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AN ARGUS SPECIALIST PUBLICATION
JUNE 1986 £1.20

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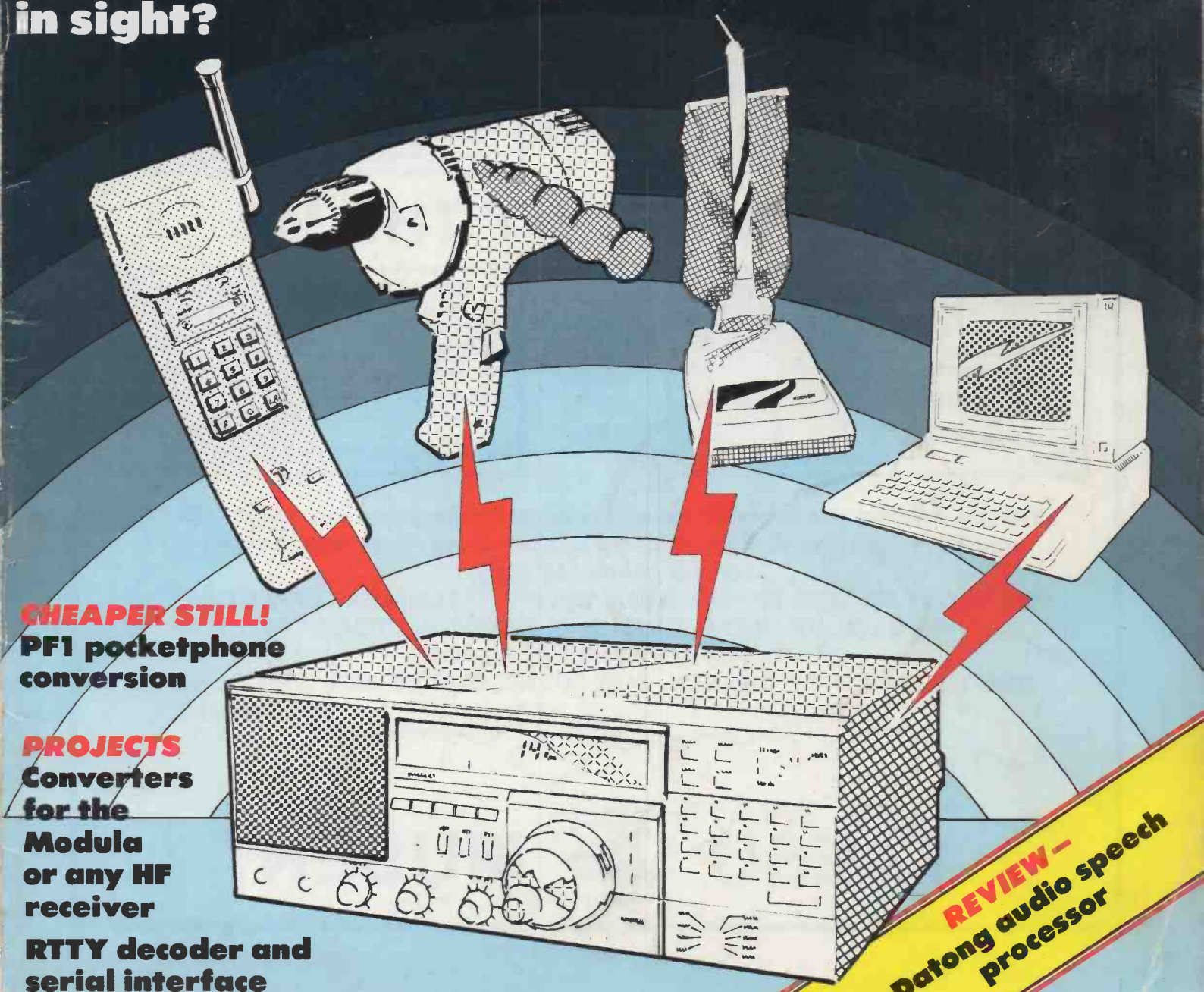

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HAM RADIO TODAY

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LETTERS

AMATEUR RADIO IN THE WORLD

Sir, Your readers may be interested in a practical example of what is sometimes represented as the entrenched conservatism of the world of amateur radio.

Last year, on May 25th, the Frensham Heights School Amateur Radio Club celebrated the school's 60th anniversary with a day on the air. Working on 15 and 20 metres, six operators mounted a 12 hour sponsored contest. We raised £300 from staff, pupils and parents, but rather more significantly we made contacts with a licenced aid official in Sudan (ST5ALR, Alastair Scott-Villiers). Through this contact we are now financing a crop planting project being implemented by three schools in drought ridden Kordofan Province.

From this link up there developed the notion of an international network of radio amateurs raising money for aid and development work. Through the medium of amateurs in the Third World, contact would be made with local small scale projects and funding would be made available. There emerged too the idea of regional and school radio clubs adopting specific aid projects under the general aegis of the aid organisations. On a more general basis the feasibility of national and international DX contests, sponsored by "off-the-air" subscription, organized to raise money for Third World projects was considered. Following in the wake of Bob Geldoff's mighty exploits, the title Radio Aid was mooted. A wag amongst us later abbreviated this to RAIDIO.

In order to test the practicability of this loose knit, rather "brain-stormed" plan, we contacted the aid agencies for comment and advice. Only three of them responded; Save the Children had little to say, but Oxfam and Help the Aged were cautiously encouraging and asked to be kept in touch. Meetings with Alastair Scott-Villiers (now Band Aid Field Director) were very useful too. The RSGB made some helpful observations concerning licensing regulations, but we heard nothing from RAYNET rather surprisingly. Finally we took guidance from a professional project evaluator, experienced in assessing the viability of aid schemes. From him we received a generally positive assessment of the RAIDIO scheme to which he added some ideas of his own.

It only remained now to introduce the scheme to the world of amateur radio. We circulated 46 amateurs in the Third World, many of them in missions, schools and scout clubs. We then circulated a selection of regional radio clubs, school clubs and individuals in this country, outlining the scheme and asking for help and advice as to its further development. We then sat back to await the response.

There was none. We received not one single reply to our circulars. To date there has been total silence from the amateurs in the Third World and the clubs and individuals circulated in the United Kingdom. This has been acutely disappointing; we had such high hopes for a scheme whose general potential seemed enormous. At the very least we had hoped for a critical response. We were aware of flaws and urgently needed some perspectives from the outside. What we weren't ready for was complete indifference.

In recent weeks it has been difficult not to become cynical. The radio amateurs resistance to new ideas is legendary, but so callously unimaginative a reception to a scheme which, for all its flaws, seeks a practical manifestation of "nation talking unto nation" has been very depressing. One has to ask: is the amateur radio community really so absorbed in the minutiae of home-brew construction, computer software and contest working that it is deaf to the real communication possibilities of the medium? Is it so insular and conservative a community that printed circuits are more important than people?

We urge that as a matter of priority, our fellow radio amateurs take a little time from the discussion of novice licences and 2 metre morse to consider the larger potential of amateur radio. And if that sounds priggish, put it down to an overwhelming sense of frustration at the imperturbability of the operators of the greatest communication medium ever devised.

If anyone out there shares that frustration, contact G4FHR at Frensham Heights School, Rowledge, Surrey GU10 4EA.

Dick Jones, G1JCD.

THE 1st COMMANDMENT

Sir, Regarding the article on converting Pye Westminsters in HRT March 1986. I am amazed at the sacrilegious advice that should the constructor own the incorrect Westminster he should throw it away! This surely breaks the first commandment of amateur radio "Thou shalt hoard everything 'til thy garage will burst".

Seriously though, there are a lot of good uses such Westminsters (and others) can be put to. The Air Training Corps run a radio network and as such are always short of suitable VHF Low Band AM equipment. Donations of such equipment (and any similar AM/FM equipment for 148-154MHz, 435-436MHz and 3.5-7MHz) would always be welcome at your local Squadron. Also help with Instructing/Servicing etc would always be appreciated.

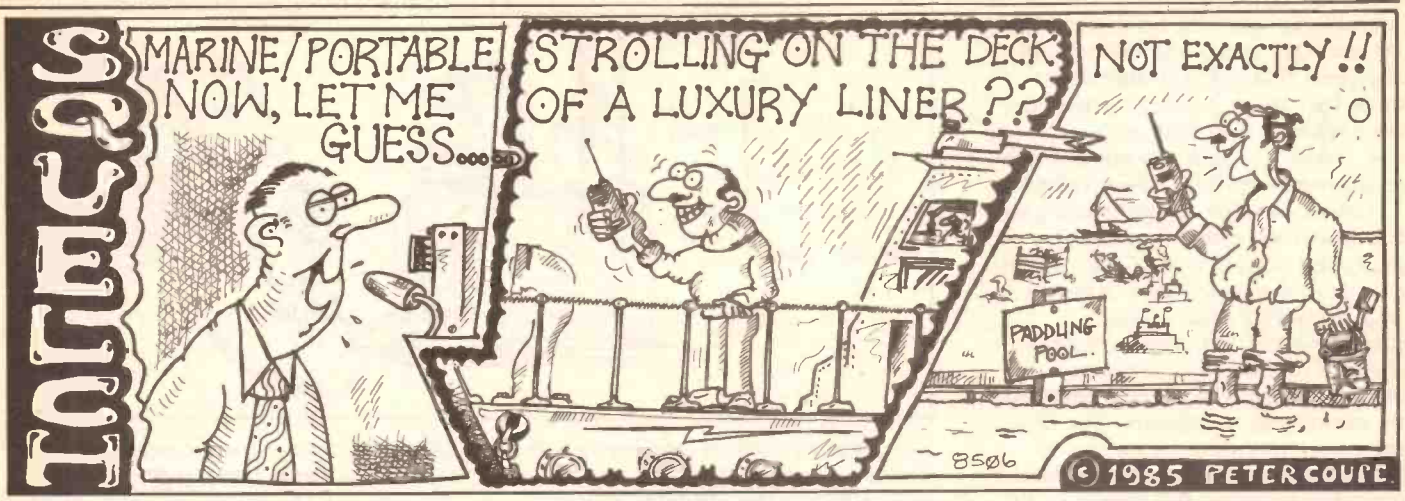
Martin Lines

RAE SWIPES BACK

Sir, The criticism of the RAE by your contributor to 'Sideswipes' in your April issue is meaningless unless he is able to quote specific examples of "deliberately obscure" and "Kafkaesque" questions having "suspect technical basis". Furthermore, the tone of his article is very much in accord with the sort of excuses one hears from candidates who have failed the exam or think they have!

With regard to the publication of past papers. The number of questions that can be set to cover the syllabus is limited and probably consists of a bank of about 120 basic questions. These can to some extent be reworded, but publication would soon render the exam pointless.

As to the RAE being a "laughing stock" it should be noted that quite a number of vocational qualifications are gained by multiple choice exams of very similar format to the RAE — for instance the C and G Electronic Servicing Certificate and others. Also



the Americans use a similar format for their RAE equivalents as do other administrations. One doesn't notice US amateurs having contempt for their system, and industry in this country certainly respects the quality of qualification represented by the C and G exams.

As one who runs a very successful private RAE course with a 100% pass rate last year and with 13 candidates well prepared for this May's exam, I feel that I am reasonably familiar with the level of knowledge required to obtain a pass. I can assure your writer that the "loud mouth and pin" approach with which he seems so familiar would not be likely to assure success.

I would venture to suggest that if the RAE were to be raised to the level of a vocational qualification, as he advocates, then the number of passes would be considerably lower than it is at present. There would probably be an insufficient readership to support the publication of the several amateur radio magazines that are on the bookstalls today and he may find himself without a tub to thumb.

With reference to your correspondent, Mr Richards, he would seem to have been misled, the pass mark for the RAE in common with many other public examinations is about 40%

L N Buck, G0DLR.

As an article published in May 1986 HRT pointed out the US system of examinations is radically different from the RAE and does not allow easy comparison between the two. For example, Mr Buck, they do use multiple choice questions but they also publish the questions, answers and even the so called distractors. What you along with many course tutors may have found, that a certain amount of valuable teaching time must be spent explaining the technique of answering multiple choice questions.

MODULA ON THE SHORTWAVES?

Sir, Regarding the article on the Modula HF Receiver. I am an active shortwave listener who also enjoys construction and modifying electronic equipment, receivers etc. I bought your magazine hoping perhaps the Modula was not just another receiver dedicated to amateur bands only with SSB and CW reception, but it was!

Pity because I am searching for a diagram to enable me to construct a receiver like the Modula, but with converters that will bring in SW broadcast bands, (my favourite DX area is 90 and 60m) and maybe even MW! The reception on these bands requires very selective and sensitive receivers with good dynamic range to cope with the high QRM levels, but the only circuits I have come across are for 'novelty' general coverage beginners sets with no digital frequency readout and no selectivity etc.

So what about it HRT, why not capture a few constructing SWLs to your readership, and you will be the only magazine to cater for SWL tastes with some decent circuits.

Steve Parry.

The first problem with what appears to be a quite simple project is that all the SW broadcast stations use AM, something radio amateurs gave up sometime ago. However, we hope to be publishing in the near future an AM/FM adaptor which will work off of any transmitter/receiver with an IF on 10.7MHz. Once you've got the AM receiver, there are no problems making the convertors for the bands you want to listen to. Although, if you want all the trimmings as well, this can get a bit complicated. Digital readout is available on the Modula and since your selectivity is only as good as your receiver and the Modula gives superb reception . . .

Finally, a magazine is only as good as its authors so the challenge has been made, can you help?

TARNISHED COUNCIL?

Sir, The news item in your April issue regarding the 1987 RSGB President misses some important points.

1. Why has the RSGB announced the election of G8VR as executive vice-president in Radcom but concealed the "election" of Mrs Heathershaw from the membership? This typifies the obsessive Masonic secrecy which pervades the way the RSGB Council conducts it's affairs.
2. The only other person to hold the post twice during the last thirty years was John Allaway in recognition of his outstanding service to amateur radio worldwide. Whilst Mrs Heathershaw may have been a good ambassador for amateur radio in the UK, she is clearly not in the same league as G3FKM.
3. It is a very sad reflection on the members of Council that none of them saw fit to propose any other candidate since unanimous votes are always suspicious.
4. I can confidently predict that for 1988 a "prestige" President who has only a very nebulous connection with amateur radio with be "elected" to celebrate the RSGB's 75th anniversary.

I urge members to lobby the RSGB Council to correct the damage that has been done to its public image before it is too late.

Peter L. Crosland, G6JNS.

If one can determine public opinion by our post bag, it seems, Peter, that no-one gives a damn about the RSGB presidency.

TALKBOX SOLUTION

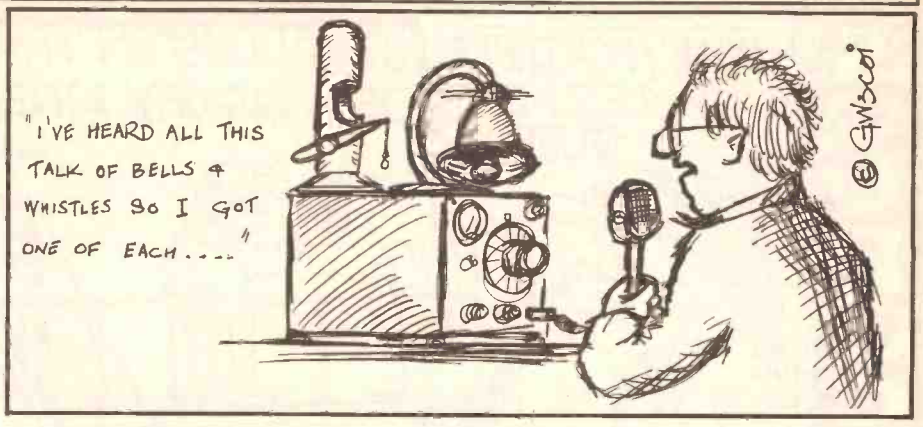
Sir, Further to my letter (published February '86 HRT), in which I refered

to problems with the front end FETs (Q1 and Q2) in the FM Talkbox 2m receiver. I thought you may like to know that these problems have now been resolved and that the receiver is now working. Thanks to some timely assistance from Tony Bailey, G3WPO.

The problem of apparent low gain, was found to be due to parasitic oscillation of both 3SK85 transistors, in spite of the use of ferrite beads on their respective drain leads. Substitution of the correct device (3SK60) cleared this particular problem. Work is now proceeding on the associated transmitter. The only slight difficulty that I have had to overcome is that I have had to file down the edges of the boards to fit them into the box. This is not easy after the boards have been assembled, so check beforehand.

Another useful tip, whether building from kits or otherwise is to lay out all the components on a large sheet of white card and then tape them down. Each component can then be checked for type, value and tolerance where applicable this information is written immediately adjacent to each component on the card. By reference to the circuit diagram and/or component list, each item on the card is then assigned its component reference number, which is also written on the card. This serves as a cross check to ensure that the correct devices are used when assembling the PCB.

Dennis Hickman, GW4ZTE.



SHRINKING PLANET?

Sir, You greatly improved the appearance of my Oscar 10 orbit chart before reproducing it on p36 of Dr Gee's interesting article in the March 86 issue (Working Oscar 10). What a pity that you somehow decreased the diameter of the earth in the process. Fortunately anyone wishing to use the chart need only redraw the earth circle in the same position but about one sixteenth of an inch greater in radius.

Although drawn in 1983, the chart is still sufficiently accurate for most purposes today. Up to date values of apogee and perigee are given in 'Oscar News' and in the weekend bulletins from Uosat Oscar 9. They are about 35, 350 and 4100km at present. Eccentricity is still about 0.6.

Harold Meerza.

Please address correspondence to:
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AN INVITATION TO

STRAIGHT KEY EVENING

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80m CW on Thursday 29th May

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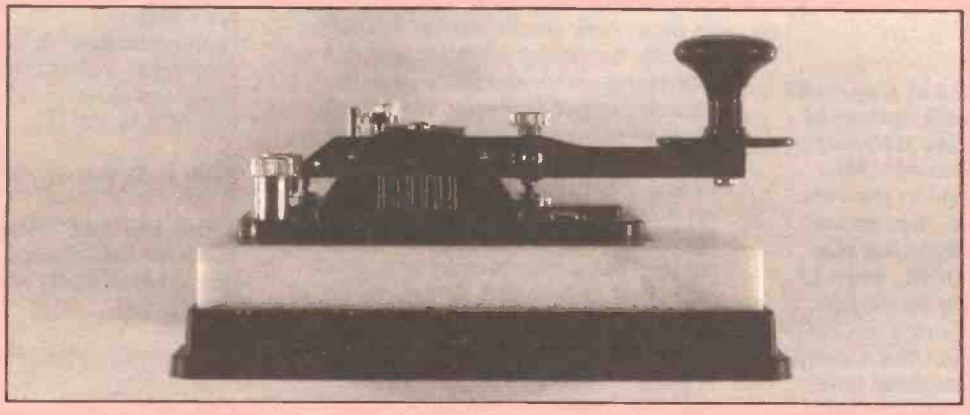

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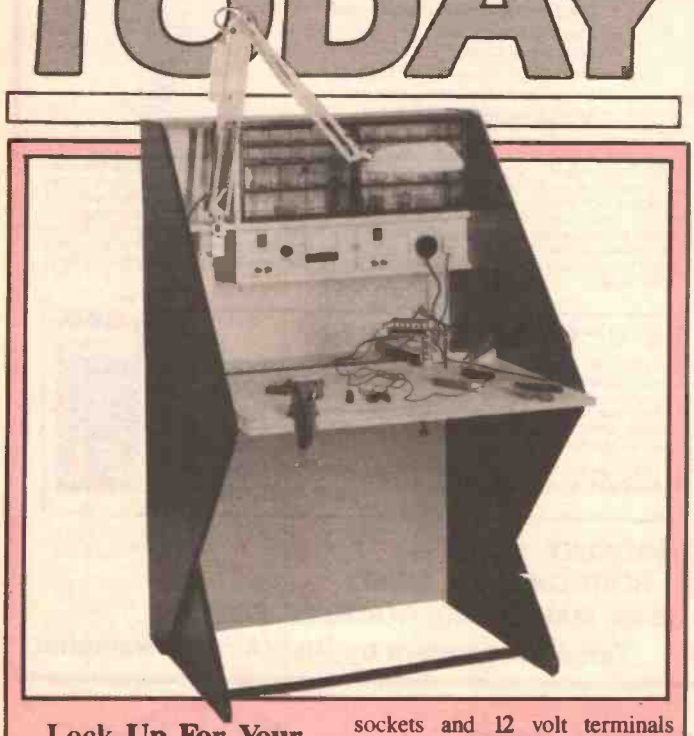
RADIO TODAY

The winner of our competition for a Kenpro KT400EE 70cm handheld is R D Sexton of Dursley, Gloucestershire.
The answers were A F H K M P.



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The desk retails for £220 plus VAT with attractive discounts for quantity and trade purchases. For further information and detailed specifications, please contact R. O. Baxter, Elek Ltd, PO Box 32, Winchester, Hants SO22 5LX (phone Winchester 0962 56452).

More Power To Your Mobile

Want a bit more power than a 2m mobile rig at a very reasonable price? Well, ICS Electronics of Arundel who import the Alinco range of Jap amateur equipment, are now marketing the ALR206E which offers a compact 25W on high power, 5W on low. It also has ten memories and scan facilities on both the band and the memories all of which are operated from the keypad on the microphone. All this for the princely sum of £295 including VAT.

ICS have just received the linear amplifier for the handheld ALM203E which should boost its power to 30W and gives 10dB gain with a GaAsFET preamplifier. The linear plus handheld combination including the connecting lead cost £249.95 inc VAT and ICS can supply more details on (024 265) 590.

Coupled For Life?

The Amcomm 9000 antenna coupler is produced and marketed by the new 'conglomerate' of the amateur dealer world Amcomm/ARE. The unit uses a capacitively tuned T network and 1:4 toroidal balun to enable you to connect a low impedance (50-75) ohms transmitter output via 300 ohm balanced feeder to your antenna.

The coupler will tune from 1.7 to 30MHz with selection by means of a twelve position 'inductor' switch. The 'tune' and 'load' capacitors can be adjusted during operation to obtain minimum VSWR and can have up to 100 watts put through it. The unit costs £89 and is available from Amcomm/ARE at 373 Uxbridge Road, Acton, London.

Special Events

GB4LF will be operational during the fifth annual Llantrisant Festival on the weekend of 4/5th May. It will be using SSB and CW on 80, 20 and 2m from 10am until 6pm on each day. There will be a special QSL card available and SWL reports are also welcomed. The organiser, GW3POM can be contacted on (0443) 224532 or at 8 Coed yr Esgob, Llantrisant, Mid Glamorgan.

GB6STJ will be on 2m and possibly on 70cm on 18th May from St Johns Middle School, Kenilworth (locators IO92EI, 2M53H and SP27) for the May Fair. G1HGD will be operating the station from 0900 to 1600 and can supply further information from 11 Lancaster Place, Kenilworth, Warks.

Lerwick RC will be operating GB0OS from Housay Island in the Outer Skerries group, part of the eastern Shetlands. The club will be on the air continuously from 24th May to 1st June on all HF bands, 2m and 70cm using FM, AM, SSB, CW, RTTY and FAX. Their equipment includes eight transceivers, two computers, three 60 foot trailer masts plus an impressive array of HF, VHF and UHF antennas. Although they will be putting out about 100 watts (except on 160m) for most of the time, there will be periods of specific QRP operation.

The QSL cards the station will supply have been provided by the Shetland Island Tourist Organisation and illustrate ten different aspects of Shetland life. Further details can be obtained from GM0AVR on receipt of an sae to 4 Ladieside Brae, Shetlands (phone 080622 406).

Another island venture comes from the Binstead ARC who have informed us of their Isle of Wight award. All you have to do is contact ten stations on the island including the club station GOBAR for the VHF award, only five contacts (including the club station) are needed for HF. Send the details of your contacts with £2.50 to QSL/Awards Manager G1BZC, 4 Green Street, Ryde PO33 2QE.

RSGB NATIONAL CONVENTION REPORT

The RSGB's National Convention took place at the National Exhibition Centre, Birmingham on 5th and 6th April. As Trevor Butler, G6LPZ, reports, this year saw discontentment from visitors, traders and even the organisers.

Hall 3A once again housed the RSGB's main rally of the season. All the big names were there, plus a large flea market for components and second hand items, a programme of lectures, on-the-spot morse testing and a large RSGB Stand with smaller ones for the committees. Talk-in was performed professionally by the local Raynet group, who also advised on traffic problems and areas to avoid.

The entrance fee of £2.50 for adults (half price for children) upset a number of exhibitors. One told me that while anyone determined to attend would, the price deterred those who might have otherwise gone and bought on spec. He went on "This is about a £1 or £1.50 too much, other rallies are not so expensive." What is the answer? It was suggested that a smaller hall would be adequate. In such a large environment, much of the atmosphere associated with amateur radio rallies was lost. The whole thing was too modular, each stand was like a separate little shop, with no overall hustle and bustle.

Whatever the problem, it has been estimated that the numbers attending were some 1000 less than on the Saturday last year and 1500 down on the Sunday, with all the major retailers reporting a lower takings figure than last year. The organisers declined to confirm or deny these estimates.

Organisational Problems

The RSGB came in for some criticism of its organisation of the show. One importer told me he was still receiving paperwork connected with the exhibition as late as the day before it opened. In some cases, the car park passes were sent out so late that traders had already arrived in the Midlands as the passes arrived at their offices. On arrival at the hall on the Friday, stands were half built, electricity, in a number of cases, not connected and telephones not working.

Provisions for exhibitors were reported as fair to poor. A small bar was provided, but only limited catering facilities were available. Visitors to the show were often queueing for up to 30 minutes for the hot food counter although the bar seemed to do a roaring trade.

Anyone expecting a catalogue of who was there, facilities available, lecture programme etc was in for a surprise. They were given a free folded sheet, that was, in some places, illegible. Traders were hoping for a smart catalogue and many offered to buy space in such a publication. When it became clear that the organisers were not going to provide one, Thanet offered to organise its publication. This offer was refused.

