpoint impedance is 50 ohms and thus matches the characteristic impedance of the feedline and transceiver antenna terminal.

The problem can be thought of by analogy to connecting garden hoses together. Connecting a large diameter hose to one of a smaller diameter impedes the flow of water. Connecting hoses of the same diameter together ensures maximum flow of water. With hoses, matching the diameters achieves maximum water flow. With antennas and feedlines etc, matching the impedances achieves maximum power flow.

If the antenna feedpoint impedance is not 50 ohms the antenna does not accept all the power flowing from the transmitter. The unused power is reflected back towards the transmitter. Think back to the waves on water. If those waves impinge upon a soft spone (like a bath sponge for example), all the wave energy is absorbed by the sponge – it absorbs all of the transmitted energy. If the soft sponge is replaced by a much firmer sponge only some of the wave energy is absorbed, that part not absorbed being reflected.

When an impedance mismatch occurs with the antenna, RF (radio frequency) waves will flow in the feedline in both directions simultaneously. The outgoing (or forward) waves to the antenna react with the reflected waves and stationary peaks and nulls of the RF power occur in the feedline. These are referred to as standing waves. The peaks produce higher than normal voltages in the feedline which can damage the transmitter power output transistor under certain circumstances. If the voltage at the standing wave peaks is compared to the voltage at the nulls a measurement of the mismatch is obtained and is called the standing wave ratio or SWR. The lower the SWR, the better the match to the antenna. Instruments are available to measure SWR. They can be connected in the feedline between the transceiver and antenna and indicate on a meter.

A lot of rubbish is promulgated about SWR and the importance of having a low SWR. Certainly, any power reflected is not radiated – and you lose it. But, it takes a big mismatch to lose a significant amount of power, very low SWR values are fine, but chasing the ultimate (1:1) is like trying to extract gold from seawater – it's not worth the effort. (There is about one gram of gold per 250 million litres of seawater – go get your gold diggers!)

Have a look at Table 1 and stop worrying. Obviously an SWR of 1.5:1 is perfectly acceptable. You only lose 4% of your power and the voltage peaks generated in the feedline are not likely to cause trouble with your transmitter. At SWRs around 2:1 and above the voltage peaks are likely to cause trouble, even though many transceivers are protected against such eventualities it is not a good idea to tempt fate.

If you tell someone you have an SWR of 1.1:1 (why you would want to do that I don't know, but let's just say you do . . .) and he tries to go one better and says he's got an SWR of 1.05:1 (I mean, it sounds real, doesn't it?) then you go back and tell him to stick the extra 0.15% of his power back up his antenna socket – that'll even things up!

Some antennas require a matching device at the feedpoint and this is often included as an integral part of the antenna.

As antennas are installed under a wide variety of circumstances, particularly mobile whips etc, it is often necessary to 'tune' the antenna to get best performance. This usually involves a simple adjustment of the length of the antenna – most manufacturers supply adjustable details. This is discussed in a little more detail later.

The Feedline

This has been mentioned briefly in the article on installation. Let's have a closer look.

The standard type of feedline used is coaxial cable. Have a look at Figure 5. Coaxial cable consists of a centre conductor of copper (or stranded copper wire), which is flexible, surrounded by a plastic insulating material. Over this is a woven wire braid which serves as the other conductor, called the outer conductor, which completely encloses the insulation and centre conductor. A plastic sleeve encloses the whole cable to keep out moisture etc. which affects the efficiency of the cable.

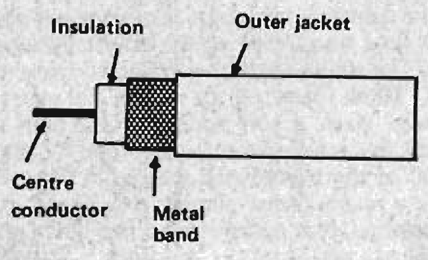
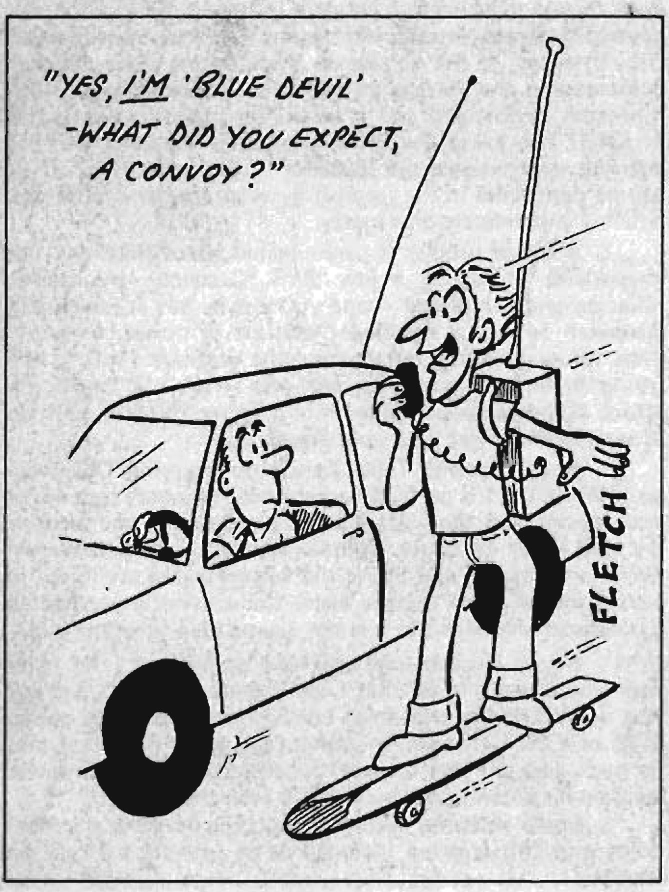


Fig. 5. Coaxial cable. The most common feedline. The two common types are RG58 (6 mm dia) and RG8 (13 mm dia).



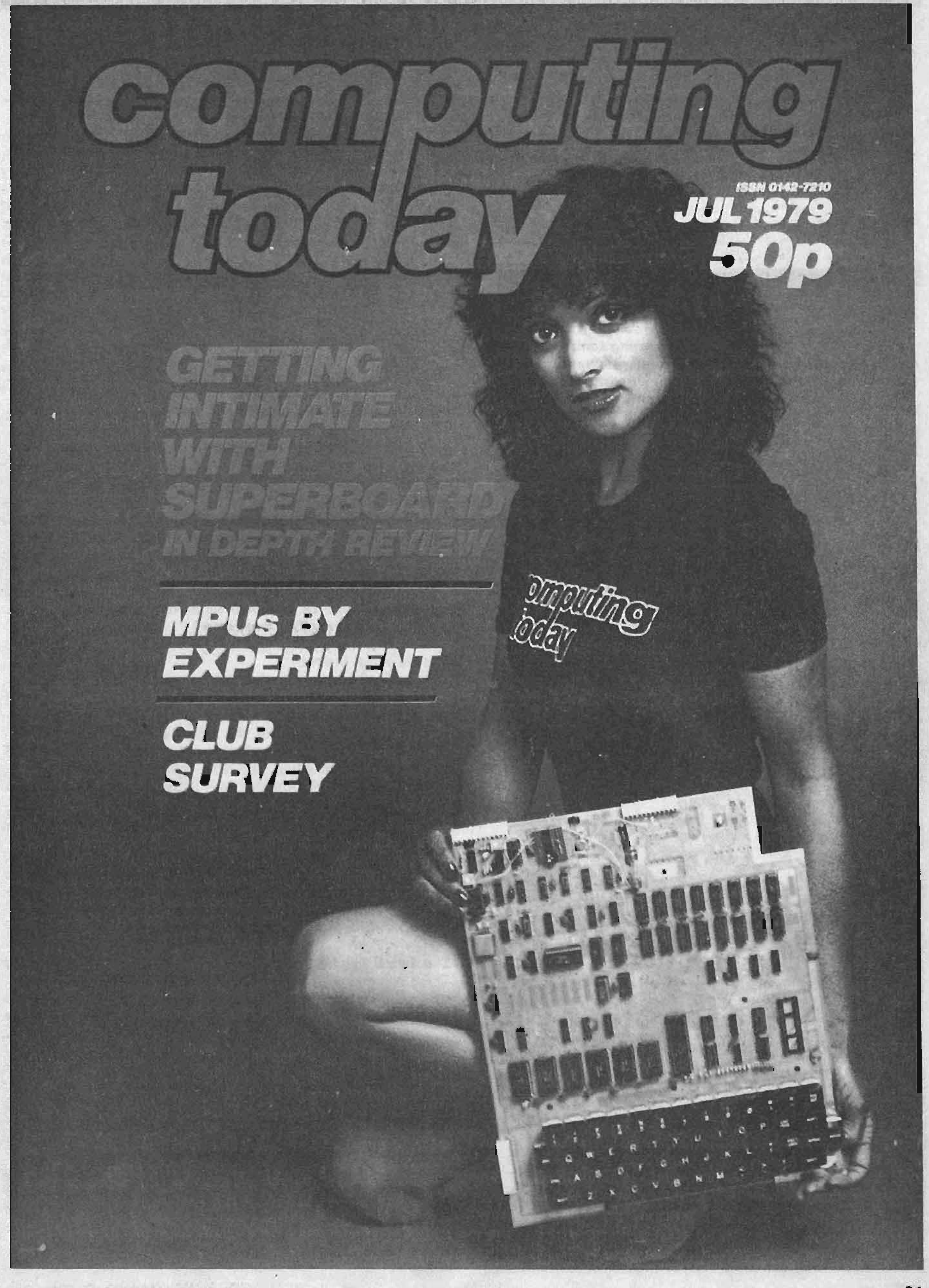
There are two common types of coaxial cable, in different diameters, to meet the majority of requirements. These are designated RG58 and RG8. The smaller diameter cable, RG58, is used in the majority of mobile and marine installations. It is 6-7 mm in diameter and several types of connector are available that can accept this cable. Owing to its small diameter it is very flexible and can be run in small diameter tubes, along corners and in grooves etc. which makes for ease of installation.

The other type, RG8, is about twice the diameter – about 13 mm – and is best used where very long runs of cable are necessary, as less power is lost than in the thinner RG58 cable. RG8 is also much more robust than RG58, if somewhat less flexible, and is suited also to installations where the feedline may have to survive some wear and tear.

TABLE 1

It is almost impossible to have a perfectly matched antenna system and a standing wave ratio of 1:1 is virtually impossible. Anyone who claims an SWR of 1:1 for his antenna is either Superman or a liar. And we all know Superman only exists in comics! Here's what happens to your transmitter power for various standing wave ratios – plus comments.

SWR	PERCENTAGE POWER INTO ANTENNA	COMMENTS
1:1	100%	Perfection! But, remember what I said above.
1.05:1	99.93%	Occasionally achieved. Don't bother to attempt any improvement.
1.1:1	99.78%	Some well-tuned mobile antennas and often base station antennas achieve this.
1.2:1	99%	Lots of well-tuned and properly installed antennas make this. If you get it – be happy!
1.5:1	96%	This sort of SWR is pretty common – and really quite satisfactory. If you get it – great!
2:1	88%	Encountered more often than you think. No cause for alarm. Get it down a bit – for your transmitter's peace of mind.
2.5:1	82%	Losing 18% of your power is like spilt milk, not worth crying over. But, reduce it if possible for reasons given above.
3:1	75%	Your transmitter is likely to get a little unhappy at this.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ANTENNA MOUNTS & FIXTURES

REPRINT FROM CB AUSTRALIA

Mounting a mobile antenna can be a straightforward business, but if you want something special — a big antenna, a removeable or relocatable antenna — then there is a range of special fittings available, as our Australian correspondant explains.

A whole range of antenna mounting fixtures are available to suit the widely varying circumstances that are encountered in mounting antennas. Most of the range are for mounting on vehicles and we will deal with these in this article. Fixtures for mounting base station antennas are another subject altogether.

Mounting fixtures can be divided into two basic categories: those that are mounted through a hole and those that are attached to a fixture on the vehicle (which sort of leaves magnetic mounts somewhere out on their own, but we'll get on to them later).

Mounting fixtures that attach through a hole include the simple 'universal' mount and swivel mounts. Those that attach to vehicle fixtures include gutter mounts, truck or mounts, rack and mirro mounts and bumper mounts.

Mounting fixtures may come as part of an antenna assembly or may be obtained separately. Many fixtures are supplied with a length of coax and a PL259 plug.

The Universal Mount

This basically consists of a strong, insulating plastic cone which mounts through a hole in the vehicle body. The fastening also provides a connection to the vehicle body (which acts as a ground plane for the antenna) and a coaxial cable connection, the outer conductor connecting to the vehicle body via the fastening and the centre conductor to the antenna element. A threaded bolt is usually provided on the top of the cone insulator to accept the base of the whip. A gasket provides a watertight seal between the insulator and the vehicle body.

The universal mount is generally secured by several screws underneath but may also be obtained in a style that is secured from the top. This is convenient as it saves working in tight spaces, such as beneath car fenders. However, you'll have to shop around for the top-secured type.

The Swivel Ball Mount

These mounts are secured via several body holes and consist of a split stainless steel or chrome-plated ball which accepts the antenna and is insulated from the body of the vehicle. It allows the antenna to be laid flat or switvelled into any convenient position. The feedline cable is attached from beneath.

The big advantage of swivel mounts is that they can be mounted on a horizontal, vertical or angled surface. They are great for boats as well as land vehicles, caravans, etc.

Gutter Mounts

Gutter mounts come in two basic styles — screw-on and clip-on. The screw-on types are secured with two small

A 'Mag Mount' antenna, the simplest and quickest way to erect an aerial.

screws and are more-or-less a permanent fixture. This style generally has a pivot arrangement so that the antenna may be angled to stand vertically, as the attachment to the rain gutter of the vehicle is often at an inconvenient angle. They typical screw-on gutter grip is illustrated in Figure 10. They are made to fit either an insulated bolt assembly which accepts the antenna base, or more usually, a type SO239 socket.

The screw-on gutter grip can generally accept a larger whip than the clip-on type, but neither will support the longer loaded whips. Generally whips suitable for gutter mounting are around 45 cm to 55 cm long, and are usually centre-loaded types. Base loaded types are not recommended because of the greater strain they place on the mount. Screw-on gutter-mounts are also available in a style that allows the antenna to be folded down

The clip-on style of gutter-mount is also illustrated in Figure 1. This style allows the antenna to be mounted or detached quickly and conveniently. With the screw-on mount the antenna itself can be detached, leaving the mount and feedline in place.

The clip-on mounts are generally supplied as part of an antenna assembly, but they can be obtained separately. An SO239 socket is fitted to accept the antenna base which is usually fashioned as a PL259 plug.

The feedline from a gutter-mount is usually taken part way down the rain gutter and through the door at a point where it won't be squeezed too much (some protection being afforded by the rubber door gasket) to avoid damage to the coax.

The particular advantage of gutter mounts is that they are very easy to fit to a vehicle. Note, though, that the vehicle must have metallic rain gutters. The clip-on types require a spot of bare metal to make an electrical connection to the vehicle body (which is required to act as a ground-plane). Chrome strips along the rain gutter may not provide a good connection.

Not all rain gutters can support a gutter-mounted antenna. It is wise to check this point before buying. Another point to watch is that not all rain gutters are the same depth. Be careful when mounting screw-on types that clearance is sufficient for the door to open.

Boot Mounts

These come in two types: boot-lid mounting and boot-groove mounting (also known as a boot-lip mount). The boot-lid mount slips over the edge of the lid and is secured with a couple of small screws. The coax feedline is passed into the boot and squeezed between the lid and the rubber gasket. It is necessary to choose a position for the mount such that the antenna doesn't foul the vehicle roof when the boot lid is raised. It is also a good idea to bond the boot lid to the body of the vehicle with a length of flexible braid (obtainable from most equipment suppliers or from some auto accessory shops) to ensure that the lid is part of the general ground-plane formed by the vehicle.

Boot-lip or groove mounts attach to the recessed groove surrounding the trunk opening and are secured either by several screws or by a clamp arrangement that requires no holes. These mounts are particularly suited to hatch-back vehicles and those having little clearance between the open lid and the rear window. Both the screw-on and clamp-on (no hole) types are illustrated in Figure 4. The coax is passed in the boot and squeezed between the lid and the rubber gasket, as for the boot-lid mount. Some pass the cable through the bracket, affording extra protection against damage.

Most screw-on types of boot-lip mount have an adjustable bracket enabling the antenna to be tilted so that it can be repositioned when the boot lid is raised.

With either type of mount ensure that a good contact to bare metal is obtained with the mounting or securing arrangement.

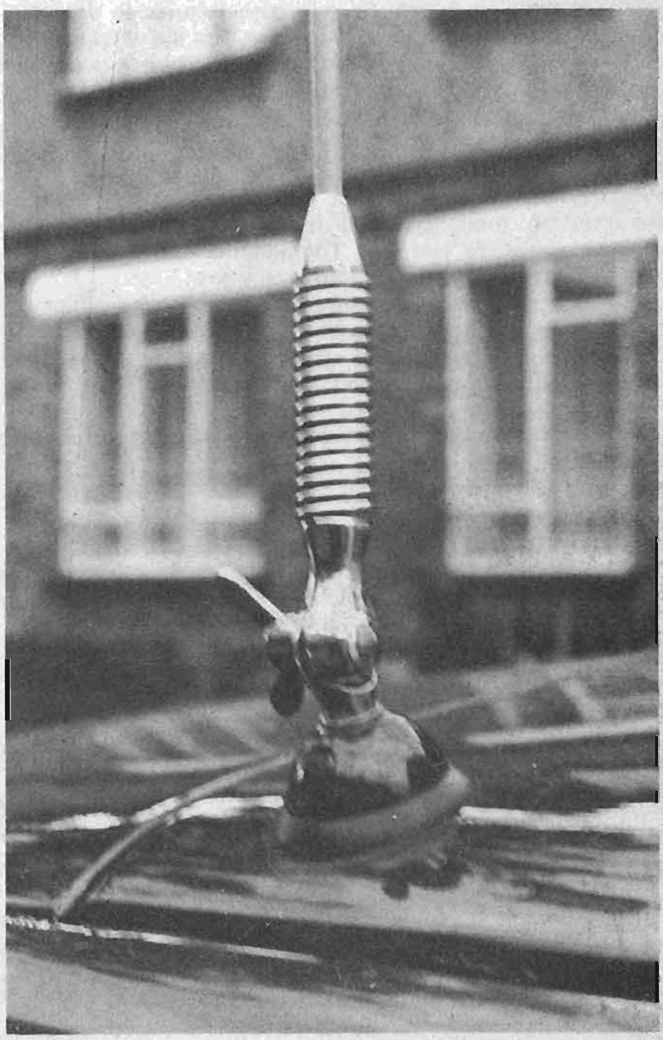
Rack or Ski-Bar Mounts

These consist of a simple screw-clamp that can be attached to tubing or square-section material. They generally fit onto anything up to a maximum size of about 20 mm diameter or square section. They are usually supplied with a length of coax with a PL259 connector attached. A typical example of this type of mount is shown in Figure 5.

The coax is taken into the vehicle in a similar fashion to that of a gutter-grip mount. The wing-nut should contact bare metal which is in good electrical contact with the body of the car. The advantages of this type of mount are its simplicity and cheapness.

Mirror-Mounts

These are similar to the rack-mount. Details are illustrated in Figure 6. They consist of a simple, robust, clamp arrange-



A typical 'universal mount' with a sprung loaded antenna.

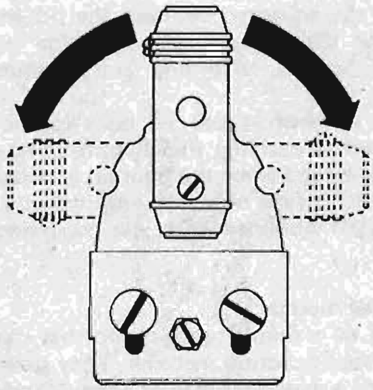


Fig. 1. The Flip over or 'quick flip' style of gutter mount allows the antenna to be laid over for garaging or head clearance without requiring removal of the antenna.

ment that can be attached to a vertical or horizontal bar that supports a wing mirror. The coax feedline is routed in the same manner as for a gutter-grip. The clamp should contact bare metal. The mirror struts should be well bonded to the vehicle frame with 'co-phased' antennas (also called 'dual-trucker' antennas; covered later).

As for the rack-mount, mirror-mounts are inexpensive and quick to install. Snap-in base fixtures to accept a whip can be used with these mounts so that the whip may be attached or taken off quickly and easily. These mounts are usually sold complete with coax and PL259 connector attached.

Magnetic-Mounts

Probably the simplest, fastest way to mount an antenna. Requires no tools, just pop it on! You can mount the antenna anywhere you like. The antenna can be placed so that you get the radiation pattern you want.

Magnet-mounts are best suited to loaded whips or helical antennas and can accept whips as long as 120 cm. However, they only stick to steel or ferrous metal surfaces, fibreglass and aluminium and are a dead loss! They work quite well on vinyl covered metal roof, however.

Magnet-mounts consist of a circular ferro-nickel magnet with a fitting on the top to accept a whip and a thin gasket underneath to prevent scratching of the surface it is placed on. An integral coax cable feedline enters at the side of the base, and a length of a coax (about 3 metres long) terminated in a PL259 connector is normally supplied.

As there is no electrical connection to the vehicle body a magnet-mount antenna is generally not as efficient as other types, especially those that mount through a hole in the body.

The coax may be taken into the vehicle in the same manner as for gutter-grip types.

Holding power depends largely on the length of the whip used, the thickness of paint on the mounting surface — vinyl covered car roofs particularly reduce holding power.

A magnet-mount should not be placed on a wet metal surface, particularly if it is painted or vinyl covered, as the water also reduces the holding power.

Bumper Mounts

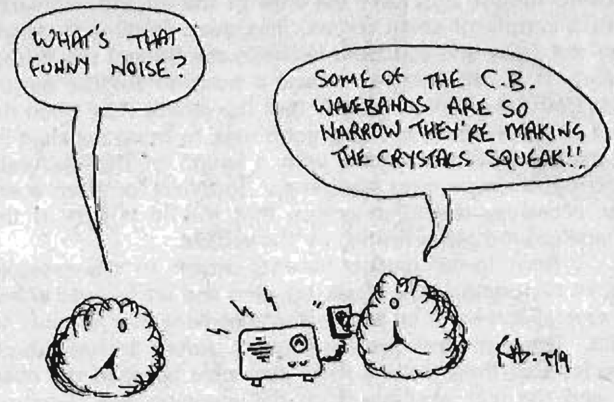
These are normally used with very long whips. They consist of a base that accepts the antenna fitting which is held on to the vehicle bumper by dual chains or metal straps.

