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CB

AN ARGUS SPECIALIST PUBLICATION

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FOR BRITAIN'S 250,000 CBUSERS



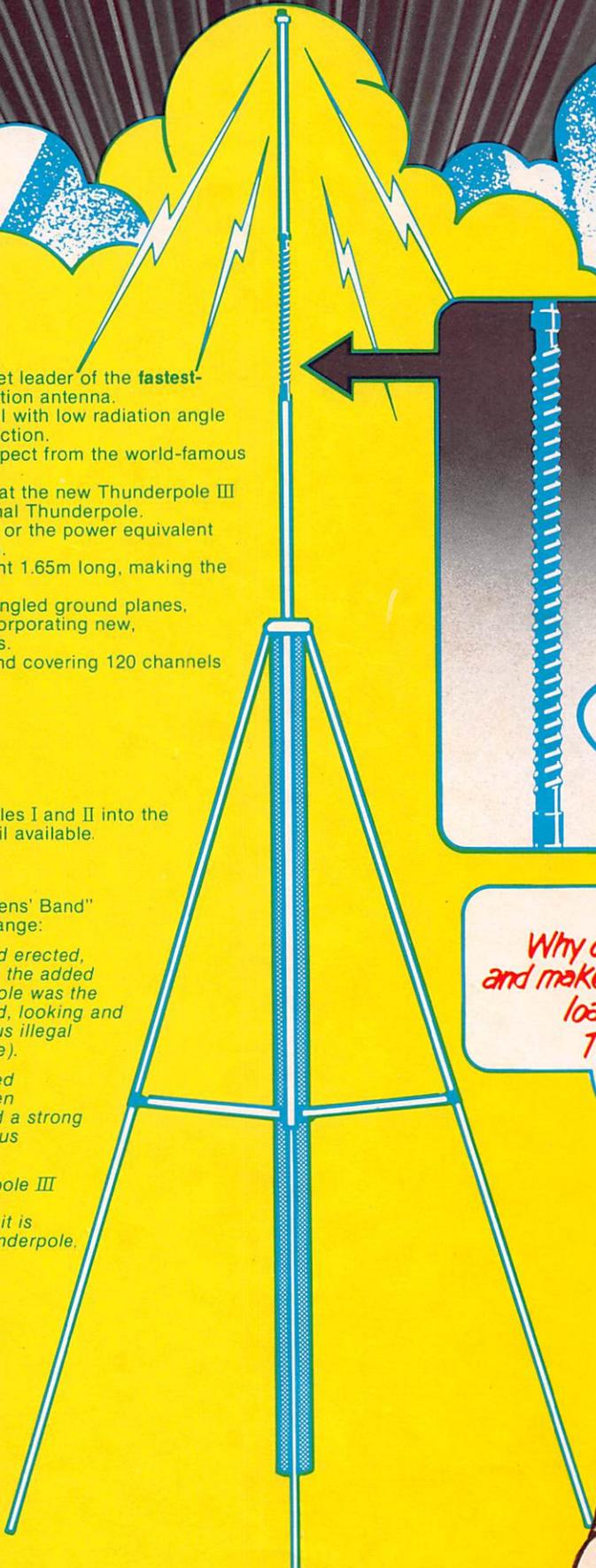
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**"HI BREAKERS!
Why don't you jump the skip
and make the trip with the centre-
loaded, helically wound
THUNDERPOLE III"**



CB

CITIZENS' BAND

NOVEMBER 1987

Volume 6

Number 12

C O N T E N T S

ISSN 0263-0613

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Editor Eamonn Percival
 Group Editor Chris Adam Smith
 Ad Manager Chris Harris
 Copy Control Jayne Penfold
 Design ASP Art Studio

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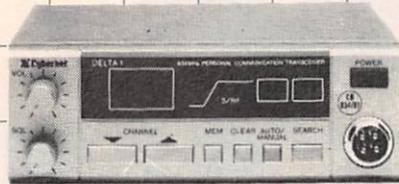
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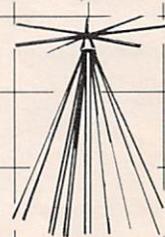
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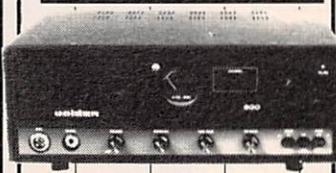
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UPDATE

Editorial

It was just approaching 8.10am as the Editor strode purposefully into the hallowed halls of Argus Specialist Publications. The coach had managed the 30-mile journey in less than 45 minutes. Not bad, mused the Editor. He tried to work out an average mph figure for the morning's journey but gave up after a few seconds. He remembered why he had not managed his Maths A-Level. He was OK at addition and multiplication; it was the other two he couldn't come to terms with. And decimals and fractions were a foreign language to him.

As usual, the lift was out of order and so he had to drag his small, but perfectly formed frame up to the second floor. The office door was a problem to open. It was jammed closed, locked behind a 3ft

mountain of letters from people complaining about the last Mack Chat article.

Eventually, with natural brute force, he managed to push the door open just enough to squeeze past and reach his desk. Ah, yes. The desk. Somewhere upon the desk lay his Adler electric typewriter, buried beneath mountainous piles of paperwork, most of which were tragically out of date. Throwing caution to the wind, and with deadly aim, he swept the papers from the desk straight into the wastepaper basket, revealing his trusty Adler in all its shining glory.

But lo, what was this? Jammed in the roller of the machine was a piece of copy paper, headed "Editorial". The piece began: "It was just approaching 8.10am as the Editor strode purposefully. . ."



Camron Brown

Aid for Hospital Radio

During the summer months, a DX group from the West Country put a lot of effort into raising funds for a local hospital radio station.

The M.A.D. Dxers — both members and friends — took part in a sponsored walk from Lydney in Gloucestershire to Weston-Super-Mare in aid of Radio Lollipop. The group also held an eyeball at Landsdowne racecourse in Bath where the cheque for £557.81p was presented to the station.

Silver Colt, president of the group, tells us that they have always channelled their fundraising activities towards the Children's Hospital in Bristol, and that Radio Lollipop gives the children a great deal of pleasure. Our congratulations to all its members and friends who took part.

Delta Bravo Appeal

The recent Bank Holiday weekend marked the first stages of a fundraising drive by the Delta Bravos, from Guernsey.



The DBs staged a DX session and, within a few hours, had contacted over 45 distant stations as far away as North Wales and East Anglia. During the DXing, a collection was also being taken in the Vale Castle car park, supported by the club's entry in the Battle of Flowers Puddle lane.

The aim of the fundraising is to collect a total of £4,500 to buy medical equipment for the Princess Elizabeth Hospital. They intend to be able to purchase an ureterorenoscope and a nephroscope, both of which are used in the treatment of kidney stones.

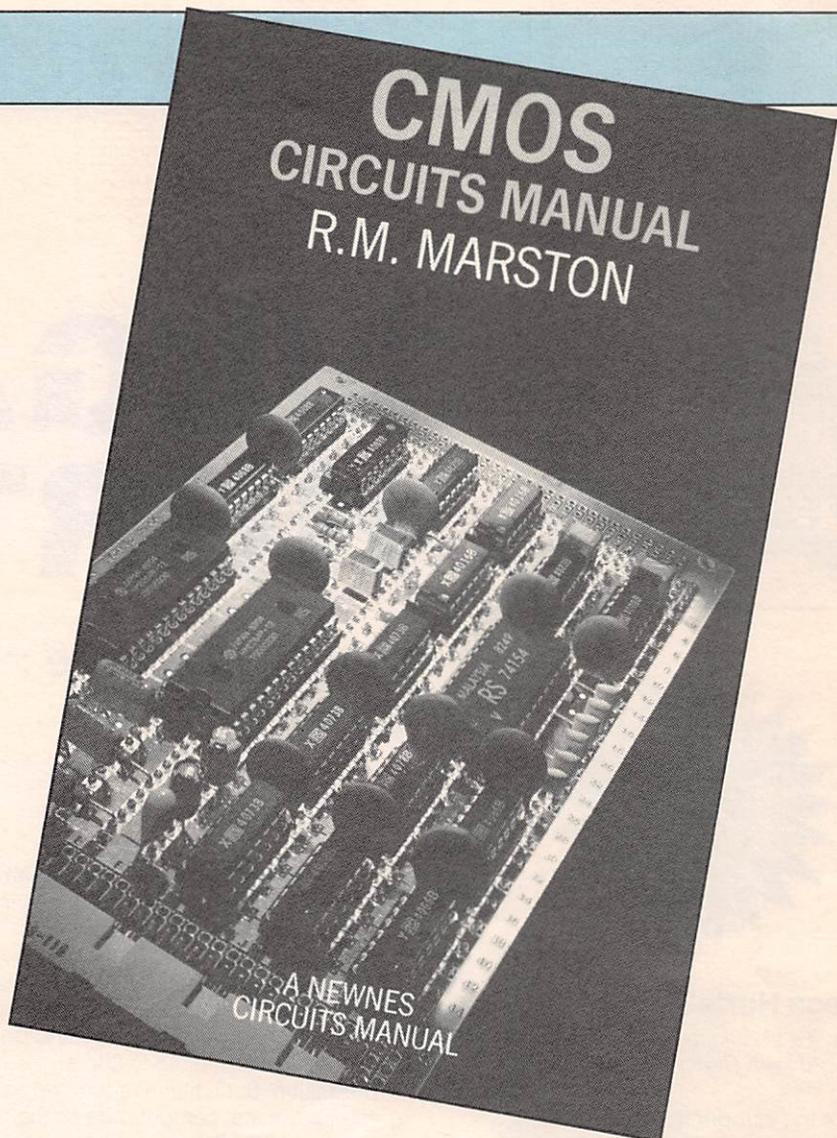
Other events also include a jumble sale at the local Salvation Army hall, St Sampson's, on 5th October and a grand Charity Ball at the Carlton Hotel on 31st October.

Roadliner (Trevor) said that the appeal has, so far, raised £510 and donations can be made direct to the Delta Bravo Medical Fund Appeal, Lloyds Bank, St Sampson's.

CMOS Circuits Manual

Heinemann Newnes recently published the CMOS Circuits Manual by R M Marston. Invaluable for the electronics engineer, student or enthusiast, the book describes the basic principles and characteristics of CMOS, the most popular of all digital logic families, and includes circuits ranging from simple inverters, gates and logic networks to more complex counters and decoders, with a large number of clock and pulse generator designs.

All the circuits have been designed,



built and fully evaluated by the author; all use expensive and internationally available devices.

CMOS Circuits Manual by R M Marston, ISBN 0-434-91212-3, Heinemann Newnes, £9.95.

NEVADA Communications



New Name for Telecomms

As from 1st November, Telecomms of Portsmouth will be changing their trading title to 'Nevada Communications'.

MD Mike Devereux explains the reason for the change: "Although we have been trading since 1969 with the name Telecomms, the name is more frequently being confused with British Telecom with our customers and,

therefore, we are reluctantly forced to move on!

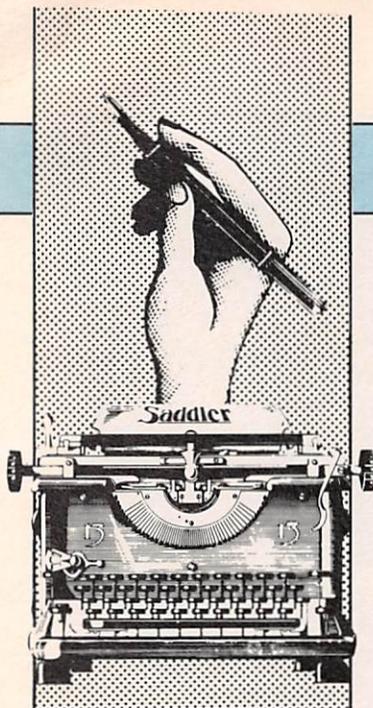
"The new name has been used for some time on products that we manufacture in the UK and has been very well received. It therefore seems a logical step forward to adopt this name as the company's trading title."

Mike also tells us that the company can now offer a Greenpar N-type silver-plated connector to fit the popular Pope H100 cable. At their request, Greenpar

have specially manufactured this item and they are holding large stocks for both trade and retail users.

In recent years, Pope H100 has become very popular with both radio amateurs and commercial users since it offers extremely low loss at an economical price. The outer diameter of 9.1mm for this cable meant that many connectors would not fit correctly.

The new Greenpar N-type sells for £3.36.



MEGA HURTS

More 934 Please :: Careless Whispers :: A DX Spot?



Mega Hurts?

Yes, it's about time we heard from Martin Wright from High Wycombe again. . .

With the introduction of the new frequencies, the grand total of 0.8MHz of bandwidth is to be used by 149,100 licensed CBers together with the probable further 300,000 unlicensed CBers.

On the 1st of June this year, the RRD quietly released to the 'Hams' a further 2.5MHz in addition to the 1145.565MHz that they had prior to this.

Two whole MHz of this allocation is nothing short of *officially sanctioned piracy*, for the frequencies are 50 to 52MHz in what is, by international treaty, reserved for European Band 1 Broadcasting.

To quote from the June issue of 'Radcom' (the publication of the RSGB), this was realised so that the amateurs would have common frequencies with their fellows in the USA, and also to ease the severe overcrowding that the 60,916 hams find in their 1145+MHz of available bandwidth!

In the same issue of Radcom was an explicit article on how to convert the Ham International Multi-mode CB rig to 50MHz. A very significant feature of this conversion was the advice that an adequate level of harmonics/spurii emissions would be 50dB down on its 12 watts power, an emission power level

some 3×4^1 *greater* than these self-same RSGB/RRD 'experts' claim is necessary for CB rigs. Especially when those potential emissions fall exactly where those of CB sets occur. Granted, it was also advised that the user resorted to the usual commercially available 'band pass filter' to give a further 15 to 20dB suppression. Such filters require no greater technical competence on the part of the 'Ham' than the ability to fit a PL 259 into its socket.

Also worthy of note in respect of 50MHz is that, in the USA, amateur usage is almost totally AM and SSB.

Perhaps Mr Pringle of the RRD would care to explain why the amateurs are able to use multi-mode CB rigs at their normal level of harmonics suppression, a level regarded as reasonable, in terms of their obligation to avoid interference to other services?

Would he also explain why the amateurs are granted access to European broadcasting frequencies that are very much in use with no plans for broadcasting to cease this century?

Would he also be prepared to justify the granting of *any* further frequencies in addition to the prior 1145.565MHz of bandwidth to some 61,000 hams, yet refuses to grant a mere 2MHz of bandwidth in total for the use of at least 150,000 CBers. Especially when the CB band 26 to 28MHz is already allocated to 'Land Mobile Services' (general use) but *not used*. Or is occupied by other services that the RRD now claims would not be significantly disrupted by the presence of CB, hospital page systems and radio models in particular.

A final point for the prime benefit of Mr Pringle concerns the claim he has often stated that it is agreed international policy to phase out AM from the HF (CB) band. Yes, that is correct, however what he carefully avoids adding is that this relates to the wide-band AM broadcasting allocations in the HF band. Not so that they can be changed to FM, but to SSB so that *more* stations can be accommodated. That particular proposal to end AM has *nothing whatsoever* to do with the use of narrow-band AM for CB.

Since some 80% of European CB practice (*legally*) is with AM, and he claims that his idea for 'harmonisation' is the reason for FCC channels, then why are we not given commonality with the majority?

For Mr Barrow IoW (July issue): Radio control model aircraft must now be on the channels granted in the 34MHz band. Other models, in fact, are granted only to those frequencies that form the holes (or Alpha Channels) in the FCC sequence of channelising.

Any grief inflicted upon radio models as a result of CB transmissions is due to the receiver of the model being either 'de-sensed' or 'bled-over' and is totally the fault of 'junk' equipment on the part of the radio modeller. Unless, of course, there is a naughty CBER using the Alpha Channels! The probability of radio models causing grief to CB are remote; this does not apply to hospital page systems that generally employ a modulation depth of some 30KHz and are centred 5KHz off the FCC CB channel frequencies, (thus effectively

bleeding over at least 3 and often 5 channels!)

What with the grief from page systems and SSB 'skip' the potential usability of an FM CB service on FCC channels is bordering on *nil*.

For some months now there has been exceptional 'skip' propagation of CB from all over Europe. At times, S7 signal strengths have been noted from SSB stations on UK channels. Earwiggling on them with an SSB HF receiver (Heathkit Mohican) revealed few to be using more than 10 watts PEP, including those showing S7 on the CB rig. So, it is a total lie that such interference is only caused by illegal stations using kilowatt 'burners'.

For the next five years such skip conditions will be on the increase as we head towards the next sun-spot maxima. Its only going to get worse folks!

As I have persistently said, its high time the RRD got themselves together with a consistent and plausible act. This continuing tirade of mis-information, half-truths, and even downright lies concerning CB gives them no credibility whatsoever and only serves to openly encourage illegal activity in a band that everyone knows full well to be devoid of any other significant use. Why won't they spend their £2m+ nailing the truly disruptive minority of music players and bucket-mouths, instead of busting responsible decent breakers whose only desire is freedom of communication? What is it that makes it impossible for CBers to use the self-same plug-in band-pass filters that they advise amateurs to use if they are, or suspect they may be, causing interference from harmonics etc?

More 934 Please

Bill from Plymouth is in desperate need of more 934MHz contact . . .

We down here are feeling rather neglected. What I mean is, where are all the 934 users? We switch on our radio, and we are talking local all the time. What we want to hear is more stations from outside our region. We are only small in numbers but we are very enthusiastic.

So come on all you users, swing your beams to the South West. We will be listening. And, who knows, we all might be surprised. And here's one for the magazine. How about more on the 934 band, projects and know-how, we want more information please.

Careless Whispers

Freelance from Sheffield writes with a warning about careless talk. . .

Recently, here in Sheffield, a young disabled couple have been the target for all manner of abuse, have had several antennas stolen from their premises and, in a recent incident, had their home broken into and smashed up. Whoever did it also helped themselves to a much-prized collection of tapes and records which the young couple had built up over the years.

Bad as this (and I suppose I will get more flak coming my way from breakers

whose conscience I prick!) I believe it's mainly the fault of many breakers here in Sheffield who will insist on giving out details of where they are off to for their holidays or weekend breaks. This is surely asking for trouble.

Those that don't, their so-called friends will do it for them saying "Breaker A is off to Spain for a fortnight" or "Breaker B is off to see the Blackpool lights" etc.

Just why can't these big-mouthed breakers keep this knowledge to themselves? They say they are friends of these unfortunates who get this hassle — but are they?

I think just the opposite!

A DX Spot?

Red 27 writes from PO Box 8, Redcar, Cleveland with a suggestion and an offer. . .

Firstly, I am glad to see that the CB magazine is still running as so many of the other CB mags have now ceased to exist, and the articles in the magazine are interesting and moving into new fields.

I would like to suggest a new article for your magazine. This article is popular in other radio mags such as Practical Wireless and Short Wave Magazine and is called in these magazines "On the Air" and "Seen and Heard". People would write in with the DX copies they have had or a good network going over a certain period of time to be published in the column. It would give people a chance to show what and where is possible with

CB DX and a chance to become famous and have their handle/callsign in the mag. Practical Wireless does do a similar column for 934MHz CB, but this is small and only has one or two contributors and no sign of 27MHz CB. I would be pleased to contribute to the new column as I often go portable on the local hills and get some very good DX on ground wave; over 150 miles has been worked.

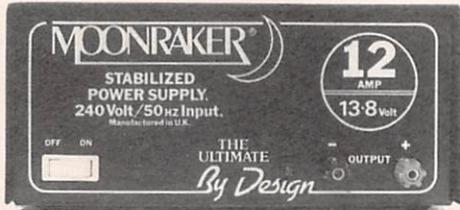
Over the past few months, I have been combining a list of CB QSL club addresses and now there is over 100 clubs on file. If there is anybody interested in the list, could you please send a stamped addressed envelope to the above address for a copy of the letter.

Finally, keep up the good work and I look forward to seeing the reviews of the CEPT band rigs as they come out.



