AN ARGUS SPECIALIST PUBLICATION

OCTOBER 1984

HAM RADIO TODAY

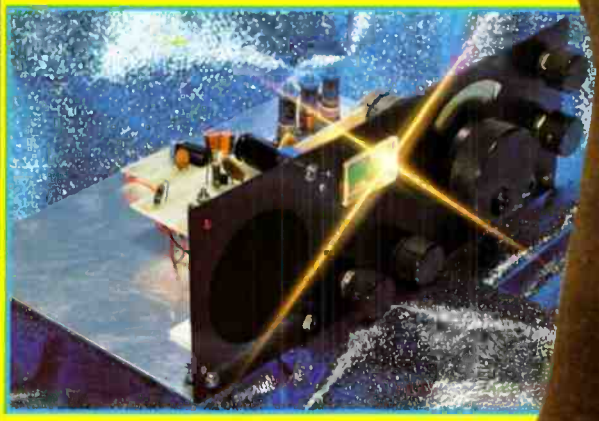
99p

Tequila and Tribanders—
a taste of radio Mexican style

Keyboard Communications—
Tono Theta 5000E CW/RTTY/AMTOR unit reviewed

Commutech FCR 130 GC receiver kit for beginners evaluated

Synthesised VFO for 2m transceivers by G3WPO



Introducing MICRO-NET
the bi-monthly forum for radio amateurs with a computer in the shack

HAM RADIO TODAY

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LETTERS

CONVERTING 'ILLEGAL' CB RIGS

Sir, I feel that I must write in connection with the article of 10 metre conversion published in your August issue. I feel that the information given was both sketchy and misleading. Typical indications of discrepancy were shown in the diagram explaining the frequency control. I have yet to experience a synthesiser which has 455kHz injected into a mixer circuit. The 455kHz is usually developed by mixing the 10.240 MHz clock oscillator with the 10.695 MHz first IF in the second mixer.

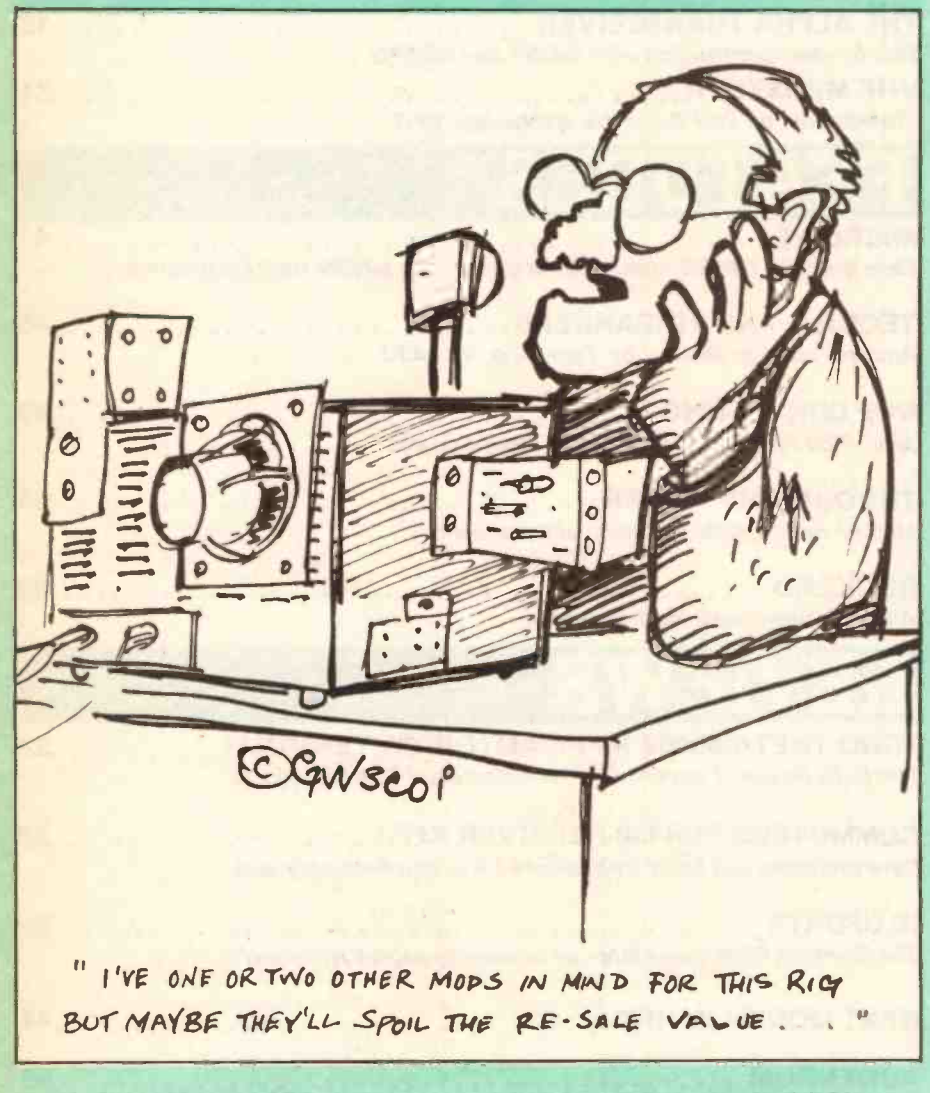
I refer to page 14 of your June 1983 issue in which the various forms of frequency translation are more carefully analysed and I also include a diagram and mathematical analysis of a commonly used technique using offset oscillators. Early forms of binary coded PLL devices had divided by N counters which would only operate at 10N frequency, hence the necessity for mixing or offset oscillators. Generally, the offset frequency was obtained from the 10.240 oscillator which was divided by 2 to give 5.12 MHz and then multiplied by 3 to give 15.36 MHz. This frequency mixed with the VCO on about 17 MHz and gave the required 1.5-2 MHz frequency which the counter could handle. This technique used with a straight binary code enabled the PLL to give the required control over the VCO. In the case of receivers using a 455kHz IF with a programmed counter, the internal divide by N counter had two ranges programmed into the PLL, the required range being selected by the TR switch. The problem in this instance was that the programme was fixed and selected by a binary coded decimal input come from 0-39 and normally could not be varied.

The difference between binary and BCD methods of counting was not clarified and left a degree of uncertainty. I have enclosed a short note on the difference for your information, together with a simple mathematical analysis of establishing the correct binary code for straight PLL devices.

It should be noted that the required offset shift the VCO and most VCO's will not tune far enough to enable 29 MHz to come in. The core maybe snipped into two parts to enable a higher frequency to be reached or an aluminium or brass core inserted to increase the frequency.

Regarding the VAT problem, I remember having many meetings at Customs and Excise HQ before I could persuade the authorities into agreeing an amnesty for conversion for illegal sets to MPT1320 spec. Originally the Customs required £25 for an agreement but eventually they settled for £5! It should be noted that the amnesty insisted that the converted set should only operate from 27.61 to 27.991 MHz on angle (FM) modulation and all other modes *must* be disabled. It would be interesting to get the official viewpoint today.

W. Sparks, G8 FBX



Basil Spencer, G4YNM, replies: *my article was intended to provide sufficient information for conversion — not a comprehensive catalogue. The block diagram of the Ham International Concorde II was simplified for clarity. The mixing to produce the second IF (455 kHz) is produced by mixing the 10.24 MHz CO already used for the 1024 divider with the first IF (10.695 MHz). I have supplied complete block diagrams for transmit and receive function of the Ham International Concorde II to the Editor which he has agreed to publish soon under 'Addendum'. I hope this will clarify the situation.*

To include a comprehensive discussion of the very wide variety of equipment using ROM, EPROM and also the various BCD differences and how (some) can be altered would have stretched the article too far or would have been at the expense of other essential parts of the article. This was

unjustifiable as anyone who wants to study ROMs, EPROMs, binary and BCD can do so from a standard textbook.

Bill's comments about obstinate PLLs are adequately covered by the list of chips at the end of the article — although new ways of moving immoveable chips are continually being found. I have yet to experience a CB type VCO that won't go straight up to 29 MHz and I have modded a considerable variety of these rigs. Those rigs in the table in which the crystal frequencies are not specified are those which I have not modified myself, but have known to be modified.

I have recently had some very interesting correspondence with a member of HM Customs and Excise and although the legal situation is not entirely clear, it appears any non 27/81 CB rig is an illegal import irrespective of where it is obtained. I am informed that the set would only cease to be of interest to that part of HM Customs and Excise that deal with 27/81 conversions when converted to MPT 1320. The information in the article was given in good faith; until such time that case law is produced, I interpret the legal situation as follows:

A Class 'A' amateur may purchase a legal FM CB radio (ie conforms with MPT 1320), convert this to 10m and then use it in any way they see fit so long as it is operated inside licence regulations. For example, they may add a PA or even run RTTY with it.

It, therefore, logically follows that if a Class 'A' amateur obtains an illegal CB, converts it to conform to MPT 1320 and has the VAT and duty paid to HM Customs and Excise, it would then be a legal FM CB. They could then treat the set as they would any legal CB radio and convert it to 10m and add any mode or a PA as it would legally be a 'conversion'.

RECIPROCAL LICENCING — 9H1 AND VK

Sir, I have just been able to buy *HRT* while on holiday in West Australia from Malta GC. The write up on 'Reciprocal Licencing' in the April issue was very interesting, most especially to those who travel abroad. This would have been very beneficial to me and many others if it was published years ago, but anyhow, as I still intend to visit different places away from Malta, some of the tips given in *HRT* are more than welcome.

I have noticed that in Table 1, of Reciprocal Arrangements existing between UK and other countries, the Island of Malta is omitted. Though officially, at this moment I cannot confirm that this reciprocity is official, there has never been any difficulty in obtaining a Maltese licence for any UK amateur or vice versa. In Malta there are two licences, namely 'B' for 2 metres — no morse test required — and full licence when 10 wpm examination is passed.

Any UK amateur intending to visit should prepare a photostat copy of his UK licence, receipt of the current year's licence fee, together with a copy of their passport for identification purposes. My club in Malta will be more than willing to help any radio amateur visiting our island. The address is The Hon. Secretary, MARL Amateur Radio League, BOx 575, Valleta, Malta GC.

At present I am in Australia, and contrary to page 57, my licence was obtained by post in approximately 5 days. The cost was 19 Australian dollars (£12.50).

One has to be reminded that the 2m frequencies in Australia range from 144-148, and the repeaters here operate from 146-148.

In six weeks, with my (Zycom) handheld, 1/5W, I was able to make 150 contacts, where 84 were different VHF amateurs.

Walter A. Gatt 9H1 DU/VK6 AWG

BEHIND THE TIMES?

Sir, Regarding Mr. P. Juden, G6ZBN, and his pen partner Mr. P. Williamson, *(Letters, July HRT)* G4WUU, I only hope these gentlemen are as handy with their soldering irons as they are with their pens. I have taken *HRT* since its inauguration and have found it a very good magazine, but to see a letter such as they have penned makes me mad. I have just had my second go at getting my Class 'B' licence. During my lectures, where I was also given some practical instruction, ie how to construct oscillator circuits, pre-amps etc. For my homework, I chose to build a regenerative receiver.

I happen to be a member of a very good CB club and our charity work and fundraising is in the top class. I never read in any of the amateur magazines where they have done this kind of work. Even if I pass my RAE, I shall still remain with my CB club. Reason: I read somewhere that if one was a class 'B' licence holder, and new to the scene, one should literally bang on the door of an 'old hand' and ask if he would show one how to proceed. Those I have met are too busy, their wives don't like strangers in their homes and others are too snotty even to be bothered. Why can't we have a novice licence? They have eight classes (of licence) in the USA, even the good old Russians beat us. Even CB operators on the continent are better provided for, FM, AM and SSB. So, gentlemen, lets go forward, not drag our feet in the mud of the day's gone by. It can be done, by making sure those who apply are, mark this, 18 years and over, and are going for their RAE classes. This will I'm sure keep those-called spoil sports, such as wallies out.

John H. Clifton, Whisky Sierra 96

There is a nationwide group of amateurs called the Radio Invalid and Bedfast Club whose aims are to assist and provide equipment for those who are invalid and disabled and who would like to take up radio. The members of RAIBC, many of them invalid themselves, voluntarily put in many hours of work and have built up over the years a considerable pool of equipment and expertise, which is dispensed to those who need this. The Secretary is Mrs. Francis Woolley, G3LWY.

I think if you look at this month's 'Radio Yesterday' you will see the kind of general charity work that has been done in the past.

Regarding your final point of an age limit on the proposed novice licence. Is this forward-looking?! I passed my RAE at the age of 16 whilst attending Secondary Modern School and my radio activity was very important part of my early teens. In my experience, age is no guide at all to the behaviour of people on the air...

I'm sorry if you have had bad experiences in your contact with radio amateurs. Try going along to the nearest radio club and if they don't seem too friendly, try the next nearest. Radio clubs can vary quite a lot, like people, so don't give up on the first one!

PINK LETTER

Sir, The August issue of *Ham Radio Today* has an article by Jack Hum detailing the various unhappy reasons why an amateur might receive a pink ticket. I do not want to cross swords with Jack (as he gives me such nice S9 reports) but he is wrong on one point. As the information might make the difference between a pass and a fail for an RAE examinee, the point should be corrected.

Jack says that you are inviting a pink ticket if you are unable to give an extract of your log to the nearest kHz if required. This is not so. Section 6 of the licence says that an indelible record shall be kept showing.....(c) frequency band(s) in each case. Notice it says 'bands', and it does not say the frequency to the nearest kHz.

Therefore, if you are transmitting on 145.5 MHz, it is sufficient to enter 144 MHz in the log and be within the law.

J O Brown, G3DVV

Thanks for this: up till 1976 it was obligatory to log the exact frequency of operation and now, as G3DVV says, only the frequency band need be recorded. Old habits die hard though and I, along with many older licencees, still log my exact frequency. Information of this kind can be very useful, say, when investigating purported interference, particularly when this involves frequencies harmonically related to the amateur bands.

Please address correspondence to:
Ham Radio Today,
1, Golden Square,
LONDON W1R 3AB.

RADIO TODAY

Norman, as played by Michael Elphick, doing some delicate final adjustments in 'CQ'

Tony Hancock Rides Again?

HRT was recently invited to watch a preview of 'CQ', a play written around amateur radio, which was reported in last months Radio Today. Julie Darby, G1CKF and new Editorial Assistant on HRT reports.

'CQ', the new play by Paula Milne, to be shortly screened on Channel 4, is one of the few glimpses via the media the public has of our hobby. Many people's first impression was formed by the Tony Hancock characters in The Radio Ham of the 1960's. Another was unfortunately developed with the controversy surrounding illegal CB and the identification of these 'pirates' as 'radio hams'. Now they have a new insight; Norman, the radio ham who alone has contact with a solo yachtsman sailing around the world.

Having seen 'CQ', people will no longer regard amateurs as eccentric, comic figures who play snakes and ladders over the air waves and let mariners sink to a watery grave while they find a pencil — as did Tony Hancock! They will begin to see us as obsessively tenacious — as Norman in obtaining and retaining the 'maritime mobile' Alec. Is this a true representation of the stereotypic character of an amateur?

There are some hams who will fit the two moulds described by writers. Making friends (Hancock's idea) and building one's prestige (Milne's theme) are two elements of the hobby. But both characterisations forget the most important element — that of the magical pleasure of transmitting and receiving signals, especially when using something you've built yourself.

However, there is a new style of amateur (of which I am one) who sees Amateur Radio mainly as a means of communication, not having yet grasped the constructional side, despite the RAE. There are many other facets of the hobby, that have gone largely unnoticed in both programmes, which show its diversity and opportunity.

My own impressions of amateurs as a newcomer and seeing it from a feminine viewpoint were not influenced by the 'Radio Ham' sketch. I saw amateur radio through contact with family (my father is G4TVC) and friends, initially on CB, then later on the amateur bands. as a kind of outsider, I can understand (perhaps even agree with!) Paula Milne's view of amateurs as determined and rather selfish, always hidden away in the shack, making that awful noise. She sees another side to it too; as the situation develops, and Norman appears on the TV, talking about himself, his family begin to understand him a little. As I became more involved in the hobby, I saw the potential for pleasure with radio and grew to accept the noise!

'CQ' will give a new insight into amateur radio which you may not agree with — it is certainly not an advertisement for the hobby. People will still think us rather odd in the Hancock style but will realise that there is some meaning behind it all. Don't think that the play is only for radio amateurs, it is a funny but also fairly serious analysis of a man's self esteem. The amateur will appreciate the technical aspects, although I'm told the Morse is a bit ropey in places (*certainly is! — Ed.*). They will also envy the amount of equipment he has. However, the substance of the play will leave a confused feeling about Norman — I liked him and felt pleased that he had been given the respect he deserved but disagreed with his methods and perhaps his motives.

On the whole, a very interesting play which at least gives publicity to amateur radio. It should be seen if only to learn by Norman's mistakes and it may also make you think about the (your?!) long-suffering XYL!

'CQ' will be shown on Channel 4 at 9.30 pm on October 11th.

Doug Willies, G3 HRK (2 nd left) County Controller for Norfolk and North East Suffolk RAYNET, being presented with equipment for use in the flood control room at North Walsham police station by Paul Willies, G6 TMU, Stephen Dorey, local Rotary Club President, and Dr Tim Thirst, G4 CTT. See 'Gifts Aid RAYNET Flooding Service'

Is There Only Good Publicity?

In the RSGB Council letter for July the Editor noticed the following item from the Chairman of the RAYNET committee, Geoff Griffiths, G3 STG.

"Following a recent Emergency Call-out of a RAYNET Group in the north of England, publicity appeared in the local press which, whilst being extremely complimentary to RAYNET and its members, was not accurate in content, and which caused considerable embarrassment to the Group Controller concerned.

It is probably appropriate therefore to remind all Group Controllers that great care should be exercised in dealing with the local or national media in the circumstances surrounding any real emergency situation.

RAYNET policy regarding statements to the press (including TV and Radio) is that general publicity is the responsibility of the Group Controller. He may designate a member of his Group as press liaison officer for the Group if he so wishes, but the Group Controller carries the responsibility.

Information regarding Group exercises which do not involve an outside User Service maybe made available to the press at the Controller's discretion. If a User Service is involved, then in addition, permission to release details to the press must be sought from that User Service.

If a group is involved in a live incident, no one is permitted to make any comment or statement to the press, either on or off the record.

If you are approached by the press, refer them, without comment to your Group Controller. If he is not at the scene, refer them to the User Service Press Liaison Officer at the scene. The Group Controller must either refer enquiries about a live incident to the User Service direct, or to the County Controller."

I can understand and sympathise with the Group Controller concerned and his consequent embarrassment, and also the desire to present a united front to the media. Dealing with the media can be difficult and someone who is in fairly frequent contact is more likely to achieve 'successful' publicity through sheer experience. That being said, the statement still seems somewhat authoritarian.

Why not appoint a Press Liaison Officer as a matter of policy in *every* group — and make this appointment rotate fairly around the group members? That way, a more general understanding of the workings of the media may evolve within the group. This is only a suggestion of course...

Four Go Mad In Granby Halls?

The Leicester Amateur Radio Show is being held on the 26th and 27th October at Granby Halls in Leicester. Only a short distance from the City Centre with parking opposite the entrance in Welford Road, admission is only £1.00. This entitles you to visit over 50 trade stands (there's a waiting list of traders)

Last year's Leicester Amateur Radio Show — at a particularly busy time! Come and see HRT at stand 54 on October 26th and 27th.

participate in the 'talk-in' on S22 and SU8 and much more besides! Food and drink will be available in plenty so the family are satisfied too! For further information ring Frank Elliot on 0533 553293.

Last year nearly 6,000 people attended and interest from the radio trade can be measured by the fact that of the people who came last year, only four have not booked for this year. HRT hope to have a stand there — more details in the next issue.

FT757 Saves The Day

In the OSTAR (Observer Singlehanded TransAtlantic Race) this year, a number of yachts were fitted by Arrow Electronics marine consultant with the Yaesu FT757 transceiver.

The transceiver installed in the yacht 'Jemima Nicolas' enabled the single-handed skipper, Alan Thomas, to rescue John Mansell, skipper of the trimaran 'Double Brown', which broke up in mid-Atlantic. Both of these gentlemen recently arrived safely in Newport, Rhode Island, thanks to the '757.

Another installation on the yacht 'Race Against Poverty', kept Chris Smith, the skipper, in touch with Portishead Radio and kept Race Control and his family informed when he had to return to Plymouth leaking badly. Chris Smith also found the transceiver extremely useful for live BBC broadcasts on Radio One — via Portishead Radio, of course!

Yeovil ARC's QRP Convention

Throughout Sunday 14th October, Yeovil ARC are holding their first QRP convention at Preston School, Monks Dale, Yeovil (via Preston Road and Larkhill Road). Admission is 50p, which includes a free programme with lucky draw number.

The programme includes lectures on Ionospheric Propagation of Low Power signals by G3MYM; Aerial Design for low power operation and Low Power Propagation at VHF, both with G3GC, and ending with a discussion on Low Power Topics chaired by G4WMV. There will also be the two club stations on air, a display of equipment, a junk stall and 'talk-in' on S22 using the club callsign G8YEO/A.

Refreshments will be available at certain times during the day and the Preston Plunknett pub is nearby! If you need more information contact Eric Godfrey, G3GC, at Dorset Reach, 60 Chilton Grove, Yeovil, Somerset, or on 0935 75533.

Unfortunately, we couldn't get a picture of the KWM40 in time for publication. Instead, here is KW MD Rowley Shears, G8KW, who has a rather nice number plate...

KW and 10m FM

The KW M40 is a specially selected design of CB transceiver modified by KW and 'peaked' for operation on the 10m FM band. The 40 position channel switch selector covers the band 29.31 to 29.7 MHz and provides channels every 10 kHz. The channel in use is clearly indicated by a digital display — channel 30 being the recognised calling frequency of 29.6 MHz.

All frequencies are generated controlled by phase lock loop (PLL circuitry) using modern integrated circuit technology ensuring excellent frequency stability. The KW modification includes the replacement of the ceramic first IF filter with a 2 section crystal unit. An alternative model is available with 100 kHz offset, for working the US repeaters. As radio amateurs we are advised to make more use of the 10 m band, otherwise there is fear that we may lose part of it to other 'interested parties'.

The price including postage and VAT is £46.00, with the repeater option, £55.00. Obtainable from KW Communications Ltd., Vanguard Works, Jenkins Dale, Chatham, Kent.

So You Want To Study The RAE?

Barking Radio and Electronics Society are running an RAE class at the **Westbury Recreational Centre**, Westbury School, Ripple Road, Barking. Register at 7.30 pm on the 13th September or obtain further details from G8IZW on 01-594-2471.

The Crawley RAE course is going to be held at **Ifield School**, Lady Margaret Road, **Crawley** on Monday evenings for 27 weeks. Enrol on the 10th or 12th September between 7 and 9 pm and costs £40 total. The course starts on the 17th September with Steve Webb, G4GHO, who can supply further details on 0293 25742.

At **Brooklands Technical College, Weybridge**, there will be an RAE course on Wednesday between 6.30 and 8.00 pm commencing September 19th. Chris Roberts is the lecturer, who assumes no previous knowledge of radio theory, and prepares students for the May examination. Enrolment is on 10th to 12th September 6-8pm and further information can be obtained from Dept. of Technology, Weybridge on Weybridge 53300 ext. 246.

Reddith Vale Evening Centre, Stockport, is the venue for the class starting on 24th September between 7 and 9 pm and leading to the May exam. You can enrol on 17th, 18th and 20th between 7 and 9 pm. Phone Dave Wood on 061-477-3544 ext. 10, during office hours, for more details.

Mid-Warwickshire College of FE is running a course commencing in September for which enrolment dates are 6th and 7th September. Further details can be obtained from Mr. Evans on Leamington Spa 311711 ext 258.

There will be a course on Monday or Thursday evening, or Wednesday afternoons at **North Trafford College of FE** at Talbot Road, **Stretford** which will deal with theory for the RAE. The evening classes run between 6 and 9 pm, afternoons 1.30-4.30. Enrolment is on 10th, 11th and 12th September and details can be obtained from Mr. Beaumont, G3NGD, on 061-872-3731 ext 45.

Basildon Adult Education Centre is running 3 courses at Fryerns School, Craylands, Basildon. A one year course in preparation for the RAE (electronics aspects only), Maths for RAE which lasts 6 weeks and a one year course in electonics for beginners. Further details can be obtained from the centre on Basildon 20599.

A course leading to the Radio Amateurs Examination will be held at St. George's School, Sleaford, Lincs. on Monday evenings from 7.00-9.00 pm. commencing on 24 September 1984. Enrolment by post from 7 September onwards — please enclose fee of

The new 'Nortower 30' extendable tower has a closed height of less than 13' (extends to 30') and can take a headload of 275lbs at windspeeds of up to 100mph. Available from Northern Communications and Amtronics at £299.

£16.24 for the first 3 terms with your enrolment — or at the first session. Further information from the Adult Education Office, Westholme, Leicester Street, Sleaford, Telephone 0529-305211 (mornings only and from 5 September).

Gifts Aid RAYNET FLooding Service

Radio equipment to help in a flooding emergency on the North Norfolk coast was handed over at a presentation at Eastern Communications' in Norwich. The presentation was to RAYNET, and will help permanently equip the flood control room at North Walsham police station. Until now, Raynet members called in to help in an emergency, have had to set up their own equipment.

The Rotary Club of North Walsham presented a Yaesu FT790 70cms transceiver, handed over by their president Mr. Stephen Dorey. Paul Willies, G6TMU, son of Raynet's County Controller, Mr. Douglas Willies, G3HRK, presented equipment, including a power supply and 70cms linear amplifier, bought from the money he raised by running a local half-marathon. Dr. Tim Thirst, G4CTT, of Eastern Communications, who is also Deputy County Controller of Raynet, handed over a Yaesu FT290 transceiver from his company and from an anonymous donor who sent fifty pounds to help equip the flood control room.

Raynet's role in emergencies was outlined by Chief Insp David Pardon, Deputy Commander of the North Walsham police sub-division which covers the coastline from Holkham to Horsey. He said the radio organisation, started in the 1953 floods, helped with communication, particularly during flooding, but also had a role in other major emergencies, such as plane crashes and blizzards. Dr. Thirst said the flood control room now had about two-thirds of the equipment needed, aerials, supplied by North Norfolk District Council, already having been installed.

Eastern Communications have recently moved from their old premises to new larger premises in the centre of Norwich at 31 Cattle Market Street. This move enables a much larger range of Amateur Radio products to be stocked as well as Marine and PMR systems. "Adjacent to the city centre car parks, shop and Castle gardens a visit to the new premises can be enjoyed by the whole family," their press release tells us. Included in the new premises is a fully stocked branch of AMATEUR ELECTRONICS U.K. including a servicing centre, covering East Anglia.

Dipole of Delight

A new family of coax-fed radio antennas notable for high efficiency; excellent rejection of focal interference; wideband low SWR and mono- or multiband operation has been invented by Maurice C. Hately, GM3HAT, a Senior Lecturer at the School of Electronic and Electrical Engineering of Robert Gordon's Institute of Technology, Aberdeen.

Mr. Hately takes as his starting point the fact that "most presently known antennas are based upon the half-wave dipole consisting of a conductor cut in the centre and fed coaxial cable. Since the dipole is balanced whereas coaxial cable is unbalanced there is a gross disturbance of electric field symmetry at the feedpoint. Such antennas badly suffer from local interference such as machine hash, computer pulses, and TV time-base harmonics."

"However, the dipole of delight is designed with the centre cut fitted with a capacitive potential divider used to centre-tap the electric field. Thus a balun is apparently unnecessary and the tuning problem is mitigated. Unfortunately, the coax is now terminated in a capacitor and further voltage versus current phase shift must be arranged so that a resistive termination is provided. The extra phase shift is obtained by either a second conductor-capacitor system closely placed in parallel or an inductor in series with the said capacitor."

The press release goes on to claim that " the benign characteristics of low

Is it a bird? Is it a plane! No, it's ex-Editor Frank Ogden, G4 JST, in his 'Micro-lite'. Frank is planning to out-do that yankee W5 LFL and make some 2 m FM contacts from the air quite soon. He tells us that he is open to requests for schedules. . .

SWR, wide bandwidth, low interference constitute a considerable advantage in system gain and operational simplicity. Any radio system with allocated bands of operation within one decade of frequency would benefit from the use of an antenna of this type. Where space is limited and there are environmental restrictions a Dipole of Delight would apparently be an essential choice of antenna."

Characteristics have been, apparently extensively evaluated in working models at SHF in an anechoic chamber, and at HF by GM3HAT and other radio amateurs. Enquiries should be directed to Hately Antenna Technology, 1 Kenfield Place, Aberdeen AB1 7UW. Telephone (0224) 36004.

The FT209R and RH are the latest 2 m FM CPU controlled handheld transceivers from Yaesu, producing 3.5 and 5.0 W RF respectively. Reviewed in next months HRT with luck as well!

National Wireless Museum Seeks Charitable Status

The wireless museum, presently housed at Arreton Manor on the Isle of Wight, will in future be known as the National Wireless and Communication Museum, thus considerably broadening its horizons.

This was decided at a recent meeting at Portsmouth, when it was also agreed to seek the creation of Charitable Status for the Museum. Trustees appointed were Dr. Graham E. Winbolt, Mr Bruce Jenkins, Mr Tony Howarth (Director of Portsmouth City Museums), and Mr Douglas Byrne, G3KPO who is curator. A new organising committee was also elected to replace the original one of the Wireless Preservation Society.

Arreton Manor is situated two miles form Newport, IOW, and is open to the public from 10 am to 6 pm on weekdays, and from 2 pm to 6 pm on Sundays.

The Hills Are Alive...

With The Sound of CQ

G6UDM is the callsign to look out for on the 22nd and 23rd September as he, David Rickwood, will be combining his two hobbies of mountain walking and amateur radio by transmitting from the 'three peaks'. With two friends, he will be trying to get to the top of Snowdon (GW), Scafell (G) and Ben Nevis (GM) in the space of 30 hours (not at the same time, I hasten to add). Somehow he is intending taking along a 2 metre SSB transceiver, a beam (sized not yet determined) and possibly a linear amplifier (if he can find a suitable portable power supply).

David hopes to make at least one contact in each of the three countries with his three callsigns. But he will only be able to stay at each site for 30 minutes, so you'll have to get in fast. Because of the nature of the 'stunt' he can only give a rough guide to his schedule — 0845BST on Snowdon on the first day and 1600BST Scafell, 1100BST on the 23rd on top of Ben Nevis. Prefered frequencies will be 144.280 and 144.285MHz. A special QSL card will be sent to all confirmed contacts and a good response to his expedition will be very welcome.

ICS Go Into 'Packet Radio'

ICS have recently announced that they are marketing what is the first Packet Radio purpose built equipment in the UK.

They have introduced two TNC units (terminal node controllers, if you want to be flash) which serve as terminal units when driven with a personal computer with the appropriate software/hardware. Both units interface directly to a VHF FM transceiver. Why a VHF FM transceiver? FM is the ideal mode for digital transmission owing to its lacks of susceptability to 'noise'. The following quote from the press release answers this question further "These units are suitable for high speed terrestrial or satellite error correcting data communication and multiple QSO's are permitted on one frequency. Each TNC can act as a digital repeater with the ability to 'digipeat' via up to eight TNCs. This means that VHF contacts will ultimately be possible from one end of England to the other under flat band conditions — given suitably equipped and attended stations."

In the view of ICS, with which the Editor is inclined to agree, is that AMTOR still remains the best mode HF data communication.

The PKT-1 is a fully assembled, tested and cased unit and retails at £499 including VAT. Also available is the 'Tucson Amateur Packet Radio Group' unit in kit form which retails at £295 including VAT. Certainly not cheap but rather interesting.

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Yaesu FRG 7700M with memory	455.00	(—)
Yaesu FRG 7700 without memory	385.00	(—)
Yaesu FRT 7700 antenna tuner	48.25	(1.50)
Trio R 600 Gen. cov. receiver	272.00	(—)
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A.O.R. AR2001 25-500MHz	345.00	(—)
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F.D.K. ATC720 Airband handheld	169.00	(—)
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The ALPHA Transceiver

In Part 2, Tony Bailey, G3WPO, and Frank Ogden, G4JST, describe the construction of this single band, high performance, SSB/CW HF transceiver project.

ALPHA, like any SSB transceiver is necessarily a fairly complex circuit in terms of component count, and a reasonably small printed ciruit board demands a compact layout. It would have been possible to build the circuitry on a PCB much smaller than that used, but the component density needed would have made it very difficult for the average constructor to physically build — and especially to fault find afterwards.

The construction is in fact very straighforward, providing you follow the sequence given. This has been designed to allow a measure of alignment and fault finding as one goes along, with some sectionalised building of the PCB. We do *not* recommend that you just build the *whole* board and hope that it works — a fault involving one of the voltage lines could be potentially disastrous besides making error-finding almost impossible.

To Build It

You will need a small tipped soldering iron and 22 swg solder to go with it (3mm bit size maximum). Any attempt to use a larger iron, such as a 'general purpose' type or 18 swg solder will almost certainly result in solder bridges (difficult to find), and possible lifting of the PCB tracks from the substrate. The authors have seen a lot of their designs built by lots of different people — poor soldering is the cause of many problems and we would not be lying if we said that some of the results can almost make you cry. . .

The drawings show how the various components should be mounted *please* follow this technique, and you will get it to work first time. Leave 10mm of lead above the PCB and you will *not* get it to work easily!