It was not a good weekend for those fine men from Herne Bay - their stand was still being built two hours after the show opened. They had some carpet laid to add a professional touch, only to discover that the hall floor was painted, and the wet paint was trodden onto their stand! In the view of a director, it was truely an 'amateur' exhibition, in every respect.

Morse testing was available in a side room. It had been announced that with effect from April 1st, the RSGB would operate the morse testing service. The fee at the NEC was £7 - the same as the Society intends to charge. This compares well to the £15 British Telecom used to levy. The £2.50 entrance fee had to be paid on top of the fee and some of those leaving the test room were heard to mumble things about being kept waiting two hours and of a poor tone generator which was off putting.

Three experienced, professional morse examiners (who were all licensed) conducted the tests, and saw 86 candidates, of which some 78% passed. The Society's plans call for three candidates to be seen every 30 minutes, with two examiners present at any one test, one to conduct the examination, the other as a witness and to handle the administration.

Theft of Goods

Several of the traders suffered from petty pilfering and some from extensive theft of valuable equipment. Garex are known to have had two scanning receivers stolen over the two days, in broad daylight. What worried others was that their stands were raided overnight while the exhibition was closed. Lowe Electronics lost two radios, valued at £500, between leaving their stand last thing on Saturday evening and returning at 0815 on Sunday. They also sustained losses during the day - even equipment fixed down and alarmed was taken. ARE Communications' stand was visited during Saturday night and a number of things moved. They are now taking stock to see if anything went. The RSGB have said that the NEC security was "next to none" and anything taken from a stand was, unfortunately, entirely the traders' responsibility.

The series of lectures were well attended and one report mentioned "saturated", which is an encouraging sign. Indeed, it is believed that the RSGB would be willing to mount such a series of lectures if another organiser could be found to stage the main event. This may be the likely outcome, for although the RSGB say it's too early to announce accurate attendance figures, they admit that numbers were down. While hall space has been provisionally booked for next year, it is too early to project the future of the convention. Certainly more and more of the major importers are, this year, more doubtful than ever about returning, and they intend to meet and discuss the position.

As one exhibitor explained, with stands costing £3500 plus £300 for electricity and £175 for tables with ten men working for three days at 15 hours a day, often at overtime rates, it is not a viable financial proposition. Another put it as a PR exercise, to fly the flag and not a business success in terms of pounds in the the pocket.

The RSGB told HRT that they thought several factors lead to 1986 being a poor year. The abysmal weather, it snowed on the Sunday, the closeness to Easter and that the VHF Convention near London had just passed. This meant that many from the South East did not travel to Birmingham. Whatever else may be said, this year may well be the last time the NEC will see the RSGB National Convention.

US Testing Over Here

Readers of G3ZAY's recent article on US licensing may like to know that a number of US voluntary examiners are working in the UK and have expressed a willingness to arrange FCC tests over here for anyone planning a US visit. Although UK class A amateurs can obtain a US reciprocal licence, it does not allow them access to the upper half of the 2m band over there, where many of the local repeaters are to be found. A full licence gets around this problem. Further information is available from the Membership Services Department, RSGB, Lambda House, Cranborne Road, Potters Bar.

A Memorable Star

Dewsbury Electronics seem to have quite a success on their hands with the Star Masterkeyer. They have just brought out a new model with the most requested modification — a memory. Called the Starmasterkey CMOS Memory keyer, it has eight 50 character memories with automatic repeat on one memory for CQ calls and such like. You can load the memory off air from a paddle key and the memories are retained throughout the life of the four AA size batteries. These are supplied with the unit which costs £95 inc VAT. If you want to know more about the key, ring Dewsbury on Stourbridge (0384) 390063.

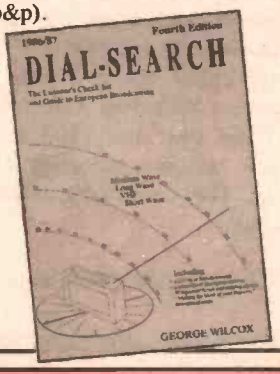
NDXE Global Radio

Ear, Here!

We have heard more news of NDXE, the new station mentioned in last month's Listening On... column. The programming will include live concerts, sporting events, worldwide phone-ins, news, international weather and pop music. To ensure 'quality transmissions' they will be using a "100kW stereo shortwave transmitter and 100 foot rotatable log periodic antenna" to deliver "three million watts of power". The station will be giving away three dimensional QSL cards amongst other things, and hopes to be on the air from 4th July. if you would like to know more about NDXE, write to the headquarters at PO Box 569, Opelika, AL36801, USA.

Two books have just come onto the market specifically for the shortwave listener. The first is the fourth edition of Dial Search by George Wilcox. George has designed the book as a listeners checklist and guide to European broadcasting and is an essential reference for UK listeners. The book includes two "unique" maps; MW and LW lists of European stations that can actually be heard in the UK and their operating times and languages spoken; and the music notation of 80 signature and interval tunes. The book costs £3 plus 30p p&p and is available direct from George Wilcox at 9 Thurrock Close, Lower Willingdon, Eastbourne, East Sussex BN20 9NF.

The second book comes from our sister company, Argus Books, and is called Scanners by Peter Rouse, GU1DKD. As a reference guide to the scanning receiver user, it covers not only the equipment — what it does and how to use it — but also has several chapters on communications theory and practice. The book costs £7.95 and is available by post from Argus Books, Freepost, Hemel Hempstead, Herts HP2 4SS (please add 10% for p&p).



From Our Man In Japan

Kiyohiro, JP1MDT, reports on the Japanese amateur radio scene.

One feature of Japan not often realised by Westerners is that Japan is about twice the size of the UK with about twice the population. However, due to the interior of the country being very mountainous, the population is concentrated far more than in this country. Add to this the fact that there are nearly 700,000 radio amateurs and you'll realise that the 2m band is very crowded!

One effect of this has been that there are no repeaters permitted on 2m. Another effect has been that manufacturers have developed selective calling systems. The DCL system may already be known to you as Kenwood (better known as Trio here) and Azden have already sold sets with the system here. Yaesu Icom and Standard have chosen the system known as Amateur Quinmatic System (AQS). This is fully compatible between the three manufacturers and many new models are now on the market in Japan with the system incorporated in the design.

AQS is a five way system that allows multi-function use of selective calling and data exchange, allowing many stations to use the same channel at the same time without mutual interference. It does this by utilising the capture effect of the FM system, without audio degradation. The basic features are:-

1. Callsign squelch which means that the squelch only opens when the right callsign is sent.
2. Code squelch which is similar to 1. but uses five digital figures for group or club calling.
3. Channel access enables automatic selection of free or empty channels or for returning to the calling channel.
4. Code memory is for selecting five group codes, two callsign modes and one CQ mode.
5. Data message transmit mode which requires the optional display and contains three statement data messages/memories (which can be up to 14 characters long) for transmitting to recipient stations. These are used for leaving a message when the amateur is out, sending QTH/QRA information and the like. It can also be used when mobile for log keeping or QSL records.

The AQS is compatible with the CAT system that Yaesu market and uses serial data.

New Miniature VHF/UHF RF Power Modules

A new range of miniature class C (FM) RF power modules have been introduced by Seraken KK primarily for handheld or portable transceivers. The modules size is only 10mm by 10mm by 40mm which is less than half the size of conventional units used in most mobile and base transceivers. There are two versions, one for the 2m band which is rated at 6.5W at 12V for 20mW input and 3.6W at 9.6V for 20mW input, the 70cm CI-122CM gives 7W out for 12V and 150mW in or 4W for 9.6V and 150mW in.

The two modules are designed to work over a very wide voltage range starting at 7.2V and up to a temperature of 80 degrees.

New Products In Brief

Tono have announced an in car mobile micro repeater system using a micro handheld (200mW on 80MHz) to a linear sized unit that matches any mobile transceiver. Puma have a dual band 144/432MHz FM handheld. Standard have launched a new 25W dual ban mobile with AQS and twin LCD display of both frequencies which will be called the C5000. Icom have released a 10W 2m mobile with AQS with the name IC26 and yes you've guessed it, Yaesu have a new dual bander, the FT3700, with AQS and optional FMPI-I display. Mizuho have a pocket sized 80m SSB/CW transceiver on the market with 25W out. And finally, Kenwood have announced a 1W 1200MHz Tx/Rx with matching 10W amplifier.

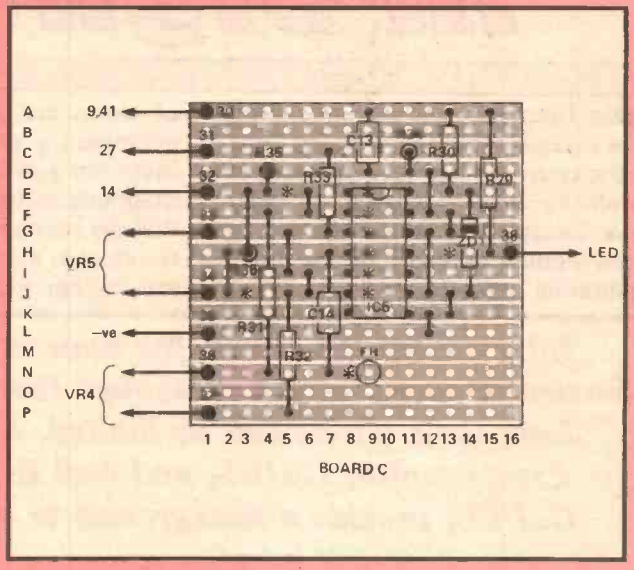
Did You Know...

In Japan, we mainly use vertical polarisation for DX on most VHF/UHF bands and that several stations have worked Australia on 6m. There is quite a lot of activity on 10m FM and also on 1200MHz FM. We have repeaters on 70cm and 1200MHz...

Addendum

Beam Splitter for an Oscilloscope (September 1985)

On Fig. 6 on page 40, the veroboard layout for board C, there should be a break in the track at the point J3. The veroboard layout is reproduced nearby with the added * in the correct position.



BOARD C

Interference Is There A Breakthrough In Sight?

Radio frequency interference (RFI) was quoted recently as being "one of the twentieth century contents of Pandora's Box". Certainly it must have brought as much misery to many people as some of the Box's traditional contents.

Interference is perhaps the bane of the radio amateur's operating life. Although the problems run deep, their effects can be limited. Here Hilary Claytonsmith, G4JKS, and Neil Brinkworth, G3UFB, provide a background to our war on interference.

Barney Owl only uses his station between 4am and 7am these days. The hash and birdies from the local TVs and computers make non-local contacts impossible at any other time. For Sid Scared the 2m band is only "open" when both of his neighbours go out, or go to bed. However Fred Fearless can operate at any time of day. Unfortunately, Fred and his family have no friends in their street. Fred's neighbours are unimpressed by his own interference free TV and hifi. They are encouraging Fred and his family to move house by various very unsubtle means.

These three rather simplistic examples indicate some of the problems which the radio amateur can experience in the day to day pursuit of his hobby. How did this sorry state of affairs arise? Could things be improved and have other countries been more successful in dealing with this situation?

Design Flaws

These problems are not there because they lack technical solutions. Nearly all the technical solutions required to combat RFI have existed for a long time. Some of them are just standard "good engineering practice" while many more are well known in the electromagnetic compatibility (EMC) world. If these solutions are implemented at the design stage of a product, they are neither expensive nor difficult. Yet they are not used — why?

One common reason is the failure of designers to appreciate that RF currents exist at all! Even among professionally qualified engineers, many regard decoupling, earthing and screening as aids to circuit stability, rather than aids to achieving EMC. Nowhere is this more apparent than in the field of digital electronics. The use of good decoupling, adequate earth returns and logical signal path routing by digital circuit designers, would not only reduce RF radiation but also improve circuit reliability, by enhancing noise margins.

Another common reason is lack of design integrity. Today, designers are neither trained nor encouraged to consider EMC as part of good design. Frequently the designer is asked to do only as much as is necessary to ensure that the design meets its specification. Provided the legal requirements are met, a company has no incentive to consider the EMC rating of a product, as rarely does this appear to damage them financially.

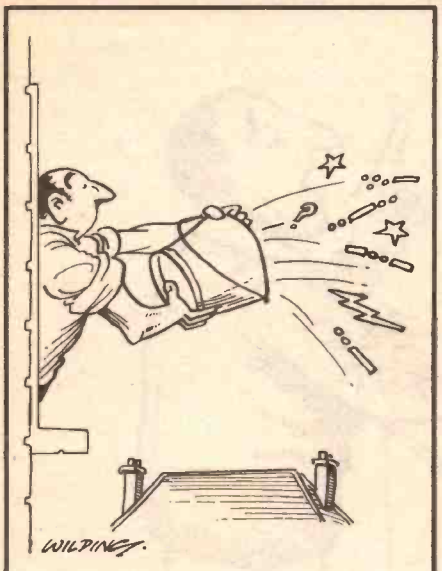
Legal Eagles

The lack of social and legal solutions is historical. RFI problems are not new. The first UK legislation to consider radio interference, was the 1924 Wireless Telegraphy Act. Between the end of the First World War and the passage of this act, there was pressure to do away with amateur radio altogether on the grounds that it could not co-exist with other services without causing interference to them! Professor W. H. Eccles, a member of the advisory council of the Wireless Society of London (later to become its president) wrote at the time "It is not impossible to devise laws to impose restrictions upon the emission of waves as will preclude interference with the public radio service of the future and yet allow liberal opportunity for the experimental study of wireless telegraphy".

Fortunately for us, considerable persuasion from various quarters led to the 1924 Wireless Telegraphy Act including provisions for amateur radio licences. Today as then, a common feature of RFI related legislation is that it only comes about after considerable pressure and inevitably several years late.

It is not surprising, therefore,

. . . they are encouraging Fred and his family to move house. . .



. . . keep your signals out of the house. . .

that the majority of RFI legislation in this country since 1924, has been to protect public broadcasting and other "essential" services. Both the general public and the essential services have considerable political clout and they are not slow in coming forward when they have a problem.

The RFI story in the USA has been remarkably similar. The Federal Communications Commission (FCC) was established in 1934 and the majority of the FCC regulations since then, have also been concerned with the control of interference to broadcasting and the essential services.

Today the situation of interference received by radio amateurs is much the same. Internationally, amateur radio is not a "protected service". It has no legal protection against interference from "non-transmitting" sources. Most regulatory authorities categorise it as a non-essential activity. What little practical protection the amateur does have, is afforded by regulations designed to protect public broadcast reception. You may have some success in getting amateur band interference reduced if it also affects broadcast reception. However the allowable interference levels are still often much too high to protect the weak signal operation common in amateur radio circles.

We are not alone in this area though. Many Private Mobile Radio (PMR) users are also concerned about RFI. Already there are "no-go" areas for mobile radio users in several towns. In a rapidly expanding communication based society, our problem today, could well become many other people's problem tomorrow.

Victim Vulnerability

The situation of the susceptibility or electromagnetic vulnerability (EMV) of electronic equipment is less clear cut. Although no specific regulation recognises it, technically it has always been the responsibility of the "victims" to keep unwanted radio signals out of their equipment. This has been the policy of most regulatory authorities throughout the world, including the Post Office (and now the DTI) in this country. However it was not until 1984 that our DTI had any real power to regulate EMV. The 1984 Telecommunications Act gave it powers to control the EMV although they do not require domestic electronic equipment to comply with any mandatory standards as yet.

Currently the EMV performance of broadcast television and radio receivers is specified in BS 905 (1985). This standard only applies to equipment containing broadcast receivers and primarily it is aimed at controlling their susceptibility to Citizens Band transmissions. Compliance to BS 905 gives no guarantee of protection against 144MHz transmissions, for example, and it does not require the level of directly picked up radio signals to be measured at all.

Ironically, this was almost entirely the radio amateur's fault. Frequently the radio amateur either helps to cure peoples' breakthrough problems, or he closes down, even though it is not his fault. As a result, amateur radio transmissions produce comparatively few complaints compared with the deluge which arise from Citizen's Band operation. The RSGB was not represented on the relevant British Standards Institute (BSI) committee when this standard was first prepared, although an RSGB representative does sit on this committee now. Hopefully the radio amateur's view will be considered when, or if, any further changes are made.

In Europe an European Communities' (EC) immunity standard is being prepared, and the British contributions are made by the committee responsible for BS 905. The EC standard is based upon existing standards in several of the member countries, including Germany, where a mandatory standard has existed for several years. Although the first issue of this standard is not likely to be strikingly effective in keeping out radio amateur's breakthrough, all the member countries will be required to make it a mandatory national standard before too long.

The US Experience

In the USA, the FCC did not have adequate power to regulate EMV until the successful passage of the much publicised "RFI Bill" of 1982/83. It seems strange that in a country that prides itself in it's protection of oppressed minorities, the embattled radio amateur received so little protection.

Up until 1950 the 7,000 to 8,000 per year EMV problems that did occur, were dealt with individually by FCC officers. The explosive growth in the use of television receivers in the 1950s changed all that. The number of complaints grew so large that by 1958, the FCC was forced to fall back on correspondence to deal with many of the complaints. FCC officers only made on-site investigations if they had the time.

This created quite a few problems and the ARRL decided to encourage the setting up of local RFI committees. These consisted largely of local radio amateurs, although they received considerable support from the FCC. They were intended to provide experienced advice to the radio amateur, to offer practical assistance in conducting tests and to give information on points of contact with other bodies. Their achievements depended both upon the character and experience of the members and upon the amount of time and money they were willing to put into running the committee. Inevitably as a voluntary organisation, the RFI committee scheme has had some failures as well as some successes. It maybe that much of their success was the result of their "united radio amateur" image.

The first of the RFI bills designed to deal with EMV was put before the United States Congress in 1972 but it failed to become law. Similar bills were presented in every session until

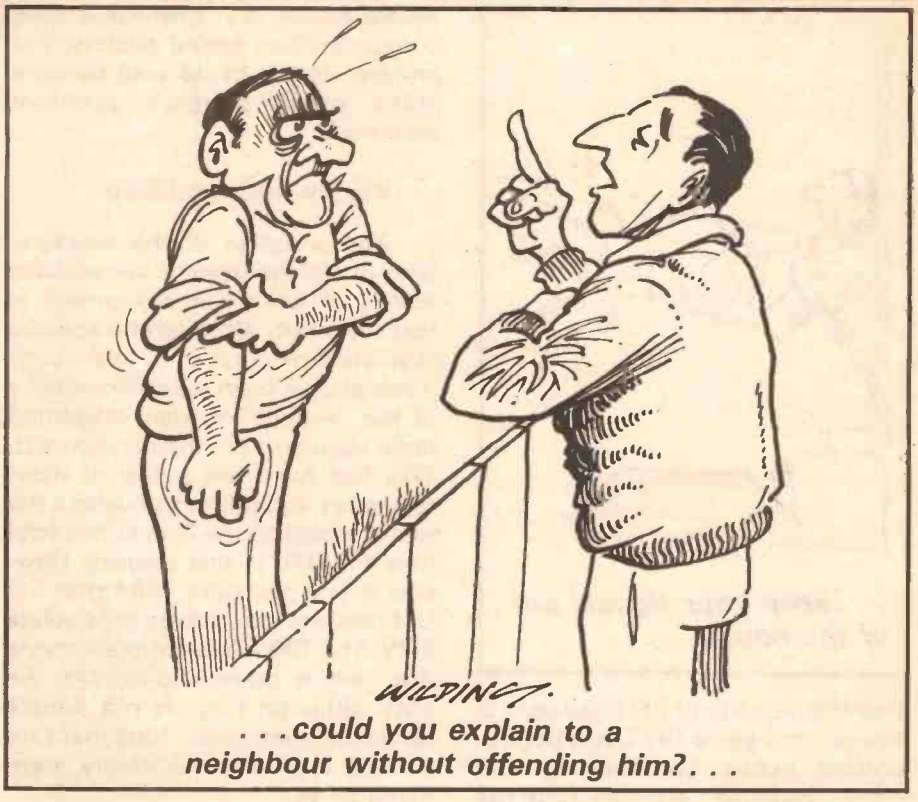
1982 with eventual success. However, even now three years afterwards, although the FCC has the power to regulate EMV they have decided not to make compliance with any standards mandatory. Many people thought that the passage of this "RFI" bill in 1983 would compel manufacturers in the USA to reduce the effects of radio signals on their products — it did not!

An American National Standards Instititute (ANSI) committee is preparing a draft EMV standard for issue in the spring of 1986, although it will cover television receivers and video tape recorders only. (Yes — the ARRL are represented on this committee). The FCC are not going to make compliance with this standard compulsory, as they are expecting a high degree of voluntary compliance. In the USA as here, the influence of the electronic equipment manufacturers is powerful and this standard is unlikely to be very damanding.

In practice, EMV standards rarely will be set to cope with "worst case" situations as to do so would place an unreasonable burden on both manufacturers and users. These standards are likely to be based on more average situations. We should beware of pinning too much hope on such standards however. Imagine what would happen in interference cases where the complainant has bought some equipment with the label "interference immunity to BS ****" on the rear. He may not be impressed by your comments that his equipment is not up to scratch any more then, than he is now! Also we may find that more attention is paid to the licence condition that requires us "not to cause undue interference". Many of our stations still are not designed with this requirement in mind. Carefully read the "Interference" chapters of the ARRL Handbook, RSGB Handbook, and the Radio Amateurs Examination Manual for more details on keeping your signals out of the houses.

Where To Now?

So where do we go from here? Firstly, we must remember that more members of the general public come into contact with amateur radio through interference cases than by other means. Not surprisingly our public image is poor. It could be made better though if *we* were better prepared. It would help if local clubs organised more interference related activities. At the moment we treat interference like a form of "electronic VD". Do you have any books or articles on solving interference problems? Do you have a free copy of "How to improve your radio and television reception", obtainable from the Post Office? Could you demonstrate that your own TV, radio, or hi-fi is free from "interference". Could you explain to a neighbour what his problem really is, without offending him and in a way that he can understand? (Try practicing your routine with a friend or maybe make a competition of it down at the local club). Do you know all your legal rights? When that unwelcome knock on the door comes, would you project the image of a responsible person who knows what he is doing, or would you seem like someone who just "tinkers with radio"?



. . .could you explain to a neighbour without offending him?. . .

Secondly, love them or loath them, the RSGB is the only organisation we have that is in a position to press the UK amateur's case upon manufacturers and local or national Government. The Society *is* keen to improve our enjoyment of amateur's case upon our enjoyment of amateur radio but how well they do this depends upon *your* active support. The letters that arrive at RSGB HQ are the barometer of amateur concern and at the moment the EMC pressure is low. Sounding off over the air or down at your local club will achieve very little. If you can't write to HQ to say how concerned you are, then you probably don't care too much. The frequent complaints about subscription levels and trivial expenditure will not encourage the RSGB to raise the tiny sum per member they currently spend on EMC matters either. If the current subscription sounds too much, compare it with what you spend per year on the rest of your hobby. In a world where you get what you pay for, the UK radio amateur already receives from RSGB more than his money's worth.

Lastly, here is where you can help. If you've been interested enough to read this far, then probably you've had some interference experiences of you own. *Don't keep them to yourself.* Your success story could be passed on to other radio amateurs with the same problem. Your problems and failures, either technical or social, could form the evidence required to solve the problem nationally. Please help by writing down your experiences in detail and sending them to the authors (QTHR).

Solving the radio amateurs' EMC problems is a job for us as well as "them". A more RFI free world for tomorrow, will not arrive, if everyone leaves it up to everyone else today.

MICRO' NET

As this edition of Micro' Net goes to press many people in Scotland are counting the cost of what can only be described as their own pet hurricane. This was not the usual forgetable type but the real McCoy with winds of 95mph at ground level and gusting to 153mph on the mountain tops. A few years ago, I became embroiled in an emergency hurricane net on 20 metres for the Carribean area and as far as I can recall the winds *then* were in the 120-140 mph region so our lot was nothing to be ashamed of.

In addition to grannies plummeting off chimney tops (a worrying prospect at the best of times!) tubular aluminium was also finding it's way to terra firma with alarming rapidity. You could easily tell who the radio amateurs were the next day by the bleary eyes of those who had spent half the night watching the metalwork waving merrily at them in the 'breeze'! Needless to say one consequence of the weather was the electricity had a rather nasty tendency to disappear without warning which made writing this edition something akin to running up a down escalator — I don't suppose that I should be too surprised though, after all it *is* number 13!

Here Is The News

One of the sadder pieces of news which has come my way recently is the fact that RAMTOP — a computing in radio newsheet run by the Rev Richard Butcher — is ceasing publication. RAMTOP has been mentioned on quite a few occasions in Micro' Net and it is fair to say that it has made a significant contribution to the computing aspect of amateur radio over the past couple of years. This particular cloud does have a silver lining, however, in so far as the small surplus left over from RAMTOP's publication has been used to improve local printing facilities. This has led to the creation of a 'genuine' job, so a pat on the back for the Rev Butcher and of course for the subscribers of RAMTOP. Only another 3.25 (officially) million to go.

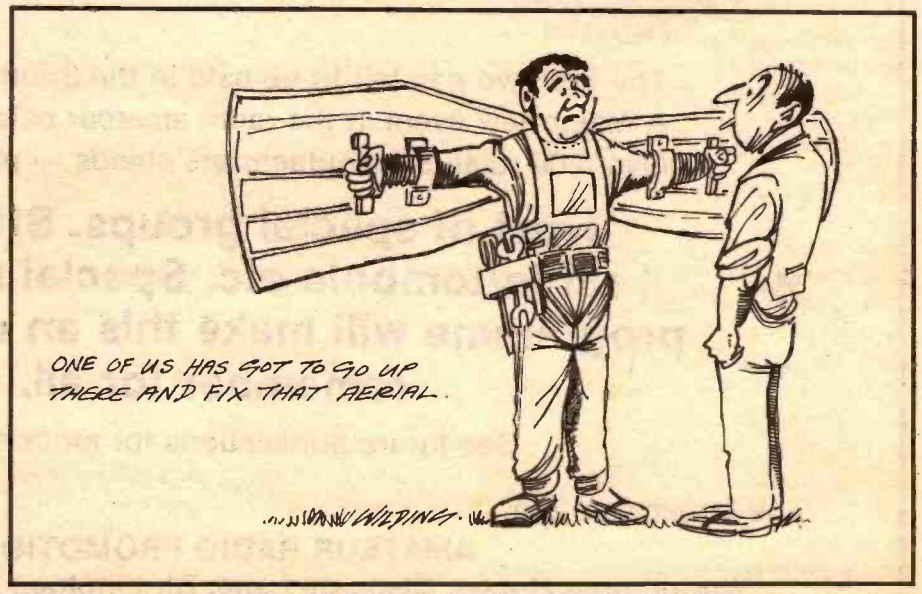
Dave Bobbett, G4IRQ, fights against all the odds to bring you the news and takes a look at some software and hardware that has taken his fancy.