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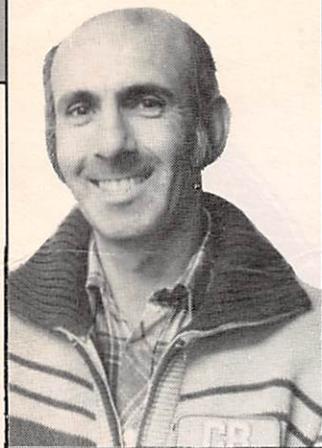
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LET'S BE FRIENDS

Mack the Hack, amongst other things, takes a closer look at dischord between national CB organisations

Zero hour or 0001, September 1st 1987. The new frequency Uniden was switched on, tuned to channel 19 and a call was put out. Instantly a station returned, HB 13 (Harry-QTH Stratford) was the first station that I worked on this first day of the new frequency. We QSYed to a clear channel and we were soon joined by other stations. AR1 (Tony) of Tottenham whom I have spoken to many times on 934MHz, MO15 (Paul) Potters Bar, and DC 86 (Dave of Swanscombe) yet another 934 user. I nattered to these people for about 30 minutes and would have done for much longer, but I was tired, I'd had a hard Bank Holiday weekend. I'd broken the ice on the new bands so I QSYed to my bed.

For the last few evenings I have spent many hours on the new 27. It has been good so far. I will talk to anyone and I don't ask what rig is being used but it seems that there are many people out there that have pulled their naughty rigs from out of storage to come on these frequencies. It is quite easy at times to tell by their transmitted signals, with over-the-top audio and even some off frequency. Roger bleeps also, of course, are a dead giveaway. There have even been stations up on the AMs trying to talk to me and others but, of course, we find it difficult to understand them or what they are saying.

As I write this, five days into the new band, there are still strange carriers on the frequency. It is believed that they are caused by hospital paging systems but we cannot be sure. They should not be there, I was told by the interference complaints department of the RRD when I spoke to them on the landline. Log the times, dates, and if possible sources and send this to the department and they will investigate, I was also told. As for the users themselves, they seem to be behaving, although I have been told

of a couple of cases of wallying about, but I have not heard any so I'll keep my fingers crossed.

It has been mentioned through these pages of this magazine and by some people over the airwaves that the formation of one national CB organisation for this country and one voice for the many thousands of CB users is needed. Maybe many would agree with these ideals but, and it's a very big but, whose would this voice be? NATCOLCIBAR, MSGB, or ABCB? Perhaps a combination of all of these groups would be an ideal answer but not a practical one. Why not you might ask? Although each of these groups and their officers have their own ideas of how they would like to see one national organisation run, and it seems that they're doing a good job as individual organisations, alas they do not see eye-to-eye on many issues. During a recent telephone conversation with the gvnor of one of our leading CB outlets, it was discussed that of the so-called user groups that attend the meetings with the DTI, who do these user groups represent? Are they the voice of the thousands of people that own and use CB?

This was the task that I took upon myself to find out. When visiting the CB mag office I randomly grabbed a hundred or so replies to the last readers surveys. On this, you may recall, was a request for information of clubs that you, the readers, belonged to. Many answered that they did belong to local clubs but only a few replied that they were members of national organisations. Of the seven groups that attended the last DTI meet I know of the involvement of the 934 Club UK and the Scottish Association of CB Clubs. So I telephoned the four that mattered and spoke to Ian Oliver (MSGB), Peggy Tapper (NATCOLCIBAR), David Daniel (ABCB), and Roy Williams (MSGB Ltd). Through these pages you will have read

of the activities of these groups and, as I said, some of these groups do not agree with the policies of the other groups.

The ABCB is a sort of breakaway from NATCOLCIBAR, MSGB Ltd broke away from MSGB although MSGB (not Ltd) is a member of NATCOLCIBAR. All these people I spoke to confirmed that they do represent many of your local clubs from other parts of the country and, since my telephone conversations, I have been sent literature presenting the organisations' constitutions and, from MSGB, copies of newsletters they send to their member clubs. Each of these organisations satisfied me that they are dedicated to the hobby and its users. But it's a pity that they have their differences.

How well do you know your power supply and do you trust it? Having spent lots of money for a rig on the new band or maybe even in the past having invested in other equipment, did you pay much attention to the purchase of your power supply? Did you, as many people do, spend as little as possible for a unit that converts mains power to the 13.8 volts required to work your rig. I purchased a 'cheapo' power supply once; there was I chatting merrily away one day. Bang! The rig went dead and smoke belched from every hole and slot of the radio. The cheapo power supply had decided to give my beloved CB more volts than it could handle. The result was an expensive repair. Since then I have been very shy of power supplies and prefer a car battery or two with regular charging. But, even if I distrust them, there are available now fully protected supplies that it is claimed by the makers will not overload and damage your rig and accessories. So, maybe one day I might pluck up courage and be tempted to purchase one of these. But the moral of this tale is: don't buy cheap supplies and only purchase, from a reputable source, a reputable make.

HALLOWEEN HORROR

The very first CB horror story,
as 31st October looms...



The headlights danced across the hedgerows as the car dashed along the country lanes. Jeff had always liked driving at night, especially along lanes like these. You could drive as fast as you liked with no chance of meeting anything coming the other way, not when you would see the lights at least a quarter of a mile ahead, and it was always so quiet.

I must try this new rig, Jeff thought to himself as he switched it on. He had bought it for twenty quid at the eyeball that weekend and hadn't had a chance to try it out properly with the car moving and it was a bit of an unknown quantity. Nobody down the club had ever heard of a manufacturer called Spectre and, come to think of it, nobody had ever heard of the breaker he bought it from. What was his handle? "Asmodai." Funny looking bloke, very pale skin.

Then the Peace was broken.

"Silver Fox. You on the one-four?", followed by a weird-sounding roger bleep. Jeff picked up the mike and spoke.

"Breaker calling Silver Fox come back . . ." Again he listened and then.

"Who you calling, Silver Fox?"

"Well, you I presume, how you doing Boatman?"

"Not so bad, but I didn't call you. Or anyone else for that matter, in fact it's dead quiet on channel tonight. Haven't heard a soul for hours."

"Are you sure? I could have sworn someone called me."

"No not me mate. You're bloody hearing things, I'm just off to bed anyhow, I can't handle these late nights, especially now they're drawing in."

"Hearing things! Cheek."

"All right suit yourself but you're the one who's cracking up! Ten ten, Were gone . . ."

"Cheeky sod," Jeff muttered to himself as the car rolled to a halt outside a small cottage at the bottom of the lane.

Picking up a briefcase from the passenger seat and the keys from the ignition Jeff walked to the house, opened the door and entered the comfortable but dark interior of the cottage.

It was a spacious but cosy, open-plan house, though it could hardly be described as tidy. Obviously the mark of someone who lived alone.

"Must get some heat on," Jeff spoke to himself as he went to the fridge, pulled

out a can of beer, opened it and took a mouthful of the refreshing liquid.

After lighting the fire, he went to the table where he left his briefcase and, opening it, took out two packets of batteries. Going to the cupboard he removed an old dusty 'walkie-talkie' and after briefly wetting his finger and cleaning away some of the dirt from the green LED display, he opened the cover and carefully installed the batteries in the back of the handheld machine.

Switch on and see if it still works after all this time . . . What was that? Jeff heard a noise. A roger bleep?

He turned up the volume on the radio in his hands but the airwaves were silent.

"Boatman was right, it is quiet tonight, dead quiet!" Then he heard it again but this time he realised it wasn't coming from there at all.

"It's coming from outside. The car?"

Looking outside he cursed as he saw it was just starting to rain and he thought to himself how he hated these autumn nights. Warily he went outside thinking to himself that perhaps it would have been a better idea to have wired the new rig through the ignition after all.

As he switched the rig off and put the mike up on the dash top, he thought that

he really ought to get round to fixing somewhere to hang the thing. He closed the door and went back inside just in time to avoid the start of the heavy rain. He took another swig of the beer, picked up the walkie-talkie and, checking that it was switched off, placed it in the cupboard, then went to the TV.

Just as he was about to turn it on he became aware of a bright patch on the wall above him.

He went to the window and, there facing the house, sat the car with its headlights on. This time it was raining properly so, getting a coat, he opened the door and rushed across to the car.

As he opened the driver's door the handle felt strangely cold and there inside he found the microphone cord looped round the stalk switch that controlled the lights.

It seemed hard to believe that the weight of the mike falling off the dashboard could do that but he unlooped the lead and put the mike on the seat instead.

Closing the car door again, not bothering to lock it because he was already getting wet; besides, he thought to himself, who would be out here at this time of night? He then ran back to the house, got to the door and . . .

"Damn!" The door was closed. It must have shut as he rushed out. He did, however, keep a spare key in this coat so dripping with rain he fumbled around in his pockets in the dark. As he tried to locate the key he cursed.

"Need some bloody light out here!" And lo and behold it lit up. Looking round at the car, the lights were on and, as Jeff winced under the flood of the illumination, he heard that roger bleep again, this time it was definitely coming from the car. He strained through squinting eyes to see who was in the vehicle as his rain-soaked, matted hair obscured his vision.

"Who's there?" he gave an angry shout but he could only see shadows as his eyes were blinded by the powerful lights against the darkness.

"One-four Silver Fox," followed by that strange metallic roger bleep. He started to walk to the car to investigate, all the time turning his head away to try to avoid the almost unearthly glare. He certainly

didn't realise his lights were that powerful.

"Now look, who's there? I'm tired of this!" Then the engine roared to life and the car was moving, accelerating towards him.

He dodged but, as he did so, the wing just caught his knee and he felt an intense pain as his kneecap cracked and blood mingled with the rainwater that already soaked his trousers — and then suddenly it all went very black.

Prone

As he came to, he found himself prone on the wet ground and thought he must only have been out for a few seconds for he saw the car now facing away from him skid to a halt just short of the house, and there it stood, engine still running.

For a while, all he was aware of was the fall of the rain on his face and the water as it soaked through his clothes to his very bones. He clenched his fingers against the ground and he felt the mud squelching through them.

Then the engine screamed again, the rear wheels spinning, throwing up great sheets of muddy water from what was a nice, hard-packed dirt drive but now looked more like a mud bath. As Jeff drew himself up from the sodden mire, the wheels suddenly gained traction and the car shot towards him. But now he was ready. Now the adrenalin had had a chance to get round his bloodstream he was no longer surprised. He lurched to the side as the car splashed towards him, knowing that if he could just stay there it would miss him.

Then just before it passed him, the driver's door swung open. He tried to jump again but, instead of lightning-fast reactions, pain shot through his leg as his knee failed him and the open door caught him hard in the chest and carried him along.

Inside the car he could now see a thin cloud of smoke, illuminated green by the LED on the rig as a faint smell of burning rubber drifted from behind the dashboard, but no driver!

"You know you can't beat me, Silver Fox!" came the metallic voice from the

rig, followed by the now-familiar roger bleep.

The movement of the car caused the glove compartment to fly open and a flurry of audio cassettes, maps and a torch fell onto the passenger seat.

Then, realising that it was the rig itself that had somehow been doing this all along, he seized his opportunity and stretched across to grab the torch. He viciously attacked the rig with the hefty torch, smashing the plastic surround as the speaker exalted a peal of inhuman laughter.

The he realised.

The wiring! If he could only disconnect the power! The rig continued its ghostly metallic laughter as he reached behind and grabbed the lead that supplied the power to the set, and wrenched with all his might.

As he gave an insane tug on the leads, he felt it give and an intense shock coursed through his body as he felt the full jolt of the battery and passed out again.

This time he must have been out for longer, for when he woke up the car was no longer moving, the engine was silent and all the lights were out. The rig was hanging loosely from half of its mounting, one tug pulled it free and it came away in his hand, the wires blackened and torn, hanging from the back.

Jeff climbed from the car, noticing that the rain had also stopped and threw the now wrecked rig into a puddle where it hissed gently as the water flooded through the warm insides. As he walked away from it, a faint green smoke drifted slowly from the smashed machine.

He found the key in his pocket and stumbled through the door into the untidy room beyond, peeled off the sodden jacket and dropped it onto the floor where it made a nasty damp patch on the carpet. He collapsed into a deep comfortable armchair and it was only then that he noticed the calendar on the wall as he fell into a deep sleep, mumbling subconsciously.

"October the thirty-first . . ."

Purely by coincidence channel thirty one was the channel number glowing a dim menacing green through the part open door of the cupboard across the room . . .



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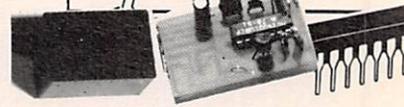
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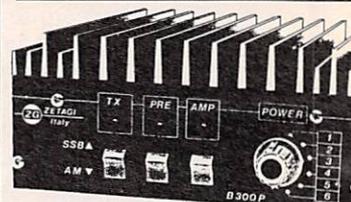
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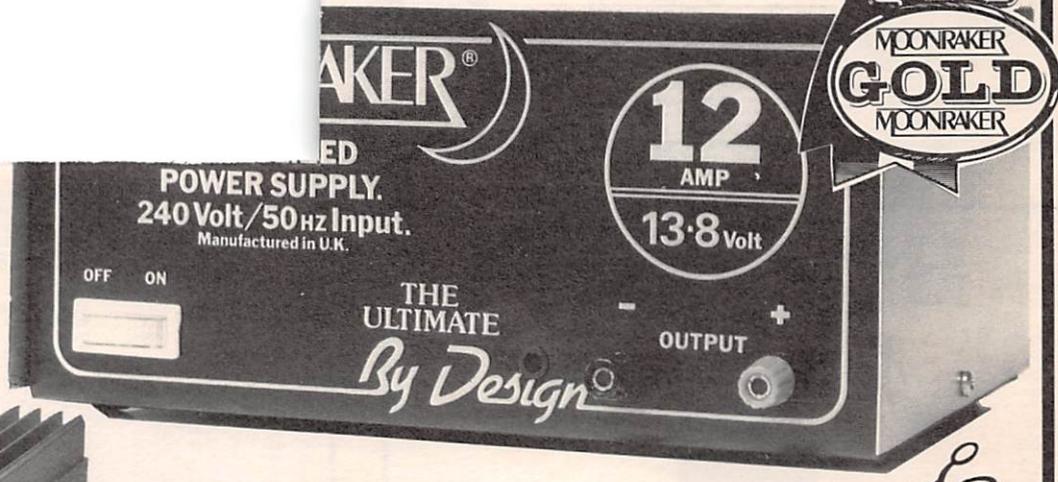
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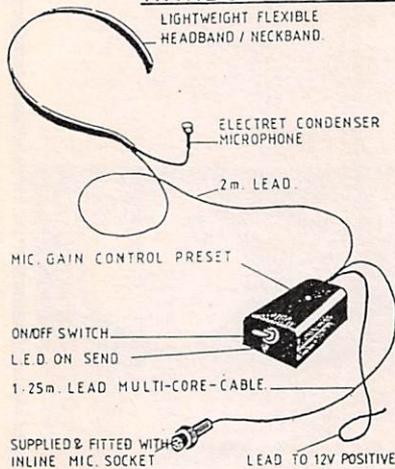
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2SA673	£0.13	2SC1312	£0.09	2SC2099	£19.25	3SK97	£2.08	BD902	£0.51
2SA678	£0.38	2SC1318	£0.22	2SC2166	£0.95	40673	£1.50	BF244	£0.39
2SA683	£0.20	2SC1359	£0.13	2SC2236	£0.22	BC107	£0.13	BF245	£0.29
2SA684	£0.31	2SC1384	£0.27	2SC2290	£24.55	BC108	£0.07	BFY50	£0.25
2SA699	£0.66	2SC1398	£0.60	2SC2312	£3.15	BC109	£0.14	BFY51	£0.25
2SA733	£0.13	2SC1674	£0.15	2SC2314	£0.30	BC141	£0.26	MRF237	£3.39
2SA966	£0.26	2SC1675	£0.14	2SC2320	£0.10	BC142	£0.19	MRF238	£13.64
2SA999	£0.10	2SC1678	£0.80	2SC2395	£16.20	BC182	£0.06	MRF450	£13.50
2SA1012	£0.68	2SC1815	£0.10	2SC2539	£10.82	BC184	£0.10	MRF450A	£13.80
2SA1015	£0.11	2SC1909	£0.92	2SC3020	£12.90	BC212	£0.06	MRF454	£22.94
2SB525	£0.25	2SC1945	£3.41	2SD234	£0.46	BC214L	£0.08	MRF455	£23.65
2SC380	£0.09	2SC1946	£12.37	2SD235	£0.41	BC238	£0.06	TIP29C	£0.26
2SC495	£0.35	2SC1947	£4.29	2SD313	£0.56	BC639	£0.12	TIP30C	£0.29
2SC536	£0.10	2SC1957	£0.66	2SD325	£0.43	BC640	£0.13	TIP31C	£0.27
2SC710	£0.11	2SC1969	£1.58	2SD330	£0.48	BD131	£0.42	TIP32C	£0.33
2SC711	£0.09	2SC1970	£1.52	2SD380	£4.26	BD132	£0.32	TIP41C	£0.35
2SC730	£3.63	2SC1971	£2.95	2SD471	£0.29	BD135	£0.22	TIP42C	£0.36
2SC828	£0.09	2SC1972	£8.25	2SD837	£0.71	BD139	£0.22	TIP120	£0.38
2SC900	£0.27	2SC1973	£0.51	2SD860	£0.41	BD140	£0.25		
2SC930	£0.17	2SC2002	£0.25	2SK192	£0.23	BD201	£0.33		

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We stock a range of modification boards to convert the most popular UK FM rigs to work on the new FCC band in addition to the existing UK band. Please quote make and model of CB when ordering.

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A 10.695MHz active filter specifically designed for the HAM International and NATO 2000 type CBs. This board significantly reduces image reception and cross modulation without affecting sensitivity.

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This is a 10.695MHz 1kohm 10KHz bandwidth xtal filter suitable for most FM CBs. The filter greatly reduces cross modulation (bleedover) and is extremely easy to fit.

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7806	£0.38	HA1388	£3.81	LC7130	£3.26	S342	£2.50	TDA1011	£1.37
7812	£0.39	HA1392	£2.54	LC7131	£3.21	TA7061	£0.76	TDA1020	£2.28
7815	£0.37	HA1394	£2.72	LC7132	£2.89	TA7120	£0.48	TDA1510	£3.89
7818	£0.59	HA1397	£2.55	LC7137	£2.77	TA7130	£0.53	TDA1512	£3.12
AN240	£1.28	HA1398	£2.68	LM324	£0.45	TA7204	£0.98	TDA2002	£0.74
AN6551	£0.73	LA1230	£1.19	LM386	£1.15	TA7205	£0.91	TDA2004	£1.81
AN7131	£1.37	LA4102	£0.84	M51102	£1.85	TA7217	£1.22	TDA2005	£1.65
AN7140	£1.05	LA4112	£0.94	M51513	£1.86	TA7222	£1.22	TDA2020	£1.81
AN7178	£2.95	LA4140	£0.58	M51515	£1.94	TA7227	£2.06	TDA2030	£1.30
BA402	£0.59	LA4201	£1.19	M51517	£1.84	TA7240	£2.08	TDA2611	£0.79
BA521	£1.55	LA4220	£1.41	MB3712	£0.99	TA7241	£1.96	UPC1028	£0.95
BA656	£1.19	LA4250	£2.23	MB3730	£2.06	TA7270	£1.93	UPC1032	£0.73
CD4001	£0.28	LA4400	£2.59	MB3756	£1.94	TA7271	£1.93	UPC1156	£2.05
CD4008	£0.89	LA4420	£1.32	MB8719	£4.12	TA7274	£1.96	UPC1181	£0.91
CD4011	£0.11	LA4422	£1.13	MC1723	£0.48	TA7310	£0.66	UPC1182	£1.04
CD4049	£0.25	LA4440	£1.89	MC3357	£2.11	TA75902	£0.99	UPC1185	£1.81
CD4066	£0.34	LA4445	£1.90	MC3359	£2.33	TBA800	£1.38	UPC1188	£0.71
CD4069	£0.18	LA4480	£1.71	MM5510	£3.00	TBA810T	£0.49	UPC1230	£1.80
HA13001	£2.16	LA4451	£1.71	NE567	£0.52	TC9106	£6.50	UPD858	£1.65
HA1366W	£1.33	LB1405	£0.97	PLL02	£7.59	TC9109	£4.38	UPD2816	£5.34

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Same day despatch on all items in stock. Cheque/Postal order with order.

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Welcome. TEL: 031 337 6950/031 337 2446.

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As U.K. Distributors for this well known European company, we are pleased to announce the recent delivery of a shipment. A selection of items is shown below. For those not familiar with this excellent range, we offer an **INTRODUCTORY DISCOUNT**. These special prices are valid until **December 1st 1987**.