There are a few special components and techniques involved in the construction of ALPHA. Wherever these occur, they have been explained in detail for the benefit of those possibly unfamiliar with that part. In fact, we have made the instructions detailed enough for the beginner, but the availability of an experienced constructor to offer advice and encouragement would be advisable if you haven't attempted anything of this nature before.

There are no voltage check charts given (other than for the VFO) in this project for the reason that when we *have* published them, the ensuing queries show that we shouldn't have! Whether you would get the voltage indicated depends on your meter (type and accuracy), and component tolerances, both static and dynamic. In general, voltage checks are more misleading than helpful most of the time; so we have only indicated them in the text where *really* helpful. A logical look at the circuit will tell you roughly what the voltage should be.

Starting Off

These instructions assume that you are using the kit of parts to build ALPHA. If you are going it alone using the ready made PCB, all of the components must be on the modern miniature type as otherwise they may not fit the board.

The first job is to fit all the connection pins that are used to attach the leads to the PCB. There are 52 in total. Each is pushed through from the underside of the board and then, using something hard, really pushed hard home until flat against the board on the underside. Solder them all on the underside, and also on the top where there is no clearance pad round them.

From this point on, a bracketed space ( ), is given after each component so that you can tick it off as you proceed with the construction.

8V Regulator

As the regulator supplies power to most of the circuit, it makes sense to check this circuitry early on.

1. Insert and solder C97 ( ), & 100 ( ), (observe polarity). Insert and solder Relay 2 ( ). Then insert IC5 ( ),through the three holes until, when bending it over, the hole in the tab lines up with the hole in the PCB. Bolt the IC into place using a 6BA 6mm bolt inserted from the underside of the PCB and attach a lockwasher and nut to the top. There is no need to use heatsink compound under the device. Solder the centre lead to the PCB top, and then the other leads on the underside ( ).
2. Apply +12 – 14V to point V, and an earth to the top foil of the PCB, and check that you have +8V +/– 0.2V at point R ( ). There should be no volts on point S (unless the relay is faulty).

VFO

The VFO is best built and tested as a separate circuit so this is next on the agenda. There are some differences in construction between the 160m and 20m versions — these will be explained as we go along.

1. Insert and solder RFC7 ( ), 8 ( ), 9 ( ) and 10 ( ) (all marked 151 plus a letter). Then make the two links using pieces of wire just clear of the board on the topside (one near IC6, the other by C122) ( ).
2. Solder in C113 — check value ( ),then D33 ( ). The latter is a double diode but only one half is used in this application. Don't forget to solder the right hand lead to the PCB top.
3. For 160m: solder in C103 ( ), C106 (check value) ( ), R118 ( ), C105 ( ), X2 ( ), C111 ( ), Cx, Cy and C112 ( ), C133, C135 and L10 are not used.

For 20m: solder in C135 ( ),

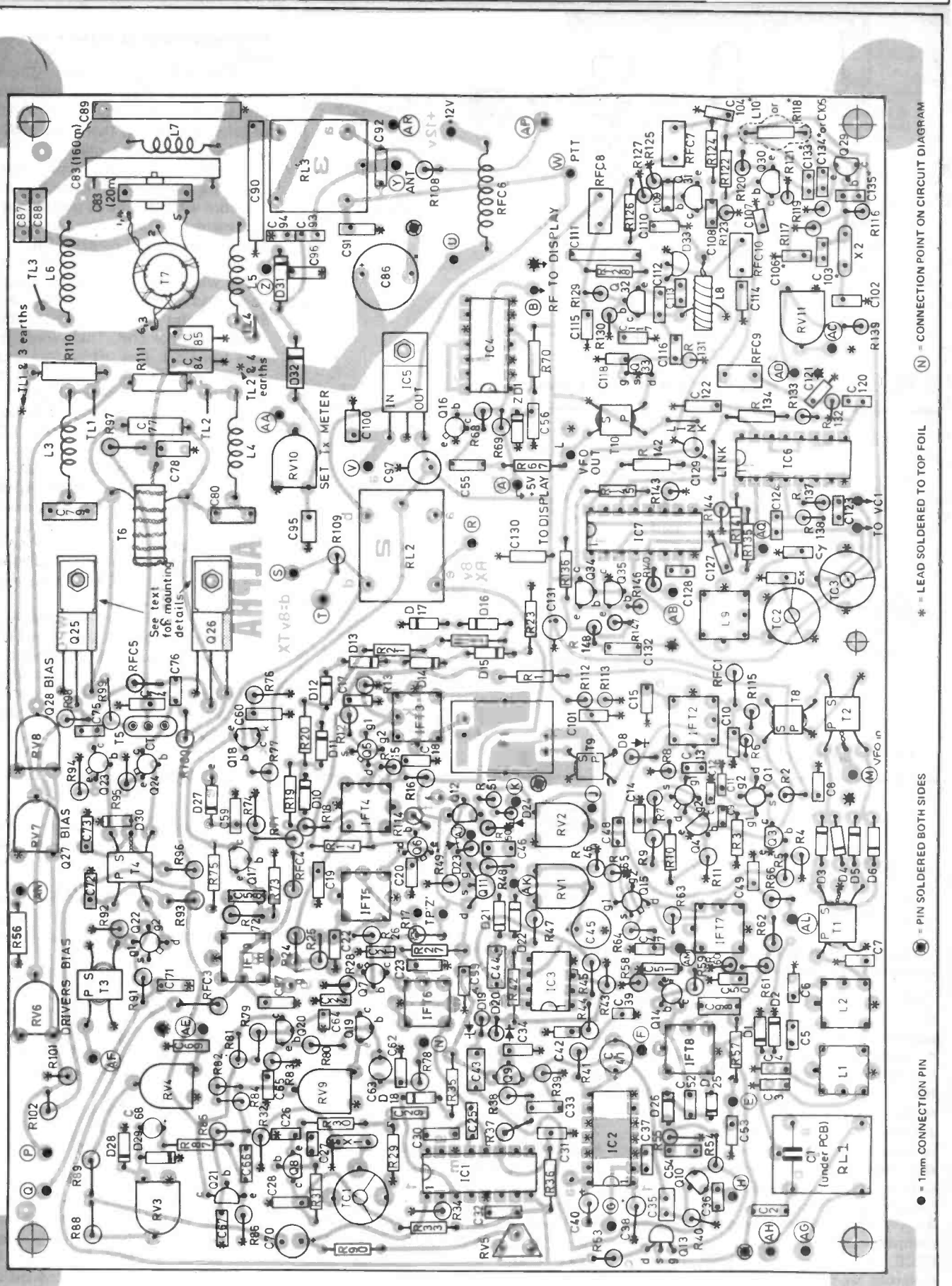


Fig. 1 Overlay diagram of ALPHA

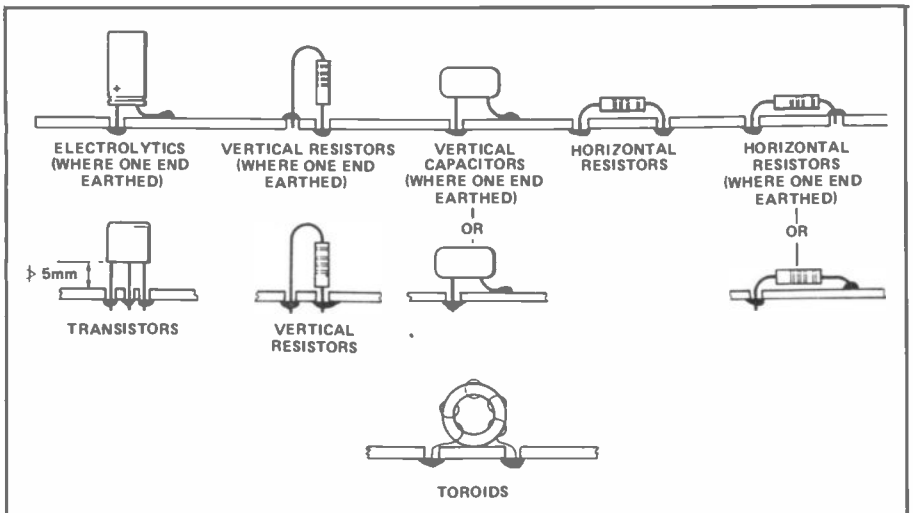


Fig. 2 Guide to mounting the PCB components

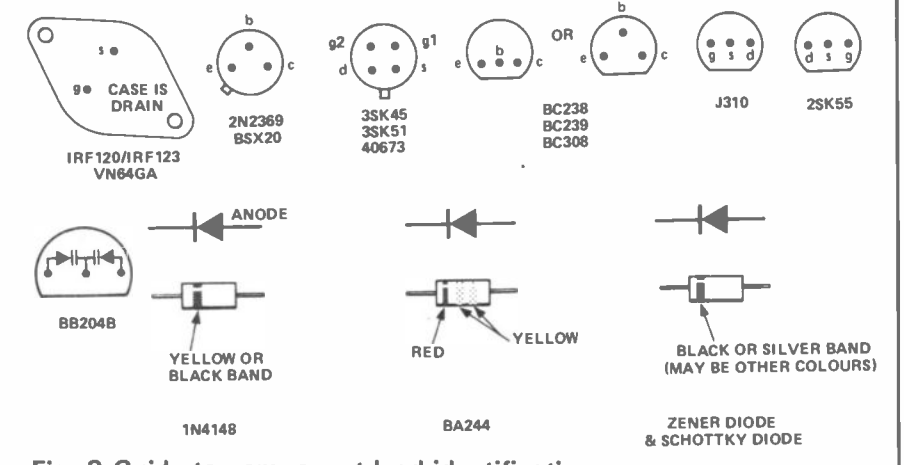


Fig. 3 Guide to component lead identification

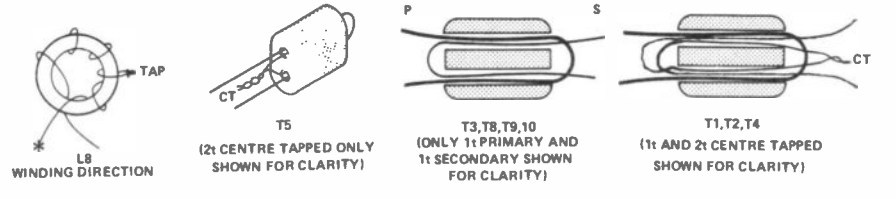


Fig. 4 Winding guide to the RF transformers used in ALPHA

C133 ( ), C134 ( ), C106 ( ), C111 ( ), C112 ( ), X2 ( ), & L10 ( ). C103, C105 and R118 are not used.

4. Insert and solder L9, also soldering the right hand side of the can to the top foil ( ). *NB: with TOKO components the letters preceding the numbers sometimes vary — as long as the numbers match then you can ignore this.* Also insert and solder TC2 and 3, with one pin of each soldered to the top foil where indicated ( ).

5. With the frequency sensitive passive components now in place, start near RFC8 on inserting the rest of the resistors and capacitors in the area bounded by and including C115, C130, C131, & C132 *except* R136, C123 & C128. Check for correct polarities on electrolytics as you go along. Include RV11 and R139, although these are part of the sidetone circuit ( ).

6. Insert and solder all the transistors (Q29 — Q35) ensuring that the outlines match the drawings ( ). Note Q35 has its collector soldered to the top foil ( ), and Q33 its source ( ).

7. Wind T10 on one of the small two-hole balun cores. This transformer will be explained in detail in a moment; most of the other transformers on these type of cores are similar in construction, but may have 'centre taps' or no secondary etc. *IT IS IMPORTANT THAT YOU TAKE CARE WHEN WINDING THIS TYPE OF TRANSFORMER — DO NOT PULL SO TIGHT WHEN THREADING THE WIRES THAT THE INSULATION STRIPS!* If you do cause this problem, finding the resulting fault is not easy. The wire supplied with the kits has a very tough coating which is difficult to strip.

The primary requires 23cm of 0.2mm wire. Insert one end through one of the holes, leaving about 10mm of wire protruding, then take the other end back down the other hole — this counts as one turn. Now, continue until there are ten turns — mark the end of the core with the wires protruding with nail varnish or whatever, so you know this is the primary winding ( ).

The secondary needs 7cm of the same wire. Insert one end through the same end as the primary wires are protruding, and leave 10mm protruding from the other end. Then wind to give two turns ( ). Cut off all four ends to 10mm, strip about 3mm of insulation off each. Then solder into place with the core flat against the PCB, so that the marked primary end is facing C122 ( ).

8. IC6 and 7 are both CMOS types. *Providing you have an earthed soldering iron, or an isolated type, you shouldn't have any trouble with these.* Avoid handling pins, and solder them into place. Both ICs have pin 8 soldered to the top foil of the PCB ( ). Now solder in C123 ( ) & C128 ( ).

All components are now in place except for L8 and R136 ( ) (which are added later), ready for alignment.

Check all leads are soldered to the top where they should be, and that you haven't any solder bridges on the underside of the PCB ( ).

VFO Alignment

For this you will need an analogue voltmeter and a frequency counter capable of measuring from 200kHz up to 14MHz (for 160m) or 26MHz (20m). Instructions are given primarily for the 20m band with any differences necessary for 160m operation in brackets.

1. Connect power to point V as before and check that +8V appears on pins 16 of ICs 6 & 7 ( ). If the voltage is lower than this, there is almost certainly a 'short' on the +8V line somewhere in the VFO circuit.

Also temporarily connect up VC1 to the two connection pins, with an earth from its case to the PCB top foil ( ).

2. Check with the counter connected to the emitter of Q30 that the crystal oscillator is working — L10 should be adjusted for a reliable (steady) reading and reliable starting of the oscillator (160m — no adjustment needed). The frequency should be close to nominal but exact agreement is not important ( ).

3. L8 is now wound. The direction of

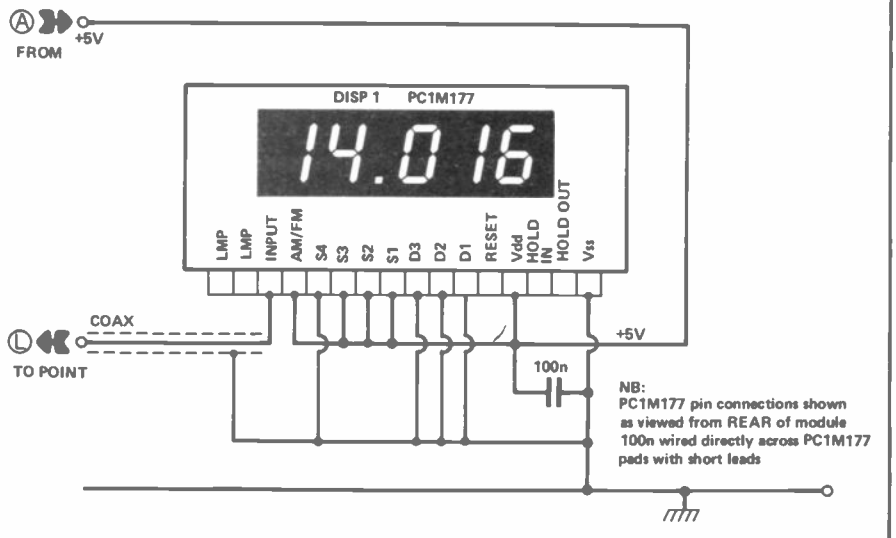


Fig. 5 Suitable frequency display for ALPHA

winding the core is *important* so that the leads come out the right way round for the board (see **Fig. 4**). These are several ways of defining the number of turns on a toroid — for our purposes, the number of turns is equal to the number of wires you can count on the outside of the core (the illustration has six turns). The tap is made by forming the leads into a loop about 8mm long as you reach the tap point, then continuing for the remainder of the winding. Make the coil using a 19cm (26cm) of 0.56mm wire, tapping at 2 (3) turns. Cut the two free ends to 10mm in length, strip off the insulation as before (off both ends and the tap), and solder into place. The tap is best connected using a short length of wire previously soldered to the PCB hole ( ).

4. The VCO now has to have its frequency roughly set so that it will lock properly. Temporarily solder one end of R136 into the hole above IC7 ( ) — the other end of R136 needs to be connected to a variable voltage supply. This is done by connecting it to the wiper of RV4 and connecting the other two terminals of RV4 to earth and point R. This pot simulates the control voltage which would normally come from Q34/35 ( ).

5. Connect a multimeter (10V range) to the pot wiper and a frequency counter to point L. Switch on the power and you should get a frequency reading somewhere in the region of 20-30MHz (12-15MHz). Set the wiper voltage to +4V and squeeze or open the turns on L8 until the frequency is near to 25.05MHz (12.7MHz). This is fairly critical to set but the frequency only needs to be accurate to within a few 10s of kHz. The actual VCO frequency will drift about a lot but this is of no consequence, as it is not locked yet. It is possible that you may have to add or remove a turn on L8 as we have found the permeability of the cores can vary somewhat between samples. Also, it doesn't matter whether the turns are far apart or bunched up — *as long as you can get the frequency!* When this is done, lock the turns of L8 in place (without moving the coil) using melted candle wax or nail polish (don't use epoxy resin in case you need to readjust it later) ( ).

6. The VFO itself is now set up. A counter connected to pin 3 of IC7 will read the frequency. Adjust the two trimmers to mid-capacity and VC1 to maximum capacity. Adjust L9 until the frequency is 0.40 (0.69MHz). Turn VC1 to minimum capacity and adjust both of the trimmers so that the frequency is 0.85MHz (0.91MHz). *Both trimmers should be at the same capacity all the time.* Now go back to VC1 at maximum capacity and readjust L9 for the lower frequency. Repeat these adjustments until you have both ends on or as near to as possible to the aforementioned frequencies. Again, due to component tolerances, you may be a little outside these frequencies. If the bandspread is too wide, adding extra fixed capacity across each trimmer in the holes provided should get you nearer after further adjustment ( ).

7. Remove power and connect R136 correctly (that is to say, fully) into the PCB. You can also attach an LED to point AQ (lock indicator) and earth. Applying power again should result in the whole circuit locking up correctly, within the frequency limits set by the VFO itself. *Note that due to the fact that the crystal is higher than the VCO frequency, adjusting the VFO LOWER in frequency causes the VCO output to go HIGHER in frequency.*

8. If there is a problem, the most likely one is that the 'loop' will refuse to lock, with the voltage at pin 13 of IC7 staying high or low. It could be that L8 has been knocked and the inductance has been altered. When you are sure everything is OK, add more candle wax around L8 and the nearby components so that they are firmly fixed in place on the PCB — this will prevent problems when operating mobile ( ).

Frequency Display

If you are building the PCIM177 based digital display, this can be tested at this stage, afterbuilding the prescaler. NOTE: there is a cheaper version of the PCIM177 available which is similar but has different pin connections. We do not recommend its use here as it appears to be RF sensitive and consequently misreads on Transmit.

1. Insert and solder IC4, noting that five of its pins are soldered to the PCB top foil ( ). Insert and solder C55 ( ), Q16 (emitter to top foil) ( ), R67 ( ), 68 ( ), 69 ( ), 70 ( ), ZD1 ( ) & C56 ( ).
2. Apply power and check for +4.6 −5.0V at point A ( ). Then connect a counter to point B (or leave until the display is actually connected). The counter should read 1/10 of the VCO frequency — it is possible that your counter may not like the square wave output from IC4 though.
3. Connect up the display as shown in the drawing. Be *very* careful that you have all the connections correct — a wrong connection could blow up the display and it can't be repaired!
4. With power applied the display should read the correct output frequency for the band in use to 1kHz resolution. If you have wrong readings or decimal points in the wrong place, look for shorts between the connections on the display.

Next. . .

The major constructional part comes now and that is the building of the rest of the PCB, except for the stages associated with the transmit drivers and PA. Because of interconnections and the bi-directional nature of some of the circuits, most of it will have to be built in one go and then tested in stages. A few components are inserted round the board first as guides to the layout in later stages.

1. Insert and solder IC2 ( ), IC1 ( ), IC3 ( ), RV1 ( ), 2 ( ), 3 ( ), ( ) 4 ( ), 5 ( ), 9 ( ) & 10 ( ). Don't forget to solder pins to the top foil where shown.
2. Insert and solder RL1 ( ), C1 soldered across its underside where shown ( ). Then RL3 ( ), C92 ( ), C91 ( ), C86 (watch properly) ( ), R108 ( )

and RFC6. The latter requires 35m of wire, distributed evenly round the core, except for the part which rests against the PCB ( ) . Be careful not to strip the insulation off the wire on the edges of the core.

3. Insert and solder: C2 ( ),C3 ( ), C4 ( ), C5 ( ), C6 ( ), C7 ( ). Then D1 ( ) (make sure they are opposite ways round). Now IFT8 ( ), IFT7 ( ), IFT2 ( ) & IFT3 ( ) — solder one side of each can to the top of the PCB where shown ( ). Then R57 ( ) , C98 ( ), C50 ( ), R60 ( ), R61 ( ), R62 ( ), R66 ( ), R5 ( ), R4 ( ), C49 ( ), R3 ( ), R2 ( ) & C8 ( ).

4. Now L1 ( ), L2 ( ), with cans soldered where shown. Then Q3 (emitter to top foil) ( ), Q1 ( ), C9 ( ) , C11 ( ), C12 ( ), C13 ( ), C10 ( ), RFC1 ( ), R6 ( ), R115 ( ), R11 ( ), Q4 (emitter to top foil) ( ), Q2 ( ), R63 ( ), R10 ( ), R7 ( ), R8 ( ) & D8 ( ). Now C15 ( ), C101 ( ), R112 ( ), R113 ( ), R1 ( ), and R23 ( ). Continue with R46 ( ), R65 ( ), C48 ( ), C14 ( ), R9 ( ), Q15 ( ), R64 ( ),C47 ( ), C51 ( ), R59 ( ), Q14 ( ), R58 ( ), R43 ( ), R45 ( ), C45 (watch polarity) ( ), R47 ( ), C39 ( ),R44 ( ),C41(watch polarity) ( ), , R41 ( )and C42 (watch polarity) ( ).

5. By now you will want a cup of tea, or possibly Brandy (*definitely! — Ed.*) After this carry on with C53 ( ), D25 ( ), R54 ( ), C36 ( ), R4? ( ), Q10 ( ), C54 ( ), R55 ( ), C52 ( ), D26 ( ), C35 ( ), C37 ( ), Q13 ( ), C38 ( ) & C40 ( ) (watch polarities). Then R53 ( ), R36 ( ), C31 ( ),C33 ( ),R37 ( ),R38 ( ),R39 ( ), Q9 ( ) and C34 ( ). Now C32 ( ), R33 ( ), R34 ( ), C30 ( ), C25 ( ), C43 ( ), R35 ( ), D19 ( ) & 20 ( ) (watch orientation), C99 ( ), C44 ( ), R42 ( ), D21 ( ) & 22 ( ) (watch orientation), R48 ( ), C46 (watch polarity) ( ), R50 ( ), R51 ( ) and D24 ( ) (watch orientation).

6. Solder in IFT6 ( ), IFT5 ( ) & IFT4 ( ), cans soldered where shown. Then C23 ( ), R27 ( ), R17 ( ), Q11 ( ), R49 ( ), D23 ( ) (watch orientation) ( ), Q12 ( ), C20 ( ),Q6 ( ),R114 ( ),R16 ( ),C18 ( ), R15 ( ), Q5 ( ), R12 ( ), C17 ( ), R13 ( ), D13 ( ), R21 ( ), D14 ( ), D17 ( ), D15 ( ), R22 ( ), D16 ( ), D10 ( ), D11 ( ), D12 ( ), R19 ( ) & R20 ( ).

7. At this point check again that all the diodes around IFT4 & IFT3 are the right way round. Carry on: R26 ( ), C21 ( ), Q7 ( ), C22 ( ), R28 ( ), Q19 ( ), R80 ( ), C64 ( ), C24 ( ), R25 ( ) & R24 ( ). Then C63 ( ), C62 ( ), R78 ( ), D18 ( ) (watch polarity), C29 ( ), R29 ( ), R30 ( ), C27 ( ), R31 ( ), R90 ( ) and TC1 ( ). Insert X1 against the PCB and solder ( ). Then use a short length of offcut to solder an earth link from the *top* of the crystal can to nearby on the PCB foil ( ).

8. Carry on with C70 ( ) (watch polarity),C28 ( ),Q8 ( ),C26 ( ),R32 ( ), C66 ( ), R86 ( ), C67 ( ), Q21 ( ), R87 ( ), R85 ( ), C65 ( ), R84 ( ), R82 ( ), R81 ( ), R79 ( ), R83 ( ), Q20 ( ), C57 ( ), RFC3 ( ), C69 ( ), C68 ( ) (watch polarity), D28 ( ) and D29 ( ) (watch orientation). Then IFT9 ( ), with can soldered where shown, R72 ( ), C58 ( ), R73 ( ), RFC4 ( ), C19 ( ), R14 ( ), R18 ( ), R71 ( ), Q17 ( ), R75 ( ), D27 ( ) (watch orientation), C59 ( ), R74 ( ), R77 ( ), Q18 ( ), C60 ( ) & R76 ( ).

9. Next, solder in F1 ( ) (don't solder the can to the top foil, it is earthed via a track on the underside), R109 ( ), C95 ( ), D32 ( ) & D31 ( ) (be careful when bending the leads of these or the glass body may break), C96 ( ), C93 ( ), & C94 ( ). Then D3 to D6 ( ). Again be careful with the leads of these Schottky diodes, and that they are inserted the correct way round (or the mixer will not work!).

10. The only remaining components for this section are the small transformers T1, 2, 8 and 9.

T1 is a simple transformer, similar to T10 that you have already wound but with a centre tapped secondary. The primary requires 14cm of wire to wind it (6t). The secondary uses two lengths of wire each 8cm long, each yielding 3 turns. Wind one length for three turns, cut one end to 10mm long, strip the insulation and join one end of the other piece of wire to it by twisting and soldering. Carry on winding in the same direction for a further three turns. Then insert and solder to the PCB, not forgetting to earth the leads where shown ( ).

T2 is similar, but the primary is centre tapped (wind the same as T1 but insert the other way round) ( ).

T8 is very similar to T10, using 5cm for the primary and 20cm for the secondary. Identify the primary as you did with T10 ( ).

T9 is again similar to T10, with 5cm for the primary and 15cm for the secondary, again with an identified primary end ( ).

11. There are a number of links to be made on the underside of the PCB. The first set use insulated hook-up wire run in a straight line between each point. First join up all the points marked with a lower case 'a'. These are on RL3 ( ), near pin 8 of IC4 ( ), on RL2 (two connections) ( ), near pin 7 of IC3 ( ), pin 14 of IC2 ( ) and RL1 ( ).

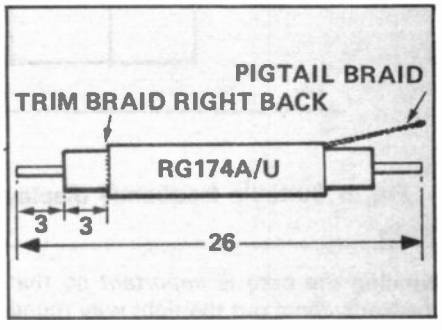
Next, join up all the points marked with a lower case 'b' — these are on RL2 ( ), & RL3 ( ). Then the two points 'c' — located under R53 ( ) and by IFT2 ( ).

Join up the two points 'd' — located on RL2 ( ) and one end of R9 ( ). Then the two points 'e' — on RL2 ( ) and one end of D27 ( ). Finally the two points 'f' — these are to the top right of F1 ( ), and the junction of R24/R25 ( ).

Lastly . . .

12. There are two remaining links on the underside. The first is made using a length of loosely twisted (about 4 twists/cm) length of .2mm enamelled wire. Twist some wire and cut it so that the overall length is 5cm. Unravel the ends for about 8mm and strip off 3mm of insulation off each of the four ends. Connect one of the wires to point 'g' near IFT9 ( ). With an ohmmeter, find out which of the wires at the other end is the corresponding end and connect this to point 'g' on IC1 ( ). Then solder the two remaining leads to the two points 'm' near IFT9 ( ) and on IC1 ( ).

Cut a short piece of RG174A/U miniature coaxial cable for the link between the two points 'k' on the underside (see drawing for cable length). The end with no braid goes to point 'k' on the collector of Q18 ( ) with the centre of the other end to point 'k' under IFT3 ( ) and the braid goes to the left hand lug of the can of IFT3 on the underside ( ). Be careful that the braid wire cannot short against any PCB tracks. This completes the links on the underside.



Alignment

Firstly, link points U & V, so that the 12V supply can now pass through RFC6 ( ) (remove any previous connection to point V first .

1. Connect up VR1 (AF gain) to the PCB with screened cable ( ) & VR4 (IF gain) with ordinary wire ( ). Connect a speaker (4-8 ohms) between point F and earth ( ).

2. Connect the 100Ua 'S' meter between points J & K, observing polarity ( ) (if you have no meter handy, use your multimeter on the nearest DC range to 100uA).

3. Apply power to +12V input. The current should not exceed about 150mA ( ). If much more, start looking for shorts between the +8V Rx line and something else.

4. Adjust RV1 to mid-travel ( ). Use RV2 to zero the S Meter reading (if the meter reading won't change, check D24 is inserted the correct way round) ( ). Then turn up the volume control (VR1) about 1/4 travel. Touching pin 2 or the slider of VR1 should induce hum through the speaker ( ) and the meter reading should also move, showing the AGC is working ( ).

5. Turn VR4 to maximum gain (fully clockwise) ( ). With a bit of luck you may hear some noises from the IF amp (depending on coil alignment). Adjust the carrier injection oscillator (Q8) trimmer TC1 so that a frequency counter connected to the junction of R29/30 reads 10.985MHz (10.7015MHz) ( ). If you have no counter, adjusting TC1 should result in the pitch of the hiss from the speaker changing — leave it set for a lowish hiss. You can also roughly peak IFT6, 5 & 4 for maximum noise at this stage if you have no signal generator available. If you can't get any output from the speaker, check if there is any change if you put a 10n capacitor across the drain and source of Q10. If noise results, there is a problem with the noise blank pulse line, or the components in that area.
6. With a signal generator set to 10.7MHz (or close-by so that a beat note can be heard from the IF strip), inject a signal onto C25. This should verify that the AGC is working by a meter deflection ( ).
7. Now inject the signal into the junction of D8/primary of T9. Using the S meter, and reducing the generator output as required, peak IFT6, 5, 4 & 3 in that order, repeating until there is no improvement ( ). You should only need about 1 uV of signal injected for a strong signal when you have finished. VR4 should also reduce the gain when varied ( ).

If you are lacking sensitivity, work forward through the IF strip, injecting the signal at each stage, until you find where gain is lacking. Then check carefully the components and look for track/pad soldering shorts etc. Also check that there are volts on the semiconductors where you would expect them. You should have approx. a 0.5V drop access test points 'z' (near IFT5) when finished ( ).
8. Inject the signal into the output lead of T2. You should only need about 0.2uV of signal for a copyable result ( ). If nothing, then the bi-directional amplifier (Q1 to Q4) is faulty. Check that the collector of Q3 is low in voltage, and that of Q4 high. If not correct, then there is a problem with the +8V Rx and Tx lines feeding these transistors (check the links under the board), or a component problem. Logical signal injection through the circuit will isolate where the problem is.

'Front End'

9. Connect the VFO output (point L) to the Schottky mixer input (point M) using a length of RG174A/U miniature coaxial cable, earthed at both ends ( ). Connect the signal generator to the aerial input (point AH), and tune it to 14.2MHz (1.9MHz) ( ).
10. Find the generator signal by tuning VC1 (approx. mid-capacity). Reducing the generator output as necessary, peak L1 & L2 for best signal, using the S meter ( ). If you are lucky enough to have access to any form of swept frequency response test gear which can look at the preselector response, you can fine tune L1 and L2 for as flat a passband as possible across 14.0-14.35MHz (1.81-2.0MHz) ( ).
11. Now adjust RV1 for the best signal, using a weak signal at 14.2MHz as before ( ).'

Noise Blanker

12. Once the basic receiver is working the noise blanker can be set up. Wire up VR2 (noise blanker level) and connect +12V to point E ( ). With a multimeter (10V range) connected across the junction of C54/R55 and earth, inject a very strong signal into point AH at 14.2MHz. You should get some deflection of the meter with VR2 set fully clockwise. Adjust IFT8, then IFT7 for maximum deflection ( ). If the blanker is working properly, a strong signal should cut off all audio output from the receiver suddenly as the VR2 is rotated clockwise ( ).
13. With the blanker disconnected, readjust VR2 for zero meter reflection with no input signal.
14. Finally, connect points AH and AR together with a length of miniature coaxial cable ( ). Check that signals injected into point Y are received OK ( ). If not, either a relay is faulty or there is a short on the coax! Also, check that earthing point W causes the three relays to switch over ( ).

Take A Deep Breath!

The receiver is now aligned, and can be tested on-air. If you have not got the test equipment to set up the receiver 'front end' properly, it is possible to align the receiver off-air with a little bit of luck. The inductors should be fairly near resonance without tuning, and if you can find a signal in whichever band the unit has been built for, it is possible to peak all the transformers in a similar order to that already given for maximum noise. The only problem is with the Noise Blanker which really needs a *strong* in-band signal for correct alignment, rather than *hoping* that you are aligning it on an in-band signal.

Note that the S meter response is preset by R51 for full scale deflection. If tolerances show that there is not enough meter deflection on strong signals (or too much) then decrease (or increase) the value of R51.

Also note that with VC1 earthed by returning it to the PCB, there may be a number of unwanted spurious responses audible in the receiver. These will go when the earth return is made via the chassis of the case rather than the PCB itself. There are a few very weak spurii in-band which should be virtually inaudible with an aerial connected.