New amateur radio programs still seem to be coming onto the market in a steady trickle. This month we'll be looking at one written for the Spectrum series of micros and at the new 'Astrid' hardware and software combination for use in satellite reception and transmission. We will be considering the RF interference levels of one of the newer micros. First of all though we appear to have. . .

Spots Before the Eyes!

Neil Taylor, G4HLX has written a "location aid for the radio amateur", better known as Spot, which is designed to run on the ZX Spectrum 48k or the Spectrum Plus computers. In common with the trend towards better use of graphics in programs, Spot can display a map of Europe and then superimpose such things as station locations and transmission paths (ie great circle routes) upon it so that the user can relate to the data visually. A location can be defined in any of the IARU (ie Maidenhead), QRA, National Grid Reference or good old Lat and Long systems and it has the added advantage of being able to accept 'mixed' data. You can enter your own location in IARU format and that of the other station(s) in one of the other formats and regardless of whichever system you choose, the program will sort it all out for you.

Conversion from one locator system to another can sometimes lead to ambiguities and when or if these occur the 'suspect' figure on the screen has its background colour changed so as to warn you of this possibility. If you are interested in achieving the greatest accuracy possible then the manual recommends that you stick to Lat and Long nomenclature although I think that the majority of users would be quite happy to sacrifice a little accuracy in



favour of having the convenience of being able to input in any location system data.

The package also sports a number of other facilities such as overlaying the map with major square boundaries in the form of a grid and giving a contest log facility. The latter will produce RSGB format log pages with 25 QSO's per page complete with the distance and radial ring points plus sub-totals at the foot of each page. All the screen information can be printed out in the form of a 'screen dump' to a suitable printer (ie an Alphacom 32 or ZX printer) and there is even a facility which is capable of plotting 1,000 'stations worked' locations on the display — hence my comment about spots before the eyes!

The package is fully micro-drive compatible, is supplied in cassette form and comes with a six page manual. This A5 sized booklet (that's about 15×21cms, or 6" ×8.5" if you still work in pounds and groats) did suffer from a failing common to the majority of documentation in that the photocopying wasn't of *quite* a good enough quality to give a nice crisp image. It could also have benefited further from not being photo-reduced — the print was rather small and not everybody is blessed with perfect eyesight.

However, having said that, the manual did more than redeem itself in a number of respects. Firstly, the printing consisted of a proper typeface and not a normal dot matrix or NNLQ (Nowhere Near Letter Quality) output. Secondly, by adopting a pleasant and easily readable style which neither patronised nor bored the user — other software authors please note! Thirdly, the layout of the booklet was good and made things easy to find.

Astrid's Seeking Satellites Again!

One of the problems with the tone standards used by the UOSAT space vehicles is that the days of the computer cassette interface really do seem to be numbered. The CUTS tones uses in these spacecraft were originally chosen precisely *because* they were compatible with the cassette interfaces of a wide variety of home micros and thus interfacing was made much easier. However, as more and more machines are being produced as being solely disc-based systems, the problem of interfacing is becoming more widespread.

This is rather a shame when you consider that these newer machines generally tend to possess exactly the graphics abilities which are so useful when used with the CCD camera systems etc, currently being commissioned on UOSAT2. In the education field the popularity of the BBC micro and the upwardly compatible nature of the new

A white box solution to the problem of receiving UOSAT data on your home micro.

Master series will postpone the problem for a few years but for other users the question of how to get the data into a machine readable form will still remain.

In an attempt to overcome the receiver-and-interface-cobbled-together syndrome M M Microwave has produced a complete UOSAT receiving and interfacing package called Astrid. It is a 'black box' solution to UOSAT as it incorporates both a receiver for the 145.825MHz downlink and an interface which converts the tones into a binary data stream. I would guess that the system is aimed primarily at the education market where easily installed, ready to run demonstrations are essential to interest people in satellite technology. It could also appeal to those interested in the field who lack either the time or inclination to build their own.

Astrid is supplied complete with aerial and 8m of feeder which connects to a double conversion superhet receiver. The Rx is nominally turned to 145.825MHz (12kHz bandwidth) and its audio output can be fed either into a cassette recorder or directly through the internal tone decoder circuit to give a 1200 baud TTL level output.

The tape facility could be rather useful as it gives the user the option of either decoding data 'live' off air (and recording it simultaneously) If the computer generates too much noise, the tones can be recorded on tape with the micro switched off and then played back later when the receiver is out of circuit — also useful for when real-time demonstrations go wrong!

Questions Arising

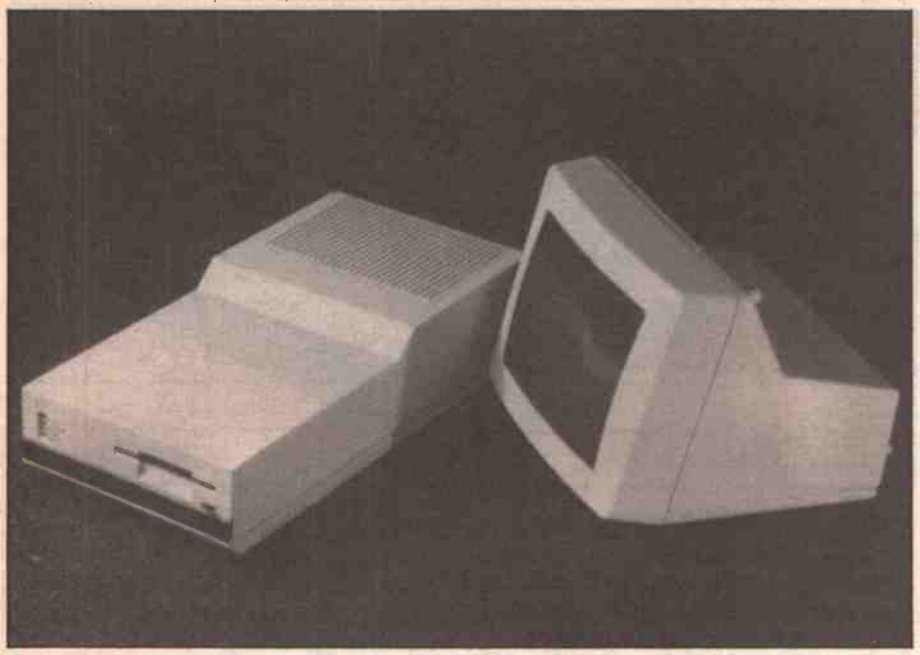
At the time or writing, we haven't been able to lay our hands on an Astrid in the flesh so there are a couple of questions which spring to mind. Firstly, it would be interesting to know if the receiver is able to track the doppler shift of the satellite's down-link, as this would lead to an improvement in the duration of useable signal (I know of at least one Rx which will do this automatically). Secondly, bearing in mind the fact that the vast majority of computers use RS232 standards for their serial ports, is there a 1200 baud ASCII output available at RS232 levels? We will endeavour to find out . . .

Return Of The Sprogii

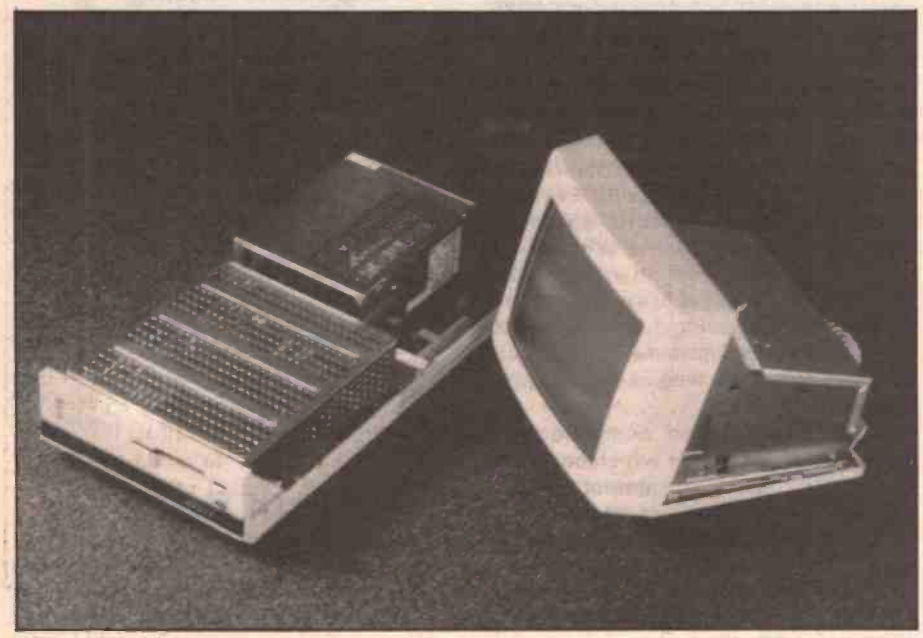
Continuing on the theme of the seemingly mutually incompatible nature of computing and radio operation, I had the chance recently of comparing the spurious emissions of a more up to date computer with that of the BBC workhorse I normally use. The micro in question was the Apricot F1, a 16-bit MSDOS machine using a 8086 CPU running at 4.67MHz. I must admit that the test was rather rough and ready in that the spurii

Table 1 Micro RF emissions

APRICOT F1	BBC 'B'
	144.100 +/– 50kHz v strong
	144.400 +/– strong
144.375 +/– 25kHz moderate	
	144.675 +/– 50kHz moderate
	145.000 +/– 25kHz weak
	145.125 carrier v strong
	145.250 +/– 25kHz moderate
	145.500 +/– 50kHz strong
144.675 carrier v strong	



The Apricot F1 micro and monitor which after removing the plastic case reveal the extensive screening which radically reduces the RF sproggies.



of each machine were measured by means of an FT208 handheld plus helical whip positioned about 2 metres from each computer.

Table 1 summarises the results. As you can see the difference is quite dramatic, especially when you consider that only about 2 or 3 years separates the design of the circuit boards. The Beeb is characterised by half a dozen 'clusters' of interference which spread for about 50kHz or so either side of the central (strongest) interference frequency. The Apricot, on the other hand, only exhibited one 'cluster' group centred on 144.375MHz which extended only 25kHz either side of the centre frequency plus a single oscillator-derived carrier (as opposed to switching generated mush) which was on 144.675. The other point which was very noticeable was that the strength of the signals coming from the Apricot was generally very much lower than those of the BBC. In fact, the squelch control had to be turned a good way up above the 'just closed' position with the latter machine in order to dissuade the receiver's scan function from stopping on every channel!

Needless to say, I wanted to know why there was such a disparity between the two machines. The screwdriver revealed all, as the photos nearby show, the difference is not due to some swish hi-tech solution but is accounted for simply by means of the extra metal screening and strengthening components contained inside the box. The switched mode PSU (rearmost box in the picture) is totally enclosed and the major portion of the rest of the circuitry is covered by the ventilated metal cover at the front of the machine, although the screening doesn't extend underneath the main PCB which runs the length of the case.

It is interesting to note that the same treatment has been given to the monitor too, as you can see the only unscreened part of the VDU is the face of the CRT. This is worth bearing in mind if you are ever in two minds about whether to buy a plastic or metal cased monitor.

Er. . . About Prestel (Blush!)

Apologies are due to all those readers who have attempted to contact me via my Prestel mailbox since the last issue of Micro' Net. By this time I wouldn't be surprised if you had begun thinking that I was a figment of my computer's imagination. The fact is that there have been some hardware problems at my end of things which have at last been sorted out. Those who have MBX'ed me will have had replies by the time this HRT reaches the shelves. If you haven't already got in touch, please don't forget that I always look forward to hearing from people.

If you prefer putting pen to paper please note that in addition to being able to contact me through the HRT editorial offices, you can also write to me direct at the address shown in the box.

Address Box

'Spot' amateur radio location aid for the ZX Spectrum and Spectrum Plus computers. Includes cassette and manual.

Price: £4.50 inc VAT and P&P

Available from: N P Taylor, G4HLX,
87 Hunters Field,
Stanford in the Vale,
Faringdon
Oxon
SN7 8ND

'Astrid' Satellite Rx system.
Includes aerial, feeder, receiver/decoder, PSU, test tape, manual and connecting leads.

Price: £149.00 inc VAT and P&P

Available from: M M Microwave Ltd,
Ings Lane,
Kirkbymoorside,
North Yorkshire
YO6 6DW
Tel: (0751) 31620

To contact Micro' Net:
Micro' Net,
Ham Radio Today,
1 Golden Square,
London
W1R 3AB

or: D G Bobbett,
PO Box 49,
Colchester,
Essex

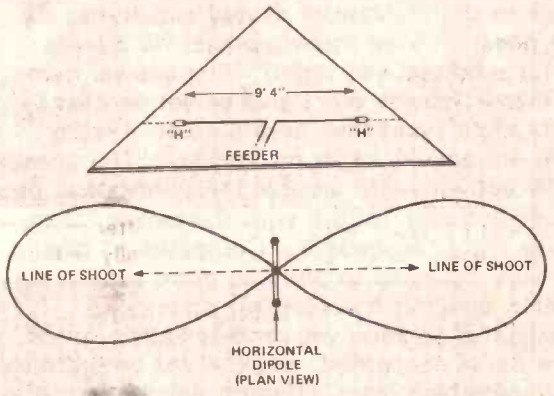
Prestel Mailbox no 01-999-9045

Metre Wave

As a follow on from Jack's 6m report (April '86 issue), here G5UM answers some of the questions that may have been bugging you about the new band.

Precisely as predicted activity on the 50MHz band tailed off markedly after the first fine raptures of February 1st and the succeeding days. This was to be expected. Formerly, the original 100 licensees were compelled to operate only during nine unsocial hours late night and early morning; now it was possible to come on to 'six' at any time.

If you did, what would you find? On a day to day basis, there is only modest, but *very interesting*, activity that demonstrated the potential of six in no uncertain terms. With users now compelled by the regulations to limit their transmitter outputs to something like 10 watts where gainy aerials were used (to stay within the prescribed limits of 20dBW PEP and 14dBW carrier power), it soon became evident that excellent results were being achieved. Contacts at 100 miles QRB became the norm under average conditions, often with the simple dipoles which a majority of stations appeared to be using — intimidated no doubt by the size of the "bedstead" they would need to haul aloft if they were to install directional antennas for the new band.



Many operators who cannot instal their 6m dipole outdoors are compelled to accommodate it in the roof space. Because it is so big (9ft 4in across) its hot ends ("H" above) may be in the vicinity of roof members, water tanks and other absorbent objects. These may change its apparent electrical length and cause a mismatch as read on the station SWR meter or even a shutdown of the 50MHz transceiver when the sampling devices at its input end detect an impedance anomaly. Answer: experimentally snip a few inches at a time from each hot end of the dipole until the problem is abated.

The bottom diagram shows the directivity to be expected from a dipole; the lobes will be neither perfectly symmetrical nor oval if trees or other solid objects are nearby. The lobes will be even more distorted in the case of an indoor dipole where solid objects are in the near vicinity.

Dipole Pros and Cons

This brings one straight to the first question which many operators new to six have put: "noting the emphasis in 'Metrewave' on the use of good aerials to put the signal where it should go, and not all around, what is the thinking in respect of dipoles at 6m?"

Answer: better a dipole than nothing at all, even if it be no more than a thick wire one in the roof space. If you *can* make it of metal rod and put it outside on an existing rotating system so much the better. The metal can be readily obtained for free from TV aerial contractors, who, as has been said here before, are only too anxious to dispose of their piles of old Band 1 skyhooks languishing in their backyards.

Always mount your dipole horizontally: there is virtually no vertical polarisation at six. You will soon discover that it does not "squirt the RF antisocially in all directions": you can utilise its characteristic directivity by pointing one of its lobes towards the source of the most wanted signals. No apology is offered for repeating here its basic properties and to emphasise its propensity to perform well, unlike those dreadful omnis that still persist on 'two'.

Just what could be done with a dipole and 10W was dramatically demonstrated only a week after the 50MHz band was released. An intense aurora developed, visible well down into southern Britain, and producing such an opening on two and 'seventy' that QSOs into the Baltic on those bands became routine. Meanwhile, on six the first phase of the Ar opening brought far south stations into contact with hitherto unheard northern stations on an unprecedented scale. If you were quick about it you could work five countries in ten minutes on the key (it took rather longer on SSB as you unscrambled the gargling noises).

But it was the expected second Ar phase two hours later (well after midnight) that opened the UK to Norway path for contacts, with a dipole and

10W, with the greatest of ease for those staying up that late. To those who didn't, there was the consoling thought that " . . . it'll all happen again: the tropo season is right ahead," so watch for the DX then.

The value of the three UK beacons became evident during the February Ar opening. Their ranges were enormously extended, and they were detected by operators who had never before heard them. There were even reports that GB3SIX, with its west facing antenna, had done what was expected of it and got itself heard across the Atlantic (though not for the first time).

Promoting Activity

Back to the problem of diluted activity on six and a question from many readers: "is there a case for a 6m activity night?" The answer came from many: "please don't give us yet another activity night", and they have a point. Already there's 4m activity night on Tuesdays. The decades old CW activity night around 144.05MHz has been coinciding during 1985-6 with the newer 70cm Monday night "Alphabetical Competition" (the latter very desirable to promote more activity on 432MHz, which it has certainly done).

Instead of creating yet another activity night where 6m is concerned, would it not be preferable to try something quite different, namely to put out a CQ call on the band regularly on the hour to promote — and provoke — a response? It has often been said that if you don't send a signal you won't get an answer: a CQ call on the hour might result in a surprising reaction. You never know who's listening. There may be many people, waiting on six, monitoring in the hope that someone somewhere would press the button or pound the key.

What does "on the hour" mean in practical terms? It means sending a CQ call on 50.2MHz at the 7, 8, 9 and 10pm peak activity hours whenever you happen to be in the radio room. It also means putting out calls at odd intervals in between to catch people who may have settled to their rigs since the last hour has passed.

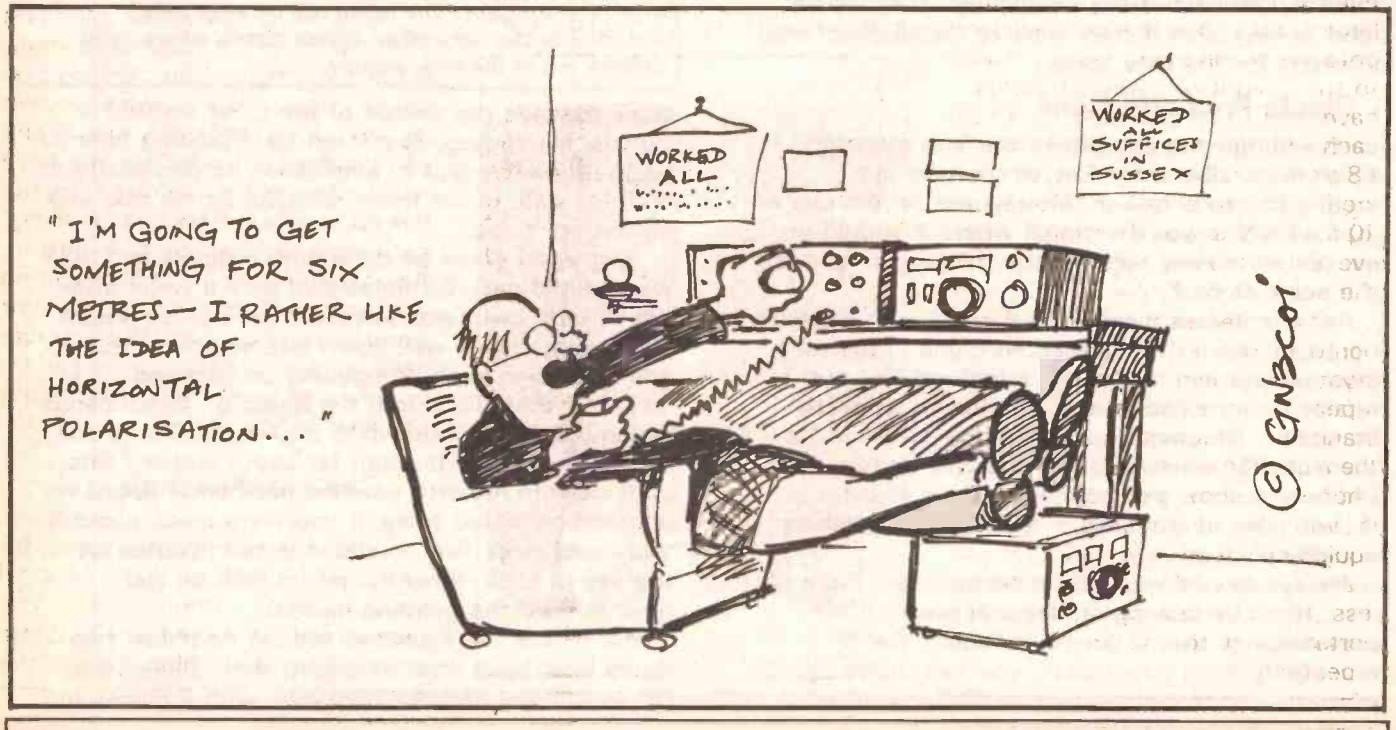
Note the recommendation to use 50.2MHz. This on six is the equivalent of 144.3MHz on two, an SSB centre of activity, as the new jargon has it, but still a calling frequency to most people. Already apparent on six but sadly less so on two is the operators' practice of sending CQ calls a few kilohertz away from the calling frequency to keep out of one another's hair and to give themselves a better chance of earning a reply. If this were done more often on two the 144.3MHz calling frequency would be more tenable under lift conditions than it is now, when bedlam develops when two dozen powerful J3E signals simply cancel each other out.

No, this has not to date been happening on six. May the present spreading out trend continue, along with the substantial QSYs away from 50.2.

Where telegraphy is concerned, the frequency to monitor is 50.1MHz plus or minus a few kilohertz. You will find it sustains QSOs more effectively than sideband does.

Another question: "is FM frowned upon on six?" Answer: it shouldn't be. To most human ears it sounds more pleasant than single sideband, and the bandplan provides for its use in the top 100kHz.

Yet another, from many class B licensees: "may I cross-band from 2m/70cm to 6m?". Answer: indeed you may under the relaxed regulations that now allow this method of communication. Warning: never allow your callsign to be emitted through another station's microphone into a band for which you are not licensed. With this proviso always in mind, it is useful for class B operators to enjoy a listening entré into the band to give them the feel of it against the time when the licensing authority may allow them to transmit on it.



Pocketphone Fun - A PF1 For 70

First there was the immensely popular PF70, then the two Wessies, now finally (well maybe...) Chris Lorek, G4HCL, converts (or should we say retunes) the Pye PF1 pocketphone.

In the 1960s, life changed dramatically for the policeman on the beat in Britain, with the introduction of the first ever truly portable radio available, the Pye PF1 Tx/Rx, which was quite revolutionary in its time. The receiver is normally carried in your top pocket and it has its own small internal aerial. The separate transmitter is carried in a side pocket and taken out when required. A novel feature of this unit is that on depression of the PTT button, a 6" quarter wave aerial rod pops up giving better performance for a low power set than an internal aerial. I remember with amusement being at a football match in my younger days, watching a constable extracting the aerial which unfortunately went right up his nose on transmit!

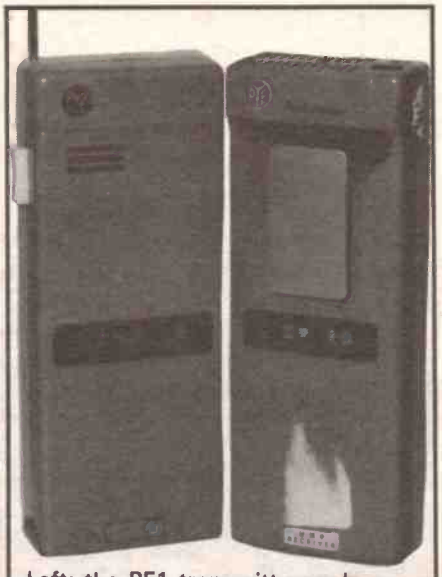
With the improvement in technology, there has recently been a large number of these sets released onto the secondhand market, much to the delight of many amateurs. I have seen receivers sold for £1.50 each and transmitter/receiver sets at £8 a pair at rallies in the East Anglian area, with spare NiCad batteries at 10 for £1. You would normally however expect to pay slightly more 'off the shelf' from dealers.

One enterprising shop in Peterborough did a roaring trade by crystalling them up on the local repeater, since people were understandably reluctant to try to tune them up themselves. Well this article I hope will show you how simple it is, with the bare minimum of test equipment. It will certainly get you going for very little outlay, and a lot less than by buying a Japanese portable just to use on your local repeater.

What They Offer

The receiver is a double conversion superheterodyne, with IFs of 10.7MHz followed by 100kHz. A battery economiser is used which effectively switches the receiver on for around 60ms every 600ms, thus prolonging battery life. When the squelch opens, this is defeated of course, and stays in the 'open' state for two seconds after the squelch has closed to allow for movement in any blind spots in coverage area. If you place a working receiver to your ear, you may hear a soft 'pulsing' noise showing the economiser to be in operation and the battery to be charged.