BASE STATION ANTENNAS

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Easy to install and space saving this sturdy efficient half wave has no radials so can be located anywhere. Not sensitive to static with external SWR adjustment at base it handles 1kw of power and has a typical band width of 1.5 Mhz, 5.5m length. Heavy gauge aluminium construction.

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An efficient 1/2 wave with a gain of over 3db. 3 small (1.5m) radials 1kw power rating and a band width of 2 Mhz, 6.6m length. Heavy gauge aluminium construction.

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Six full size 2.75m radials ensure this high efficiency 1/2 wave gives plus 5 db gain and a 2 Mhz band width, 6.6m length, 1kw power capacity. Heavy gauge aluminium construction.

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Over 6db gain from this giant 1/4 wave antenna. Made from quality aviation aluminium this 7.6m high antenna is an all round performer. With SWR adjustment at the base it's easy to tune. Good static discharge capability, high power handling — upto 2kw. Plus shortened 1.5m radials. This is one of Europe's top base antennas.

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(inc. carrier delivery)

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The ultimate 1/4 wave, stands a giant 9.9 metres high. It's unique design assures a gain in excess of 7 db, 2 Mhz band width with a usable power of 2kw. Six full length radials of 2.6m, external SWR adjustment with an external coil to reduce humidity influence and static interference. Heavy construction in high gauge aluminium. It's special design gives good horizontal radiation, reducing interference and enabling first class performance where long distance or difficult communications are required.

*** 7 DB GAIN**
*** 1/4 WAVE LENGTH**
*** HIGH POWER CAPACITY**
*** BROAD BAND WIDTH**
*** REJECTS STATIC AND HUMIDITY**
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ALL MIKE PRICES INCLUDE WIRING & BATTERY IF APPLICABLE. QUOTE RADIO MODEL PLEASE.

TW 232 DX BASE MICROPHONE

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TW-232 DX

Improved version of the 4200, 232 type base mike. New mike cartridge and redesigned DX head give especially sharp, punchy moduls. This mike is particularly suitable for FM use and SSB DX where clarity is required. (State radio type when ordering).

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RELAX

Well known power mike suitable for all mode transmission. Variable gain setting and rugged housing. Value for money, mid priced and justly popular. Supplied ready wired with battery. (State radio type when ordering).

HAM INTERNATIONAL REPLACEMENT MIKE

REGULAR COST £9.50

OFFER PRICE £8.50

A good quality standard mike suitable for most types of radio.

FOXY DIRECTION FINDER ANTENNA

Designed for DF'ing, interference tracing and fox hunting, this versatile portable antenna can also be used to transmit mobile to mobile using low power (0.5w max.). Covers 27 Mhz, approx. 60m length supplied with cable and PL 259.

REGULAR COST £39.00
OFFER PRICE £36.00

VOX 3 EXTENSION SPEAKER

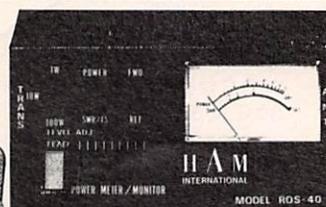
Quality speaker with noise filter switch, supplied with variable fixing bracket.

REGULAR COST £9.50
OFFER PRICE £8.00

VOX 2 MINI SPEAKER

Powerful mini extension speaker measures just 2" across, with fully adjustable bracket.

REGULAR COST £9.95
OFFER PRICE £8.50



ROS 40

REGULAR COST £14.00
OFFER PRICE £10.00

Quality SWR, Power and FS. meter reads power to 100w. Plus AM monitor.



ROS 110

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OFFER PRICE £19.00

SWR, Power to 100w, matched FS. meter plus AM monitor.

PRICE BUSTERS

FLEXIWHIP — FOR HANDHELDS

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REGULAR COST £9.95 **OFFER PRICE £8.50**

HAM, LESON 4200 REPLACEMENT PTT SWITCHES NOW IN STOCK £2.00 EACH

HAM DX 27 5/8

Helically wound big version of DV 27 with 200w power capacity, wide band for DX'ing. Fibreglass construction. **Top loaded whip with adjustable base, cable and fittings.**

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If you wish to be added to our mailing list, please send cheque/P.O. for £1.50. (This price includes discount vouchers).



LADY BREAKERS

TREASURE HUNT

This month, Filly tries her hand out at out-hunting Anneka Rice

It seemed like a good idea at the time. Why not take on a rival club from the next village in a pub crawl — er, I mean treasure-hunt with the odd refreshment stop at a local hostelry — as a means of temporarily forgetting the rapid approach of winter?

For once, it was someone else's idea — no one would blame me if it went wrong. For once, I wasn't the organizer — no one would blame me if it ended up in a shambles. All I had to do (I told myself) was sit back and enjoy the fun while someone drove me from pub to pub — er, from clue to clue, that is.

I really should have known better — and so should our team. They elected me mapreader.

Now, you all know about me and navigation. We don't mix. I couldn't navigate my way out of a paper bag. I couldn't mapread my way out of my own front drive. In our local treasure-hunts, map co-ordinates and clues are commonly used — we had lost before we have even started!

But could I get the rest of the team to see it? I could not.

"C'mon Filly, be a sport," said Big Jane (appointed Guardian of the Thermos). I tried to explain that I was not being unsporting, but Big Jane flexed her muscles at me and I shut up. One does not argue with Big Jane.

"You can do it if you really try, Filly," said Oily Rag from the garage (he insists his handle is Steel Wizard, but to everyone else he's Oily Rag). "A two-year old could read one of these big-scale local maps." I suppose he was

big Volvo and waited for the adjudicator (the local vicar) to wave his handkerchief, signalling that we could open communications with our base station.

I'd better explain how the hunt works. It's a bit like that thing with Anneka Rice on TV. In each time, four people drive around the countryside chasing up clues while two others sit at the base station with a pile of sealed envelopes. Two adjudicators, one from each side, stay with them to make sure there's no cheating. When the team in the car solve a clue and radio back the correct answer, the next envelope is opened, the clue read back to the mobile team, and they hare off in search of the answer. And so on. There's no other communication with the base station in between, to avoid hogging the channel.

All good, clean fun — or it would be if everyone played by the rules. In actual fact, anything goes, and everyone tries every trick they can think of to get the upper hand, which includes downright cheating if they think they can get away with it. The only real rule is not to bring the club or CB into disrepute.

The vicar waved the handkerchief and beamed at us, and the voice of The Shocker, the local electrician (an unfortunate choice of handle, I thought) came on the air.

"The Black Spot, seek the Black Spot," quavered The Shocker, probably imagined to be a blind man. Then nothing came of each other blankly. Our car, a battered Rover, leapt forward and disappeared up the road.

things like tomato juice in the pubs we stop at.)

"They haven't," said Big Jane shrewdly, cracking her knuckles. "They're trying to demoralize us."

"Perhaps we should follow them," suggested Oily.

"Too late now," said Harry.

"The Black Spot," I said musingly to myself, peering at the map. "What sort of a clue is that? The first clue's meant to be easy! The Black Spot, indeed . . . Ah!" Because of course, there it was, the black spot, right in front of me. The symbol for a post office! I told the others.

"Bit easy, wasn't it?" said Oily disdainfully.

"You didn't get it, did you?" I snapped.

"I haven't got the map in front of my nose!" he retorted.

"Children, children!" said Big Jane soothingly. "Let's reserve our energies for beating the opposition, shall we? Or I'll knock your heads together. Now, is there only one post office on the map?"

"No, three," I said, disconcerted.

"Right, we'd better find out which one, hadn't we?" said Jane. "Where are they, Filly?"

"One just round the corner, in the High Street. Another over at Wicklebury, that's

COMMUNICATION THE

QSL WAY



This year is really flying by! Although this is the November issue, you should have it just in time for the Kendal & District Breakers Weekend Eyeball (17th & 18th). Hopefully the weather will be reasonable for it. Last minute details can be obtained from Ian (*Winalot*) on Kendal 26760.

Earlier this year I popped up to Consett for the day and visited a few QSLer friends and the evening was spent in the Sierra Romeo's Social Club where I was made to feel very welcome. A big thanks to all there, especially Dave (*Podgy*), Beth (*Irish Cream*), Bill and Angela (*Steampusher* and *Chocolate Raisin*), Jim (*Cadillac Cowboy*), Chris (*Blackhawk*), Ken (*Beerman*), Steven (*Powerslave*), Gerry and Val (*Gerrycan* and *Birthday Girl*) and not forgetting either Paula or Trisha, even if I couldn't spell her name by the time the meeting ended! Not to mention all those I've surely forgotten! Also thanks to all the girls at Currie QSLs for their help and welcome.

Moving right along now with a selection of names and cards from the backlog! First up is that of Juan (*Espacial 008*) of Venezuela, a very long letter from Tony (*Crafty Crusader*) of Swindon who has asked me to apologise to anyone who sent him mail via the Great Western's PO Box as there have been problems and he never received any post from the Club. A selection of cards from Ron (*Happy Jack*) of the Sierra Alpha CB Club, membership £4 and 15 cards or £6.50 including stamp. A selection of his cards from Robert (*Roto Power*) of the Papa Delta DX Club of Tenby which costs £3 for your Unit number, certificate, 25 club cards, 20 stickers and welcome letter. Cheques are accepted, and should be made payable to the club. The PO Box is available to members free for the first year, then £1 annually if required.

David Shepherdson sorts out this month's QSL mail for new names and addresses

Another batch of cards in from Steven (*Wells Fargo*) of Scotland who uses Sharp Graphics of Grangemouth who now do hot foil cards. Other "Hot Foilers" include Charlie and Ensign cards. Talking about Ensign cards fits in here as contained in a QSL package from Tom (*Green Forest*) of Telford are some Ensign cards along with a great POMA Club card for the Telford Thunderbirds DX Club. As I've said before, I do like the style of this club's card. For membership of the club and cost of obtaining these cards, I'm afraid you'll have to drop the club a line (with SASE) and ask. The club's chairman is Terry (*Big T*).

From Belfast comes a card from Robert (*BC 05*) along with information on the Bravo Charlie International Radio Group. This group was founded for all 11 metre band operators and offers two packages. The first costs £2, whilst the second costs £10 plus, in both cases, two passport-sized photographs. The smaller package consists of your unit number and ID card, 10 QSL certificates, 10 envelopes, viewcards, welcome letter and tourist info. The other package has the group stamp and a souvenir gift for yourself and XYL. Cheques etc are *not* accepted.

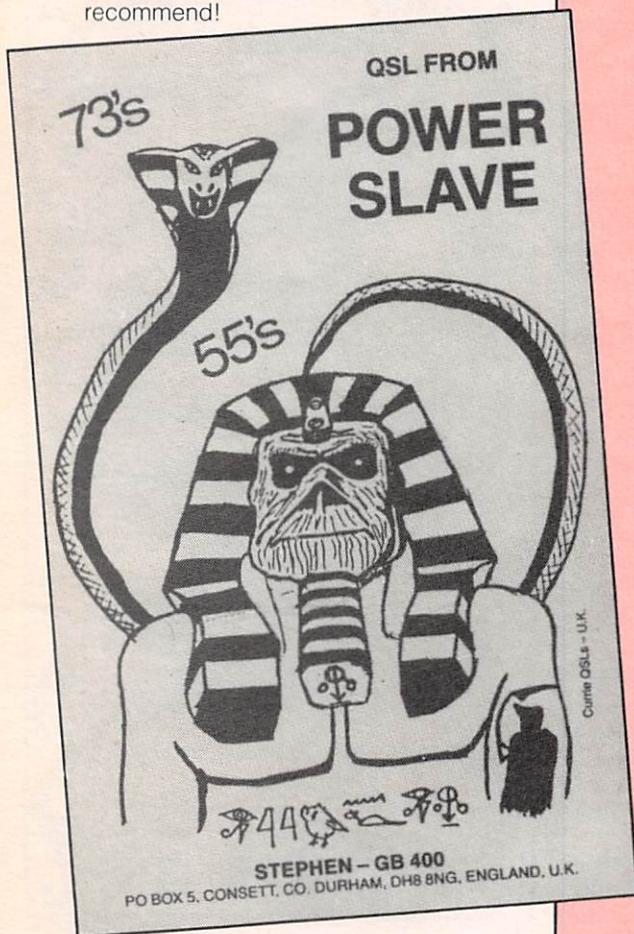
News in from the 5 C's, also known (in full) as the County Colour Card Collectors Club of Canterbury, is that they have a new POMA Club card, and another one as a joint club card with the Yorkshire Rose DX Club of Bradford. Membership of the 5 C's costs £7 (cash) and 20 *personal* cards. For this you receive your unit number, ID card, full colour certificate, FCC club cards, club stamp, FCC sew-on patch, at least 50 FCC exchange QSL cards, plus other items. The club has three different sections for you to join and you are



asked to state which you prefer to be in. These are QSLer, DXer or full-colour card collector holder. Extra club cards are available at £3 for 50, and these can also be personalised at a cost of £18 (plus P&P) per 500. Membership of the Yorkshire Rose costs £6, according to the form I have, plus 10 *personal* signed

and dated QSL cards for which you can expect your unit number, ID card, certificate, club stamp, 10 club cards, exchange QSLs, envelopes, DX certificates, stickers, a club pen, key fob, 5 log sheets, exchange invites, tourist info, roster etc.

News also in from the European Radio Group of West Germany is that the club now has some new colour cards available, details from Uwe but please don't forget to supply two International Reply Coupons which are the overseas equivalent of a UK's SASE. These IRCs are available from your local Post Office costing 55p each (at the time of writing). Membership of the ERG costs a very reasonable £5 (cash) and 20 personal QSL cards, which *must* show your full address, including country clearly! The package consists of your ERG No, certificate, ID card, mounted stamp, roster, welcome letter, prefix list, QSLing tips, coloured ERG stickers, ERG Club cards, pen, viewcards, exchange cards and invites, plus lots more! When I say a very reasonable £5 fee, I've just been looking at a Norwegian club which charges £9 for a lot less and the stamp is not even mounted! That one I wouldn't recommend!



Continuing with the (apparent) theme of overseas clubs, there's a new one in Bavaria now. This is the Lima Uniform X-Ray DX & QSL Club run by an old friend of mine, Franz. Membership of the club costs £7 from the UK for which you can expect your LUX No, ID card, certificate, prefix list, LUX invites, 10 LUX

FORTHCOMING EVENTS

3rd weekend October — Kendal & District Breakers Eyeball. Contact Ian (Winalot), PO Box 37, Kendal or (0539) 26760.

When writing for details on any of the above, don't forget a suitable SASE for the club's reply. Also, should you send monies to book, don't forget a SASE should you require a receipt.

The following are provisional dates only. The clubs held meetings in 1987, and

may do so in 1988, if interested, please check with the club in question nearer the time.

April 1988 — Cutty Sark POMA Meet — Cutty Sark Club, 116 Bradenham Ave, Welling, Kent DA16 2JG.

April 1988 — GBQDC Giant Eyeball — GBQDC, PO Box 5, Consett, Co Durham.

May 1988 — Southport Charity Eyeball — Tango Papa (83), PO Box 13, Southport, Lancs.

QSLer ADDRESSES

Dave (<i>Podgy</i>)	GB 332, PO Box 5, Consett, Co Durham DH8 8NG
Beth (<i>Irish Cream</i>)	PO Box 5, Consett Co Durham DH8 8NG
Bill & Angela (<i>Steampusher & Chocolate Raisin</i>)	PO Box 5, Consett, Co Durham DH8 8NG
Jim (<i>Cadillac Cowboy</i>)	SR 392, PO Box 3, Houghton-le-Spring, Tyne & Wear DH4 4DB
Chris (<i>Blackhawk</i>)	45 Southway, Sheriff Hill, Gateshead NE9 5QT
Ken (<i>Beerman</i>)	PO Box 5, Consett, Co Durham DH8 8NG
Steven (<i>Powerslave</i>)	PO Box 5, Consett, Co Durham DH8 8NG
Gerry & Val (<i>Gerrycan & Birthday Girl</i>)	1 Roland Rd, Wallsend, Tyne & Wear NE28 6QB
Juan (<i>Espacial 008</i>)	PO Box 197, Punto Fijo, CP 4102, Falcón, Venezuela
Tony (<i>Crafty Crusader</i>)	63 Pewsham Road, Swindon, Wiltshire SN2 5EL
Ron (<i>Happy Jack</i>)	PO Box 43, Rhyl, Clwyd, North Wales LL18 1YW
Robert (<i>Roto Power</i>)	59 Heywood Ct, Tenby, Dyfed, South Wales SA70 8BS
Steven (<i>Wells Fargo</i>)	PO Box 288, East Kilbride, Glasgow G75 85R
Tom (<i>Green Forest</i>)	PO Box 555, Telford, Shropshire TF7 4RL
Robert (<i>BC 05</i>)	PO Box 245, Belfast, Northern Ireland HDX 109, PO Box 16, Widnes, Cheshire
Colin (<i>Tattoo</i>)	5705 Brandon Blvd, Virginia Beach, VA 23464, USA
Jack (<i>Ghost Rider</i>)	PO Box 249, Poole, Dorset BH15 2LR
Bert (<i>Tenpin</i>)	School Bungalow, Laburnum Avenue, Hove, Sussex BN3 75D
Jim (<i>Sunray</i>)	18 Oak Lane, Ambrosden, Bicester, Oxon OX6 0SH
Brian (<i>Runabout</i>)	29 Warren Ridge, Frant, nr Tunbridge Wells, Kent TN3 9EE
F.E.L. (<i>Pipeman</i>)	

cards, roster, stickers, exchange QSLs and invites, club stamp and extras as available. In most cases of overseas clubs, they do not accept UK cheques or Postal Orders; therefore you have to send cash. For everybody's peace of mind I do strongly recommend that you

use Registered Post for this! I know it costs over a pound more, but if you send £5 or more through the post without any sort of registration, if it gets lost, or the club says it never received it, you have no comeback!

This month there's plenty of room for a

QSL CLUB ADDRESSES

Bravo Charlie Int Radio Group	PO Box 245, Belfast, N Ireland BT14 6JW
County Card Col' Club	PO Box 106, Canterbury, Kent CT1 3YN
European Radio Group	PO Box 1212, D-5810 Witten, West Germany
Lima Uniform X-Ray DX	PO Box 1142, 8261 MARKTL/INN, Bavaria, West Germany
North Sea Buccaneers DX	PO Box 2, Sheringham, Norfolk NR26 8TY
Papa Delta	PO Box 28, Tenby, Dyfed, Wales
Sierra Alpha CB Club	PO Box 43, Rhyl, Clwyd, North Wales LL18 1YW
Telford Thunderbirds	PO Box 555, Telford, Shropshire
Yorkshire Rose Int' DX	28 Farmhill Rd, Bradford, West Yorkshire BD10 8BD

When writing to any QSL/DX club, always include return postage for their reply; it really does help!

The last name for now is that of Brian (*Runabout*) of Oxon who sends out a terrific package of both personal and club cards.

That's it, no more room again but I'm finally making an impression on the piles of your cards and letters! If you want a mention in next year's magazines, now is the time to put pen to paper and get writing! But please do remember that I cannot promise to reply so if you need a reply, do include a SASE and if I can't read it, I can't use it! Also, especially where a forthcoming event is concerned, please do allow plenty of time, not just a few weeks! You can write to me care of the mag, but please allow an extra month or so before I can expect to see it, or direct to 3 Tarn Villas, Cowpasture Road, Ilkley, West Riding of Yorkshire, LS29 8RH, UK. That's it, catch you again next month, so 'til then, do take care and watch the dark nights!

"Browse Through a Club's Package" and this month it's the turn of the North Sea Buccaneers of Norfolk. Just a reminder here, this is *not* a "Club of the Month" slot, but a more detailed examination of a club's package. Membership to the NSB costs £4 (UK, £5 elsewhere), payable either in cash or by UK Postal Order. Should you send cash, then both Ken (*NSB 001*) and I recommend you use Registered Post for safety. One thing I am asked to point out is that the group is a DX-only group.