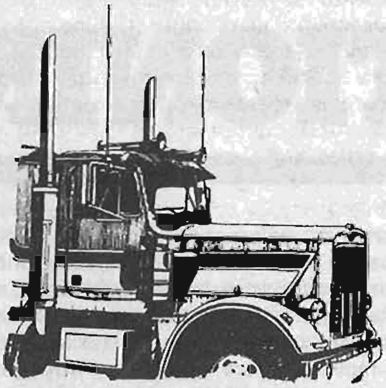
They can be awkward to fit to the small bumpers on old small cars. There is a slight disadvantage with bumper mounting in that the base of the antenna is low so the lower portion of the antenna runs fairly close to the vehicle body, possibly impairing the efficiency.

However, a full-sized quarter-wave whip (almost 3 metres long!) can be mounted in this way, and such an antenna generally gives better performance over loaded whips mounted up on the vehicle body. Long whips have the disadvantage that they literally 'whip' around somewhat, especially at speed. Quick-disconnect fittings can be bought to allow quick mounting and detachment of the antenna.

If a long whip is to be mounted on a bumper mount a heavy-duty shock spring should be used to add some flexibility (to avoid undue strain on the whip itself).

The bumper should be electrically bonded to the body of the vehicle for reasons outlined previously. The coax





may be taken through the trunk, squeezed between the lid and the rubber gasket. Alternatively, it may be passed through a hole in the adjacent body panel.

Van Mounts

This sort of fitting mounts on a vertical metal panel such as on the side or front wall of a caravan or van cabin. It consists of a plate that can be screwed on to the required surface, with a right-angle bend on which moujnts the antenna fixture — see Figure 9. The latter is made so that the antenna may be laid over from vertical to horizontal for overhead clearance or vehicle garaging.

Loaded whips or helicals up to 120 cm are best suited to this type of fitting.

Wing Mounts

These are like the ordinary AM broadcast antenna fittings. They are often supplied as part of a combination antenna assembly (for AM/FM/CB) or with motor driven/retractable antennas. An existing car radio antenna may be replaced with one of these CB antenna assemblies.

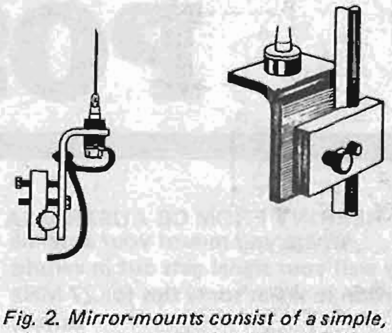


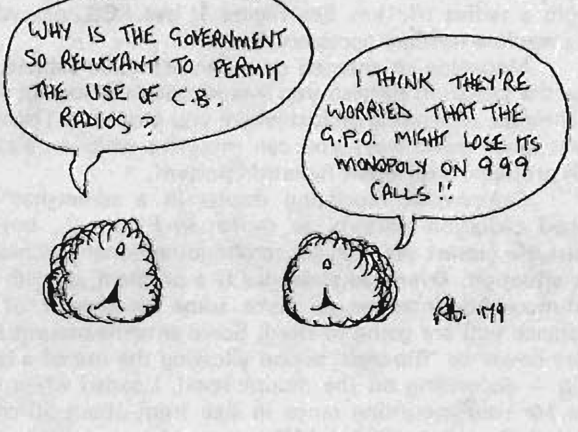
Fig. 2. Mirror-mounts consist of a simple, robust clamp arrangement that attaches to the tubing struts of wing mirrors.

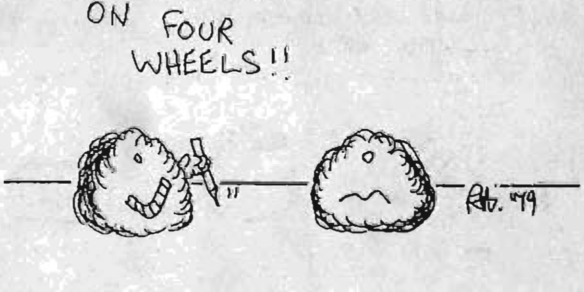
Miscellaneous Fittings and Accessories

Mention has already been made of springs. These are mounted at the base of the antenna, directly on the mount. They are available in a range of sizes from light-duty to heavy-duty. They prevent your whip from being wiped off if you accidentally run under something with insufficient clearance. They add flexibility also, avoiding possible damage to the whip or mount when travelling at speed.Springs add some height to your antenna so it will be necessary to retune the system to account for the extra length. Antenna manufacturers usually provide an antenna tuning guide. If you don't feel confident to do it yourself then have it done by a technician.

Quick-connect fittings are available to fit on most antenna mounts to enable the antenna to be mounted or detached quickly. They generally consist of push-on type of socket that mates with the antenna fitting.

Whip clips that attach to the vehicle rain gutter and hole the tip of a bent-down whip are very handy for permanently-mounted whips. The whip can be bent down and secured by the clip for garaging or for overhead clearance.





CB ANTENNA POSITIONING

REPRINT FROM CB AUSTRALIA

Where you mount your antenna has a big effect on how well your signal gets out in various directions. Roger Harrison looks at some tips for 27 MHz aerials.

A range of different antennas are made for mobile, marine and fixed station installations, each having their own particular advantages and disadvantages. Making a wise selection of your antenna is part of good planning for your installation and it pays to consider a number of factors before purchasing your antenna. Compromises are almost inevitable, particularly in mobile installations, but it's not too difficult to make a choice once you have assessed your situation.

In mobile and marine situations the rule of thumb is: the biggest antenna mounted in the highest position. Now that can be a tall order (Oh dear – those puns keep slipping in). Overhead clearance needs to be taken into account, especially with car and truck installations. Here's where you have to start making compromises. An inefficient antenna mounted high on a vehicle may be better than a full-sized whip mounted low. The position of a short, loaded whip may make up for its deficiencies, even though a larger whip in the best position. Then again, you may not wish to drill holes in your vehicle or boat, etc. and a different style of mounting is called for.

Let's have a look at a few pointers on where to mount antennas, what is the effect of different positions on a vehicle to the radiation pattern of the antenna, things to avoid etc.

Pointers on Antenna Mounting

Base or fixed station antennas are best mounted high and clear of any nearby structures or trees where possible. Don't take this to extremes though. If the base antenna is mounted too high and far from the transceiver a very long feed-line is necessary. This usually means that some power will be lost in the coax to the antenna, thus losing any advantage you may have gained. A feed-line run more than 30 or 40 metres is not really desirable unless it is quite unavoidable. Where possible, a base station antenna should be mounted somewhere between 5 and 15 metres above the average terrain within a radius of 1km. See Figure 1. Use R68 coax where long feedline runs are necessary.

Mounting an antenna on a car, or similar vehicle, can alter the radiation pattern you would normally expect from an antenna, depending on just where you mount it. There are about seven basic ways you can mount a whip on a car – each produces a different radiation pattern.

Centre-roof mounting results in a somewhat egg-shaped radiation pattern, as shown in Figure 2., but it's about the closest you can get to omnidirectional radiation in this situation. Overhead clearance is a problem, as with any roof-mounted antenna, so make some assessment of the clearance you are going to need. Some antenna mounts have a 'lay-down' or 'flip-over' action allowing the use of a larger whip – depending on the mount itself. Loaded whips suitable for roof mounting range in size from about 50 cm to about 110 cm long (20" – 44").

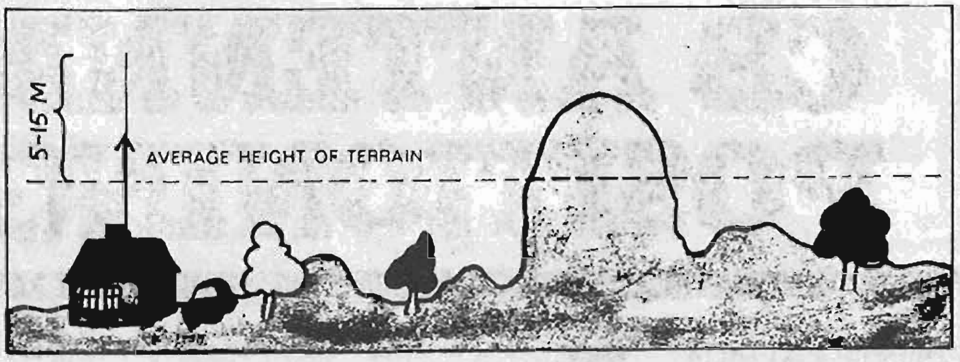


Fig. 1. A good rule for base or fixed station antennas is to mount them about 5-15m above the surrounding terrain within a radius of 1 km. (Picture courtesy of Handic).

The most obvious problem you're likely to encounter is getting into your own garage, carport, etc. If it's too low to accommodate a short, loaded whip then either a lay-down type mount will be necessary or another mounting position will have to be considered. You could park in the street!

Some antennas are sufficiently flexible to be pulled down and held in a rain gutter clip.

Mounting an antenna in the centre-roof of your vehicle can be done in a variety of ways. Through-the-body mounts require a hole to be drilled. If you don't mind doing this to your vehicle then it is probably about the all-round best way to do it. This style of mount can be obtained in two basic forms under-side fastening and top-side fastening. You'll have to shop around for the latter as the underside mounting seems to be the one most readily available. A variety of mounts obtainable on the market are discussed later. Another method of centre-roof mounting is to mount the antenna base on a roof rack. A distorted radiation pattern may result but this may only be slight, depending on how far above the roof the roof rack projects on its own mounting. Generally speaking, this can be an adequate compromise.

Mounting the antenna on the vehicle rain gutter gets it high and in the clear but the radiation pattern is angled across the opposite side of the vehicle as illustrated in Figure 3. Good reception forward and backward is still achieved, as with centre-roof mounting, but it is biased toward the opposite side of the vehicle, reduced signals being experienced off the same side as the antenna is mounted.

Overhead clearance is still a consideration, the same goes for gutter-mounted antennas as for centre-roof mounts. Lay-down or flip-over mounts are available – as discussed later. Clip-on gutter-grip mounts are available also enabling you to unclip the antenna to garage your car, or whatever, but they cannot support a very large whip.

The radiation patter of trunk mounted antennas favours the forward direction. Positioning the antenna on the centre-line of the vehicle gives quite an acceptable radiation pattern as illustrated in Figure 4. Good signals are obtained off to the sides but response to the rear is degraded. If the antenna is positioned to one side the radiation pattern is skewed diagonally across the car as illustrated in Figure 5. A magnet-mount whip placed centre rear-deck is a good performer if it can't be put on the roof.

Trunk mounting enables a larger, and possibly more efficient whip to be used, apart from reducing the overhead clearance problem. If you have little or no overhead clearance problem a base loaded 2.6 m whip may be mounted on the trunk lip, usually giving an excellent account of itself. A light-weight, flexible whip is recommended in these circumstances.

Wing-mounted antennas are often convenient as they

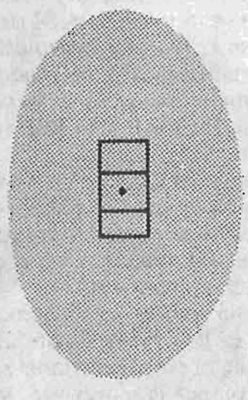


Fig. 2. Mounting the antenna in the centre of your car roof produces about the best radiation pattern – but, overhead clearance is a problem. Good transmission front and rear is obtained with some reduction off to the sides.

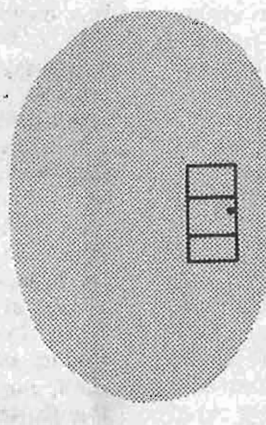


Fig. 3. Gutter mounting places the antenna high up but distorts the radiation pattern. Good transmission and reception front and rear is still obtained with good signals across opposite side of vehicle, somewhat reduced on same side as antenna.

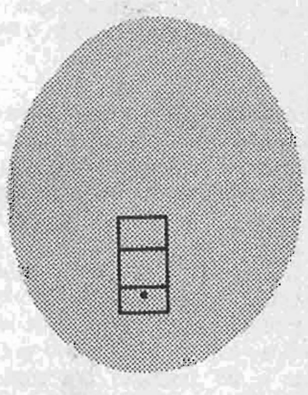


Fig. 4. A trunk mounted antenna positioned on the centre-line of the vehicle produces a radiation pattern that favours the forward direction. Good signals are obtained off to both sides.

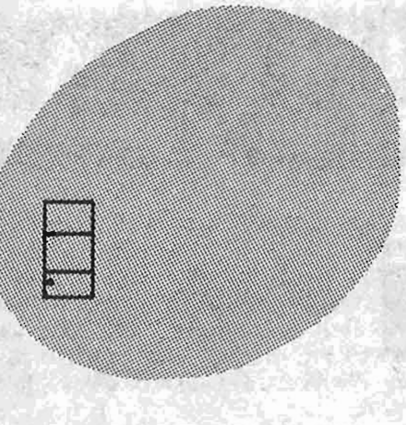


Fig. 5. A trunk mounted antenna positioned to one side angles the radiation pattern diagonally across the car in the forward direction.

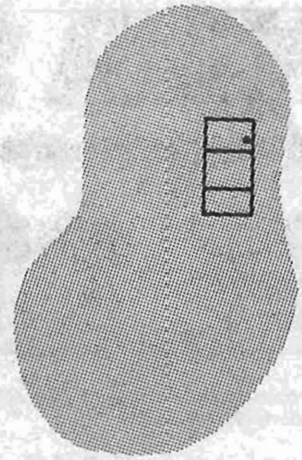


Fig. 6. An antenna mounted on the forward cowl puts most signal across your left shoulder but has advantages in convenience apart from allowing larger whips to be used.

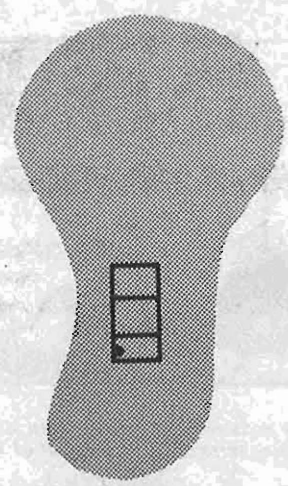


Fig. 7. Mounting the antenna on a rear cowl puts the best signal forward, diagonally across the car.

are simple to mount, robust, can be fitted in an existing car-radio antenna hole and allow the larger whips to be used. Mounting the antenna on one of the front cowls results in a radiation pattern that favours the rear directions, diagonally across the vehicle, as illustrated in Figure 6. Placing the antenna on one of the rear cowls puts the best radiation forward, again diagonally across the car, similar to Figure 5.

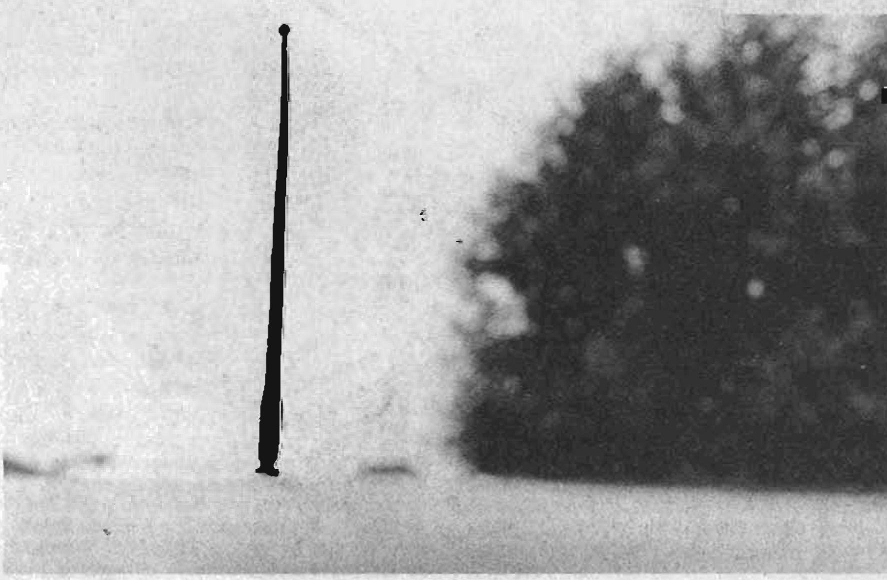
If you favour a long whip, a bumper mount is probably the best. The most popular position for bumper mounted antennas is on the rear bumper as they tend to be distracting on the front of a vehicle. Although positioning the antenna on one of the rear wings puts the best radiation access to the boot, or engine if you have a rear engine machine! Generally they are placed towards one side, resulting in a radiation pattern that places the signal forward, diagonally across the car, similar to Figure 5 or Figure 7. Bumper mounted antennas are unfortunately exposed to damage from other people's bumpers.

Mirror-mounted antennas give similar results to gutter mounted antennas. They are handy on trucks or other vehicles that have projecting wing mirrors. A particular style of base mount is available to suit this method of mounting.

When positioning an antenna on the side of a vehicle don't place it too far down so that the bottom portion of the whip etc. is close to a mass of metal as this adversely affects the operation of the antenna, severely reducing its efficiency. This should also be remembered with bumper-mounted antennas as proximity to the body or bumpers of the car can have the same effects. If mounting a whip on the rear deck or wing of a car, position it away from the roof supports for the same reasons. A bumper-mounted whip on the rear of a Land Rover or an estate car is not a very good idea. A large portion of the whip will be in close proximity to the body mass of the vehicle, reducing its efficiency. That is why you often see such vehicles with a bumper-mounted whip at the front.

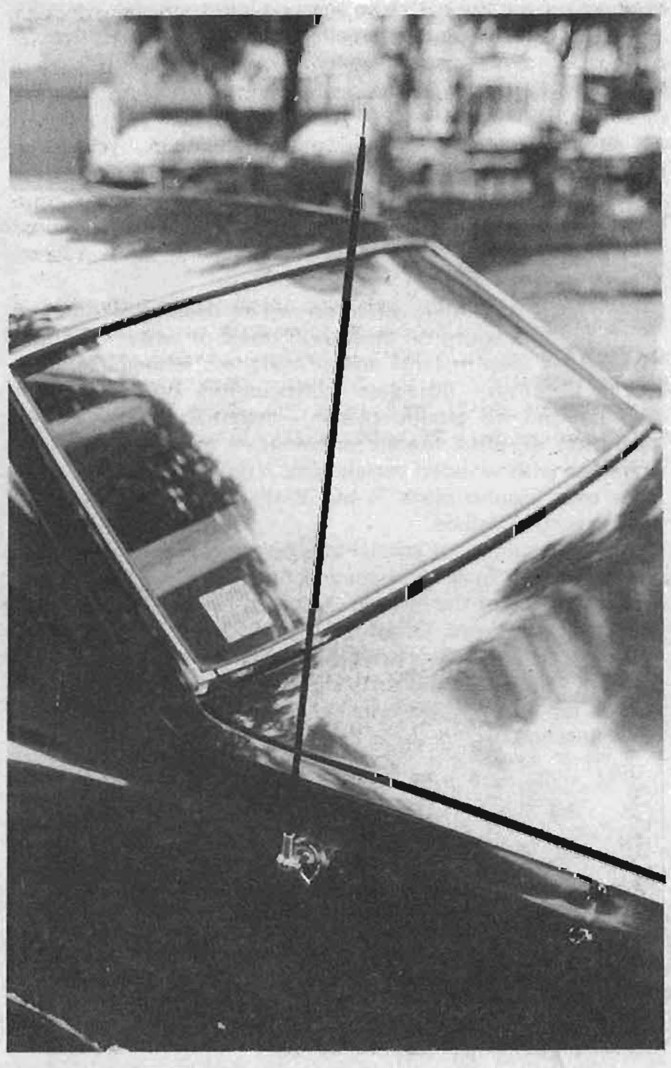
On boats, mounting a whip with portion of it in close proximity to a metal mast is not a good idea for the same reasons just outlined. Position the antenna, as far as is possible, away from mast guy wires as well.

All-wooden or fibreglass boats do not provide a "ground plane", which is automatically provided by the metal body of land vehicles, which is necessary for the proper working of many antennas. Some sort of ground plane may be constructed but as whips are available especially for applications such as this it is hardly worth going to the trouble.



ANTENNA SURVEY

REPRINT FROM CB AUSTRALIA
Here we take a look at some of the CB antennas available to the Australians.



Probably the widest range of antenna types and styles are made for mobile application. Many come complete with mount, spring and coaxial cable. Alternatively, you can buy just the whip itself and separately obtain the other fixtures. Naturally, you can't mount a full size quarter wave whip on a gutter grip mount. It would be equally as silly to mount a 50 cm centre-loaded whip on a bumper mount.

Loaded whips require adjustment after installation, the antenna tip is moved up or down slightly and the SWR checked until a minimum is obtained. The antenna tip is usually set in the top of the loading coil with a small set screw, as shown in Figure 1. Loosening this allows the tip to be moved up or down until you find the optimum length. Move the antenna tip only 3 mm to 5 mm at a time. Tighten the set screw each time and check SWR reading. An acceptable minimum SWR reading would be 1.5:1 to 1.8:1. Try and get better if possible. If you can't achieve these figures look for troubles with connections or the mounting.

Quarter Wave Whips
These are generally 2.59 or 2.74 metres in length. Most come complete with a base spring and a mount. The whip itself is either fibreglass (with a wire through the centre) or stainless steel, the fibreglass whip being somewhat lighter weight. Fibreglass whips have the advantage of being super flexible — but they 'detune' as they move around, and they move around a fair amount at speed. Stainless steel whips are considerably more robust, and more stable on a moving vehicle.

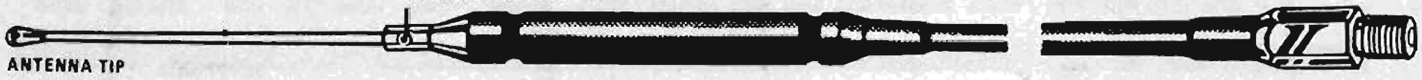
Base-loaded Whips
These are generally intended for mounting on the vehicle body with a 'universal' type of mounting. Often the mounting is integral with the antenna assembly.

The length varies from 103 cm for the shortest type, up to 125 cm. They can be obtained by themselves to fit a variety of bases or as a complete, ready-to-mount assembly with base, coax etc. Some include a small steel spring at the top of the loading coil on which the whip top mounts.

Centre-loaded Whips
Centre-loaded whips are the smallest and the cheapest mobile whips available. They range in size from 43 cm up to 55 cm and are generally suited for gutter mounting, low profile roof mounting or small, tight pockets. As they are very small, don't expect big things from them.