An internal plate aerial is used on early sets, together with a small transducer acting as a speaker beneath the aerial. This gave a characteristically 'tinny' audio reproduction. Later receivers employed a miniature speaker which improved on this, and the speaker frame doubled as the aerial. Examination of the case front will show an extension in depth at the top to house the speaker on the later sets. Typical sensitivity achieved is around 1uV pd for 12dB SINAD, although this can easily be improved as will be seen later. A 9V NiCad battery is used, the same size as a PP3 but with different connections at the top. If you can't get hold of the correct NiCad then a PP3 battery-clip may easily be fitted instead.



Left: the PF1 transmitter and right: its receiver.

The transmitter utilises a standard oscillator, phase modulator and multiplier approach, giving typically 100mW into its quarter wave aerial. Although low power, it performs well when communicating with a base station or repeater and matches the receiver performance nicely. An 18V NiCad battery is used, the same depth and width as the receiver battery but twice the length. Again, if you can't get hold of the correct batteries, two PP3s end to end will do.

A novel feature when operating with these sets through a repeater is the ability to get 'listen through' on your signals. You can hear your own signals coming back as you talk, and can instantly tell whether you have whistled the correct tone to bring the box up, or whether you are 'doubling' with a stronger station or whatever. Also when portable communicating with a base station using different frequencies for Tx and Rx you can have a full duplex conversation, which certainly has interesting possibilities!

Channel Spacings

The equipment was made for both 50kHz and 25kHz channel spacing. This means that the receiver will have either a +/−15kHz or a +/−7.5kHz filter fitted; the

matching transmitter will be preset to either 15kHz or 5kHz peak deviation. The transmitter may be modified simply by changing one resistor value, but receiver modification involves the change of a crystal filter. Unless you expect to receive reasonable strength signals at +/−25kHz spacing, for instance a repeater on the next channel, you probably won't have any problems. However, by opening up the receiver case you may discriminate between the two by the markings on the large metal crystal filter which are: filter type FC03219 : 25kHz spacing; filter type FC03208 : 50kHz spacing.

If you do have problems, Garex Ltd stock replacements although it would be best to check inside the receiver before purchase if you live in a congested 70cm area.

Crystals

These are available ex-stock from several suppliers on popular 70cm channels, the crystal frequencies required are:

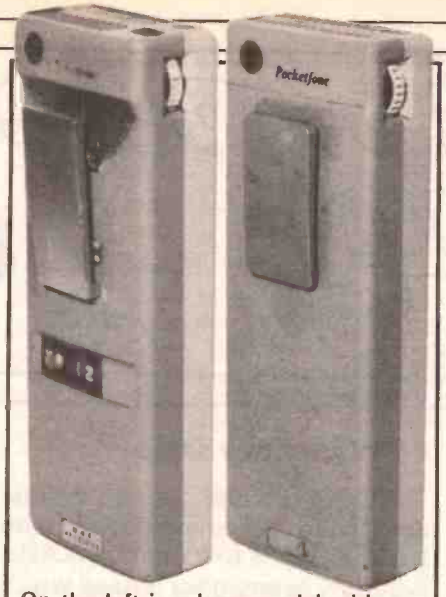
$$\text{Tx xtal freq (MHz)} = \frac{\text{transmit freq (MHz)}}{36}$$

$$\text{Rx xtal freq (MHz)} = \frac{\text{receive freq (MHz)} + 10.7}{5}$$

The crystal can size is HC25/u; be sure to quote the PF1 when ordering to ensure the correct loading etc.

In the commercial band of 450-470MHz, subtractive rather than additive mixing is used in the receiver, which means that the image frequency will fall in the 70cm band. This can certainly be a great advantage, as if you have a choice of receivers then take a look at the rear serial number plate and note the frequency marked on it, if shown. Note that some receivers do not have this shown for security.

If you find one marked exactly 21.4MHz higher than your intended receive frequency then a quick retune is all you need, no crystal to buy! For instance a receiver on 454.750MHz will be fitted with the correct crystal to operate on 70cm channel RB14, 433.350MHz. Many suppliers do not remove the crystals as this entails removing a screening can and its associated tiny fixings as well as desoldering the crystal itself, more difficult than the usual exercise of unplugging a visible crystal.



On the left is a later model with a speaker, the one on the right is an early model with a transducer.

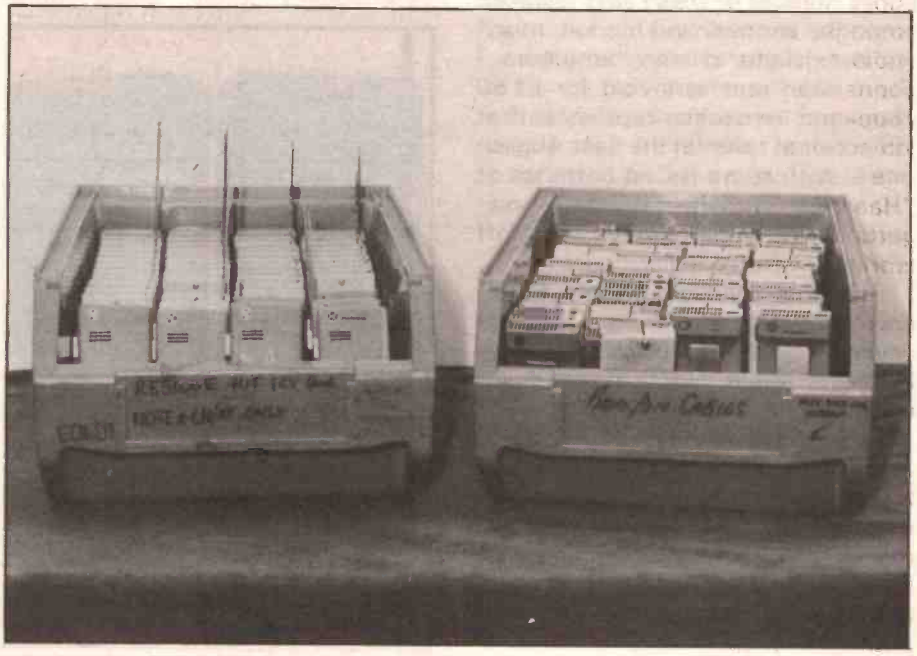
Transmitter Alignment

Remove the case back and desolder the main board output link from the aerial connection. In its place connect a piece of coax, inner to the link tapping point and braid to earth, leading to a 50 ohm load (a 47 ohm ¼ watt resistor serves well) via a power meter or some form of power indication such as a diode probe or absorption wavemeter. You can now gently hinge the transmitter out from its case. Remove the screen by undoing the small nuts on the track side of the PCB and desolder the existing crystal, replacing it with your own, keeping lead lengths short. Replace the screen. Take a look at the ferrite cores used in the set, you will need to make up a small non-metallic adjusting tool to fit these; I would suggest a filed down matchstick or knitting needle.

Set your multimeter to a low voltage range, ideally 1V max deflection, and connect the negative lead to supply negative. With an 18V supply, either from the battery or an external power supply, key the transmitter and referring to **Fig. 1** tune the core of L1 for maximum voltage on the TR6 emitter test point. Note that this will be fairly broad, with a typical reading of 0.25V, do not worry if a definite peak cannot be achieved initially. Then transfer multimeter positive to TR7 emitter, tuning L2 and L3 for maximum, typical reading 0.4V. Transfer to TR8 emitter, tuning L4 and L5 for maximum, typical reading 0.7V. Now set your multimeter to the next voltage range up, around 2.5V ideally, and modify the other end of your matchstick into a flat screwdriver shape, for tuning the variable capacitors at the end of the board. Now adjust C41 for maximum voltage on TR9 emitter, finally retuning slightly the previously adjusted coils for absolute maximum voltage at TR9 emitter, typically 1.8V.

Now place your multimeter, set to a current range around 100mA, in series with the 18V supply. Set C53 and C56 for minimum capacity, ie vanes fully apart, and tune C47 for maximum current indicated on your meter. By now you should be seeing

Roll up! Roll up! Roll up for the lucky dip! PF1s by the boxful — take your pick.



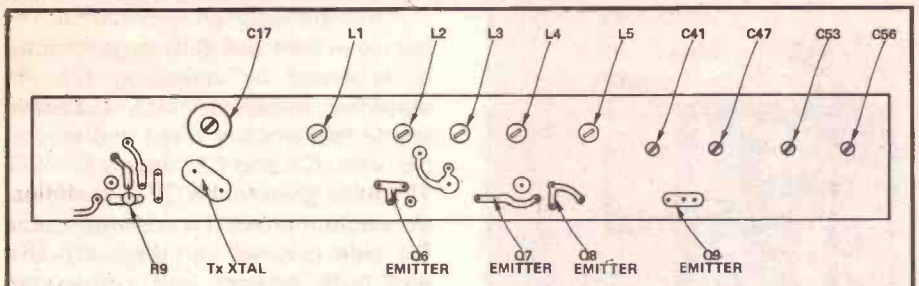


Fig. 1. The transmitter alignment (bottom view).

some output power on your in-line power meter or diode probe. Set C56 for maximum capacity, ie vanes fully meshed, and tune C53 for maximum power output, then retune C56 again for maximum. Carefully readjust C47, C53 and C56 for absolute maximum output, you should be able to get around 100mW.

The internal aerial may now be reconnected, and although not absolutely necessary, you may if you wish slightly readjust C53 and C56 for maximum radiated power if you have access to a field strength meter, although in the past I have only achieved a very marginal improvement. Final frequency setting is done by adjusting C17, accessible through a hole in the screen, and may be done with a frequency counter if you have or can scrounge one, by a quick on-air check, or by monitoring on an adjacent 2m receiver tuned to one-third of the 70cm transmit frequency.

We now go back to L1 which is the phase modulator coil, again by an on-air check either on an adjacent 70cm or 2m receiver, tune L1 for absolute maximum transmitted audio level. The technical boffins amongst us may wish to use an audio oscillator on the microphone connection and a deviation meter coupled to an oscilloscope to do the job correctly; but when I first tuned one up ten years ago a loud "Haaarrlo" into the mike whilst getting deafened from my 2m rig worked just as well!

If audio level reports on 70cm are reasonable then I would leave the deviation setting alone, it will already be set to near 5kHz. However if every speech peak drops you out of the squelch then it appears you have a 15kHz deviation set. Don't worry, by altering the value of R9, a pre-set resistor value, you may vary the peak deviation to the required amount. I would suggest a miniature 1M potentiometer placed in line, at least until the required level is found, then replacement by a fixed resistor of the nearest value can be made. A useful test for deviation is by a friend switching between input and output on a repeater and comparing your peak audio level to that of the repeater, we can't all afford posh deviation meters!

The telescopic aerial originally had a small plastic disc fitted to the top, but these invariably get lost in commercial usage. To avoid damaging the facia features when in use, I would advise you add a similar form of protection to the top.

Receiver Alignment

Remove the case back and hinge the receiver board out carefully, you will need to slide the earphone socket out first. Now remove the large silver plated screen by undoing the four tiny securing nuts, two on each side of the board. Beneath this you will find the receiver crystal, desolder this and replace it with your 70cm crystal, then replace the screen, remembering to tighten the nuts. The positioning of this screen is critical to the tuning, so if you remove it for any reason again you will need to slightly retune the receiver to obtain the best possible performance. You will also see a further crystal outside the can, this is the 10.80MHz conversion crystal which should be left in place.

Before applying power, temporarily short out R51 to defeat the squelch, this will considerably aid tuning. Connect 9V either from battery or external power supply, and check you can hear squelch noise from the speaker or transducer. If not, then check the contacts on the earphone socket, this is often a cause of problems when the mating connection in series with the audio output becomes corroded slightly.

Now you will need to find a strong 70cm signal, I have known amateurs in the past to drive up to the local 70cm repeater site for this reason, but if you have a 2m rig then the third harmonic of this will perform adequately. Using your home made trimming tool, tune L2 for clearest reception, ie least distortion, of a signal with speech modulation. This is the crystal frequency adjuster, and will ensure that right from the start you will hear something. Otherwise you would be frantically tuning everything else with no results and probably make things much more difficult later on. Remember that if you use the third harmonic of a 2m rig with a 25kHz spacing set, your received deviation will be 15kHz peak, so bear this in mind and talk much further away from the microphone when testing to give lower deviation.

Once you've got the receiver on frequency, you'll need to gradually reduce the received signal strength, by varying aerials, transmitter power and so on. You may at this point connect an external aerial in place of the internal one if you wish to aid tuning. Having received a signal with a detectable amount of noise present, tune T2 and L3 alternately

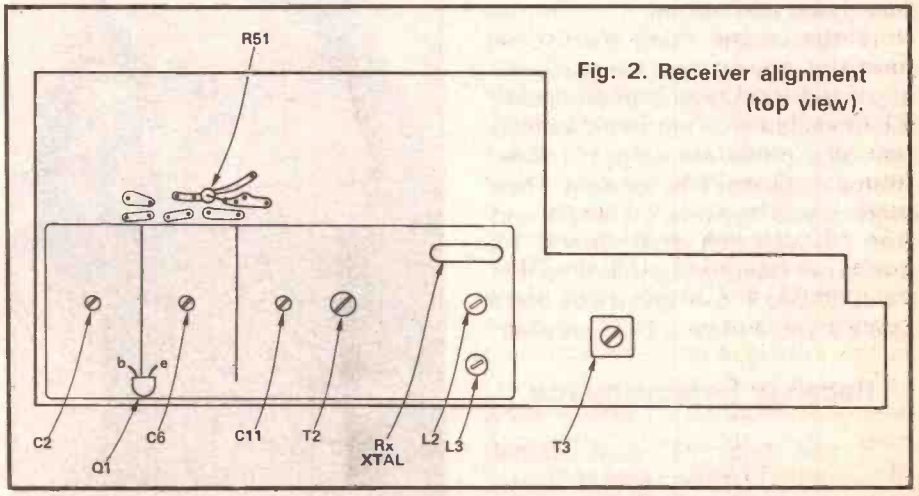
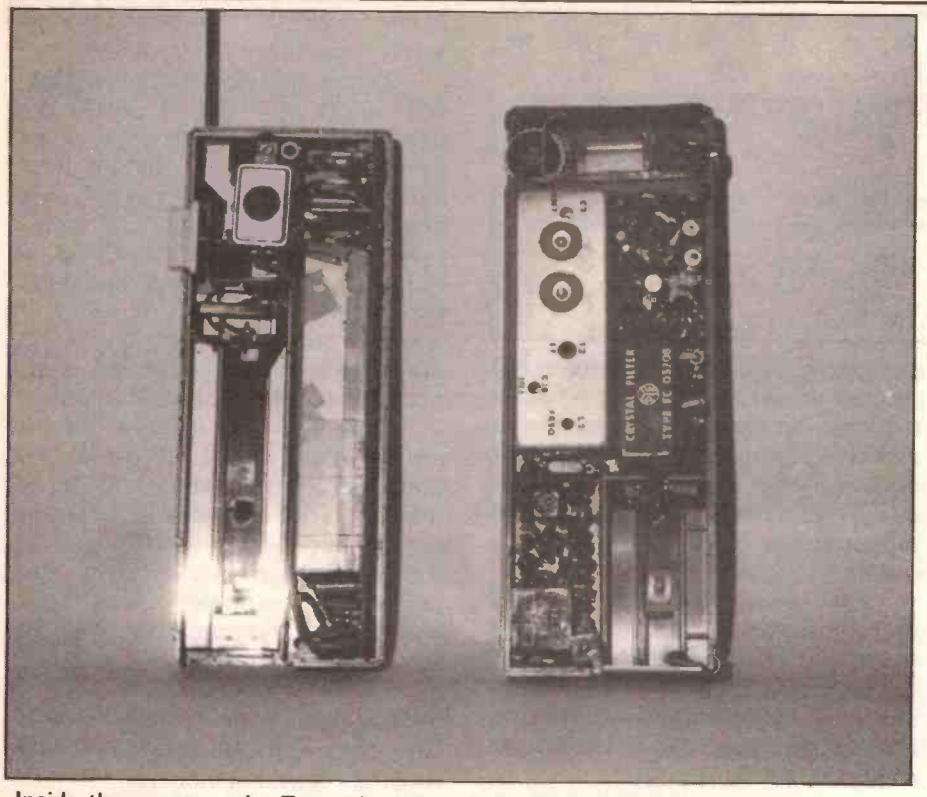


Fig. 2. Receiver alignment (top view).



Inside the cases — the Tx on the left and the Rx on the right.

for the best quieting, reducing the received signal level as required. Now tune C2, C6, C11 and C18, again for the best quieting. Note that these adjustments will be fairly sharp, particularly C6 and C11, so take care.

If you intend using the internal aerial, carry out the final tuning of C2 with that aerial connected and the receiver mounted as far as possible in its plastic case to ensure the best performance. Once you cannot get any better quieting level on a weak signal, you can try slightly retuning L2 again for absolute best (least distorted) reception, and then remove the link from R51 to return the squelch to normal operation. That's it, congratulations, you now have a fully tuned PF1 set-up.

There is one thing that some amateurs may contest me on. Some 'alignment instructions' photocopied and produced in an authentic looking light blue cover are sold at rallies, often alongside PF1s for sale. They instruct you to leave L3 alone and tune T3, well that isn't correct! T3 should not need realignment as it is the 10.7MHz IF coil, and if you don't tune L3 you'll have a deaf receiver.

Receiver Improvements

If you find the weak signal performance rather lacking when portable, you may like to try fitting a 6" quarter wave aerial made from a piece of stiff wire. Put in place of the internal aerial, with some form of protection at the end, and a small coax socket fitted to the case top, it will allow you to plug in a whip or helical (Feb 86 HRT for a low cost high performance helical design) or an external aerial from the home QTH.

PF1s in use.

Alternatively, an improvement of between 3dB and 6dB in sensitivity is achieved by replacing the RF amplifier transistor TR1, mounted inside the receiver front end screen between C2 and C6, with a BFY90. The base goes to the C2 side original connection point, the collector to the C6 side original connection point, and both emitter and screen are soldered to the internal dividing screen. No further component changes are required but you will need to retune the receiver front end stages slightly after fitting. I have performed this modification to several sets in the past with good results each time.

Batteries

Both batteries are rated at 80mA/H, in use they will give around 20 hours of normal operation in both the transmitter and receiver. There are three connection points at the top, the centre is always positive and the two outside connections are both negative, internally linked. To recharge them, use a current limited supply at 8mA, charging for 14 hours from a completely flat state. A standard PP3 battery charger circuit is ideal for the receive battery for instance.

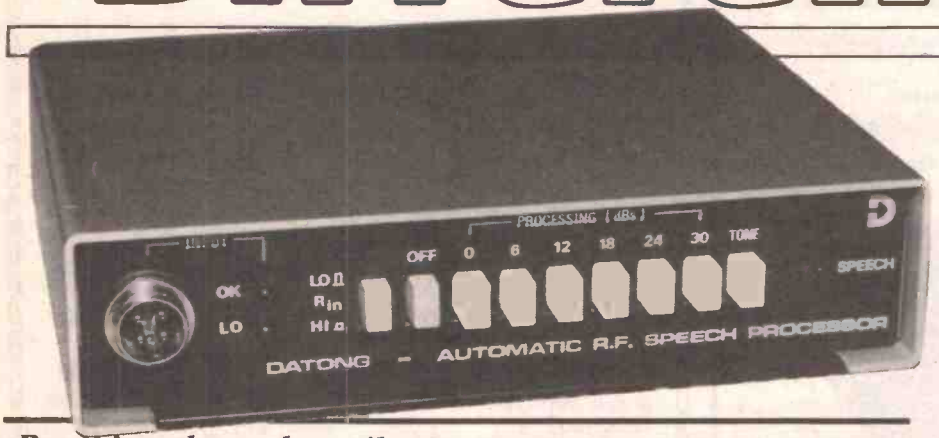
Rally Hunting

The rally season is now in full swing, I hope you find a few bargains. If you have been following this series you'll know what to look out for and more importantly what not to waste your money on, eg AM sets hoping for a simple FM conversion. Eventually more and more equipment featured in this series will no doubt become available on the second hand market as firms update existing equipment. As an example, at the time of writing I know of over 2000 Pye sets just waiting to be sold, makes you think doesn't it?

This concludes the present series on converting ex-professional Pye equipment onto the amateur bands, thank you for all your letters and calls on the series, I have been pleasantly surprised at the large amount of interest shown, and it only remains for me to wish you — good hunting!

My thanks go to Mr B Bamber of Anglia Industrial Auctions for the loan of the PF1s photographed in this article.

The ASP: A Processor With A Difference?



Breaking through a pile-up need not require very high power and/or a fantastic aerial system since a good speech processor can be worth several valuable dBs. Ian Poole, G3YWX, looks at the Datong Automatic Speech Processor which is definitely not a snake in the grass!

David Tong of Datong Electronics was once quoted as saying "Single sideband without speech processing is an outdated form of communication". This was never more true than in today's crowded band conditions when every bit of available power should be used to its maximum effect — the signal contains as much useful modulation as possible.

It is, of course, possible to increase the signal strength of a station by adding a linear or putting up a larger aerial; but surely with today's technology it is better to first make the best use of the power already available. Using a processor is a far more cost effective way of improving one's signal strength because even the most sophisticated processors will cost less than a linear or new aerial system.

The Need for Processing

Speech does not have the ideal waveform to modulate a transmitter efficiently. If it is viewed on a 'scope it will be seen that there are transient peaks followed by periods of lower intensity. This gives speech a low average power level when compared with the transient peaks. To make matters worse, the average level will also vary as the speaker places a different emphasis on some words or speaks closer to or further away from the microphone. These factors lead to a very inefficient use of a transmitters power which logically should be improved. Fortunately the human ear is very tolerant of electronically processed speech used to increase the average power level as long as it does not introduce undue amounts of distortion.

Speech processing basically involves reducing the dynamic range of a signal. This is normally accomplished by clipping the speech waveform or altering the gain of an amplifier to compensate for changes in level of the speech. Both methods can be employed if required.

Speech clipping involves passing the audio through a non linear circuit which limits or clips the peaks and troughs of the waveform if they exceed a certain level. Depending on the amount of clipping applied, this will reduce the dynamic range of the audio and increase the average power. The resulting distortion products take the form of harmonics and intermodulation. If the signal is clipped at audio frequencies then only the products which lie outside the required audio bandwidth will be removed. This still leaves the 'in band' distortion products which cannot be filtered out. The result of this is that the speech will sound distorted and if high levels of clipping are employed, it will actually reduce the intelligibility of the speech.

The way to surmount this problem is to generate a single sideband signal at a suitable frequency to be clipped. Again harmonics and inter-modulation distortion will be produced but they will fall outside the bandwidth of the SSB signal

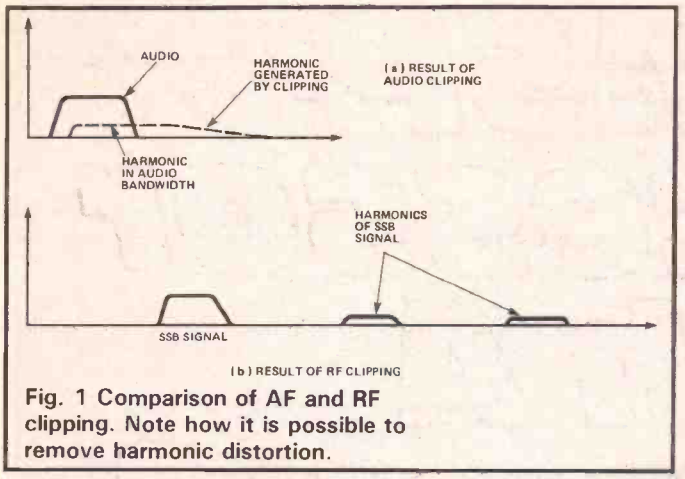
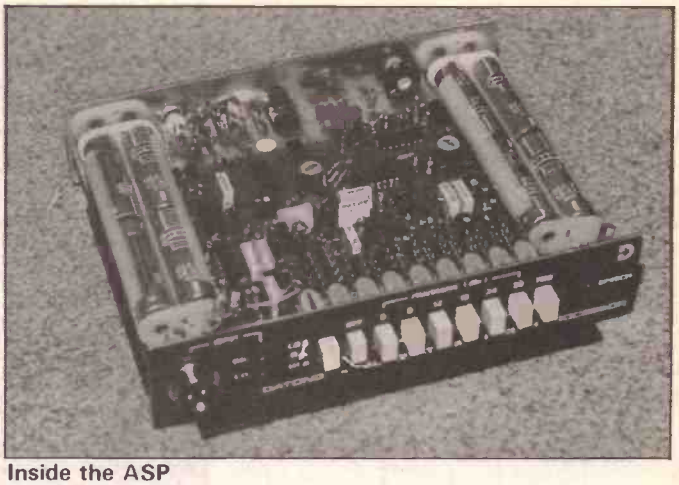


Fig. 1 Comparison of AF and RF clipping. Note how it is possible to remove harmonic distortion.



Inside the ASP

and can easily be removed. The audio can then be regenerated to produce a cleanly clipped signal with the absolute minimum of unwanted distortion.

In order to overcome the problem of level variations in the speech an audio automatic gain control can be used. These circuits go by several names such as speech compressor and VOGAD (Voice Operated Gain Adjusting Device). These circuits vary greatly in their design, some having very fast time constants whilst others have slower ones. However, they are particularly useful in maintaining a constant level to a modulator or clipper so that a constant and known amount of clipping is employed.

The Datong ASP (Automatic Speech Processor) incorporates both an RF clipper with selectable clipping levels and a sophisticated level control. It is housed in a very smart aluminium fold round type case, with a front panel that has been well thought out so that in spite of the number of switches and LED's it is uncluttered. It is certainly not in the same category as much of today's Japanese equipment where the controls are too small for the British Standard Finger!

The microphone input socket is located on the left hand side of the front panel. The socket is the standard four pin type which can be wired to be compatible with either Yaesu or Trio equipment depending on the variant of the ASP bought. The two LED's indicating the input level are located next to the microphone socket. They provide an 'at-a-glance' indication of whether the voice input is within the wide acceptable range. If it is too low the LO light comes on, if correct the 'ok' LED lights.

Further to the right is the bank of push buttons. Six of them control the clipping level from 0 to 30dB in steps of 6dB. The remaining three select the input impedance (either 100K or 600 ohms), turn the unit off, and select a tone which can be used to set the output level. On the far right there is another LED, which gives an indication of speech present and background noise.