Right, the package arrives in a massive Jiffy bag, well protected and intact. The package consists of your unit number and quality ID card and an 8" by 6" certificate, plus the same items free for your XYL/M. The group stamp is fully mounted on an ornately carved wooden handle which fits nicely in your hand, a mixture of 25 club QSL cards including one in the series of Currie Collectors Cards. Then there's a selection of the President's and Vice President's cards which include a right mixture, ranging from Currie cards to Poma FCCs. An assortment of club stickers, containing the more usual white Vine Lodge labels and, surprisingly, VL's new clear and even their fluorescent red labels! An excellent club pen, and it writes first time too! A leather key fob plus, of course, the standards of exchange invites, NSB invites and "extras when available". What are they? Well, I'll leave something unknown for you in this package! One more thing, a very nice touch from this group is *free* use of the group's PO Box! Non-local members should provide a number of suitable SASEs for this service by the way.

Okay, a last few names for this time, starting with Colin (*Tattoo*) of Widnes, Jack (*Ghost Rider*) of Virginia Beach, Bert (*Tenpin*) of Poole, Jim (*Sunray Jim*) of Hove and a long and rather formal letter from Mr F.E.L. (*Pipeman*) of Frant(?) who has recently started to QSL.



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One year's subscription	£2.10

CB IN DEPTH

(part 8)

Paul Coxwell looks at the magical Phase Locked Loop

This month we move into the mysterious realm of the Phase-Locked Loop that causes so much anguish to some people. A good mathematical mind helps a great deal when we come to deal with this area of a CB transceiver and having a pocket calculator beside you as you read would definitely be a help. Here we go, hold on tight!

Oscillators

In examining the operation of the transmitter we saw that one of our first requirements is to generate an RF signal called the carrier. We also saw that a similar RF signal is required for the correct operation of a superhet receiver, though we did not look in detail at how such a signal is produced.

We did, however have a brief look at a simple crystal oscillator that could be used for providing these signals and such a circuit is reproduced in figure 1. The operation was described previously and as we have a lot to cover this month we'll skip a recap. Suffice it to say that this circuit could easily supply the carrier for the transmitter or local oscillator signal to the mixer in a superhet receiver. Virtually all CB circuits use this configuration of oscillator which is known as *Colpitts Oscillator*.

In the early days of CB it was quite common to have less than the full complement of channels available. Often a six or eight-position channel switch was fitted along with 12 or 16 sockets on the PC board to allow installation of crystals for the required channels. The reason for having double the number of crystals as the number of channels should by now be obvious if you have followed this series from the start. In the transmitter the crystal chosen would be at the channel carrier frequency of a sub-multiple thereof (where frequency doubling, trebling etc. is used). For the receiver the oscillator must run a fixed amount above or below the channel carrier to give the correct I.F. output from the mixer thus the crystals' frequencies will be different.

This scheme of using a separate pair of crystals for each channel worked fine for a while and is still found in some portable rigs that operate on a couple of

channels only, but as people began demanding more and more channels it became uneconomic. With 23 channels allocated in the U.S. sets would need 46 crystals to give full coverage – very space-consuming and very expensive! Clearly then a more viable method had to be found and crystal synthesizers came into use for CB apparatus. These work on the familiar principle of mixing two signals together and winding up with the sum and difference as well as the two original frequencies; just like the mixers of the receiver in fact. Using this method 23 channel rigs could be made to work with just 12 or 14 crystals. We will not go into detail here as you will rarely see any such rigs in this country these days, but if you would like to know more before continuing take a look back at the November 1986 issue of *Citizens' Band* where the two most common mixing schemes were examined.

Phase-Locked Loops

The later 23 channel sets started using PLL technology and all 40 channel transceivers use it, which is just as well because even with crystal synthesis a 40 channel rig would need rather a large number of crystals. The Phase-Locked Loop in its simplest form is shown in the block diagram of fig. 2(a). A crystal oscillator provides a stable, accurate reference signal which feeds to one of two inputs to a phase detector. This is a device which can compare two signals and give a voltage at its output that varies with the relationship between the two inputs. In this application we have one input that is fixed (hence the term *reference*) and one which can vary. The output is a DC voltage dependent on the frequency of this variable signal. VCO stands for Voltage Controlled Oscillator, a neat piece of circuitry whereby altering a DC voltage fed to the oscillator changes the frequency at which it runs. Coupled in a loop as shown the VCO will always run at the same frequency as the reference oscillator. Why? If the VCO tries to run below the required frequency the inputs at the phase detector will be different causing a DC voltage to pull the VCO back on-tune. If the VCO tries to run too high the voltage will swing the other way causing a similar correction. The output of the VCO therefore is locked to

the reference frequency. You may be wondering why the circuit is called a phase-locked loop and not a frequency-locked loop. The latter term could be applied but in a strict technical sense is not so correct as the former. There is a subtle difference between frequency and phase which we do not have time to go into here; if it makes it easier for you then think of the phase detector as a frequency detector, comparing two signals and giving an output dependent on their difference.

So far so good, though you may have noticed that in our primitive PLL arrangement we could get the resultant output directly from the reference oscillator! So why have the PLL at all? Well, here we find digital electronics gets a look in as with so many things in this computer age. Let's break the loop between the VCO and the input to the phase detector and insert a digital divider – fig. 2(b). Let's start including a few actual frequencies in our examples. Assume the reference oscillator runs at 100kHz and that we want a stable 10MHz at the output of the VCO. If we arrange the divider to provide an output of 1/100 of its input frequency ($\div 100$) then we will get just this. Converting all figures to kilohertz we have $10000 \div 100 = 100$. Lo and behold this is just the same frequency as the reference oscillator so the loop is locked. If the VCO tried to drift away from its nominal 10MHz then the output of the divider would shift accordingly. The phase detector would sense this and send a correction voltage to the VCO to bring it back on frequency.

With the wonders of modern science we can build a programmable divider which can be set to divide by any number we care to tell it to. Let's change the divider from $\div 100$ to, say, $\div 101$. The 10MHz output from the VCO will be divided down to give:
 $10000 \div 101 = 99.0099 \text{ kHz}$.

This is now lower than the 100kHz reference signal so the phase detector will output a voltage telling the VCO to lower its frequency until the divider output is one again 100kHz. The VCO will therefore be running at:
 $100 \times 101 = 10100 \text{ kHz}$, or 10.1 MHz if you prefer.

In the same fashion if the divider was

changed to ± 99 the VCO would be driven to 9.9MHz giving the same 100kHz at the divider output. You can see that by using just one crystal and a programmable divider PLL we can generate hundreds of different frequencies. The VCO output will always be the reference frequency multiplied by the setting on the divider.

PLL Arrangements

Now you have a rough idea of how a PLL operates we'll look at an actual arrangement found in CB equipment, though still only in block form for the moment. Figure 3 shows the mixing scheme actually used in many American and European rigs. Integrated circuits are invariably used for PLLs though how much of the circuit is in chip form and how much is discrete parts varies. In this example the phase detector and programmable divider are combined leaving the reference oscillator and VCO separate. Notice that the reference is a 10.24MHz crystal oscillator. Peculiar frequency you may think! Well, it has two reasons for being so. Firstly, the frequency of the reference signal determines the spacing between channels. In fig. 2(b) we had a reference of 100kHz and the output changed by 100kHz when the divider setting was moved by one. For CB where channels are 10kHz apart then it would be reasonable to assume the reference could be 10kHz. It could be less of course, but not more – with 20kHz for example the output would only be able to change in 20kHz steps minimum. 10.24MHz may seem like a long way from 10kHz but with digital circuitry it is extremely easy to divide by any multiple of two. Take 10.24MHz and divide it by two ten times and we have 10kHz. Therefore the PLL chip also incorporates a fixed divider that divides by 1024 to provide a 10kHz reference for the phase detector.

At first, it may seem like a lot of trouble to go to rather than using a 10kHz oscillator to begin with. We have reached the point, though, where hundreds of transistors can be squeezed onto a tiny slab of silicon for less than the cost of a crystal! The cost of crystals vary too and a 10.24MHz crystal is much cheaper to produce than a 10kHz one so whilst it may seem to be introducing complications unnecessarily this scheme is the most cost-efficient. Secondly, using 10.24MHz means that one oscillator can perform two tasks. Recall that in the double-conversion superhet receiver we have a first I.F. of 10.695MHz and a second I.F. of 455kHz. We saw that the oscillator signal for the second mixing stage must therefore be the sum or difference of the two IFs. 10.24MHz happens to be the difference signal, so the one oscillator can feed the PLL and the second mixer in the receiver thus saving the cost of an extra crystal. A

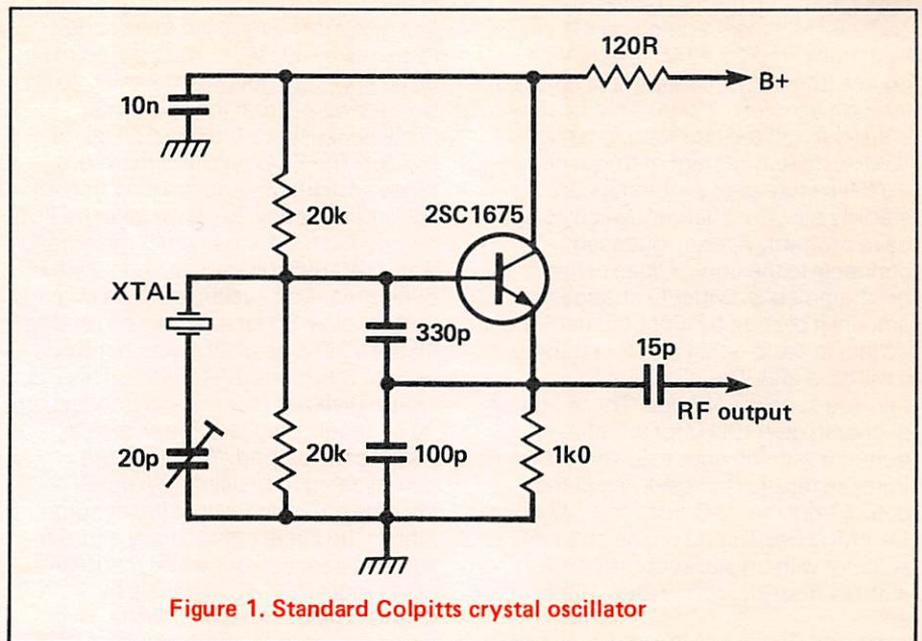


Figure 1. Standard Colpitts crystal oscillator

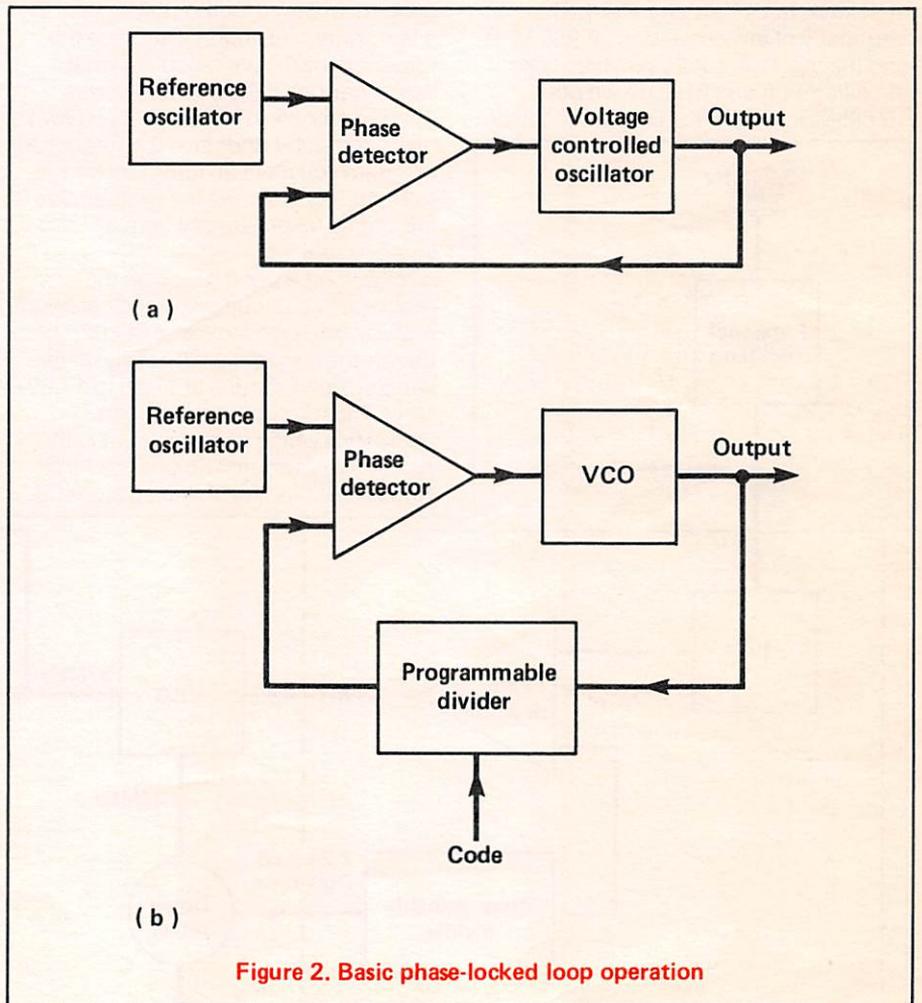


Figure 2. Basic phase-locked loop operation

little later we'll see how the reference oscillator may perform yet another function!

Returning to figure 3 the frequencies that the VCO run at have been included. 37MHz may at first seem a rather weird way of going about things but it will all fall into place soon enough so bear with us. Now the early PLL beasts such as the PLL02A couldn't handle signals as high

as 37MHz. It is only in more recent years that digital circuitry has improved and in modern PLL arrangements you may well find the high-frequencies fed back directly to the programmable divider (we'll look at such a circuit in time). In this chassis however we have an extra mixer with its own oscillator (crystal-controlled naturally). The fixed frequency is 35.42MHz which gives an

output from the mixer of between 2.24 and 2.68 MHz, depending on the VCO frequency. The 35.42 MHz actually comes from an 11.8066MHz crystal fed through a tripler – it's easier to do this than try to get the oscillator to run at 35MHz directly. At higher frequencies we have increased problems with stability etc. The channel switch as you have probably already guessed connects to the control lines of the programmable divider to change the amount it divides by. For channel 1 the divider is set to ÷224 and for channel 40 it will be ÷268. The divisor is often referred to as the N-code. These figures of course give 10kHz for the phase detector with the above downmix signals from the mixer. The result is that the output from the VCO goes from 37.66 to 38.1 MHz depending on the channel selector with crystal accuracy and stability from just one crystal! Pretty neat eh?

Now for the explanation of the choice of 37MHz. Let's take channel 1. The frequency of this channel is 26.965 MHz and the VCO runs at 37.66 MHz. Take the difference and what do we get? 10.695MHz – the first I.F. in the receiver.

So the VCO signal is used to feed the first mixer in the receiver to give the required 10.695MHz. The second mixer in the superhet gets its 10.24MHz fixed signal straight from the reference oscillator so that's the receiver taken care of. The VCO output is therefore always 10.695MHz above the channel carrier frequency. So, if we take the VCO output and feed it to another mixer, add a fixed 10.695MHz signal and take the difference, we have the desired channel frequencies. So for example on channel 40 the VCO runs at 38.1 which mixed with 10.695 gives 27.405MHz. This PLL set-up gives us receive and transmit on 40 channels from just three crystals which can't be bad. Yes, it's more complicated than using separate crystals but it means that the average man in the street can actually afford a set. The transceiver can be made to cover more than 40 channels by changing the codes sent to the programmable divider or altering the 35.42MHz signal for the downmixer. Try a few figures for yourself and see the results. In particular calculate what would happen if the 35.42MHz was changed for 35.87MHz say. If you own a microcomputer and have a spreadsheet program you have an ideal tool for PLL work and fig. 4 shows the frequencies for this circuit taken straight from a spreadsheet file.

After getting a good grasp on the previous PLL circuit take a look at figure 5 where we have the same PLL02A chip but arranged slightly differently. In this version the VCO runs at 17.18 to 17.62 MHz. The mixer is supplied with 20.48MHz which gives an input to the divider of between 2.86 and 3.3 MHz. Notice that this time the fixed signal is

above the VCO frequency so that the resultant downmix is higher on channel 1 than on channel 40. All this means is that the channel switch must be arranged accordingly and generate codes of 330 to 286 for channels 1 to 40 respectively to give an input to the phase detector of 10kHz. That's the loop section out of the way which leaves the connections to the receiver and transmitter. Now when the 17MHz VCO is mixed with the fixed 20.48MHz we not only get the low-frequency downmix signal but a high-frequency sum as well. So on channel 1 we have:

$$20.48 + 17.18 = 37.66 \text{ MHz.}$$

Sound familiar? It's the frequency that the VCO itself ran at in our last example. So 37.66MHz is the correct frequency for the first receiver mixer and a transmit mixer and 10.695MHz oscillator are used as before. Thus we've now got 40 transmit/40 receive with two crystals! Wait, I hear you shout, how is it two crystals, what about that 20.48MHz? We mentioned a third use for the reference oscillator a while back and this is it. Take 10.24MHz, feed it through a doubler and hey presto – 20.48MHz! Sneaky these PLL designers using one oscillator for three functions. The tabulated list of frequencies for this circuit is shown in fig. 6 for you to experiment with.

Conclusion

It may seem rather hard going to get through PLLs but after playing around with the figures for a while you should get the hang of it fairly quickly. We haven't actually looked at the wiring of PLLs yet but we still have some more PLLs yet but still have some more PLL outlines to consider first. They form the subject of next month's instalment.