For those with no test gear who want to know whether the receiver is as sensitive as it should be, connecting an aerial (resonant or via an ATU) should result in an audible increase in the general noise level when not tuned directly to a signal.

Transmit Strip Construction

With a receiver successfully built, the Tx can now be tackled. The stages as far as the drivers are built and tested first.

1. Insert and solder R88 ( ), R89 ( ), R102( ), R101 ( ), C71 ( ), R91 ( ), R93 ( ), R96 ( ), Q22 ( ), R92 ( ), C72 ( ), RV6 ( ), RV7 ( ), RV8 ( ), R56 ( ), C73 ( ), D30 ( ), Q24 ( ), R95 ( ), R94 ( ), Q23 ( ), R98 ( ), C75 ( ), R99 ( ), C74 ( ), RFC5 ( ), C76 ( ), &R100 ( ). Then C79 ( ), C80 ( ), R97 ( ), C78 ( ), C77 ( ), R110 ( ) & R111 ( ).
2. Insert and solder C84 ( ) and C85 ( ). The earthed leads on these should be bent at right angles to the body with *great care* (don't pull against the body or they may become detached from it!).
3. Wind and insert/solder T3 ( ) and T4 ( ). T3 is a straight transformer — the primary needs 7cm of wire and the secondary 14cm. T4 is centre tapped, with the primary using 23cm of wire and the CT secondary, two lengths of 7cm each. Identify the primary of T3 as before.
4. Wind and insert/solder T5 ( ). This is simply one winding centre tapped, using 10cm for each half. This is mounted standing vertically, with the windings emerging from the bottom.
5. Wind and insert T6 ( ). This is a *bifilar* wound transmission line transformer — this simply means that the windings are made using two lengths of wire which have been twisted together beforehand. Take two lengths of 0.56mm enamelled copper wire 28cm long. Fix one pair of ends in a vice, and the other ends in the chuck of a hand twist drill. Then turn the drill until the length is twisted together (about 8 twists per cm). Now wind 10 turns through the core (coloured grey and 10mm in dia.). Unravel each set of ends back to the core, cut to 15mm long and strip off about 5mm insulation from each. Using a multimeter on one of the leads, find out which lead is which, and that there isn't a DC short between them, and connect the beginning of one lead with the end of the other. The pair then becomes the lead next to C78, and the other two go as shown

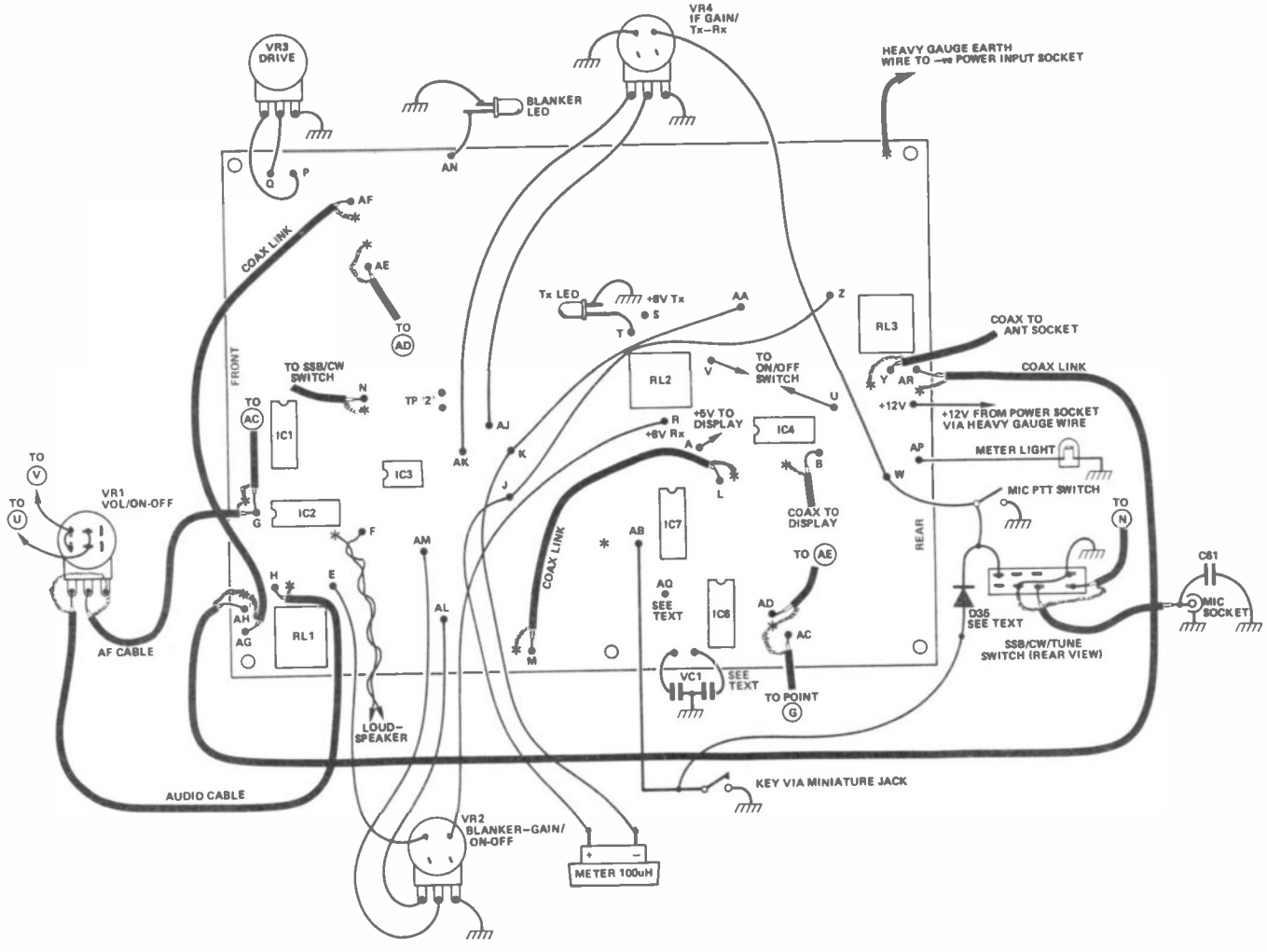


Fig. 6 Interconnection diagram for ALPHA

(the transformer is symmetrical).

6. Wind and insert L3 ( ) and L4. For 20m, each is 5 turns (use 16cm) on an Amidon T68-6 (yellow — 15mm dia core). They are mounted with the core vertical and the winding distributed evenly around the core between the fixing holes — the core should touch the PCB at the bottom. For 160m, they are simply 10uH axial chokes instead (looking like 0.5W resistors coded brown black black), mounted like horizontal resistors.

7. Now, Q25 ( ) and Q26 are mounted and soldered. Both of these are FETs with *unprotected* gates. Some caution is therefore necessary when handling them — *avoid touching the leads until after the devices are soldered into circuit*. The tabs (drains) must be isolated from the PCB — a mylar insulating washer is placed over the 3mm mounting hole with some heat sink compound to aid heat transfer smeared on each side. On top of this is placed a small spacer made from 18swg aluminium sheet, size 10 x 11mm with a 3mm hole (this allows the tab of the device to remain horizontal when screwed down).

Smear some heatsink compound on top of this, then insert the VN66AF through the three holes until, when bent over, the hole in the tab aligns with the PCB hole. Insert a 6mm 6BA bolt through from the underside and tighten everything down with a locknut and washer. The PCB foil has been cleared on top around the hole so a nylon bolt is not required. Now solder the leads into place, not forgetting to solder the sources to the top foil of the PCB.

This completes the major part of the transmitter, you may now take a deep breath, a large mug of Brandy and put your feet up!

Kits

Kits of parts for this project will be available from WPO Communications. Options available for, either the 160m or 20m version will be a complete PCB KIT, with all board mounted components, PCB, VFO capacitor, pots, wire and drilled heat sink for the PA, priced at £149.50 or a complete kit with case (ready punched, painted and screened) plus mobile mounting bracket, and all switches, speaker, hardware etc (leaving only a microphone, key and PSU required) priced at £199.50 (all inclusive of VAT & Post).

Printed circuit boards alone (drilled and tinned) are priced at £22.45 inc.

Next month — Construction of the PA stage, transmitter alignment and details of a suitable case.

Reviewing the Tono Theta-5000E

In my previous articles about RTTY and AMTOR, May and August 1983 and February 1984, I discussed two ways in which the Radio Amateur could enter this fascinating world. This is the third way, and comprises the whole 'works' in one box with a keyboard in front as a separate entity.

The Tono Theta-5000E with AMTOR, CW and RTTY facilities plus CW auto decoding, would seem to be the 'Rolls Royce' of keyboard communications. Ken Michaelson, G3RDG, took one for a spin.

The Tono Theta 5000E is complete and the only equipment the user has to supply is his transceiver or receiver/transmitter. The unit is programmed to send and receive CW (Morse Code), RTTY (in both Baudot Code and ASCII Code) and AMTOR in the RTTY (Baudot) and CCIR modes (both Mode B and ARQ Mode A). Truly a formidable piece of gear to drive. It also has Japanese 8 bit RTTY and CW, though I feel that these two modes will not interest British amateurs! Received and transmitted characters are read on the built-in 5 inch high resolution green monitor. The unit also has provision for a Composite Video Signal output, a Centronics Parallel compatible interface for a printer and two phono sockets to connect a monitor oscilloscope if required. Power requirements, by the way, are AC mains or 13.8 volts DC.

After reading the manual which, by the way, is very well printed and does not contain any 'Japanese English', I was astounded at the number of facilities which are available. Several things impressed me before actually using the gear. One was a built-in time clock, which displays the month, date and time on the screen, and even has input digit differences to account for Leap Year. This time clock is powered by a 'back-up' battery, as are the contents of the 17 memories, so that there is no need to reload information each time the unit is operated. Another was the provision of either 'FSK' or 'AFSK' keying of the transmitter in all modes. The 'FSK' keying uses the high or old tones (2125/2295 Hz) and enabled me to use the FSK position on the mode switch of my Trio TS820S, which is the normal method of operation with my own equipment. The AFSK position, if required, is switched in at a touch of one of the buttons on the front panel, and uses the new tones (1275/1445 Hz).

Getting It Going

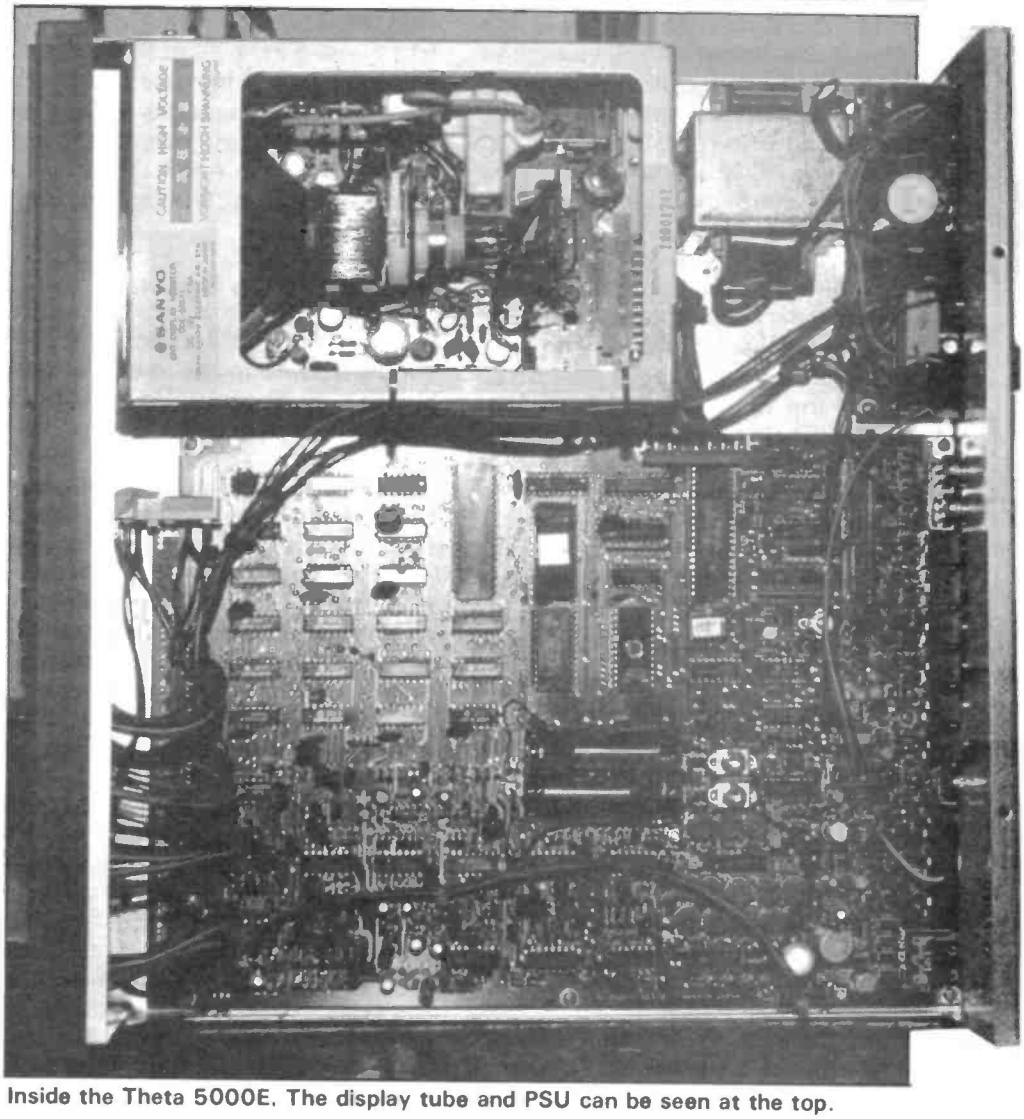
Having carefully connected the equipment to the transceiver, I must emphasise a most important point. It is vital that the manual is read thoroughly, not once but several times. In fact, it should really be studied as one might do for an examination, otherwise not only is it impossible to get the best performance out of the unit, but on occasions the unit refuses to function at all! Examination of the manual

shows that there are 18 different functions which can be called up by the use of the 'ARROW' key (top right of the keyboard), followed by a letter of the alphabet, a further 13 which can be called by the use of 'REPT' followed by a letter, and yet another 18 by the use of the keypad at the right of the panel followed by a number or numbers. All these are listed at the end of the article.

Anyone Out There?

I had decided that the first try on the air would be to call G3PLX on 80 meters since there was every chance that I would get a reply, so the first thing was to set the controls so that I would operate AMTOR mode A using the old tones on LSB. It will be seen from the illustration of the front panel that there are two rows of keys below the opening for the bargraph LED tuning meter. These are switches for various options, and in my case for the first transmission the following had to be pressed: AUDIO AC, MODE in, TOR C/BAUDOT in, IN R/IN N in, HT/LT in SHIFT 170. In addition to this, on the keypad, FUNCTION (held down) and '7' gave me AMTOR mode A transmit/receive.

The first action was to insert G3PLX's Selcal, (GPLX). This was done by depressing ARROW, (top right of the keyboard), holding it down and pressing the letter 'U'. This sequence, followed by the four letters 'GPLX' entered his Selcal into the memory for transmission. The next thing was to insert my own Selcal, (GRDG) by ARROW and then the letter 'H'. To transmit GPLX as a Selcal it was only necessary to key REPT 'G'. Immediately the transmitter was activated, sending a stream of GPLX. While this was happening, I entered 'DE G3RDG +?' which now appeared in the first of the four lines available for the 'type head buffer'. Between the pre-load buffer (type ahead) and the space available for the display of incoming messages, (10 lines by 40 characters), is a status line. In this particular case it was showing, from left to right, 'C' capital letters, 'L' letters (as opposed to figures), TOR-A for mode A,M (which is displayed in reverse. That is to say, a green square with the



Inside the Theta 5000E. The display tube and PSU can be seen at the top.

'M' in black), since I was master calling 'GPLX'; PHASE because my unit was looking for a signal from 'GPLX' to phase with; F for any function I might have instructed the unit to perform, followed by the month, date and time.

Idle Thoughts

The equipment would continue to send 'GPLX' indefinitely if no signal was sent out by the other station, so if there is no reply, the transmission is stopped by pressing REPT followed by 'W'. The unit then reverts to standby, and the Status line symbols change. The 'M' in reverse changes to 'S' in normal video and the 'Phase' changes to 'Wait'. The unit is now in a condition that if someone would call 'GRDG' (my Selcal) my transmitter would be activated and commence a contact. There are several other very interesting displays in the Status line which deserve a mention. Dealing with AMTOR Mode A first: I have described 'WAIT' and 'PHASE'. When a contact is achieved and data, words etc are being sent, either from the other end or by me, 'TRAFF' is displayed, showing that the characters are either being received correctly, or transmitted properly. When either station takes a rest to think of what to say next (!), the word 'IDLE' is displayed. In the case of data not being received by the other end 'RQ' is displayed, and finally if either end is unable to decode the characters or the control signals, then 'ERR' is shown. When in AMTOR Mode B, only 'WAIT', 'TRAFF' and 'IDLE' are shown, and in mode L the same three.

I have described the operation of AMTOR Mode A with the Theta 5000E. A similar procedure is carried out when you wish to operate in AMTOR Mode B, except that it is necessary to press 'FUNCTION' on the keypad at the right, together

with '8'. When this is done, the Status line indication will change to 'TOR-B'. To transmit, again press 'REPT G', whereupon the Status line changes to read 'T' in reversed video and 'IDLE'. When characters are sent from the keyboard, they first appear in the buffer below the Status line, and are instantly transferred to the upper part of the screen and transmitted. The word 'IDLE' changes at this time to read 'TRAFF' reverting back to 'IDLE' when the message is concluded. To go back to receive (standby), 'REPT W' is entered and the unit waits for an answer to the call. In the case of AMTOR Mode L, FUNCTION and '9' have to be pressed, and 'TOR -L' appears on the Status Line.

On RTTY

Having had several satisfactory QSOs in the AMTOR mode, both in ARQ and FEC, I now tried out the RTTY side of the unit. To do this as far as my own rig was concerned, it was only necessary to release the red Mode switch to the OUT position, whereupon the Status line promptly changed from 'TOR=L' to 'BAUDOT 45.5 BPS' leaving all the other data as it was. To change from Receive to Transmit 'SHIFT TAB' has to be pressed. This acts as a toggle, that is to say, one 'SHIFT TAB' changes to transmit and the next one changes back to Receive. The characters are transmitted in the same manner as AMTOR, first appearing in the 4 line buffer below the Status line and then being transmitted character by character. If you wish to start typing the reply to the other end's transmission before he has finished, you have 4 lines to fill up (160 characters). However, you have to enter 'ARROW P' and tape what you want to say, and then when the other end has finished, press 'SHIFT TAB' followed by 'ARROW P' and the preloaded buffer contents will be sent. If you wish, there is another variation available. You can use 'PTT-AUTO', which means that whenever a key is pressed the transmitter is activated. But to end the transmission one has still to press 'SHIFT TAB'. In my opinion, the 'PTT-AUTO' is useful if no preloaded buffer is used, but it is really a matter of choice. I found that the filters for both AMTOR and RTTY were very good indeed, and although I normally used FSK Old Tones, it was possible for me to alter things so that I was able to use the new tones in AFSK. Thus I was able to try the filtering in both methods.

Unshift On Space

A number of successful RTTY contacts were made, many helped by yet another option which is available on this unit. That is 'Unshift on Space', or 'USOS' as it is labelled. This is very useful when the channel is noisy or there is bad QRM. It operates in the following manner. If a bad character is received which the receiving end thinks is a 'Figure shift', then, in normal circumstances, the receiver would go on printing 'Figures' until the end of the line or another 'Letter shift' was sent by the other end. When using USOS, however, the first 'Space' character that is copied by the receiver after the mistaken 'Figure shift' forces the printer/display into 'Letter shift' and all is well again.

In addition to the normal amateur RTTY contacts, it was possible to display, (and/or print if the option to connect a printer was used) commercial transmissions using the normal commercial shift of 425 Hz. There are, in fact, three shifts available to the operator. The usual amateur shift of 170 Hz and the commercial shifts of 425 Hz and 850 Hz. These are obtainable by pressing one or other of the three keys on the front panel, lower row right hand side.

The speed is set initially, to 45.5 bauds and is shown on the Status line. However, this can be changed to anywhere in the range 12 to 300 bauds, (600 bauds using TTL level), merely by pressing 'SPEED' on the keypad followed by the desired speed, remembering to type in three digits, that is 50 bauds= 50.0 bauds. In the case of speeds below 99.0 bauds it is necessary to type **two digits** decimal point **one digit**. This will also apply to CW speed setting. One is able to make a fine adjustment of the transmitting speed by using the keypad, pressing 'SPEED' followed by '0' to speed up slightly, or followed by '.' to slow down slightly.

In order to change the Case 'FIGURES/LETTERS' one can either press CASE on the keypad or press 'ARROW K' on the keyboard. The unit has automatic carriage return/line feed and this is inserted from the keyboard with no CR/LF press ''ARROW R 0', 64 characters/line press 'ARROW R 1', 72 characters/line press 'ARROW 2' or 80 characters/line press 'ARROW R 3'. Another feature which is available is the 'Letter Diddle'. By pressing 'ARROW D', whenever there is a pause in transmission, (such as looking for the next letter!), the unit sends the 'Letters' character continuously in order to keep the receiver in synchronization. Personally, I don't use it, but many operators like the idea.

Too Many Options?

My view on this mode is that there are so many options to use that it requires prolonged study of the manual to make full use of them. I feel that perhaps the Tono Corporation has given us too much to play with but I must emphasise that is only my own view.

I now tried the third mode available on this sophisticated machine, that of reception and transmission of the Morse Code (CW). To do this I left the red Mode button out and pressed the MORSE.J/MORSE.E button. The Status line was now altered and read, from left to right, E E meaning that it was printing the alphabet in European CW, (as opposed to Japanese CW), MORSE being the mode, 9.0 wpm being the sending speed on default (at the start lacking any instructions from the operator). To increase or decrease the sending speed it is only necessary to press 'Speed' on the keypad at the right, and type in the desired speed, not forgetting to use three digits. Due to the circuitry used, the unit **automatically** adjusts to the speed of the sending station once the signal is tuned in correctly. As usual, the bargraph tuning LEDs at the top of the front panel are used for this operation, and the correct method is to tune to the point where the maximum amplitude of the Mark side is achieved.

Amazing

At this point the Theta-5000E

The rear panel of the Theta-5000E carries most of the terminal's input/output connections.

starts decoding the CW and printing it on the screen. Personally, I never cease to be amazed at the decoding of CW, and when the unit tracks the speed automatically I stand back and watch! One has to press the red HT/LT button for autotrack at the higher speeds, (say above 50 words per minute). For the reception of commercial Morse the system worked beautifully, but I must admit that the keying characteristics of some of the amateurs upset the computer's decoding program although it was perfectly possible to read the same message using the biggest computer available, the human brain.

I had several CW contacts on the 14 MHz band taking care that I didn't try to send too fast. A steady 15 wpm from me seemed to satisfy the other end who sent his message so that it could be read reasonably well on the screen. QSB upset the reception of some amateurs, but this did not appear to spoil commercial transmissions because they were using much more power.

While on the subject of Morse, there is yet another feature which is available on the unit, that of 'weight setting', the dot to dash ratio. This is variable in the range of 1:3 to 1:7 and can be set by pressing 'WGT' on the keypad followed by the desired number from 0 to 9. One can also fine-tune the speed from the keypad by pressing 'SPEED' followed by '0' to increase slightly or 'SPEED' followed by '.' to slow down slightly. This is similar to the fine speed adjustment mentioned above for RTTY. The Theta-5000E does not send or receive at speeds greater than 100 wpm.

There are also three characters which send special MORSE formats and these are: '('which sends 'KN', '+' which sends 'AR' and '#' which sends 'VA'. These three will delight the confirmed CW operator, I don't doubt. All in all, I would say that if one used CW as the main mode of transmission, one would become familiar with the various options available, and, in my opinion, would be able to use the Theta-5000E to very good effect.

Memories Are Made Of This

As I mentioned above, there are 15 battery back-up memory channels which can be programmed and, of course, remain in the memory as long as the battery lasts. They are numbered 1 to 0 and A to E and the first seven have space for 72 characters each, (except that in AMTOR Mode A, ARQ or Mode B, FEC, channel 1 is used as a system memory). There are 7 more memories of 24 characters each, and an eighth one which is used for CW ident, Selcal, or the 'Quick brown fox' test message. It is quite a simple matter to program any or all of these memory channels, and to do this the 'ARROW' key mentioned above is pressed, together with the letter 'M' followed by the channel number or letter. The message is then entered and the 'ARROW' key pressed again, and the job is done. To correct any typing errors I had to press 'SHIFT-DEL' to erase the character and then enter the correct character again. To transmit the pre-recorded message one has to press the 'REPT' key followed by the channel number or letter followed by the number of times one wishes to transmit the same message, as in a CQ call, for example.

The Theta-5000E offers two screen pages. Page 1 is reserved for the actual QSO communication, but Page 2 may be used for the composition of text which is longer than the 160 character 'type-ahead' buffer. Data from the 'type-ahead' buffer or the memory channels may be inserted in the text. In order to program Page 2, it is first called by the keystroke 'ARROW 2' or the front keypad button 'PAGE'. In order to program Page 2 it is necessary to call it. This is done by pressing 'PAGE' on the keypad or by 'ARROW 2' on the keyboard. Now one presses 'ARROW X' and enters the text. 'X' will be shown on the Status line. Channel memories may be entered here by pressing 'REPT' followed by channel number, followed by the number of times you want the channel memory to be inserted, (like a CQ call). When all the text has been entered one presses 'ARROW' again to lock it in place.

To send the contents of Page 2 type 'REPT Z'. The transmission will now start from the home (top lefthand) position. One can instruct the unit to start from somewhere else by moving the Cursor to the desired place and typing 'REPT X'. There are three test messages embedded in the channel memory as permanent fixtures, and they are 'The quick brown fox' '....de' (callsign memorised in channel E) called by 'REPT Q', 'RYRYRYRY' called by 'REPT Y' and random CW for practice called by 'REPT R'.

Unlicensed Operations

There are two other special features in this unit which deserve mention, although I understand

that their operation is contrary to the terms of the Amateur Radio licence in Great Britain. They are a Selective Calling system, and a Timer transmission. Dealing with the first facility, it is possible for another station to call using a previously agreed Selcal, (not to be confused with the Selcal used with AMTOR). This Selcal activates the station whereupon the Theta-5000E starts decoding and keys a remote line to external equipment, such as a tape recorder, thus recording the message. On receipt of the closing Selcal, (which must be different to the first one), the unit stops decoding, sends the Answerback and returns to the receive/standby state.

The five channels A,B,C,D and E are used for this operation and are divided up so that channels A and B have the opening and closing (respectively) Selcal of the other station; channels C and D have the opening and closing (respectively) Selcal of one's own station, channel E has the answerback of ones own station.

It should be noted that the code for the opening Selcal of ones own station should be different from the Answerback code. The keystroke 'ARROW S' activates the feature and another keystroke 'ARROW S' deactivates it. Any data which is entered from the keyboard will be written in the buffer and may be sent although nothing will be written in Page 1 or transmitted to a printer if connected. All the incoming information will appear on the cassette and will be printed when the cassette is played back. This Selcal feature is not available in the AMTOR modes.

The second additional feature to mention is a TIMER transmission. This enables the operator to send a message at a predetermined time without his attention, in other words, unattended operation. The message must be entered in Page 2 in advance, not forgetting to press 'SHIFT-TAB' at the end of the text to conclude. Having entered the message, one then enters the time, and this has to be preceded by '.' followed by six digits.

Summary Of Operations

I said above that I was going to list the operation of the various Function keys and here they are. All the first lot are preceded by pressure of the 'ARROW' key.

C . . sends data from buffer character by character

D . . transmits DIDDLE signal in BAUDOT mode. (toggle switching)

E . . activates Echo Back function. (toggle switching)

H + 4 letters . . enters your Selcal in AMTOR (ARQ mode).

K . . changes the case of received signals in Japanese CW, Baudot or AMTOR.

L . . sends data from the buffer to line groupings.

M + number (1 – E) + message + 'ARROW' enables channel memory programming.

N . . activates 'printer select' and outputs signal to printer (toggle switching)

P . . activates preload function.

Q . . moves cursor to the home position (top left) of Page 2 to prepare for transmission or programming.

R + 0, 1, 2 or 3 . . selects automatic CR/LF insertion: 0 = none, 1 = 64 char., 2 = 72 char., 3 = 80 char.

S . . activates the Selcal function. (toggle switching)

T . . activates the TIMER transmission. (toggle switching)'

U + 4 letters . . enters Selcal of other ARQ station.

W . . sends data from buffer by word groupings.

1 . . displays Page 1.

2 . . displays Page 2.

The following are all preceded by pressing the 'REPT' key.

+ channel number (1-E) + number (1-9) . . transmits the message memorized in each channel memory the desired number of times.

G . . in AMTOR mode (ARQ) transmits the Selcal of the other ARQ station.

H . . in AMTOR mode (ARQ) displays ones own Selcal.

I . . transmits the CW indent in RTTY (Baudot, ASCII and JIS) modes.

Q . . outputs the Quick brown fox test message. Any keystroke stops it.

R . . starts the random CW outputr. Any keystroke stops it.

T . . transmits the time displayed on the screen.

U . . displays the Selcal of the other station in AMTOR (ARQ) mode A.

W . . returns ones own station to the Waiting state in AMTOR modes.

X . . transmits data written in Page 2 from where the cursor is located.

Y . . transmits the 'RYRY' test message. Any keystroke stops it.

Z . . transmits data written in Page 2 from the top left of the screen.

Conclusions

I have used the Theta-5000E for the past month in all three modes and the two adjectives that I find most appropriate to use about it are 'admirable' and 'astonishing'. This is high technology carried almost to its limit. It does not seem fair to carp about one or two points, but nevertheless I shall do so. Speaking from my own angle as a confirmed AMTOR addict, it is not possible to send the CW ident in this mode. I think is a great pity as current practice is to end the transmission with the CW ident, which is usually followed by the word 'AMTOR' in CW. My other gripe is that I feel the two phono sockets for the oscilloscope should have been placed in the back panel rather than inside the box. This also applies to the printer Centronics connection. I don't fancy the strain of the 'scope cable or for that matter the printer cable pulling on the PCB. There is also a bad point of assembly on the board. The 470uF electrolytic capacitor C196 is too close to the connector No 9 causing the capacitor to be forced to one side. Not a good thing to see in an instrument made to such a high standards and costing a substantial sum of money.

But these are relatively small moans. I found the Theta-5000E a very interesting and satisfactory piece of equipment to use, only with the proviso which I made earlier. The manual has to be read and re-read to get the results. Perhaps there are too many options available, although one would normally concentrate on one mode, and learn by heart all the different functions available to that mode. My final observation. A beautiful piece of gear worth every penny of its price of £749.00 including VAT. I would consider it the Rolls Royce of keyboard operation and was very sorry to have to return it. Thanks are due to Amateur Radio Exchange of 373, Uxbridge Road, London, W3 for the loan of the equipment for this review.

Radio Yesterday

The early post war days were a hungry time for many Britons. A chance conversation between two radio amateurs, one in California and the other in Kent, resulted in a plan to redress this. Brian Herbert, G2WI, tells of the 'Ham Marshall Plan'.

It was a rainy afternoon in the Autumn of 1947.

I was seated at my Radio Desk, running over the Ten Metre band for likely contacts — this year was near the peak of the sunspot cycle and signals were pouring in from all over the world. I was particularly interested in North America contacts, having spent some three years there during my War Service and making many friends during that time.

My attention was suddenly attracted by a signal which was outstanding — "This is W6AL, Lodi, California, calling CQ on Ten", this was repeated several times. I pressed down the 'Transmit' switch and called him. There was a momentary pause, then the loudspeaker sprang to life — my call had been received and W6AL came right back with name and personal details. He was not at business as he was convalescent after a dose of 'Flu; in my reply to him, commiserating, I also included his signal report and general details of my gear.

Bill, for that was the operator's name, proceeded to chat and eventually mentioned that the morrow would be "Thanksgiving Day," a public holiday over there, and usually a day for family celebrations with massive Turkey Lunch etc! I went back to him and in the course of conversation said that I knew all about "Thanksgiving Day" and the sort of celebrations that would be held. Laughingly, I added, "well, look out that you don't finish up with a large dose of indigestion as well as the 'flu germs! — there's no chance of anyone over here being troubled *that* way."

Bill came back to me and asked what exactly I meant, so I explained to him that, over here, we were still quite closely rationed — nobody was starving but there was certainly no margin for celebratory spreads!! He came back with an enquiry as to what conditions were really like, as he put it, "We don't ever get much information in our Press as to how you are faring in day-to-day living". I went back and elaborated, pointing out that some folk, particularly aged people on their own, and low wage earners with large families, were in a most difficult plight.

Bill turned it back to me, "OK Brian, sure am sorry to hear that things over there are still difficult." He paused, "you know I am only what one would call a 'Shirt Tail Christian but I sure would like to do something to mark Thanksgiving. Say! I know! You send me the names and addresses of two needy families and I'll send 'em a food parcel!!" I replied and demurred, but Bill was adamant and so I agreed to write him an Air Mail letter, giving the addresses and expanding on what I had touched on in our chat.