Dual Truck or Co-Phased Whips
This type of antenna assembly consists usually of two centre-loaded whips about 120 cm to 130 cm long and these are intended for mirror mounting either side of the cabin of a large vehicle. They are connected together by a special coaxial cable 'phasing harness'. The result is a reinforcement of the signal forward and backward resulting in a figure-8 radiation pattern as shown in the illustration. To work correctly, the two antennas need to be separated by at least 2.4 to 2.75 metres. They may be spaced closer together but the effectiveness is lost. The advantage of having a radiation

Fig. 1. Loaded antennas require adjustment after installation. The antenna tip above the loading coil is held in by a small screw.



pattern such as this is fairly obvious for highway travelling, as most contacts desired will be ahead or behind.

Owing to the special nature of this type of antenna they are normally sold complete with all coaxial cables, mirror mounts and connectors.

Top-loaded Whips

These antennas are pretty rare on the Australian market at the moment, the only one we could find was a 125 cm long whip and included a 'universal' type of mount with a swivel base that allows the whip to be adjusted in all directions. It can be adjusted after installation, as with the other types of loaded whips, to tune the antenna for lowest SWR.
the other types of loaded whips, to tune the antenna for lowest SWR. The assembly is designated type MA-1 and 2.65 m of coax terminated in a PL-259 connector is included.

Helical Whips

These consist of a fibreglass whip with a length of wire wound in a helix from the base to the tip of the whip (puns, yes – poetry, no!). They can be thought of as a loaded whip with the loading coil spread out over the length of the whip! They range in length generally from about 102 cm to 160 cm. They can be mounted with a universal mount or one of the boot mounts.

Helical whips are renowned for their efficiency – being second only to a well-mounted, quarter wave whip.

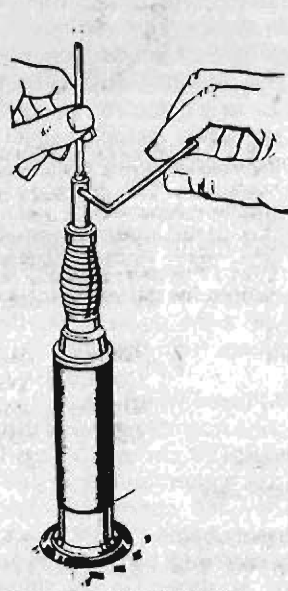


Fig. 2. The set screw is loosened and the antenna tip moved only 3 mm to 5 mm, then check the SWR.

Combination CB-AM/FM Antennas

These resemble an ordinary car radio antenna and mount with a similar cowl mount. They are meant to either replace an existing car radio antenna or to be used as a combination antenna instead. The cowl mount usually requires a 24 mm hole and adaptors are available to fit holes up to 32 mm diameter. They are available with either a telescopic whip or a detachable whip. A 'dividing harness' is included with leads for the car radio and transceiver. They are often known as 'disguise' antennas for obvious reasons.

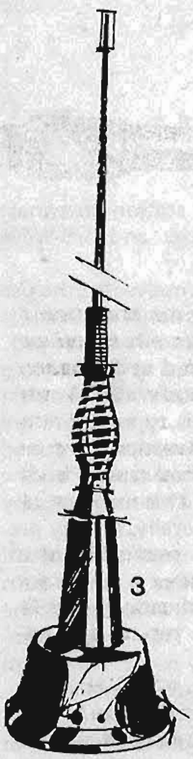
Naturally, an antenna such as this is somewhat of a compromise. It can't off the same performance as a proper 27 MHz whip, but is at the same time satisfactory – while having the advantage of being useful for two vehicle appliances.

Dividing harnesses designed to match a 27 MHz transceiver to a standard car radio antenna as well as provide a connection for the car radio antenna input are also available, but these will be discussed in a later article on accessories.

MARINE ANTENNAS

Most mobile antennas can be used in marine applications on metal-hull boats or where a 'ground plan' – large area of metal etc, is available. However, fibreglass construction boats are very popular and no ground plane – essential for the correct operation of most mobile antennas – exists. The same is apparent with wooden vessels also. You can of course make your own ground plane – but that's really the subject for a construction article.

A number of special antennas are produced to meet this situation. In general they consist of a quarter-wave or wave whip fed at the bottom. A special feeding and matching system is employed. Often the feeding system incorporates a loading coil and a shortened half-wave antenna is used. The whip or antenna element itself is generally about 2.4 to 2.6 metres long in this case rather than 5.5 m for a full-sized half wave antenna.



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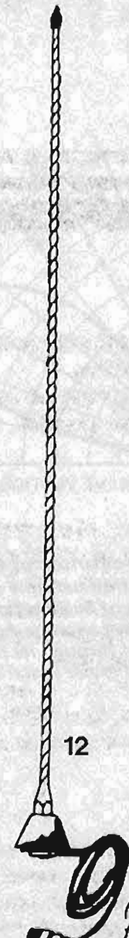
(3) Tandy's 1.06 m trunk-grip base-loaded antenna. (4) A typical gutter-grip. (5) Heavy-duty spring, many suppliers. (6) Stainless steel trunk-mount base-loaded antenna.
(7) 550 mm mini-whip with magnetic base. (8) 457 mm gutter-clamp stainless steel type. (9) Radiation pattern of the co-phased antennas shown in (10).



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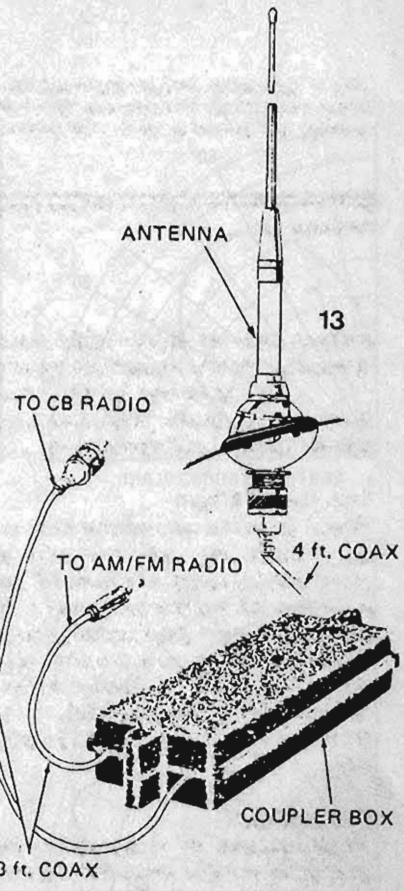


(11) The Scalar CB-13 Marine antenna designed for fibreglass boats (needs no ground-plane).
(12) The White Flash helical antenna.
(13) What an AM/FM/CB antenna looks like.

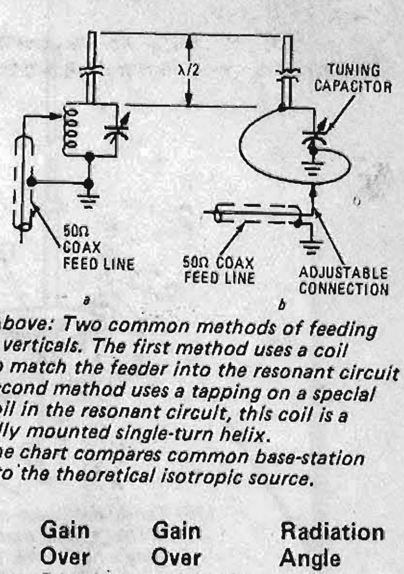
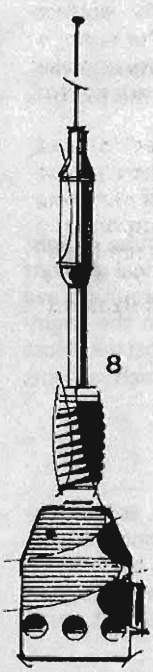


Fig. 14. Above: Two common methods of feeding half-wave verticals. The first method uses a coil tapping to match the feeder into the resonant circuit and the second method uses a tapping on a special type of coil in the resonant circuit, this coil is a horizontally mounted single-turn helix.
Below: The chart compares common base-station antennas to the theoretical isotropic source.



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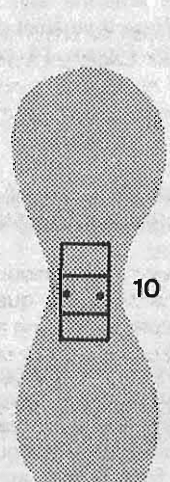

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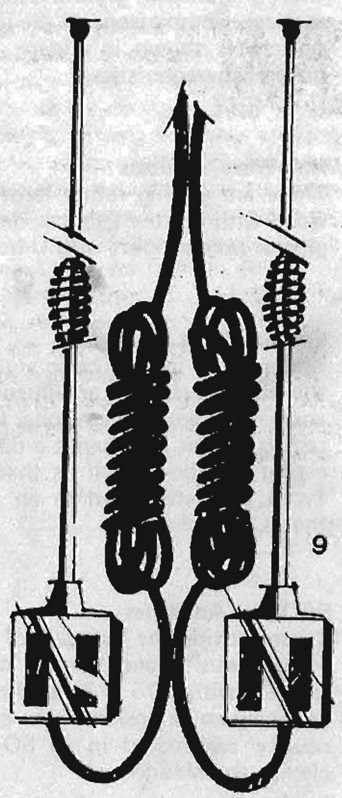

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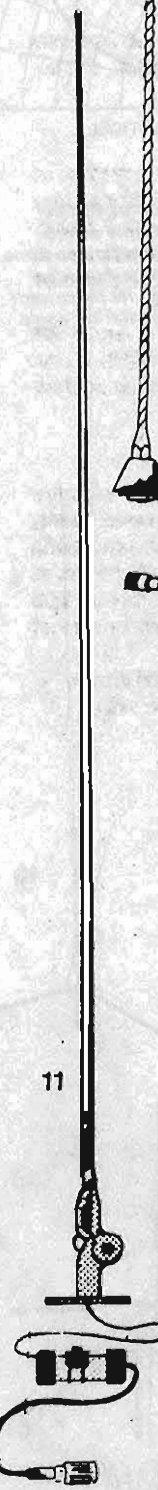
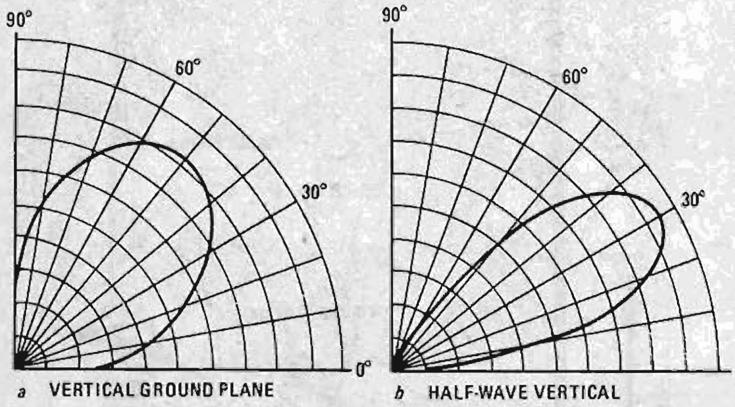


11

Type	Gain Over Dipole (dB)	Gain Over Isotropic (dB)	Radiation Angle
Isotropic (theoretical)	−2.1	0	All angles
Ground plane	−1.8	0.3	Low
1/2-wave vert	0	2.1	varies inversely with mounting height
5/8-wave vert	1.2	3.3	Gen. low



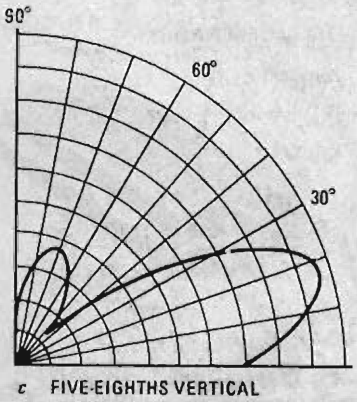


Fig. 15. Comparison of vertical plane radiation patterns of the three types of base station antenna. The 5/8-Wave antenna provides highest gain through its narrower pattern and lower radiation angle.

BASE ANTENNAS

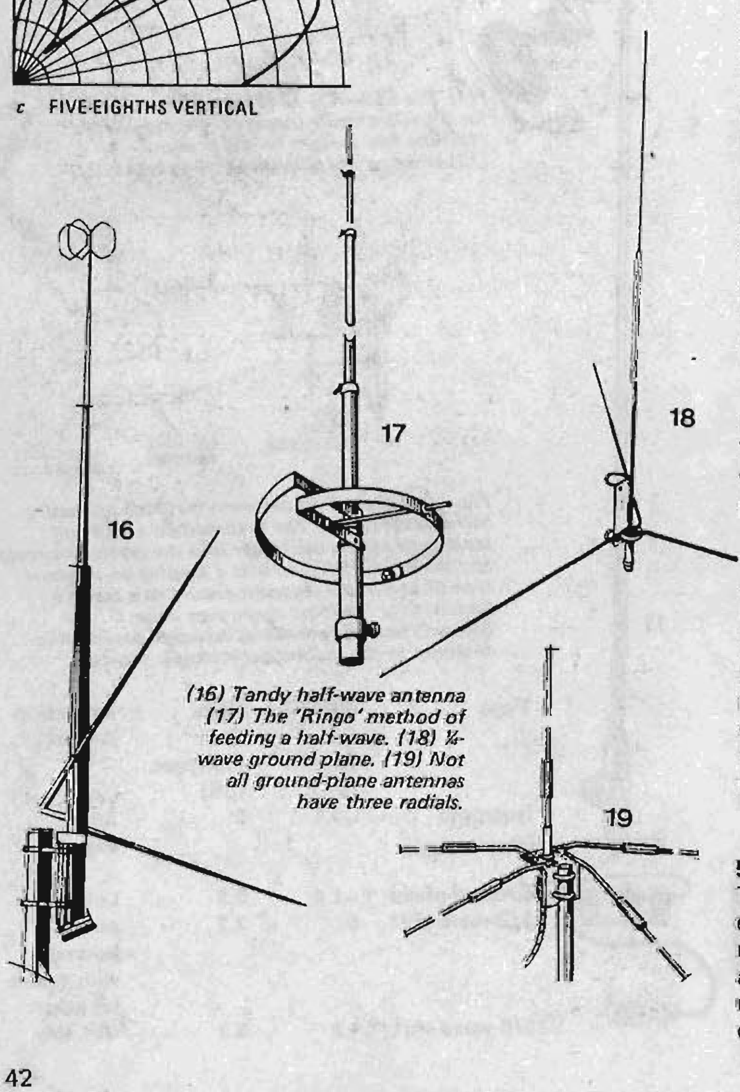
There are three basic types of base station antennas: Half-Wave Verticals, Ground Planes and 5/8-Wave Verticals.

Base station installations lend themselves to the use of large size antennas with gain. Omnidirectional coverage is desirable and so vertical polarization is commonly employed.

Half-Wave verticals are incvitably fed at the bottom (end-fed or bottom fed) as this is obviously the simplest mechanical method with an antenna of this type. There are two common ways of feeding a half-wave vertical: A tuned circuit at the base of the antenna has the coax tapped up the inductance, as illustrated in Figure 14 (a). This may actually be part of the structure. The tuning is generally factory preset by the manufacturer and should not need adjustment. The second method (Figure 14 [b])employs a single turn helical coil with an integral capacitor tuning adjustment, the coax being tapped on to the helical coil. This type is generally known as a 'Ringo' from a proprietry name. (The term Ringo is derived of course from the single turn helical coil.)

Ground plane antennas consist of a quarter wave vertical rod with horizontal radial ground plane elements at the base of the rod. The coax inner conductor connects to the base of the vertical rod and the outer conductor connects to the ground plane elements. They are mechanically simple antennas and generally inexpensive. Sometimes, the radial elements, instead of being horizontal, are 'drooped' down. This improves the impedance match, ensuring a low SWR.

5/8-Wave verticals are similar to the ground plane with the important exception that the vertical radiating element is 5/8 wave long (about 6 m). This results in gain over a standard ground plane antenna and the half-wave vertical. Comparisons of the different vertical plane radiation pattern is shown in Figure 15. Figure 14 compares their general characteristics.



(16) Tandy half-wave antenna (17) The 'Ringo' method of feeding a half-wave. (18) ¼-wave ground plane. (19) Not all ground-plane antennas have three radials.

Half-Wave Verticals

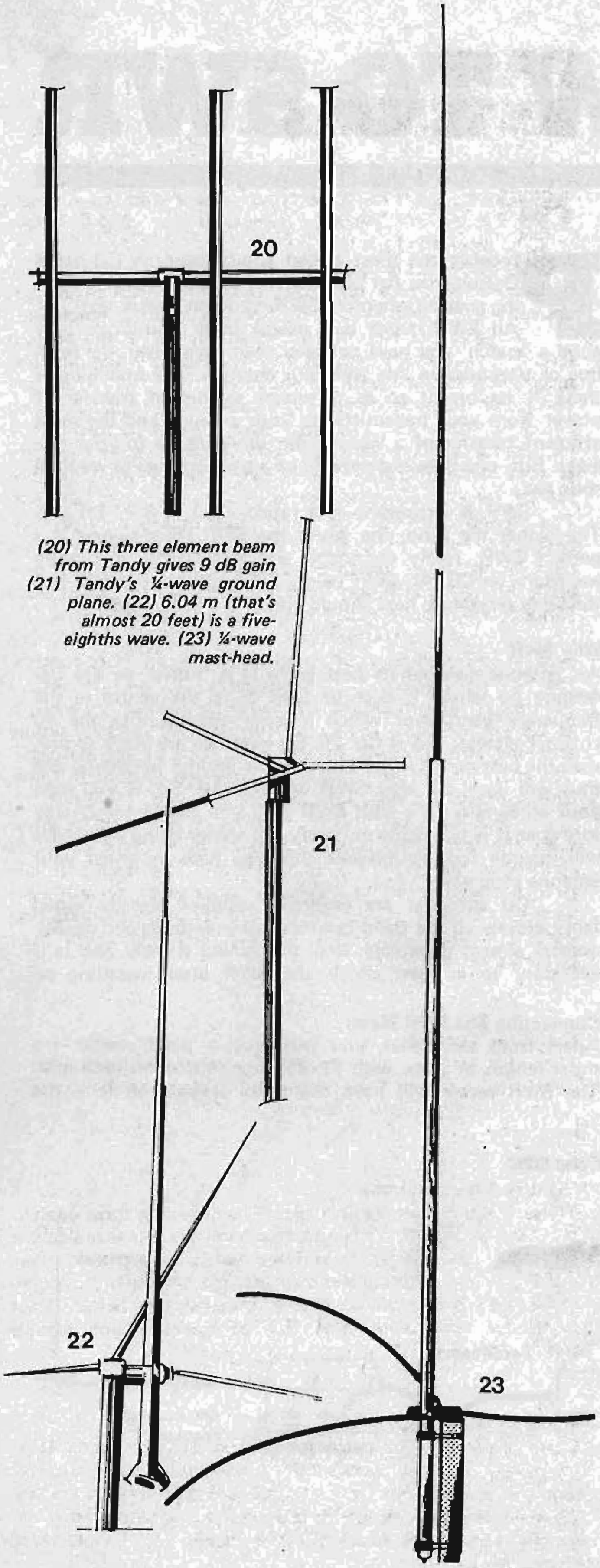
These are getting rather large at 5.5 m and are usually provided with a mount that is designed to clamp to the top of a pipe or pole support with U-bolts.

Ground Plane Antennas

These come in two basic styles — one having three radials, the other four. Both are illustrated here. The vertical element and radials are 275 cm long. Only having three ground plane radials, is not necessarily a disadvantage although the engineering text books tell us that four radials are better. Most types are terminated in an SO-239 socket which accepts the PL-259 plug.

5/8 Wave Antennas

These provide the best gain of the types available, as explained previously, and consist of a 6.04 metre long vertical radiator with 2.75 m ground plane radials at the base. They are really an extension of the ground plane antenna. They are usually terminated in an SO-239 socket and U-bolt mast clamps are included.



(20) This three element beam from Tandy gives 9 dB gain (21) Tandy's ¼-wave ground plane. (22) 6.04 m (that's almost 20 feet) is a five-eighths wave. (23) ¼-wave mast-head.

HOW TO SWR

REPRINT FROM CB AUSTRALIA
Roger Harrison looks at the SWR bridge, much talked about but little understood.

Probably the most talked about topic on CB is Ess Double-you Arr and SWRing – and the most swearing goes on when the SWRing doesn't work out!

An SWR meter is a device used to indicate how good a 'match' you have between your transceiver, the feedline or transmission line and your antenna. The matching of these is important so as to ensure maximum transfer of power from your transmitter to your antenna and the most efficient transfer of a signal from the antenna to your receiver. But, one does not need to be a perfectionist as we shall soon see.

SWR is expressed as a ratio:– 3:1, 1.8:1, 1:1 etc. The higher the ratio, the worse the SWR. 'One-to-one' is a perfect SWR, rarely obtainable and fortunately, not really necessary on CB. An SWR below 2:1 is quite acceptable and the table reproduce here should give you a good guide.

Why SWR

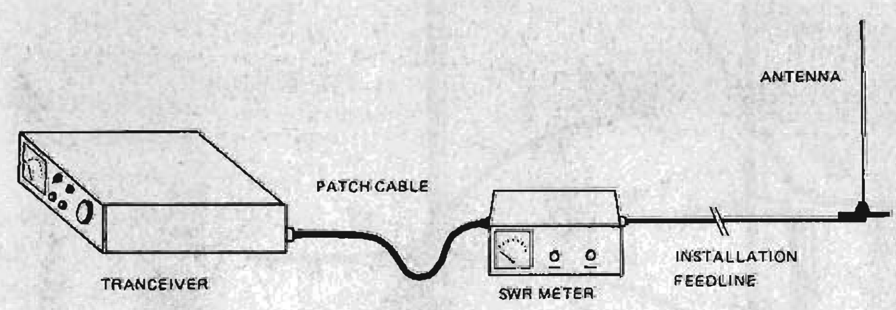
An antenna gives of its best when it is 'tuned' to the frequency on which it is to be used or to the centre of the frequency band over which it is to operate. For the 40 channel system, this is Ch. 20. CB antennas are made to provide the best match when tuned to the desired frequency and thus will have the least SWR when tuned. So, if you tune your antenna for the least SWR then you can be reasonably sure that it is operating correctly, all things being equal. We will assume for this exercise that you have mounted your antenna properly.

CB antennas are generally supplied already tuned fairly closely to the band but mounting methods and nearby objects almost invariably alter the tuning slightly and it is necessary to at least check the SWR after installing an

Connecting The SWR Meter

Apart from the meter, you will need a 'patch' cable – a short length of coax with PL-259 connectins on each end. The SWR meter will have two coax sockets on it – the

Figure 2. Set-up for measuring SWR.



SO-239 type are standard — one marked 'transmitter', the other marked 'antenna'.