The back panel has three sockets and a small hole giving access to the output level pot. Two of the sockets are phono types for the audio output and press to talk lines. The third is a jack socket for an external power supply.

Inside

Access to the inside of the unit is by removing the four screws which hold on the feet. Then the top of the wrap around section of the case slides off to reveal the electronics and the battery holders.

The layout of the components on the board is neat and uncluttered, illustrating a well thought out board design. At either end of the board, there is a battery holder which take four HP7 type cells. All the switches and sockets are mounted on the board, except the microphone input which is bolted to the front panel using a "special" washer. This gives a good earth connection to the case and enables the microphone input to be directly decoupled to earth using the washer as the earth point.

The board itself is single sided with a few short wire links, which saves the added cost of having to use a double sided board with plated through holes, clearly unnecessary here. All the components are of good quality and in the unlikely event of a failure there should be no difficulty in obtaining replacements.

The Datong ASP employs RF speech processing which has selectable levels of clipping. Unlike most processors, the amount of clipping selected is accurately maintained by an audio level control. The circuits used to control these levels do not use any of the proprietry speech processor IC's. They have, apparently, been completely designed by Datong Electronics so that the performance is not set by the limits of the processor IC's.

Following the circuit it can be seen that the audio is fed into a low noise amplifier, whose gain is controlled by sophisticated level detection circuitry. This circuitry quickly determines the level of the incoming speech and retains the information even during speech pauses. In addition to this, extra time constants in the circuit prevent one off transients — such as dropping the microphone — from causing long term gain reductions. This means that the processor will smoothly follow any variation in speech level without the unpleasant effects associated with many simpler circuits.

The audio then passes into the clipper section where initially the level is predetermined. The signal is converted into single sideband at 60kHz which is clipped and filtered to remove the unwanted distortion products. It is, then, demodulated to give the cleanly processed audio. The level of this audio is corrected so that it remains constant

regardless of the level of clipping chosen. The final stage is a buffer circuit in which the gain can be preset to suit the user's requirement.

In addition to processed speech, it is possible to generate a 700Hz tone for setting the correct level for the processor output. This is generated by switching in circuitry around the RF section of the processor so that the tone is generated at exactly the same level as the processed speech.

In Use

Setting up the unit proved to be a very simple matter. Having installed the batteries, the microphone was plugged into the processor which was connected to the transmitter via a supplied lead. The only remaining procedure was to set the correct output level. This was easily accomplished using the 'tone' button. The tone enables the processor output level to be adjusted to the correct setting. This feature is one I have not seen on any other processors and it proves to be particularly useful and effective for setting the level rather than guessing what it should be.

With the ASP on and the required level of processing selected, I noticed the three LED's on the front panel lighting up at various times. I must admit I dislike unnecessary flashing lights and frills but these gave a good indication of the audio levels and proved to be useful and not at all unnecessary.

When on the air on VHF using an aerial fairly close by, some RF feedback was noticed at high clipping levels. Any RF finding its way back into the processor will be particularly troublesome because of the very high audio gains which have to be employed. However the problem was overcome by adding some more filtering on the microphone input to ensure the unit was trouble free. Datong Electronics were informed of the problem and were helpful in sorting it out.

Reports received over the air proved to be very encouraging. They indicated that in the 6 or 12dB position, the audio sounded louder but in no way harsh. As the processing level increased it became louder but sounded more clipped. No reports indicated that the signal sounded unclear or unduly harsh as some processors do.

Other tests carried out using a tape recorder and a noise source proved the processor to be surprisingly good. Initially tests were carried out to investigate the reduction in speech quality with increased clipping. It was found that at 6 or 12dB clipping there was almost no reduction in quality, but there was a distinct increase in audio level. As the processing was increased, the lower intensity sounds like 's' and 'f' became more prominent as would be expected. Nevertheless the speech quality remained high and the speech did not sound distorted.

The final test was to set the noise level so that at 0dB clipping the signal just could not be copied. From this point the clipping level was increased in 6dB steps. It was found that at 12dB clipping, copy was possible but difficult; when using 30dB copy was perfectly clear. This demonstrated, if in a simple way, the value of good processing.

For normal use, the settings recommended by Datong are probably most suitable: 6 or 12dB for local contacts; 12 or 18dB for DX and 24 or 30dB for pile ups.

Specifications

Degree of clipping available:	0.30dB in 6dB steps
Frequency respone at 0dB clipping:	400-3400Hz±3dB
Total harmonic distortion: (single 1kHz tone 30dB's clipping)	0.5%
Automatic control range	
Rin = 'LO'	1.4 to 200 mV ptp
Rin = 'HI'	10 to 1500 mV ptp
Automatic control system	
Hang time:	5s
Learn time:	1s
Attack time:	20ms
Input impedance	
Rin = 'LO':	680 R
Rin = 'HI':	200 kilohms
Maximum output level.	150 mVptp
External supply voltage range:	6 to 16V
Max supply voltage (short duration):	35V
Current drain:	15 mA
Internal batteries:	8 off HP7 or equivalent
External supply socket:	3.5mm jack on panel
Dimensions:	
Width	184mm (7.2 inches)
depth	153mm (6 inches)
height	44mm (1.7 inches)
extra height for feet	11mm (0.4 inches)
Weight including packing	1kg
Accesories-supplied complete with plugs for all connectors ie 4 pin mic plug 2 phone plugs 1 jack plug	

Summary

The processor proved to be an invaluable asset once the RFI problem was overcome. It gave considerable flexibility of operation and enabled the best level of clipping to be chosen for each situation with the minimum of fuss. The cleanliness of the processed audio was particularly impressive, and having spoken to people who have regularly been the cause of pile-up they say this factor alone can be worth several dB's.

Overall the performance of this unit was very good and the price tag of £82.80 makes it good value for money especially when compared to a linear or larger aerial system! When ordering there are two variants, ASP/A which has the microphone connections wired for compatibility with Yaesu equipment and ASP/B for Trio. Thanks are due to Dr D Tong of Datong Electronics for his assistance and to G4SVG for helping with some of the tests over the air.

Aerial Bent In Eire – A DXpedition to get across the pond

DXpeditions need not be to exotic locations, challenges still abound closer to home. If you've ever considered going on one, this article from Dave Green, G4OTV/EI2VUM may help you avoid the pitfalls along the way.

The idea of upping sticks and setting up an amateur radio station in some rare and exotic DX location must be one that has attracted many amateurs at one time or another. Unfortunately, turning the pipe dream into a reality is something that requires lots of planning and financial commitment and is not to be undertaken lightly.

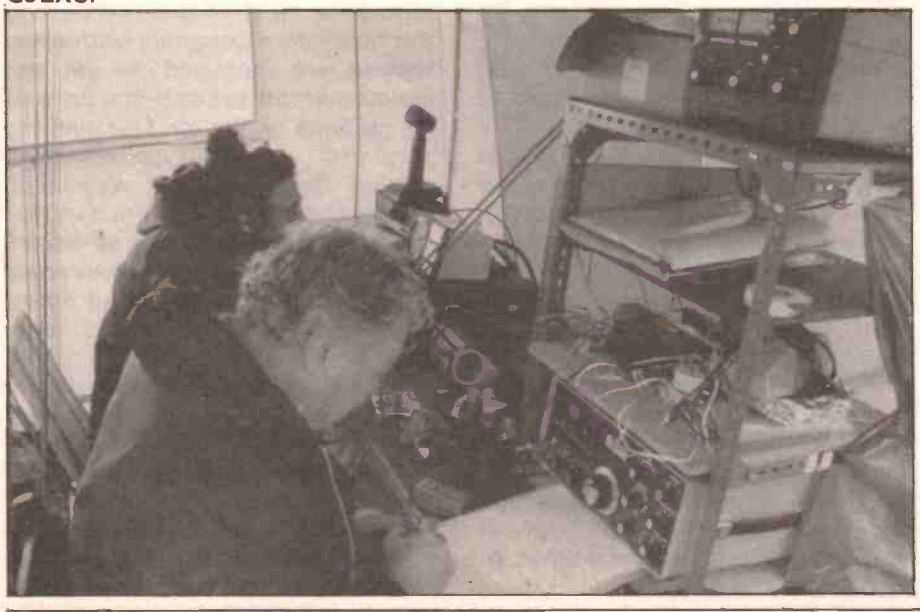
When the idea was put forward at the West Kent Amateur Radio Society in the autumn of 1983, there was no shortage of enthusiastic potential participants. The idea was not to charter aeroplanes and ships to get to some remote island in the Indian Ocean but a more modest expedition to a European location; perhaps with a view to gaining experience and expertise so that a real DXpedition could be undertaken in a few years time. Our first decision was to plan for a journey in the summer of 1985 which at that time was 20 months away. This may seem a ridiculously long time in the future, but in the event we made full use of all that time in planning and making the necessary arrangements for the trip.

Our second decision had to be the selection of the location. A number of sites were considered on the basis of their relative rareness on the amateur bands. These included Andorra, Leichtenstein, San Marino and the Balearic Islands. This last idea would have made a very pleasant summer location although how much operating would have got done amongst all those topless holiday makers is another matter. But another idea put forward was not necessarily to go to a rare location, but rather to try to do something which had never been done before. It was Roger, G4BIA, who had the brainwave of having a go at making the first ever direct transatlantic contact on the 2m band. Out came our maps. The closest European location to North America was the west coast of the Republic of Ireland and that was what we eventually decided to try.

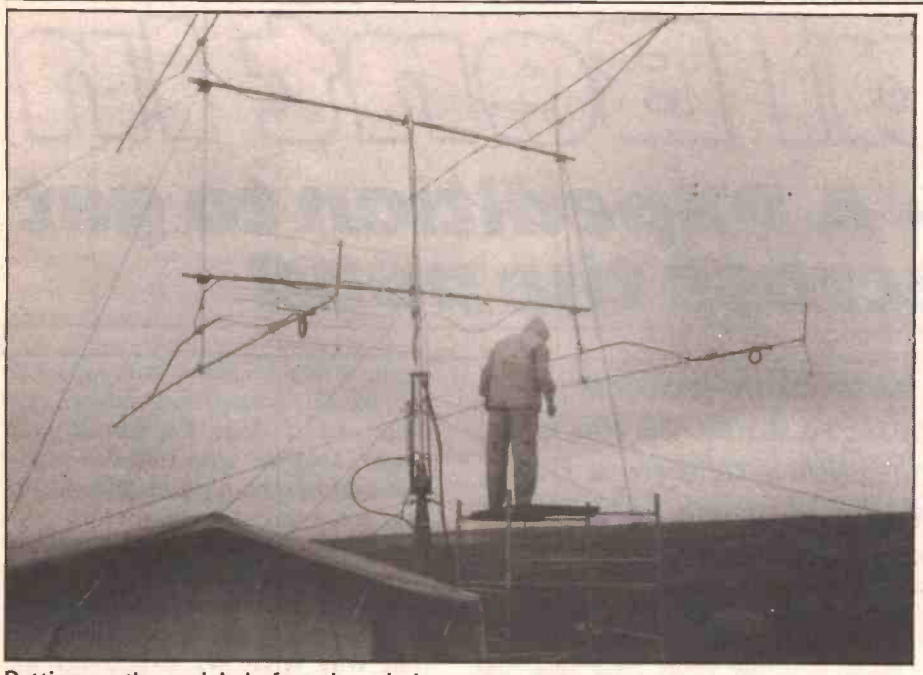
Now at last the real planning could begin. We decided on a two week expedition to commence in mid August 1985 with part of the time being spent in the Galway mountains and part on the small island of Inishmore off the west coast. Inishmore is the largest of a group of three islands making up the Aran group. The island it was thought would give us a real taste of DXpeditioning since Inishmore is served only by a passenger ferry. All gear, estimated at about one ton, would have to be manhandled onto the ferry, off the ferry and up to the site.

If we were to try contacting North America on 2m, we were hardly likely to succeed with an FT290 and a telescopic whip. We thought that to have the maximum chance of success, we would need a 2m transceiver with an excellent front end, a maximum legal power linear amplifier, four long yagis and a 40 foot mast with heavy duty rotator, as well as HF equipment for talk back purposes.

Fortunately, West Kent ARS already owned some of the equipment needed including an FT221 with MuTek front end, a pneumatic mast and a Ten Tec Argosy for HF. Had the mast not been available, we would have had to consider taking scaffold tubing which would have been far less convenient for transport purposes, although there would of course have been no need for the heavy duty rotator. How on earth we would have got a scaffold



An early photo of the operating tent when still inhabitable with Tony, G4 RPQ, nearest the camera and Jim, G8 ZXC.



Putting up the aerials before the wind had really started blowing.

mast aloft with the antenna array which we eventually purchased is something we prefer not to think about.

Our next problem was to raise sufficient money to buy all the gear which we felt we needed. We began thinking of suitable potential sponsors until someone had a brainwave... Was there not a beer which refreshed parts other beers could not reach? And were we not trying to get radio waves where other radio waves had not reached? The answer was Heineken. Poste haste we wrote to them giving details of the expedition and its objectives and asked for their assistance. Yes, they said, they were interested and so a meeting was arranged with their public relations company in London.

At the meeting we had to be careful not to talk in technicalities of high gain yagis and sporadic E propagation effects. Our PR man asked us if we could produce a broadcast quality tape recording of the first transatlantic 2m conversation! The PR company sent a recommendation to their principals Heineken, who eventually offered us a substantial sum towards our costs and we were extremely grateful to them for it. So you won't forget which beer to drink will you?

The balance of the money needed was raised by donations from the West Kent ARS and a variety of fund raising events such as jumble sales, a disco, raffles and other nefarious means.

We also had to sort out how we were going to shift over a ton of equipment. In the end we decided on a Sherpa diesel van, kindly loaned to us for the trip by G4RPQ's employers, a Volvo 245 estate car and a Citroen Visa hatchback. In addition Tony decided to tow his caravan behind the Volvo.

At this stage we issued advance publicity and press releases which were well covered in the amateur radio press, in local newspapers and on local radio. We had made contact with a number of American amateurs interested in participating in the tests on their side of the Atlantic including Harry, K3HZO, who visited us in Tunbridge Wells on two occasions. He was to act as Stateside co-ordinator for the various US and Canadian stations who wanted to be involved.

The first time we were able to try out the new equipment in anger was the May 144MHz contest. Everything was erected, tested and given a good trial and whilst we only managed to operate for 19½ hours out of the 24, we nonetheless had a fairly respectable result to show for our efforts.

Eventually, August 17 arrived and it was time to set off on the expedition proper. The group set off at 1100 hours that morning and drove to the ferry terminal at Holyhead stopping several times on route. In the dock the vehicles were separated since the van was travelling under cover of an EEC Community Carnet and therefore had to travel as a freight vehicle. With customs formalities quickly completed on arrival at Dun Laoghaire the group drove across Ireland to Slieve Elva arriving at about 1500 hours on Sunday.

A number of the group walked up the mountain, but having reached what they thought was the summit they were unable to see the sea. The true summit was several hundred yards further away and separated from hard ground by a bog which was impossible for us to traverse, let alone getting the equipment across. A council of war was held. By now it was pouring with rain, and Jim, Alex and Brian were sent off to investigate any possible alternative ways of getting to the top of the mountain or failing to find an alternative west facing site.

Eventually, Brian returned with what appeared to be good news. He had discovered a site further down the mountain which overlooked the Aran Islands in Galway Bay and was complete with a friendly landowner who was willing to allow us to do as we pleased on her land. We drove to the site and found a heavily sloping field, part bog, with a narrow entrance gate. We decided that this would have to be it and managed to get Tony's caravan into the field by the armstrong method. We erected the tents and retired for the night.

On the next day, Monday August 19th, we got up early and began unloading the vehicles. It rained for most of the day turning the field into a quagmire but nevertheless we managed to get the aerials erected and both the 2m and HF stations on the air. Our evening sked to our UK co-ordination station Gerry, G4JZP, was made successfully. Our first 2m sked on the transatlantic path was moonbounce, but there was a heavy mist obscuring the moon and no echos could be heard from our own transmissions.

By Tuesday, we had began to fear that the mast head preamplifier, kindly loaded to us by MuTek, was not working. We, therefore, closed the station at 0230 hours and retired to bed. We were awakened at 0430 by the noise of a terrific storm raging out-

The operating tent as lashed down during the many storms.

side. At 0600 Tony raised the alarm and we all turned out as quickly as possible to find that the four long yagis and the pneumatic mast were leaning over at about 70 degrees to the horizontal. They were being held aloft only by the scaffold tower which by sheer chance had been left in the place where the mast would otherwise have fallen. Nevertheless the aerials were in imminent danger of crashing to the ground.

In driving rain, and unfortunately without time to take photographs, all hands turned to and managed to get the mast upright and lower it to minimum height. Additional guys were added to hold the array in place. At this time the storm was still raging with the operating frame tent pulling at its guys and suffering substantial damage. With fears that the operating tent would be blown away we removed all equipment and reloaded it as best we could into the van. The frame tent was lashed to the ground using large diameter rope and secured to heavy spikes driven into the ground in the centre of the tent.

By lunchtime the storm had abated somewhat although there was still heavy rain. The damage was assessed and newplansmade. No important equipment had been damaged although all packing cases had been ruined and the operating tent was in a parlous state. In addition, Roger's personal tent was all but destroyed. The army mess tent had suffered several corner tears as a result of the high winds to which temporary repairs were effected. It had not been the most pleasant of days!

The next day, the weather started somewhat brighter and a contingent was sent off to Galway to buy extra rope, heavy polythene sheeting and a new spade. The Galway party also took wet sleeping bags,bedding and clothes with instructions to find a launderette with lots and lots of tumble dryers. The remaining group members tidied up the camp as best they could and re-installed as much of the equipment as possible. It was confirmed that the mast head preamp was not working and it was therefore bypassed.

Skeds with North America were recommenced in the evening although no 2m signals were heard other than a few pings which could have been reflections from random meteors. Subsequently, we found out from America that they too heard pings at similar times. It does therefore seem likely that some signal was getting through but because of the heavy winds the aerials were now at minimum height.

On Thursday there was more rain and no 2m signals were heard other than some very weak auroral sounds. This may have been morse but they could not be resolved sufficiently well to claim as Au signals with any certainty. Because we now had the bulk of the mountain behind us our signals were blocked in all directions except for the sector between north and west. This meant that no European or British signals could be heard. Many European and North American stations were worked on HF but generally the bands were in very poor condition. Skeds back to the UK with Gerry, G4JZP, and Syd, G3AIO, were maintained on 40 and 80 metres without much trouble.

By Friday, weather conditions were getting worse and worse. Because of warnings of further gale force winds we had to add to the lashings on the remains of the operating tent and to another frame tent. The operating tent was now continually awash with mud and was virtually uninhabitable. Alex, who had been feeling ill for the last two days, decided that morning that he would not continue and was therefore driven into Limerick in order to make his way home by train and ferry.

The future of the expedition was now in doubt with some members of the group feeling that abandonment should now be seriously considered. Despite all of these difficulties we continued to maintain all specific schedules on the 2m band. Also regular contacts were maintained with the UK and there was some general HF working. A further ping was heard on 2m in the early hours of the morning but nothing more. In the afternoon we made our first contact with G3YPQ/MM on the QE II and tried some 2m tests with him which were unfortunately unsuccessful. At that time the QE II was positioned 150 miles off the US coast in 70 knot winds. 2 metre equipment onboard the vessel was very limited and therefore the chances of success were not good. However, we were encouraged by the HF contact and made a further sked for the following day.

Saturday turned out to be a fateful day. There was heavy rain for most of the night. At breakfast time a meeting was held to discuss a proposal. In view of the virtually untenable condition of the site, the fact that most people were sleeping in wet beddng, together with the continuing low pressure area over the Atlantic, the expedition should be abandoned. Every member expressed great disappointment at having to consider taking such a

decision but when a poll was taken 2 were in favour of staying on, 7 were in favour of abandonment and 1 was undecided.

It was however agreed that a group of four would go on to the island of Inishmore for low power HF working although no 2m operation would be possible. The Inishmore group consisted of Brian, G4MXL, his son Paul, Jane, G4UPI and Dave, G4OTV. During our usual sked with Gerry we told him of the group's decision and received the welcome news that Alex had arrived home safely that morning.

Work began on dismantling the station at 0815 with an attempt being made to clean up pieces of equipment before they were reloaded into the vehicles. The operating tent was considered to be written off and was therefore given a viking funeral in a hollow below the man operating site. Despite continuous working, the reloading of the vehicles was not completed until about 1800 hours that evening.

A deputation visited the two long suffering elderly ladies whose land we had turned into a quagmire and whose television we had made unwatchable during the 2m operation. We gave our sincere thanks and some small gifts for them and their grandchildren before making our farewells. The main group then embarked on the journey back to Dun Laoghaire and England with the sub group setting off to find comfortable bed and breakfast accommodation before catching the ferry to Kilronan the next day.

The party of four which had decided to go on to Inishmore, ironically travelled in bright sunshine on the small ferry from Rosaveel to Kilronan and looked across to watch the rain clouds pouring their contents onto the mountainside site which had so recently been abandoned. They were staying at Mrs O'Flaherty's comfortable bed and breakfast accommodation on the island from which low power HF operation was undertaken. The group also identified two sites on the island which would make a good basis for a further attempt on a transatlantic 2 metre QSO — although one site was totally inaccessable by road and would have required an air lift to get the equipment to it.

Many lessons have been learnt on the expedition which will stand the group in good stead should a second attempt be made. The week spent on the island was most enjoyable with the return trip to the mainland being made particularly memorable by the small ferry being followed by a school of dolphins. As to the mainland site which we had been forced to abandon, our memories are of a totally inhospitable climate in a very hospitable country. As far as the 2m attempt is concerned we are convinced that it is possible to bridge the Atlantic on the band. As so often happens it is a matter of being in the right place at the right time. We think it will happen, and sooner rather than later.

RADIO Tomorrow

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

1 May
Horndean DARC: *CW With A Difference by G3JZU.*
N Wakefield RC: *Crime Prevention.*
Horsham ARC: *Databases (with 'on line' demonstration fingers crossed!) by G3IEE.*
Barry College FE RS: meets every Thursday in the College Annexe, Weycock Cross, Barry at 7.30pm.

2 May
Ayr ARG: AGM.
Aberdeen ARS: junk sale.
Amateur Radio and Computer Club: meeting at the Crown at Bishops Waltham.
W Kent ARS: constructors contest.
Southend DRS: meets every Friday at 7.30pm at the Rocheway Centre, Rochford.
Coventry ARS: night on the air.
Taunton DARC: meets every Friday at 7.30pm in the Basement, County Hall, The Crescent, Taunton.
Dartford Heath DFC: AGM at the Scout House, Broomhill Road.
S Manchester RC: meets every Friday at 8pm in the Salemoor Community Centre, Norris Road, Sale.
Radio Society of Harrow: activity night.
Nunsfield House ARG: natter nite.
Borders ARS: collection and plans for rally entry.

3-5 May
Porchester Community Association Arts and Crafts Exhibition with Fareham DARC running GB2HAM special event station.

4 May
British Amateur Television Club rally at the Crick Post House Hotel, junction 18 on M1, with more space for demos and traders plus lecture programme and lots for all the family. Free admission and doors open 10.30am.
Mid Ulster ARC: meets at the Guide Hall, Castle Hill, Gilford at 3pm.
Kelsoe Amateur Radio Rally.

5 May
Borehamwood and Elstree ARC: meeting.
Basingstoke ARC: *Home Construction with G3CBU.*
Felixstowe DARS: *Fibre Optic TV.*
Todmorden DARS: chat night and RTTY.
Dartmoor Mobile Rally at the Town Hall, Princetown. From 10 am till 3 pm for traders followed by an auction of equipment. Further details phone Cliff on Tavistock 2818.
Sandwell ARC: meets every Monday and Thursday evenings at 7.30pm in the Broadway, Oldbury, Warley.

6 May
Fylde ARS: equipment sale.
Dartford Heath DFC: pre hunt meeting.
Dunstable Downs RC: visit to MK TV.
Stevenage DARS: quiz.
Wolverhampton ARS: home built equipment competition.
Bourne ARS: meets twice a month at 7.30pm at the Village Hall, Edenham, Bourne.
Chichester DARC: meeting.

7 May
Fareham DARC: *24cm TV Demonstration by G3VXM.*
Worksop ARS: visit to Bolsover club.
Brighton DARS: meeting.
Havering DARC: informal.
Crawley ARC: junk sale.
Cheshunt DARC: natter nite.
S E Kent (YMCA) ARC: *Crime Prevention.*

8 May
Conwy Valley RC: fox hunt.
N Wakefield RC: visit to Leeds/Bradford Airport.
Southgate ARS: *A History of the Marconi Company.*
Edgware DRS: meeting.
Preston ARS: *Commercial Radio and Stereo Broadcasting by G6UOH.*
Stirling DARS: meeting at the Argyl Centre, Princes Street, Stirling.
Pontefract DARS: Raynet exercise.

9 May
Wimbledon DARS: inter club quiz vs Coulsdon ATS.
Radio Society of Harrow: *The Outgoing Chairman's Lecture.*
Aberdeen ARS: *Dealing With TVI by GM8FFX and GM4AXR.*
Crawley ARC: club annual dinner.
Nunsfield House ARG: *Lecture by G8OWA.*
Coventry ARS: *FAX and Packet Radio by G6VHI starting at 7.40pm.*

10 May
Radio Boot Fair at Whitfield near Dover opening at 10am with an entrance fee of 20p. Further details available from Ian, G3ROO, on 0304 821588.

11 May
Dartford Heath DFC: DF hunt.
Drayton Manor Mobile Radio Rally at Drayton Manor Park, Tamworth in Staffs. Doors open at 11am, with trades stands, group displays, side shows, flea market and fun for the kids.