That evening I sat down and wrote to him. I was, by virtue of my profession, in close touch with many families and so could easily comply with his request — little did I reckon on the consequences! Over the next few days, I worked Bill each afternoon till the day came when he triumphantly announced," Got your letter Brian, went downtown to the Store; they, after hearing my story have agreed to suitably pack and despatch my parcels, and they are now on their way!" I expressed my gratitude but was quite unprepared for what was to follow.

I didn't work Bill over the weekend but, on the Monday, there he was, roaring in and obviously very excited. "Brian, I took your letter down to my pastor on Sunday and he upped and read it out to the congregation. Now I have eight other folk who wish to join in — can you let me have more names, please, Air Mail??"

Well, I was a bit stunned but I duly listed names and addresses as requested. Three days later, I was in for another shock. Bill came up and said that he had my latest list but he had read "that letter" to his Masonic Lodge and now required 30 *more* names! This, I agreed to supply but I was getting near to the end of suitable candidates!

I appealed to the local WVS who helped out with recommendations and again the lists were Air Mailed off!

Bill, in the meanwhile had been talking to "Hams" all over the western world. He had dubbed the fledgling organisation "ARIFA" — he explained it as "Amateur Radio International Friendship Association" — and was asking that

Stockton Daily Evening Record

STOCKTON, SAN JOAQUIN COUNTY, CALIFORNIA—FRIDAY, APRIL 2, 1948 17

Bill Erich of Lodi Is Santa Claus to Britons

ON FAMILIAR GROUND—Mrs. Tom Melling is on familiar ground. A visitor here from England and wife of a radio "ham," she is inspecting the W. J. Erich set as she thanks Erich for his aid to hungry people in England. Erich has received much publicity and wide thanks in England for his aid to needy people there. He works with radio amateurs in his one-man relief drive.

Radio Ham Enlists Nation Into Aiding Needy Britishers

By WILLIAM J. ROGERS

Last Thanksgiving Bill Erich had the flu. As a result a lot of people in England today are eating a lot better than they would be eating if the little bug hadn't laid the Lodi man down and given him time to fiddle with his radio set.

The whole story goes back a long way—back to before the first war, when W. J. "Bill" Erich was a sea-going radio operator and a purser on round-the-world cruises and on freighters.

Like all sailors Bill's ambition was to "go ashore and own a farm" but, unlike most of them, he succeeded in his ambition. After leaving the sea he was associated with his brother Wesley in the radio business in this city.

LIVES ON VINEYARD

Now he lives on a comfortable vineyard property on the Lower Sacramento Road, near Towne's Corner. With him lives his wife, three dogs and a roomful of radio gadgets. He has a couple of ranches at Susanville and a place in Sacramento County which he farms.

Above all, however, he has a revolving aerial. With it his 600-watt station, not a particularly powerful layout as ham stations go, can reach out and pull in the distant ones. With the directional antenna and careful tuning Erich has reached out to all continents of the earth. In one day he has chatted with amateur operators in every part of the world.

SICK IN COMFORT

Well, Bill Erich got the flu last fall. He went to bed on orders of Mrs. Erich, but he went to bed right beside the set. If he was going to be sick he was going to be sick in comfort. He could reach the dials. He could talk. He could listen.

Fooling with the dials he finally contacted G2WI, a man named Brian Herbert, at Bromley, in Kent, England. Herbert, a former RAF flier, is now a school teacher.

THANKSGIVING CALL

donors write with their parcels and endeavour to maintain a correspondence with the recipients. It is worthy of note that almost all the recipients complied and some of these links carried on for many years — some even to this day.

One notable contribution came to Bill from an American Missionary (also, obviously a Ham!) who was working among Peruvian Indians in a remote village high in the Andes. This man had heard from Bill 'over the air' and had brought the organisation to the notice of his village council, and they, though desperately poor, had voted TEN DOLLARS from their community funds, to be forwarded to Bill to help the scheme!

The scheme ran on for many months; I had to enlist aid from fellow Hams all over the UK to cope with the demand for names of families! I was made "second addressee" on all parcels in case they could not be delivered to the named person. Fortunately, there weren't many like this but I did have as many as twenty stacked in my Front Hall on one occasion. They all got to their correct addressees eventually!

A touching vignette of the scheme in operation came to me via a lad I knew who did a paper round on a neighbouring council estate. He reported to me one morning, "I went to this Old Girl's house and was just putting the paper thro' the door when it flew open, and the old dear was standing there, with her arms full of groceries, she was crying and said, "Look what someone send me from America — and *I don't even know them!*"

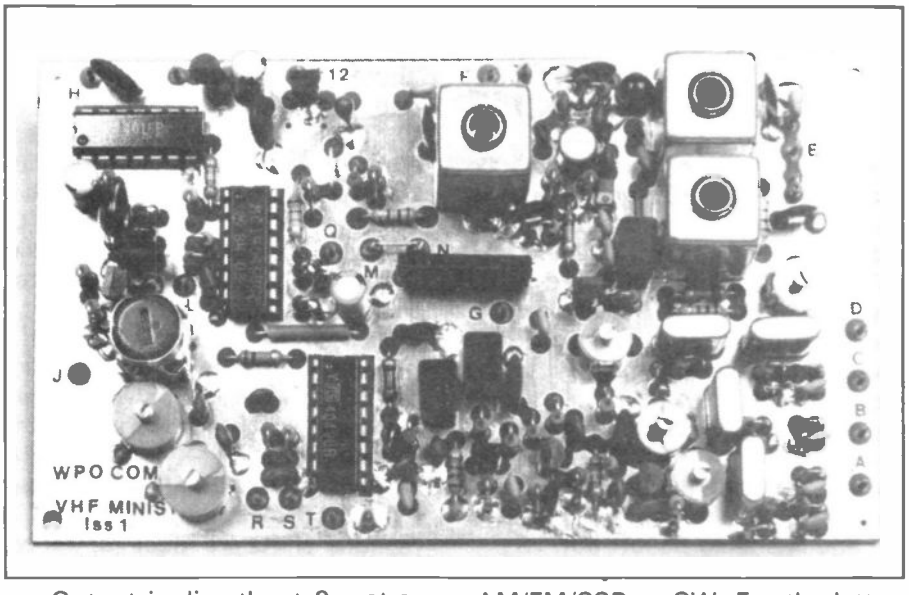
Toward the end of 1948 I was appointed to a post overseas and a Ham in the Midlands took over the UK end of things; up to that date over 2000 parcels, each weighing 22 lbs, had been received in this country.

With the passage of time, the scheme of course dwindled away, as conditions here returned to normal; Bill Erich retired to a South Sea Island for a time, before returning to Califoria. At this date, I have lost touch with him (indeed he may now be a 'Silent Key') but in the families of many, over here, his effort is still remembered with gratitude.

The 'Minisynth' for HF VHF VI

Now that you've had time to build our 2m 'Talkbox', Tony Bailey, G3WPO, and Frank Ogden, G4JST, offer a suitable synthesised VFO for this and other VHF transceivers.

Following the publication of the MINISYNTH HF PLL VFO Project, we were inundated with requests for a 2 metre version of this design. It seems there are a lot of you out there with 2 metre rigs that could do with some form of VFO control. This circuit fulfils the need and covers the whole of the two metre band in one tuning sweep (2MHz).



Output is directly at 2 metres, with facilities for IF shifts (10.7MHz or 9MHz) for either receivers or transceivers, and also for repeater shifts. With these combinations, it is possible to use the VFO with almost any VHF rig such as converted Pye Cambridges etc, and of course our 'Talkbox' project published earlier this year.

Using a VFO does have the advantage over a stepped synthesiser, in that you have continuous tuning both on transmit and receive and are not limited to 5, 12.5 or 25kHz steps. The VFO can also be used for output on, say, the 136MHz satellite band.

Modulation facilities are built in for FM use (with the addition of an outboard single stage mic. amp, or input from existing circuitry) and the stability is such that the VFO is usable for any mode — AM/FM/SSB or CW. For the latter, sidetone facilities are built in, so even an FM rig can be used for CW by modulation of the carrier by the 800Hz tone.

Kits

Full kits of parts are available from WPO Communications and no coil winding is involved for the construction. For alignment, you will need a suitable frequency counter covering up to 150MHz (or the loan of one) and a multimeter. An oscilloscope would be a useful accessory if you have one.

Circuit Description

Obviously, to generate a signal up around the 2 metre region, one does not attempt to do it by building a free running oscillator! There are a number of ways of solving the problem, including the use of mixer type designs, but these tend to need banks of filters on the output to sort out the wanted mixer product from all the other frequencies produced. Even after filtering, you are still likely to be left with unwanted sproggies in the spectrum of the 2 metre signal.

We have opted for the Phase Locked Loop principle, whereby a low frequency VFO is used, running over a 200kHz range. A voltage controlled oscillator running at signal frequency (say 144MHz), is divided by 10, to 14.4MHz (for transmit) and compared with the difference between a crystal oscillator near this frequency and the reference VFO itself. A phase detector then looks for any phase or frequency error, and generates a control voltage which is used to alter the VCO frequency by means of a varicap, and bring the oscillator into lock — its frequency is thus always ten times the (xtal + VFO) frequency.

The reference VFO is obtained from IC1c/IC1d running over a nominal frequency range of 0.25-0.45MHz. For stability, an air-spaced tuning capacitor is required as the tunable element. It should be twin gang, with each section having a maximum capacity of 350pF or higher.

The crystal oscillator chain uses Q2 as the active device, with the option of four different, selec-

table crystals to receive IF offsets, repeater shifts, alternative bands etc. Each crystal is activated by applying +12V to either of points A, B, C or D. Output from the crystal oscillator is then fed to the mixer, Q3. The other mixer injection signal is from the VCO, having divided by 10 in the prescaler IC5. The difference frequency (which will be between 0.25 and 0.45MHz when locked) is amplified by IC1a/IC1b and applied to one terminal of a 4046 (IC2) CMOS phase detector. The other phase terminal is fed direct from the reference VFO.

The error voltage appears at pin 13 of IC2, and after filtering by the loop filter components is used to bring the VCO into lock via a varicap diode D11 (BB119). Normally, only L2 is functional in the VCO, as D10 is reverse biased effectively blocking L3 out of circuit. L2 covers the 133MHz region, which, when the inductance needs lowering (to raise the frequency to around 144MHz) L3 is brought in parallel with L2 (thus decreasing the inductance). This is effected by switching on Q7 via +12V to point E, thus allowing D10 to conduct.

Modulation

Frequency modulation of the loop requires that the loop filter components need changing from the optimum for low-noise SSB/CW use: as it stands the loop just overcorrects and you get little or no modulation. Extra components have to be added to slug the response time of the loop and also give the 6dB/octave frequency rolloff required. Thus applying +12V to point J brings in R44/C40/C39 via Q4 and makes a pair of CMOS switches (part of IC6) conduct. Modulation is then applied to point H via R50. For SSB/CW use, point J must be left unconnected or earthed.

Putting It Together

For assembly you will need a small tipped soldering iron. Under no circumstances use anything larger than around ⅛" or 3mm or you may damage both the PCB tracks and the components.

The PCB is available ready drilled and tinned, or you can make your own, preferably by photographic reproduction. The component density on the PCB is fairly high in certain areas — in particular around the VCO and buffer stages. However, if the following instructions are followed no difficulty should be experienced.

Step by Step

1. Fit the 21 connection pins shown on the component overlay. These should be pushed home from the underside of the board until the heads are flush with the board. Solder into place and on the top where there is no track clearance.
2. With the PCB placed with the lettering on the top foil the correct way up, begin soldering in the components for the crystal oscillators at the bottom left hand corner. Work along from right to left until the bottom half of the PCB is completed. **Do not** solder in IC1 or IC2 at this stage. Where component leads are marked with a cross they must be soldered to the top foil (as well as underneath at some points).
3. Now begin work on the area around the VCO.

a) Fit Q6 and solder, making sure the source connection is soldered to the top foil.
b) Fit C29, C23, R28, C36, C32, R32 and solder in that order.
c) Fit L1 and L2 and solder.
d) Fit remainder of components except R29, R33, R35 and R30 (R30 is not fitted until the alignment stage).

4. Now complete the board working from right to left, leaving out the components in 3(d). Make sure the screening cans are soldered to the top foil near the lugs.
5. Fit and solder all remaining components except R30. The two links which are through the board should be fitted but the link between pins M and N should be left out.
6. Fit and solder IC1, IC2 and IC6. Take care that the soldering iron is earthed or connected to the PCB as the ICs are CMOS and susceptible to excess static charges. With care no damage should result but the legs of devices should not be handled until they are in place on the PCB. The main trick in avoiding damage to CMOS is to make sure that both the iron and yourself are at the same potential as the PCB.
7. Check that all ICs, transistors and diodes are fitted correctly before passing onto alignment.

Alignment Procedure

This should not prove difficult if the instructions are followed closely.

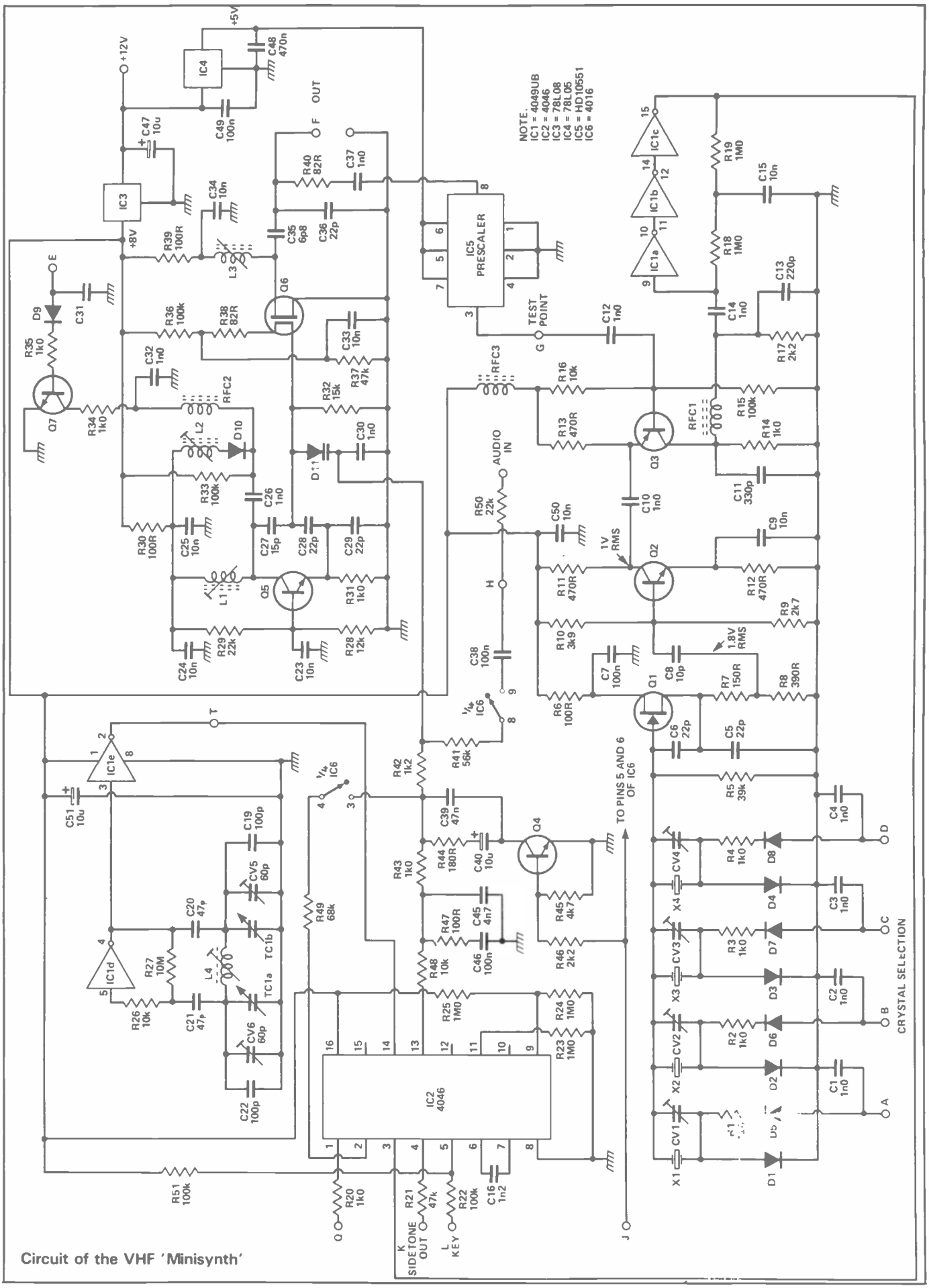
The test equipment required is a multimeter (20kohm/volt) and a frequency counter. The counter should be able to read to 150MHz and be reasonably sensitive. An oscilloscope would be useful if problems arise but not essential to basic alignment.

Before connecting any power to the PCB, check carefully that the components have been fitted correctly and a cross check on values compared with the components list is useful at this stage. Pay particular attention to the fitting of electrolytic capacitors, observing their polarity, and to the orientation of semiconductors. Also double check the track side of the PCB for solder bridges and dry joints and rectify if any are found.

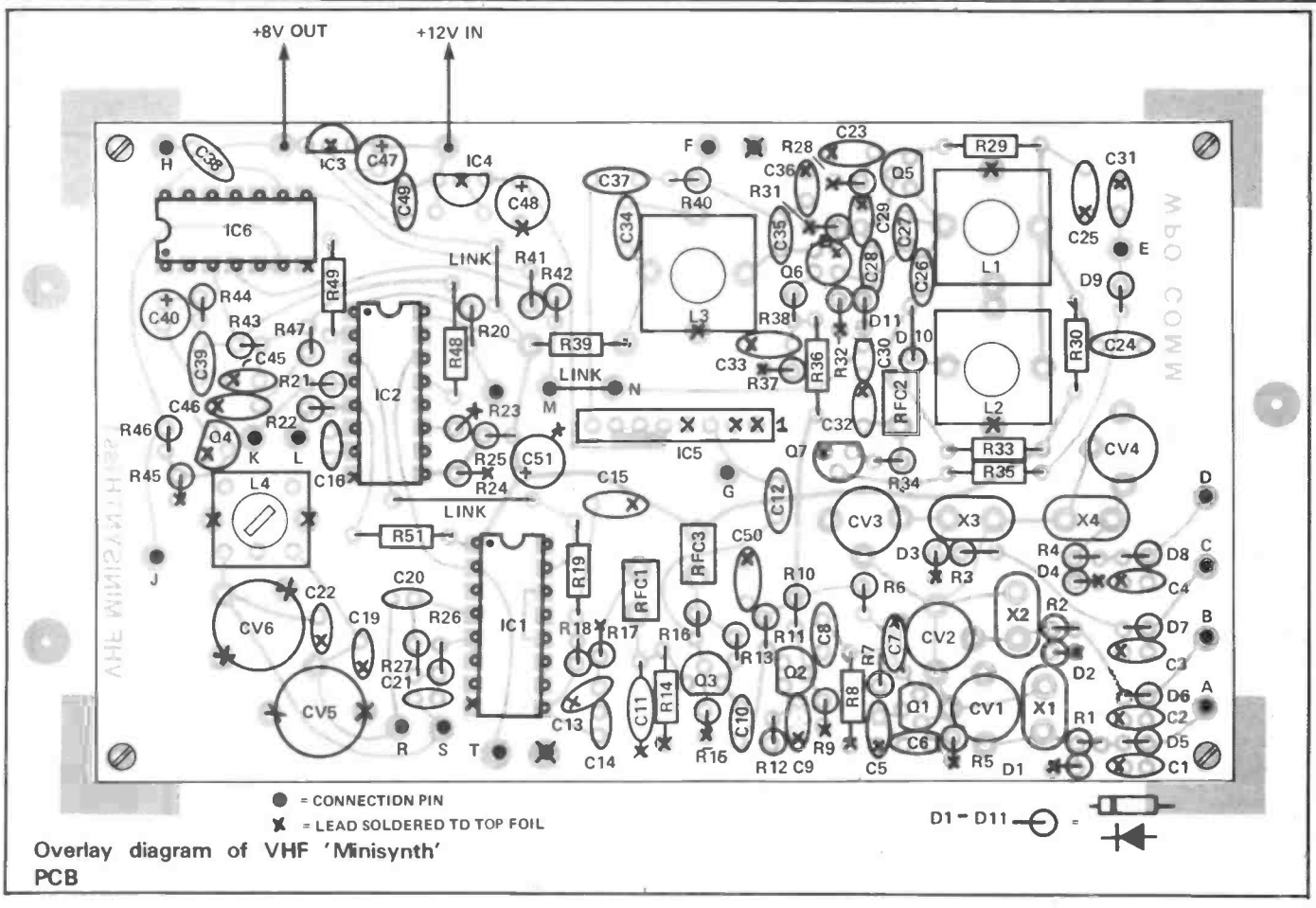
Having completed the PCB checks, the next step is to connect a power supply (12 to 13.8V) preferably current limited at 100mA. Connect the +ve supply to the +12V pin on the PCB, adjacent to C47, and the -ve lead to the top foil. Switch on the power and check that the current does not rise above 90mA. Typically, the current will be between 80 and 90mA. If all is well, the alignment can now begin. Note that R30 should still be omitted (this leaves the VCO disabled for the moment — having it running will initially cause confusing readings).

First the crystal oscillator is aligned. There is provision for 4 crystals on the PCB, two of which are used to give coverage of, for example, 133.3 — 135.3MHz on receive (10.7MHz IF offset) and 144-146MHz on transmit. If repeater shifts are required, the two remaining crystal positions may be used to accomplish this on both transmit and receive. If your rig has an IF offset on both Rx and Tx, then you would only need one crystal, the same frequency being used on both Tx/Rx, plus one additional crystal for repeater offset.

When used on the 144MHz range, as well as selecting the correct crystal frequency, a +12V supply must be connected to pin E in order to switch in the additional inductance across the primary VCO coil.



Circuit of the VHF 'Minisynth'



Overlay diagram of VHF 'Minisynth' PCB

To begin the alignment, check that you have selected the correct pin for the crystal position, and have connected that pin to +12V. Connect a frequency counter to the collector of Q2. Switch on power and adjust the appropriate trimmer to bring the oscillator on to the frequency marked on the crystal. Repeat this operation for each crystal fitted. This completes the alignment of this section. If for any reason oscillation does not occur, check all components around the crystal oscillator, especially for dry joints or missing earth connections on the top foil.

Reference VFO

The VFO coverage required is 0.25 to 0.45MHz. A frequency counter should be connected to pin 2 to IC1. Adjustment of the VFO coverage is made by varying the inductance of L4, and the two trimmer capacitors VC5 and VC6. During the alignment equal adjustment of VC5 and VC6 is needed. Therefore, if one is at ½ mesh the other should also be at ½ mesh.

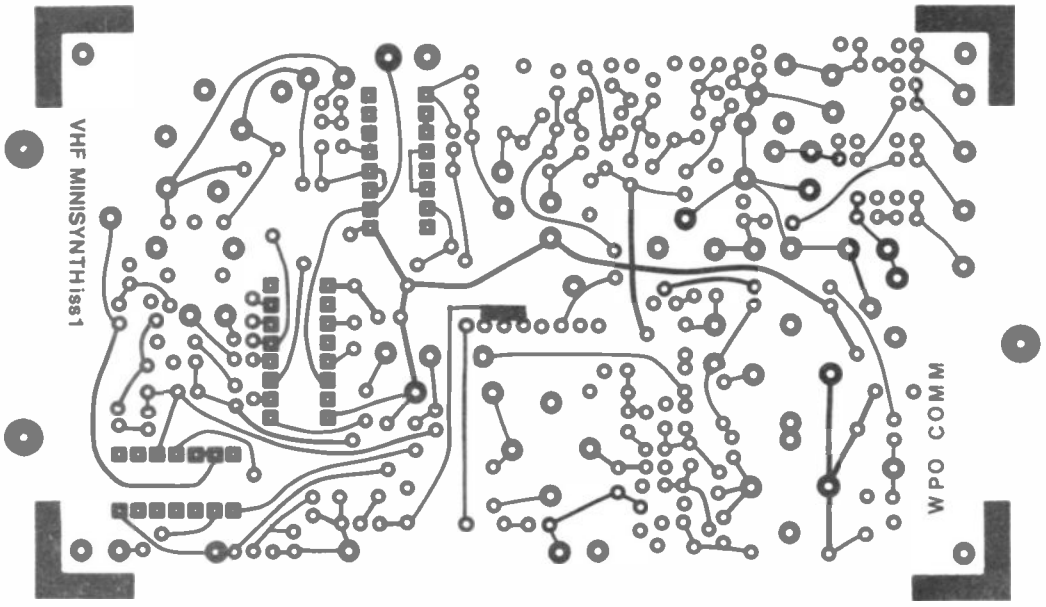
First set VC5/6 to ⅓ mesh, then set L4 so that the top of the tuning slug is 4mm above the top of the can. Set the main tuning capacitor TC1 to maximum capacity. Switch on power and adjust L4 carefully to give an output frequency of around 0.24MHz. Adjust TC1 to minimum capacity and set both VC5/6 so that the output is 0.46MHz approximately. Reset TC1 to maximum capacity and retune L4 again to give 0.24MHz. Continue to alternately adjust L4 and VC5/6, resetting TC1 each time, until the range of 0.24 to 0.46MHz is obtained. This gives a 10kHz overlap (100kHz at 2 metres), but the extent of this overlap is not at all critical. This completes the alignment of the reference VFO.

VCO Alignment

Fit R30 — this will allow the VCO to free run, but do not yet fit the link between pins M and N. To align the VCO, a variable supply of between 0V and 8V is required. This can be obtained by tapping off the 8V stabilised supply on the pin provided to one side of IC3, taking this to one end of a variable resistor, the other end of which goes to the top foil (the resistor can be any value between 5k and 100k). The slider can then be taken to pin N via a 1k or so resistor.

Set the cores of L1 and L2 so that they are flush with the top of the screening cans. Set the core of L3 to be flush with the top of the former (**not** the screening can). Note that the VCO cannot be aligned without the screening cans fitted as they affect the tuning range. Connect a 47R or 56R resistor across the output pin F and earth, and couple the frequency counter to pin F. Switch on the PSU and set the voltage on the slider to 6V. It will be helpful to connect a multimeter to the slider so that you can continuously monitor the tuning voltage — measure at the slider **not** at pin N though.

Now adjust the core of L1 until a frequency reading of 135.8MHz results. There is no need to be exact at this stage, just reasonably close. As the tuning rate is fairly fast some patience will be needed to get the "feel" of things. The next step is to apply +12V to pin E to shift the VCO onto 144-146MHz. Carefully adjust L2 until an output frequency of



Foil Pattern

146.6MHz is obtained. Remove the supply from pin E again and readjust L1 to give 135.8MHz. Reconnect the supply to pin E and carry out further trimming to L2 getting as close to 146.6MHz as possible. Go through this routine as often as required to reach the two suggested output frequencies.

Now, with the supply removed again from pin E, move the variable voltage down, watching the counter until a frequency of 133.3MHz is obtained. This frequency should be reached at around the 1 volt level. Carry out the same procedure with the supply to pin E connected. A frequency of 144MHz should be obtained, again at about 1 volt. Do not worry if the voltage readings obtained are a little above or below 1 volt as this is only a check on VCO range against control voltage.

This now completes the main VCO alignment (except for checking lock a bit later) but does not allow for peaking the buffer tuned circuit L3. With the suggested core settings, this should be fairly near optimum. If a diode probe is available, connect to pin F and ground and tune L3 for maximum voltage output.

The approximate output voltage ranges from 0.9 to 1.2V rms across the bands. Slight variations may occur due to differences in circuit constants and individual transistors, so regard the above voltages as a guide, rather than a rule.

If the output voltage is far too high for the required application, use a suitable 50 ohm input/output attenuator pad between the output and mixer rather than detuning L3 as the latter will degrade the performance of the unit.

Sidetone

A sidetone circuit is provided for CW use and is brought into operation by earthing pin L, with output taken via a screened cable from pin K. The output voltage level is 8V peak and this will almost certainly require lowering via a suitable potential divider in actual use. The frequency will be around 800Hz, but may be adjusted if required by altering the value of either R25, or C16.

Last Alignment

The remaining job is to remove the variable voltage supply and to link pins M and N. When this is done the power can be applied again. If the alignment has been correctly carried out, the loop should lock. The state of the loop may be checked by measuring pin 1 on IC2 (4046) using a multimeter set to 10V (or similar) range. When in lock, the voltage will be around 7.5 to 8V, and around 2 to 3 volts when out of lock. An LED connected between pin Q and +8V can be used as an out-of-lock indicator, and will light when out-of-lock.

If problems are found in persuading the loop to lock, the alignment checks should be carried out again, as this is the most likely reason for failure. Failing this, a check should be made for incorrect components etc. One of the most common causes for this type of module not to function is missing earth connections to the top foil, so these should receive a double check by the constructor.

A list of typical voltages together with representations of the waveforms to be expected is given in this text. An oscilloscope is, in this case, a useful tool and most work may be carried out with a 5 or 10MHz bandwidth type. Note: the frequency alignment assumes that the two bands to be covered are 144-146MHz and 133.3-135.3MHz, but other ranges may be adopted if required. The important point when aligning the VCO for other ranges is that when setting the upper limit of frequency swing, it is carried out a control voltage of around 4 - 6V provided by the temporary variable supply. There is nothing magical about these voltages, except that they work for the ranges described here. The constructor should be prepared to experiment with the inductance of L1 and L2, and the control voltages at which they are set, if non-standard frequency ranges are used.

The output frequency of the divide-by-ten prescaler (IC5), measured at pin G should be

1/10th of the VCO input frequency. If this is not so the loop will not lock.

Repeater Shifts

If the above are to be used, then only alignment of the appropriate trimmer in the crystal oscillator is needed, the VCO ranges will lock as set. By appropriate wiring of the crystal selection, via a switch, you can have normal and reverse shifts when using 2 repeater shift crystals. Note that the loop will go out-of-lock if the repeater shift is in use on transmit and the final output frequency would be below 144MHz.

Crystal Frequencies

To calculate the crystal frequencies required, deduct 2.5 from the lowest end of the VCO output coverage required, and divide the result by 10 :ie for 133.3, the crystal is 133.3 – 2.5 = 130.8/10 = 13.08MHz. For 144MHz = 14.15MHz. For standard repeater shift on transmit (ie downshift of 600kHz on transmit) the crystal is 143.3 – 2.5 = 14.09MHz. For reverse repeater shift (ie down 600kHz on receive) = 13.02MHz. For 9MHz IF, the lower VCO frequency is 135MHz = 13.25MHz.

Crystals may be obtained from Knight Crystals, Hardley Industrial Estate, Hythe, Southampton SO4 6ZY (tel 0703 848961) via their 24 hr service. Each crystal will cost £5.50 inc post and VAT. State frequency required plus "HC18/U, 30pF parallel resonance."

Using The VFO

The output from this unit is sufficient to drive a balanced ring mixer such as the MD 108 or SBL1 type. For many applications, such a direct injection to transistor bases, you will need an isolation capacitor on the output of the unit to prevent dc grounding of the circuit to which the VFO is connected. Suitable injection points have to be determined by the individual constructor. But this will generally be around the driver stages on transmit (after any multiplier stages) or mixer on receive (for transceivers the injection point will probably be the mixer on both Tx and Rx).

Please note that neither the publishers or the authors can advise connections for individual rigs – if you cannot deduce this yourself, then almost certainly someone at the local radio club can help you if you go armed with the circuit diagram of your rig.

As noted earlier, various voltages have to be applied to select crystals, and to switch between transmit and receive. Basically this can be done with small relays, or by solid state switching, possibly using a rotary or toggle switch in addition to give normal/reverse repeater operation. To recap, the appropriate crystal has to be selected between transmit and receive, and point E must have +12V applied on transmit (if output at 144MHz is being used for transmit). The PTT switch on your rig almost certainly carries +12V on receive, and this may be useful in controlling the switching sequence.

Modulation

The VFO can be used on FM (or MCW) by applying low-level audio input (350mV or so maximum required for 5kHz deviation) to pin H, via R50 (external to the PCB), at the same time applying +12V to pin J. The deviation level is set by varying the audio level applied. If FM only is to be used on transmit, then point J can be wired to the same point as the 144MHz transmit crystal pin is wired to.

Using The VFO With The FM 'Talkbox'

The addition of the VHF Minisynth to the 2 metre 'Talkbox' Project, published in the February and March issues of this magazine, in place of the bank of crystals enables the entire 2 metre band to be covered with the option of repeater shifts.

The procedure for modifying the 2 metre boards is fairly straightforward. It requires the removal of a few components from both PCBs and the addition of some miniature coax plus one 1n ceramic capacitor. Provision in these instructions has not been made for running both crystal and VFO controlled, but no doubt the enterprising constuctor could arrange this.

Receiver

Refer to the circuit diagram and locate T3. The secondary of this transformer has a connection to gate 2 on Q2 via a 10pF capacitor. Remove this transformer carefully so as to preserve the PCB track under the PCB, and in the vacant hole which was occupied by the **non-earthy** pin of T3, solder the inner of a piece of miniature coaxial cable (RG174A/U or similar). The braid of the coax can be connected to the top foil of the PCB nearby. The coax should be long enough to reach the output pin F on the VHF Minisynth.

R20 can be removed to disable the crystal oscillator but this is not essential. Virtually no further adjustments need to be made except possibly to repeak T1.

Transmitter

Refer to the circuit diagram and locate Q4, L3, C17 and C18, taking care to preserve the tracks under the PCB. In place of C17 fit a 1n ceramic capacitor. Connect the inner of a piece of miniature coaxial cable to the vacant hole previously occupied by the collector of Q4 and solder in place, with the braid again to the top foil.