Disconnect the feedline from the transceiver socket and plug it into the antenna socket of the SWR meter.

Then, taking the short 'patch' cable, connect the transceiver antenna socket to the 'transmitter' socket on the SWR meter. The basic set-up is illustrated in Figure 1.

Some SWR meters have small switches, usually located on the back, marked '50' and '75' or something similar. These should normally be switched to '50' as they set the instrument to correctly measure the SWR in a '50 ohm' system which is used for CB installations (the transmission line or coax, the transceiver and the antenna are all meant to match an impedance of 50 ohms. SWR meters that do not incorporate these switches are generally made for use with 50 ohm systems.

An SWR meter can be left permanently installed if desired, or convenient, so that the performance of the transmitter and antenna system can be constantly monitored. In other words — peace of mind, if you're that way inclined!

Measuring The SWR

The transceiver should be set to the frequency you will, or do, use the most or channel 14 (27.125MHz). SWR measurements or checks should be carried out with the transceiver in the AM mode to provide a sustained RF power output. A sustained whistle can be used on SSB.if you wish — but you might run out of breath before you can tune your antenna!

Keep measurement periods short to avoid interference with others; make sure the channel is clear before commencing in any case. Or you could SWR your antenna at three o'clock in the morning!

Follow the step-by-step procedure here and you will be surprised how easy it is!

(1) If you are using a single-meter instrument, switch to read 'forward'.

(2) Turn the 'sensitivity' control to minimum and then press the transmit button. Quickly adjust the sensitivity control to obtain maximum reading on the meter, or the forward meter on instruments with two meters.

(3) Now switch to 'reverse' or 'reflected' and the SWR will be indicated on the meter scale. Two meter instruments will show SWR on the 'reflected' meter.

Some SWR meters incorporate a power measurement scale or a separate meter for measuring power. The function switch in these models usually has three positions: power, forward and reverse (or reflected). The SWR measurement should be made as for a single meter instrument, as explained above.

Antenna Tuning

If your antenna needs to be tuned then the procedure is a little different. The set-up remains the same and you should carry out an initial check of the SWR as outlined above. Now, make a small adjustment to the antenna as detailed by the manufacturer. Switch the SWR meter to read forward and adjust the sensitivity control to give maximum reading again if necessary. Now switch to reflected (or reverse) and read the SWR. If it has decreased (from say over 2 down to 1.8 for example) your adjustment was in the right direction. Make a further adjustment in the same direction, switch the SWR meter to read forward again and repeat the procedure.

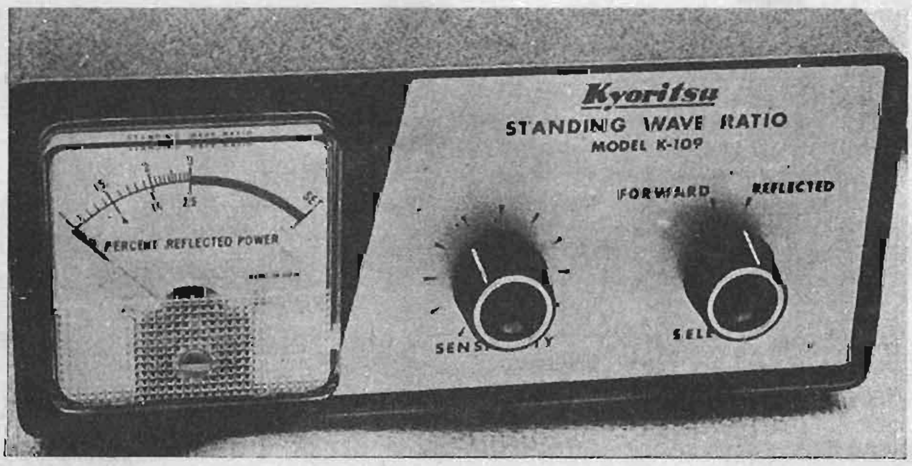
If, on the other hand, the SWR reading increased after you adjusted the antenna, then your adjustment was in the wrong direction. Make an adjustment in the opposite direction, set the SWR meter to read forward and repeat the procedure.

Once the SWR reading does not change very much with an adjustment, or you have reached an SWR of 1.5, it is wise not to continue because, for a start, it is a little pointless, and if the adjustment to the antenna is by means of 'pruning' the tip by cutting off short lengths, then you may possibly go too far!

If you are using an 'antenna coupler' or 'matcher' then the procedure is much the same. After each adjustment of the coupler or matcher, reset the sensitivity control of the SWR meter for maximum forward reading and then switch to reflected or reverse to read the SWR. If the SWR goes down, you're adjusting the coupler or matcher in the right direction, if it goes up, you're adjusting it in the wrong direction.

As a last note, the power measurement facility on many SWR meters i very handy, but an accurate reading can only be obtained if the SWR is fairly low (say, 1.5:1 or less). If you want to check your power output properly, obtain one of the inexpensive CB 'dummy loads' and plug it into the 'antenna' socket of the SWR meter in place of the feedline to the antenna. The meter should be set to read power and when you press the mike button (with the transceiver set to the AM mode), you can read the power output of your transmitter.

A typical SWR bridge.



CB SYNTHESIZERS: HOW THEY WORK

REPRINT FROM CB AUSTRALIA

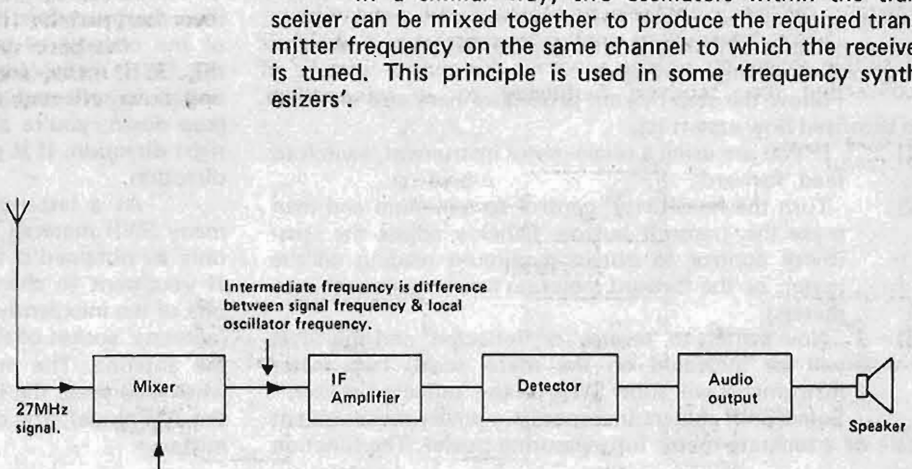
One of the main arguments against CB is the lack of technical knowledge its users would have. Prove them wrong, the synthesizer is the heart of any modern CB get to learn all about them here.

A bewildering variety of CB transceivers is available on the World market today. There are economy AM transceivers, 'high-quality' dual-conversion AM transceivers, SSB/AM transceivers, PLL synthesizer transceivers, etc. — all finding some niche in the market according to price, promotion and performance.

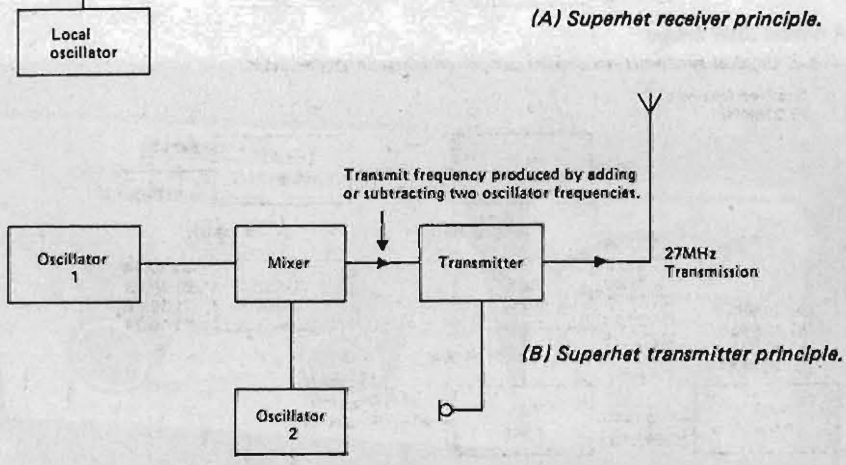
Well, let's have a look at how the various types of transceiver generate the required transmitter and receiver frequencies to put it on the channel you select.

CB transceivers are of the superhet type. For the receiver, the incoming signal is mixed or 'heterodyned' with another local frequency generated within the transceiver. The local frequency (generated by the local oscillator) is different from the received frequency by a certain fixed amount. The difference is called the intermediate frequency or IF. The signal is then amplified at this lower frequency and detected.

In a similar way, two oscillators within the transceiver can be mixed together to produce the required transmitter frequency on the same channel to which the receiver is tuned. This principle is used in some 'frequency synthesizers'.



(A) Superhet receiver principle.



(B) Superhet transmitter principle.

Figure 1. Basic principle of superhet as applied to receivers and transmitters.

Figure 1 shows the basic superhet scheme as it applies to a receiver or a transmitter.

Now, as the CB band is divided up into 40 channels the simplest transceiver would require one crystal each for the receiver and transmitter (non-superhet transmitter) for each channel — that's 80 crystals in all! At around £1.50 each to the manufacturer, that would be over £120! There's gotta be a better way! And there is — synthesizers.

Crystal Synthesizers

By using the superhet principle, the number of crystals required to generate the 40 channels on 27 MHz can be reduced to 14 — a great saving!

Crystal synthesizers can be realised using any one of a number of basically similar systems. Generally, two sets of four 'low frequency' crystals are mixed with the outputs of six 'high frequency' crystals to obtain the required frequencies for the transmitter and receiver for each channel.

A typical single-conversion scheme, most often employed in economy AM-only transceivers, is illustrated in Fig. 2. For an incoming signal on 27.015 MHz (channel 1), the effective local oscillator signal for an IF of 455 kHz (0.455 MHz) is 26.56 MHz. This is obtained by taking the difference between crystal A in oscillator 1 and crystal 1 in oscillator 2. (32.71 — 6.15 MHz = 26.56 MHz). A similar scheme applies for the transmitter. The difference between crystal A' in oscillator 3 and crystal 1 in oscillator 2 is 27.015 MHz! Each channel is obtained by selecting the appropriate crystals. This is accomplished by the switch operated by the channel selection knob on the transceiver.

Some transceivers employ 'dual-conversion' which is a simple extension of the superhet principle — instead of converting the incoming frequency to an intermediate frequency once only, it is done twice. This has a number of advantages, chief amongst them being the reduction in response of the receiver to 'image' frequency interference.

A typical synthesizer scheme for transceivers employing dual-conversion receivers is illustrated in Fig. 3. The crystal synthesizer system works in exactly the same manner as just described — only the numbers are different!

While AM transceivers may be relatively cheap, SSB has the advantage of greater efficiency over AM transmissions Channel occupancy can be greater and there is often an advantage in greater range.

Most SSB rigs include AM transmission and reception and for this reason they employ dual conversion to a second IF of 455 kHz. The block diagram of a typical SSB/AM transceiver crystal synthesizer is illustrated in Fig. 4.

However, despite the popularity of the crystal frequency synthesis techniques, modern technology can reduce the number of crystals required to one; or two in practical systems, one for transmit and one for receive. These synthesizers use a circuit called a 'phase-locked loop', usually abbreviated to PLL.

PLL Synthesizers

PLL synthesizers utilise digital circuitry in parts of the system enabling a simple switch to 'program' the circuitry to produce the required frequency.

They have the great advantage over crystal synthesizers that their inherent frequency tolerance is much greater. All the channels are virtually 'spot-on', and remain that way over long periods. If one channel isout — all will be out!

The basic system of a phase-locked loop is shown in Fig. 5. The frequency of an oscillator is controlled by dividing down its output and comparing this with an accurate

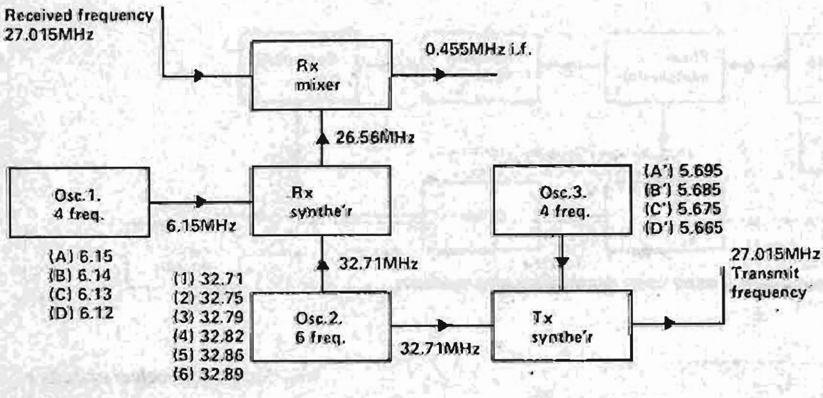


Fig.2. Crystal synthesis on an a.m. single conversion transceiver.

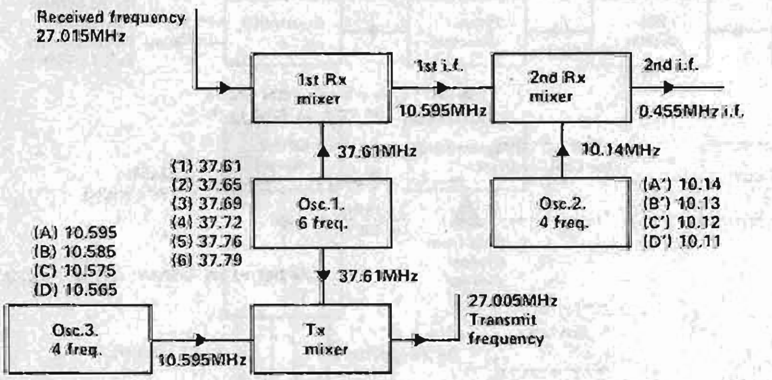


Fig.3. Crystal synthesis on an a.m. dual conversion transceiver.

reference in a phase comparator which derives a control signal proportional to the difference between the divider output and the reference, thus setting the frequency of the oscillator and maintaining it very accurately. The controlled oscillator provides the output frequency. If the divide ratio (or number), N, is changed, then the oscillator will be forced onto a new frequency. The low pass filter between the phase comparator and the controlled oscillator helps to maintain the oscillator on frequency without any noticeable 'jitter', or small jumps and wanderings of the frequency.

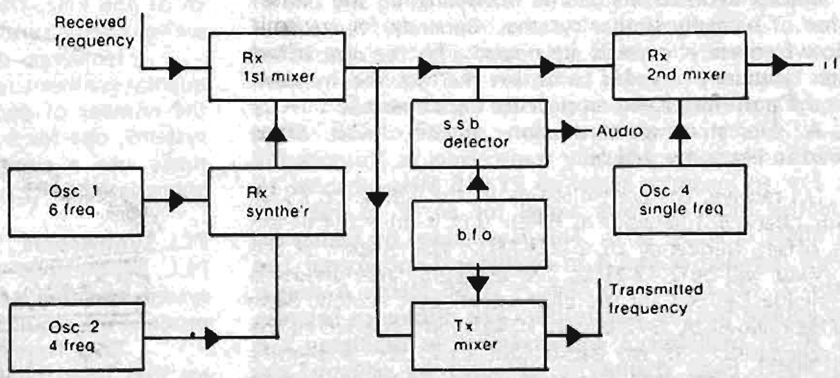


Fig.4. Crystal synthesis on an a.m./s.s.b. transceiver.

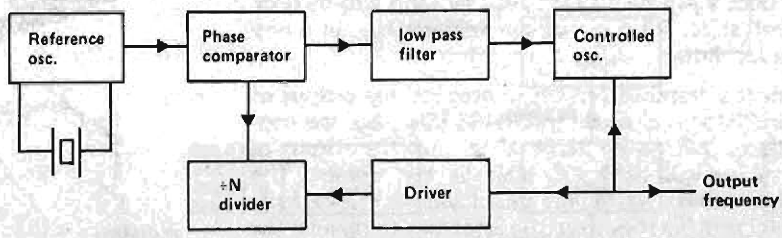


Fig.5. Basic phase locked loop synthesiser arrangement.

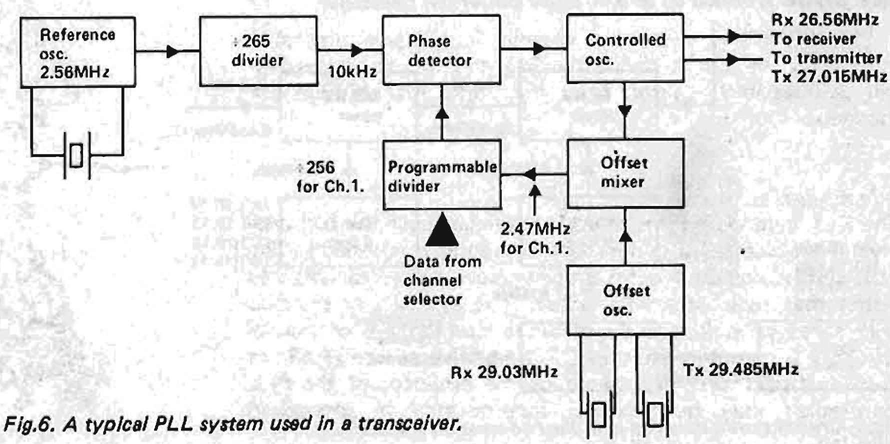


Fig.6. A typical PLL system used in a transceiver.

As you can see, the circuit forms a loop which includes the controlled oscillator, the driver and divider, the phase comparator and low pass filter — hence the name, phase-locked loop.

A typical PLL system used in a transceiver is illustrated in Fig. 6. A reference crystal oscillator on 2.56 MHz is divided down to 10 kHz and fed to the phase comparator which incorporates a low pass filter. Why isn't a 10 kHz crystal reference oscillator used? Well, 10 kHz crystals are quite expensive and the combination of a high frequency crystal followed by a divider is quite a lot cheaper.

Some output from the controlled oscillator is fed to a mixer which mixes it with the frequency of the 'offset oscillator'. This services to alter the frequency for transmit and receive, these being 455 kHz apart. The receive offset oscillator frequency is 455 kHz lower than the transmit offset oscillator frequency to provide the correct frequency for the receiver mixer which produces the IF of 455 kHz as explained earlier in the article.

On receive, the controlled oscillator will be on 26.56 MHz for channel 1 reception. When this is mixed with the receive offset frequency of 29.03 MHz, the output of the offset mixer will be 2.47 MHz. The programmable divider is set to divide by 247 by the channel selector switch. Now 2.47 MHz divided by 247 equals 10 kHz, which is fed to the phase comparator. If the controlled oscillator is slightly different to the required frequency, say 26.565 kHz, then the output of the offset mixer will be 2.475 MHz. The programmable divider will divide this down to 10.02 kHz which differs from the reference frequency of 10 kHz. The phase detector will then apply a control signal to the controlled oscillator, forcing it back down to 26.56 MHz. When the correction is complete, the outpu of the programmable divider will once again be 10 kHz and the loop will be back in the 'locked' state. All this happens very rapidly, in a tiny fraction of a second!

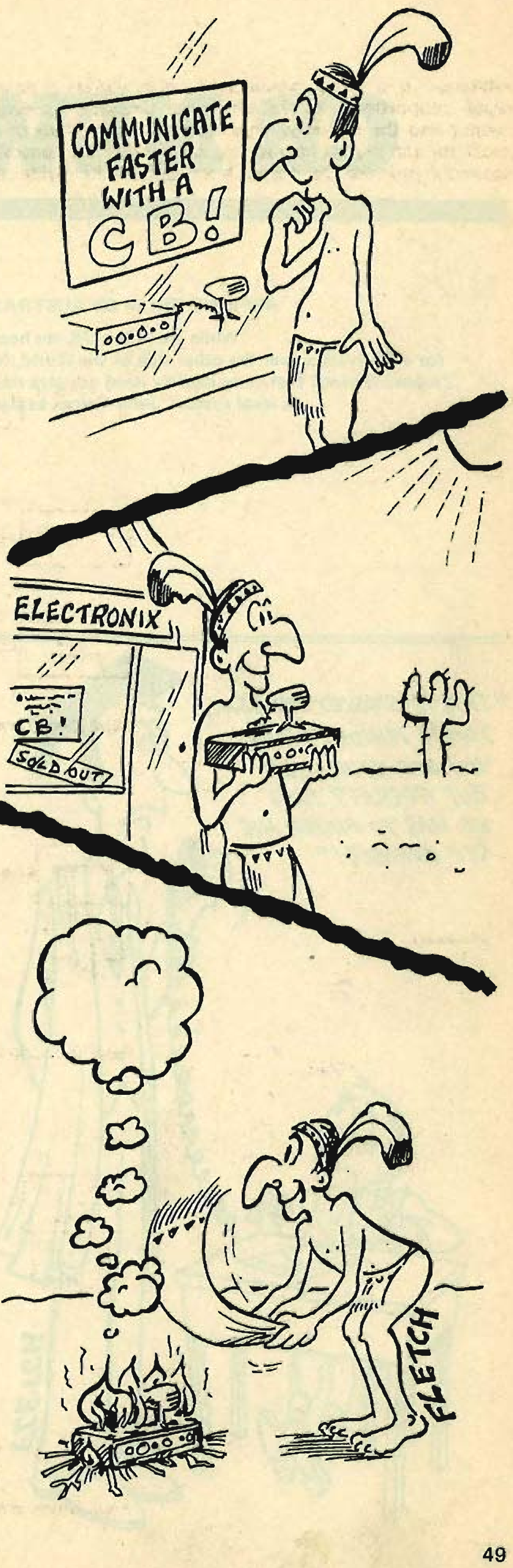
When the transmit button is pressed, the output of the offset oscillator is changed to 29.485 MHz. But the controlled oscillator will be on 26.56 MHz, thus the output of the offset mixer will be 2.925 MHz at this instant. The programmable divider will divide this down to 11.842 kHz. As this is a large difference from the reference frequency the output of the phase detector will be high, forcing the controlled oscillator to quickly change frequency.

When the controlled oscillator reaches 27.015 MHz, the output of the programmable divider will again be 10 kHz and the loop will be locked — all before you can say your first word!

When you switch to channel 2, the programmable divider will be set to divide by 248 and the whole process will be repeated — faster than you could run through the channels!

Advantages

The PLL synthesizer has many advantages over the old one-crystal-per-channel and heterodyne crystal synthesizers. The PLL synthesizer is a self-correcting device that cancels any 'drift' that may otherwise occur. The synthesizer requires only three crystals, greatly reducing the chances of crystal failure (a common fault in CB transceivers) and it allows more compact circuitry. Much of the circuitry of the PLL synthesizer may be (and is) incorporated in integrated circuits.