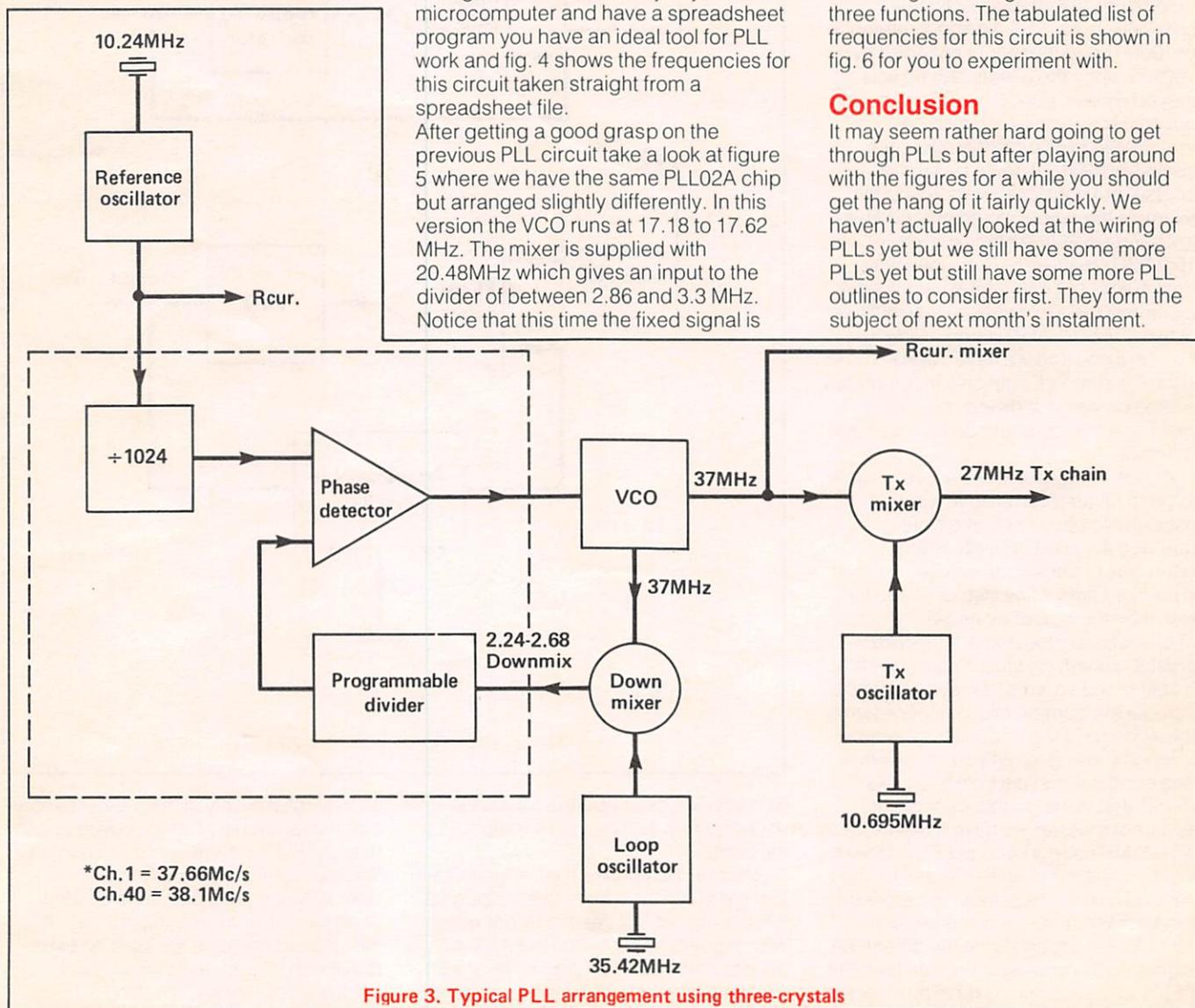


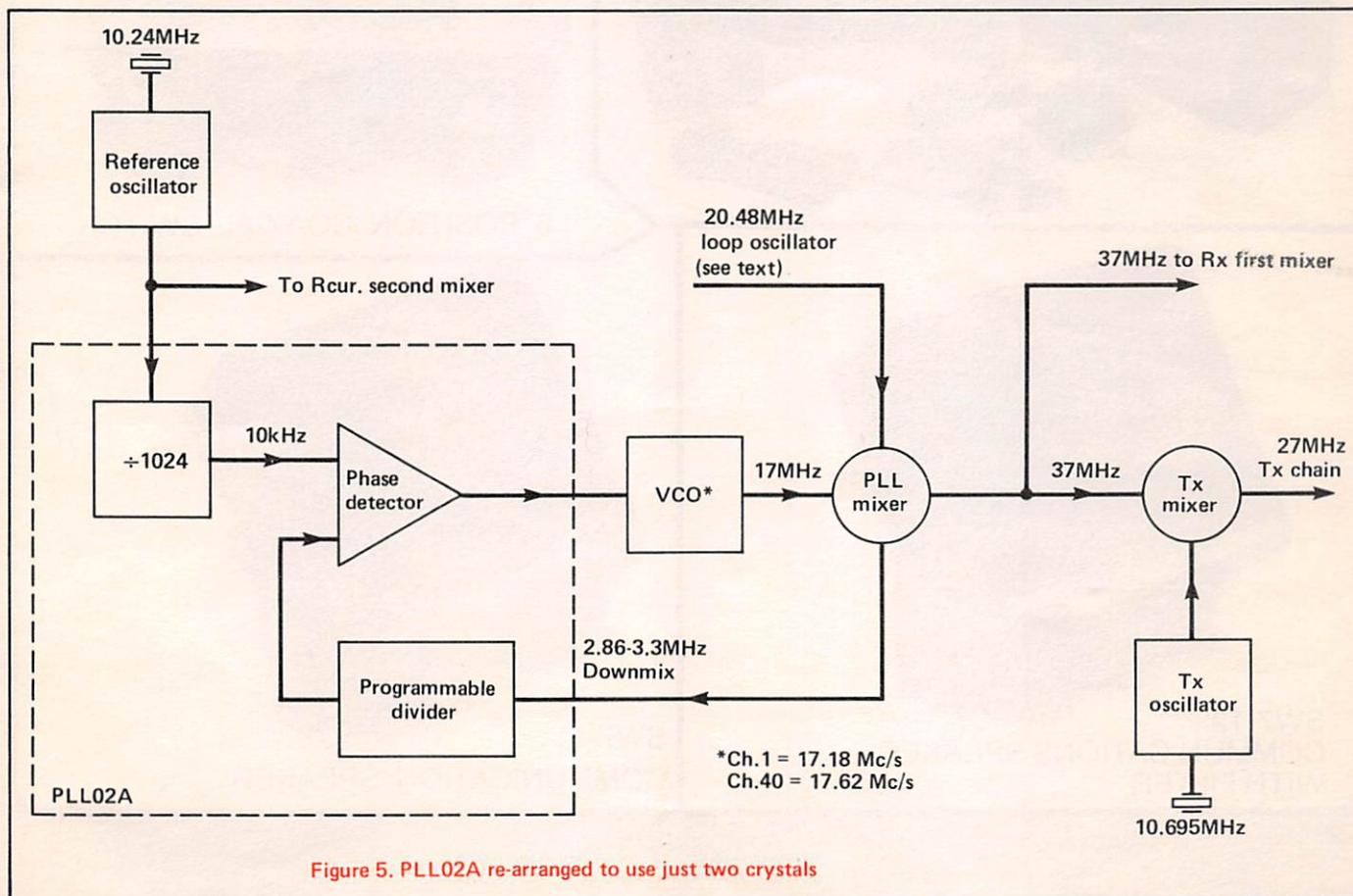
Figure 3. Typical PLL arrangement using three-crystals

Fig. 4. Frequencies to be found in fig. 3.

Channel	N-Code	Downmix	Tx mixer Loop mixer VCO	10.695 35.420 Ch. Freq.
1	224	2.24	37.66	26,965
2	225	2.25	37.67	26,975
3	226	2.26	37.68	26,985
4	228	2.28	37.70	27,005
5	229	2.29	37.71	27,015
6	230	2.30	37.72	27,025
7	231	2.31	37.73	27,035
8	233	2.33	37.75	27,055
9	234	2.34	37.76	27,065
10	235	2.35	37.77	27,075
11	236	2.36	37.78	27,085
12	238	2.38	37.80	27,105
13	239	2.39	37.81	27,115
14	240	2.40	37.82	27,125
15	241	2.41	37.83	27,135
16	243	2.43	37.85	27,155
17	244	2.44	37.86	27,165
18	245	2.45	37.87	27,175
19	246	2.46	37.88	27,185
20	248	2.48	37.90	27,205
21	249	2.49	37.91	27,215
22	250	2.50	37.92	27,225
23	253	2.53	37.95	27,255
24	251	2.51	37.93	27,235
25	252	2.52	37.94	27,245
26	254	2.54	37.96	27,265
27	255	2.55	37.97	27,275
28	256	2.56	37.98	27,285
29	257	2.57	37.99	27,295
30	258	2.58	38.00	27,305
31	259	2.59	38.01	27,315
32	260	2.60	38.02	27,325
33	261	2.61	38.03	27,335
34	262	2.62	38.04	27,345
35	263	2.63	38.05	27,355
36	264	2.64	38.06	27,365
37	265	2.65	38.07	27,375
38	266	2.66	38.08	27,385
39	267	2.67	38.09	27,395
40	268	2.68	38.10	27,405

Fig. 6. Frequencies to be found in fig. 5.

Channel	N-Code	Downmix	Tx mixer Loop mixer VCO	10.695 35.420 Ch. Freq.
1	330	3.30	37.660	26,965
2	329	3.29	37.670	26,975
3	328	3.28	37.680	26,985
4	326	3.26	37.700	27,005
5	325	3.25	37.710	27,015
6	324	3.24	37.720	27,025
7	323	3.23	37.730	27,035
8	321	3.21	37.750	27,055
9	320	3.20	37.760	27,065
10	319	3.19	37.770	27,075
11	318	3.18	37.780	27,085
12	316	3.16	37.800	27,105
13	315	3.15	37.810	27,115
14	314	3.14	37.820	27,125
15	313	3.13	37.830	27,135
16	311	3.11	37.850	27,155
17	310	3.10	37.860	27,165
18	309	3.09	37.870	27,175
19	308	3.08	37.880	27,185
20	306	3.06	37.900	27,205
21	305	3.05	37.910	27,215
22	304	3.04	37.920	27,225
23	301	3.01	37.950	27,255
24	303	3.03	37.930	27,235
25	302	3.02	37.940	27,245
26	300	3.00	37.960	27,265
27	299	2.99	37.970	27,275
28	298	2.98	37.980	27,285
29	297	2.97	37.990	27,295
30	296	2.96	38.000	27,305
31	295	2.95	38.010	27,315
32	294	2.94	38.020	27,325
33	293	2.93	38.030	27,335
34	292	2.92	38.040	27,345
35	291	2.91	38.050	27,355
36	290	2.90	38.060	27,365
37	289	2.89	38.070	27,375
38	288	2.88	38.080	27,385
39	287	2.87	38.090	27,395
40	286	2.86	38.100	27,405



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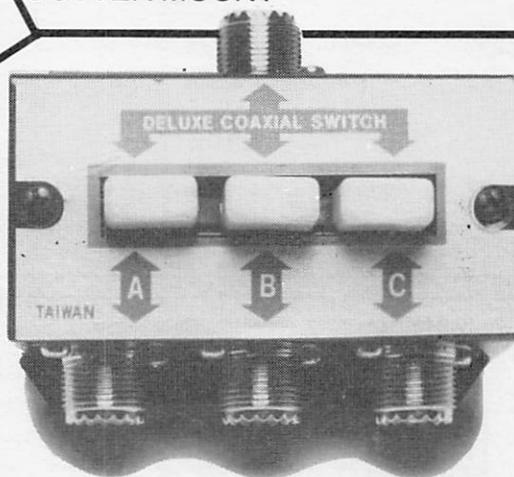


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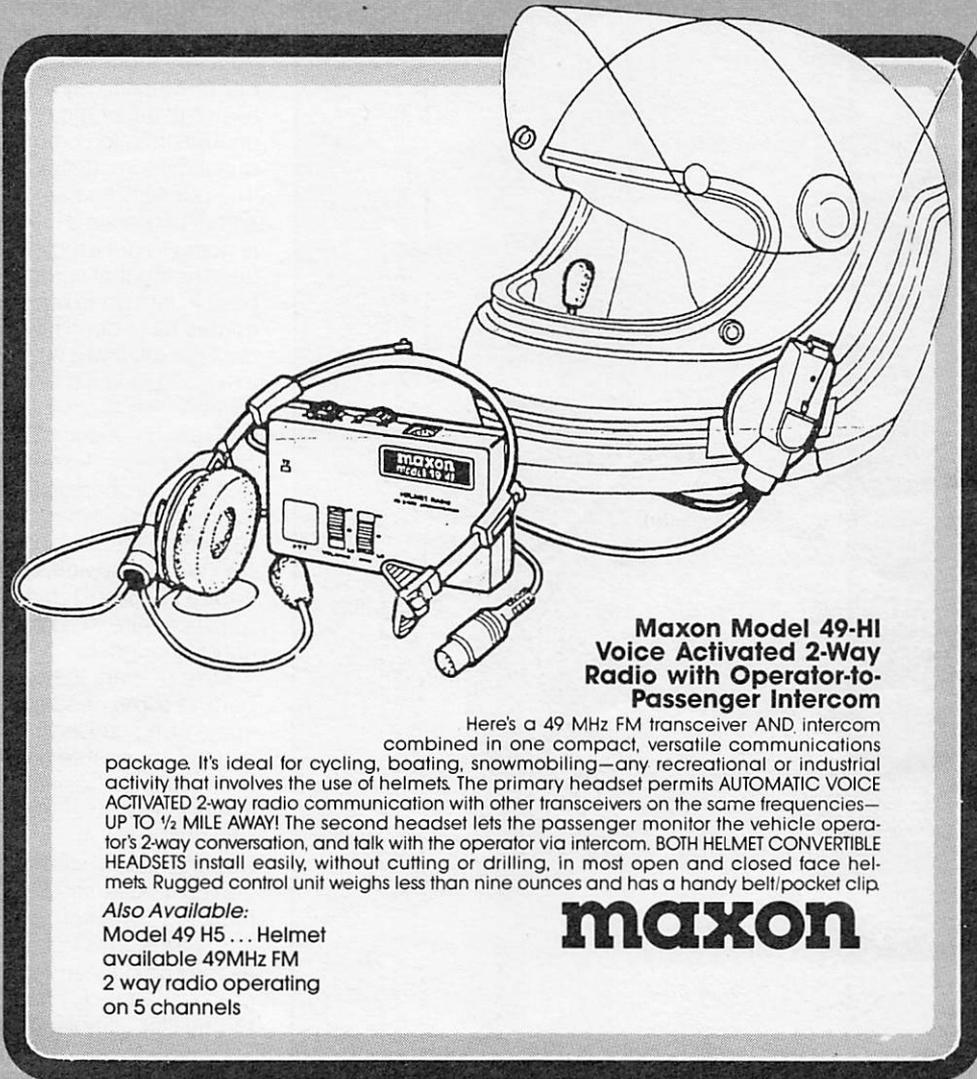
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PRINTING PRINCIPLES

Brandybird presents a guide to some of the top printers in the QSL card business

After looking at the many different types of QSL cards about, I realised that the majority of people use the printer that is closest to their home, perhaps

because of the postage costs, but more likely because they just didn't know what is available. Bearing in mind, I sat down and typed up a questionnaire which, I hoped, covered all aspects of QSL printing. I sent out 22 copies to various printers around the country, all known for advertising QSL cards. I've tried to cover them all; black and white, colour printing, hot-foil, plastic and photo cards. Much to my amazement, only twelve of the original 22 thought it a good enough idea to complete and return my questionnaire, despite the promise of free publicity for them! This shows what sort of response a member of the public is going to get if they write for samples. I have heard that some of the companies have in fact gone out of business, and a couple have been taken over recently, but I still felt that it was a poor response to a good idea. I'd like to take the printers who received questionnaires, and also the results from those who *did* bother to reply. I'd like to take the opportunity, then, to sincerely thank all those who did bother to return to me, especially those who telephoned with queries and advice, and those who added sheets of typing to my questionnaire with information that I hadn't thought of.

Most printers will send out a sample pack of some description on request; some also charge a nominal sum for this, usually refundable against your first order. One of these chaps has asked me to stress that you must send a decent-size envelope, at least 6" x 8", self-addressed and with a stamp of at least 20p on it. Also, when you write, please mark the corner of your envelope, *CB QSL cards*. This helps them enormously, as they do do many other types of printing. Can you imagine them getting a request for samples that does not stress what type of samples you require? So, please stress in your letter, or on the envelope, that it is a request for samples of CB QSL cards.

So, you've decided upon one of two things. Either (a) you've decided upon the type of card that you want, or (b) you're working to a budget and want the best available for the price. First, *always* read all of the print, especially the small stuff. Most printers have a basic charge for what they consider is their basic card. Some then add a bit here and a bit there for the extras, such as a different colour of ink, or more than one colour of ink, or a different colour of card, either glossy or matt. Most are easy enough to work out, if you read everything they send you, but these extras can mount up, so do be careful and make sure that

you know exactly what you are going to get.

Another thing to watch out for, are the 'plate' costs. Ordinary printing, such as black and white or full colour printing, can be of two sorts. One is letterpress, which requires each letter of the writing to be mounted separately (called typesetting) and any drawing or design has to be engraved on a special metal plate, which usually costs extra on your first order, but isn't charged for future orders as the plate only needs to be made once. Typesetting usually costs a nominal sum, and is really dependent upon the size of the printer as to whether it will have to be re-set for future orders. These engraved plates are usually sent out to engravers (thus increasing your waiting time) but costs do vary tremendously. If, at a later date, you want to go to a different printer, the first will probably retain the plate as their copyright, so you will have to pay to have another one done. This, to my way of thinking, is wrong; if you have paid good money for the plate, then it should be your property, especially if it was your own artwork. However, most printers work to this method, but it is worth enquiring.

On the side of ordinary printing, black and white cards seem to cost an awful

lot, compared to the price of their glamorous cousins, hot-foil, especially when you deduct the plate charge. Star-Rider does a smashing coral (textured card) card for £9/250, which are very nice, compared to the ordinary black on white matt card costing around £6/100.

Full colour cards come in many guises. There is the full colour on gloss card such as Des Currie's at around £56/1000, to the Coral, full colour done by Star-Rider at £40/1000 or POMA's gorgeous cards at £59/1000. Again I was very impressed with Star-Rider's cards, they compare very favourably with both POMA and Currie's and yet, he has so far managed to keep the price down to make it easier for us hard-up CBers.

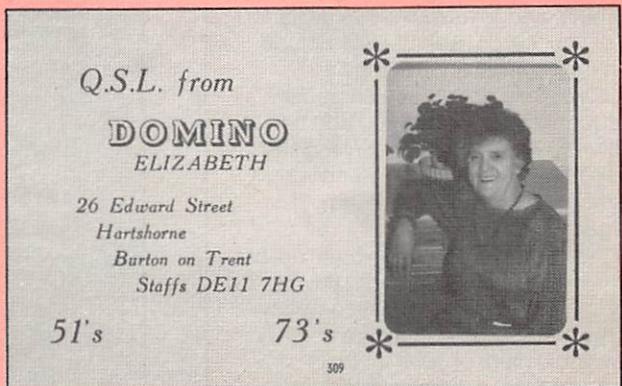
Of course, we mustn't forget plastic cards; these can be very classy and will stand up to rough treatment. Ensign do a hot-foil print onto plastic card for £10/100 plus their plate charge, whilst Raymac do a superb, credit-type card, QSL size for £24/100 for first order, thereafter £18/100. If you want to add a touch of class to your QSLing, then these are well worth looking into. Raymac charge £2 for their superb sample pack, but do knock it off your first order. Do please enclose a self-addressed

envelope of at least 5½×8½" and at least a 20p stamp.

I've made my completed questionnaires into a type of graph, which I hope you will be able to follow, and included prices where known and addresses, but please don't take my price list as gospel. Check for yourself, before you send your money. Twrog press have only just started to do CB QSLs, so most of their samples are ham, but their prices are worth considering.

Most of these printers also do eyeball cards at a reduced size and cost, which I haven't gone into here, and most also print many other things as well. I would like to thank everyone who took the trouble to return the completed questionnaire. Those who didn't, well, I'm not too sure what to make of that. Either they no longer exist, or they didn't want the free publicity, or perhaps they felt that their prices wouldn't stand up to comparison. Whatever your conclusions are, I hope you'll be happy with the printer that you chose. Happy QSLing, and don't forget to send your cards out quickly. There's nothing worse than having to wait months to receive your QSLs back.

The other type of printing is called lithographic. This is being used more and more now, as it is a much easier and



simpler process, especially for colour printing. What this involves is taking a plate again, but this plate is more like a photographic negative (but more complicated). A different litho plate has to be made for each colour you require, so increasing the price. This usually isn't as expensive as letterpress, after all, a 'photograph' can't be as expensive to produce as an engraved metal plate.

If you are a bit of an artist, or have a friend who can draw up your artwork for you, then you may feel that your printing cost should be cheaper, not using their artist. However, very few printers actually give a reduction for your own supplied artwork. Saying that, none of the printers charge the going rate for artwork anyway. Art is a skilled and trained job, and no professional artist would do your artwork for a couple of quid. Most have a relative or friend who does this job cheaply for them. One of the problems with artwork is that most people do not understand what is meant by 'camera-ready' artwork. This usually means that it is past the first stage, and ready for the litho 'photograph' to be taken. In black and white printing, or one colour ink, this means that the artwork is finished, all wording intact, on a glossy white paper, and the correct size. Do your drawing with a technical pen, such as the Rotring, or a good quality dip pen, using *black Indian ink*, not biro or marker pen. There should be no poorly-covered mistakes or smudges. The technical pen used, should be 0.3mm or 0.5mm. If all that is in order, and the chosen printer does give a reduction for artwork, then you are well away. If you're wanting a full colour print, the artwork needs to be exactly the same as above. Then get a photocopy of it, and use basic strong colours to show the colours that you want. Artwork for photo cards also needs to be a specific size, so do check first with your printer. If you are sending a negative. It must be 35mm and a good clear bright print for the best results.

Next thing to consider, is the postage and packing costs, some first charge as much as £3.50 per 100 for P&P; this could be a charge as excessive as £9 for 1000 of your cards. Another will include P&P in their overall price so beware; what looks like a good price on paper will suddenly rocket when you add the P&P costs. Of course if the printer goes to swap meets and eyeballs, then you can arrange to collect, so cutting out postage charges.

Also look closely at the minimum order requirements. If you only want 100 cards, then don't order from a company that only prints 1000's. One firm actually quotes a minimum of 3000 for their full-colour cards, but they are looking into smaller quantities at the moment.

Hot-Foil cards do seem to add a touch of class to your QSLing and, when you start to compare prices, they do seem quite cheap compared to other printing



**QSL FROM
BOOMERAN**

personal: KEITH
QTH: Brierley Hill
Bravo Hotel 02

PO Box 27, Brierley Hill, West Midlands, DY5 1HZ.

"SEA DART"
MARCUS
PO BOX 201
WOLVERHAMPTON
WV10 9HH
ENGLAND
U.K.