Audio for modulation may be derived from the existing modulator in the following way. Remove C36, C37 and R21. Fit in place of R21 a 100n ceramic capacitor and solder the inner of a piece of screened audio cable into the vacant hole left by the **non earthy** side of C37. Solder the braid to the top foil. This cable then connects to the Minisynth at pin H via R50.

The level of audio required for full deviation is only about 350mV which is likely to be exceeded by the normal setting of RV1. Therefore use only low settings of RV1 to prevent overdeviation. Set up the deviation level with the assistance of a local station over the air, or by using a suitable modulation meter. The clipping level control, RV2, is adjusted as suggested in the original instructions. The only realignment to the transmitter is to repeak C21 for maximum output as before.

VHF Minisynth — typical voltages on IC1 and IC2.

IC1 — 4049 (measured in locked condition)

PIN NO	WAVEFORM	AMPLITUDE
1	DC	+7v
2,3,4	Square wave	+7v
5	DC	+1v
6	DC	+7v
7	No reading	
8	DC	0v GROUND
9	Ripple superimposed on	+2v level shift
10,11	Sine wave (distorted)	3.5v p/p +3/4v level shift
12	Square wave	+7v
13	No reading	
14,15	Square wave	+7v
16	No reading	
IC2 — 4046		
1		+7v (1-2 u/l)
2		+7v
3	Square wave	+7v (VCO i/p)
4	No reading	
5	DC	+6v
6,7	No reading	
8	DC	0v (Ground)
9	Ripple superimposed on	+2v level shift
10,11,12	No reading	
13.	DC + noise component	+2v (+6v loop control)
14	Square wave	+7v VFO input
15	No reading	
16	DC	+7v

COMPONENT LISTING

Resistors

R1,2,3, 4,14,20,31, 34,35,43	1k
R5	39k
R6,30,39	
47	100R
R7	150R
R8	390R
R9	2k7
R10	3k9
R11,12,13	470R
R15,22,33	
36,51	100k
R16,26,48	10k
R17,46	2k2
R18,19,23	
24,25	1M0
R21,37	47k
R27	10M0
R28	12k
R29,50	22k
R32	15k
R38,40	82R
R41	56k
R42	1k2
R44	180R
R45	4k7
R49	68k

All resistors 0.25W 5% carbon film.

Capacitors

C1,2,3,4,10 12,14,26, 30,31,32,37	1n ceramic disc
C5,6,28,29,36	22p ceramic disc
C7,46,49, 38,50	100n ceramic disc
C8	10p ceramic disc
C9,15,23, 24,25,33,34	10n ceramic disc
C11	330p ceramic disc
C13	220p ceramic disc
C16	1n2 polystyrene
C40,47,51	10uF 16v radial electro
C19,22	100p ceramic disc
C20,21	47p ceramic disc
C27	15p ceramic disc
C35	6p8 ceramic disc
C39	47n Mylar
C45	4n7 Mylar
C48	0.47uF 35v tantalum bead
VC1-VC4	10pF film trimmer
VC5,6	60pF film trimmer
IC1	4049UB (must be UB)
IC2	4046B
IC3	78L08
IC4	78L05
IC5	HD10551
IC6	4016B

Semiconductors

Q1	J310
Q2,4,7	BC238 or BC239
Q3	BC308
Q5	BF273 or BF241
Q6	3SK45 or 3SK51 or 40673
D1-10	IN4148
D11	BB119 or BA102

Miscellaneous

L1	TOKO 301-AN-0300 (orange — aluminium core)
L2	TOKO 301-KN-0800 (white — ferrite core)
L3	TOKO 301-AN-0400 (yellow — aluminium core)
L4	TOKO CAN1A350EK (red core)
RFC1,3	TOKO 7BA or 7BS 10uH (100)
RFC2	TOKO 7BA or 7BS 1mH (102)
Crystals	Approx 13-14MHz HC18/U 30pF parallel resonance (see text for calculation)

Printed circuit board; 3 off TOKO S18 screening cans; Dual gang 350pF air spaced tuning capacitor; TOKO S18 trim tool and 21 off 1mm PCB connection pins.

Kits

Complete kits of parts for this project, ex crystals, are obtainable from WPO Communications for £38.50 inc VAT & P&P. The PCB alone (double-sided, drilled and tinned) is £8.40 inc.

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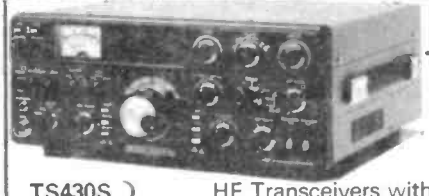

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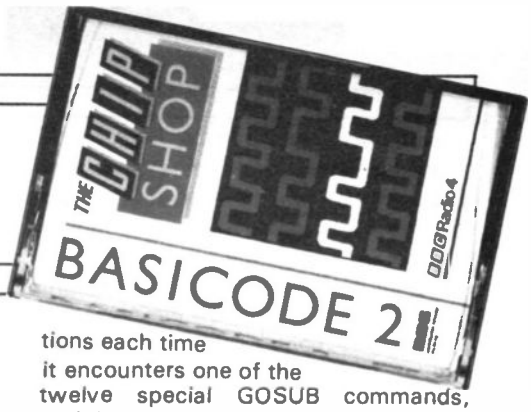

In the first of our new bi-monthly column, David Bobbett, G4IRQ, tells how to make your computer track satellites — by BASICODE, of course!

Avid radiophiles will have noticed a new 'mode' appearing on the bands over the past few years; most often encountered on 2m FM it may be identified by long periods of blank carrier interspersed with keyboard clocks, occasional (mild) expletives and a callsign every 15 minutes, after which the ritual is taken up by another station. In short, computing has arrived in amateur radio.

Introducing Micro Net

With more and more operators using computers both on air for RTTY, SSTV etc and off air, helping with circuit design and other calculations, it seems to be the right time to introduce a new column which deals specifically with the computing aspect of radio. Micro Net, will do just this by looking at ways in which computing can be used to enhance the hobby, hopefully removing some of the more tedious aspects of the former and generally acting as a forum for those operators who are deviant enough to be interested in both radio *and* computing at the same time!

Traditionalists need not despair however; HRT will not turn into 'Popular Micro Monthly' with thirty pages of three dimensional space invader programs! — Micro Net will deal with the use of computers in radio, the emphasis being firmly placed upon the word 'radio' and not the other way about. Amateur radio afficionados have always come from a wide variety of backgrounds, and naturally there will be a mix of both computer experts and novices involved in this particular aspect of the hobby, so hopefully Micro Net will provide a forum for an exchange of information, hints, tips, short-cuts and ideas. Programs appearing in Micro Net will, as far as possible, always be written in BASICODE (see September '84 HRT for more details), which will allow virtually all micro owners to make use of them once they have their appropriate translation program for their machine.

BASICODE — The Story So Far

Last month we looked at the compatibility problems encountered when radio enthusiasts want to use identical programs with different computers. We then looked at the BASICODE system as one possible way of being able to write programs which were universally usable. Although there is no ideal solution to this problem, as long as users can live with a few short-comings and be prepared to sacrifice one or two 'machine-specific' features along the way, the BASICODE system is ideally suited for the sort of programs which are in use in the amateur radio field.

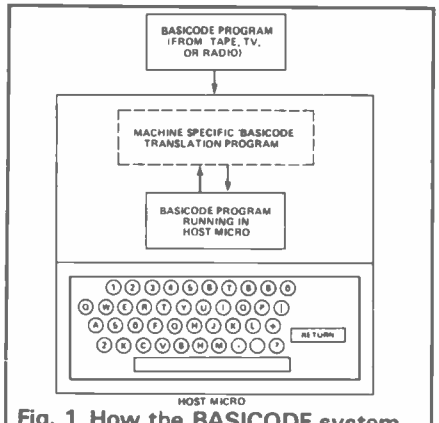

Fig. 1 How the BASICODE system works.

Fig.1 briefly summarises how the BASICODE system operates. A 'translation program' specific to that particular machine is loaded into the 'Host Micro'. Once it is in the machine, this program does two things:

i) it modifies the operation of the host's hardware so that it is capable of correctly receiving standardised BASICODE-format program. (As yet untranslated).

ii) it installs a group of special subroutines in the computer's memory which are then ready to be used in translating the BASICODE program into host's dialect of BASIC when the program is run.

Whilst the BASICODE program is running, the host computer refers to the translation program for detailed instructions each time it encounters one of the twelve special GOSUB commands, which serve to compensate for language incompatibility. For example, if a programmer wanted to erase all the text which was written on the screen, the precise command would vary from one computer to another. So, rather than using a machine specific commmand such as 'CLS' (in the case of the BBC Micro), 'GOSUB 100' would be used instead because GOSUB 100 has the same effect of 'Clearing the Screen' in all translation programs. Then, if the completed program is run on a different machine, it will refer to Subroutine 100 in it's own translation program and retrieve the appropriate instructions for clearing the screen. Exactly the same principle applies to each of the remaining eleven BASICODE subroutines which deal with a variety of other operations. Further details of these can be found in the BASICODE manual and supplied with the kit.

Line Numbering

In numbering BASICODE programs it is clearly very important that the special subroutine mentioned earlier are not written over or occupied in any way. In order to avoid this, all line numbers below 1000 are reserved for the exclusive use of the translation program. As well as averting disaster by over-writing, this method also allows for the varying length of translation programs required for different machines. **Fig.2** shows the recommended line numbering convention for BASICODE programs and although this is not as crucial as avoiding line numbers of less than 1000, it does make a finished program much easier to follow.

Find The Satellite!

This month's program is designed to display pages consisting of suitable orbits for one of the UOSAT series of satellites, but, before you start typing,

Fig.2 Recommended Line Numbering for BASICODE programs.

Line No.	Recommended Use
0-999	RESERVED for special BASICODE routines.
1000-19999	BASICODE program area using compatible statements.
20000-24999	BASICODE program area using non-compatible statements.
25000-29999	DATA statements area.
30000-32767	REM statements area.
32768-.....	Line numbers above 32767 are PROHIBITED

please note that the listing requires the presence of the appropriate translation program for your computer and so it will not run if it is simply entered as shown. Before looking at the structure of the program itself, it may be useful to consider the problem which we are trying to solve — contrary to popular belief you do not have to work for NASA before you can understand satellite prediction!

Stop The World

First of all, it is useful to be able to visualise what is happening from a point in space, so let's assume that we are standing on the Moon's surface, facing the earth. To simplify things, we will stop the Earth spinning for a moment (with the Greenwich Meridian at 0° Longitude directly in view) and consider the stationary globe and a satellite which is orbiting vertically around it, over the poles. Let's assume that it has just appeared from behind the Earth at the South Pole and is travelling upwards from the south, crossing over the Equator on the visible side of the Earth at a point which is in line with Greenwich (ie at 0° Longitude). From here it continues on northwards and disappears from view over the top of the North Pole. It will then pass down over the Equator on the far (blind) side of the Earth and finally re-appear at the South Pole ready to continue on northwards to cross the equator once.

The 'Equatorial Crossing Point' is an important piece of information because it can tell us not only *where* the satellite crosses the equator (which acts as a useful reference point) but also, by noting the time, we can tell *when* the equator-crossing occurs. The 'Equator Crossing Time' is always measured in GMT (now UTC), and if we measure the time taken for the satellite to go right around the Earth and arrive back at the same place again, we have found another important piece of information, the 'Orbital Period'.

If we know the Equator Crossing Time (let's say 1300 GMT), and we add the Orbital Period (eg 90 minutes) to it, then we can predict when the satellite will next cross the equator. In our example this will be 1 ½ hours later than 1430 GMT. By repeatedly adding the Orbital Period to the original Equator Crossing Time, we are able to make predictions for many orbits in advance. So if we want to know the time of the first equator crossing three days hence, we just keep adding the Orbital Period and calculating the time until we reach a point three days from now. The 'Equatorial Crossing Point' will be the same with each orbit, as neither the earth nor the satellite are moving sideways relative to each other. There are only two other points concerning this 'stationary earth' model; the first is that we need to number each orbit so that we can tell them apart, and second it is the convention to use the equator crossing where the satellite is travelling towards the *north* for calculations — the southbound crossing (which occurs on the blind side of the Earth) is not used.

So far we know that, in order to make predicitions, we must have the Orbit Number, the Orbital Period, the Equator Crossing Time (GMT) and the Equator Crossing Point. The process if fairly straightforward when the earth doesn't rotate and the satellite follows exactly the same track orbit after orbit — but what happens when we start the Earth spinning?

What If The Earth Moves?

Let's assume that the satellite's orbit remains unchanged as seen from our lunar vantage point — ie it follows exactly the same track relative to the observer. If the earth is set spinning at the precise moment that the satellite crosses the equator at 0° Longitude, the planet will have rotated a certain number of degrees by the time the satellite arrives back at the equator on the visible side. The satellite would now be crossing the equator at perhaps 25° Longitude, 50° on the next orbit and so on. This westwards advance of the crossing point is called the 'Longitudinal Increment', and is simply added to the current orbit's crossing point when predicting subsequent orbits. The only remaining point to note is that, unlike the geographic convention where Longitude is expressed X°W or Y°E of the Greenwich Meridian, Longitudinal location is expressed as a number running from 0 up to 360°W. If we change our position and sit directly above the North Pole looking down, we could see the Longitude numbering increasing from 0 (at Greenwich) on around the earth in a clockwise direction until 360°W was reached, full circle, at Greenwich.

In summary then, all that is required for a reliable satellite prediction is a set of accurate data — the 'Reference Orbit', and two simple additions. The first addition will increment the equatorial crossing time (the *when* component), and the second addition will increment the equatorial crossing place (the *where* component); repeat the sequence and you have an orbit prediction program.

How The Program Works

Fig.3 gives the listing for a satellite prediction program written in BASICODE. Apart from the necessity for a machine-specific translation program mentioned earlier, the listing can be typed in and run directly — the spaces following the line numbers are there just to improve readability and may be omitted.

Fig.4 shows a flow chart of the operation of the program in general terms, the numbers in the top left-hand corner of each box correspond to the appropriate group of line numbers in the listing.

The program is fairly straightforward but one or two comments could be of help.

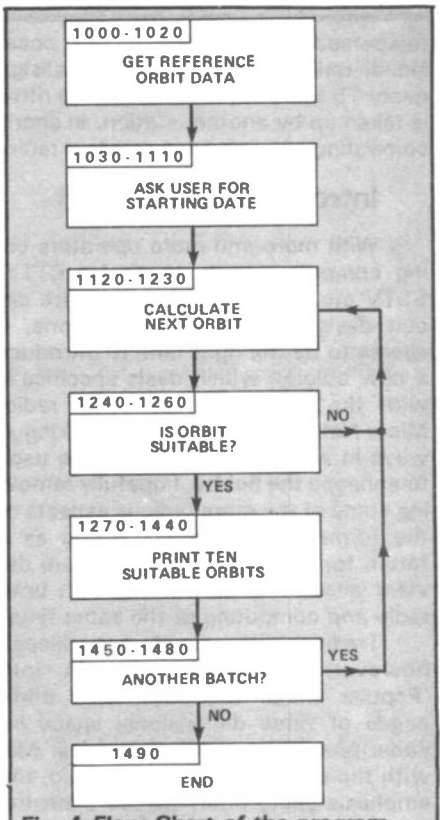

Fig. 4 Flow Chart of the program.

The only problems which are likely to be encountered are those associated with the screen format; different machines use different screen sizes and, whilst this program will print correctly on the standard 24 line by 40 column screen, smaller formats may require alterations to the lines concerned with the print format — ie lines 1380 to 1430. The horizontal print position can be altered by changing the value of 'HO' in these lines. The format of printed numbers can be shortened (perhaps omitting numbers after the decimal point) by the use of 'CT' and 'CN' as detailed in the BASICODE manual. If more (or less) predictions are required in each 'page' of data then altering the maximum value of 'M' in line 1180 will achieve this. If the program is still in use in 1985 don't forget to change the third number in line 25000 from 29 to 28 — this tells the computer how many days

```
1000 A=200:GOTO 20:REM SAT DEMO
1010 DIM YR(12):FOR J=0 TO 12:READ YR(J):NEXT J
1020 READ R$,RD,RM,RN,RX,RL,RP,RW
1030 GOSUB100
1040 HO=0:VE=12:GOSUB110:PRINT"Please insert START"
1050 HO=0:VE=13:GOSUB110:PRINT"date (numbers only)."
1060 HO=0:VE=14:GOSUB110:PRINT"Starting date  ";:INPUT DT
1070 HO=0:VE=15:GOSUB110:PRINT"Starting Month ";:INPUT MN
1080 IF MN>12 OR MN<=0 THEN GOSUB 250:GOTO 1030
1090 IF DT> YR(MN) OR DT<1 THEN GOSUB 250:GOTO 1030
1100 FOR K=0 TO (MN-1):DS=DS+YR(K):NEXT K:DS=DS+DT
1110 IF DS>366 THEN DS=DS-366
1120 FOR L=0 TO (RM-1):DR=DR+YR(L):NEXT L:DR=DR+RD
1130 IF DR>366 THEN DR=DR-366
1140 RF=RN:DN=DR
1150 GOSUB100
1160 HO=11:VE=0:GOSUB110:PRINTR$
1170 HO=0:VE=1:GOSUB110:PRINT"Date   Orbit  Time   Place"
1180 FOR M=0 TO 9
1190   RX=RX+RP:DF=0:IF RX>1440 THEN DF=1:RX=RX-1440
1200   DN=DN+DF:IF DN>366 THEN DN=DN-366:DS=1
1210   DE=DN
1220   RF=RF+1
1230   RL=RL+RW:IF RL>=360 THEN RL=RL-360
1240   IF DN < DS THEN M=M-1:GOTO 1440
1250   IF (RL>24 AND RL<138) THEN M=M-1:GOTO 1440
1260   IF (RL>233 AND RL<285) THEN M=M-1:GOTO 1440
1270   HH=INT(RX / 60):SR=HH:GOSUB300:HH$=SR$
1280   IF LEN(HH$)<2 THEN HH$=("0"+HH$)
1290   MM=INT(RX-(HH*60)):SR=MM:GOSUB300
1300   MM$=SR$:IF LEN(MM$)<2 THEN MM$=("0"+MM$)
1310   FOR N=1 TO 12
1320     IF DE <=YR(N) THEN MH=(N):N=12:GOTO 1340
1330     DE=DE - YR(N)
1340     NEXT N
1350   SR=DE:GOSUB300:DE$=SR$:SR=MH:GOSUB300:MH$=SR$
1360   IF LEN(DE$)<2 THEN DE$=("0"+DE$)
1370   IF LEN(MH$)<2 THEN MH$=("0"+MH$)
1380   HO=0:VE=(3+M):GOSUB110:PRINT;DE$;"/";MH$;
1390   CT=5:CN=0:SR=RF:GOSUB310
1400   HO=7:VE=(3+M):GOSUB110:PRINT;SR$;
1410   HO=14:VE=(3+M):GOSUB110:PRINT;HH$;":";MM$;
1420   CT=5:CN=1:SR=RL:GOSUB310
1430   HO=21:VE=(3+M):GOSUB110:PRINT;SR$
1440   NEXT M
1450 HO=0:VE=14:GOSUB110:PRINT"Next set of orbits?    (Y/N)
1460 GOSUB210:IF IN$ = "Y" OR IN$ = "y" THEN 1150
1470 IF IN$ = "N" OR IN$ = "n" THEN 1490
1480 GOTO 1450
1490 PRINT"PROGRAM ENDED":END
5000 DATA0,31,29,31,30,31,30,31,31,30,31,30,31
5010 DATA"UOSAT 1",21,07,15476,792.983333
5020 DATA318.4,95.4063,23.5996
0000 REM  ****************************
0010 REM  * SATELLITE PREDICTOR DEMO *
0020 REM  *     by G4IRQ 20/07/84    *
0030 REM  *         V2               *
0040 REM  * For 24hr Orbit Updates:  *
0050 REM  * GUILDFORD (0483) 61202   *
0060 REM  ****************************
```

Fig. 3 Satellite Predictor Program in BASICODE.

there are in February, and 1984 was a leap year! Continuing with the leap year theme, the computer is told how many days there are in a year so as to avoid ridiculous dates such as the 37th of December, again all references to 366 should be changed to 365 in lines 1110, 1130 and 1200 — all this may seem a bit tedious but you will only have to do it once every four years!

Orbital Updates

One thing which you should do considerably more often than every four years is to update the Reference Orbit data stored in lines 25010 and 25020, every month or two is about right. The information on reference orbits for UOSAT can be obtained from the Surrey University 24 hour answerphone service, the number is given in the program (Fig.4), or by monitoring the AMSAT UK nets which are held regularly on a number of bands. Further details can be obtained direct from AMSAT (don't forget the SAE) — see the address box at the end.

Bits And Bobs

This section of Micro Net is devoted to any hints, tips, suggestions or news which readers would like to contribute to the column. We would be particularly interested to hear of any regular or experimental BASICODE transmissions; sources of translation programs for some of the rarer machines, operators who are interested in arranging schedules or in fact anything which you think may be of interest to other readers. Unless otherwise requested, contributors will of course be acknowledged for the help in developing the 'forum' part of Micro Net — again the contact addresses are 'in the box'. For this month however here are a few pearls of wisdom to start things off:

At the time of going to press I haven't yet had a chance to confirm this myself but I have been told that PA0AA makes BASICODE transmissions on or near 3.586MHz at 20:30 GMT on Fridays. This comes from G3RDG via G3ZZD.

BASICODE translation programs are now available for both Dragon and Sharp MZ700 machines, no price details though I'm afraid — see address box.

The BBC's BASICODE translation tape and manual for a variety of machines is still available, cost £3.95 (see last issue for a full list of machines catered for), this range should be extended soon — drop a line to find out if your machine is now supported.

We hope to stage a BASICODE experimental transmission some time in November/December, it's all rather tentative at the moment but further details will be published nearer the date.

Address Box

Dragon translation tape (no price):
Grosvenor Software,
22 Grosvenor Road,
SEAFORD,
East Sussex.

Sharp MZ700 translation tape (no price):
DCS,
38 South Parade,
Branhall,
STOCKPORT.
SK7 3BJ

BBC BASICODE tape and manual (£3.95):
Broadcasting Support Services,
P.O. Box 7,
LONDON.
W3 6XJ

AMSAT UK,
94 Herongate Rd.,
Wanstead Park,
LONDON.
E12 5EQ

Contact address for Micro Net:
Dave Bobbett,
'Micro Net',
Ham Radio Today,
1 Golden Square,
LONDON
W1R 3AB

New Magazine

Railways is still the most popular area of modelling, and we're about to make it more popular still. Because September 21st will see the launch of **Your Model Railway,** the first really professional magazine for *all* who have ever been interested in making scale layouts.

We don't have space to tell you all about it here, but be sure to look out for it on September 21st. **Your Model Railway** – simply the best.

Out Fri. Sept. 21st

HAM RADIO TODAY NEXT MONTH

METHODS AND TECHNIQUES OF FAULT FINDING FOR RADIO AMATEURS
by GI4FFL of QSK Electronics

PROJECTS

2m 20W PA FROM CIRKIT

THE 'SUPERNOTCH'
- a tuneable audio filter.

THE ALPHA TRANSCEIVER
Case and PA construction

REVIEW
THE TEN-TEC CORSAIR HF TRANSCEIVER
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	DD 14/21	length 10·7m (36ft)	33.00
MONOBANDER's	DDM 10	length 15m (50ft)	23.50
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'Tequila and Tri-banders'

Despite the attractions of sun, senoritas and tequila, Thomas King, VK2ATJ, finds a small but highly active amateur radio scene in Mexico.

If spark gap technology could have allowed the development of a 1914 HF transceiver, arbitrarily priced at a "convenient" US $1,000, it would have cost 1000 Pesos in Mexico. Even if the totally impossible was possible with the American price tag remaining the same for the next 70 years, the rig would have still cost 2000 Pesos in 1925; 4850 Pesos in 1945; 12,500 Pesos in 1954, 1964 and 1974 and 17,500 Pesos in 1984. These extraordinary price increases have been caused by a continued devaluation of the Mexican Peso.

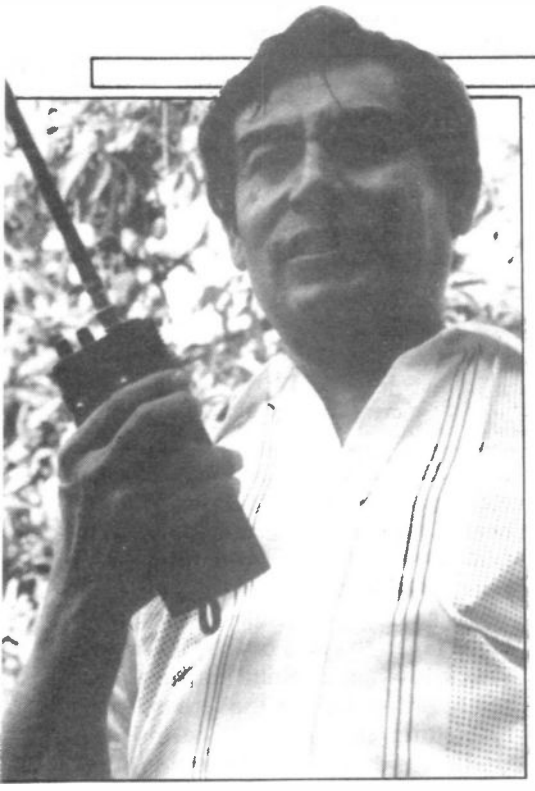
The continuing devaluation (about .03½p a week) coupled with the current hefty 70 per cent rate of inflation has affected Mexico's 3,550 amateurs in a number of ways. For a starter the country's one and only amateur radio equipment outlet in Mexico City was forced to close because of an unrealistic customs duty and constantly escalating rig prices. Additionally, the country's only amateur radio journal ceased publishing because of substantial paper and ink cost increases every time the magazine was printed. These two facts were soberly pointed out to me as I journeyed around a tourist triangle on a two week long ham holiday of Mexico.

Mexico, a republic more than eight times the size of the UK, is not well known in England. But with so many British holidaymakers annually visiting the USA it's surprising that more don't venture to this sunny land which is vastly different in culture, character and climate to its northern neighbour.

Pacific Playground

Acapulco, situated in Mexico's west central coast 1600 miles southeast of Los Angeles, lures holidaymakers from around the world with its broad variety of dining, shopping and entertainment possibilities not forgetting its splendid range of water sports. Devotees of water skiing and parasailing claim these sports started in Acapulco. The Mexican Government Tourist Office advised me that it is also noted for deep sea fishing, sailing, swimming and snorkelling with horseback riding on the beaches thrown in for good measure. It is hard to imagine all this concentrated around the broad sweep of beautiful boomerang-shaped Acapulco bay which stretched out before me.

Leaving a forest of striking high rise hotels, glass walled restaurants, smart boutiques, stylish cinemas and all night discos behind me on the boulevard-like Costera Miguel Aleman I ventured out of "The Strip" to the non touristy side of Acapulco. Passing through the Col. Progresso City Market with its assortment of aromas, it wasn't long before I had spotted a massive red and white guyed tower supporting a



XE3K, Alfredo, one of the most active homebrewers in Acapulco can operate through a choice of three 2m repeaters in this world famous resort city.

tribander. After untangling myself from the maze of small lanes and shops within the sprawling fruit, vegetable and clothing market, I located Vallarta and knocked at No. 13, the home of an important Mexican radio amateur.

Ham and Tequila?

Alfredo, XE3K introduced himself and welcomed me into his airy house. He then introduced the members of his family which included two other amateurs, his wife, XE3MOM, Maria and his oldest son, XE3T, Ignacio Jnr.

Alfredo's shack was well equipped with floor to ceiling metal shelving containing ICOM, Kenwood, Azden and KDK HF and VHF rigs. It wasn't XE3K's financial ability to obtain gear that impressed me as much as his aptitude for homebrewing. Just above his IC2AT was one of the two 2 metre repeaters and the sole 440MHz repeater he had built.

There are currently three 2 metre repeater in Acapulco 146.16/.76, call XE3RAE; 146.34/.94, call XE3CRA; and 147.15/.75 locally known as "Enlace a Ciudad de Mexico." translated these words mean "linked with Mexico City" and that's exactly what happens when Acapulco hams trigger 147.15 and interconnect with other repeaters along the 420 km path to the country's capital.

About 30 of Acapulco's 49 amateurs are active of the VHF bands. They use the four repeaters as well as 148.000 for their simplex calling frequency. (The normal simplex frequency in Mexico is 146.520).

Repeaters and simplex alike are well used on the last Saturday of each month when the Club de Radio Aficionados de Acapulco holds its regular meeting. About 25 members usually attend these meetings which are preceeded and followed with activity from XE3CRA (Club Radio Acapulco).

Join The Club!

Club members pay 2000 Pesos a year (£8) to belong to the city's only amateur radio club. The money is primarily used to maintain existing repeaters and buy new ones. Repeaters not built by XE3K were purchased from the American company, VHF Engineering. However, many club memberships have to be collected before one of these US$1,000 repeaters can be purchased. Inocencio, who had entered the shack while I was learning about Acapulco's VHF scene, said he thought Alfredo's repeaters worked just as well as those bought in from the States and they were a far sight cheaper, as well.

XE3BJ was the first of five Acapulco hams to arrive at Alfredo's QTH that Saturday evening. In due course XE3AD, Theodoro, XE3CC, Evarisito and XE3CH, Alfonso and XE3M, Antonio knocked at 13 Vallarta, most carrying VHF gear and all accompanied by wives and children. By evening's end six families including 10 children and an assortment of dogs were all vying for the same frequency!

The seven radio 'aficionados' retreated to one corner of the living room and with glasses of tequila in hand began exchanging further notes on the state of the art.

XE3M, a ground controller produced his amateur licence card which, with the operator's picture attached, doubles as an identity card explaining he was allowed all privileges in Mexico.

There are three grades of licence in the republic: 1st class, 2nd class and novice with three exam segments for each grade: CW, rules and regs and theory.

The rules and regs are the same for all grades with code speed running from 5 wpm to 10 wpm and 15 wpm respectively for novice, 2nd and 1st class.

First class operators are allowed to use 1000 watts on CW/SSB/AM and 300 watts on VHF while 2nd class operators are permitted 250 watts and 100 watts, respectively. Only 50 watts on the HF band is allocated to the one year holder of a non-renewable novice licence. An oddity of this licence is that a novice cannot work DX on phone. He can only use CW! Furthermore, novice VHF privileges are not available.

Prior to sitting for an exam, application must have been made in Mexico City well in advance. The applicant details where and when he would like to attempt the exams. Exams are conducted at post offices, SCT offices (Secretary of Communications and Transport), official monitor stations and maritime communication stations. It is not uncommon for an applicant to take the three part exam over three days which are separated by two fortnight 'rest' periods although some amateurs-to-be want to complete their examination in one long day.

It costs 200 Pesos (80p) to sit for the exam and another 100 Pesos for the picture licence. Every 5 years another 200 Pesos is payable for licence renewal.

Radio amateurs in Mexico are permitted to use 1.8-2.0; 3.5-4.0; 7.0-7.3; 14.0-14.35; 21.0-21.45; 28-29.7; 144-148; 220-225 and 430-480MHz. Although a band width of 50MHz is available in this latter band, 450-460 is actually authorised. The 220 MHz band is even more confusing as the band is authorised but not the equipment.

Helpful Customs

I looked around the living room table spotting a collection of VHF rigs (one 440 MHz unit with all the rest tuned for 2 metres) and asked how gear is obtained since it can no longer be imported. (A 100 percent import duty used to be levied along

with a 15 per cent sales tax when gear was legally imported.) The general concensus was that "shoe bags can often hold something other than shoes!"

"That may be the case of VHF rigs," I said pausing to request my umpteenth glass of potent tequila, "but what about the larger HF rigs and the repeaters?"

"Immediate negotiations are made with the customs officer on duty at the airport in Mexico or at the Mexican/USA border checkpoint!" came the reply.

Of course, used equipment does come up from time to time. Since there is no longer an amateur journal in Mexico the most convenient way to buy and sell used gear is through a flea market. These are part and parcel of the annual convention which also includes sessions on computers, propagation and other technical subjects.

Last year's convention at Saltillo (near Monterrey) was attended by over 1,000 enthusiasts. The event, which is usually held over two or three days in early July, even featured a display of Kenwood equipment. The dealer who flew down from California was prohibited from selling equipment at the convention. But he knew that some gear would eventually end up in XE land.

Currently the only accessories or pieces of equipment legally available (because they're manufactured in Mexico) are VHF and UHF antennas (made by Disenos Electromecanios), towers from Dual Instalaciones of Mexico city and two brands of 40 channel, 5 watt AM CB transceivers which sell for about £140 per unit! Even in my semi sober state I realised that a bit of profit was being made!

The following days were just as pleasant as my initial introduction although I took time for senoritas, shopping, siestas and sightseeing. The low cost of buying Pesos meant that my accommodation charge for a private room with a Mexican family was a mere £1.50 a night. The favourable exchange rate was also instrumental in allowing me to feast on a smorgasbord of tortillas, tacos and tamales one night while taking in a night club tour which featured La Quebrada.

Occupational Hazard

A trip to Acapulco is not complete without a visit to La Quebrada to see the divers make spectacular leaps from the cliffs into the undulating Pacific Ocean, 135 feet below. The dive is made into a narrow cove which is only momentarily safe.

XE1AZ, Carlos, is a regular operator of XE1LM, the amateur station of the Mexican League of Radio Amateurs.