CB NEW ZEALAND

REPRINT FROM CB AUSTRALIA

While we in the UK are hoping for a CB system over the other side of the World, New Zealand is proof that early legality need not give rise to an ideal system. John Gaines explains.

In New Zealand tens of thousands of CB sets are in daily, and quite legal, use. But not on the frequencies at the lower end of 27 MHz. Citizen's Band has been allocated 26.5 MHz because 27 MHz is an industrial, scientific and medical band used for diathermies, industrial welders, and telemetry.

The original frequency allocated was 465 MHz, back in the 1950s, but there were no sets available for this frequency, no interest and no licences were ever issued.

On 24 March 1961 the Director-General of the New Zealand Post Office issued a statement that it had been decided to allocate the additional frequency of 26.5 MHz for use in the Citizen Radio Service.

Sets had to be type approved by the Post Office and this is now a detailed specification, RTA23.

In August 1963 additional frequencies were allocated, 26.425, 26.450, 26.475, 26.525, 26.550 and 26.575 MHz. The complaint now is there aren't enough frequencies as compared with the American's 23, and now 40, and that the New Zealand Government created the 7 channels and then in biblical fashion rested.

The first set approved for use was the Heathkit GW10 on 16 October 1961, conditional on the whip aerial not exceeding 10 feet. There are now 121 different brands and types of set approved. Foreign brands abound but usually the power has to be cut and facilities such as tone calling disabled.

Most sets in use are locally manufactured, though possession of an American set has prestige, especially if it is over-powered. Piracy is rife. After all, it's probably more fun to operate without a licence, using a fictitious callsign, with a set running 5 watts instead of the permitted half watt, in the delicious anticipation that a Radio Inspector or Roger India will suddenly knock at the door with all the weight of the Radio Regulations behind him.

To be legal costs six dollars a year for the licence. You have to be British, which in New Zealand is officialese for being a New Zealand citizen.

A callsign is allocated to each set licensed. There is a two-letter district prefix, such as AK, the abbreviation for Auckland, followed by a number which runs from 1 for the first set licensed up into the thousands now. The full callsign has to be announced at the commencment and the end of each transmission and at least every 5 minutes during lengthy transmissions. Calls must be directed only to specific stations in the citizens Service. General calls to all stations, (ie CQ calls) are not to be made except in emergencies.

Communication with stations outside New Zealand is not permitted, the sets being licensed only for contact between similar stations in New Zealand.

The transmission of news, music or other entertainment or recordings of any kind on citizen channels is prohibited. That's quite a list of no-noes, but many official rules are ignored.

Technical Limitations

The maximum power is 0.5 watt. This is considered to be adequate to satisfy the short range communications requirement for which the service is intended. In addition, it permits a high degree of channel sharing with a minimum of interference between stations.

But for type approval, which costs twenty dollars, there are other conditons to be met. Some of them are:

Antenna The antenna shall preferably be an integral part of the equipment and may be either a monopole (with or without ground plan?) not exceeding 3 metres in length or a centre-fed dipole not exceeding 6 metres in length. The antenna may be separately mounted and fed by a non-radiating type of transmission line.

The radiating element may be helically wound, inductively loaded or folded to permit easier matching to the transmitter or transmission line but antennas employing parasitic elements to give greater gain than the above-mentioned types are not permitted.

Vertical polarisation must be used in all cases.

Environment The equipment shall meet the requirements of frequency tolerance, unwanted emissions and power output when tested over the range of temperatures between 5 degrees Centigrade and 30 degrees Centigrade with the following supply voltage variations:
(a) Mains operated equipment:— + 10%
(b) Lead-acid battery operated equipment:— 1.8V to 2.3V per cell.
(c) Other power sources:— Maximum possible operating voltage at which the equipment fails to operate.

Frequency Tolerance + 0.005% of the nominal frequency.

Unwanted Emissions With no modulation or when a loud talker speaks into the microphone the peak level of any discrete components in the RF output spectrum outside of either 10 kHz below or 10 kHz above the carrier frequency shall not exceed —40 dB relative to the carrier power except that components which are harmonics of the carrier frequency shall not exceed —30 dB relative to the carrier power.

Power Output The RF power output when the transmitter is modulated with a sinusoidal tone to the maximum depth obtainable shall not exceed 500 mW.

But when the overseas traveller comes up to the Radio Inspector's office counter with a pair of CB sets he's bought cheap in the States he's often in touble. The duty-free dealer didn't tell him he needed a licence or type approval, small matter to him.

Often they can't be licensed. For the twenty dollars the Post Office will look at them for type approval, but they perhaps won't comply, unwanted emissions being where the cheaper sets often fall down.

Licensees are not allowed to modify their equipment in any way. The replacement of transistors by types no longer available, or which might have given trouble in some brands (as has happened) is not looked at with favour. It's possible to put switches in for multi-channel use on single or dual-channel early-model sets — but it still has to be looked over by the local Radio Inspector.

NZ Sets and Prices
Local sets are Airlane, Autocrat, Telstat, Tait. Typical of current prices is the Tait CB4. The basic unit is £100, mains power unit £25, portable kit and helical whip £12, mobile cradle £6, mobile speaker £6, gutter grip helical antenna £15, crystals per pair £3, ground plane antenna for base station £25.

Every Radio Inspector's Office in NZ, all 17 of them, has a safe full of CB sets that have been taken into custody, for illegal operations, illegally modified for high power or illegally modified for use on 27 MHz.

The sunspot cycle is at a low point, and skip is not very prevalent; but now we're into the upswing and as the higher frequencies open up skip will become more common and it's a temptation for New Zealanders when 26 MHz CBers can be heard to buy 27 MHz crystals — any bicycle shop can provide them.

Bike shops often sell CB sets, maybe because bicycles haven't been good business. A simple solder job, a retune and there we are talking to Australia and it doesn't cost a dollar fifty a minute which the NZPO asks for the use of its telephone system. This is Buck Rogers stuff, now. And after all the radio spectrum belongs to the people of the world, not a monolithic government department!

And to hell with the International Telecommunications Union which lays down the world-wide rules for communications. We aren't doing any harm. And when a CBer is prosecuted the judge looks at the defendant and his tiny CB set and asks mildly what is the harm? It's sometimes difficult to convince the court that a serious offence has been committed. After all, it's not muder. No worse than parking over the allotted time on a meter. Or speeding. Everybody does it. The crime is to get caught.

Policing of the New Zealand Citizens Band has been helped by the Australian authorities going back for many years.

Way back in 1969, reports from monitoring stations and from other sources had revealed that unlicensed Australian stations had formed an organised but illegal group of radio hobbyists who inter-communicated sporadically and who were most careful during transmissions to disguise both their identity and their location. A large number of these contacts were with New Zealand stations.

To complete the legal, or illegal, QSO, QSL cards are available in New Zealand. For postcard size, minimum order 300, cost £4.

Aerial housie games were once played by up to 64 members of the Taranaki Citizens Band Club — until they were closed down by the Roger Indias.

There has been introduced into New Zealand as in Australia, a Novice Amateur Examination with a simple technical content and a slow morse test at only 6 words a minute which the New Zealand Association of Radio Transmitters, the equivalent of the WIA, hopes will provide for CBers who want to make the transition to the 'real world of radio'.

There are CB clubs and groups in most places, some taking their name from the town or city, others with names like 'Socially 11 Metres', 'Windy City CB Radio', 'Good Guys CB Social Group'.

CB people have banded together into groups such as IMPACT — Integrated Mobile Public Assistance Communications Team — to act as a link in the case of auto accidents, to assist CBers and others in the case of fire, earthquake or other natural disaster, to assist police to get word in case of crimes seen by CBers and any other form of assistance where life or property is at risk.

But at least New Zealand does have a CB service, and half a watt is better than no watt, to paraphrase, even if there is no butter or jam on the slice doled out.

AVOIDING TVI

Tennessee valley indians or television interference — TVI for short — can be a bit of a problem to CB installations. The fault does not lie wholly with the transmitter, nor wholly with the TV receiver.

TV receivers are not really made to cope with strong RF signals close by, even if they may be far removed in frequency. In short, the TV tuner can only take so much, and at some point it will have 'had it up to here' and it overloads and passes the strong signal onto the rest of the TV circuitry. The resultant interference usually manifests itself as black lines or streaks that move about the picture as you talk, or modulate the transmitter. The sound system may even be effected, your transmission 'breaking through' and being heard on the TV set loudspeaker.

This situation usually applies to TV sets located very close to a CB transceiver, such as in the same house as a home or base station.

How do you cure this problem, or avoid it if possible? Well, there are several ways. Firstly, mount the CB antenna as far away as possible from the TV antenna, and higher than it if you can. Don't mount the CB antenna in the 'line of fire' of the TV antenna; ie: in the line between the TV antenna and the TV station. A 'high pass filter' can be obtained from a TV accessories supplier and fitted to the antenna terminals of the TV set. It is also a good idea to have a coax feedline for the TV as much of the pick-up comes from ribbon feeder widely used on TV antenna installations. Be sure to use 'baluns' at either end. The coax and baluns can be obtained from many electronics parts suppliers or from TV accessories suppliers. Connecting instructions are supplied by the manufacturers.

Ensure that the connections at the TV antenna are properly made and not badly corroded. Clean them up if they are. A properly connected TV antenna and feeder are a must.

Trapping for TVI

These steps usually make a remarkable difference to TVI on a TV set located close to a CB installation. In persistent cases, a 'trap' which prevents 27 MHz transmissions from reaching the TV tuner will have to be obtained and fitted to the antenna terminals of the TV set. Unfortunately, these are not generally available at present and it would be best to call on the assistance of someone you know who is technically competent to fit one for you. Fortunately, these cases are not common.

Well, that largely takes care of the TV set. Now; what about the CB installation?

CB transmitters aren't perfect and they do produce some output that is within the frequency range of TV sets and FM tuners. These 'spurious' outputs may only be very weak, but they are there and neighbouring TV and FM receivers may pick them up. Interference is the result. It is a fact that it is impossible to get rid of them altogether — but you can make them so weak that they would be unlikely to cause any trouble!

How do you do that? Well, a device called a 'low pass filter' can be obtained and this allows the 27 MHz signals to pass to and from your transceiver without affecting them, but it reduces any spurious outputs above 27 MHz by a large amount.

Low pass filters range in price from around £5 to £15. Connect one as shown in Figure 1. It should be connected with a short patch cable, the shorter the better. It does not matter which of the filter sockets is connected to the transceiver or the antenna.

A coupler can also assist in reducing spurious outputs from the transmitter. If you use a low pass filter, it should be the closest accessory connected after it.

Ensure that all connectors are properly attached; any loose or corroded joints will certainly aggravate any problems, if not cause TVI.

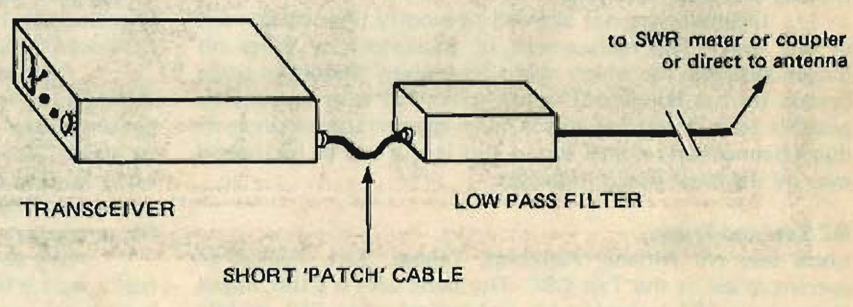
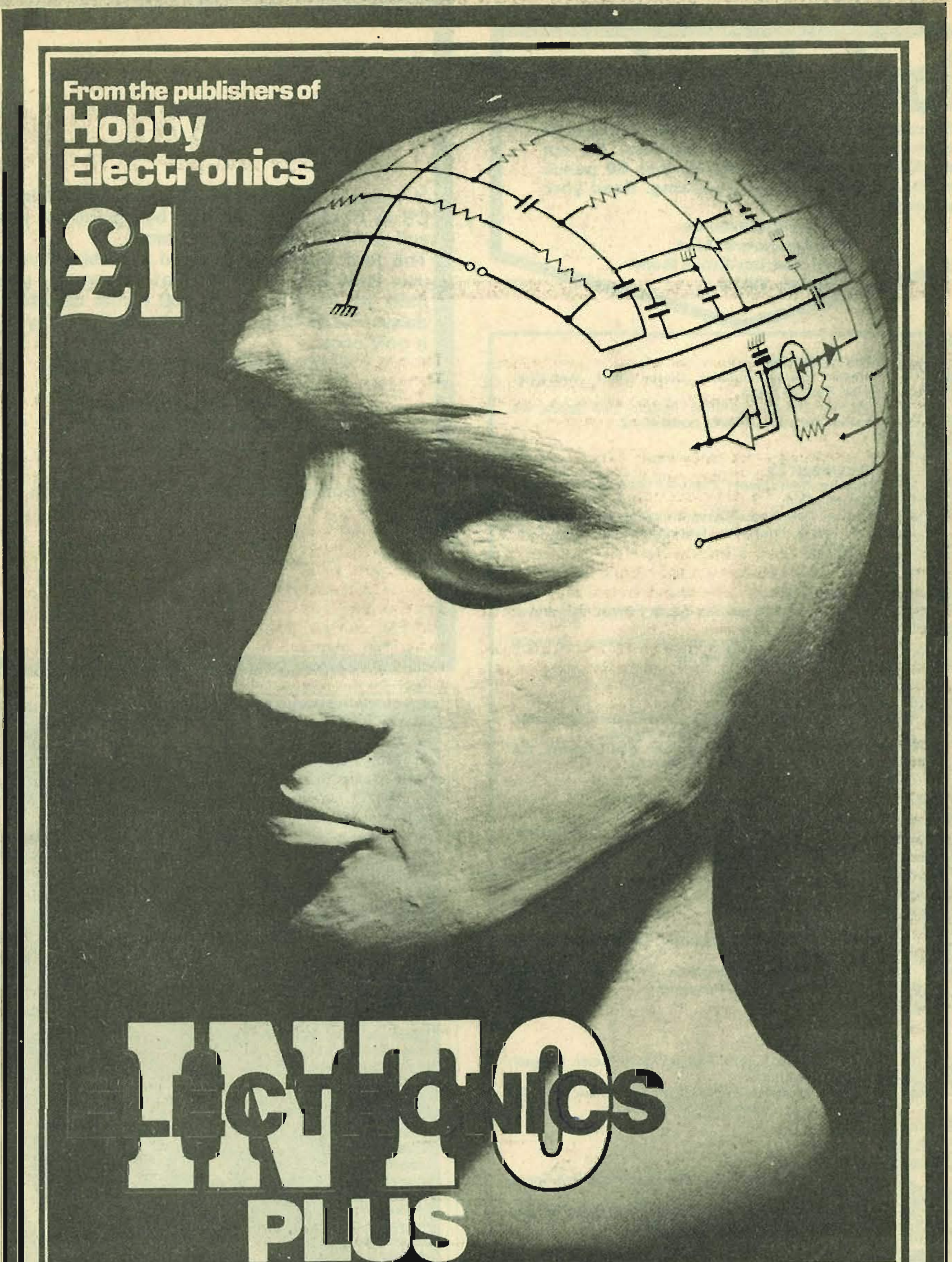


Fig. 1. Connecting a low-pass filter to a CB transceiver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If you support our campaign for the legislation of CB in Britain you can help by signing our petition and getting others to do the same.
This form originally appeared in Hobby Electronics July issue and at the time of this special going to press we have nearly 10,000 names despite postal delays. Please help us to retain credibility by signing it only once.

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PETITION

TO: THE HOME SECRETARY

We, the undersigned, hereby petition Her Majesty's Government to introduce legislation to permit the use of a radio system similar to that commonly referred to as "Citizens Band" as permitted in the majority of western democratic nations.

We appreciate that such a system would have to be allocated frequencies which would not interfere with existing users and that adequate control would have to be exercised to prevent misuse or abuse.

Note to signatories: We will feel unable to pass on any forms with anything other than legitimate signatures. If we suspect misuse we shall invalidate the entire form in order to maintain credibility.

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CB ACCESSORIES

REPRINT FROM CB AUSTRALIA

Roger Harrison looks at the current accessory scene in Australia, what you can buy and what it's good for.

Accessories for CB installations can be broken down into about four categories:

(a) **Antenna Accessories** such as connectors, patch cables coax switches, couplers, filters, etc.

(b) **Receiver Accessories** such as RF amplifiers, hash filters, converters, remote speakers, etc.

(c) **Transmitter Accessories** such as SWR meters, power meters, field strength meters, dummy loads, etc.

(d) **Operator Accessories** such as headphone/mic combinations, mic holders, transceiver mounts, power supplies, test sets and accessory operators(!) etc.

Accessories are items that are not necessarily essential for an installation but are usually convenient additions, or they extend the operating convenience, or they allow checking of the equipment performance, etc. It's possible to spend more on accessories than you paid for your transceiver!

Exactly what you get in accessories depends greatly on individual circumstances. You may have to get some accessories because you find they are necessary — a low pass filter, for example, to prevent TVI (or help anyway). Some accessories are simply 'dressing' and could never be envisaged as 'necessary', while others simply improve the convenience of an installation.

Whatever your excuse, or perhaps your need, browse through the survey and you'll get an idea of what's around.

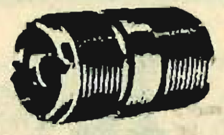
Antenna Accessories

The simplest of antenna accessories are probably the humble connectors. Apart from the common-or-garden-variety PL-259 plug, there are a whole host plug/socket 'adaptors' (as they are called). These are useful in situations that suggest themselves when you don't have them on hand. I tell you — Murphy and his crazy laws sure get around!! There you are, you've just put the finishing touches to installing the transceiver in your new car — it fits great. Now just plug the antenna in and give it a burl . . . but the connector won't go in the socket — there isn't enough clearance at the back of the set (even if the set is removed and the antenna plugged in before mounting the transceiver). Call Murphy the magic word. And then get a 'right angle adaptor', put that on the transceiver antenna socket first — the antenna can then be plugged in from below. A right angle adaptor is simply a PL-259 plug, a right angle bend and then an SO-239 socket. Handy, no?

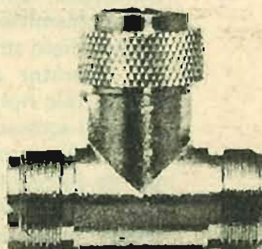
The common connectors/adaptors are illustrated in Figure 1. It is wise to keep a selection on hand. Most are quite cheap, so it won't break the bank to stock up.

Coaxial switches are often used in base station installations so that the operator can select different antennas, or perhaps switch between an antenna and dummy load/power meter to check transmitter performance. Alternatively, it may be used to switch an antenna between several transceivers or between a transceiver and a monitor or scanning receiver.

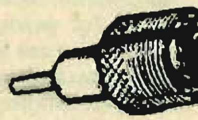
Right angle adaptors. Just the thing for 'dressing' coax in convenient directions or where space is limited behind a rig.



Double-female adaptor. Generally used as a cable joiner. Useful where a cable needs to be 'broken' to permit the insertion of an SWR/Power meter or other, not permanently installed, accessories.



'T'-connector. Often used with co-phased antenna installations. Can be used as cable-joiner in emergencies.



"UHF" to "RCA" adaptor. Standard RCA plug with standard ("UHF" series) SO-239 socket on back. Useful on accessories fitted with RCA sockets. Standard PL-259 plug fits into SO-239 socket.

Fig. 1. Common connectors/adaptors.

Coaxial switches are available in several combinations. Perhaps the most common, and certainly the least expensive, are the single-pole, two-way (or two-position) variety. Several are illustrated in Figure 2. Some types come with a rotary switch, some with a slide switch.

What do you do when your antenna won't match? Why, you get a matchbox of course!! Now, there are a whole variety of devices on the market that will purportedly match a cranky transceiver to anything you can conjure up. Well, not quite perhaps, but you get my drift. They can be useful. For installations where there is not a long feedline run to the antenna, these devices can be quite useful where the antenna either refuses to be matched and produce an SWR within reason, or where the antenna has no provision for adjustment.

These devices go under a whole variety of names such as 'matchers', 'couplers', 'antenna eliminator' (I know it's crazy but it really says that!) and the ubiquitous 'black box'.

Basically, they consist of circuitry that adjusts the antenna feedline system for optimum resonance and matching to the correct impedance (50 ohms) to suit the transceiver. Some types may include an SWR/power meter for convenience. Various different types are illustrated in Figure 3. If you really want to go to town, you can pay more for a coupler than for a transceiver (people do!?!) — as the

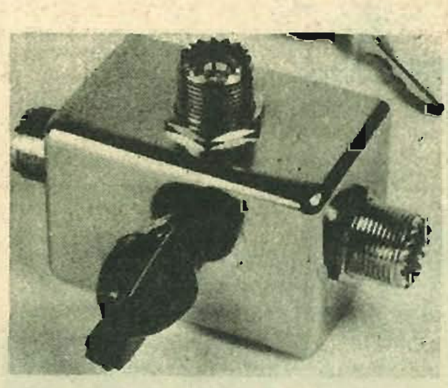
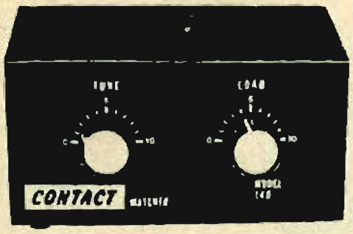
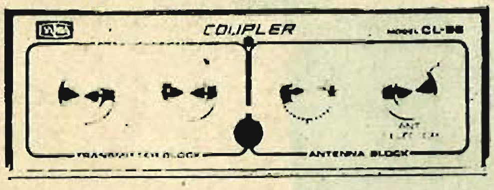


Fig. 2. Typical coaxial switches of the single-pole, two-way variety.



The simpler type of antenna matching devices generally include two controls: 'tune' and 'load' to effect correct resonance and matching of the antenna and feedline system.



Somewhat more sophisticated is this Model CL-66 coupler by Daiwa. It is claimed to cover 3.5 MHz to 29 MHz and to match 10 through 600 ohms (unbalanced) to 50-70 ohms. It includes a four position coax switch.

This deluxe model, also by Daiwa, includes an SWR and power meter. It also covers similar ranges as the CL-66 More useful for amateurs really.

The 'antenna eliminator'; similar units referred to as 'black box', for obvious reasons. These allow you to use a standard car radio antenna for CB. They permit both the transceiver and the car radio to be plugged in at the same time. The car radio is disconnected by the internal circuitry when you go to transmit. Some provide a tuning knob to obtain best match (low SWR) while others are pre-set.

Fig. 3. A variety of antenna matching or coupling devices.