12 May
Atherstone ARC: club night/night on the air.
Southdown ARS: meeting.
Morecambe Bay ARS: *RSGB by G3XSN.*
S Cheshire ARS: *Contest Working by G4APA.*
Milton Keynes DARC: meeting.
Coulsdon ATS: *Glider Radio by G6MFM at St Swithins Church Hall, Grovelands Road, Purley starting at 8pm.*

13 May
Bromsgrove ARS: AGM.
Bury RS: film show.
Chester DRS: *Computer Aided Design by GW8ICT.*
Delyn RC: meeting at 8pm in the Daniel Owen Centre, Mold.
Westmorland RS: AGM.
Wolverhampton ARS: *PEP — The Why's and Wherefore's.*
Keighley ARS: informal.
Dorking DRS: informal at the Star and Garter.
Verulam ARC: activity evening.
Newbury DARS: *Sporadic E by G4VSQ.*

14 May
White Rose ARS: AGM.
Three Counties ARC: *HM Coastguard.*
Fareham DARC: on the air natter night.
Lothians RS: *Raynet by GM3OWU.*
Stockport RS: meeting.
Wirral DARC: quiz night.
Havering DARC: *Developments in Microwaves by G4ALN.*
Crawley ARC: informal.
Cheshunt DARC: meeting.
Stroud ARS: meeting.
S E Kent (YMCA) ARC: video.

15 May
N Wakefield RC: *Lecture by G4OOC.*
Pontefract DARS: natter nite.

16 May
Ayr ARG: field day planning.
Aberdeen ARS: *The IBA Transmitter Network by GM3YMK.*
W Kent ARS: meeting.
Winchester ARC: *Satellites for TV by G3RDQ.*
Nunsfield House ARG: surplus equipment sale.
Coventry ARS: night on the air.

17 May
Milton Keynes DARS: *Long Range Aircraft Radio Communication.*
Basingstoke ARC: *Contest Operator Training.*

18 May
Mid Ulster ARC: annual mobile rally at Parkanaur House, six miles from Dungannon on the main Ballygalley Road, usual trade stands and bring and buy stall. Talk in on S22.
Basingstoke ARC: *Contest Operator Training.*
Special event station GB6STJ will be on the air from St Johns Middle School, Kenilworth from 9 till 4pm to celebrate the May Fair. Operation on 2m and possibly 70cm.

19 May
Braintree DARS: AGM.
Felixstowe DARS: social.
Todmorden DARS: practical construction demonstration, hints and techniques.

20 May
Worksop ARS: *Clandestine Radio by G3BA.*
Chester DRS: outside activity evening at Shepherds Houses near Frodsham.
Wolverhampton ARS: *SSB transmitter checks, tests, and power measurements by G4WAS.*
Bourne ARS: meeting.
Chichester DARC: meeting.
Biggin Hill ARC: quiz.
Fylde ARS: *Satellite TV in the UK.*

21 May
White Rose ARS: meet the new committee.
Fareham DARC: *SHF Measurements by Alan Dearlove.*
Hastings ERC: *Antennas.*
Brighton DARS: meeting.
Stockport RS: natter night.
Havering DARC: pre contest briefing.
Cheshunt DARC: portable from Baas Hill Common, Broxbourne.
S E Kent (YMCA) ARC: natter nite.

22 May Greater Peterborough ARC: VHF NFD preparations.
N Wakefield RC: social at the Water Prince Floating Restaurant.
Edgware DRS: constructors contest and NFD briefing.
Preston ARS: preparation for HF NFD.
Stirling DARS: meeting.
Pontefract DARS: 2m DF hunt for the G8BVH trophy.

23 May Dunstable Downs RC: rig doctor checks your equipment.
Nunsfield House ARG: rally job distribution.
Borders ARS: meeting.
Coventry ARS: an evening portable at Hartshill Hayes Country Park.
Aberdeen ARS: fox hunt.

25 May **Plymouth Mobile Radio Rally at Plymstock Comprehensive School, Plymstock, Plymouth. From 10 till 5 with talk in on S22. Details from G0BNT on 0752 777777.**
Southdown ARS: raft race.
Wolverhampton ARS: 2m DF hunt.

26 May Atherstone ARC: DF hunt.

27 May Bromsgrove ARS: club night.
Wirral DARC: *Lecture by G3LEQ.*
Chester DRS: *ATV by G4EZO.*
Delyn RC: meeting.
Wolverhampton ARS: your problems solved plus night on the air.
Keighley ARS: *Amateur Radio on a Shoestring by G3RJV.*
Dorking DRS: informal at the Cock, Headley.
Verulam ARC: *Is There Life Below 40? by G3ROO.*

28 May White Rose ARS: NFD briefing.
Three Counties ARC: junk sale.
Fareham DARC: on the air natter night.
Lothians RS: DF hunt.
Stockport RS: meeting.
Havering DARC: DF hunt.
Crawley ARC: quiz vs Mid Sussex ARC.
Cheshunt DARC: *Contest Operating and Logging by G3TIK and G3WFM.*
Stroud ARC: meeting.
S E Kent (YMCA) ARC: visit to a brewery.

29 May Glossop DARG: activity night from Dinting Railway Centre.
Coulsdon ATS: a general morse and RAE help night.

30 May Ayr ARG: *Stargazing.*
W Kent ARS: meeting.
Maidstone YMCA Sportscentre ARS: AGM.
Wimbledon DARS: summer barbecue.
Nunsfield House ARG: rally preparation.
Coventry ARS: night on the air.
Aberdeen ARS: building competition.

1-6 June **GB2NM Centenary special event station at the Chalk Pits Museum operated by Chichester DARC.**

1 June **Southend DRS Amateur Radio and Electronics Rally at the Rocheway Centre, Rochford, Essex. Trade stands, bring and buy, refreshments, RTTY demonstration and family amusements. Talk in on S22 and further details Ron G6SOH or Brian G4RDS.**
Mid Ulster ARC: meets at the Guide Hall, Castle Hill, Gilford at 3pm.

2 June Basingstoke ARC: VHF NFD arrangements.
Felixstowe DARS: meeting.
Southdown ARS: meeting.
Todmorden DARS: car treasure hunt.

3 June Worksop ARS: visit to Scunthorpe club.
Dartford Heath DFC: pre hunt meeting.
Fylde ARS: top band DF hunt.
Wolverhampton ARS: *Electricity in Water by G3RVA.*
Bourne ARS: meeting at the Village Hall, Edenham, Bourne, starting at 7.30 pm.
Chichester DARC: meeting.

4 June Fareham DARC: *The G6NZ Lecture.*
Havering DARC: informal.
Cheshunt DARC: NFD final arrangements.
S E Kent (YMCA) ARC: natter nite.

5 June Horndean DARC: *SSTV.*
N Wakefield RC: visit to Spen Valley junk sale.
Preston ARS: test your rig night by G3SYA.
Sandwell ARC: meets every Monday and Thursday at their premises in Broadway, Oldbury, Warley.
Barry College FE RS: meets every Thursday in the College Annexe, Weycock Cross, Barry.
Pontefract DARS: visit to the Spen Valley junk sale.

6 June Taunton DARC: meets every Friday at 7.30pm in the Basement of County Hall, The Crescent, Taunton.
Clifton ARS: meeting.
Nunsfield House ARG; rally preparations.
Borders ARS: meeting.
Dunstable Downs RC: *Wire Antennas by G3WLM.*
S Manchester RC: meets every Friday.
Aberdeen ARS: HF NFD preparations on site.

7-8 June **HF National Field Day.**
Three Counties ARC operating a portable station at the Lurgshall Fete.
Wolverhampton ARS operating a demonstration station at the 21st Tipton Carnival and show.

8 June Dartford Heath DFC: DF hunt.
17th Elvaston Castle Mobile Radio Rally in the showground of the Country Park, 5 miles SE of Derby on the B5010. Admission is free although there is a car park charge of 45p. Over 90 trade stands, bring and buy and flea market, plus fun for all the family. Further details from the sec or G4CTZ on 0332 799452.

9 June Southdown ARS: meeting.
Morecambe Bay ARS: *SSTV by G0AVF.*
Milton Keynes DARC: meeting.
Coulsdon ATS: an open evening for anyone interested in amateur radio and the club. Demonstrations of HF, VHF, RTTY and ATV.

10 June Chester DRS: surplus equipment sale.
Delyn RC: meeting at 8 pm at the Daniel Owen Centre, Mold.
Keighley ARS: informal.
Dorking DRS: informal at the Star and Garter pub.
Newbury DARS: *Intermodulation, Phase Noise and Dynamic Range by G3RZP.*
Bromsgrove ARS: lecture.

11 June Three Counties ARC: *Cellular Radio.*
Fareham DARC: on the air natter nite.
Lothians RS: AGM.
Wirral DARC: practice DF hunt.
Havering DARC: VHF NFD briefing and crystal set competition.
Crawley ARC: informal.
Cheshunt DARC: natter nite.
Stroud ARS: meeting.
S E Kent (YMCA) ARC: top band DF hunt.

12 June Conwy Valley RC: AGM.
N Wakefield RC: on the air.
Edgware DRS: meeting.
Stirling DARS: meeting at the Argyle Centre, Princes St.

13 June Amateur Radio and Computer Club meeting at the Crown in Bishops Waltham.
Wimbledon DARS: constructors contest.
Clifton ARS: meeting.
Nunsfield House ARG: rally round up.
Aberdeen ARS: super sale of good equipment.

14 June Milton Keynes DARS: meeting.

16 June Felixstowe DARS: social.
Todmorden DARS: *JOTA and Radio Reminiscences.*

17 June Worksop ARS: *mystery lecture by G3MGX.*
Midland ARS: meeting.
Fylde ARS: informal.
Wolverhampton ARS: *Lightning Protection.*
Bourne ARS: meeting.
Chichester DARC: meeting.
Chester DRS: barbecue.
Biggin Hill ARC: *Moonbounce Operation.*

18 June Fareham DARC: *Basic Digital Techniques by G4ITF.*
Hastings ERC: *Medical Electronics.*
Havering DARC: *Lecture by G5RV.*
Cheshunt DARC: meeting.
S E Kent (YMCA) ARC: natter nite.

19 June N Wakefield RC: fox hunt and barbecue.
Preston ARS: *Analysis by G3ZXC.*

20 June Ayr ARG: summer natter nite.
Winchester ARC: *Spectrum by G4CFY.*
Clifton ARS: meeting.
Nunsfield House ARG: *Mobile ATV.*
Borders ARS: meeting.
Dunstable Downs RC: *The Scene of the Crime by G8XTW.*
Aberdeen ARS: competition winners talk about their projects.

22 June Wolverhampton ARS: 2m DF hunt.

23 June Morecambe Bay ARS: *Raynet.*

24 June Maltby ARS: visit to Stones brewery, Sheffield.
Chester DRS: *Cellular Radio by GW1ATZ.*
Delyn RC: meeting.
Wolverhampton ARS: night on the air and your problems solved.
Keighley ARS: *Antennas by Mr Simpson of Ant Products.*
Dorking DRS: *Amateur TV — a live demonstration by G6YPN on Ranmore Common.*
Bromsgrove ARS: club meeting.

25 June Three Counties ARC: computer night.
Fareham DARC: on the air natter nite.
Lothians RS: *Forward Planning.*
Wirral DARC: *film night — troposcatter communications in the oil industry and amateur satellite operation.*
Havering DARC: *Meteor Scatter by G8VR.*
Crawley ARC: *Weather Satellites by G4TVC.*
Cheshunt DARC: meeting.
Stroud ARS: meeting.
S E Kent (YMCA) ARC: setting up portable equipment for outdoor operations.

26 June Greater Peterborough ARC: meeting.
Edgware DRS: VHF NFD briefing.
Glossop DARG: return to Dinting Railway Centre to discuss Glossop in the park and a practice run.
Stirling DARS: meeting.
Coulsdon ATS: meeting.

27 June Wimbledon DARS: *Space Exploration of the Solar System by Dr Hunt.*
Clifton ARS: meeting.
Nunsfield House ARG: treasure hunt.
Aberdeen ARS: HF NFD debriefing and natter nite on the air.

28 June Three Counties ARC: summer barbecue.

30 June Felixstowe DARS: meeting.
Sandwell ARC: *Amateur Radio on the Burma Railway by G3BA.*

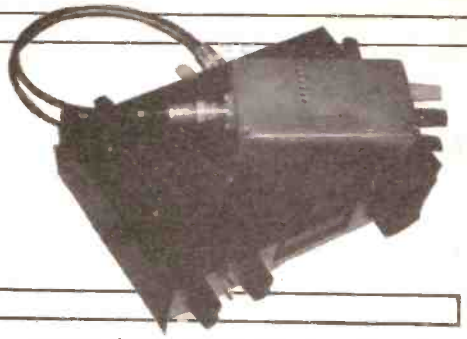
1 July Dartford Heath DFC: pre hunt meeting.
Bourne ARS: meets at the Village Hall, Edenham, Bourne.
Chichester DARC: annual summer social at Goodwood.

Will club secretaries please note that the deadline for the August segment of Radio Tomorrow (covering radio activities from 1st July to 1st September) is 25th May.

Contacts

Aberdeen ARS	Don	04676251
Abergavenny & NH ARC	GW4XQH	0873 4655
Alyn and Deeside ARS	GW4RKX	0244 660066
Amateur Radio & CC	Trevor	04895 81032
Atherstone ARC	Roy	0203 393518
Axe Vale ARC	Bob	029 74 5282
Ayr ARG	GM3THI	Ayr 42313
Barking RES	R. Woodberry	01 594 4009
Barry College RS	John	065679 710
Basingstoke ARC	Dave	07356 5185
Bath DARC	G4UMN	Frome 63939
Biggin Hill ARC	G0AMP	0689 57848
Borehamwood Elstree ARS	Tony	01 207 3809
Braintree ARS	G6CJA	0376 45058
Brighton DARS	Peter	0273 607737
Bristol ARC	G4YOC	Bitton 4116
Bristol (Shirehampton) ARC	Ron Ford	0272 770504
BT (Reading) ARC	G4MUT	0734 693766
Bury RS	Allan	0204 706191
Cambridge DARC	D. Wilcox	0954 50597
Cheshunt DARC	G4VMR/G4VSL	092084 250
Chester DRS	Alan	0244 336639
Chichester DARC	C. Bryan	0243 789587
Clifton ARS	RA Hinton	01 301 1864
Conwy Valley ARC	G4VVW	0492 636376
Coulsdon ATS	Alan	01 684 0610
Coventry ARS	Robin	0203 73999
Darenth Valley RC	Sec	0322 63368
Dartford Heath DFC	Pete	0322 844467
Denby Dale DARC	G3SDY	0484 602905
Derwentside ARC	G1AAJ	0207 520477
Donegal ARC	EI3BOB	074 57155
Dorking DRS	John	0306 77236
Droitwich DARC	G4HFP	0299 33818
Dudley ARC	John	0384 278300
Dunstable Downs RC	Phill Morris	0582 607623
East Kent ARS	Stuart	0227 68913
East Lancashire ARC	Stuart	0254 887385
Edgware DARS	John	Hatfield 64342
Exeter ARS	Roger Tipper	0392 68065
Fareham DARC	Alan	0329 288139
Farnborough DRS	Mr Taylor	0252 837581
Felixstowe DARS	G4YQC	0473 642595
Fylde ARS	PRO	0253 737680
Galashiels DARS	GM3DAR	0896 56027
G. Peterborough ARC	Frank	0733 231848
Halifax DARS	D. Moss	0422 202306
Harrow RS	Dave Atkins	0923 779942
Hastings ERC	Dave Shirley	0424 420608
Haverhill DARS	Rob Proctor	0787 281359
Havering DARC	GOBOI	04024 41532

The Modula Converters



In this part, S Niewiadomski describes the construction and alignment of a set of simple matching amateur band converters to extend the coverage to 1.8-30MHz, including the WARC bands.

Two types of amateur band converter have been designed, one with an RF amplifier for use on bands above 14MHz and one without an RF amplifier for bands below 14MHz. 14MHz is the normally accepted frequency above which RF amplifiers are useful, but sufficient information is given to allow either type of converter to be built for any band. Since the 14MHz receiver can demodulate only USB signals, the conversion frequencies for the converters have been chosen to cause sideband inversion for bands where LSB is used (below 10MHz) but not for bands where USB is used.

The converters need not be used with the 14MHz receiver, since they can be used with any receiver covering 14-14.5MHz. The converters for the 10, 18 and 24MHz bands, for example, could be used with amateur band receivers which do not cover these relatively new bands.

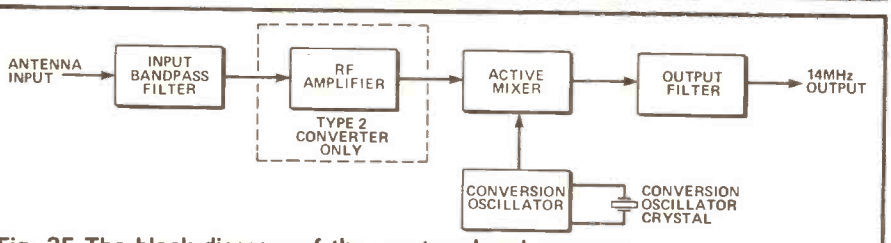


Fig. 25 The block diagram of the amateur band converters.

Circuit Description

The block diagram of the converters, shown in **Fig. 25**, may help in understanding their operation.

In the case of the converter design without an RF stage (**Fig. 26**), the antenna input feeds the SL6440 active mixer, IC601, via the input bandpass filter consisting of T601, C601, C602, C603 and T602. This filter gives better than 50dB of image rejection on all bands except 10MHz where the rejection is approximately 25dB. This is a result of the image frequency for this band being at approximately 18MHz, less than one octave above the desired frequency. *It may be better to construct a type 2 converter for the 10MHz band, the extra tuned circuit improving the image rejection.*

The DC operating point of IC601 is set to be identical to the mixer in the main receiver. Some rejection of unwanted mixer products is provided by the tuned circuit formed by the

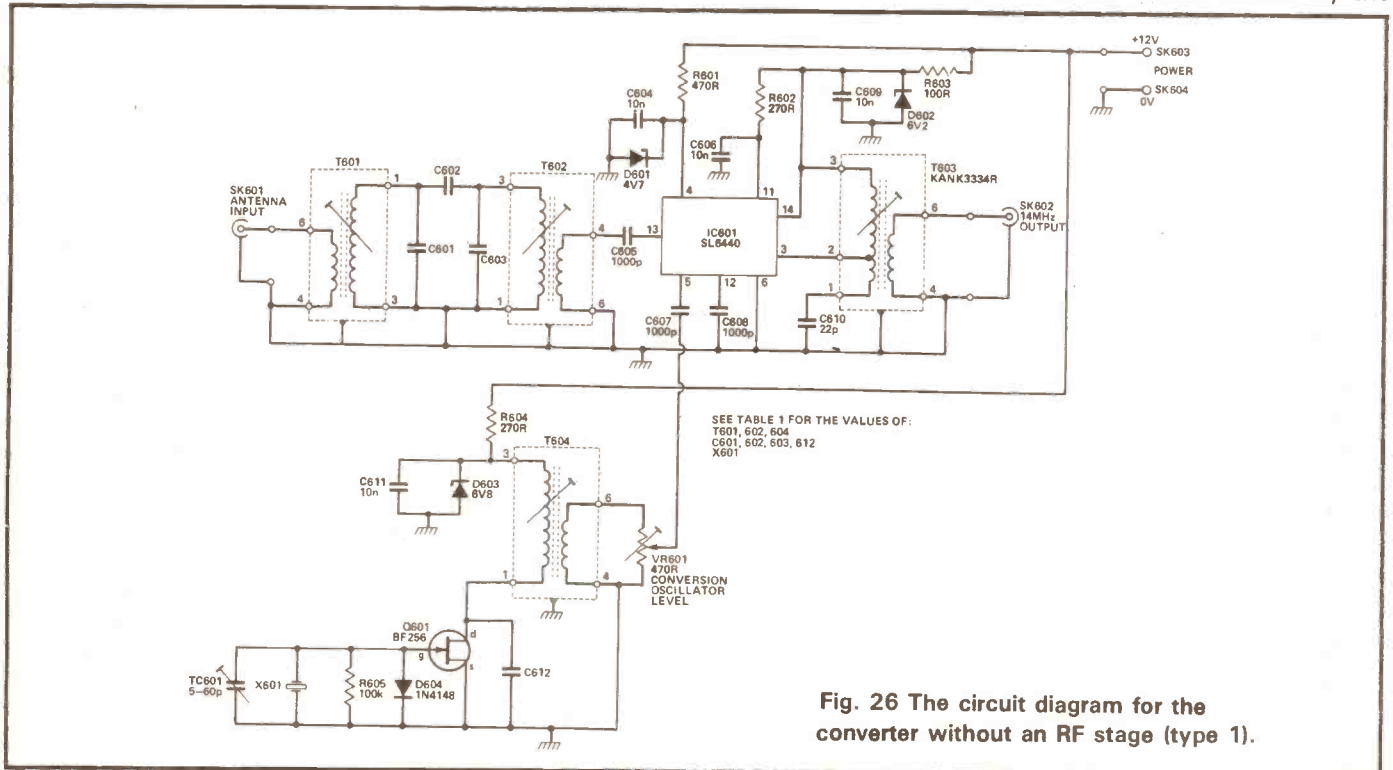


Fig. 26 The circuit diagram for the converter without an RF stage (type 1).

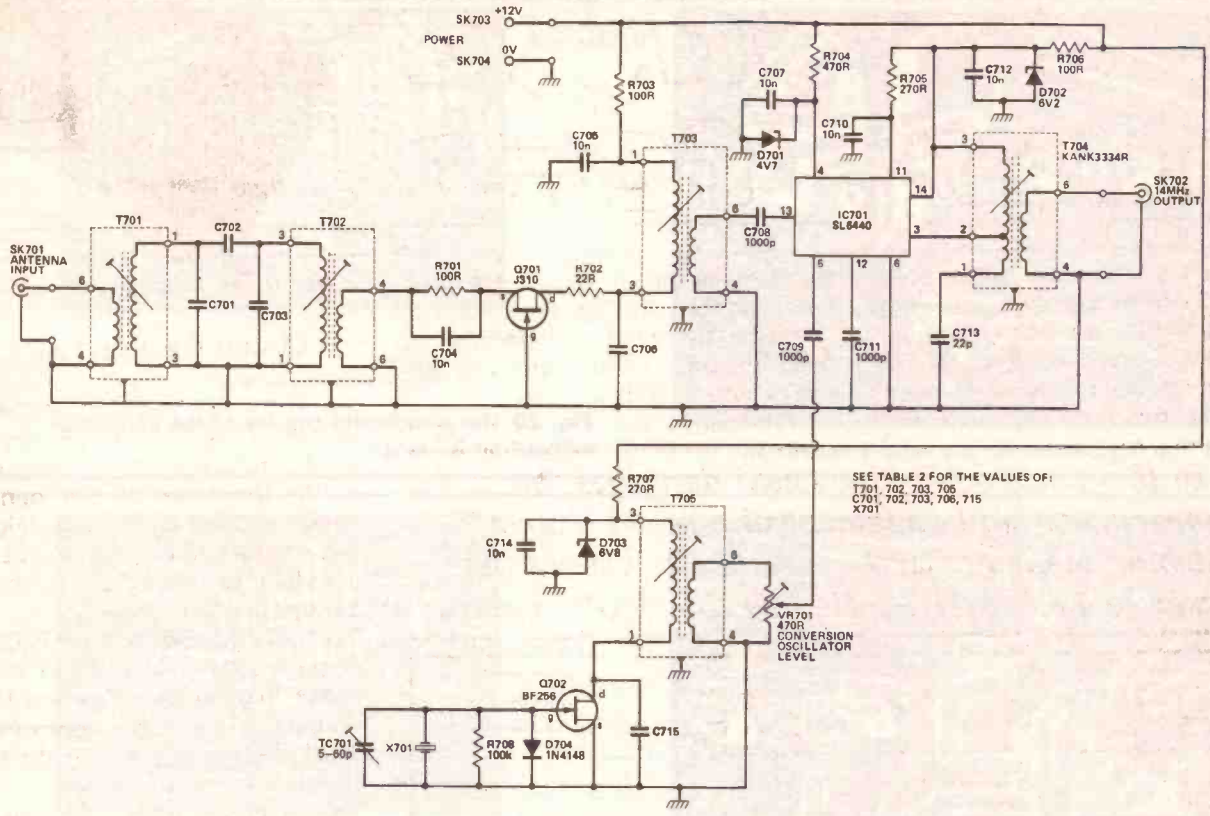


Fig. 27 Circuit diagram for the converter with an RF stage (type 2).

primary of T603 and C610, set to resonate at approximately 14.25MHz. A low impedance output from the converter is taken from the secondary of T603 via SK602.

Q601 and associated components form the conversion oscillator. The exact frequency of oscillation is set by varying TC601 and the output level is set by varying VR601.

Table 1 shows the types of transformers, the capacitor values and the crystal frequencies used for each band. The frequency given for X601 is the most convenient to use if a new crystal is being bought for this project. A crystal in the alternative X601 range might well be available in the shack junkbox.

The circuit of the type 2 converters (**Fig. 27**) is identical to that for the type 1 converters with the addition of an RF amplifier stage, Q701, and an extra tuned circuit coupling the RF amplifier to the mixer. **Table 2** shows the transformer types, capacitor values and crystal frequencies for each band.

Construction and Alignment

Each converter is built on its own PCB and mounted in a die cast box.

The foil pattern for the type 1 converters is shown in **Fig. 28** and the component layout in **Fig. 29**. The type 2 converter is shown in **Figs. 30** and **31**. As used for the 14MHz receiver, the converters are built on single-sided PCB, and the technique described in part 2 used for producing the boards.

Assembly of the boards is straight forward and again a socket was used in the prototypes for the SL6440, without any problems being encountered.

Drilling details for the die cast boxes used to house the converters are shown in **Figs. 32, 33** and **34.** These boxes are identical for either type of converter. Ventilation holes are drilled in the boxes around the position of the SL6440 to allow heat to dissipate. No details have been given for the antenna socket fixing holes, SK601/701, as the type of socket used is left to individual constructors. Similarly, the 14MHz output socket, SK602/702, should be chosen to suit the antenna input socket on the main receiver.