Eventually, I decided to leave this Pacific playground and bought a bus ticket for the hillside-sited Taxco. "You won't find any amateurs there," my ham friends had previously told me in Acapulco. I confirmed this with a constant scan of 2 metres on my Kenwood 2400. Even without the attraction of ham radio I found Taxco to be a particularly enticing town. Views of its cobblestone streets, quiet zigzag lanes, and twin spired Church of Santa Prisa were all duly recorded in 35mm colour.

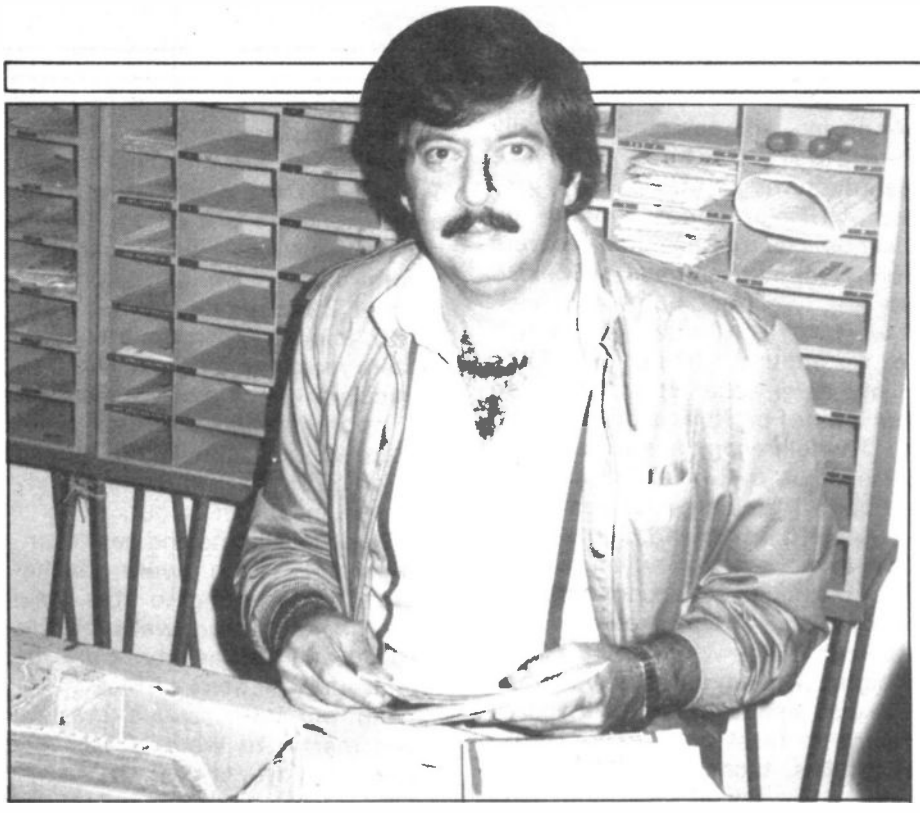
The cool climate and gentle ambience of Taxco were further reasons for wanting to stay amid the white stuccoed walls of this 450 year old silver city. Only the promised attractions of Mexico City and the pre-arranged meeting urged me on to what is arguably North America's largest city.

Sprawling City

Metro Mexico City's 15 million people are as diverse as its attractions: a majestic cathedral which is sinking at a rate of 2 inches a year, the National Palace housing the offices of the President of the Republic, the historic Chapultepec Castle where the Austrian-born emperor of Mexico once resided, the floating gardens of Xochimilko and the Pyramids of the Sun and the Moon built by the Toltecs over a thousand years ago. But the scheduled visit to "La Liga" was of far more immediate interest than any tourist attraction.

Whereas my contact with Alfredo and his friends had produced an insight into the operating conditions for hams in one (atypical) city and the operations of a small club, my visit to Liga Mexicana Radioexperimentadores (The Mexican League of Radio Amateurs) (Molinos 51, Col. Mixcax, phone 563-14-05 after 5pm) was to see how club activities were co-ordinated on a national level.

Officials of Mexico's amateur league meet every alternate Thursday but even on the Thursday when there is no scheduled activity the league headquarters in Room 307 are still frequented by some of Mexico City's 563 hams. (The league is the "Club of Mexico's Clubs" as there are 10 other amateur radio organisations in the sprawling city: two of them, the



The League's QSL bureau in Mexico City processes some 40,000 QSLs a month.

VHF Association and Azteca, a club designed for newcomers, also have their headquarters in rooms off 307).

The Club Scene

Mexico's amateur league is governed by an executive committee of six members who are elected every two years. The current president is Pablo Mooser, XE1SR. Below the executive committee is the 40 member strong Board of Directors who play a unique role in the league's operations. Each board member, who must live in Mexico City represents an affiliated club and is contact with that club to relay news and solicit comments every week or fortnight. The board members convene every alternate Thursday for an administrative meeting to resolve issues which have been raised by their "adopted" affiliate club.

To be an LMRE affiliated club, the local organisation must be an incorporated club with at least five members already belonging to the LMRE. Forty four of the 61 amateur radio clubs in Mexico are affiliated with the LMRE and about 1500 of the 3550 amateurs in Mexico are league members.

A poor amateur growth rate of only 100 to 200 new XEs a year is an important issue to the league. (However, it is far easier for league members to isolate the problems, I found, than to propose workable solutions). Reasons given for such a small ham population ranged from Mexican's general lack of inclination towards a hobby and "amateur radio is a hobby for the more affluent" to lack of promotion at high school level and a general lack of publicity about amateur radio in Mexico with difficulty in obtaining equipment and little need for league type activities in the 1980's thrown in for good measure.

A number of problems it seems could be dealt with if a suitable public relations and publicity campaign was undertaken by a consultant on behalf of the league. This would be an investment on the leagues future, complimenting all other activities of the LMRE.

Fast QSL Bureau

The annual league membership fee of 2000 Pesos (£8) already entitles league members to a number of benefits. Judging by the activity in the league's QSL room the bureau provides a much needed service. Carlos, XE1AZ, my mentor for the evening, was clearly proud of the leagues abilities when he unhesitatingly said, "We have the best QSL Bureau in the world." A claimed five day turnaround time from APDO Postal (PO Box) 907 to amateur whether he is a league member or not is the bureau's policy.

Another major activity of the league is its thrice a week meeting with the SCT. At these meetings a league representative brings up issues such as applications for exams, address changes, applications for mobile permits and even such "irregular matters" as licences which have expired six months ago.

The league has a weekly Sunday bulletin at 0900 local time on 7.080 MHz which can run up to two hours! This bulletin is supplemented by official correspondence which the league sends out to affiliated clubs three or four times a month.

Emergency Net

If that isn't enough paperwork the LMRE is responsible for producing a number of publications including XE directory, a study guide, the log book, the National Emergency Net Handbook, an illustrated history of amateur radio in Mexico (which began in 1921 with the licencing of Carlos Gonzalez, XE1CE) and a technical handbook.

League members are also rostered to participate on the emergency net which has met every night for the last 25 years at 2100 (local) on 3.000MHz. There is seldom emergency traffic so the net members provide net control with weather information from around the country which is then distributed to various government offices.

Carlos, XE1AZ was net control of XE1LM, the official league station on the evening I visited the LMRE headquarters. While net stations checked in I gazed around the shack looking at the assortment of donated equipment and certificates even finding one from the Golden Days of radio which certificated XE1LM's participation in the Wireless Institute of Australia Victorian Division's Centenary 1934 Contest. With the interest and enthusiasm shown by the dedicated group of league members I can foresee the LMRE receiving another certificate for operating achievements. It will be for participating in the Bicentanary Contest and will be dated 2034!

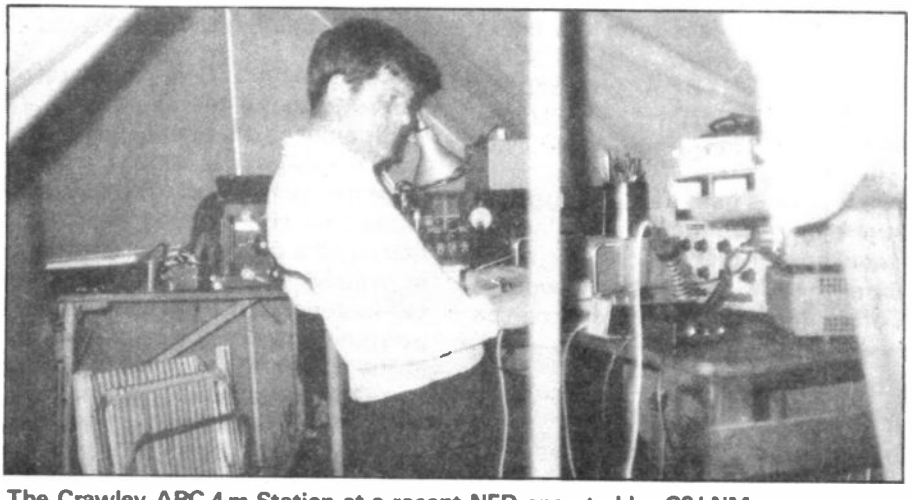
VHF CONTESTING II

In Part 2, John Ridd, G8BQX, looks at the practicalities and actualities of VHF contesting today.

Operator Resource Planning

The contest organiser should be a regular user of the band and the mode to be used in the contest.

The organiser will have noted the stations who are regularly active on the band and mode. In addition to this, he/she will have noted those locals who have the right mental attitude (RMA — another military term) to the efficient processing of contest 'pileups', and who put into practice the Segal philosophy of not bumbling and flanneling, but being forthright, direct, courteous, efficient and enthusiastic in working both the DX and local contest stations. These are the qualities, either potent or latent, stamina, and good judgement.



The Crawley ARC 4 m Station at a recent NFD operated by G3 LNM

Fortunate, indeed, is the organiser who can cajole, blackmail, persuade, or otherwise obtain a dozen or so such proficient types.

The organiser will have to do some operator training — even basic things like the aforementioned technique of RSVP. Practice with the recognised ICAO/NATO phonetics pays dividends: it is to be deprecated that so many British and Continental operators insist on using exotic phonetics instead of the approved system. A great deal of research went into the established system; after an amount of familiarisation, the most amazingly weak and noisy signals can be read by virtue of a familiarity with phonetic alphabet. On a personal note, I have found that a fairly regimental instruction to calling stations, to the effect that they should call only using proper ICAO/NATO phonetics has frequently enabled the swift processing of large contest pileups — where previously a welter of calling stations could not be 'sorted' at all. I sometimes think this works well because it eliminates half the surplus callers straight away — since they have to pause to recollect the proper phonetics!

Suggested topics for an operator training session might be: addressing the microphone (RSVP), NATO phonetics, constituents of a basic contest contact, dealing with a pile-up, listening for new stations, tactical operating and the importance of keeping an accurate and readable log and check log. Tactics depend on location and power. Your local VHF DX proficient chaps, who naturally have been co-erced into the team, are best fitted to lead a discussion on tactics.

One important point of procedure I would like to mention at this juncture: *at least* in one 'over' in the contact the operator should give *both* callsigns — every over if interference is bad. We get too many QSLs for contacts we never had! Apropos this — I have heard of an HF contest operator who claimed to have filled in a log page with contacts in *ten minutes*! Knowing how chaotic HF contests sound like, I wonder that perhaps about half of those contacts never took place — the operator thought they had.

Two In Harness

Having trained the operators, an operating roster should be organised. Our rule is two hour sessions, but it has been suggested that some operators can easily do three hours at a time. I know I can't without the contact rate dropping. The ideal is two skilled operators per session, but, with a view to the future, the '2nd op.' can be an up-and-coming novice, or an SWL. The 2nd op's job is to look after the check log, and to write down calls he hears in a pileup, to pass to the operator, so that he can marshal incoming traffic into some order and impose some necessary discipline on the frequency. The 2nd op also relieves the 1st op, if he is qualified so to do, when it is time for a smoke break or other natural function.

The date to announce the roster timings is important. Ten to fourteen days prior to the contest is about right; the operators have not enough excuse claim that they forgot when their operating time ends, and it's time enough for any changes due to unforeseen circumstances. Don't forget you'll need setting up and dismantling crews in addition to the operators.

Operating Aids

Most of these are obvious, but perhaps prospective contestees might be interested in our check log system. No originality is claimed for this — it's basically common sense!

Duplicate contacts are more than just a nuisance. Penalties may be imposed if undeclared duplicates are found by the adjudicator. It is therefore vital that all such contacts are found, either at the time of contact or during the scoring of the log. A secondary point of some

import is that the check log provides a confirmation of the callsign of the station worked, if needed. My own writing is horrible, most people's is at times of pressure, so it is useful to have a cross check between what the operator writes on his sheet, and what the logger writes on the check board. It is very easy, for instance, to make DK0LVP look like PA0IUB (think about it) and it is also difficult to decide which is correct, especially if the QTH locator is, say, DM74e. Thus good writing is all important; a logger, who must read the callsign off air *whilst the contact is in progress* is not under such pressure as the operator (who is, perhaps, writing whilst speaking, whilst holding a cigarette, whilst having a swig of beer etc) and he should thus ensure that he gets the callsign correctly and corrects the operator if he has noted it down incorrectly.

The HERC checklog is shown in Fig. 1. The letter in the first column is the *last* letter in the callsign of the station worked. Why the last, you say? Well, most callsign series are biased. Calls are usually issued in strict alphabetical order, AAA, AAB, AAC, AAD, etc., so, for instance, in a new callsign series, most of the callsigns worked have the first letter A or B or C. In an older callsign series, first letters Z, Y, X, would predominate. So, the letter of a callsign suffix which has the most even distribution is the last, and, over a long period, chances are that each horizontal line on the checklog will have about the same number of entries recorded. There are one or two continental series where the last letter of the call has some geographical or chronological significance, but so relatively few are worked that distortion does not occur. G4BUO has other ideas — see page 1009 of RADCOM 1983.

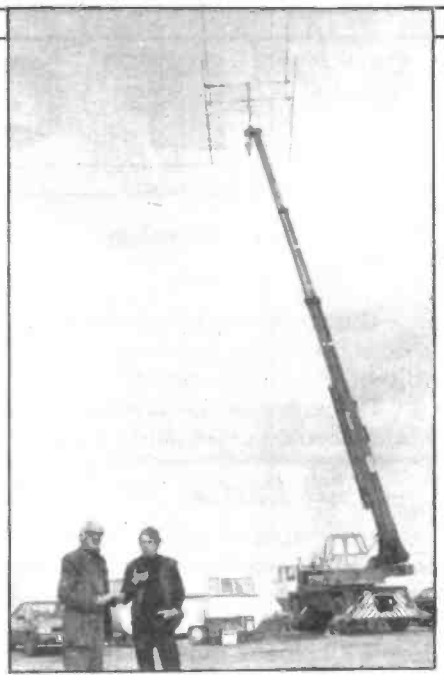
Checking Your Log

So, for example I have entered the following calls onto the check board: G2AXB/M, DL6XQD/A, GM4TOF, G1BUA, Y23CMG, OX4AH, F1BOH, PA3HZF, G600F/P. Note that /A, /P, /M, etc., are not recorded.

It is thus easy for the logger to run along the horizontal line as soon as the call is heard to make sure that it hasn't been worked before. If it has, the operator can be kicked and told 'deja contacte' or words to that effect.

It amazes me that, in every contest, the same few stations manage to work us twice or even thrice. I know we change ops every two hours, so a different voice is heard, but really! The smallest time interval experienced between first and second contacts is eleven minutes, in the March 1984 contest. Amazing! Get that check log going!

I might explain that, running high power, we tend to sit on one frequency and holler CQ, so people search and call us. Not that, in the middle of the night, we don't search right through the band and interrogate any bit of RF we hear to see if there are any points in it for us, but as soon as things get busy again, back we go to one frequency and holler. Best of both worlds, that way. If everybody called CQ and nobody listened — no contacts would be made. Similarly, if everybody searched and nobody called — no contacts again. A judicious mixture of both serves every one well.



HERC's Crane mounted 2 m 4 x 17 ele Tonna's with G6CCW and G8OXD

On The Day

The great day arrives. The erection crew on site nice and early. Three hours at the least are put aside for the site erection. Up goes the aerial. Up goes the tent, the mast going through a window in the tent, right handy to the operating position. In goes the

Technical Resource Planning Check List

a. A good, reliable, sprog-free transmitter. Continuously variable output, mateable with the other equipment.
b. A good, reliable receiver. Low in sproggie response. Mateable. We get round the former and the latter with a much-modded FT225 Tx/Rx
c. A good reliable power amplifier. "Clean." Proven to work with the Tx without producing nasties — even with the loudest voiced operator! Ours is a Dressler.
d. A good reliable masthead preamplifier. This should only have enough gain to overcome the feeder/switching losses. Ours has a 3SK97 device in it, but there are better!
e. The biggest antenna possible — with a good front-to-back ratio and minimum side lobes. Ours is 4 x 17 el Tonnas, in a square, approx. 13 ft x 13 ft.
f. Good aerial feeder. We use RG214 which is double screened — all conductors are silver plates as well.
g. A really strong rotator, with an electromagnetically controlled bolt brake. We would prefer 'Armstrong' rotation, but haven't found out how to do it yet (see our problem below)!
h. Skyhook. We are lucky that one of our members has a 90 ft telescopic jib mobile crane. A bracket was made for the top of the jib, upon which sits the rotator and stub mast to the aerial framework.
i. Generator. Diesel 250 V AC — property of one of our members. The generator should have enough spare power to run a 3 KW electric heater in the winter.
j. Operating caravan. We were lucky enough to get a big old 'clunker' very cheaply. The operating end is partitioned off and the other end is used for log checking and as a general 'conference' area. The caravan should be well lit
k. Power distribution. A unit containing a variac to compensate for line loss on transmit, switched with the Tx, leakage trip, and bags of power sockets. Long cables to generator.
l. Fuel for 24 hours endurance plus luboil.
m. Spare headphones/microphones, interconnecting leads, fuses, valves (yes, we still use them!), frequency meter, wavemeter.

Operational Aids Planning List

a. Plain paper.
b. Lined paper.
c. Log sheets.
d. Plenty of pens and pencils (remarkable how quick they go!)
e. Check log board (to be described later.)
f. Clock.
g. Operating rota schedule.
h. Generator filling rota schedule.
i. Copy of the rules of the contest.
j. QTH locator card, showing big squares, with beam direction lines.
k. QTH locator print out book — covering distances to every small square out to 1000 Km. (A megametre?).
l. QTH locator map on a large board, with "dartboard rings" every 50 Km.
m. Callbook — not so important now that QTHs in plain language are not required in most contests, but still of use if a corrupt QTH locator is received.
n. Red felt tips — for editing completed log sheets, and scoring.
o. Booze — to operators' tastes.
p. Ashtrays.
q. Rubbish sack — for "confidential waste," beer tins, take-away boxes, etc.
r. Notice boards — for external display to tell the public who we are, and what we are at.
NO, WE ARE *NOT* CB, NOR POP PIRATES, NOR A SMUGGLER TALK-IN STATION.
NO, WE ARE NOT PLANNING TO PUT UP A PERMANENT HIDEOUS PYLON IN YOUR LOVELY COUNTRYSIDE. THE OLD BILL DID ENOUGH OF THAT ON THE NEXT HILLTOP!
'COURSE WE CAN. WE *HAVE* PERMISSION. TOWN AND COUNTRY PLANNING LAWS DO NOT PROHIBIT OCCASIONAL SHORT-TERM USE.
YES, ALL THE WAY TO SPAIN, SWITZERLAND, AUSTRIA, CZECHOSLOVAKIA, POLAND, SCANDINAVIA, SCOTLAND, IRELAND.
NO, WE CAN'T CATCH A YANK JUST TO IMPRESS YOUR BIRD.
KING HUSSEIN ? NICE — BUT UNLIKELY.
THAT BIG HOOK UP THERE ? THAT'S FOR THE OPERATOR WHO MAKES A CODS OF IT!
NO, WE ARE *NOT* AFFECTING YOUR GOGGLE-BOX!
Yes, we have had them all!

A recent Crawley ARC 2m NFD station, G3JKF/P, in which a Yaesu FT901DM was used in conjunction with the FTV901 transverter. HF rigs with add-on transverters seem presently being displaced for 2m transceivers, typically the FT225RD and the Icom 251/271 variants which offer excellent 'strong signal' performance — when fitted with muTek 'front ends' (see John's remarks last month!).

gear, on goes the genny. A few quick chats with those stations on the local hilltops to mutually check signal quality. "Best of luck in the contest, old chap!" Synchronise clocks .....59. Off we go. CQ CQ.....

Station supervisor very busy chastising the blockhead who got the time wrong. "What's the difference between ZULU and ALFA time — no, ya twit, the other way." Doing a bit of PR with some members of the public who happen by. Also make sure the operators are well supplied with beer. Ensure that *only* the duty operators are sitting in the tent and the spectators are keeping well back and maintaining the necessary cloistral hush. Does his dam'dest to button his lip when the operator makes a hash of that callsign which is perfectly R5 and can be heard two fields away over the loudspeaker.

"Ignore that deliberate QRM, Jim, and it will go away! ..... Who's that twit who's splattering all over?.... Hmm a French Station. Should know better than to try and work Gs right up our vestigials. Shove the beam round a scrunnick and notch him out.....Yeah, glad we did that, not a bad contact, that SP, any more there, I wonder? CQ CQ CQ.....Hey, Phil, I am sure there's an EA in there. Yes, there he is again. Beam round 180 degrees. Oh, no, that's F7EA. Have him — he's a good way away — Zulu Echo I remember. Fine....Say Koo, Say Koo, Ah Kee Ay Ah Oono Bay Ee Oo — right, he's mine. ECHO ALFA ONE BRAVO INDIA UNIFORM this is.....Hello, here's the Old Bill...Evening Sir....Yes, certainly we'll get a message to you if those yobbos come up here. Code word EASTER, OK?.....Jim, go and tell that motorcyclist to hiss off — the QRM's terrible....Ta .....Cripes, what a session! Me right arm's dropping off. Open us a tin of ZULU OSCAR ZERO THREE, Arfer!.....Signal sound all right, Ken? ? ....Good-Oh....See Ya .....2358.....1358½..... 1359.....Right. That's it. No, you can't, Tim, I'm going to kill the genny. Right. Rig in my car. Back seat.....1430.....Nineteen... Twenty. All there. Pegs in that bag. Off we go! Down the Club, Thursday. Should have it done by then. That G9BF's going to get a right rollicking from me, be sure of that. Cheers!"

After The Contest

Now the *real* work starts. First, red pencil off all the superfluous information in the log. "Hello, Bill's left the times off. Let's see — one minute is right. 1745. 1746. 1747. 1748. 1749. 1750. That's better!"

Each horizontal line of the check board is inspected to make sure the same call is not down twice. If a duplicate is found, the log is marked "2nd contact. No points claimed...."

"Now, what the devil's this callsign? DA, EA, or PA ?? DK01g. *Must* be a PA. No military fixed stations that near to the border in DL land. Check log didn't help that time, He must have copied it off the main log. Have a word with him about that!"

Each contact must be inspected to make sure that the QTH locator agrees with the callsign.

"ZK.... No, *can't* be right. That's in the sea. Quick look in the callbook. Northants. Oh, Well — must be ZM... Where's the record

Personal Kit Planning List

a. Sleeping bag.
b. Groundsheet.
c. Warm clothing — even in summer, the high spots can have a sufficient wind chill factor to cause exposure.
d. Mug, knife, fork, spoon.

from last year? Lumme, he did the same on us in the September too. Something his best friends won't tell him?''

Most of the scoring can be done off the QTH locator map marked in 50km rings. The great majority of the stations worked will be well away from the boundaries of the rings. Just the odd one will need to be confirmed with the QTH distance print-out because it is right on a line.

I *know* it works. One contest scored out like this was also scored out using a computer program. The computer program showed an error of much less than +0.1%! Despite this, my preference is still for scoring by map inspection. Why not a computer, you ask. I will first ask ''on site, or afterwards, at home?''

On site, computers are fraught with danger. Will the computers memory be wiped under power supply glitches? Is it RF proof? Can the operators cope with the inputting? At contacts of one a minute, the operator will have to be a *very* good typist.

No Computer. . .

At home. The log is typed out onto log sheets. It would take just as long to input a computer. And a computer is essentially stupid. A computer cannot decide whether G4.... is in Northants or the English Channel. It cannot distinguish between PA, DA, EA, and would not even notice that there are no DAs in DK01g.

So, it's of no advantage, especially since distance determination is also used in the superior computer between my ears *to verify the other information.*

The log sheets are typed up, with a carbon for record purposes. Twenty five contacts per sheet. If, as happens, you get a 'hop' in the serial numbers, it is not the end of the world. There are two ways to cope. Either you stick to 25 effective contacts per sheet, with a brief explanation and apology, or you mark against the used numbers like this:

RADIO SOCIETY OF GREAT BRITAIN

SHEET NUMBER 2 OF 38 SHEETS

VHF - UHF - SHF CONTEST LOG SHEET Form LSVHF

CONTEST	BAND	CALL SIGN	LOCATOR	LOCATION
OCTaMBEr	144 MHz	2A4CDS	AK14h	

DATE G.M.T	CALL SIGN	RS(T) SERIAL NUMBER SENT	RECEIVED	Q.T.H. LOC	LOCATION	POINTS RADIAL	KMS
1423	OP1BNB	56026	59006	CA05e		13	
1423	OP6HC	52027	55016	BL57a		9	
1424	OP1BXK	42C28	57002	BL78e	2nd contact. No points claimed...		
1425	DO6IH	51C29	55001	AL34g		23	
1426	DP8YK	52030	52005	DK46b		19	
1428	DQ2EAD	52031	55004	EA75j		23	
1428	DO1ZN	52032	53003	DL54j		17	
1429	OO7JV	53033	54O1C	CK73d		11	
		034			Serials not used		
		035			owing to operater error,		
		036			with apologies		
1430	DQ5JQ	53037	57006	DL66e		19	

Either would seem to be acceptable to the adjudicator.

Note that the total on the sheet for 25 contacts must necessarily be an *odd* number. Fig.2 is an example of a completed log sheet. Too many clangers!

What the adjudicator does *not* want to see, are scribbled and illegible log sheets, with tea, beer, and red pen all over them. Red is used by him to do his marking. He will accept computer print outs, if in standard form, and dissected into 25 contact standard size sheets.

The 427 form comes next. Fill in every thing asked for. The adjudicator accepts the ''signature and callsign of all operators'' section, if you type in the name and call of each. It is obviously quite ridiculous to be expected to travel many miles (as might happen if one of your operators lives some distance away) just to get a signature.

That being said, contest organisers don't forget to sign the certificate yourself, because that *will* result on your log being chucked out!

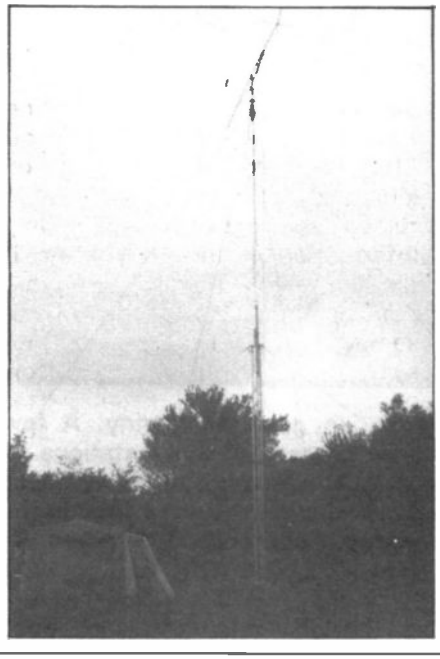
Now the 4422 form. It is necessary to complete one for every event proclaimed as a multiband effort, even if you have concentrated all your effort just on the one band. One observation. Single band 2 metre entries are not accepted on VHF NFD. I see that last year one group produced a VHF NFD entry with just two contacts on 4 metres and the rest on two metres: that would seem to have been due to equipment troubles or geography, rather than gamesmanship.

The 4422 has to be signed as well, but there is no certificate.

Encourage Your Op's

Statistics are now prepared to indicate the performance of each of your operators, and these are circulated. We run a sweepstake, and the operator who produces the best performance, after due weighting

For those Clubs with modest means, a 14 ele parabeam or 'Tonna' type yagi can provide excellent results.



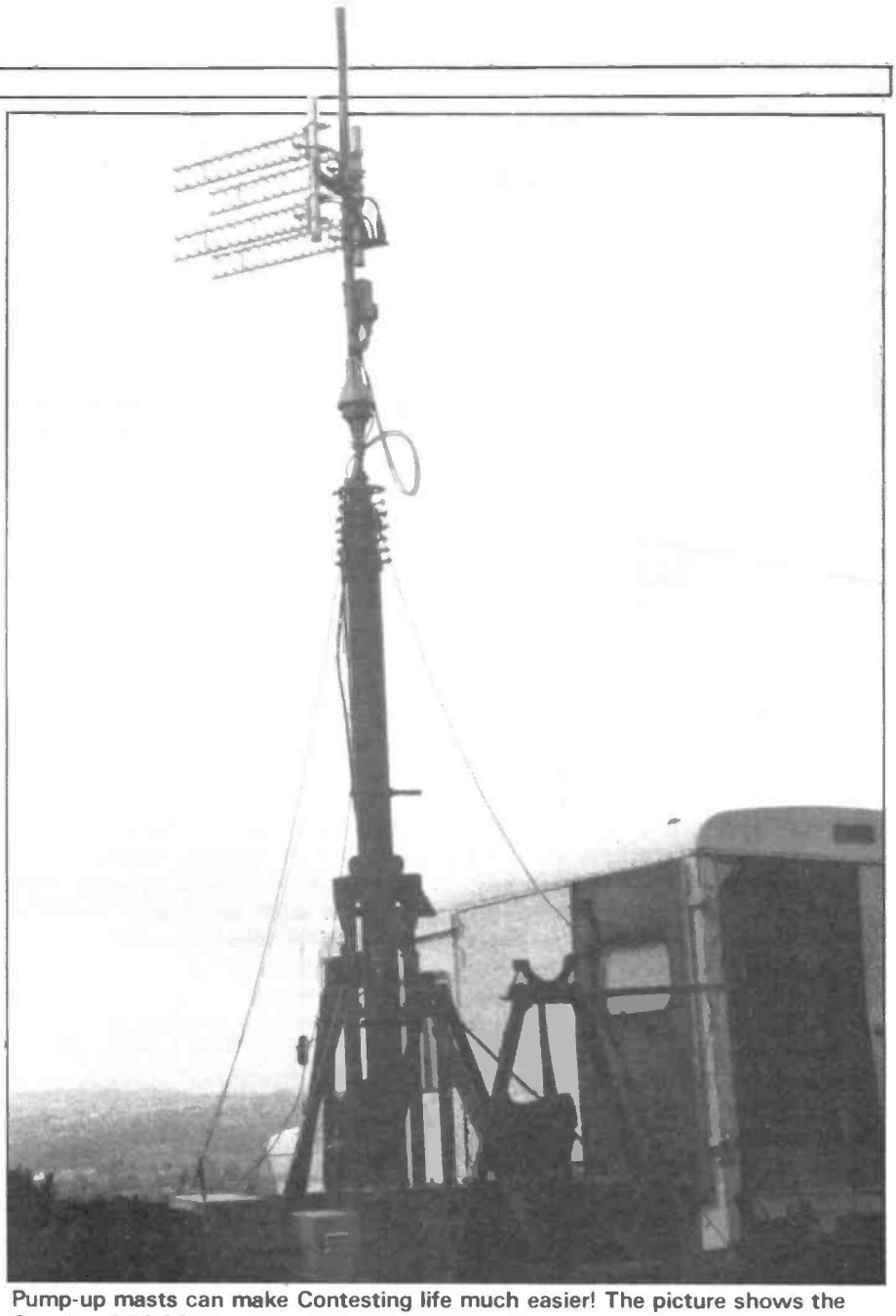
Accommodation Resource Planning Check List

a. Sleeping tent(s).
b. Operating tent.
c. Table.
d. Chairs.
e. Cooking stove.
f. Cooking and eating utensils.
g. Food box — filled.
h. Water — for cooking.
j. Shovel — for the mobile khazi — behind the hedge over there!

of the results to allow for equity between easy stages and difficult ones at unsociable hours, gets some recognition of his efforts.

One has the invitation to comment on the contest rules, on the obverse of the 427. There have been some changes of the rules this year, as a result of many years' representations, but these were minor and rather disappointing in view of the expected radical 'spring clean'. At least, contest exchanges are now harmonised with those in Europe. Illogicalities remain. There is a lovely touch of bathos in the announcement on page 1089 of RADCOM 1983. I am reminded of a certain jingoistic newspaper which, when fog and high seas caused the cancellation of ferry services across the channel, published the headline "EUROPE ISOLATED."

The announcement read that the exchange of QTH will not be required except on 70 MHz where *"continental stations do not distort the results."*!!



Pump-up masts can make Contesting life much easier! The picture shows the Crawley ARC 23cm set-up in the lowered position.

Radial Scoring Is Best!

One thing which does *not* require modification. The radial ring system of scoring is a winner. Much better I think than the one kilometre, one point system that rules in the rest of IARU Region 1. Information in my possession indicates that, no matter which points system is employed, the same result is thrown up. So, a system which helps both competitor and adjudicator by lightening their workloads is to be commended — and should be adopted by the IARU straight away, if not sooner!

And finally, a most important point. Make sure you post the log to the adjudicator at the address given in the contest rules. The log must be post-marked no later than 15 days after the end of the contest. Note "postmarked", not "posted". HERC entries are always sent *early* and by recorded delivery.