Daiwa models from VICOM in Figure 3 show. These types would be more use to amateurs, though.

The 'antenna eliminator' type is really a matching and tuning system for standard car radio antennas. They permit the car radio and transceiver to be connected to the antenna simultaneously. Internal circuitry disconnects the car radio from the circuit when you go to transmit. Some types are simply a 'black box' without adjustments and these are preset. Other types include a knob to allow adjustment of the tuning for best SWR. Sounds alright – but tempting for the inevitable 'knob twiddler' – mount this type out of their way.

There are a number of other antenna couplers about but they are generally for the amateur market and their operating features, etc, are geared that way. However, that does not mean to say that they are unsuitable for CB applications.

One advantage that goes along with the use of a coupler (except perhaps for the antenna eliminator variety) is the reduction of harmonics from the transmitter (weak transmissions from the transmitter 2,3,4, etc, times the actual transmit frequency, generated in the transmitter circuitry). Harmonics can cause TVI. The very nature of the tuned circuits generally employed in couplers/matchers effects the reduction.

If you don't use a coupler or matching device, or even if you do, it is a wise precaution to fit a 'low pass filter' in the feedline. This, as its name implies passes all frequencies below a given 'cutoff' frequency, usually around 34-36 MHz. It attenuates (severely reduces) any signals or trans-

Fig. 4. An ATU, (Aerial Tuner Unit) used to math the impedance of rig to aerial.

missions above the cutoff frequency. Harmonics from 27 MHz transmissions fall at 54 MHz, 81 MHz (in low-band VHF land mobile service), and 108 MHz (top end of FM band); these would probably be the strongest (2nd, 3rd and 4th harmonics). Some sets are worse than others regarding the radiation of harmonics.

Low pass filters should be installed close to the set with as short a length of feedline between the transceiver and the filter as possible. If you have a good quality transceiver ('top of the line', particularly an SSB transceiver) then one of the less expensive filters will probably be sufficient as the more expensive transceivers generally have lower harmonic output, than the economy transceivers. For the latter, one of the more expensive filters, which provides higher degree of attenuation to harmonics, is a safer bet. Funny that, isn't it!

Now, to plug all your accessories in the feedline to the antenna you're going to need a short length of cable with two PL-259 plugs on each end – a 'patch' cable. These are quite inexpensive and can be obtained in a variety of lengths, generally 0.5m, 0.6m and 1m. Cost depends on length and varies from distributor to distributor.

Apart from patch cables, 'adaptor' leads and cable/connector sets are available. An adaptor lead consists of a length of RG58 coax with a PL-259 connector on one end and a set of spade lugs attached to the inner conductor and braid at the other end. They are often used for installing antennas, particularly those that comes without a cable.

A cable and connector set generally consists of a 3 m or 4 m length of RG58, a pair of PL-259 connectors (usually the solderless or crimp-on type), and a set of spade lugs. They come in handy when installing antennas as they can be made up in the same manner as an adaptor cable. They are also useful as a feedline extension cable, using double-female connectors to 'splice' in the extension.

Before leaving antenna accessories, we should mention coaxial lightning arresters. These are inserted in the feedline to prevent damage to the transceiver etc during electrical storms when high voltages are induced on antennas – this situation is usually worse with base station antennas as they are generally mounted much higher than mobile or marine antennas. Even if lightning does not strike nearby, quite high voltage may build up on the antenna. If they discharge through the transceiver's receiver input circuitry then it may be damaged. The lightning arrestor will cause these high voltages to be passed to earth without harm to the transceiver – if installed according to instructions. They will not protect against a direct strike.

Receiver Accessories

To improve receiver performance an RF amplifier may be connected in the antenna lead to boost the strength of the signals. These are useful where only an inefficient antenna system can be used, which affects receiver performance. Unfortunately, while you can 'hot-up' the receiver like this and hear all those signals you couldn't copy previously, transmitting efficiency is still poor.

The 'RF Signalizer' model Rp-10 is a typical device for these sort of applications. It includes a very handy 'RF Gain' control that allows the operator to vary the sensitivity of the unit over a range from full gain of 15 dB (amplification of about 30) to an attenuation of 20 dB (attenuation

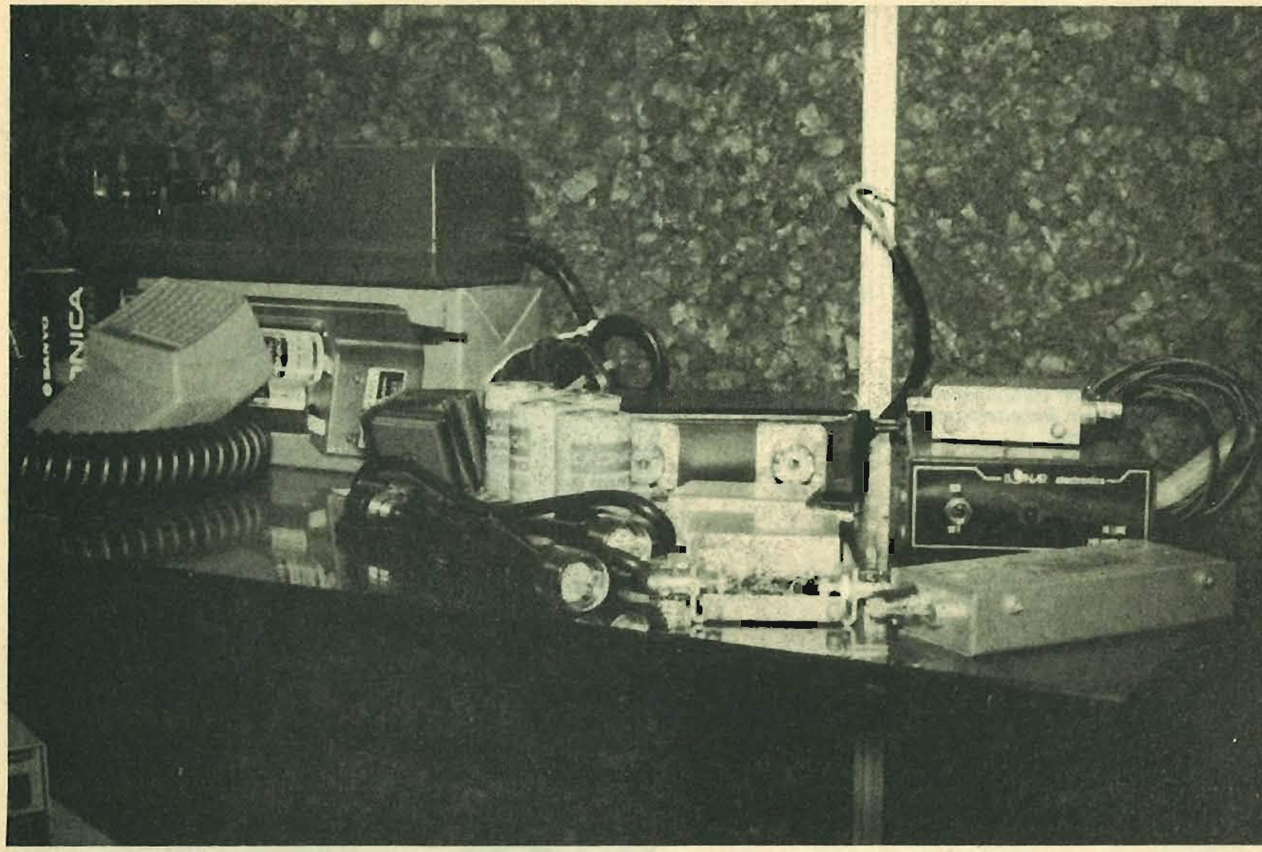


Fig. 5. A small selection of accessories as found in any Australian spares shop.

of 100). This permits you to adjust for maximum gain on weak signals and lets you reduce the gain for strong local signals that would normally overload the receiver in your rig.

A popular 'accessory', if it could be classed as such, is a CB converter. Intended for mobile operation, these convert CB band signals down to the broadcast band range so that you can hear them in a clear spot on your car radio antenna and connects into the antenna feedline between the antenna and car radio. A front panel switch is included to switch it out and the car radio to normal operation.

A remote speaker can improve intelligibility of received signals (but not the intelligence of the other operator, more's the pity too often!) as the loudspeakers used in most CB rigs are quite small. In addition, the rig's speaker is often obscured somewhat (depending on the mounting position of the transceiver) and the actual sound output is restricted. A remote speaker can make quite a difference. Figure 6 shows two typical remote speakers. The square one is best suited to installation in a car and can be mounted either under a dash or on top of it – or any other convenient place. Remote speakers are also very handy in base station installations. The horn speaker is weatherproof and ideal for mounting in a boat installation. Make sure you get a weatherproof type and not a 'weather-resistant' type (unless it can be mounted in a sheltered position).

Getting rid of hash generated by a vehicle's electrical system, even if the ignition system is fitted with suppression components' Often it is conducted via the battery connections to the transceiver. Such cases call for a 'hot line filter'. It consists simply of an iron-cored inductance and a

Fig. 6. Typical remote speakers. The one on the left is best suited to cars whereas the horn speaker on the right is weatherproof and best suited to boats.

large value capacitor. It is connected in the 'hot' lead (i.e: the un-earthed lead) from the transceiver to the vehicle battery. The sort of components supplied are illustrated in Figure 7 and they should be connected in accordance with the instructions supplied. In addition to reducing ignition system noise conducted via the power lead these devices also reduce alternator/generator hash that is often conducted along the same path. As they are usually constructed to operate on currents up to 20A, one filter can be used for several appliances.

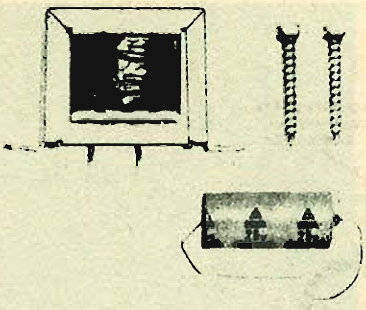


Fig. 7. 'Hot Line Filter' components to reduce ignition system and alternator noise in transceivers etc.

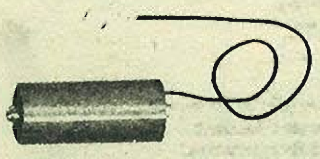


Fig. 8. A coaxial capacitor suitable for suppressing alternator whine and other noises. It is installed as close as possible to the 'hot' output terminal of the alternator.

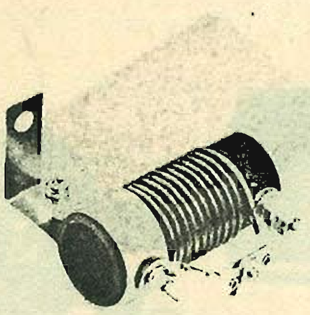


Fig. 9. A generator hash suppressor. It should be installed close to the generator and connected in series with the 'hot' lead from the generator. The trimmer is tuned to minimise hash in the receiver.

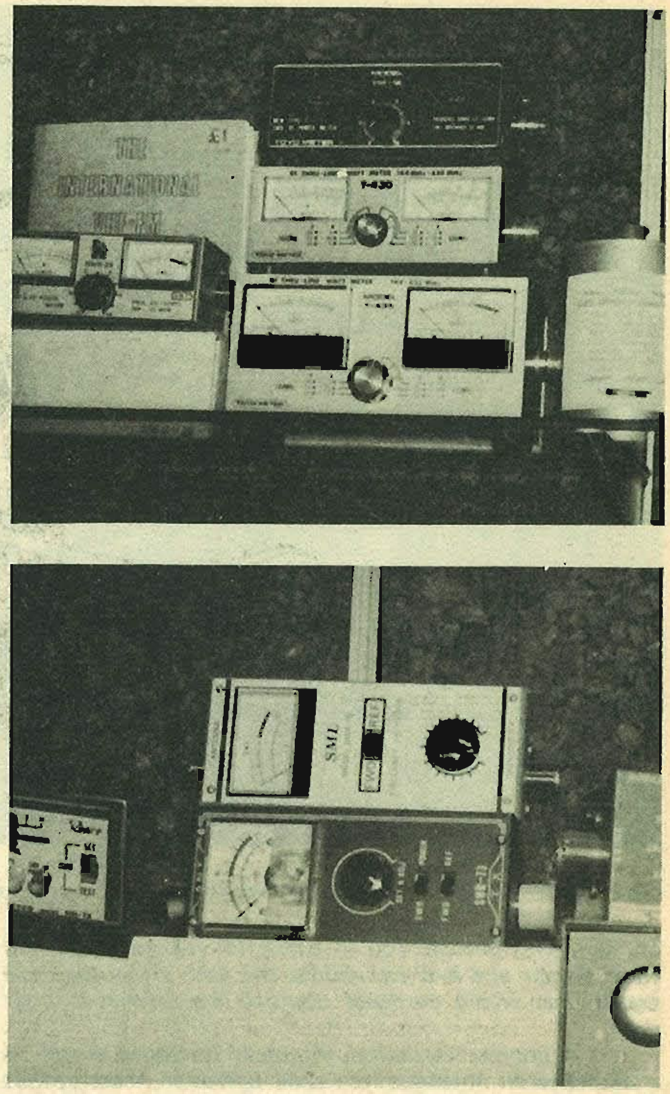


Fig. 11. SWR and Power meters. The instruments in the upper photo are designed to read relative power outputs and/or Standing Wave ratios. The lower pair are purely SWR meters, both have the facility to measure field strength via a short external antenna.

Alternators and generators produce electrical noise that can be troublesome to eliminate and can severely interfere with clear reception – even on strong signals. This sort of noise sometimes appears on transmission as well! A coaxial capacitor, such as the one illustrated in Figure 9 is best for eliminating alternator whine and other noises. It should be installed as close as possible to the 'hot' output terminal of the alternator using as short a lead as possible.

Cars fitted with generators need a different sort of filter to reduce the electrical noise produced by the generator brushes – which can be quite considerable.

The generator filter illustrated in Figure 9 is a broadly tuned circuit that can be optimised to provide maximum noise reduction over a small band between 3 MHz and 30 MHz. It is suitable for any vehicle electrical system from 6 V to 24 V. It needs to be mounted as close as possible to the 'hot' output lead of the generator and connected with a short lead to the generator terminal. With the receiver on and the engine running somewhat above idle, the trimmer is adjusted to minimise any generator noise in the receiver.

Transmitter Accessories

The most common instrument used to check transmitter and antenna performance is the SWR meters is illustrated in Figure 10. Those types having a single meter are fitted with a 'Forward-Reverse' switch. The dual meter types have one

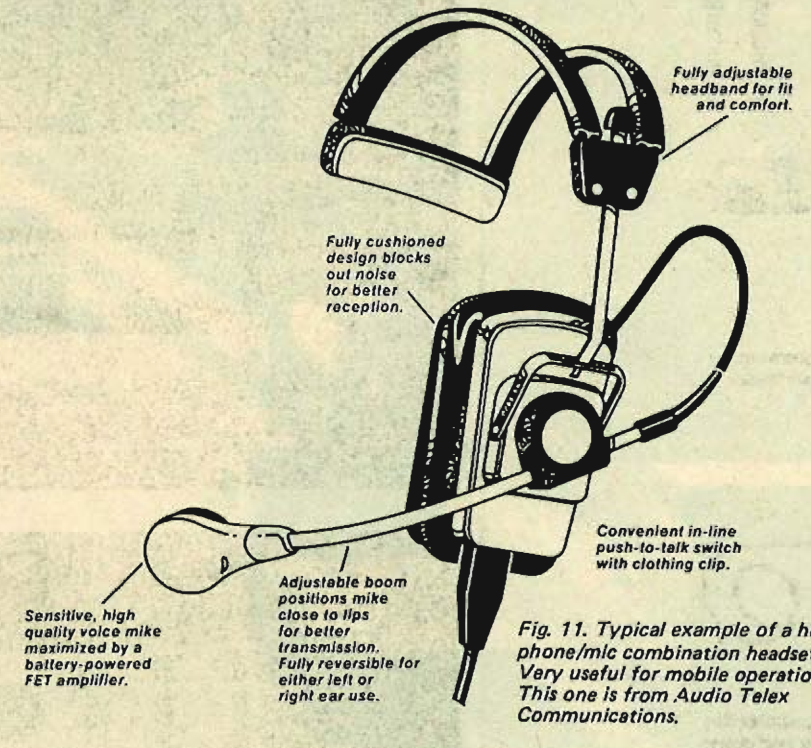


Fig. 11. Typical example of a headphone/mic combination headset. Very useful for mobile operation. This one is from Audio Telex Communications.

meter to measure forward energy and one to measure reflected energy, in order to obtain the standing wave ratio. All types have a 'sensitivity' control.

An SWR meter can be left permanently installed, if convenient, so that the performance of the transmitter and antenna system may be constantly monitored.

The power measurement facility on many SWR meters is very handy, but an accurate reading can only be obtained when the transmitter is connected to a dummy load via the SWR/power meter (unless the SWR is fairly low, say 1.5:1, or less). It is best to get one that has a5 W or a 10 W scale. Trying to read 3 W or 4 W on a 20 W or 50 W scale is somewhat difficult, as you may appreciate.

Field Strength meters are useful for checking that an antenna is really radiating and they allow comparisons to be made between antennas operated under similar conditions. You can also get a rough idea of the radiation pattern of your mobile antenna. Park your car in a large, open space and, maintaining a constant distance from the vehicle, walk around it in a circle noting relative signal strength readings at a number of points. This can then be plotted up on a graph. The field strength meter sensitivity should be set at some arbitrary point first, by trial and error if necessary, and then not touched.

A very handy accessory when checking a transceiver's performance is a 'dummy load'. It is simply a small power resistor of 50 ohms mounted in a PL-259 fitting. Some types add a small light that turns on when you transmit and which flickers to indicate modulation when you talk. On SSB, it will only light up when you talk – or something is very wrong!

The advantage of a dummy load is that it provides a load of correct impedance (no standing waves) and does not radiate (or pick up signals!) while tests are being conducted.

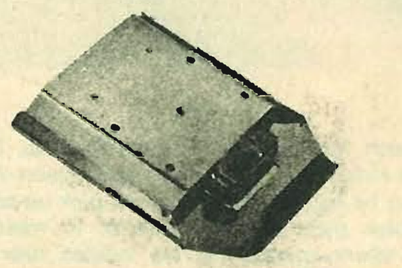
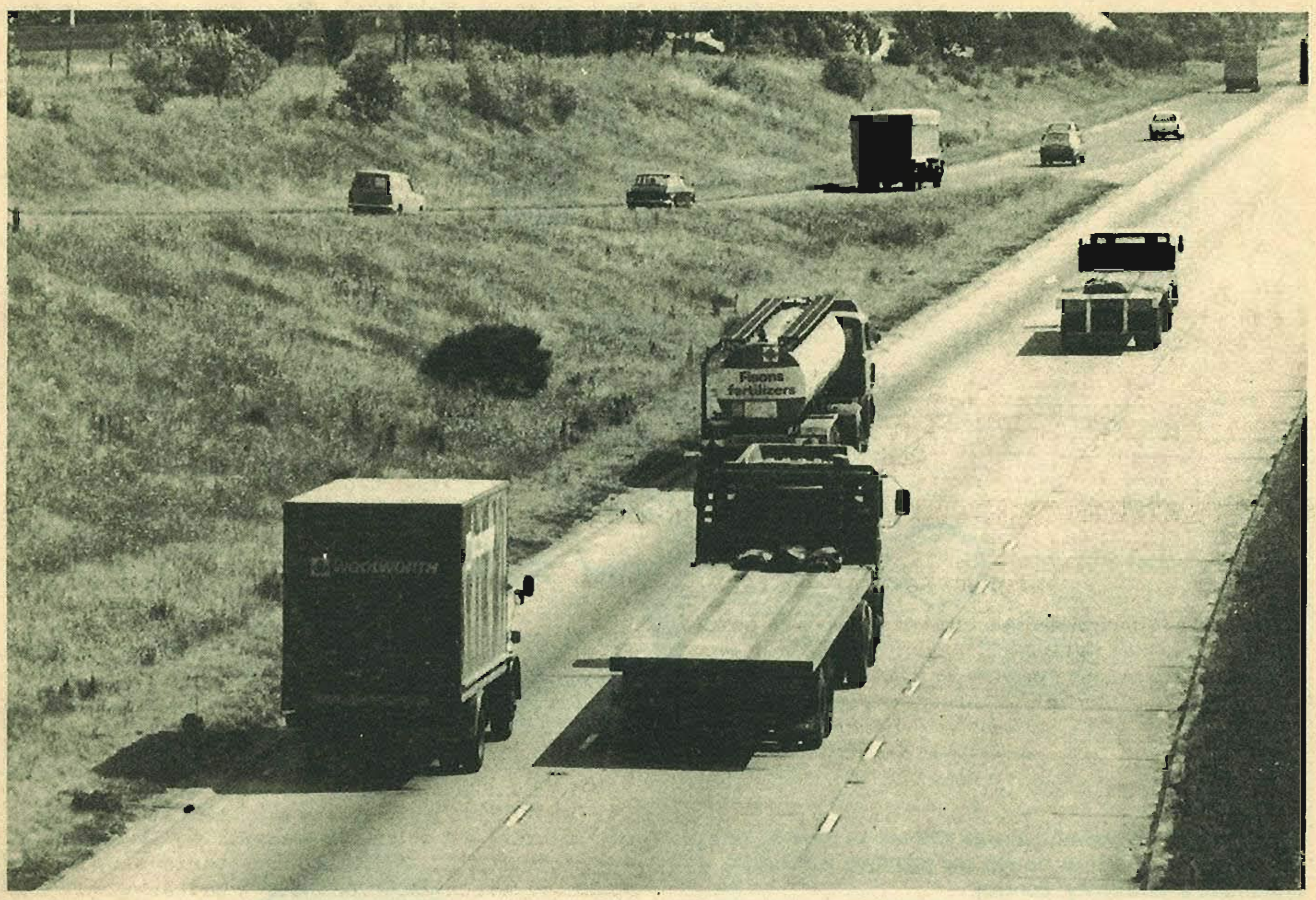


Fig. 12. One type of transceiver mount that allows the transceiver to be locked in and out of the mount easily for storage or portability away from a boat or car.

Operator Accessories

About the most useful operator accessory is an accessory operator! Capital outlay is virtually nil but upkeep and maintenance costs may stretch the budget on occasions. They are readily available – you don't even have to go down to your local CB shop to get one. The choice is yours.

A useful accessory in high noise situations, such as mobile, is a combination headphone/mic. A typical example is illustrated in Figure 11. It consists of a single headphone (you're got to hear what is going on around you), a microphone on a short boom, positioned to one side of your mouth and an in-line push-to-talk switch that can be clipped to your clothing. This feature is convenient as you don't



have to reach for the usual push-button mic. The earphone blocks out external noises to give you clearer reception and the mic can be located for best voice pick up and least background noise pick up. Very useful in multiple-operator situations where transceivers are located near other transceivers, telephones, etc.