Testing and alignment of these converters is very simple and straight forward. With all the components mounted on a converter board, check thoroughly for short circuits and obvious errors. Then apply power and check the zener voltages and oscillator operation before mounting the board in its box.

The current drawn from the supply should be approximately 100mA, for either type of converter. Check that the voltages across D601/701, D602/702 and D603/703 are within 5% of their nominal values. Connect an oscilloscope or high impedance voltmeter on a 1V range between the wiper of VR601/701 (or IC601/701 pin 5) and earth, set the wiper to approximately midway, and rotate the core of T604/705 until oscillation is seen. Adjust the core to give the maximum output level. If no oscillation is seen, make sure that the correct T604/705 and C612/715 combination for the required band has been fitted. When the maximum oscillation level has been found, TC601/701 can be trimmed to give exactly the correct frequency.

Now set the injection level into IC601/701 pin 5 to 800mV peak-to-peak by adjusting VR601/701. It is best now to fit the board into its box and connect up its input, output and power supply connections. **Fig. 35** shows the orientation of the board in the box, it being identical for both types, by showing the position of T603/704. When the connections

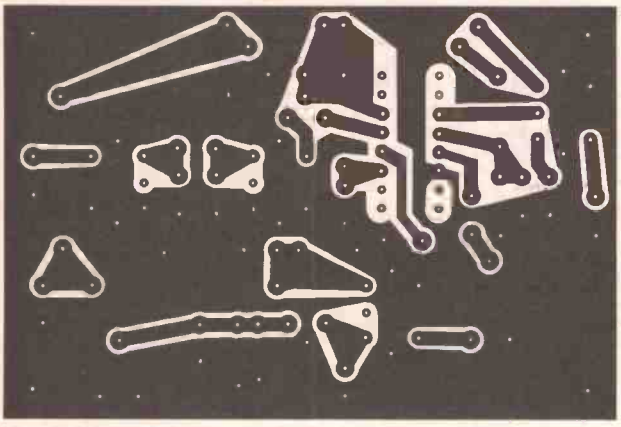


Fig. 28 The foil pattern for the type 1 converter.

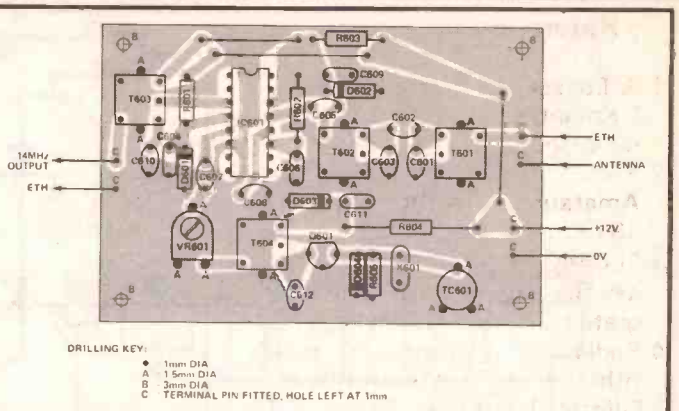


Fig. 29 The component overlay of the converter without an RF stage.

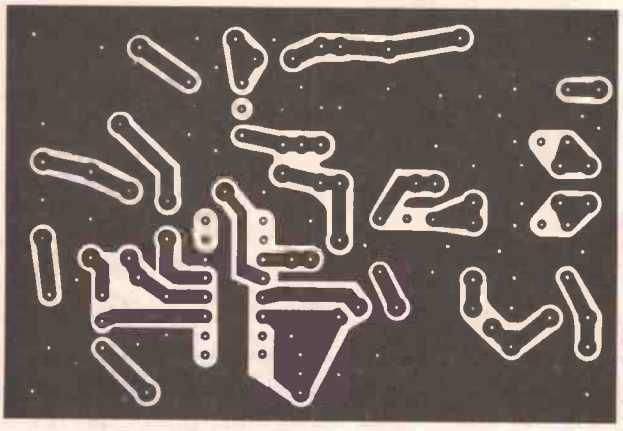


Fig. 30 Foil pattern for the type 2 converter.

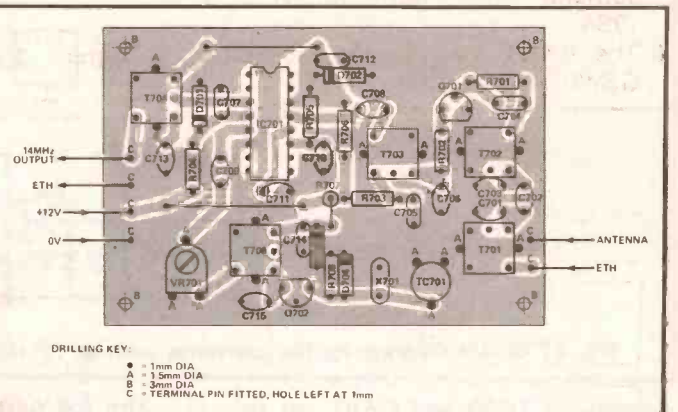


Fig. 31 Component overlay for the converter with an RF stage.

have been made, the input and output filters can be aligned.

Inject with a signal generator a sine wave of a frequency in the middle of the band to be covered of approximately 100mV peak-to-peak into the antenna input and monitor between IC601/701 pin 13 and earth with the oscilloscope. Adjust the core of T601/701 and T602/702 (and T703, if fitted) for maximum signal at IC601/701 pin 13. Several adjustments of each core will be needed before the best setting will be found.

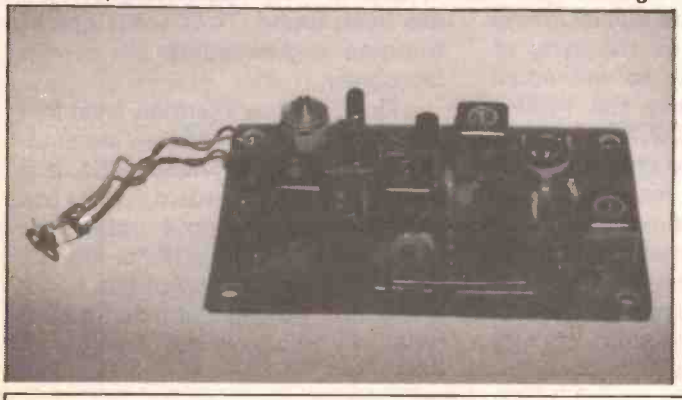
Now monitor the 14MHz output, SK602/702, and adjust the core of T603/704 for maximum output in the 14MHz band. The tuning of this resonant circuit is quite broad, the major selection at 14MHz being provided by the main receiver input tuned circuits.

In Use

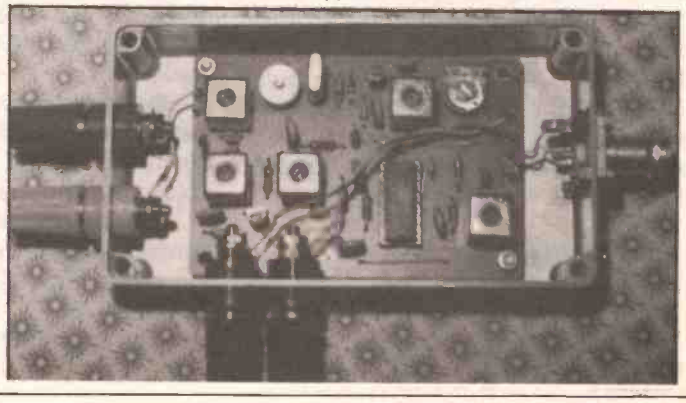
Preparing a converter for use is simply a process of connecting its power supply sockets in parallel with those of the 14MHz receiver, coupling the converter 14MHz output to the receiver antenna input and connecting an antenna to the converter input. Tuning charts relating the receiver digital frequency readout and the received frequency for each band are shown in **Fig. 36**. These charts assume that the single value given for X601/701 has been used, rather than a value in the alternative range.

CPL Electronics have informed us that they can supply a kit of the 14MHz Rx for £142 (+ £2 p+p). The five PCBs are available from them for £14 (+ 70p p+p). Contact CPL at 8 Southdean Close, Hemlington, Middlesborough TS8 9HE (phone 0642 591157).

The completed PGB of the converter without the RF stage.



The boxed and completed type 2 converter.



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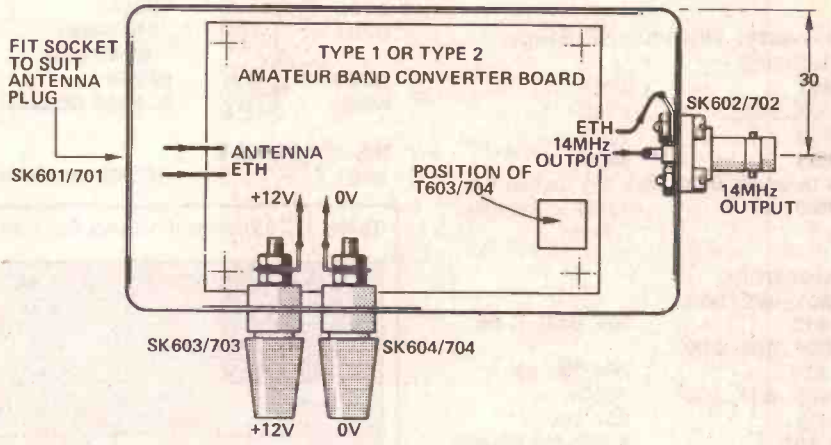
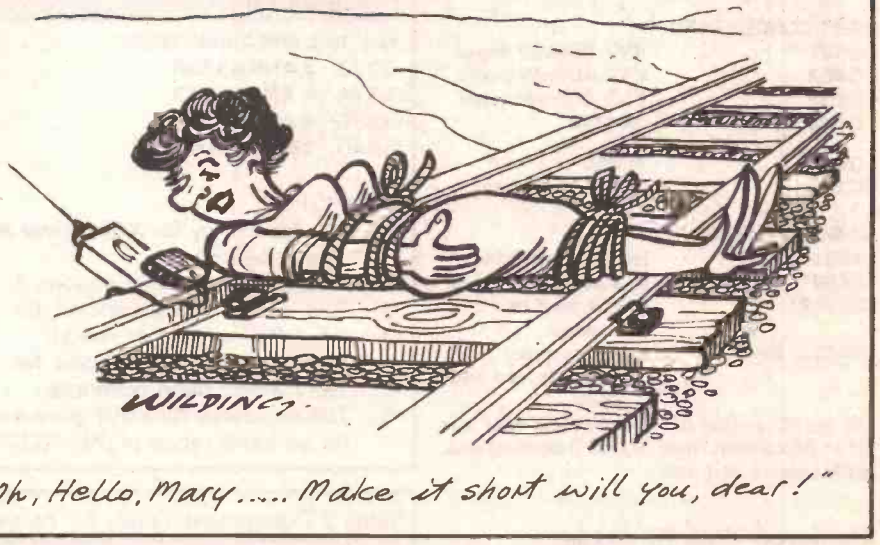


Fig. 35 The view from the top of both types of converter showing the position of the major components.



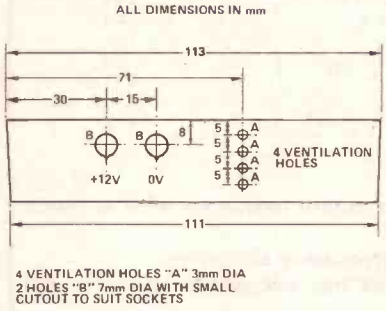


Fig. 32 The mechanical details of the power input sockets, side of the converter case.

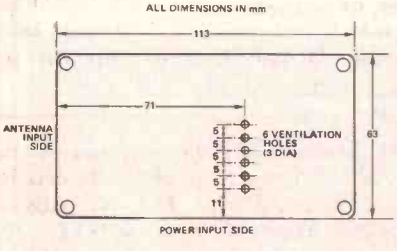


Fig. 33 Drilling details for the lid of the converter case.

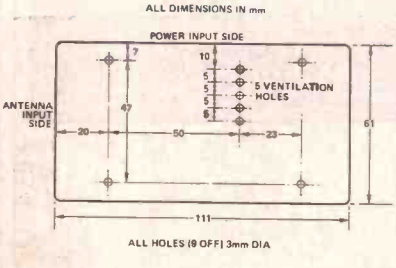


Fig. 34 How to make the bottom of the converter case (viewed from the bottom).

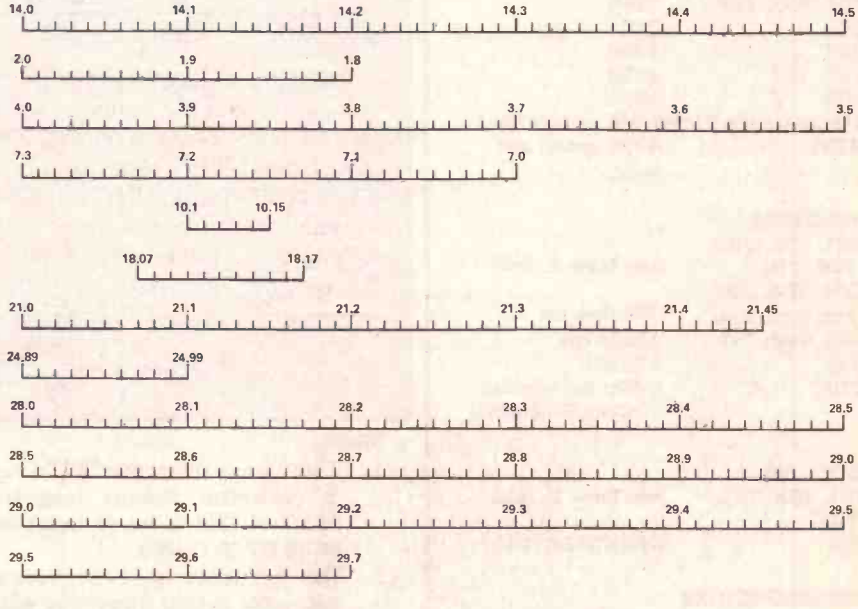


Fig. 36 Tuning charts for the amateur band converters.

Components List

Converter Without RF Stage

RESISTORS

R601	470R
R602, 604	270R
R603	100R
R605	100k

All resistors are 0.25W 5% carbon film

VR601	470R preset min horiz.

CAPACITORS

C601, 602, 603, 612	see Table 1, cer
C604, 606, 609, 611	10n disc cer
C605, 607, 608	1000p cer
C610	22p cer
TC601	5-60p foil trimmer (Cirkit 06-60001)

INDUCTORS

T601, 602, 604	see Table 1, Toko
T603	KANK3334R Toko

SEMICONDUCTORS

D601	4V7 400mW zener
D602	6V2 400mW zener
D603	6V8 400mW zener
D604	1N4148
Q601	BF256
IC601	SL6440 (Plessey)

MISCELLANEOUS

X601	HC18U (see Table 1)
SK601	to suit antenna plug
SK602	to suit lead to receiver
SK603, 604	4mm insulated terminals, red and black

16 pin IC socket (if required); die cast box 113×63×31mm; 1mm (0.040") terminal pins; 68A screws and nuts.

Converter With RF Stage

RESISTORS

R701, 703, 706	100R
R702	22R
R704	470R
R705, 707	270R
R708	100k

All resistors are 0.25W 5% carbon film

VR701	470R preset min horiz.

CAPACITORS

C701, 702, 703, 706, 715	see Table 2, cer
C704, 705, 707, 710, 712, 714	10n disc cer
C708, 709, 711	1000p cer
C713	22p cer
TC701	5-60p foil trimmer (Cirkit 06-60001)

INDUCTORS

T701, 702, 703, 705	see Table 2, Toko
T704	KANK3334 (Toko)

SEMICONDUCTORS

D701	4V7 400mW zener
D702	6V2 400mW zener
D703	6V8 400mW zener
D704	1N4148
Q701	J310 (Cirkit 59-02310)
Q702	BF256
IC701	SL6440 (Plessey)

MISCELLANEOUS

X701	HC18U (see Table 2)
SK701	to suit antenna plug
SK702	to suit lead to receiver
SK703, 704	4mm insulated terminals, red and black

16 pin IC socket (if required); die cast box 113×63×31mm; 1mm (0.040") terminals pins; 68A screws and nuts.

Table 1 Component values for converters without RF stages.

BAND (MHz)	T601, 602	C601, 603 (pF)	C602 (pF)	T604	C612 (pF)	X601 (MHz)	ALTERNATIVE X601 (MHz)
1.8-2.0 LSB	3333	150	12	3335	82	16.0 note 1	16.0-16.3
3.5-4.0 LSB note 2	3333	39	6.8	3335	68	18.0 note 1	17.8-18.0 note 3
7.0-7.3 LSB note 2	3334	100	12	3335	47	21.3 note 1	21.1-21.5 note 4
10.1-10.15 USB	3334	47	6.8	6440	39	4.0 note 5	3.9-4.35

Key to transformer types:

3333 KANK3333R
3334 KANK3334R
3335 KANK3335R
6440 154AN7A6440E

Notes:

1. This frequency for X601 gives a converter output frequency with its lower end at 14MHz.
2. This is the full IARU regions 1, 2 and 3 frequency allocation.
3. This range of frequencies for X601 does not necessarily give the full 3.5-4.0MHz band coverage.
4. This range of frequencies for X601 does not necessarily give the full 7.0-7.3MHz band coverage.
5. This frequency for X601 gives a converter output frequency of 14.1-14.15MHz for an input range of 10.1-10.15MHz.

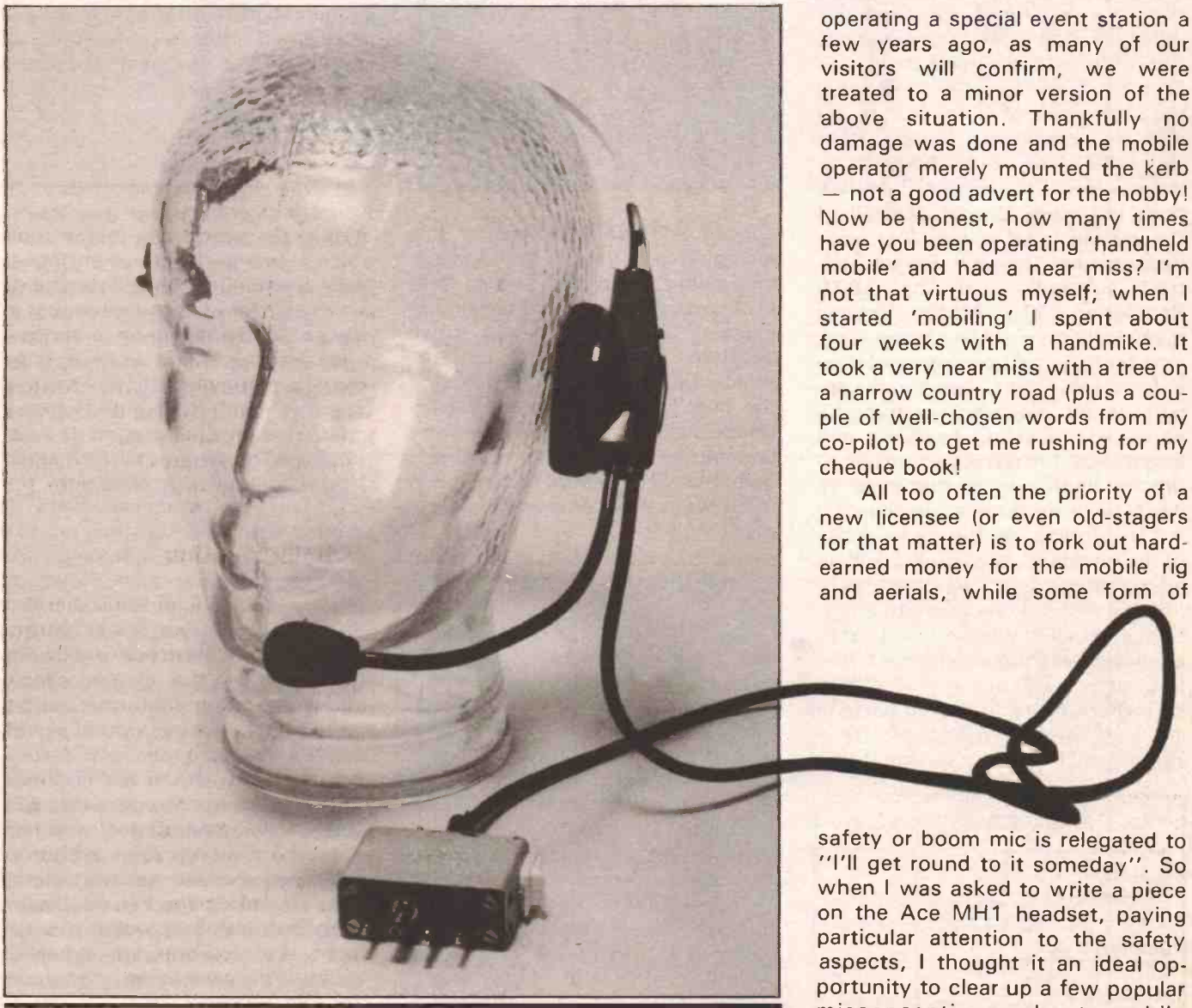
Table 2 Component values for converters with RF stages.

BAND (MHz)	T701, 702, 703	C701, 703, 706 (pF)	C702 (pF)	T705	C715 (pF)	X701 (MHz)	ALTERNATIVE X701 (MHz)
18.07-18.17 USB	3335	68	6.8	6440	39	4.0 note 1	3.67-4.07
21.0-21.45 USB	3335	47	6.8	3334	100	7.0 note 2	6.95-7.0
24.89-24.99 USB	3335	33	3.3	3334	39	10.89 note 2	10.49-10.89
28.0-28.5 USB	3335	22	3.3	3334	22	14.0 note 2	-
28.5-29.0 USB	3335	22	3.3	3334	22	14.5 note 2	-
29.0-29.5 USB	3335	22	3.3	3334	22	15.0 note 2	-
29.5-29.7 USB	3335	22	3.3	3334	22	15.5 note 2	-

Notes:

1. This frequency for X701 gives a converter output frequency of 14.07-14.17MHz for an input range of 18.07-18.17MHz.
2. This frequency for X701 gives a converter output frequency with its lower end at 14MHz.

An 'Ace' Headset For Mobiling



Peter Metcalfe, G8DCZ, tries out one of the many headsets available on the market and looks at the rather confused legal situation.

"...Yes OK from G2 XYZ/M...I do agree...mobile operation using...QRX...er...where was I? Oh yes...a handmike is so tricky...QRX gears...the cable gets all wrapped up with the wheel...QRX roundabout..." (Insert sound effects of bangs and crashes followed by an abrupt dropping of carrier!)

Does this all seem a little far fetched? Well may be, but while operating a special event station a few years ago, as many of our visitors will confirm, we were treated to a minor version of the above situation. Thankfully no damage was done and the mobile operator merely mounted the kerb — not a good advert for the hobby! Now be honest, how many times have you been operating 'handheld mobile' and had a near miss? I'm not that virtuous myself; when I started 'mobiling' I spent about four weeks with a handmike. It took a very near miss with a tree on a narrow country road (plus a couple of well-chosen words from my co-pilot) to get me rushing for my cheque book!

All too often the priority of a new licensee (or even old-stagers for that matter) is to fork out hard-earned money for the mobile rig and aerials, while some form of safety or boom mic is relegated to "I'll get round to it someday". So when I was asked to write a piece on the Ace MH1 headset, paying particular attention to the safety aspects, I thought it an ideal opportunity to clear up a few popular misconceptions about mobile operation.

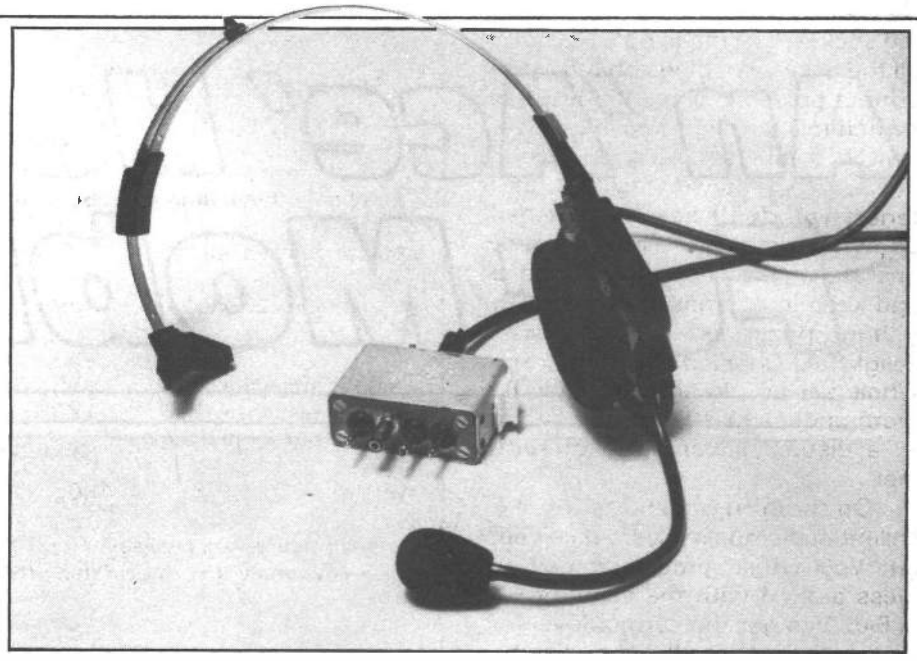
Handmikes Illegal?!

There is a rumour going around CB and amateur circles that, at about the time that CB was legalised, there was a law passed banning the use of handmikes. But, where does it leave the PMR and radio telephone people? With this in mind, I sought the advice of our

local friendly constabulary. Here's where some of the confusion begins as they didn't know! The classic line from one chap was something like "... there are so many laws around — how do you expect me to know them all — I'm only traffic police"! To be fair to this poor overworked fellow he did give me a phone number to ring at the Lewes training school and this proved to be most helpful.