Finale

That's how we run the station. Sorry about the occasional royal "we", but it sounds at least a lot less bigheaded than "I" all the time. HERC contest efforts are really a communal enterprise, even though this exposition may seem to indicate a one man band!

No real originality is claimed for this piece, but, at the same time, I feel I have no apology to make for plagiarising others' work either. It must only be to the benefit of all VHFers that the phenomenon of the contest continues to exist, with all the concomitant advantages to all users, in that new techniques, improved equipment, and also, bags of activity from rare spots are forthcoming as a result. Some new blood is needed among contest entrants, so, if just one new contest entry is encouraged by my ramblings, the object of this article will have been realised. See you in the next 2 metre scramble I hope.

The writer has the advantage of many year's association with military communications in the Territorial Army. Those in the know will recognise the significance of the appointment title "BLUEBELL" coupled with three stripes on the arm. Some might say they should be branded on my posterior!

Good Contesting!

Through My Filter . . .

An occasional column by 'Old Cheshire Tom', a moniker disguising a wise and rather well known radio personage. Here he addresses himself to matters of VHF propagation and the new QRA locator system

Welcome to my first offering. Your commentator hopes to keep a beady weather-eye on doings on the HF and VHF bands and then present a personal and sometimes controversial viewpoint of the amateur scene. Feedback from readers is anticipated and is most welcome. We (ALL at HRT) shall be pleased to discover *your* point of view and if you wish, a strict anonymity can be observed.

'Old Cheshire' is well placed for VHF operations and can normally hear and work stations on 144 MHz SSB up to 200 miles away, regardless of band conditions. Within such a radial range there must not be hundreds but thousands of people who are equipped for the band, and indeed if each of these decided to come on at once chaos would reign. Why is it then that on most weekday evenings under typical 'non-lift' conditions the band appears almost empty? *(Why indeed? — Ed).* Your scribe has a hunch that many operators listen to Jim Bacon (a licensed amateur by the way) or some other weather pundit after the early evening news and should there be no sign of high barometric pressure they do not bother to switch on their VHF gear.

Just recently, we have had quite a long spell of anticyclonic settled weather over the UK and indeed much of Western Europe. This certainly stimulated some activity, but for much of the time really enhanced propagation just was not there. A high pressure system is *not* an automatic indicator of DX Tropo conditions, and on the contrary during last winter when the glass was low and the WX was more than a little miserable, some nice openings occurred. We still do not fully understand the mechanics of VHF propagation (What does cause Sporadic E?) and it is always worth while to nip into the shack and actually put out a call or listen for the Beacons.

By the way, don't be misled by the strength of distant beacons for they are not always a true indicator of actual propagation to their country of origin. Some are located at high altitudes and can be radiating well above the ducting layers of air so 'underestimating' true propagation. At other times I have heard the Swiss beacon loud and clear yet found it impossible to hear or work anyone in that country. Good 'tropo' conditions often lie along narrow well defined paths. It may be possible to have a good solid contacts with stations in the Ruhr area of West Germany and yet hear nothing of other German stations just a hundred or so miles to their south. The DX 'kings' on the VHF bands are always around listening, probing and keeping both ears open.

Whilst on the topic of our VHF bands another question comes to mind already aired on the letters page. Where are all the G6 stations which seemed to dominate two metres a year or so ago? They seem to have been replaced by the new generation of G1 callsigns and one wonders if these too will vanish in the near future.

Are you prepared for the 'Maidenhead' Locator Squares system? It seems that at the recent IARU Region 1 Conference it was decided that this new locator system (which was originally devised by G4ANB) should come into use from January 1st 1985. For some time both the existing and the new system will operate in tandem, but this may generate problems for VHF Contests. Although a World-Wide scheme such as the 'Maidenhead' is needed now that MS, EME and Satellite work is becoming commonplace it has its weaknesses. A full locator will have six characters to be transmitted as against the present five, and it will not be so precise. At present it is possible to place a station within any one of the 720 sectors within a major square (such as AL,ZM etc.) but the 'Maidenhead' system reduces this to only 576. This will introduce a considerable inaccuracy in distance measurement whether a computer or a simple rule is used! For those interested, Table 1 gives the replacements for our old Locator Squares. They take in most of the UK.

The initial pairs of letters identify a large unit called a 'Field' which contains 100 squares, each of which corresponds identically with our present locator squares. Within these smaller squares are 576 even smaller units arranged as an alphabetical grid of 24x24 letters (leaving out Y and Z).

Table 1 The New Locator Squares

AK = J000	AL = J001	AM = J002	AN = J003	ZK = 1090	ZL = 1091
ZM = 1092	ZN = 1093	ZO = 1094	ZP = 1095	ZQ = 1096	ZR = 1096
YK = 1080	YL = 1081	YM = 1082	YN = 1083	YO = 1084	YP = 1085
YQ = 1086	YR = 1087	YS = 1088	XK = 1070	XL = 1071	XM = 1072
XN = 1073	XO = 1074	XP = 1075	XQ = 1076	XR = 1077	XS = 1078
WK = 1060	WL = 1061	WM = 1062	WN = 1063	WO = 1064	WP = 1065
WQ = 1066	WR = 1067	WS = 1068			

It is not yet really possible to find out your own position using the new system and it is best to await the publications of the new locator map. If you are however right in the corner of an existing square you should have no trouble! In practice it will not be necessary to send the first two letters (the 'Field' letters) during a QSO unless you are working someone at real DX, say in Greece or Estonia for the, 'fields' which hold 100 smaller square are very large, being some 20 degrees wide and 10 degrees high from north to south. At first all this must seem rather confusing but I feel sure that we shall soon get used to the new order!

HRT hope to be publishing the first 'Maidenhead' QRA locator map in the UK - FREE in the November issue of HRT.

Addendum

Converting 'Illegal' CB Sets To 10m

Printed below are the *full* transmit (*Fig. 1*) and receive (*Fig. 2*) block diagrams of the Ham International Concorde II, as promised in this months *Letters*.

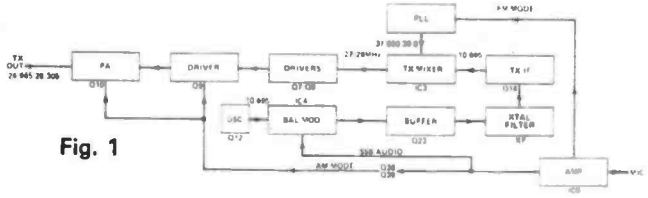


Fig. 1

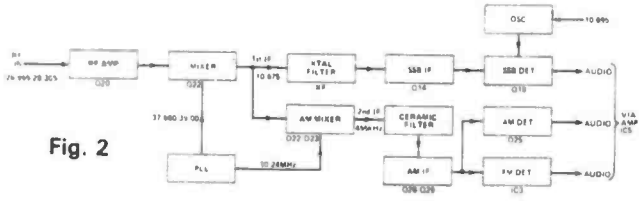


Fig. 2

Control Units for the 2m GaAsFET Pre-amplifier

There are a small number of errors on the circuit diagram on p50.

1. The anode of D3 is only connected to the collector of Q2 and RL2. There is no connection between RL2 coil and the RL2 contact immediately below it as was shown.

2. The anode of LED1 and the collector of Q3 should only be connected to each other - and not also to C17 as was shown.

3. IC2b should connect to R9 only

4. The collector of Q4 should not be connected to R7, R10, R9 and IC1d pin 11 as was shown..

ALPHA Part One

A few errors crept into part one of the article as follows.

1. There are two points marked AJ within the circuit. The point marked AJ coming from relay 3 should be 'AR' and connects with point AH on relay 1.

2. The VFO input at T1/T2 is point 'M', the right of it is L6.

3. On the VFO diagram, the top of RV11 is point 'AD', and the slider point 'AC'. The Key is point 'AB', and the 50ohm VFO output is The voltage range from the output of Q34/35 is 2 - 7.6V.

4. On the components list, C84 and 85 are 330n polyester, not 470n.

5. On page 17, the unmarked capacitor across Q27/28 is C136 (150p - 20m only). The top transmission line is TL3, and the inductor to

6. D35 should be added to the list of 1N4148 diodes in the components listing.

7. Cx and Cy should be shown in the components listing as 330pf for 160m only. In Fig. 5 Cx and Cy are additional parallel capacitors across TC2 and TC3 respectively.

8. L9 for 160m only should be listed as Toko YRCS18576AQ.

ATTENTION ALL WRITERS . . .

. . . or just those of you who sometimes think "I could do better than that!"

We want to hear from you!

The magazine you hold in your hand is part of ASP's electronics group of titles. These include *ETI, Ham Radio Today, Digital and Micro Electronics,* and our new magazine, *Electronics.* All these magazines are looking for new authors, so if you've designed something for yourself that you think may be of interest to others, or if you've a subject you'd like to write a feature article on, then drop us a line with an outline of what you have in mind.

We particularly need:

- Projects for the Commodore Vic 20 and 64, the Amstrad, the BBC A and B, and the Electron computers;
- Simple projects that do something useful, perhaps in a novel or instructive way;
- Radio projects (not necessarily for radio amateurs);
- Features on amateur satellite radio.

If you're interested in writing for us, send an outline of your proposed article to: Dave Bradshaw, Group Editor (Electronics), Argus Specialist Publications, 1 Golden Square, London W1R 3AB.

Please note that while we take ever care, we cannot be held responsible for the loss of unsolicited manuscripts. We advise all authors to keep a photocopy or carbon copy of any article they send us.

RADIO Tomorrow

Your at-a-glance guide to what's happening around the clubs, on the air and in general radio-wise.

1-2 Sep **RSGB 144 MHz Trophy and SWL Contest.**
RSGB SSB Field Day.

3 Sep Stourbridge ARS: 'Your Construction Project' (a forum).
Leighton Linsdale RC: AGM.
Braintree DARS: *Test Gear and Operating Aids.*
Southdown ARS: ring PRO for details.
Stowmarket ARS: A Visit to Suffolk Police HQ.
Thornton Cleveleys ARS: *Japanese Morse by G3CSG.*
Todmorden DARS: *Lecture by John Nelson G4FRK of RSGB.*
Dudley ARC: Committee Meeting.
Sutton and Cheam RS: Natter Nite.

4 Sep Wakefield DRS: to be arranged.
Flyde ARS: *Aerial Circus with G6CJ* (video).
Vale of White Horse ARS: *Talk by G3RZP of Plessey.*
Chichester DARC: Visit by Sussex Repeater Group.
Bristol ARC: Informal at YMCA, 6 Park Rd, Kingswood.
Hastings ERC. Micro Evening.

5 Sep Fareham DARC: *Satelite Communications.*
Wirral ARS: Debate on 'CW is a dying art?'
S. Bristol ARC: AGM.
Wirral DARC: D & W.
S. Lincoln SWC. CW/RAE/Hamfest.
Stockton DARG: ring PRO.
Nene Valley RC: Natter Nite.
Cheshunt DARC: Natter Nite.
Hastings ERC. Committee Meeting.

6 Sep Horsham ARC: Junk Sale.
Cray Valley RS: ring PRO for details.
Shefford DRS: *Fault finding — Symptoms and Diagnosis with G6TQT and G4PSO.*
Newark DARC: Social Evening.

7 Sep **World Association of Christian Radio Amateurs and Listeners Conference Weekend at the London Bible College, Northwood, Info G3AGX 0482 822276.**
Axe Vale ARC: *The RSGB by G3XC.*
Maltby ARS: DF Hunt.

8-9 Sep **Cray Valley RS SWL Contest. 1800-1800 Sun. Up to 18H of logging to be done. Arguably the best SWL contest there is! Log sheets and rules from Owen Cross, 28 Garden Avenue, Bexley Heath, Kent DA7 4LF.**

8 Sep **Scottish Amateur Radio Convention at Cardonald College Glasgow (short distance from the M8). Trade stands demonstrations, RSGB Bookstall and guest lecturers including George Dobbs of the G-QRP Club and Chas Bartram of MuTek. Parking and refreshments readily available. Open 1100-1700 with admission £1.00. Talk-in on S22.**

9 Sep Wirral DARC: 5th and final DF Hunt.
Telford Amateur Radio Rally at Telford Town Centre, (junction 10A off M6) Telford, Shropshire. Displays over 80 trade stands, Flea Market and the rally is near to the town park. Talk-in and refreshments (Ansells Bitter!) Info. G8DIR 9743 64273.
Chichester DARC: G2NM Commemorative Station at Chalk Pits Radio Museum.
RSGB National DF Hunt Chelmsford/Colchester.

10 Sep Exeter ARS: Visit from Spectrum Communiations.
Milton Keynes DARS: ring PRO.
Thornton Cleveleys ARS: Morse Class.
Dudley ARC: Natter Nite.

11 Sep Mid-Warwickshire ARS: *Metal Bashing.*
Bury RS: *Video Vs Photography by G4OAC*
Dartford Heath DFC: Pre hunt meeting.
Basingstoke ARC: *RTTY, AMTOR and Packet Radio.*

12 Sep	Fareham DARC: On-air/Natter Nite.
	Wirral DARC: Equipment demonstration by Lowe Electronics.
	Farnborough DRS: Pre-AGM discussion.
	S. Bristol ARC: VHF/UHF Activity Night.
	Lincoln SWC: *VHF Aerials by G3FDW.*
	Stockton DARG: ring PRO.
	Cheshunt DARC: Junk Sale.
	Nene Valley RC: RSGB Topics with G3DOT.
13 Sep	Southgate ARC: 'Birds Nest' Night.
	Edgeware DARS: Informal.
	Shefford DRS: *Oscar 10 with G3VZV.*
14 Sep	Haverhill DARS: Open Evening.
	Dunstable Downs RC: *RTTY, AMTOR and Packet Radio by G3NRW.*
	Maltby ARS: Video Night with G3ZHI.
16 Sep	**RSGB 70MHz Trophy and SWL Vange Amateur Radio Society Mobile Rally at Nicholas School, Basildon 1000-1700. Info Mrs D. Thompson 0268 552606.**
	Glenrothes DARC: AGM.
17 Sep	Stourbridge ARS: ring PRO for details.
	Leighton Linsdale RC: ring PRO.
	Braintree DARS: *Clay Pigeon Shooting.*
	Thornton Cleveleys ARS: to be arranged.
	Dudley ATC: Natter Nite.
	Dartford Heath DFC: Club Hunt.
18 Sep	Biggin Hill ARC: *Antennas by Louis Varney, G5RV.*
	Wakefield DRS: to be arranged.
	Halifax DARS: AGM.
	Fylde ARS: Informal and Morse Class.
	Newark DARC: Noggin and Natter.
	Hastings ERC: Micro Evening.
19 Sep	Fareham DARC: *Multi-band HF Antennas.*
	Wirral DARC: D & W.
	S. Bristol ARC: ATV Activity Night.
	Wirral ARS: Air Your (radio) Problems Night.
	Midland ARS: Homebrew Evening.
	Lincoln SWC: CW/RAE/Hamfest.
	Stockton DARG. ring PRO.
	Cheshunt DARC: Natter Nite.
	Nene Valley RC: Natter Nite.
	Hastings ERC: *Repeaters and Power Supplies.*
20 Sep	Chichester DARC: ring PRO.
	Cray Valley RS: *AMTOR, Packet Radio and RTTY with G3NRW.*
	Shefford DRS: Junk Sale.
21 Sep	Bridgend DARC: Discussion on Club constitution.
	Bridgend DARC now meets at the YMCA, Angel St, Bridgend.
	Sutton and Cheam RS: ring PRO for details.
	Maltby ARS: Call My Bluff — a competition with Worksop ARS.
23 Sep	**Lincoln Hamfest. Trade Stands, Bring and Buy, fairground attractions and model aircraft display. Food, picnic area, parking and talk-in. Located at Lincolnshire Showground (4m N of Lincoln A15).**
	Dunstable Downs: Car Boot Sale at the Shuttleworth Collection, Old Warden.
	Nene Valley RC: Special Event Station at Hinwick Hall Craft Fair.
	RSGB National Final Slade.
	Galashiels DARS: Open Day at the Focus Centre, Livingstone Place, Galashiels. From 1200-1700 with trade stands. Bring and Buy stalls and an exhibition station in operation.
	Hastings ERC: Raynet Group meeting.
24 Sep	Thornton Cleveleys ARS. Club Project and Construction Evening.
25 Sep	Mid-Warwickshire ARS: Junk Sale.
	Bristol ARC: Visit to Mitell Chepstow.
	Harlow ARS: *AMTOR, RTTY and Packet Radio.*
26 Sep	Fareham DARC: On-air/Natter Nite.
	Wirral DARC: Inter-Club Quiz Night with Chester at Irby.
	Farnborough (Hants) DRS: Annual Construction Contest.
	S. Bristol ARC: SWL Activity night with Ron Gardener.
	Stockton DARG: ring PRO.
	Cheshunt DARC: Club Project Discussion with G4OAA.
	Nene Valley RC: *Lecture County Emergency Planning Officer.*
27 Sep	Edgeware DARS: Quiz with G3PSP as MC.
	Greater Peterborough ARC: to be arranged.
	Shefford DRS: *A Bit Of A Lift On with G3YLA*
28 Sep	Haverhill DARS: *HF Operating Procedures.*
	Dunstable Downs RC: *Colour Offset Printing by G4WYO.*
	Maltby ARS: *G4SRX tells all — How It Works — The Domestic Microwave.*
30 Sep	**Welsh Convention at Oakdale Community Centre, Blackwood. There will be a talk given by Dr A.W. England W0ORE of Mission Specialist Shuttle Flight 51F in April 1985. Admission is by ticket only. There are also trade stands tape/slide presentation on County Hunting, video of shuttle mission. Admission £1.00 at door, exit 27 off M4.**
1 Oct	Stourbridge ARS: Informal.
	Braintree DARS: *TVI Prevention — Theory and Practice.*
	Stowmarket ARS: *The RNLI by Mike Smith.*
	Todmorden DARS: Secret Listeners (Video).
	Marconi Basildon ARC: *RTTY, AMTOR and Packet Radio.*
2 Oct	Wakefield DRS: On-the-air/Natter Nite.
	308 ARC: AGM.
	Fylde ARS: *British Telecom by David Gregson.*
	Chichester DARC: ring PRO.
3 Oct	Fareham DARC: *VHF Propagation.*
	S. Bristol ARC: ring PRO.
	Cheshunt DARC: Natter Nite.
	Nene Valley: *Town and Country Planning Act 1971.*
4 Oct	Horsham ARC: ring PRO.
	Cray Valley RS: Grand Surplus Sale.
	Newark DARC: *Lecture to be arranged at Palace Theatre, Newark.*
5 Oct	Axe Vale ARC: Microwave Evening.
5-6 Oct	Dartford Heath DFC. Slade Two Station Night Event.
6-7 Oct	**IARU 432MHz — 24GHz Contest.**
	RMG Open Meeting, 1330 at the Crest Hotel off A63, North Ferriby, Hull. There will be a talk-in on GB3HS and/or S22. Buffet available.
7 Oct	RSGB 21/28MHz Phone.
8 Oct	Exeter ARS: AGM.
9 Oct	Mid-Warwickshire ARS: *Aircraft Radio by G3III*
	Bury RS: Construction Competition.
	308 ARC: Junk Sale at St. Marks Church Hall, Church Rd, Surbiton.
10 Oct	Fareham DARC: On-air/Natter Nite.
	Farnborough (Hants) DRS: Film Night.
	S. Bristol ARC: Club Winter Project.
	Cheshunt DARC: Film Show with G3TIK.
11 Oct	Southgate ARC: *Audio by G6GOS.*
12 Oct	Haverhill DARS: Video.
	Dunstable Downs RC: Film Night.

13-14 Oct **BARTG Autumn VHF Contest 1800-1100 144MHz only. Details on log sheets to BARTG Contest Manager, 64 Whippendell Rd, Watford.**

13 Oct **Midlands VHF Convention at BT Training College, Stone, Staffs. VHF Forum plus lectures, software display, Bring and Buy and trade stands. Free parking. Admission £1.30. For further details send an sae to Peter Burden, 18 Langley Rd, Wolverhampton, WV3 7LH.**
RNARS: Social (1430) and AGM (1930) at HMS Mercury.

13 Oct DAFG 13th Short Contest 80m and 40m part 5.
BARTG committee meeting.

14 Oct **QRP Convention organised by Yeovil ARC at Preston School, Monks Dale, Yeovil (entry via Preston Road). Lectures, light refreshments and talk-in (S22). Pub nearby. Further info from Eric Godfrey 0935 75533.**
Dartford Heath DFC: Club Hunt.
DAFG 13th Short Contest 2m and 70cm part 5.

15 Oct Stourbridge ARS: ring PRO.
Braintree DARS: Construction Contest.

16 Oct Biggin Hill ARS: Construction Contest.
Wakefield DRS: *PCBs by G8UCH.*

17 Oct Fareham DARC: *Meteor Scatter by G6BBG.*
S. Bristol ARC: Computer Activity Night with G4WOD.
Cheshunt DARC: Junk Auction (non members 50p).

18 Oct Chichester DARC: ring PRO.
Greater Peterborough ARC: RSGB video evening.
Cray Valley RS: Natter Nite.
Sheffield ARC: *RTTY, AMTOR and Packet Radio.*
Shefford DRS: *AMTOR and Packet Radio by G3NRW.*

19 Oct Bridgend DARC: AGM.

20-21 Oct **Scout Jamboree-on-the-air. Applications for special event callsigns received before Monday 24th Sept on the correct form to Membership Services Dept, RSGB HQ.**

21 Oct RSGB 21MHz CW Contest
Hornsea Radio, Computers and Electronics Exhibition at the Floral Hall, Hornsea. Trade stands, junk stall, 'Bring and Buy'. cafe, bar and refreshments. Doors open 1200 and admission is 30p.

23 Oct Mid-Warwickshire ARS: *Talk by G8MWR.*
Haverhill DARS: Junk Sale.

24 Oct Fareham DARC: On-air/Natter Nite.
Farnborough DRS: Surplus Equipment Sale.
S. Bristol ARC: Discussion regarding 1985 Calender.
Cheshunt DARC: *Coaxial Cables by G6BTQ.*

25 Oct Shefford DRS: *The History of the Fire Engine (Hot stuff!).*

26-27 Oct **Leicester Amateur Radio Show at Granby Halls. Entrance in Welford Road, a short distance from City Centre. Over 50 trade stands — and with a waiting list of traders. Food and drink available in plenty. Park opposite the entrance. Talk-in S22 and SU8 and admission is £1.00 Info Frank Elliot 0533 553293.**

26 Oct Haverhill DARS: BARTG.

27-28 Oct Mid Thames three station night DF event.

28 Oct RSGB 70MHz Fixed.

30 Oct Wakefield DRS: *The Human Machine As A Radio Operator* (slide lecture).

31 Oct Fareham DARC: *6m Operation by G4JCC.*
S. Bristol ARC: Bring and Buy Night with G4RZY.
Cheshunt DARC: Natter Nite.

Will Club Secretaries please note that the deadline for the December segment of Radio Tomorrow (covering radio activities from 1st November to 1st January '85) is 21st September.

Contents

Axe Vale ARC	Roger Jones	Upottery 468
Bristol ARC	T. Rowe	0272 559398
Braintree RS	Alan Moore	0304 822738
Bury RS	Bryan Tydesley	0282 24254
Cheshunt DARC	Roger Frisby	0992 464795
Chichester DARC	C. Bryan	0243 789587
Cambridge DARC	David Wilcock	0954 50597
Dunstable Downs RC	Phill Morris	Dunstable 607623
East Kent RS	Stuart Alexander	0227 68913
Edgeware DARS	John Cobley	30 64342
Exeter ARS	Roger Tipper	0392 68065
Fylde RS	PRO	Lytham 737680
Halifax DARS	D. L. Moss	0422 202306
Harrow RS	Dave Atkins	0923 779942
Hastings ERC	Dave Shirley	0424 420608
Haverhill DARS	Rob Proctor	0787 281359
Hornsea ARC	Norman Bedford	0262 73635
Horsham ARC	Pete Head	0403 64580
Leighton Linslade RC	Pete Brazier	052 523 270
Maltby ARS	Ian Abel	Rotherham 814911
Medway ARTS	Andy Wallis	0634 363960
Mid Ulster ARC	D. F. Campbell	0762 42620
Preston ARS	George Earnshaw	0772 718175
S. Bristol ARS	Len Baker	0272 834282
S. Lakeland ARS	Dave Warburton	Ulverston 54982
S. Manchester ARC	Dave Holland	061 973 1837
Stockton DARS	John Walker	0642 582578
Stowmarket DARS	M. Goodrum	0449 676288
Southdown ARS	P. Henly	0323 763123

REVIEW:
Commutech FCR130 receiver kit

Getting started? Want to build a receiver? Dave Bradshaw and Steve Ireland evaluate the Commutech FCR130 kit for beginners.

Building an SW radio, to me, was quite a nostalgic thing to do. It took me back to my childhood, when a neighbour who worked at a near-by radio observatory diverted me from building my own radio telescope (carefully designed to be an 11 year old's version of Jodrell Bank's first dish) into building a single-valved short wave radio.

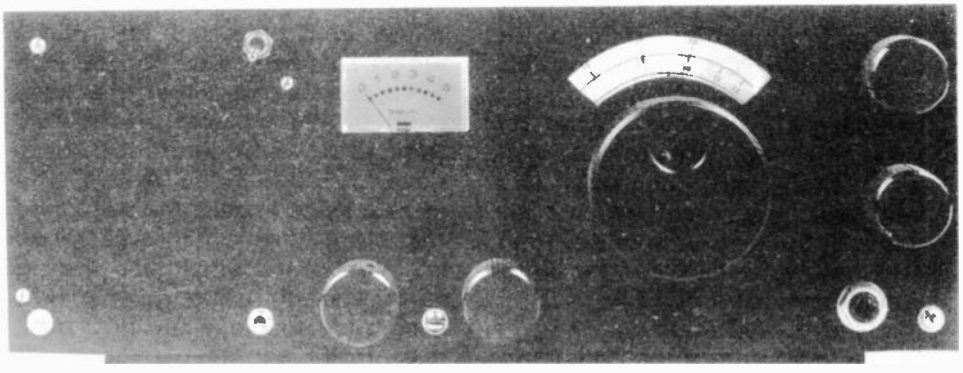
What a device that was! It took three batteries to get the thing to go, if I remember correctly: one for HT, one for the heater supply and finally one for grid bias. I wonder how many other readers started out their listening with the 'Hear All Continents' short wave receiver, purchased from 14 Old Bond Street.

Thus began my career in electronics, which has got me into my current predicament — editor of ETI, briefly editor of HRT until we had a real radio amateur ready to take over, and now (the acolade!) Consultant Editor of HRT. Well, let's get on with the review.

On Arrival

The kit arrives all very neatly wrapped up, tissue paper used to protect things like knobs that would spoil if scratched. The instructions come in a little plastic folder, and these contain a checklist: next to every item on the list was a little pencil tick. Someone was certainly setting out to be thorough.

The receiver is a tuned radio frequency type (TRF), but with regeneration around the RF stage to increase gain and selectivity. The RF end of the receiver is formed by three FETs, all 2N3819s, operating in common source, common gate and common drain (I wonder if this design had started life as a wager along the lines of 'I bet you can't design an RF stage that uses all three modes of FET amplification'?). The detector is a BC1109 and audio amplification is provided by an LM380.



The controls provided, all on the front panel, are as follows: tuning, bandswitch, regeneration, AF gain and on/off, tone and speaker disable. The 'internal' speaker (mounted rather in a rather exposed position at the end of the unenclosed front panel) is approximately 65mm across, and there are sockets for headphones and tape recorder. An illuminated S-meter is also provided.

The receiver requires a supply of 9 to 15 volts, and on 9 volts it consumes around 100-200mA (depending on volume and regeneration control settings).

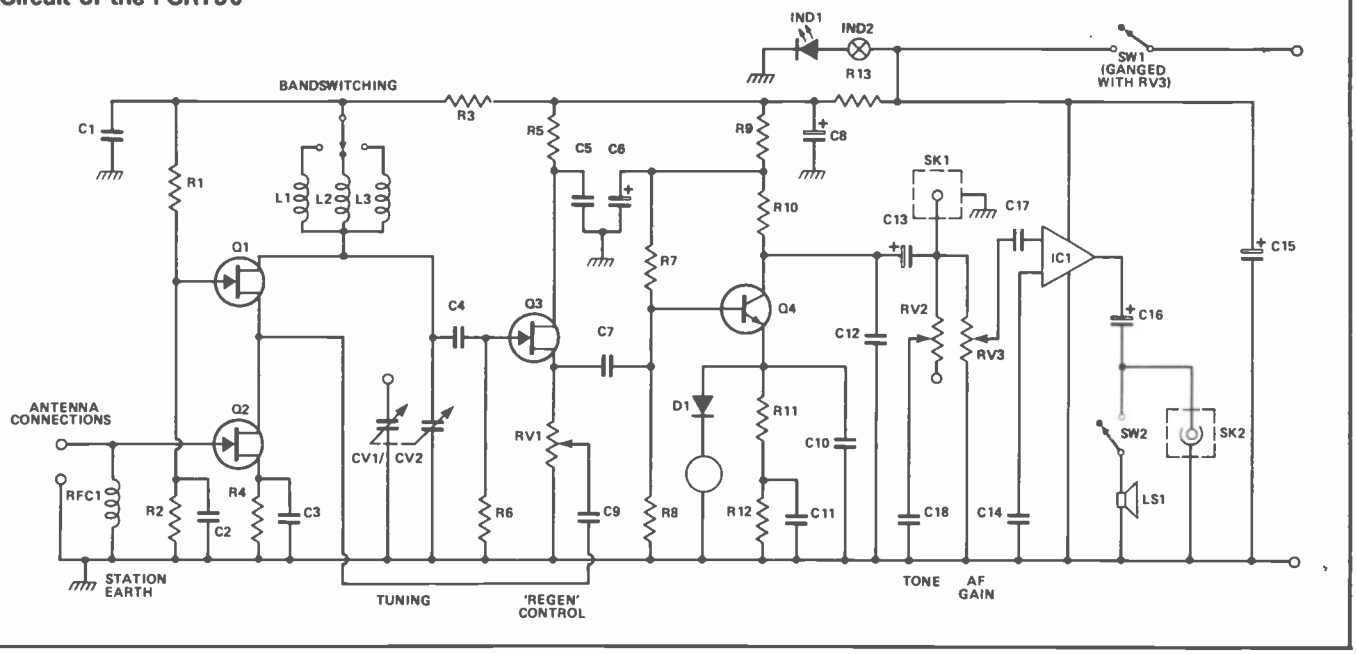
Under Construction

The receiver is quite straightforward to make; however, there are a number of irritating points that I feel would benefit from further attention the part of the kit supplier.

Firstly, the instructions read like a selection of notes on the assembly, not like a complete, concise and comprehensive description of construction that the average beginner needs. Indeed, part way through, one finds the following: ''We are assuming that you have read all the notes *before* you started the assembly work so a few odd ideas won't be out of place.'' I'm afraid that in my experience, a few odd ideas will be out of place! To a newcomer, everything needs to be crystal clear — when exploring an entirely new subject, one does not need any additional barriers to understanding, and I'm afraid that the instruction's disorder is a severe limitation to their usefulness.

The PCB is not as well designed as I would have expected; in fact there is not one but three PCBs one for the RF, one for the AF IC amplifier and associated com-

Circuit of the FCR130



ponents, and one for a few components associated with the S-meter and illumination. For a start, I don't see why there should not be just one PCB, which could be just a little larger than (or possibly just the same size as) the RF PCB, which is very spacily laid out. This would reduce the cost of making up the kit slightly, and certainly simplify assembly.

This brings me to a subsiduary but quite important point on the design of the PCB. This is that very nearly all the connections from the boards are from pads on the foil side. Attaching wires to pads with no through-board connection is a very good way of removing not just the pad, but a fair amount of track attached to the pad. Far, far better would have been PCB pins.

Finally, with respect to the PCB, a large number of the component holes are inappropriately spaced. On the main RF PCB, out of the 34 components on this board, 11 had wrongly-spaced lead holes (here I'm counting the five resistors mounted vertically but for which, with a minimum of re-tracking, it would have been perfectly easy to accommodate horizontally). A few problems of this sort can be expected with capacitors, as these can vary greatly from one source of supply to another, but there just shouldn't be this number of wrong holes.

Despite the above gripes, assembly of the PCBs was relatively straightforward. It took nearly as long again to wire up the interconnections between the PCBs and the controls, etc, and to get to the point of fitting the slow motion drive. I have already commented on the instructions, but one point I would add here is that it wasn't until I came to assemble them onto the drive chain that it became apparent that two reduction gears are used to drive the main tuning capacitor. Actually coupling up the drives is fiddly, and my advice would be to file slots for the PCB fixing screws in either the base plate of the receiver or the PCB itself; I followed the cutting instructions for the reduction gear shafts as exactly as I could and still found that there was a gap where one shaft ends and where the mating shaft started. Filing slots makes it possible to move the PCB back and forth to get a good fit without straining the drives. Also, on the drives; one point which isn't made clear in the notes (at least, I couldn't find it there) is the clamping of the body of the drive next to the capacitor. I found myself having to drill an extra hole in the PCB to accommodate a clamping screw.

One slightly 'tacky' point which I'd like to see improved on is the frequency scale; this is made by glueing a paper scale to a sheet of card, which is in turn glued to the drive to the capacitor. The paper scale comes as part of the instructions and is hand-written. It's a pity someone didn't take the trouble to do a bit of letra-setting, because this really does let down the appearance of the front panel which is otherwise very good indeed.