Keep losing your mic because it falls on the floor from the seat beside you when you go around corners? Well get a mic holder and attach it to a convenient spot on the dash in front of you. Then the mic is within easy reach all the time.

There are two basic types available — the screw-on type and the magnetic type. Both are self-explanatory.

Having a transceiver permanently mounted in a boat or vehicle can be both an inconvenience and a risk. It is inconvenient to remove it if you want to use the equipment elsewhere and it is vulnerable to burglary.

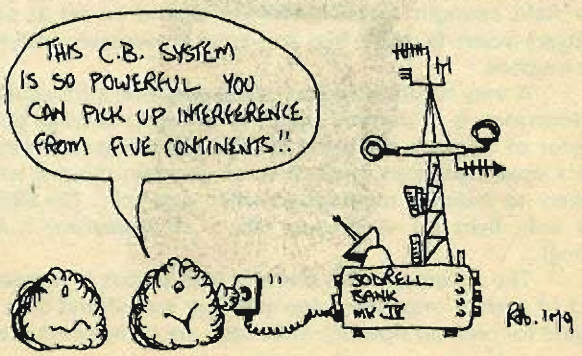
The solution is to mount the transceiver on a 'lock-in' mount that is permanently bolted to the vehicle or boat but allows the transceiver to be installed or removed easily for storage (out of harm's way) or for transporting the equipment to another place.

Most CB transceivers are designed to operate from a nominal 12 V supply, specifically a vehicle battery. However, if you want to use your mobile as a base station a suitable supply is necessary. Sure, you can keep a car battery under the kitchen table but they are bulky, heavy and somewhat of a nuisance in that situation. And how are you going to keep it charged?

Power supplies that deliver a fixed output at around 12 V, or, variable ones that can be set to the required voltage are suitable to power a mobile transceiver for a base station installation. It should be capable of delivering 3 A to 5 A, certainly no less than 2 A, if adequate performance is to be obtained.

Suitable power supplies are available that deliver a regulated fixed 12 V or so, or have a variable output, regulated, that can be varied between 0 V and 15 V.

Apart from the main sorts of accessories detailed in this article, other accessory components such as microphone, plugs and sockets, microphone 'curly' cords, in-line fuse holders, etc. etc., can be obtained from many outlets if you happen to need a replacement component for one of these items or if you wish to change one.



PROCESSOR CONTROLLED SSB/AM CB TRANSCEIVER

REPRINT FROM CB AUSTRALIA

We thought this review of an American (Texas) rig would be of interest to all those doubting Thomases who worry about the technical drawbacks associated with CB. Yes, even CB has been infiltrated by the microprocessor, the shape of things to come perhaps?

Earlier in 1977, Texas Instruments announced that they had developed the world's most advanced CB transceiver which incorporated two microprocessors in the circuitry along with a number of unique, and sophisticated, features.

As Texas Instruments have started something of a revolution in both ergonomic and electronic design with their transceivers, we thought you might like to have a look at what they're doing.

Two transceivers will be produced, using much the same circuitry but differently packaged. The mobile model, designated SM-172, will be a remote-control type having a transceiver section about the size of a hard-cover book that can be mounted anywhere out of sight.

The base model, the SB-173, will be quite unlike most bases.

Both models will be 40 channel SSB/AM transceivers to meet current FCC specifications.

The SM-172 appears to be the world's first remote-controlled SSB/AM transceiver. This type of transceiver has been AM only to date, and a number of manufacturers, like Hy-Gain, Johnson and Bowman, have been marketing remote rigs for some time.

The big, and revolutionary, feature of the TI rigs is the handset. It looks like an electronic calculator but contains all the controls and indications usually encountered on a CB transceiver — and then some!

A microprocessor in the handset sees to all the handset functions and 'communicates' with another in the transceiver which commands all the transceiver functions.

Memory storage facilities are available for a variety of unique functions designed into the TI transceivers.

The design of these transceivers and the incorporation of the microprocessors heralds the advance of push-button (computerised!) communications on CB removing the necessity for dial twisting constant control adjustments and the distraction of checking dials and indicators.

A unique feature of these TI rigs is the 'automatic clarifier'. Manual fine tuning is a thing of the past! This is of paramount importance on SSB where the clarifier on ordinary rigs is probably the single, most-used control.

When communicating between two TI rigs, clarifier adjustment is instant and automatic — don't touch a thing, the transceivers do it all themselves. When using a TI rig and

TEXAS INSTRUMENT'S SM-172 MOBILE & SB-173 BASE STATION 27 MHZ CB TRANSCEIVERS

SPECIFICATIONS

General:	
Frequency Range	26.965 – 27.405 MHz (40 channels)
Frequency Stability	± .002%
Supply Voltage	13.8 V pos. or neg. ground (reverse polarity protected)
Transceiver Protection	Dual fusing and automatic SWR protection
Transmitter:	
RF power output	4 watts (carrier), AM mode 12 watts PEP, SSB
Harmonic & Spurious suppression	greater than 60 dB
SSB Carrier suppression	40 dB
Audio Frequency response	300-2500 Hz @ -6dB
Audio Distortion	less than 5% at 1 kHz with 80% modulation
Modulation limiting	AM–20 dB audio compression SSB–16 dB RF ALC
Output impedance	50 ohms
Emission modes	AM, USB, LSB
Receiver:	
Input impedance	50 ohms
Sensitivity	0.6 uV, AM for 1kHz & 30% mod 0.4 uV SSB . . . both for 10 dB (S + N)/N ratio
Squelch threshold	4 uV min., 1000 uV max
Adjacent channel rejection	greater than 80 dB
Image rejection	greater than 60 dB
Crossmodulation rejection	75 dB at +50 kHz
AGC performance	less than 6dB change for greater than 100 dB change in input level
Audio output	3 watts (RMS) at less than 5% distortion, into 3 ohms
Noise blanker	separate receiver antenna sampler and IF gate

communicating with a conventional SSB rig, clarifier adjustment is available at the push of a button!

A selective calling system is provided in both transceiver models. Preselected channels can be monitored in complete silence until a call from a particular TI transceiver is received. Calls between the two units can then proceed.

The selective calling code and channel number can be entered into the transceiver's 'memory' via the handset keyboard pads. Up to 100,000 combinations can be stored for any of the channels giving the transceivers an enormous versatility.

This unique digital selective calling system of the TI transceivers virtually allows 'direct dialling' between rigs using the pre-selected codes. When in the selective calling mode, the receiver will remain silent until someone with another TI rig, with the appropriate code stored, calls on the channel.

The odds are millions to one against someone with the same combination calling within an operator's geographical range!

The five most-used call codes can be programmed into the processor memory so that they can be selected by pressing only one keyboard pad.

Both the mode of operation and the channel number can be incorporated in the call code.

Facilities to find a clear channel and a busy channel are also incorporated. The first allows rapid search for a clear channel when you want to QSY from a call channel. The busy channel facility allows you to find a contact already in progress that you can 'break'.

Transmit Features

The transmitter features an automatic level control (ALC) on SSB that provides 16 dB of RF compression to present flat-topping and maintain a high average-to-peak power level. This makes for a really punch SSB signal.

On AM, 20 dB of audio compression is provided to maintain high average modulation level with varying voice level.

A unique frequency-lock digital synthesizer is used to select channels. This is controlled by the transceiver microprocessor and incorporates the addition of an 'automatic clarifier'. We'll discuss this in detail later in the article.

In conjunction with the automatic clarifier, the receiver incorporates a digital-tunable charge-coupled device (CCD) filter that markedly improves reception and reduces adjacent channel rejection. More on this feature later too!

The Handset

The handset for the SM-172 and SB-173 contains all the operational controls, plus a five-digit LED channel and mode readout together with the microphone!

Styling is very similar to a small, hand-sized pocket calculator as it has twenty key pads for function selection and digital control and two rocket switches for volume and squelch operation.

A conventional bar on the side provides press-to-talk operation of the transmitter. Signal strength and SWR can also be displayed on the readout.

The squelch can be decreased in incremental steps by depressing the left hand end of the squelch rocker switch. It is increased by pressing the right hand end.

Similarly, the volume can be increased or decreased in increments by depressing the left or right hand ends of the volume rocker switch respectively.

Mode Selection

Four keypads along the top of the keyboard on the handset operate various functions. The two on the left are marked LB and UB. These select the SSB operating modes of upper sideband and lower sideband respectively. The two pads on the right increment the clarifier when communicating with non-TI transceivers.

Ten pads marked 0 to 9, as on a calculator keyboard, are used to enter channel numbers and selective call codes. To the right of these are a row of pads for the selection of other functions.

The one marked AM is obviously used to select the AM mode of operation.

Busy and Clear Channels

The CC and BC pads are to initiate the receiver to search for a clear channel (CC) or a busy channel (BC).

Their operation is as follows:

Say you've raised a station on the call channel and you're about to QSY (change channel). To find the nearest clear channel the CC key is held down. The receiver then scans until a clear channel is found. The digital readout indicates which channel it is. When the CC key is released, the receiver returns automatically to the channel you were on and you can then tell your contact which channel to QSY to.

Say you've broken down on the motorway and can't raise a station on the emergency channel. What you need to do is break in on an existing QSO. The busy channel is found holding down the BC key. The receiver then scans until the nearest busy channel is found, the digital readout indicating the channel on the numerical key pads and the transceiver will then move to that channel.

SWR Monitor

The SWR is monitored by the microprocessor in the transceiver and protection is provided in the event of a high SWR occuring on the feedline. This prevents transmitter damage that could be caused by severe antenna mismatch, broken cables, connections or damaged antenna.

Each time the PTT is pressed when you take an 'over', the SWR is instantly checked. If the SWR is above a certain value the transmitter is deactivated automatically and the processor alerts the operator by flashing "AAA AA" on the LED readout.

The SWR can be read at any time by pressing the SWR key. The SWR is then displayed on the LED readout.

Selective Call

The selective call numbers consist of the channel number and mode followed by five digits.

Selective calling works like this:

A particular channel and mode is selected and a five digit number. These are entered into the transceiver processor memory via the keyboard, on each transceiver.

For example, say channel 16 upper sideband is the desired channel and mode. The number 16 is punched up on the numeral keys followed by the UB key. Any random five digit number is then entered on the numeral keys — say, 74291.

If this combination is used in a base-mobile situation, the code is keyed into both transceivers. The base will monitor the selected channel (16) in silence, on USB. When the mobile wishes to call base the operator enters the code on the keyboard, presses the PTT, and calls. The base receiver squelch will open and the call will be heard.

Similarly, the base can call the mobile. If any other stations use the channel while both base and mobile are only monitoring, the calls will not be hard, and the operators will not be distracted by having to listen for calls not intended for their stations.

Up to five most-used codes can be entered into the transceiver processor's memory and recalled at the press of a single key. This saves having to punch out the complete code each time a call is made.

With the five digit numeral code used in the selective call feature, up to 100,000 combinations are possible *per channel, per mode!* That's 1.2×10^7 combinations!

You're in trouble if you forget the code! That's why the code memory facility is provided.

Inside the Transceivers

The transceivers apparently use two microprocessors from the TMS1000 series made by Texas Instrument's solid state manufacturing division.

They are four-bit, single chip microcomputers currently used in calculator, microwave oven and burglar alarm applications.

It is believed that Motorola are making a CMOS version of these microprocessors, thus making possible hand-held and portable CBs incorporating the sophistication of the SM-172 and SB-173 transceivers.

Automatic Clarifier and IF filter

The frequency synthesizer uses a unique frequency-lock system to effect automatic clarifier operation in the SSB mode. Working along with this is a special CCD 3rd-stage IF filter that is adjusted by the microprocessor once the signal is clarified to reduce the band-width, providing optimum signal tuning and greatly reducing adjacent channel signals.

The automatic clarifier works between two TI transceivers. When the PTT is pressed, a carrier-burst is transmitted just prior to when the operator speaks. The receiver of the other station detects the carrier-burst and computes the difference between the suppressed carrier of the transmission being received and the re-inserted carrier provided the receiver for resolving the SSB sign.

The processor then shifts the synthesizer frequency slightly, centreing the signal in the receiver IF passband and the re-inserted carrier is then virtually 'locked' to the suppressed carrier of the received transmission.

The receiver is a triple-conversion type, the third IF stage using a charge coupled device filter (CCD).

The CCD filter is a Fairchild invention developed for imaging, signal processing and memory applications in airborne radar. It is used in Texas Instrument's sophisticated airborne radars for computer tuned and controlled signal processing to enhance signal-to-noise ratios for optimum radar target detection systems.

The CCD filter in the 3rd IF of the TI CB receivers can be frequency and bandwidth tuned by the on-board microprocessor, to optimise signal-to-noise ratios and adjacent channel rejection on received signals.

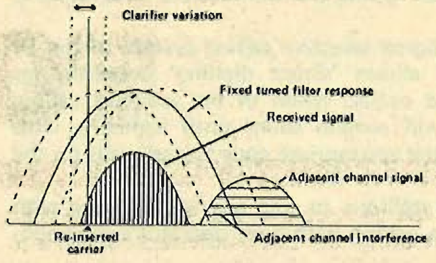
The action of the automatic clarifier and the digital tunable CCD IF filter are illustrated in Figure 2, compared with a conventional clarifier. Over 80 dB of rejection of adjacent channel signals is provided by the steep 'skirts' of the CCD filter. This compares very favourably with conventional CBs which generally have around 45-60 dB adjacent channel rejection only.

In a fraction of a second before voice communications commences, the signal is automatically clarified and the receiver bandwidth adjusted to provide optimum reception.

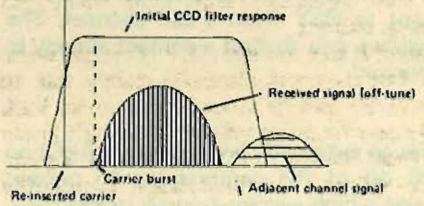
Pretty nifty, eh?

When are they going to make amateur band transceivers with these features?

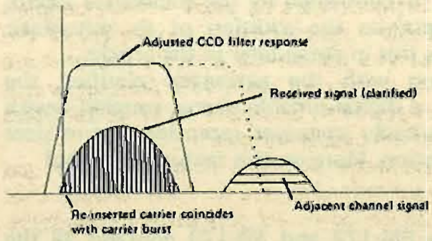
Fig.2. Comparison of conventional clarifier and T.I. system automatic clarifier and IF tuning.



(A) conventional clarifier and IF filter. Clarifier manually tunes Rx local oscillator to centre passband and re-inserted carrier on signal.



(B) T.I. system IF and clarifier. Carrier burst is detected and compared with re-inserted carrier. IF filter is 'wide' initially.



(C) Carrier burst locked with re-inserted carrier and filter adjusted. Adjacent channel interference reduced.

Noise Blanker

The noise blanker used in the TI CBs employs an antenna-sampling receiver. This is virtually a separate wideband receiver that is always connected to the antenna. Any noise pulses, car ignition, static etc, received are turned into a 'gating' pulse. This pulse operates a 'gate' in the receiver IF system that literally turns the receiver off for the duration of the noise pulse. The small 'hole' in the received signal goes unnoticed and no manual switching of the noise blanket system is necessary. It is equally effective on both AM and SSB.

This type of noise blanker is one of the most effective available.

The Future?

If that's the sort of high technology sophistication that's setting the pace in CB transceiver design — what does the future hold?

HOW TO WRITE TO YOUR MP

To get the law changed and C.B. legalised the most important thing that each individual can do is to write to his M.P. — and keep writing. M.P.s are very sensitive to their constituants feelings (or should be if they want to be elected next time round). This short article gives a few hints on how to make your letters as effective as possible. Most of the advice also applies to letters to the Prime Minister and the Home Secretary, which you should also send from time to time — they will not see them themselves but they will certainly know how many are received on any particular subject.

First of all — send it to your own M.P. You can write to other M.P.s as well but they will almost certainly talk to your M.P. about your letter and he would be made to look very foolish if he had never heard of you. If you don't know who your M.P. is the local library or Citizens Advice Bureau will certainly be able to tell you and the Police will probably know, too. Make sure that you get the spelling of his name, and his initials, correct as it annoys people when letters are badly addressed. Write to him at his home if you know the address, otherwise send it to him at: The House of Commons, London, SW1A 0AA.

Next; — make sure your own name and address are clearly on the letter. Signatures are no good — many people's signatures are unreadable — as membership secretary of the Citizens Band Association I get several letters a day that are quite clear — except that they are from A.G. Smudge or is it R.C. Smear — or perhaps N.K. Squiggle? so be certain that your name and address are clearly written.

Keep your first letter short — ask him to act to get the law on CB changed and give two or three reasons (not more) why this should be done. At this stage a long letter is likely to put him off.

If you have time it pays to look up your M.P. in the "Parliamentry Directory" or "Who's Who" — your library will have copies. You can then write giving a reason to legalise CB which will appeal to his particular interests: i.e. if he is a small-boat sailor you point out the benefits of CB to sailors, if he has been on a sub-committee on road mending you point out how road mending is done more efficiently and pleasantly with the aid of CB etc.

Any strong reason you have for needing CB should also be given — disabilities, isolated job etc.

In addition to arguments which are likely to appeal to you or your M.P. you could also give a mere general one — it saves lives on the road, or it saves petrol, or it increases VAT income and reduces unemployment. A number of such arguments are listed in a leaflet available from the Citizens Band Association (16, Church Road, St. Marks, Cheltenham) called "Why Have CB Radio?" which is available free of charge on receipt of a stamped addressed envelope (Large numbers of this leaflet cost 1p each).

Finally — write your letter. You can spend ages making it better and better but it will do no good at all if it is not written and posted — preferably with a first class stamp (your MP will not think a letter worth much if you can't be bothered to send it first class).

You will certainly get a reply. If it is just a card saying that your remarks have been noted write back at once saying that you don't just want notice — you want action and what is he going to do for CB in the U.K.

If you get a letter with reasons why we should not have CB — or containing a Home Office letter giving such reasons — write back with answers to the objections and see that you get a reply. If you get a letter saying that your letter has been sent to the Home Office for comment wait a month and write again asking what the Home Office's comment is.

In other words — one letter is fine but a continued correspondence is what gets results.

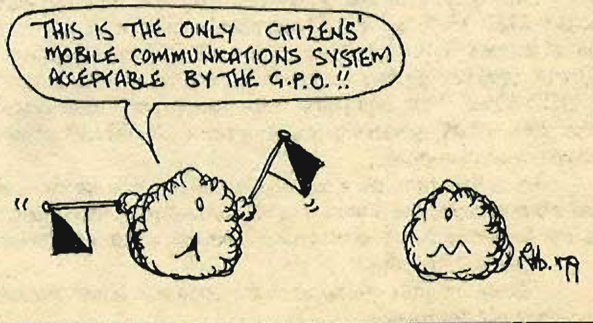
M.P.'s pay much more attention to individual letters than to the same letter received from a number of people so try to get all your family and friends to send their own letters. If this is not possible it is worth duplicating a formal letter (saying "Dear Mr. M.P., Please work to legalise CB Radio for the following reasons ———— ———— and ————") and getting a number of people to send it — WITH THEIR OWN NAME AND ADDRESS — to individual, NAMED, M.P.s Such a letter has less impact but is better than nothing.

The same is true for letters to the Prime Minister (The Rt.Hon Mrs.M.Thatcher, M.P. P.C., 10, Downing Street, London SW1) and the Home Secretary, (The Rt.Hon. W. Whitelaw, M.P. P.C., The House of Commons, London, S.W.1) — form letters are better than nothing but individual ones are far better.

So — write and keep writing. Demonstrations and petitions are fine, but they do not last. A steady stream of letters, to your M.P. to the Prime Minister and the Home Secretary and to any other M.P. who might be particularly interested in supporting CB is the best way that an individual can possibly hope to influence the Government — Don't wait until tomorrow — WRITE ONE NOW!

And another tomorrow as well.

Pamela Webster,
Membership Secretary, C.B.A.



THE ENGLISH DICTIONARY OF CB SLANG

As you will see the following pages contain examples of CB slang with their English translation. Unfortunately CB in the UK is still in its (illegal) infancy, so examples of truly English slang are few and far between. So we've taken this opportunity to put as many relevant US terms and as many English terms as we could find into what we believe is the first attempt in this country to establish a CB dictionary. At the end of the dictionary we've also included the much used (little understood) 10 code, the amateur Q-Code and a few other odds and ends that may come in useful, just in case CB is legalised.

ACE a CBer with a powerful transceiver, big antenna, and bigger ego, who thinks of himself as the number one channel master.
ADIOS goodbye, farewell, finished talking.
ADVERTISING flashing lights, antennas, numbers, etc., on a marked police car.
AFFIRMATIVE yes.
ALLIGATOR 1. a CBer who makes a transmission, but doesn't reply, "That cottonpickin' alligator is all mouth and no ears." 2. a linear amplifier.
ANCHOR MAN a base-station operator.
ANTENNA The aerial to which the transceiver is connected.
APA Aerial Pre-Amplifier, used in conjunction with a RF power amplifier (see Burner or Boots).
ATU Aerial Tuner Unit, device to give optimum matching between TX/RX and aerial.
BACK replying back.
BACKDOOR 1. last CB vehicle in a line of two or more, see CONVOY. 2. the road behind.
BACK DOOR CLOSED rear of convoy covered for police.
BACKGROUND interference noise heard on CB radio.
BACK OFF 1. stop transmitting. 2. slow down.
BACK OFF THE HAMMER slow down.
BACKSIDE return trip. "We's got the hammer down on the backside and we're heading for home-20."
BACK TO YOU used to let whomever you're talking to know it's his turn to talk, also COME BACK, COME ON, TAKE IT BACK, BRING IT BACK.
BACKSTROKE return trip.
BAD SCENE cluttered CB channel.
BALLET DANCER CB antenna blowing in the wind, especially a center or top-loaded antenna.
BAND BENDER single sideband user.
BAREFOOT operating a CB within legal power limit. "I'm running barefoot."
BAREFOOT MOBILE mobile CB rig with no extra power.
BASEMENT Channel 1.
BASE TWENTY The home of a CB operator.
BEAM a highly directional antenna.
BEAN STORE a restaurant.
BEAR BAIT a speeding vehicle without CB.
BEAR CAGE police station.
BEAR CAVE police station
BEAR IN THE AIR police helicopter or airplane.
BEARS ARE CRAWLING police are switching from one side of the road to the other.
BEAR REPORT request for information on police location.
BEAVER any female.
BEAVER HUNT looking for girls.