Curria Collector Series: 234

NAMES AND ADDRESSES OF QSL PRINTERS

B & M Printers

PO Box 12
Waterlooville
Portsmouth
PO7 7PU
Tel: 0705 261201

Twrog Press

Dept CB
Penybont
Gellilydan
Blaenau Ffestiniog
Gwynedd
LL41 4EP
Tel: 076 685 341

D. Currie QSLs

Room 2
89 Derwent Street
Blackhill
Consett
DH8 8LT
Tel: 0207 505191

Ensign

58b, Market Street
Ashby De-La-Zouch
Leics.
Tel: 0530415730

New Midas

c/o 40 Marklew Close
Shire Oak
Brownhills
WS8 7AP

Poma/DB Cards

c/o Ray
P.O. Box 106
Canterbury
Kent
CT1 3YN
Tel: 0227 457627 (evenings)



Charlie Cards

26 Edward Street
Hartshorne
Burton on Trent
DE11 7HG
Tel: 0283 221261

Sharp Graphics

PO Box 3
Grangemouth
FK3 9BD
Tel: 0324 473432

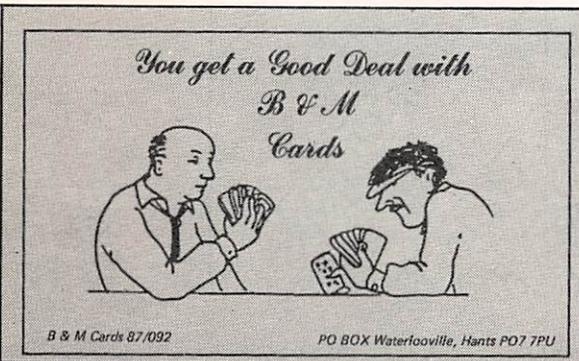


D. H. Elbourn

1 Downside
Rowner
Gosport
Hants PO13 0JS
Tel: 0329 289165

C. D. Jones

St Ivey
North Road
Queenborough
Kent ME11 5ET
Tel: 0795 665789



Star-Rider Designs

PO Box 112
St Leonards on Sea
East Sussex TN34 6NX
Tel: 0420 026398 (evenings)

Raymac Club Supplies

CB QSL
No 2 Showfield Ind. Units
Pasture Lane Ind. Estate
Malton
N. Yorkshire

types, especially when you deduct the plate charge. Again, hot-foil printing requires a metal plate to be engraved, costing somewhere in the region of £10-15, meaning that your first 100 ordered will cost somewhere around the £20 mark, but further orders will only set you back £5-£8. If you're thinking of having the larger 6"×4" cards, then do consider that you'll have to buy larger envelopes for them.

With hot-foil, try and get some samples, either from friends or from the printer himself. Look particularly at the foil solid blocks, check for splits, scratches and foil where there shouldn't be foil. This is usually a sign of a poorly-made plate, or the foil being too hot or cold. I was very impressed by the multi-colour cards from Charlie, but disappointed to discover that they do these for family only. Not surprising when you discover that each colour of foil requires a separate plate, and has to go through the machine every time, so 100 cards would take 400 pressings, and cost an awful lot. Looking closely at the foil blocking on all the samples I received, I must admit that the Ensign cards do seem to come out on top, although I have also to admit to bias, as I use Ensign myself. No two people will want the same from their cards, so it's up to you to make your own decision.

Another item to check upon, is whether the cards are printed on the back as standard, with a CB QSL report. Some do it automatically, some only on request, and some have several designs to choose from. Again, some charge extra, some include it in their total cost, so do check first before ordering.

With the more expensive, but classy 'photo-cards', there are several things to look into. To start with, what exactly does the printer mean 'photo card'? Some, I've found, print a full-colour picture and add a small passport size photo of yourself (POMA), some print a 'words-only' hot-foil card, again with a small photo, (Charlie, £21/100 for first order) and some will do an original painting, cartoon or otherwise, complete with your handle and call-sign, then photograph it (Ensign, first 100 £40). For cheapness, I paint a picture myself, add the handles with Letraset, photograph and waste a full film, and then order double prints, so giving me 48 or even 72 cards for as little as £5. Better still, once you've taken the picture, call one of the big photo processing agencies who do the same day service for the chemist. I've been quoted £18.50 for 100 prints off one negative. Some of the printers include a wallet/folder complete with QSL report with the first order (Ensign) which, as a QSL cards, looks very classy indeed. Apart from POMA who only print to 1000's, most photocard people will print 100 off, so look around and make sure that you know what you are getting as a photocard.

	PLASTIC	HOT FOIL	BLACK/WHITE	COLOURS	FULL COLOUR	PHOTO	MINIMUM ORDER QUANTITY	APPROX. SIZE OF CARDS	CARDS PRINTED BOTH SIDES?	PRICE FOR PRINTING BACK	OVER-PRINTING AND COST £	STANDARD DESIGNS AVAILABLE AND COST £	ANY REDUCTION FOR OWN ARTWORK	DELIVERY TIMES	DISCOUNTS FOR LARGER QUANTITIES £	EXTRA INK COSTS £	POSTAGE & PACKING COSTS £
Ensign	●	●				●	100	3 $\frac{3}{8}$ " x 5 $\frac{3}{8}$ "	If require	INCL.	from £2/100	£7/100	£5	2-3 weeks	£10 = /1000	—	Free 100 £5/1000
Charlie Cards		●				●	100	3 $\frac{1}{4}$ " x 5 $\frac{1}{4}$ "	YES	INCL.	£7	—	—	10-14 days	=59 /1000	—	INCL.
New Midas		●					100	85 x 135 m.m.	YES	INCL.	£4/100	£7/100	£4	21-28 days	NEG.	—	INCL.
Sharp Graphics		●		●			100	100mm x 150mm	IF REQ.	approx £1/100	£1-50 /100	—	—	28 days	=57-50 /1000	—	90P /100
B & M Printers		●	●	●			100	3 $\frac{1}{4}$ " x 5 $\frac{1}{2}$ "	IF REQ.	£1/100	—	£12 /250	—	4 weeks max.	NEG	£2-00	£3 U.K
D.H. Elbourn			●	●			100	3 $\frac{1}{4}$ " x 5 $\frac{1}{2}$ "	YES	INCL.	QUOTE	—	REQS. artwork	2-3 weeks	NEG	£1 /100	INCL.
Twrog Press			●	●		●	100	90 x 140 mm.	YES	£3/100 £5/1000	£5 /1000	£25 /1000	—	14-21 days	NO	£3	INCL.
C.D. Jones			●	●	●		1000	up to 6" x 4"	YES	+50%	—	—	—	2 weeks max.	NEG	£3-90	INCL.
Currie QSLs			●	●	●		1000	3 $\frac{1}{8}$ " x 5"	IF REQ.	BY QUOTE	NO	£16-50 /1000	—	10-14 days	?	£4-60	INCL.
Star-Rider Designs			●		●		B/W. 250 col. 1000	3 $\frac{1}{32}$ " x 4 $\frac{3}{4}$ "	NO	QUOTE	QUOTE	—	—	7-10 days	NO	QUOTE	£2 250 B/W
Poma/D.B.			●		●	●	1000	3 $\frac{1}{4}$ " x 5 $\frac{1}{2}$ "	IF REQ.	£8 /1000	£8 /1000	artwork ready	£5	4-6 weeks	NEG	—	£3 /1000
Raymac	●						100	3 $\frac{1}{2}$ " x 5"	NO	N/A	NO	—	—	2-3 weeks	YES	—	Plus 5%



CAPTAIN SPARX

GREAT RADIO FIRSTS

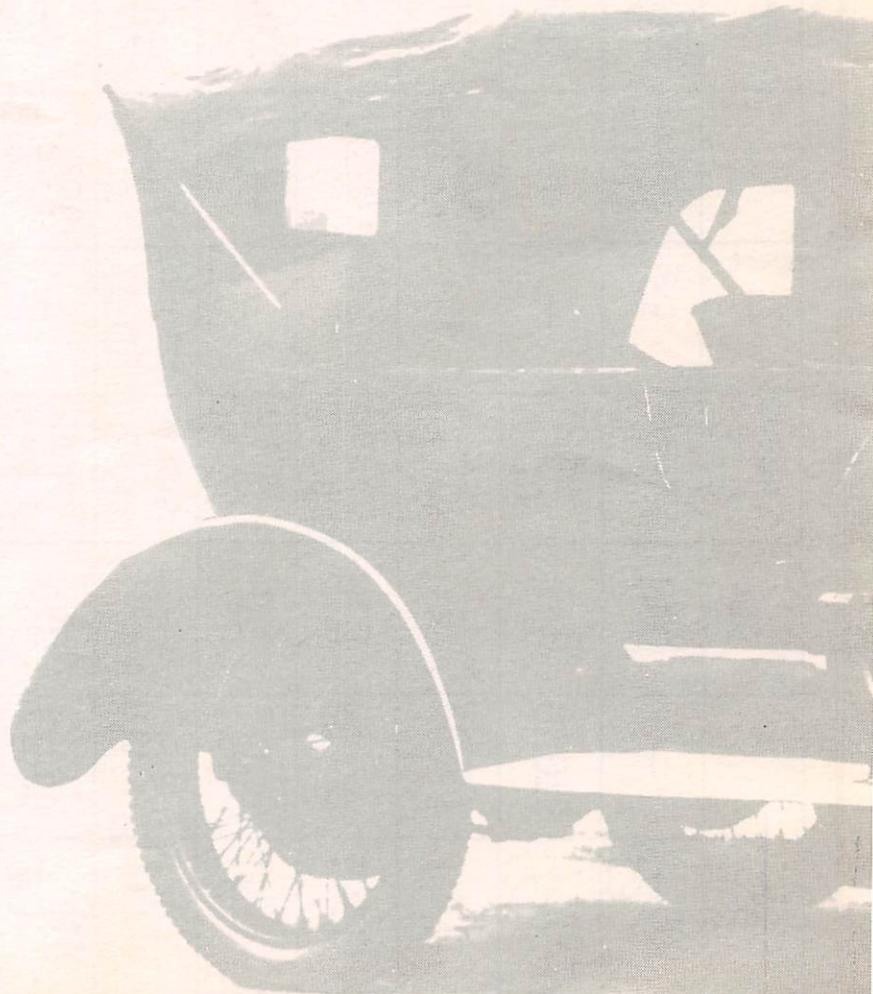
Captain Sparx looks at a few communications innovations

Who will be the first whiz-kid to take over a satellite TV transponder — just to show he/she knows something about technology? The question came up in a US satellite TV seminar a few years ago, and in a lighthearted manner, some of the not-too-junior whiz-kids suggested how it might be done. True, it had distinct overtones of Flash Gordon film serials, but the discussion indicated why satellite TV operators are somewhat thoughtful on the matter of security. The problem is that, in the USA especially, people love to be First in doing something neat. And what could be neater than interrupting the official transmission on a satellite transponder with unofficial greetings from Junior, somewhere east of Iowa? It's a tough life for anyone involved with communications security, even at this level.

During last year's coal miners' industrial dispute, my local (ILR) station was much upset by occasional use of its official frequency by an illicit operator eager to mention the strikers' point of view. Well, it made a change from the station's usual diet of commercials slightly interrupted by records. Things are now back to mind-numbing normality at the station, but as and when the industrial problems flare up again, somewhere a transmitter will possibly be brought down from the attic for propaganda use. Even apart from such toil in the cause of industrial democracy — whatever that is — such use of rigs can be claimed as Radio Firsts. Introduction of legal community radio would, at the very least, divert such enthusiasm into officially approved channels.

A few years back, you could meet in almost any town of any size (e.g. one having both Woolworths and a Co-op, plus phone boxes that worked) fellows ready to claim that they were the first in

This staff car was used by General Allenby on his victorious entry into Jerusalem in 1917, the man who was later to provide a liberated theatre in the city for The Roosters



the locality to operate on CB radio. Necessarily, this is a local rather than a national claim, since anyone saying he/she was the first in all Britain could reasonably be asked with whom he/she was communicating. True, skip conditions make many marvels, but to be the very first in all the UK would be as great a distinction as owning up to inventing the Poll Tax (which, by the way, is likely to cause more creased brows than overloaded CB rigs). One long-distance driver reflected that on runs from the north of England to London, in the early 1970s, you might just occasionally encounter a fellow user of the noble radio art. In fact, radio contacts of this kind were by pre-arrangement more often than not, as the pools of the CB Intelligence were somewhat rare. CB operators, using imported US rigs, tended to regard one another as fellow members of a Lost Tribe of Israel.

You will recall that some of the CB conservatives, mercifully few in number, thought that CB would be ruined if provided for the population in general. They suggested that the best policy was to keep the politicians from finding out about it (not too difficult) and keeping the communications to a sort of Radio Aristocracy. Well, it makes a nice idea for some politico seeking re-election: "Vote for me, and I will make sure that CB is *never* legalised." Those very early rigs would certainly be rated as vintage

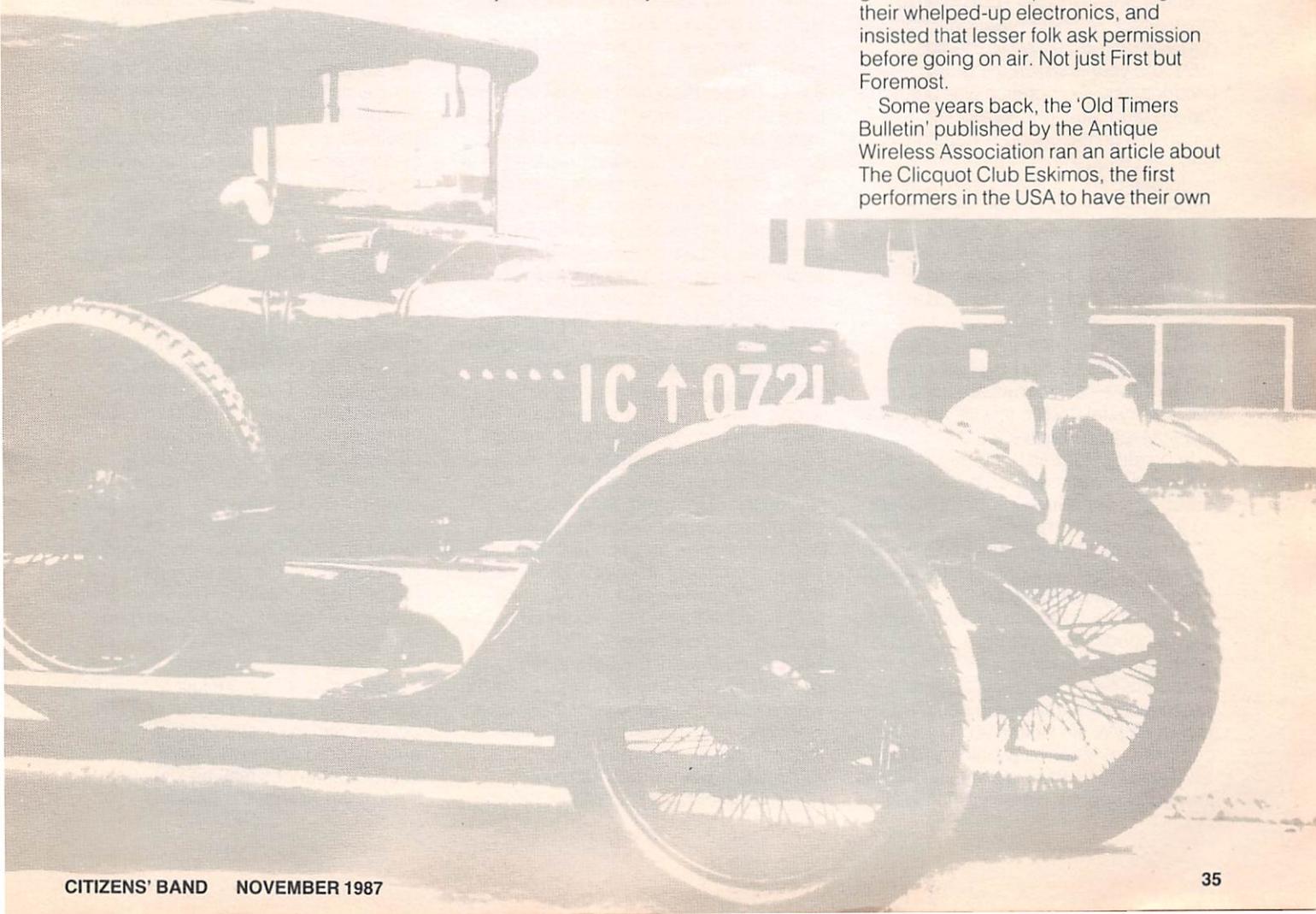


1930s shot from the 'In Town Tonight' studios. Far right is the producer, A W Hanson, whose programme achieved many Radio Firsts!

by now, including the original 18 channel models, though SSB soon became an illicit favourite in Britain, among the CB hoi-polloi (that's meant to be a compliment, so don't write in to the Captain). If asked how it was in the old days, the CB prospectors of the past say things like, "It was nice to chat with Signor Marconi and Sir Oliver Lodge." They like to show they were ... FIRST.

Meanwhile, the concept of the Radio First crops up in the US amateur radio publications, whilst CB journals of the 1970s certainly ran pieces on gents eager to assert their claim to history, sometimes by running rigs so powerful that everyone in town got a headache just walking down the street. There were also those 'channel masters' who grabbed all the frequencies through their whelped-up electronics, and insisted that lesser folk ask permission before going on air. Not just First but Foremost.

Some years back, the 'Old Timers Bulletin' published by the Antique Wireless Association ran an article about The Clicquot Club Eskimos, the first performers in the USA to have their own

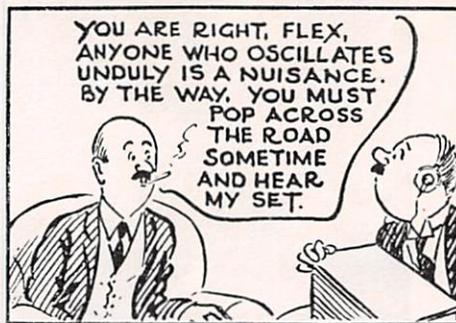


regular radio show (1926, NBC, syndicated 1951). The show was sponsored by the Clicquot Club Beverages, and ran for 30 minutes, though this intelligence suggests that Britain had even more prestigious claim to be first. In response to the US claim, the Captain Sparx Research Unit, consisting of two blokes and a long ladder, has been investigating. So here is the kind of Great British Radio Firsts Claims you can drop into your conversation, along with your personal claims to fame, like being the first chap in the street to fall off the roof while trying to tie a CB antenna to the chimney.

The Big Money awaiting people ready to broadcast on radio (or later to appear in the Wogan Show) became evident early on. Radio output was initiated in November 1922, under the auspices of the British Broadcasting Company. The first broadcast was primarily designed to cover the general election results, but people easily tiring of politicians in those days, the Company suggested some light entertainment. Norman Long – 'a song, a smile and a piano' – was invited to take part in that first radio broadcast. At first, he turned the offer down, but eventually agreed, though the grand fee was 'nowt'. As in some aspects of modern radio, the professionals tended to think that anyone allowed to go near a microphone ought to be glad to do it for nothing (even if they never would themselves). So Norman Long claimed to be the first not only to broadcast from Marconi House in 1922, but again to claim a first, when he broadcast from the newly acquired Savoy Hill Studios in 1927, the year in which the British Broadcasting Corporation was created. We are glad, and indeed relieved to report that on the second occasion, he was paid handsomely for his performance – a guinea, or in modern parlance, one pound, five pence. He also appeared at the 1927 Royal Command Variety Performance at the Victoria Palace, first of these events to be transmitted on radio. He lived in Sydenham, by the way, a part of the metropolis which has its own radio aristocracy today. Rumour has it that some of these aristocrats are hoping to get the Crystal Palace rebuilt, as a place to install really effective aerials.

Soon after Norman Long had proved the popularity of music on the air, the British Broadcasting Company signed up a dance band, namely that of Marius B. Winter (1923) – also the first to use a signature tune ('Whispering'), to engage a lady announcer for radio announcements, and to add soft music backgrounds (piano/string arrangements) to radio link announcements. Incidentally, that excellent dance band (subject of a recent EMI/World Records LP compilation) Maurice Winnick and his 'sweetest music this side of heaven' was the first to appear in a British 'talkie', the

FLEX'S FRIEND WANTS HIS SET TO BE HEARD—



—IN HIS OWN HOME



The Oscillating Neighbour was one of the Radio Perils of the 1930s, as this strip from a 1931 radio weekly confirms

BIP production, 'Atlantic', made at Elstree Studios in the late 1920s. Maurice Winnick was quite a character, and had his own dance band before reaching his twenty-first birthday. His own special Radio First was that of being the first British band to be heard in an Outside Broadcast, what was then called 'a relay' direct from The Piccadilly Hotel in London (1931).