Eventually, the receiver was assembled more or less as the instructions suggest; I'd used all the leads supplied as recommended (though more of this later), although I had substituted a stereo'phone jack for the mono one supplied (apart from a very old pair of high-impedance' phones, all mine are stereo). Now was the time to try it out.

In Use

To my surprise, the radio worked first time, the only problem being the 'on' LED and the meter light (connected in series); in bending the LED's leads. I'd somehow broken the device and had to replace it.

The receiver managed to pull in stations from all over the place in the region of 8 MHz on just a crude loop aerial strewn across my living-room floor, and I will be interested to see what results Steve Ireland gets on his rather better antenna. However, a couple of faults made themselves apparent.

Firstly, it was noticed that on high volume settings but with low output into the loudspeaker, it was possible to get feedback oscillation. This was eventually tracked down to microphony in the S-meter, which is mounted directly next to the loudspeaker. Adding a 10R/4u7 simple filter seemed to

lessen the effect sufficiently to remove oscillation at all control settings.

Secondly, it was noticed that higher frequency oscillation of the AF amplifier IC was occuring over mcu of the mid-range of the volume settings; this manifested itself by the receiver being quite noisy with the volume control at either a low or a high setting, but completely silent with the volume control on a middle setting (it was also noticed that PSU current drain increased markedly with this sort of volume setting).

Examining the instructions revealed the most likely source of the trouble: the inputs and outputs to the AF amplifier IC were both passing along different cores in the same multi-way screened cable. Removing the output from screened cable put a stop to the oscillation.

This prompted me to revise the inter-wiring of the PCBs and controls completely for the audio section. On my prototype, the output from the RF board is now taken directly to the volume and tone controls by a single-screened lead; the audio is then taken to the audio amplifier board by another single-screened lead; the output from this board is taken to the headphone socket and then to the loudspeaker via the mute switch with a twisted pair. This actually neatens up the receiver quite considerably!

DJB

Fond Memories

I was very interested to get my hands on the FCR 130 because, like Dave, this TRF receiver brought back memories of my youth.

Whilst at school, a friend of mine built a TRF receiver from 2m which used 2N3819 FETs for the RF stage, as does the FCR 130. With my small store of knowledge and large store of prejudice along the lines of — ''Superhets are the thing for today, with a converter for VHF listening. TRF's were OK in the 1930's when there was hardly anyone on the air. Broad as a barn door, noisy and not that sensitive either'' — I really didn't expect much from his receiver.

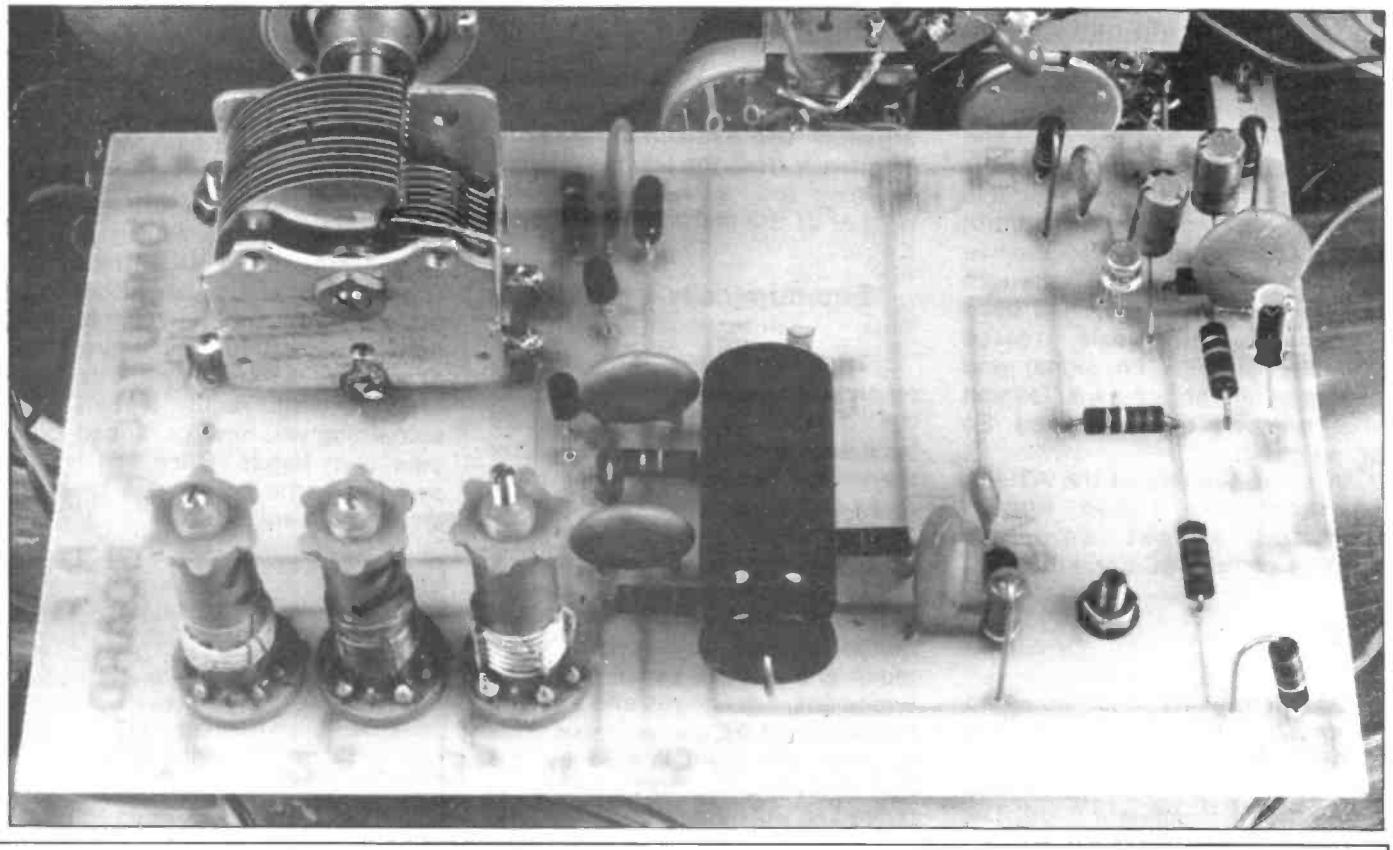
To my surprise, the TRF pulled in stations up to 20 miles distant with a simple dipole antenna. The selectivity was admittedly poor; if a local station came on at the top end of 2m and you were listening to a not-so local station at the bottom, the latter would be completely blotted out by the former.

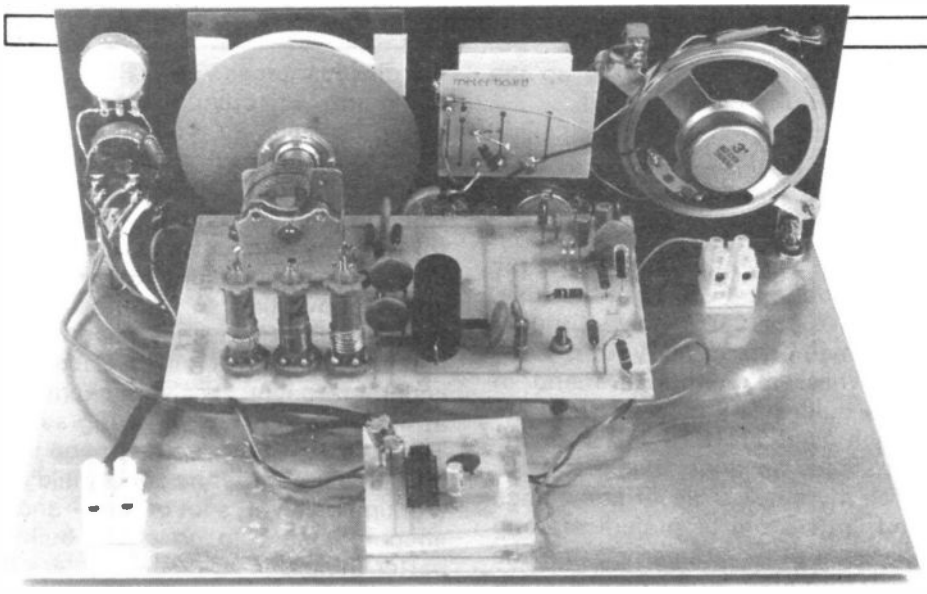
Particularly from the viewpoint of a poor schoolboy, the advantages of this approach outweighed the disadvantages. The TRF used a minimum of components, was cheap, simple to construct and easy to align, having only an absolute minimum of tuned circuits. One stage of RF amplification was followed by a detector and a stage of audio amplification. No worries about converting to 'intermediate frequencies', 'frequency changers' and all that clever stuff! Building superheterodyne receivers seemed at that time way beyond our grasp. The little 2m TRF gave my friend irrefutable proof that he could build a working receiver, a lot of fun — and encouragement to go on to build better things.

The aforegoing was not merely a trip down memory lane for me, but I hope will serve as a framework for this section of the review.

For the review I decided to erect the kind of antenna most likely to be used by a fledgling short wave listener, to whom I thought the FCR 130 would most likely appeal too. Thus about 18m of wire were strung out at about 6m high to a convenient tree. Noting that the manual stated a supply of between 9-14V could be used, the receiver was first connected to a 13.8V PSU I happened to have handy.

On switch on, the receiver,





although receiving very strong signals from European broadcast stations, seemed extremely unstable and prone to oscillation with the merest touch to the regeneration control. I also noticed that I was getting rather bad breakthrough from Radio 2 on the 12-30MHz range and that Radio 1 was obliterating much of the 1-6MHz range.

I live in North London only a few miles distant from the BBC transmitters at Brookmans Park which generate some 150kW of R1 on 1089kHz and 140kW of R2 on 909kHz. Not surprisingly, with an untuned aerial input and an untuned aerial, the receiver simply could not cope with all this RF.

Switching the receiver off, I discarded the 13.8V supply for a PP9 (9V) and connected a simple L match ATU between the aerial and receiver. On switch on, I found the receiver to behave in a stable fashion, the regeneration control having a fairly smooth and positive action and the signal strength meter, which previously had been permanently full scale, rested around zero with no signal and responded in an upward fashion when one was being received. So far, so good!

A careful tuning of the ATU to resonance, as I had hoped, produced almost complete rejection of the BBC breakthrough.

Down To Business

Broadcast stations bounded in, particularly between 6 and 10MHz. After a hour or so of generally tuning around. I decided to find the 40m amateur band. The tuning range of the receiver proved to be somewhat inaccurate, '40' eventually being found at 6.8MHz on the dial. That being said, considering the simplicity of the calibration this is not unreasonable. European and British stations were found on both CW and SSB, although the former mode was somewhat easier to resolve than the latter. Sensitivity seemed good, stations coming in at S8/9. Listening to a G4 in QSO with a Scottish station the strengths and shortcomings of the TRF were revealed almost simultaneously. Impressed by the strength of the signals and becoming engrossed in the conversation of the two stations, I was rather annoyed when they were both blotted out by a stronger Scottish station calling CQ. I soon realised that the apparent interloper was arguably some distance away in frequency from the QSO I had been listening too, as he was causing neither of the stations any difficulty.

Ergonomically Speaking

The main tuning control of the receiver is excellent, the action being positive with no trace of backlash and the 'feel' is better than many ready made shortwave receivers costing twice the FCR 130.

Resolution of SSB stations was rather difficult as the degree of regeneration (ie self oscillation) required seemed quite critical. Too much and a weak signal would be wiped out, not enough and a strong signal would be unresolvable. This process was complicated by the fact that adjusting the regeneration tended to shift the frequency of the receiver. There was thus a tendency to initially 'chase' SSB stations up and down in frequency when attempting resolution. After a little while though, you became used to assessing what degree of regeneration was needed for each level of SSB signal and once the signal had been nearly resolved on the main dial, final tuning adjustments were made with the regen' control!

The regeneration, AF gain, 'tone' and band change controls all operate positively and have matching, fairly chunky black aluminium knobs which blend in well with the satin finish black front panel.

Operational Conclusions

The receiver is straightforward to operate and is reasonably sensitive, particularly on the 6-15MHz range. The 15-30MHz range was found to be fairly disappointing in terms of stations heard, although this situation was not helped due to poor conditions in this region due to lack of solar activity and the breakthrough from my local MF transmitting station.

If you are an SWL looking for a receiver for serious amateur or broadcast band work then the FCR 130 is not for you. For someone who wishes to explore the shortwaves in general, with something they have built themselves, which will receive AM,CW and SSB modes of transmission the receiver is well-worth consideration. As far as the writers are aware, this is the nearest the present age can offer to the 'Hear All Continents' single valve receiver. With attention to the manual in particular and a general smoothing out of the rough edges, this receiver could become popular with the newcomer. For both the practical and impractical of us there is a magic all of its own of receiving radio signals on something you have produced with your own hands. Once this is experienced, the hobby can take on another dimension.

The Commutech FCR130 is available from Commutech (Devon) Ltd, Chapel Street, Holsworthy, Devon at £77.70 including postage and VAT. Commutech are presently re-writing the manual, have improved the PCB interwiring and have introduced turret tags for interconnections on the RF PCB, in line with the comments in this review. The reason for three PCBs is to give practice in interwiring.

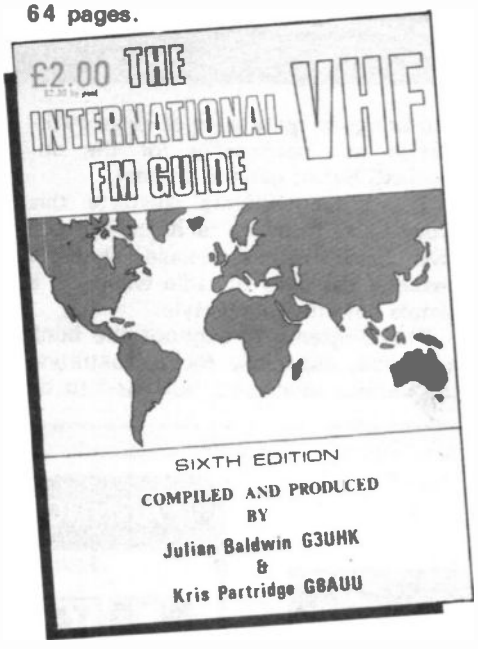
BOOKEND

RTTY TODAY
(First edition, 1984)
by Dave Ingram, K4TWJ, 112 pages
Published by Universal Electronics, Inc. of Columbus, Ohio, USA., soft covers.
Available at £5.40 including postage from Interproduct Ltd, Lynton, Stanley, Perthshire, Scotland PH1 4QQ

This is a new book, describing the well-established principles of RTTY but going further into the use of the computer with RTTY than has been mentioned in previous books. It might well be called 'A beginner's guide to RTTY' as it describes at the commencement, the very simplest type of RTTY setup that will function and goes right through the range of possibilities to a most exotic, completely computerised station. In between these extremes, the book describes in great detail the construction of a simple terminal unit and a suitable power supply. I must point out that this is an American publication, and as such describes American equipment, some of which is not available in this country. Please also note that the computer models mentioned are made for the American market and have different timing systems to those made for this country. If, therefore, these facts are taken into account, the book is certainly worth a place on the bookshelf, if only for the general information that is given within.

The author, Dave Ingram is a widely known and respected figures in amateur radio today and is active on all bands from 160 metres to 70 cm. In addition to broadcast engineering and teaching both elementary and advanced electronics, he has apparently written eight books, a large number of articles on amateur radio and so should be well qualified to give advice on the subject. Contents: Chapter 1 An Introduction to the world of RTTY (9 pp); Chapter 2 Operating parameters and concepts of RTTY (8 pp); Chapter 3 Straight talk on home computers (10 pp); Chapter 4 RTTY converters you can build (5 pp); Chapter 5 RTTY systems for home computers (22 pp); Chapter 6 Dedicated RTTY terminals and systems (25 pp); Chapter 7 Mini RTTY systems (12 pp); Chapter 8 A guide to RTTY action on shortwaves (15 pp). **Ken Michaelson, G3RDG.**

THE INTERNATIONAL VHF FM GUIDE
(6th Edition)
Compiled and Produced by Julian Baldwin, G3UHK, and Kris Partridge, G8AUU.
Published by the UK FM Group.
64 pages.



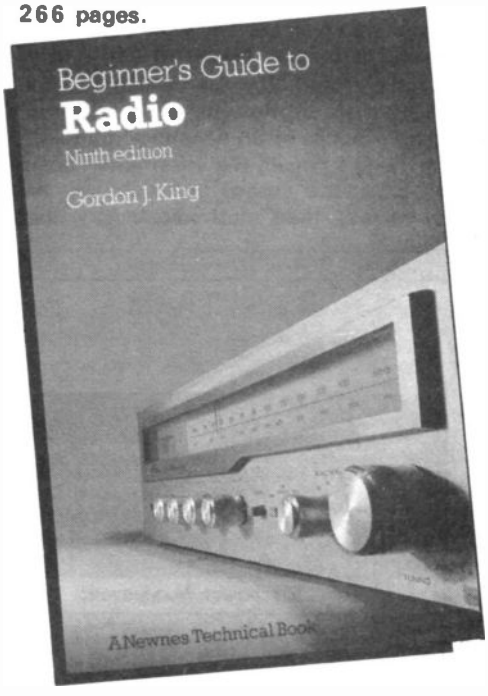
This A3 sized book gives you much more information than even the ambitious sounding title suggests. Not only does the book tell you the frequencies of 2 metre FM repeaters from Andorra to Argentina and Hong Kong to Hungary, but contains a wealth of reciprocal licencing information, covering some thirty-five countries. As far as I am aware, no other comparable compilation of reciprocal licensing information exists anywhere other than in this slim paperback. Among the more esoteric information I noted the existance of a 2 metre repeater in Papeete, Tahiti which could doubtless be useful if I can get the Chief Executive to give me a decent pay rise.

Among the other information is a worldwide beacon listing (from 28 MHz upwards), VHF and UHF simplex and repeater channelisations for IARU region 1 (that is, Europe) and a page devoted to each operational UK 2 metre repeater. Brief details are also given of the new QRA locator system, designed by G4ANB, and due to come into use at the end of this year.

All in all, an excellent purchase for the VHF person and for the HF operator who holidays or travels abroad.

The book can be obtained, price £2.30 by post, from G3UHK at 41 Castle Drive, Maidenhead, England SL6 6DB and is also available from many dealers.

BEGINNER'S GUIDE TO RADIO
By Gordon J. King
Published by Newnes Technical Books
(9th Edition)
266 pages.



This reasonably sized paperback is exactly what it claims to be — a beginner's guide aimed at an informed reader. It is thorough in its explanation and would be a very useful book to read whilst studying for the RAE.

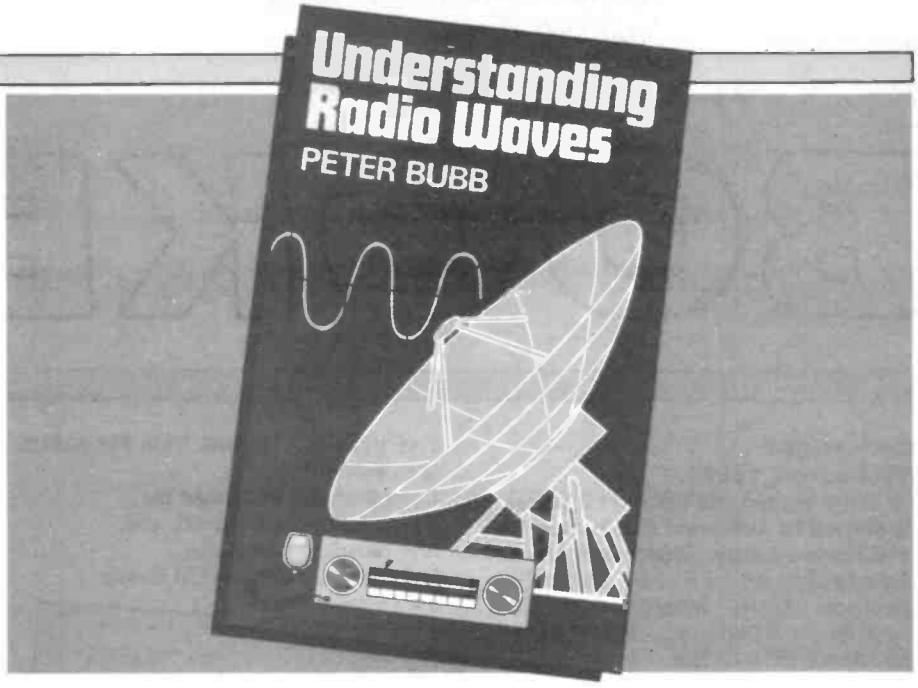
However, it is a very scientifically written book: each section needs to be understood before going on to the next section. But this cumulative knowledge building does provide a considerable base for an enthusiast.

There is a very useful description of components and circuitry, but this is not a constructional book despite being an excellent guide for anyone starting out. It is not confined to amateur bands, discussing independent television and BBC transmissions, although not to any great depth. Mr. King also brings the book up-to-date with a chapter on CB

licences and equipment.

Throughout this well-written book there are some excellent diagrams that are clearly linked to the text. This makes for an informative, interesting and particularly useful text-book for anyone doing any kind of course in radio. **G1CKF**

The book can obtained, price £4.50 from most bookshops.



UNDERSTANDING RADIO WAVES
By Peter Bubb.
Published by Lutterworth Press (1984).
76 pages.

This book provides a taster of the variety of uses for radio waves and is written as a reading book rather than as part of course of study. It is much more historical in aspect and description (by analogy) of many of the points made in the previously mentioned *Beginners Guide to Radio*.

The earlier chapters cover the scientific aspects of electricity through to radio transceivers (!), with some very useful summary tables at the end of each chapter. However, these chapters are not so clearly written as in Gordon King's book, often seeming 'muddled'. In trying to make the information easier to read, the author unfortunately has been less than methodical. Mr. Bubb also brings in quite a lot of extra information not necessarily for the enthusiast, but of general interest.

The latter chapters illustrate this move away from the technical but still give basic details. These chapters describe the uses of radio waves in a simple but interesting style.

The diagrams throughout the book are good, especially those illustrating the various analogies, but need to be linked to the text in a more explicit way. There are also some quite useful appendices.

This is not a book that will get an aspiring amateur through the RAE. But it will entice the curious, but unknowledgeable, would be enthusiast to want to know more, and supplies the information very well.

The book can be obtained, price £8.50 from all 'good' bookshops.

IC Update

The US semiconductor giant Signetics has designed a most useful pair ICs for use in portable NBFM radio applications. The first of these, the NE602 double balanced mixer/oscillator chip will cover a far wider area of use. It operates from DC to 200 MHz, shows a 5dB noise figure, consumes just 2.5mA and requires the absolute minimum of external components. These characteristics make it suitable for everything ranging from VHF front ends through to really low power SSB exciters from HF R/T sets.

HRT keep you abreast of the latest IC radio technology with this occasional column. The Signetics NE602 and 604 have great possibilities...

The second chip is slightly more limited in application although it is exceptionally effective in the intended use. The NE604 low power (2.5mA drain) FM IF system incorporates a pair of limiting amplifiers (1.5uV input sensitivity at 455kHz) a muting system, dual quadrature detectors, logarithmic signal level indicator/mute driver and voltage regulator.

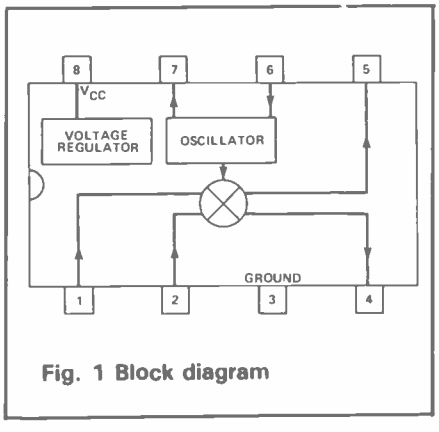


Fig. 1 Block diagram

Fig.1 shows the block diagram of the NE602. Like the IF chip it was designed with cellular radio in mind mainly as a second convertor from the first receive IF. Although it happily mixes down (or up) frequencies to the 200MHz mark, it was originally intended to mix the 45 MHz output from a crystal filter. down to 455 kHz for amplication and detection in the NE604. Particularly useful is an on-board crystal oscillator which will operate in either fundamental or overtone mode. A suitable choice of inductance associated with pin 7 should allow 7th overtone crystal operation to 140 MHz.

Circuit Description NE602

This chip uses an active double balanced mixer. The RF input port, (pins 1, 2) can be used in either a symmetrical or unbalanced configuration. The RF resistance between these pins is typically around 1.5k shunted by 3pF. When used as a single ended input, one of the two input pins must be grounded to RF with a bypass capacitor. The bias components are internal to the chip and there should be no DC connection to ground. A DC path between pins 1 and 2 is in order however.

The on-chip local oscillator is an emitter follower type and can be connected in many different ways. Pin 6 (transistor base) and pin 7 (emitter) do not require external bias circuitry. An external local oscillator source such as a synthesiser VCO can inject a signal directly into pin 6.

The NE602 output pins can be used in either single or push-pull mode. There are internal 1.5k resistors which connect to Vcc and there is therefore no requirement for external DC connection. A DC path may exist between pins 4, 5 and Vcc. A typical circuit is shown in **Fig. 2**.

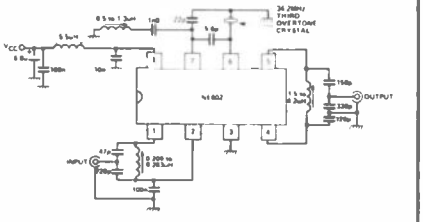


Fig. 2 Typical circuit

Circuit Description NE604

The operational block diagram of the chip is shown in **Fig. 3**.Both the first IF amplifier block and the subsequent limiter amplifier have a bandwidth up to 15 MHz although operation is only specified to 10.7 MHz. The original application envisaged an operating frequency of 455 kHz. The overall gain of the amplifier and limiter is 30 dB and 60 dB respectively. Input impedance of these blocks is 1.5 k in each case while the output impedance of the first amplifier is 1 k. Th quadrature (pin 8) is in the region of 40 k. This enables direct NBFM demodulation at 10.7 MHz.

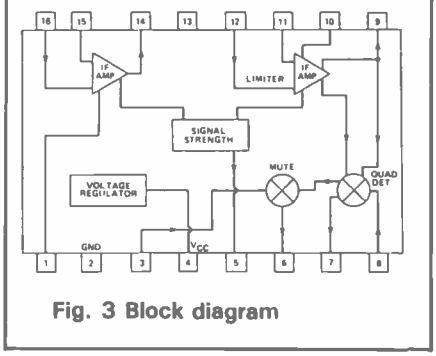


Fig. 3 Block diagram

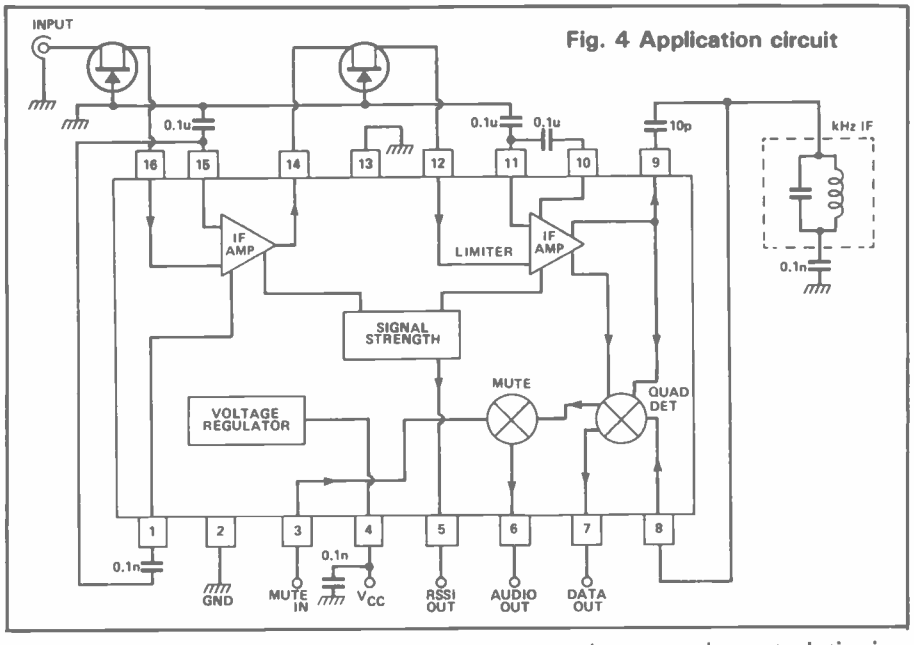


Fig. 4 Application circuit

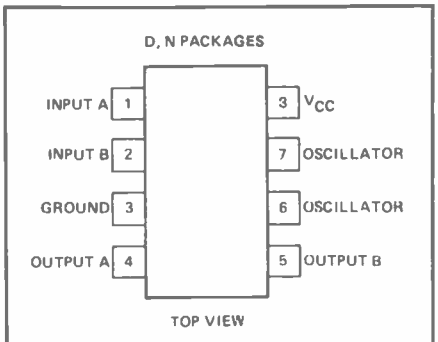


Fig. 5 Pin configuration

This characteristic is very similar to the now discontinued but excellent SL6650 circuits from Plessey.

There are two audio outputs, one of which is muted by a logic level voltage applied to pin 3. The other — as intended by the original application — provides an unmuted output for a tone decoder. Both AF outputs have a characteristic impedance of 50 k with 180° phase shift between them.

The logarithmic signal strength indicator is a current source output with a maximum of 50 microamps. The transfer function is approximately 20 dB of signal strength for every 10 microamps. The log response of the circuit is independent of IF frequency. The log circuit has been designed to take account of a 6 dB loss in the interstage filter. The circuit has enough accuracy to make the perfect basis for a log reading meter/detector circuit.

Signetics' application circuit is shown in **Fig.4**. Note that pins 1, 16, 15, 14, 12, 11, 10, 9 and 8 do not require external bias and should not have a DC path connected to them. These circuits may be purchased through Mullard/Signetics IC distributors. Price is yet to be announced.

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Wanted manual for Eagle Rx 80 receiver cash, copy or loan. Also 44MHz crystals for 144-148Mhz band receiver or VFO for same. Contact DeWynter, 21 Woodside, Wimbledon, SW19.

RTTY exchange robot model 800 dedicated RTTY CW slowscan terminal unit for BBC Model B computer excellent with manual leads etc. Originally cost £680. Sharp MZ80A computer with manual mint condition £199 for quick sale. G6GUW Witsend, Stillington, North Yorks. Phone 0347 810066.

Datong PC1 converts any 2M multimode into superb general coverage receiver, 0-30MHz in thirty synthesised bands of 1Mhz. No receiver mods required. Plus Amtech 100 ATV and SEM Ezitune for perfect S.W.L. station £130 01247 6097 daytime.

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Amateur radio and CB worked very successfully together on a special event station in Sutherland for the 'Highland Scanner Appeal', as previewed in July 'Radio Today'. Many contacts were made on HF and 2m and 27MHz FM. Shown above is the CB station with some of the operators.

Swap memorizer FT227RB 2M FM mobile rig, Micronta 9501 oscilloscope, heat sinks various sizes for any good quality VHF/UHF scanner SX200N or similar.Also will consider 934MHz Tx/Rx and associated equipment as alternative. Willing to make cash adjustment. Telephone 051 531 7497.

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Radio vlaves for sale 5 5B/254M £3 each, or £10 the lot. Postage extra. G3SVO tel. Chelmsford 76129.

Microwaves modules MM2001, RTTY to TV converter. Connects between receiver and TV to display 64 character 16 line RTTY/ASCII. Eight selectable baud rates, LED tuning indication, little used, complete with plugs. £145. Phone 0247 473759 after 6pm.

Barlow Wadley portable receiver 500KHz to 30MHz £60 + postage. P.R. Shepherd, 5 Barnard Close, Chislehurst, Kent 01 467 2023.

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Electric diagram scanner AR2001 £3. Xerox copy of service manual, £7. Air and meteo code manual, discloses those RTTY 5-figure transmissions and others £11. I5XWW Crispino Messina, Via di Porto 10, 50058 Signa Fi, Italy.

Yaesu FT101ZD, FC902 YD 148 base mic, YH55 headphones £420. Ring Chesterfield 454852.

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Trio TR9130 25W multimode 2M transceiver mic etc, boxed £290 BNOS LPM144 — 25-160. Linear amplifier. 25W in 160W out mint £130. 1COM 255E 2M FM transceiver 25W vgc £140. Yaesu FT227RB 2M FM transceiver mic, £130. Telephone 0305 786930.

Wanted Helford G4CLG board, crystal filter not required. Or working Helford HW7 HW8 Argonaut 405. Sale KW E-ZEE match £26. Mr Grieveson 30 Rozel Court, Beck Row, Bury St. Edmunds, Suffolk IP28 8AX.

Wolec legal radio mic pocket transmitter mains receiver 174,8MHz £125. NRD NDH515 24 channel memory unit £125. Racal diversity unit MA168B manual £45. Nombrex signal generator type 31 £15. Iskra unimer 3 multimeter £9. Decade attenuator at 201 0-111dB. 600 £12 Tel. 0704 840328.

Wanted FT225RD or IC251E must be in good condition, cash available, will collect or pay carriage. Chris Kelland 40A Kingfishers, Grove Village, Nr Wantage OX12 7JN. G6LRY. PHone 023 57 2205.

For sale SB-75D frequency meter 0-30 MHz — 9999.9kHz 12V DC £30. Alan Mather 11 Allenby Rd, Cadishead, Manchester M30 5FA.

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