BETWEEN THE SHEETS sleeping.
BIG CIRCLE The North Circular Road in London.
BIG EARS clear reception.
BIG SWITCH the on/off switch on a CB.
BIG 10-4 absolutely, "I'm with you 100%."
BLEEPER BREAKER A coded bleep to signify the end of a transmission.
BLESSED EVENT a new CB rig.
BLOOD BANK ambulance.
BLOOD BOX same as above.
BOOTS linear amplifier or other illegal signal booster.
BRA BUSTER bosomy woman.
BREAKER a CBer who wants to come in on a channel, "Go ahead, BREAKER."
BREAKING THE OLD NEEDLE transmitting powerfully.
BRING IT BACK answer back.
BUBBLE GUM MACHINE any vehicle with flashing lights on top, usually a police car.
BUBBLE TROUBLE tyre problem.
BUCKET MOUTH a dirty talker who pollutes the airwaves.
BURNER A RF power amplifier, often with a power output in excess of 100 watts.
BUST Getting caught.
BUTTON PUSHER a person who pushes his microphone button without talking, thereby causing interference and/or preventing others from using the channel.
CAMERA police radar, (also Kodak). "There's a bear with a camera at Exit 20."
CARRIER a signal transmitted without modulation, see KEYING THE MIKE.
CB citizens radio band.
CHANNEL British/American CB utilises 40 separate channels.
CHECKING YOUR EYELIDS FOR PINHOLES a state of mind characterized by extreme fatigue.
CHECK THE SEAT COVERS look at the (female) occupants in a car.
CHICK woman, girl.
CHOPPED TOP 1. short antenna. 2. homosexual.
CHOPPER helicopter, usually with Smokies.
CLEANER CHANNEL channel with less interferance.
C'MON See Bring It Back etc.
COLORS GOING UP policeman turning on lights atop patrol car.
COME BACK "answer me," also COME HERE, COME ON.
COMING IN LOUD AND PROUD strong, clear reception.
COMING OUT THE WINDOWS perfect reception.
CONVOY a line of trucks in CB contact. The first truck is the FRONT DOOR. He SHAKES THE TREES and lets the vehicles behind know if there are any police or radar traps. The last truck is the BACK DOOR. He RAKES THE LEAVES and reports any police coming up from behind. The vehicles in between the doors ride in relative security in the ROCKING CHAIR position.
COPY to understand or receive a transmission, "Do you copy?"
COPYING THE MAIL 1. listening in on a conversation. 2. receiving a clear signal.
CUT THE COAX turn off the CB.
CUT SOME Z'S get some sleep.
DEAD KEY 1. a person who presses a microphone switch without talking, causing interferance. 2. a creep.
DF Direction Finding.
DIESEL DIGIT channel 19 truckers' channel.
DIG YOU OUT to understand, to pull in a signal through noise.
DO IT TO ME "answer me back," "come on."
DON'T FEED THE BEARS don't get a speeding ticket.
DOUGHNUT tyre.
DOWN AND GONE a sign off, turning off CB.
DOWN AND ON THE SIDE through talking, but monitoring
DO YOU COPY? "Do you understand?"
DX long distance. DXing means long-distance transmitting.
EARS 1. CB radio. 2. antennas.
EARS ON CB radio turned on.
EARWIG Listening in to a conversation.
EASY CHAIR CB vehicles in middle of a CB convoy, between the FRONT DOOR and the BACK DOOR, also ROCKING CHAIR.
EIGHTS AND OTHER GOOD NUMBERS best wishes.
EIGHTY-EIGHTS love and kisses.
EYE BALL 1. meet a CBer face-to-face. 2. to look at, "Put an eyeball on it."
EYETIES A somewhat unkind name for the Italians who dominate the CB channels during the early part of the day.
FIND A CLEAN ONE switch to channel with less conversation.
FIVE "Give me a FIVE", means transmit the numbers one to five for establishing signal strength.
FIVE-BY-FIVE strong signal. (Also, KICKING OUT FIVE.)
FOLDING CAMERA a police car equipped with Vascar speed measuring equipment.
FOOT WARMER same as LINEAR AMPLIFIER.
FOR SURE that's right.
FOUR "That's a FOUR", means simply yes.
FOUR ROGER message received. Also TEN ROGER' ROGER DODGER.
FOUR-TEN 10-4 (emphatically); right on!
FRONT DOOR lead rig in line of two or more trucks, see CONVOY.
GET HORIZONTAL go to sleep, go to bed.
GLITCH 1. an indefinable technical defect in CB equipment. 2. Also a CB gremlin.
GO BACK talk again.
GOING DOWN Going off the air, switching off.
GO JUICE or GO-GO JUICE gas, fuel, especially diesel fuel.
GOOD BUDDY another CBer, but never a RUBBER-BANDER.
GOOD LADY feminine equivalent of GOOD BUDDY.
GOOD NUMBERS best wishes, especially 73's and 88's.
GOT A COPY do you hear?
GOT MY EYEBALLS PEELED I'm looking.
GO TO 100 head for rest-room stop.
GUARANTORY definitely, guaranteed.
HAMBURGER HELPER same as LINEAR AMPLIFIER.
HAMMER accelerator.
HAMMER DOWN to accelerate. Also, HAMMER ON.
HANDLE CBer's nickname.
HAPPY NUMBERS an S-meter reading, especially, a five or maximum output reading.
HARVEY WALLBANGER reckless driver.
HIT THE HAY go to sleep.
HOLE IN THE WALL An area of poor signal strength.
HOME PORT residence location. See HOME 10-20.
HOME 10-20 same as above.
HOT PANTS 1. smoke or fire. 2. the driver's seat.
HOT WIRE same as LINEAR AMPLIFIER.
HOW AM I HITTING YOU? "How well do you receive my signal?"
KEYBOARD controls on CB set.
KICKER same as LINEAR AMPLIFIER.
KICKING transmitting.
KODAK police radar.

KOJAK WITH A KODAK police with radar.
LADY BEAR policewoman.
LAND LINE telephone.
LET THE HAMMER DOWN drive full speed, road is clear of Smokies and obstructions.
LETTUCE money.
LINEAR AMPLIFIER illegal amplifier which boosts CB transmitter output.
LOAD OF VW RADIATORS truck travelling empty.
MAYDAY distress call. (10-34.)
MEANIES Any anti-CB authorities such as Home Office, Post Office etc.
MEAT WAGON ambulance.
MIKE Microphone.
MOBILE 1. CB transceiver designed for use in car, truck, boat, plane, car, etc. 2. a CBer in a vehicle. 3. vehicle with CB.
MOBILE PARKING LOT auto carrier.
M-TWENTY meeting place.
MUD coffee. Also JAVA, BROWN BEER, et al.
MUSH Noise, masking or interrupting the signal.
NEGATIVE CONTACT station being called but not responding. Also, "Nobody answered my call."
NEGATIVE COPY no answer.
NEGATORY no. Opposite of POSITORY.
NUMBERS "ALL THE HIGH NUMBERS, GOOD BUDDY", is a cordial farewell, referring mainly to the Ten Code.
OIL BURNER car with smoking exhaust; car in need of ring-job.
ON CHANNEL On the air.
ON STAND BY listening, but not transmitting; also on the by.
ON THE SIDE 1. parked. 2. monitoring a channel and joining in once in a while.
OPEN As On Channel.
OVER through transmitting. "I'm over. Your turn to transmit."
OVERMODULATING incoming voice is muffled or whistling, often caused when a preamp microphone is turned too high.
PEDAL TO THE METAL accelerate.
PERSUADER same as LINEAR AMPLIFIER.
PICTURE BOX same as PICTURE TAKING MACHINE.
PICTURE (TAKING) MACHINE police radar unit.
PIECE OF PAPER speeding ticket.
POLAROID radar.
PORTRAIT PAINTER police radar.
POSITIVE yes, affirmative.
PREGNANT ROLLER SKATE Volkswagon Beetle.
PRESS SOME SHEETS get some sleep.
PRESSURE COOKER sportscar.
PUT AN EYEBALL ON look at.
PUT THE HAMMER DOWN accelerate.
QSL CARD postcard bearing call sign of a CB station mailed to verify communication or exchanged at coffee break or club meeting.
QUICK TRIP AROUND THE HORN scanning all the CB channels.
RATCHET JAW CBer who talks too much.
RADIO CHECK a report on the quality of transmission.
RADING Clarity of reception.
RELOCATION CONSULTANTS moving vans.
RIG 1. truck. 2. CB transceiver.
RINGING YOUR BELL "Someone's calling you."
ROAD TAR coffee.
ROCK slang for crystal, the tuning device set to allow CB transceiver to receive specific channels.
ROGER yes, okay.
ROGER DODGER same as ROGER, also "Roger D."
ROLLER SKATE Production line car.
RUBBERBANDER 1. a new CBer (who doesn't know the CB language). 2. any deadhead, in general.
RUBBER STATIONARY Static, not moving.
RUNNING BAREFOOT Operating without a Burner, or Boots.
SAIL BOAT FUEL wind.
SALT SHAKER salt spreading truck in winter.
S&H GREEN STAMPS money.
SEAT COVER woman in an automobile.
SEVENTY-THREE(S) best wishes.
SHAKING THE WINDOWS signal is coming in loud and clear.
SHOT GUN 1. police radar device that looks like rifle. 2. seat adjacent to the driver, as in riding SHOT GUN.
SIDEWINDER single side band user.
SLAMMER jail.
SLIDER an illegal CB device which permits transmission on unauthorized CB channels.
S-METER signal strength indicator, see Technical Glossary.
SMOKEY (THE BEAR) police of any kind.
SMOKEY ON RUBBER police moving.
SMOKEY TOWN London.
SMOKEY WITH A CAMERA police with radar.
SMOKEY WITH EARS police with CB.
SNAFU foul up.
SOCKS same as LINEAR AMPLIFIER.
SPAGHETTI Italians again, wall to wall spaghetti denotes the Italians are active on the particular channel.
SPARKIE electrician.
SPLIT YOUR SIDES transmit on single-side band.
SQUAWK BOX CB radio.
STEPPED ALL OVER YOU interrupted your transmission.
STEREO "Getting you in STEREO", coming through loud and clear.
STINGER antenna, especially a center or top-loaded model.
STROLLER CBer with a walkie-talkie.
SUPPOSITORY negatory.
SWR Standing Wave Ratio, a method of determining the quality of match between the Rig and aerial.
TAKING PICTURES police using radar.
TAKE IT DOWN Move to a (specified) lower channel.
TAKE IT UP Move to a (specified) higher channel.
TEN, BYE BYE good-bye.
TEN CODE A code devised in America many years ago to convey often repeated messages quickly and clearly.
TEN FOUR Yes.
TEN FOUR HUNDRED drop dead.
TEN NINE Repeat last message.
TEN ONE Signal strength and readability are poor.
TEN-ONE HUNDRED (10-100) restroom stop.
TEN POUNDER excellent radio.
TEN ROGER message received.
THIRTY TWELVE (30-12) ten four, three times.
THREES AND EIGHTS (73s AND 88s) best regards, hugs and kisses!
THROW A FIT use a linear amplifier.
THROWING transmitting.
THROWING A CARRIER same as keying the MICROPHONE.
THROWING NINE POUNDS AT ME strong signal that reads "9" on the S-meter.
TIGER IN A TANK same as linear AMPLIFIER.

TIGHTEN UP ON THE RUBBERBAND accelerate.
TIN CAN CB rig.
TOILET MOUTH CBer who uses dirty language on the air.
TRANSCEIVER combination radio transmitter and receiver.
T V I TV interference from CB transmission.
TWENTY location.
TWO WHEELER motorcycle or motorbike.
UNDRESSED 1. not using linear amplifier. 2. unmarked law enforcement vehicle.
WALKIE TALKIE 1. hand-held transceiver. 2. broken-down truck with CB rig.
WALL TO WALL 1. a superpowerful CB signal. 2. everywhere.
WALL TO WALL AND TREE TOP TALL receiving you loud and clear; also blowing smoke, loud and clear.
WALL TO WALL AND TEN FEET TALL clear reception of signal.
WALL TO WALL BEARS police all over the place.
WE GONE GOOD-BYE just listening.
WEAR YOUR BUMPER OUT to follow too closely.
WEARING SOCKS using a linear amplifier.
WE'RE CLEAR signing off. Also road is clear of police and obstructions.
WE'RE DOWN signing off. Also, WE'RE OUT.
WE'RE DOWN AND ON THE SIDE through transmitting, but still listening.
WHAT ARE YOU PUSHING? 1. What are you driving? 2. What kind of CB are you using? 3. What kind of antenna are you using?
WHAT'S YOUR TWENTY? "Where are you?"
WHEELS mobile CB.
WHIP long antenna.
WILLY WEAVER drunk driver.
WORK TWENTY place of employment.
WRAPPER the color of a vehicle, especially a police car.
WRINKLE uneven transmission or reception.
W.T. walkie talkie.
X-RAY MACHINE police radar.
YOU GOT IT go ahead, I hear you.
ZOO bear headquarters.

TRADITIONAL TEN CODE

This code, still used by older CBers, is no longer recommended because it has many more entries than are needed. Note conflicts—for example, 10-24 versus 10-36 (time check)—with the new revised and shortened official APCO Ten-Signals Code.

ing poorly.
g well.
smitting.
e received.
e.

leaving air.
t to call.

lete, standing by.

d condition.

10-18	anything for us?
10-19	nothing for you, return to base.
10-20	my location is
10-21	call by telephone.
10-22	report in person to
10-23	stand by.
10-24	completed last assignment.
10-25	can you contact
10-26	disregard last message.
10-27	I am moving to Channel
10-28	identify your station.
10-29	time is up for contact.
10-30	does not conform to FCC rules.
10-32	I will give you a radio check.
10-33	emergency traffic at this station.
10-34	trouble at this station, need help.
10-35	confidential information.
10-36	correct time is
10-37	wrecker needed at
10-38	ambulance needed at
10-39	your message delivered.
10-41	please tune to channel
10-42	traffic accident at
10-43	traffic tieup at
10-44	I have a message for you.
10-45	all units within range please report.
10-46	assist motorist.
10-50	break channel.
10-60	what is next message number?
10-62	unable to copy; use phone.
10-63	network directed to
10-64	network clear.
10-65	awaiting your next message/assignment
10-67	all units comply.
10-69	message received.
10-70	fire at
10-71	proceed with transmission in sequence.
10-73	speed trap at
10-74	negative.
10-75	you are causing interference.
10-77	negative contact.
10-81	reserve hotel room for
10-82	reserve room for
10-84	my telephone number is
10-85	my address is
10-89	radio repairman needed at
10-90	I have T.V.I.
10-91	talk closer to the mike.
10-92	your transmission is out of adjustment.
10-93	check my frequency on this channel.
10-94	please give me a long count.
10-95	transmit dead carrier for five seconds.
10-97	check test signal.
10-99	mission completed, all units secure.
100-200	police needed at

OFFICIAL APCO TEN SIGNALS CODE

This official code adopted by the Associated Public Safety Communications Officers, Inc., is strongly recommended for all CB communications where a coded transmission is desired.

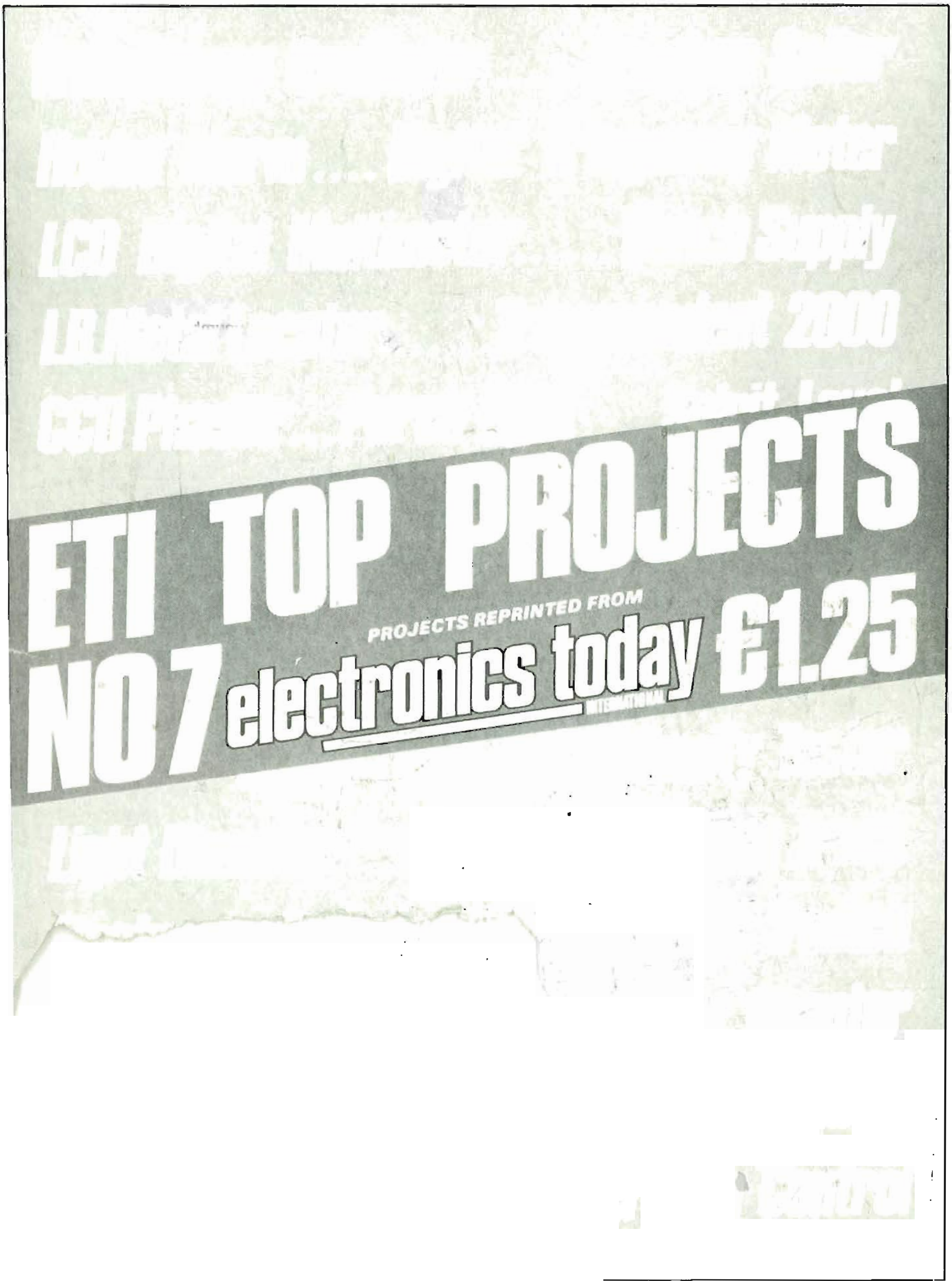
10-1	signal weak.
10-2	signal good.

10-3	stop transmitting.
10-4	affirmative (OK).
10-5	relay (to).
10-6	busy.
10-7	out of service.
10-8	in service.
10-9	say again.
10-10	negative.
10-11	on duty.
10-12	stand by (stop).
10-13	existing conditions.
10-14	message/information.
10-15	message delivered.
10-16	reply to message.
10-17	enroute.
10-18	urgent.
10-19	(in) contact.
10-20	location.
10-21	call ( ) by phone.
10-22	disregard.
10-23	arrived at scene.
10-24	assignment completed.
10-25	report to (meet).
10-26	estimated arrival time.
10-27	license/permit information.
10-28	ownership information.
10-29	records check.
10-30	danger/caution.
10-31	pick up.
10-32	units needed specify/number/type.
10-33	help me quick.
10-34	time.

Q SIGNALS

Although the "Q" Code is out of vogue and seldom used today, some of the signals familiar to CBers are listed below.

QRA	what is the name of your station?	the name of my station is
QRB	how far are you from my station?	the distance is
QRD	where are you bound and where are you from?	I am bound for from
QRE	what is your estimated time of arrival at (place)?	my estimated time of arrival at is hrs.
QRF	are you returning to (place)?	I am returning to
QRL	are you busy?	I am busy with please do not interfere.
QRM	are you being interfered with?	I am being interfered with.
QRS	shall I speak more slowly?	speak more slowly.
QRT	shalll I stop transmitting.	stop transmitting.
QRU	have you anything for me?	I have nothing for you.
QRV	are you ready?	I am ready.
QRW	shall I inform that you are calling him on Channel	please inform that I am calling him on Channel
QRX	when will you call me again?	I will call you again at
QRZ	who is calling me?	you are being called by
QTJ	what is your speed?	my speed is
QTN	at what time did you depart from	I departed from at
QTR	what is the correct time?	the correct time is
QTU	what are the hours during which your station is open?	my station is open from to
QTV	shall I stand guard for you on Channel	yes, stand guard for me on Channel
QTX	will you keep your station open for further communication with me until further notice or until ?	yes, I will keep my station open for further communication with you until further notice or until
QSL	can you aknowledge my receipt?	I am acknowledging receipt.
QSN	did you hear me on Channel ?	I did hear you on Channel
QSO	can you communicate with ?	I can communicate with
QSX	will you listen to on Channel ?	I will listen to on Channel
WSY	shall I change to another channel?	change to Channel
QUA	have you news of (specific CBer)?	here is news of (specific CBer).
QUD	have you received the emergency signal sent by ?	I have received the emergency signal ser by
QUF	have you received the distress signal sent by ?	I have received the distress signal ser by ?
QUM	is the distress traffic ended?	the distress traffic is ended.
QUO	shall I search for ?	please search for
QUR	have survivors . . . 1. received survival equipment? 2. been picked up? 3. been reached by rescue party?	survivors 1. are in possession of sur 2. have been picked up. 3. have been reached by
QUS	have you sighted survivors or WRECKAGE?	i have sighted
QUT	is position of incident marked?	position of incident is by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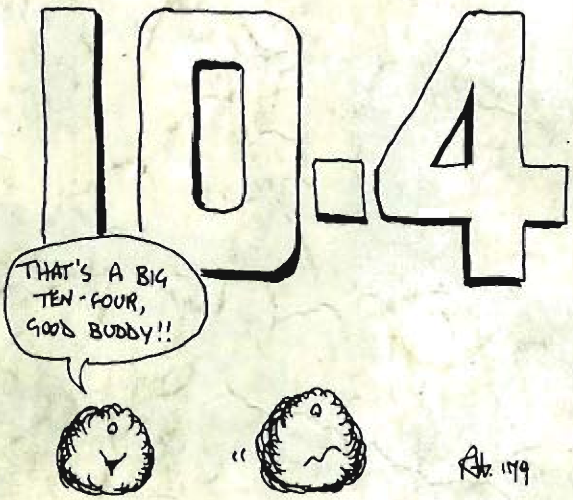
10-4
THAT'S A BIG TEN-FOUR, GOOD BUDDY!!