Now, as every CB Committee Member knows, the best laid plans can result in S.B.C. (Sheer Blooming Chaos) and this is not entirely unknown in broadcasting matters. As the newly founded British Broadcasting Corporation prepared to move its facilities from Savoy Hotel on the Thames Embankment, to the new Broadcasting House in Portland Place, there was a certain amount of S.B.C. relating to where performers were expected to go. One day, a pianist, who had been booked to participate in a live broadcast, Patricia Rossborough, turned up on time only to find that one of the BBC bureaucrats had sent her to the wrong site, namely to the new battle-ship like building in Portland Place, instead of Savoy Hill. As broadcasts were made live, there was no time to travel to Savoy Hill; on the other hand, the yet-to-be-completed complex at Portland Place, had only one live microphone, and that was in the chapel. In what is known in the trade as a Lash Up Job, the live mike was linked to Savoy Hill, a piano was pushed into the Chapel and Miss Rossborough went ahead with the programme. The music was 'jazz', by the way, and this 'christening' of the chapel would not have gone down well with those ecclesiastics who still wondered if radio was a sneaky idea from down below. But – what a Radio First, playing

jazz on a piano, to the only live mike at the BBC in a building still welcoming tradesmen and artisans! Maybe it anticipated the current boom in Gospel Music, in which the BBC has played a distinguished part, of course.

My favourite Radio First Story concerns 'The Roosters', almost the First Concert Party to broadcast though beaten by the shortest of cat's whiskers by 'The Co-optimists'.

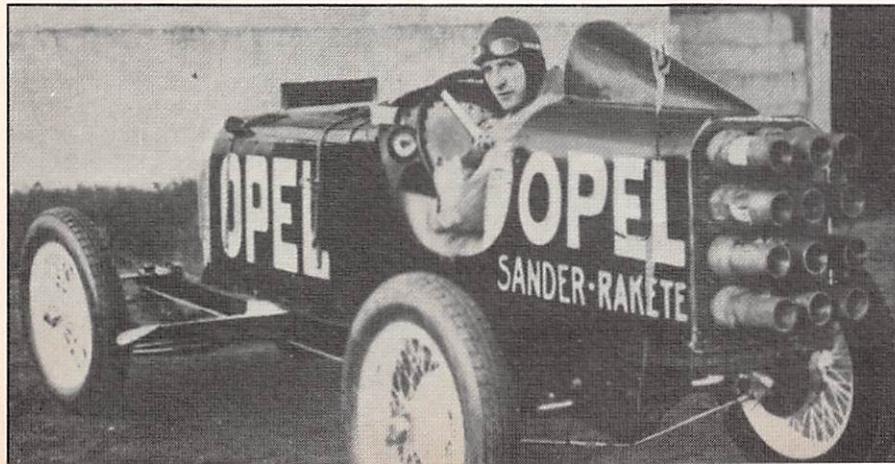
It's a yarn that even out-does some of the claims to fame coming from veteran Cbers after the second gin. 'The Roosters' were a concert party created by army personnel during the Salonika campaign in 1917. The title of the concert party was 'inspired' by the name of the Commanding Officer of the Summerhill Camp at Salonika, a certain Captain G.U.B. Roose. Within a remarkably short time, 'The Roosters' were playing to troop audiences throughout the Middle East theatre of operations. General Allenby was so impressed that he assigned the former Turkish Municipal Theatre in Jerusalem for the concert party's use. With appropriate changes, the theatre became, for some four months, the centre of Rooster shows – The Palestine Pavilion. Rigours of army life perhaps faded into insignificance compared with what faced them in the early days of radio. The BBC invited 'The Roosters' to broadcast from Savoy Hill, and there was no Hospitality Room in those days. According to a press report, 'there was no rehearsal, they were just bundled into a small room and told to carry on'. Of course, with the restrictions on finance encountered at the BBC these days, such experiences may be just ahead! Twenty years after the Salonika



campaign, i.e. in 1937, 'The Roosters' were still going strong, broadcasting from Radio Normandy in a show sponsored by Fynnon Salts, a health care product. Four of the originals, Arthur Mackness, Percy Merriman, William Mack and Charles Harrison were still in the show, whilst George Western, another of the originals, was now part of one of the radio and variety's most popular acts, The Western Brothers. Although Captain Sparx has used original research for this epic chunk of literature, we heartily recommend Denis Gifford's 'Golden Age of Radio' (Batsford) if you want to know more about Great British Radio Firsts, of which there were many.

Outside broadcasting, there were many other Radio Firsts, including a scheme to detect mineral deposits, sunken steel hull wrecks, etc using radio. This sort of thing is done visually by sensing satellites, today, far more significant for humanity, long term, than all the chat about more entertainment on satellite. The idea was really a French Radio First, based on a technique developed by the French Army during the first world war. Idea here was to detect caches of ammunition, abandoned by the enemy, for example,

This Opel Speed Racer, with a top speed of 430mph, would be ideal for avoiding traffic problems mentioned on the rig!



or other 'buried metal' which could mean counter-espionage activity. A signaller would go into No Man's Land – the sector between allied and enemy lines – armed with a couple of copper earth rods which (if he was not duly observed by an enemy sniper) he placed about 200 yards apart, running the wire/cable connection back to the trench listening post. At the headquarters of the operation, the two rods were connected to the secondary terminals of a Low Frequency transformer carrying what were then known as 'the speech currents'. Low frequency currents radiated from the copper earth rods, acting as aerials, could be monitored via headphones connected across the two earths at the receiver. Large quantities of metal – buried in the ground – so affected the earth current activity that on-the-spot searching could be carried out at appropriate times. Of course, where a large amount of shrapnel lay in a wide area, the technique was well near useless, but the point of the observation was not lost, and throughout the 1920s, was used as a base for further research – in the USA, Canada and in Germany, for example. In the western states of the USA, for example, 50 meter transmitters, on the very short waves, were used to detect the presence of metallic ores. By the 1930s, the potentialities of 'treasure hunting by radio' were being discussed, but if anyone actually found treasure by fixing up a home-designed system, there was no publicity about such a discovery. This would have been the kind of Radio First best kept to oneself!

Germany was well ahead in many aspects of radio and recording technology, first for example in developing a plastic recording tape, though no-one in Britain seemed especially interested in the pre World War Two announcements of this astonishing technology. The autobahns, shown in cinema newsreels as if canals on Mars rather than a model for UK developments, could have been ideal for CB style information systems, of the type envisaged by General Motors in the 1950s and 1960s. To General Motors laboratory work in the USA, surely goes the honour of being First to demonstrate the possibilities of cars equipped with CB radio, as provision of updated traffic and weather information for the driver. It

all seems a long time ago, seeing that we are just developing use of in-car technology today, i.e. beyond demonstration stages.

Hitler's People's Car – the Volkswagen ' was a great propaganda coup, but the truth was that this astonishing model was never put into great runs for civilian production before the second world war. Had it been, the radio-minded Fuhrer might well have gone along with something remarkably like CB radio, *in its traffic control applications*. As it was, the beloved beetle did not come into its own until after the collapse of the Third Reich. Characteristically, the Germans came to recognise the possibilities of CB communication, and like other Western Europeans, have used the techniques to good, time-and-money saving effect. Some might argue that far from being First in this aspect of Radio, Britain – thanks to the bumbles of bureaucracy and uncertainties of our Wisers and Betters – is closer to the Last.

Still – if Woody Allen ever makes a 'Radio Days II', he may mention the Brits, 'Radio Days', his latest movie released this summer, is full of delights for the radio enthusiast, especially those who have visited the USA or know something of that great nation's radio preoccupations. The film includes a visit to that showplace of entertainment, the Radio City Music Hall in New York, though even this has links with a Great British First. The first personality to appear in the celebrated British radio interview show, 'In Town Tonight' was a certain Austen Croom Johnson, a composer. That was in 1933, and Croom Johnson later became producer of his own show, 'Soft Lights and Sweet Music'. Later in the 1930s, he presented shows at The Radio City Music Hall; maybe the infant Woody Allen was there at the time.

Woody Allen's film gives the impression that radio was an integral part of family life (it makes for more individual listening today). Several films have had a CB theme, of course, including Paul Le Mat's 'Citizens Band' (Paramount) and the picture of small town US life, 'Honky Tonk Freeway'. Presumably, in some future decade, someone will take a 'Radio Days' approach to CB, and show how Pa and Ma, sat nights around the rig, hoping Aunt Mabel, spinster extraordinary, would find herself a nice young man on the rig. As and when such a film is made, Captain Augustus Sparx here mentions his willingness to mention his Radio First, not before revealed to the human race.

On the whole, Captain Sparx reckons he was the first man in Britain to drop his power mike into Ma's home made mix. It happened while he was unpacking the thing, and he didn't like to mention it to Ma, as she thrust the bowl into the oven. It was one of those Great British Firsts that could have been put into Mrs Beeton's Cookery Book, don't you know.

DIY SIGNAL INJECTOR

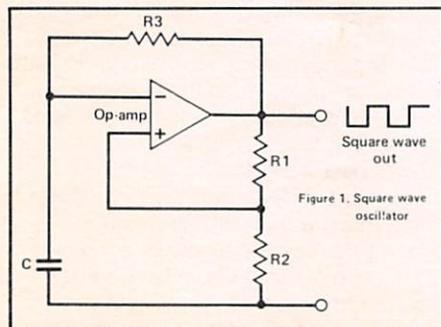
David Cox proffers a homemade signal injector for troubleshooting audio equipment

Signal injectors have been around for some time now and are used in the repair of audio equipment. The project below is a simple version of this principal. It emits a medium pitched tone which can be inserted into an audio signal path and followed through the various stages of the circuit under test, to track down a fault. The project also boasts a variable output amplitude to suit both high and low level circuits.

How It Works

In order to generate a tone, an oscillator is called for. For this kind of project, a sine wave is normally used, but this is more complicated to produce than the simple square wave incorporated here. Fig 1 shows an operational amplifier connected as an oscillator.

At first, consider the output of the op-amp to be "high" (positive) and the capacitor C having no charge. At this stage, the voltage at the (-) terminal of the op-amp is zero and the voltage at the (+) terminal is roughly half of the output voltage, due to the divider action of the two resistors, R1 & 2. As time passes by, the capacitor will slowly gain charge as a small current flows from the output of the



op-amp, via the resistor R3 and into the capacitor. When the voltage at the (-) terminal of the op-amp exceeds that at the (+) terminal, the output switches to low, or negative. Now, the capacitor discharges and when the voltage at the (-) terminal becomes lower than that present at the (+) terminal, the output switches to high again. The cycle simply repeats over and over to produce the output tone.

The frequency of the oscillation is governed by the values of R3 and C. The higher these values, the lower the output frequency.

The Circuit – See Fig 2

The circuit was designed to operate from a DC voltage of between 12 and 18 volts. This current enters the circuit via the diode, D1 and this prevents the supply being connected the wrong way around. R10 sets a suitable current through the power indicator D2. The following resistor and zener diode, R9 and ZD1 respectively, are used to correct the supply to exactly 10 volts. When the voltage at ZD1 exceeds 10 volts, it short-circuits, bringing the voltage down. The precise supply is required to keep the output of the unit at an accurate amplitude. The next stage is to centre tap the supply and this function is performed by the resistors R7 and R8, and also the capacitor C2. As the two resistors are equal in value, the voltage between them is half of the supply voltage. Therefore, with reference to this junction, pin 8 of IC1 is at +5 volts, and pin 4 is at -5 volts. This split supply is common in op-amp circuits.

IC1a forms the heart of the square wave oscillator; its associated components, C1 and R3, set the output frequency at about 750Hz. The output is then carried to the amplitude selection stage formed by the range switch S2, the

two resistors R4 and R5, and the potentiometer, VR1. As the wiper of VR1 is moved away from the 0 volt line and towards the resistors, the amplitude of the square wave on the wiper increases. The switch was included to give the user improved control over the very low amplitudes.

The next stage in the process is a buffer circuit. Its purpose is to maintain the output voltage even into low impedance loads. If this circuit was not included, the loading effect on VR1 would mean that the desired output amplitude could only be guaranteed when working with higher impedances.

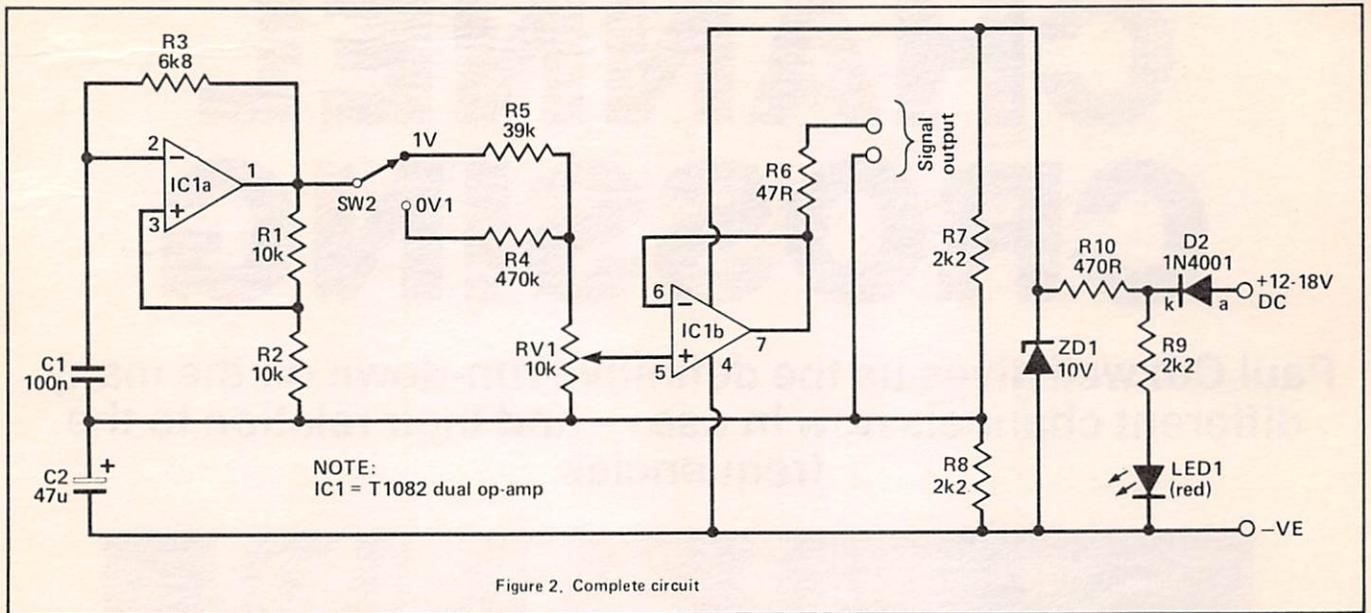
Finally, the signal output is presented at the front panel of the box after passing through the protective resistor, R6, which prevents the unit from being damaged if the output is accidentally shorted.

Construction

Construction begins with the assembling of the board. The copper strips need to be broken between the two rows of pins on C1, and this should be done before soldering into place the 8 pin IC socket. Note that the IC should not be soldered directly, but inserted into its socket when all other construction is completed. The rest of the components can then be inserted, whilst making sure that D1, D2, ZD1 and C are placed in the right way around. Fig 3 shows the overall layout of the board and connections to the off-board components.

The prototype was housed in a two-tone "verobox" which measured 153 x 84 x 39.5mm. This gave a very pleasing finish and a rugged casing to a unit that is bound to be well used.

A total of 7 holes needed to be drilled in order to accommodate the panel components. As can be seen from the photograph, on the prototype, VR1 was mounted on a bracket, away from the



front panel. This was found to be necessary as such a small knob had no room to hide the mounting hardware. The 'power' indicating LED was mounted on the board and bent through 90 degrees to shine through a 4mm aperture. Two 4mm sockets were used to allow the output to be connected to a pair of probes and, likewise, a pair of similar sockets were mounted on the rear panel for connection to the power supply.

Once the panel components are sited, they can be linked to the board via suitable lengths of connecting wire. Note that resistors R4 and R5 were mounted directly behind the switch, S2, and their unconnected wires brought together to a common point. Also, note that on the prototype, VR1 included an on/off switch for the power supply. Alternatively, a separate switch could be used.

Finally, the box can be finished by decorating it with rub down transfers and fixing to its base, four rubber feet.

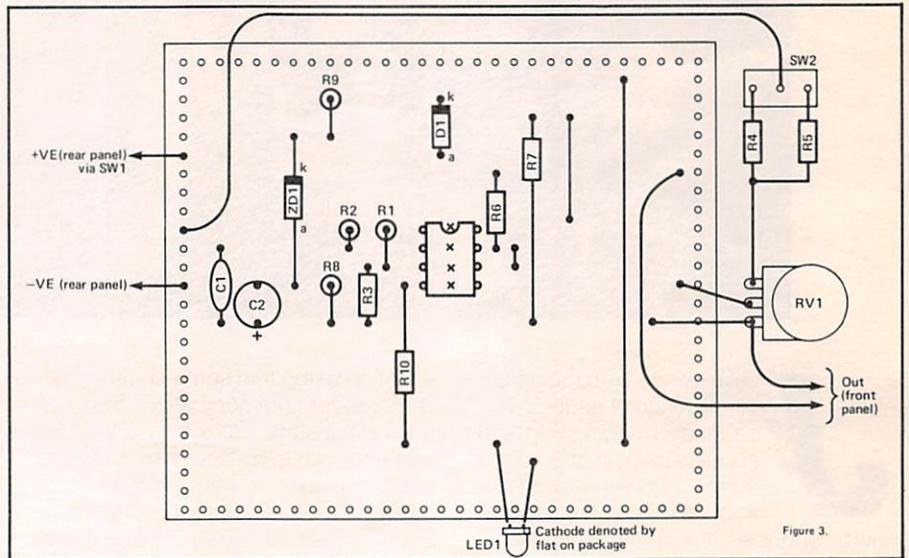
Testing

For a complete and thorough test, an oscilloscope is required to check that the output amplitude and frequency, hold true. However, oscilloscopes are highly specialised and highly priced units. Therefore, the unit can be given a rough check by connecting the output to

a small loudspeaker or set of headphones. Once the unit is switched on, a medium pitched tone should be heard. If not, rotate the level control clockwise as this should act as a volume control. The amplitude switch will also make an audible difference. If no tone is heard, re-check all of the connections and component positions. If VR1 appears to work in reverse i.e. rotating clockwise decreases the volume, then simply change around the outer wires connected to the back of VR1.

Use

Let's say, for example, we have just finished constructing an audio power amplifier circuit. Once a suitable power supply and loudspeaker have been wired up, the Signal Injector can be placed across the input to the amplifier. If all is well, a tone should be heard from the loudspeaker. If no sound is heard, or the sound is intermittent or badly distorted, then obviously something is wrong. The most likely problem is a duff component or 'dry' solder joint. The



Components

Resistors	R1,2	10k (2 off)
	R3	6k8
	R4	470k
	R5	39k
	R6	47Ω
	R7-9	2k2 (3 off)
	R10	470Ω 1 watt

Capacitors	C1	0.1μF ceramic
	C2	47μF min elect.
Semiconductors	IC1	TL082 dual op-amp
	D1	1N4001 diode
	D2	5mm red LED
	ZD1	10 volt, 1 watt zener

Miscellaneous Copper strip board, 30 holes by 24 strip. Suitable box, socket, 2 red & 2 black 4mm sockets, probes, connecting wire, solder, hardware, 10k linear potentiometer, SPDT switch, knob, letter.

Signal Injector can quickly track down such devils. Just connect the tone source at a later stage in the amplifier circuit and keep progressing along the amplifiers signal path until a sound is heard. The point between the lastest (working) connection and the previous connection contains the fault.

The injector can be used in many situations and is well worth the cost of the project. It is particularly useful for checking that old microphone that keeps breaking up!

CHANNEL CROSSING

Paul Coxwell gives us the definitive run-down on the many different channels now in use — and their relation to the frequencies



Just recently, with the official introduction of another 40 channels bringing England in line with most of Europe, there has been a lot of talk about old frequencies and new frequencies and, in many cases, considerable confusion. To set the record straight then, we will take a look at the different channels in use, both officially and unofficially.

If we take a trip back into the dim distant past of pre-1976 we find that the Federal Communications Commission (the American department that deals with such radio matters) allowed the use of just 23 channels. These are the frequencies listed in table 1 and you will see that the channels are essentially spaced at the familiar 10kHz. Various rules applied as to which channels could be used for what purpose, the original

intention being that some channels were reserved for communications between units of the same call-sign, i.e. working under the same licence, whilst others may be used for communication between units of different call-signs. Emergencies obviously overruled such limitations.

All such constraints were dropped long ago, however, and need not concern us here. Notice that there are distinct gaps in-between certain channels, 3 and 4 for instance. These channels were allocated to radio-control devices for model aircraft, boats and so on and are still in use worldwide, although many people are now moving to higher frequencies because of interference. The six basic radio-control channels are often referred to by colours rather than channel numbers as with CB and table 2 shows the allocations. As a

slight detour from our main aim you may sometimes notice small coloured flags attached to the antenna on the transmitter of model enthusiasts' equipment. This shows the channel they are operating on so that anyone close by can avoid trying to use the same frequency with slightly detrimental effects to the models.

It was in the seventies that CB started to catch on in a big way with a succession of fuel shortages and the advent of such movies as *Convoy* and *Smokie and the Bandit*. It was clear that 23 channels were not sufficient with the increased activity and the FCC expanded the band to 40 channels (table 3). There had been a large space between channels 22 and 23, enough for two more channels, and these were duly filled with the new channels 24 and 25. Channels 26 through 40 then followed

straight on from the old channel 23 with no gaps for other services. This is how that peculiar assignment around channels 22 to 26 came about. The new rigs could have been made so that the channels from 20 upwards ran in order but then channel 23 on an old rig wouldn't correspond to channel 23 on a new rig! One other point to notice is that the blue radio-control channel is actually shared with channel 25 of CB. It was also at this time that the old 23-channel sets were being sold off at ridiculously low prices because the FCC rules that they must be off dealers' shelves by a certain date.

Across the pond in Europe the various governments were either deciding or being forced to introduce CB in their respective countries and the now standard FCC allocations were used. In some places, such as Australia, people had been using equipment illegally bought in from the United States so much that the authorities could do little except authorize such sets! Whilst it is true to say that most countries now use the frequencies listed in table 3 there are considerable variations in exact requirements. In America you are allowed to use AM or SSB with power limits of 4W and 12W PEP respectively. Some countries adopted this exact system, some made minor alterations such as allowing 2-watts. Many European authorities decided that they were only going to allow operation to be FM and quite a few restricted use to 22 or 23 channels rather than the full 40. Although it may seem very hard to believe, Italy only has (legally) 23 channels! There are also some very peculiar quirks which take some figuring out, such as in Austria where you may use FM on any channel and AM on a selected few. The main point however is that the frequencies used are in the 26.96 to 27.41 MHz range.

Unless you are very new to CB it should come as no surprise that a very large number of stations operate illegally, the Italians being a classic example where the general rule of survival seems to be "use whatever frequency on whatever mode with as much power as you like." Whilst 40 channels may be plenty in a remote rural area, people soon began to get somewhat annoyed with the overcrowding in cities and the constant abuse and plain bad-manners that are unfortunately still with us today. The natural reaction, of course, was to get radios modified so that they would work just outside the permitted band of frequencies allowing a little peace and quiet and this occupation soon turned into an international pastime on CB. Before long, manufacturers realized that there was potential profit here and started turning out sets with extra channels fitted. These were generally the same as the basic 40-channel

models but with a few extra parts fitted and a switch on the front to select between the regular band and "high-band." Flicking this switch just shifted the whole band of 40 channels upwards so that channel 1 of this band continued where channel 40 of the legal band left off.

In table 4 you can see these channels under the "Hi" column. Notice that the same skips at channels 3/4, 7/8 etc, are present, as is the mix-up at 22 to 26. Use of all these frequencies was, and still is, totally illegal of course, so the jumps weren't concerned with missing radio-control channels or anything like that — it is simply that that was the easiest way to make the radios. It is here that channel numbering can start to get a little confusing, because some manufacturers left the display as it was on the new band, going from 1 to 40, and others decided to arrange things so that flicking the band switch made the display run from 41 to 80. So where the chart says 27.415MHz any particular radio may display it as either channel 1 or channel 41, depending on the design.

On the basis you can't have too much of a good thing, even if it is illegal, 120-channel transceivers started appearing. Different manufacturers again decided to go different ways, preferring two main systems for these rigs. Some opted for another 40-channels continuing below the legal band thus giving access to all the frequencies listed under low, mid, and high in table 4. Mid-band has become somewhat of a general name for what is the authorized band in most countries. The low band shows on the display as 1 to 40, regardless of whether high-band is 1 to 40 or 41 to 80. The other approach employed was to continue upwards from the top of high-band giving what is now generally referred to as super-high. On those rigs where high band channels are numbered 41 to 80 it may therefore seem most logical to label these channels 81 through 120 but to enable standard 2-digit displays to be kept the numbering usually reverts back to 1 through 40.

Confusing? Just to make things even more difficult, many of these radios also use the terms low, mid, and high for the bands. Low on one of these sets is mid on the former type, and mid is high band! You can see that for the unwary it is very easy to get lost. It is a sure sign that if a band switch is marked low, mid and high and on the mid setting the display reads from 41 to 80 then the bands are those marked mid, high and super-high on table 4. If the display reads 1 to 40, though, it doesn't necessarily mean that the set covers low, mid, and high.

Transceivers with 80 or 120 channels were all the rage at one time but they have faded into insignificance against many of the "Export" sets now available

that cover super-low to super-high, i.e. 200 channels. It is well worth remembering that different people use different terms when referring to the various bands. After all, the makers couldn't agree about low, mid, and high! Sometimes they then call the bands below and above these super-low and super-high! You'll meet the odd one too who talks about extra-low and ultra-low and generally makes a right hash-up of everything.

Whilst it is common in many European countries to have radios covering the five bands listed, beyond these limits activity (of the CB kind) is very much reduced. Super-high extends well into the 10-meter amateur band and super-low just touches the 11-meter broadcast band anyway, which are both out-of-bounds to most sensible operators. To complete the picture most wideband transceivers now have a shift control to allow operation anywhere between channels by giving a plus or minus 5kHz shift. Finally to fill in those gaps where the channels jump 20kHz you will often find a switch that shifts everything up by 10kHz; failing that the shift control will go up and down 10kHz rather than 5kHz. Before leaving this subject one final word — *use of low, high, super-high, super-low, shift controls etc is completely outside the terms of the licence and totally illegal throughout the world.* In some countries you might get away with it but in others there are very heavy penalties. We've covered these bands here just to fill you in on what is used and how these bands fit around the others. You have been warned!

As you probably already realize, legal CB arrived in England a little late and people were already using illegally imported equipment, mostly on mid-band AM. Being the odd one out, as usual of course, Britain decided to use channels that were totally different to everywhere else in the world. In defence of the government's decision, however, it must be stated that paging systems and alarm devices were already occupying frequencies inside mid-band in this country.

Table 5 shows the frequencies chosen. Firstly, there are no skips as with most other countries and the channels go in straight 10kHz increments all the way up. Secondly, the channels aren't in multiples of 5kHz as with everywhere else, hence the 125 on the end of every frequency instead of just 5. Thirdly, the channels are well above those of mid-band. If you look closely you will see that British channel 1 lies a little below high-band channel 16 (or 56 if you prefer). Channel 26 lies just below high-band channel 40 and UK channels 27 to 40 interleave with super-high channels. This is the main reason why when conditions are right (or wrong, depending on your point of view), people complain of sideband interference on their sets. All



Table 1. Pre-1976 FCC Allocations

1	26.965
2	26.975
3	26.985
4	27.005
5	27.015
6	27.025
7	27.035
8	27.055
9	27.065
10	27.075
11	27.085
12	27.105
13	27.115
14	27.125
15	27.135
16	27.155
17	27.165
18	27.175
19	27.185
20	27.205
21	27.215
22	27.225
23	27.255

Table 2. Radio-control channels

Brown	26.995
Red	27.045
Orange	27.095
Yellow	27.145
Green	27.195
Blue	27.245

those high-powered Italian and Spanish stations were using high-band long before the British channels were allocated. Maybe they're not supposed to be there but that doesn't help you talk up the road when you're getting wiped-out; the fact is that they are there, like it or not.

So what of the new MPT-1333? Quite a while ago the EEC established a "standard" for CB with the ultimate aim of getting every member of the common market to adhere to it. The plans are for

4-watts, FM on mid-band 40 channels. This is the standard already in use by many countries, including Ireland. Some countries have already stated their intentions to change to this system and others have made no plans to change from their own individual schemes. MPT-1333, then, is a step towards this EEC goal. Some people seem to be under the impression that the "new" channels are just that, never before been touched by

Table 3. Current FCC CB Allocation

1	26.965	21	27.215
2	26.975	22	27.225
3	26.985	23	27.555
4	27.005	24	27.235
5	27.015	25	27.245
6	27.025	26	27.265
7	27.035	27	27.275
8	27.055	28	27.285
9	27.065	29	27.295
10	27.075	30	27.305
11	27.085	31	27.315
12	27.105	32	27.325
13	27.115	33	27.335
14	27.125	34	27.345
15	27.135	35	27.355
16	27.155	36	27.365
17	27.165	37	27.375
18	27.175	38	27.385
19	27.185	39	27.395
20	27.205	40	27.405

the ravages of CB. This is not so, they are just the channels that are authorized for CB throughout the world. As far as the allocations go, that just about wraps it up.

To finish off then, one or two implications of changing to mid-band if you've never used it before. First of all, to dispell some popular rumours — you will not magically get out ten times as far just by changing to mid-band. The differences in frequency between the two bands is so little as to make no practical difference. 4-watts on mid-band will go just as far as 4-watts on the original UK channels. If you enjoy DXing, however, the big difference is that there are obviously more foreign stations on mid-band because that is their legal band. When the propagation opens up over Europe you'll get long-distance contacts with absolutely no trouble at all. Most of the stations up on high-band that overlaps the old British allocation use SSB so are unintelligible on UK sets.

Now for the bad news — if you think our present channels get crowded sometimes just listen on mid-band in the height of summer. As I write this we are just a few days away from the authorization of mid-band so by the time you get to read this many of you will no doubt be legally using it. You will have discovered that when the skip is running it is very difficult to talk more than a couple of miles locally. Of course with millions of people on the continent using these channels it is bound to happen. If you were using CB in about 1979/80 (naughty!), you'll remember those summer days when you could find some quiet place on top of a hill and talk into the States almost every afternoon on 4-watts of AM! As sunspot activity runs in 11-year cycles we are on the gradual build-up again towards this situation. By about 1990 you can bet that, during the daytime, local range will be almost non-existent. If you want the DX it is fine but if you want local contacts you may be better off on the "old" channels.

Which band(s) you choose to use must be left up to you but we've tried to show how they came about and what to expect. Happy talking!

Table 4. All commonly-used CB channels

Channel	S/Low	Low	Mid	Hi	S/Hi
1	26.065	26.515	26.965	27.415	27.865
2	26.075	26.525	26.975	27.425	27.875
3	26.085	26.535	26.985	27.435	27.885
4	26.105	26.555	27.005	27.455	27.905
5	26.115	26.565	27.015	27.465	27.915
6	26.125	26.575	27.025	27.475	27.925
7	26.135	26.585	27.035	27.485	27.935
8	26.155	26.605	27.055	27.505	27.955
9	26.165	26.615	27.065	27.515	27.965
10	26.175	26.625	27.075	27.525	27.975
11	26.185	26.635	27.085	27.535	27.985
12	26.205	26.655	27.105	27.555	28.005
13	26.215	26.665	27.115	27.565	28.015
14	26.225	26.675	27.125	27.575	28.025
15	26.235	26.685	27.135	27.585	28.035
16	26.255	26.705	27.155	27.605	28.055
17	26.265	26.715	27.165	27.615	28.065
18	26.275	26.725	27.175	27.625	28.075
19	26.285	26.735	27.185	27.635	28.085
20	26.305	26.755	27.205	27.655	28.105
21	26.315	26.765	27.215	27.665	28.115
22	26.325	26.775	27.225	27.675	28.125
23	26.355	26.805	27.255	27.705	28.155
24	26.335	26.785	27.235	27.685	28.135
25	26.345	26.795	27.245	27.695	28.145
26	26.365	26.815	27.265	27.715	28.165
27	26.375	26.825	27.275	27.725	28.175
28	26.385	26.835	27.285	27.735	28.185
29	26.395	26.845	27.295	27.745	28.195
30	26.405	26.855	27.305	27.755	28.205
31	26.415	26.865	27.315	27.765	28.215
32	26.425	26.875	27.325	27.775	28.225
33	26.435	26.885	27.335	27.785	28.235
34	26.445	26.895	27.345	27.795	28.245
35	26.455	26.905	27.355	27.805	28.255
36	26.465	26.915	27.365	27.815	28.265
37	26.475	26.925	27.375	27.825	28.275
38	26.485	26.935	27.385	27.835	28.285
39	26.495	26.945	27.395	27.845	28.295
40	26.505	26.955	27.405	27.855	28.305

Table 5. UK Channels, assigned in 1981

1	27.60125	11	27.70125	21	27.80125	31	27.90125
2	27.61125	12	27.71125	22	27.81125	32	27.91125
3	27.62125	13	27.72125	23	27.82125	33	27.92125
4	27.63125	14	27.73125	24	27.83125	34	27.93125
5	27.64125	15	27.74125	25	27.84125	35	27.94125
6	27.65125	16	27.75125	26	27.85125	36	27.95125
7	27.66125	17	27.76125	27	27.86125	37	27.96125
8	27.67125	18	27.77125	28	27.87125	38	27.97125
9	27.68125	19	27.78125	29	27.88125	39	27.98125
10	27.69125	20	27.79125	30	27.89125	40	27.99125

★ JOHN RICHARDSON
Twong

LOOKIT OUR HERO ON PATROL... HE LOOKIN' FOR C.B'ERS IN NEED OF HELP... HE TAKIN' OL' RAGDOLL ALONG TOO...



HEY! LOOKEE! DAT HUMAN'S FLYING THE WHITE BATTLEFLAG OF BUNGROVIA!

'MUST BE ONE OF OURS! I'LL GIVE IT A BELL!



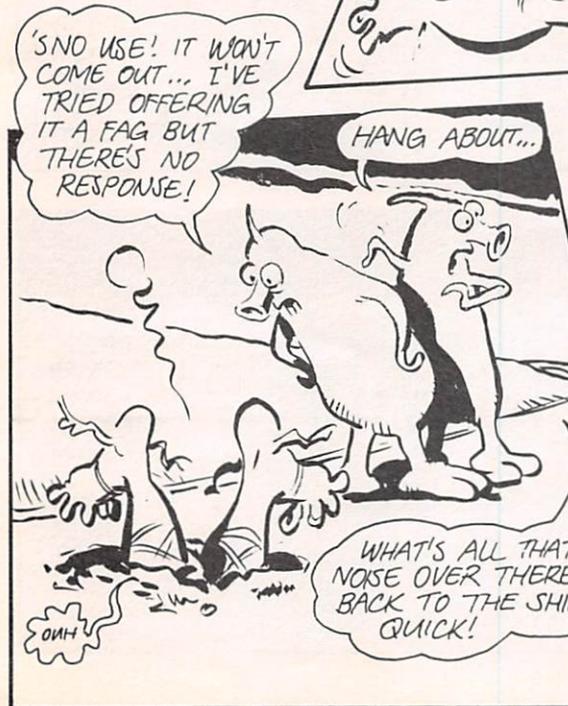
GREETINGS FROM THE BUNGROVIAN INVASION FORCES

ARGH!



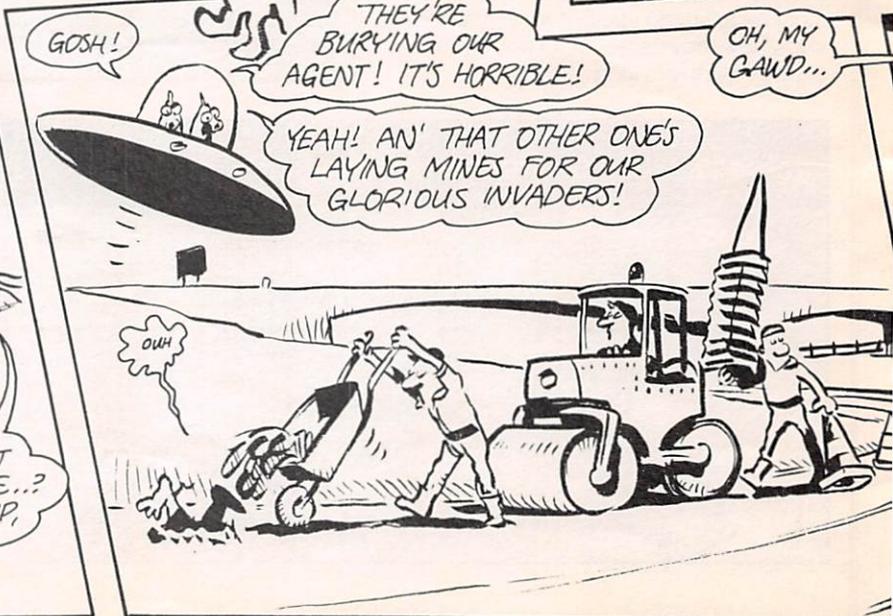
FAINT

CRUMP



S'NO USE! IT WON'T COME OUT... I'VE TRIED OFFERING IT A FAG BUT THERE'S NO RESPONSE!

HANG ABOUT...



GOSH!

THEY'RE BURYPING OUR AGENT! IT'S HORRIBLE!

YEAH! AN' THAT OTHER ONE'S LAYING MINES FOR OUR GLORIOUS INVADERS!

OH, MY GAWD...

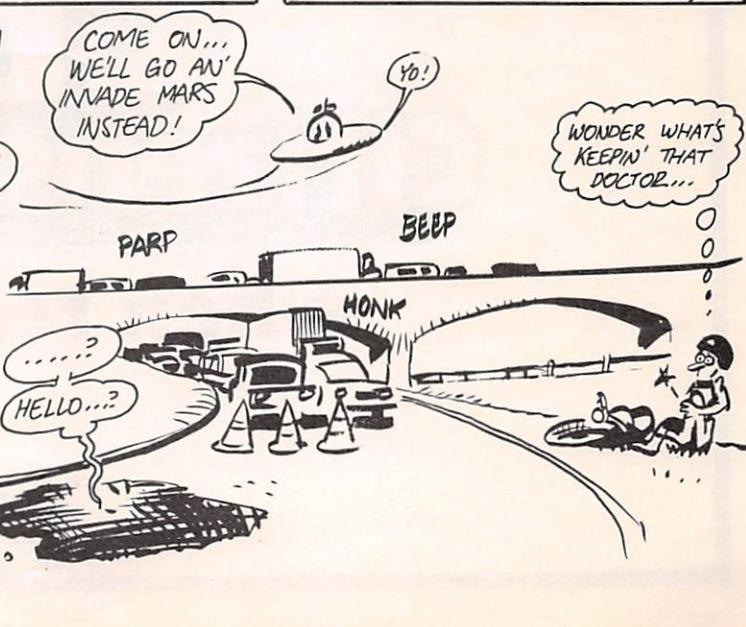
OHH

WHAT'S ALL THAT NOISE OVER THERE...? BACK TO THE SHIP, QUICK!



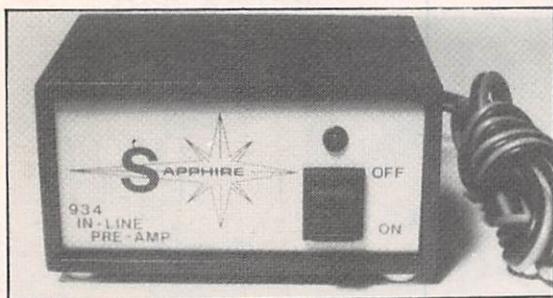
MEANWHILE...

MAYDAY! MAYDAY! I'M A DOCTOR AN' MY CAR'S CONCKED OUT AN' I CAN'T GET THE DOORS OPEN AN' I GOTTA 'MERGENCY TO ATTEND!



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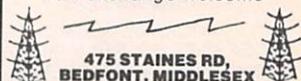
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