The legal situation is as follows: if a police officer notices someone operating a handmike while driving but that the driver has full control of the vehicle there is no problem. However, this implies that the overs are kept short, ie that you pull into a parking place if you want to 'waffle'. The trouble begins if, in the opinion of the officer, the driver does not have 'proper control' of the vehicle or, of course, if an accident ensues. Then the 'Proper Control' subsection of the 1978 Regulation 119 Motor Vehicle (Construction and Use) takes over. (Incidentally, part of this regulation also states that headworn apparatus on motorcycles must be approved, including headsets and boom mics. I'm not sure who has to do the approving in this case so you'll have to check yourselves.)

Depending on the seriousness of the 'incident', the result could be anything from a 'warning' to a 'driving without due care and attention' summons, which could lead to an endorsement and about a £100 fine (or worse). In extreme cases, say where injury to a third party is involved, it is even possible for a summons of 'reckless driving' to be applied and the penalties for this are going to be very heavy! Another interesting thing that arose from my investigation was that using the excuse "but I didn't see it/him because I was talking on the radio/adjusting the controls (etc) at the time" would be automatically discounted as evidence — so don't be tempted to try it. The message is quite plain if you want to be safe (in more ways than one) get a safety mic!"



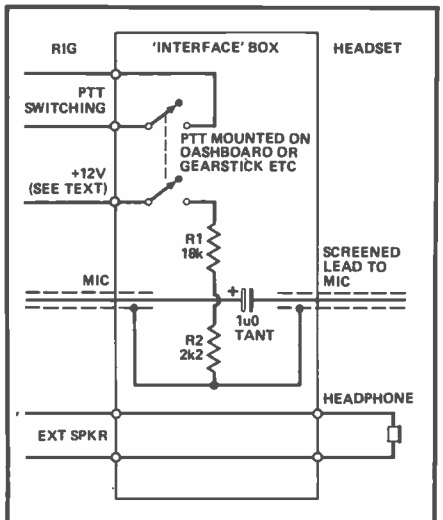


Fig. 1 A suitable circuit for the interface box.

Alternatives

An attractive alternative to a headphone boom mic set. The Ace MH1 headset is a single earphone on a flexible headband with an electret mic insert attached to a moveable boom extension. A look at the construction and specifications makes it obvious that this is simply a standard pair of medium range headphones with one speaker removed and a mic section added. I found that this made it awkward and very heavy to wear. In fact the whole unit, being weighted only on one side, tended to slide down gradually into a most uncomfortable position — if not onto the floor. My other main gripe is with the lead which is very thick, heavy — thus aggravating the slipping problem — and very short. Although the length would be adequate for use with a portable rig clipped onto a belt, it would not be practical in a car and I found that an extension cable was necessary.

I must say that having operated mobile for years with just a boom mic, I found the speaker facility very useful. It makes listening to weak signals a pleasure, without all the car and wind noise to contend with. However, one word of warning if you have both the headset speaker and the rigs internal speaker on for passengers to hear, do put an attenuator in the headset lead otherwise it is deafening!

There are many headsets on the market specifically tailored to a particular rig, so matching problems should never arise. However, the Ace unit as supplied is merely a basic electret/speaker set up and some form of interface is required. Unfortunately the review sample came without any information, but after a little poking around with a meter I devised a little interface circuit, see **Fig. 1** for the FDK700. The problems here are that a 12V supply is needed (or anything greater than 1.5V, with appropriate resistor changes). A possible solution is that, as the current consumption is going to be no more that 1mA or so, a battery could be used. For long term economy some form of on/off switch would be beneficial.

Canal Mobile

In preparation for this years holiday I also modified the headset to work with a belt/handheld TR2400. This rig has the advantage that all the relevant sockets are on one side of it, including the power supply, ie the battery charg-

ing socket. So I made up a box with all the necessary plugs bolted in the correct positions and a double pole switch to act as PTT and mic power switch combined. After all, in the interests of conserving the batteries, you don't need it switched on while listening. The ability to operate canal locks two-handed and keep in contact with the boat, giving progress reports, was delightful. Coupled with this, the whole set up, rig and all, could be worn under a plastic mac and hood – a distinct advantage last summer.

On both rigs reports of excellent audio quality were received, but you would probably need to mess around with the value of R2 in Fig. 1 to get the correct level for your individual rig. It might also be a good idea to experiment with a simple RC filter to tailor the audio response to your liking. This is not a purpose built communications mic and it can be a little 'toppy'. I doubt that there would be any problems with the mic level being too low for any rig, but if this was the case, simply add a single BC108 stage, since the power must be available anyway. The only major snag that I can see is when using it with the IC2E or IC4E which have their own peculiar PTT switching technique. I am sure that there must be ways round it but I'll have to leave you to experiment.

In summary the Ace MH1 unit, while having its problems, is a very cheap way to be safe when mobile – a bargain at £9.50. You'll have to add the cost of plugs when budgeting, but it beats a £100 fine anyday! Many thanks to Sgt Pryor, lecturer at the Lewes Traffic Officers Training Centre, for his valuable legal advice.

Specification

	Value	Remarks
Microphone impedance:	600 ohms	
Microphone frequency response:	50Hz to 20kHz	Not communications tailored.
Microphone sensitivity:	– 65dB	Perfectly adequate for a range of rigs.
Microphone current:	1mA	It worked well on much lower eg 35uA on a TR2400
Speaker impedance:	about 32 ohms	
Speaker response:	120Hz to 20kHz	
Speaker output pressure level:	about 88dB	
Weight:	80g	And rather lop sided.

Note No figures are available on distortion although it sounded fine even in a noisy environment with deafening output level!

100kHz And Down Post-script

Mike Bedford, G4AEE

At the time of writing the article, a letter was sent to the RSGB making the points outlined in 'the Radio Amateur and Practical Applications'. It also pointed out the scope for experimental work and challenging communications possibilities which exist within the realm of VLF/ ELF. No reply has yet been received at the time of going to press.

If there proves to be sufficient interest in this area, the RSGB may then make representations to the DTI for some sort of allocation. Clearly, it is important to be able to gauge the level of interest in such a project. So, if you are interested in this field, write to the RSGB and watch for reports of any developments in the magazine.

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The last three are for general reading.

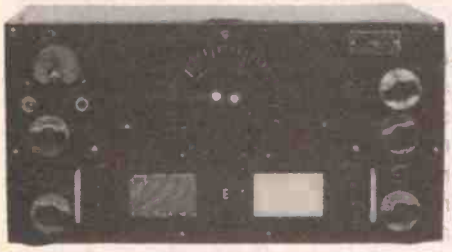
Get Onto HF Cheaply! part 2

Limiting the cost of getting onto HF sufficiently to enable you to look your bank manager in the eye requires certain compromises. However, as we saw last month, these need not degrade the efficiency of the station.

Setting up a really cheap HF station can be done with the minimum of fuss if you know your animal...As Brian Kendal, G3GDU, explains.

The equipment selected will obviously be determined largely by the finance available. In increasing cost the possible options are:

1. All home-brew station.
2. Commercial receiver with home-brew transmitter (CW only).
3. Commercial receiver and AM/CW transmitter (CW only).
4. Commercial receiver and SSB transmitter (all modes).
5. Commercial SSB transceiver (all modes).



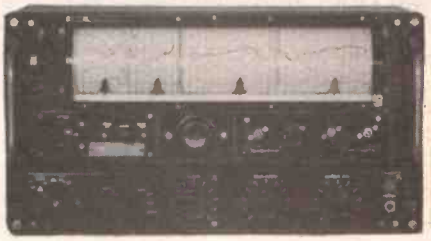
The classic National HRO receiver. Still giving excellent performance on most HF bands, the bandspread coils enable the widely spaced dial calibrations to each represent about 1kHz.

The first two options call for the home construction of equipment. Possibly the simplest way of achieving this would be to purchase one of the excellent kits available from several manufacturers. But within the scale of cost we are considering, these kits would all be QRP and may not necessarily be the cheapest way to get on the air.

Although it is quite feasible to build a receiver, this can be very time consuming for anything more than a very simple circuit. I would therefore recommend that the purchase of a good receiver should be the first consideration. This will serve as station receiver, and if it has a crystal calibrator, also meeting the licensing requirements for frequency standards. Then again during home construction it can always act as a poor man's spectrum analyser! A calibrated receiver considerably simplifies the alignment and calibration of home built transmitters.

Either valves or solid state designs are suitable for the transmitter. But if reasonable power of 25 watts or more is required, this is far more easily obtained with the old fashioned valve technology. Perhaps an extreme of 'valve power' was in the wartime USAF BC191 transmitter which ran over 300 watts with only three valves — two of which were in the PA. This transmitter also used the TU series coil packs so beloved in the early post war period.

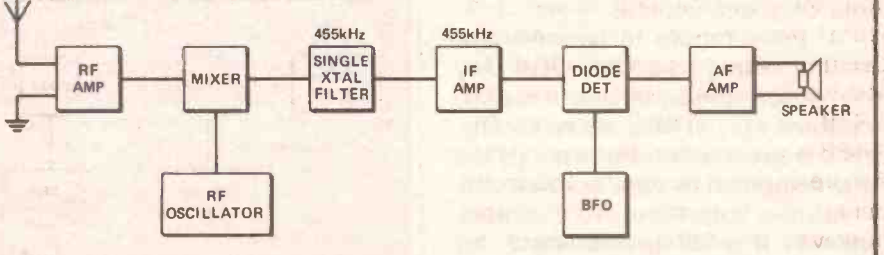
More practical for the average amateur is a three stage transmitter. This would comprise of a Clapp-Gouriet oscillator, a buffer or frequency multiplier second stage, and a medium power valve, such as an 807 or 6146, in the PA. Such a circuit could easily provide up to 50 watts on three different bands. Recently I have heard Soviet stations using this combination.



The R1475 is possibly the most under rated receiver of them all. Covering 2-30MHz including five amateur bands and can be modified for top band.

Components for this type of equipment can be obtained quite cheaply at rallies or junk sales. Even old valve TVs and broadcast receivers can provide many of the items needed. You may find it preferable to buy a quantity of the appropriate components and then design to match the parts available rather than attempting to find parts for a specific circuit configuration. For powers up to about 50 watts, receiving type components are quite feasible.

One useful item which can still be found from time to time is the Geloso VFO unit. This came in several models that all comprised a Clapp-Gouriet oscillator followed by one or two further buffer/multiplier stages. These gave sufficient output to drive — depending on model — either a single or two 807s or 6146s to full output. This unit also formed the basis of many of the commercial



A block diagram of a typical wartime or early postwar reveiver.

The first of a series of Eddystone post war receivers, the 504. Even today, this would be a good buy for general coverage and amateur CW reception.

equipment of the 1950s, particularly those from the KW stable.

Geloso also produced a receive converter which gave a good performance on all the pre-WARC bands except 160m. Using one of these with a general coverage receiver would give excellent bandspread. Alternatively, modification to cover 160 metres and the new WARC bands is quite simple.

Should you decide to use a commercial CW/AM transmitter for CW only, as suggested in last month's article, you need to remove the modulator valves and short circuit the modulation transformer.

Equipment Available

Very little, if any, older equipment is available on dealers' shelves, so recourse has to be made to "readers ads", rallies and junk sales.

Except for old timers, many may find the type numbers mean nothing. If you are not careful, you may be left with an expensive piece of equipment which is of little use. Here is a basic guide to what equipment may be suitable.

Ex-government Equipment

Many wartime receivers were extremely well made and will still give a good account of themselves on CW. Some, such as the National HRO, Hallicrafters SX28, RCA AR88 and the Hammarlund Super Pro, were pre war general coverage designs which proved ideal for service use. Of these the HRO and AR88 are still regularly available. The AR88 is rather large, but the HRO is a more appropriate size for the shack bench. It has the disadvantage, however, of requiring a separate coil pack for each band. Some of these coil sets are 'bandspread' which give an equivalent of 10 feet of dial length for each amateur band! Both sets have excellent crystal filters and either would make a good station receiver.

Several excellent HF receivers were manufactured for the American armed services, the most commonly available being the BC342 and the BC348. The upper frequency limit of each was 18MHz. Both were quite sensitive and the filters were excellent for CW working, although the BC348 filter has to be adjusted internally for optimum bandwidth.

The British equivalents were: the R1155 aircraft set, Eddystone 358X, Marconi CR100 and the R1475. The first of these, although excellent for its purpose, has poor bandspread (14 MHz covers about ¼ inch on the dial), no crystal filter and needs considerable modification, so cannot be recommended except for historical interest. The Marconi CR100 also suffers from poor bandspread and most samples are rather insensitive on the highest band. The bandswitch is also prone to trouble and in consequence this receiver would not be a good buy.

For some reason, the R1475 has never proved popular, but in good condition, it is an excellent receiver. It has good bandspread and is reasonably sensitive. It also has several switched bandwidths and incorporates a crystal calibrator. It is, however, a complex circuit design which makes repair time consuming rather than difficult. The frequency coverage is from 2.0 to 20MHz enabling operation on the 3.5, 7, 10.1, 14 and 18MHz bands and 160m may also be added by a very simple modification.

Few ex-government transmitters are suitable for amateur use. The best is probably the TCS set which was made by Collins and other manufacturers. This transmitter is very well made and will give an extremely stable 20-50 watts on the three lower frequency bands.

The 888 is the last in a long line of amateur band receivers from Eddystone.

All the above equipment is suitable for CW operation.

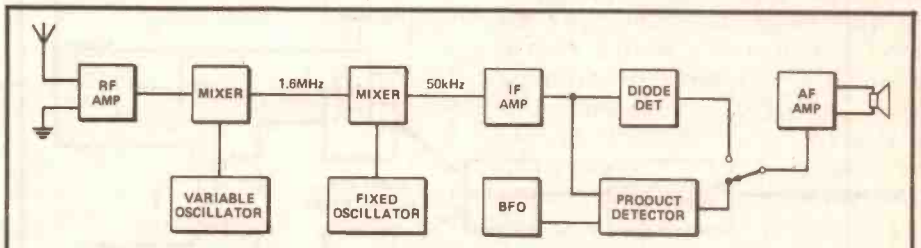
Post War Receivers Up To 1965

Most pre war receiver manufacturers turned their attention to other things at the end of the war — the market was flooded with ex-government equipment which made sales difficult. Until the late 1960s, when Japanese equipment reached Europe, few firms made amateur equipment.

However, during this time, the leader in the UK receiver market was Eddystone who produced a range of excellent equipment, starting with the 504 and shortly followed by the cheaper 640. The earlier models used a single crystal filter and are more suitable for CW operation. Later they introduced the 680, the 880 and the 888. These were double superhets with product (SSB) detectors, variable bandwidth, good sensitivity and good bandspread, even on the general coverage models. Any of the larger Eddystone receivers (9 valves or more) would make an excellent shack receiver for any mode of operation. All these receivers are available for under £75 with the R1475 as low as £10-£15.

Also in this period, KW Electronics introduced their KW 76, 77 and 202 which were manufactured to a full SSB specification. Samples still occasionally appear for sale.

Only one American receiver



A block diagram of a typical double superhet of the late 1950s and early 1960s. The selectivity was gained in the IF amplifier which frequently had mechanics to vary the response.

made any real impact in the UK at this time. This was the Drake 2B which was specifically designed for SSB operation. The bandspread, selectivity and stability are excellent and it is surely a high recommendation that, even today, owners will rarely part with their receivers. When available, these usually sell for about £80.

Finally, there were the Racal RA17 and Collins 51J series professional receivers. These are superb even by present day standards and still have fairly high prices.

Post War Transmitters

The first UK manufacturer to introduce amateur band transmitters after the war was Labgear of Cambridge with their LG50 and LG300 ranges. The LG50 was crystal controlled and ran at 50 watts input, CW or AM whilst the LG300 ran the full legal limit (150 watts) to an 813 output stage with VFO control.

KW Electronics manufactured a series of AM/CW transmitters capable of 50 or 150 watts input. In 1958, KW introduced the 'Viceroy' SSB transmitter which proved to be the most popular commercial transmitter available at that time. It gave a clean stable output of about 100 watts PEP on all bands from 80-10 metres and was housed in a table top cabinet. It appeared in four versions (mk I-IV) and although the earliest model radiated upper sideband on 40 metres, this was corrected in the later versions. Later, KW produced the Vespa transmitter which was somewhat smaller and ran about half the power.

The Drake 2B was the only post war American receiver to penetrate the UK market. The auxillary bands enable the new WARC band to be included without modification.

Minimitter manufactured a low power mobile and a 150 watt static transmitter, both capable of AM and CW operation. The former turned out to be unsatisfactory and should be avoided, but the latter is a worthwhile buy.

Heathkit produced both low (DX40), high power (DX100) AM/CW and later a series of SSB transmitters which gained a good reputation. A further Heathkit product which still appears in the "readers ads" columns from time to time is the SB10 SSB adaptor. This unit may be fitted after the driver stage of a CW transmitter and by phasing techniques produces 5 watts of upper or lower SSB drive for the power amplifier which is then biassed for linear operation.

All these transmitters mentioned should be available for £50 or less.

Transceivers

The earliest SSB transceivers generally available were the Collins KWM series followed later by their S line. These were built to the highest standards — with prices to match. They still command high prices.

Less expensive were two models produced by National. The NCX3 covered three bands and the NCX5 five. Although widely advertised for a while, they never really became popular and it was left to KW Electronics to open up the market with the KW2000. Originally, it was rated at 90 watts PEP input, but later models (suffixed A to E) ran at twice this power. Even today, these are a very popular range and, especially when upgraded, can still hold their own in performance terms with the best that Japan has to offer. (Malcolm Healey, G3TNO, described a variety of mods for the KW2000 series in articles published in Jan, Feb, Mar, May, July and Oct '83 and Jan '84 HRT.) Despite this, KW2000s can be bought for as little as £150.

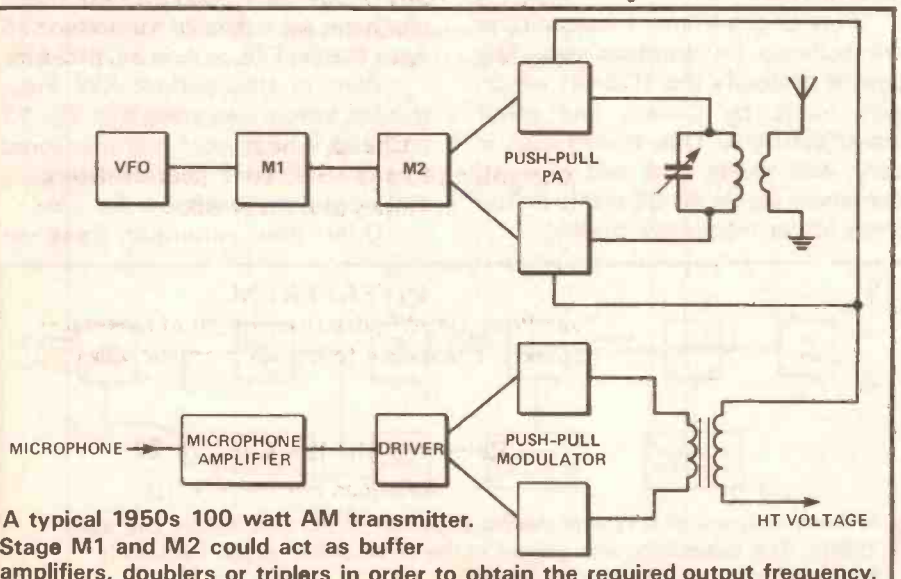
When the large Japanese manufacturers entered the market, one of the earliest sets was the Yaesu FR100 receiver and FL200 transmitter. These could be used as "separates" or coupled for transceive operation. The performance was broadly similar to the transmitters and receivers previously mentioned and today the combination would cost £100-£150.

Yaesu then manufactured a series of transceivers which culminated in the FTDX560. These were introduced in the late 1960s and early 1970s and give considerably more power than earlier equipment. By replacing the 6146 PA valves with TV sweep tubes, the output was increased to about 250 watts PEP. These transceivers now sell at about £200-£250.

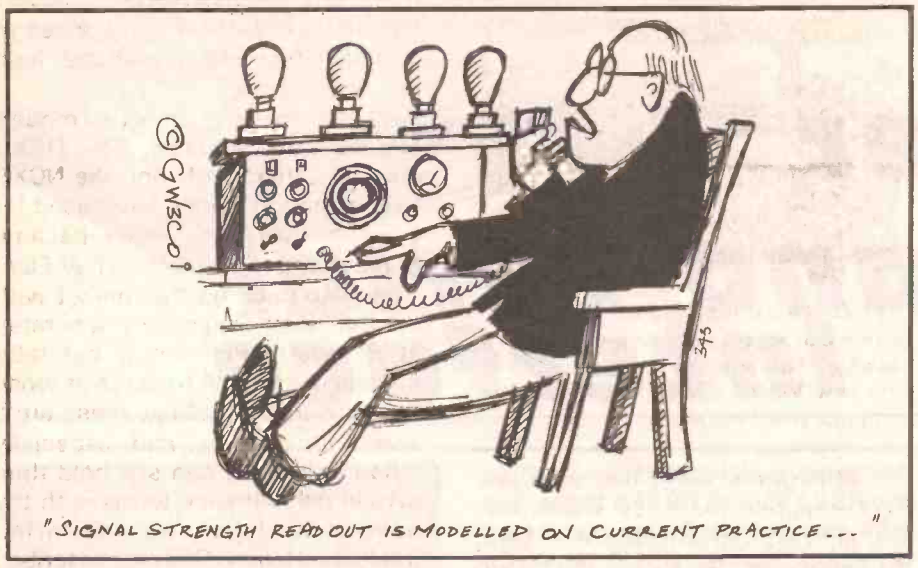
The Swan 100MX is a much more modern, fully solid state, mobile rig in the same price range although it does not possess all the "extras" available on other, more expensive, mains transceivers.

In this brief survey, it is obviously not possible to mention every piece of equipment which may be suitable. If, therefore, you are offered a wartime or early post war receiver or transmitter which I have not mentioned and with which you are not familiar, I can only suggest that you seek the advice of an amateur who was operating in the early post war period.

Many different models have



A typical 1950s 100 watt AM transmitter. Stage M1 and M2 could act as buffer amplifiers, doublers or triplers in order to obtain the required output frequency.



been introduced since those mentioned above, but being more modern, tend to fetch prices which take them beyond the scope of this article.

The final selection must be made on the basis of price and availability. Within the past year I have seen almost all those mentioned for sale, either in the pages of various amateur magazines or at rallies or club junk sales.

For less than £50, the R1475 could be allied with one of the 100 watt AM/CW transmitters. With the modifications suggested, a potent, maximum legal power CW station will be available on 80, 40 and 20 metres.

For a few pounds more, the same transmitter could be combined with an Eddystone or a Drake 2B receiver to give the additional availability of 15 and 10 metres, whilst for just over a hundred pounds these receivers with a KW Viceroy would give CW and SSB operation from 80 metres through to 10. Finally, for £150 the KW2000 transceiver or the FR100-FL200 combination becomes available.

If, however, even these costs are too much, consider home-brewing the transmitter. With careful buying, it should be quite possible to build a 25-50 watt valve equipment for less than £10 with the whole station less than £25.

Postscript

In September 1985 issue of "Wireless World", Pat Hawker, G3VA, told of Phil Evans, GW8WJ, who was licensed in 1937 and still uses his original 10 watt, two valve transmitter in conjunction with an HRO receiver and an 85' aerial. This equipment puts out a useful signal which has reached as far as VK and ZL on 80 metres. Now that's *real* amateur radio.

HAM RADIO TODAY NEXT MONTH

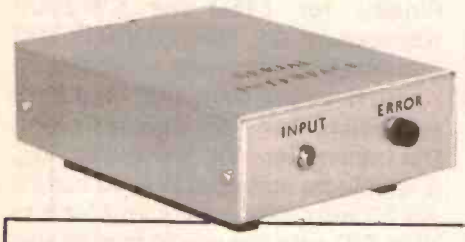
A Parametric Equaliser For Communications Use
Tony Bailey, G3WPO, and Frank Ogden, G4JST, design the communications equivalent of a professional graphic equaliser that will solve all your Tx audio problems.

Cheap, Cheap
Your guide to used VHF/UHF gear available at rallies and junk sales.

INTERFERENCE
Steve Price, G4BWE, describes this pit of snakes and provides an antidote to each of the many poisons.

Review of the KW Century 22
The morse man's perfect CW rig?

RTTY Decoder and Serial Interface



Ever thought of building some of your own hardware to link up computers and amateur radio? Well, this decoder and serial interface enables you to receive RTTY on your BBC B, Commodore 64 or Vic 20, with the minimum of software. By Robert Penfold.

Until quite recently RTTY (radio teletype) was very much a minority interest in amateur radio. Things have changed considerably with the arrival of the home computer; with the aid of a suitable machine it is now relatively easy to send and receive RTTY signals. Large and noisy teletype machines are no longer needed; messages are read from the television or monitor screen, with hard copy via an inexpensive thermal or dot-matrix printer.

The system described is for reception only. It consists of two units: a tone decoder to convert the received tones into a serial output signal, and a serial interface for the popular BBC model B, CBM64, or VIC-20 computers (or any computer having port B of a 6522 VIA available). It is not essential to use the two units together — the tone decoder can be used with any computer having a suitable serial interface or RTTY decoder program. Similarly, the serial interface can be fed from any decoder which provides standard 5V logic output levels.

Tone Decoding

RTTY communications rely on a tone encoding and decoding process to transmit serial digital signals. There are various standards for digital radio links, the most common one being the ordinary RTTY five bit code type. The serial signals are similar to those used in standard computer serial interfaces such as the RS232C and RS423 types, but with only five bits (rather than seven or eight) normal ASCII or ASCII based codes can not be used. Instead, Baudot codes are used, and these use a shift system to accommodate the alphabet, numbers and punctuation marks within the 32 available codes. Details of the Baudot codes are provided in **Table 1.**

As Table 1 shows, only upper case letters are provided. Normally, received characters are assumed to be letters, but if the 'Figures Shift' character is received, subsequent characters are taken to be figures or punctuation marks. At least, they are until the 'Letters Shift' character is received, whereupon characters are interpreted as being letters once again.

The serial signals are transmitted in standard asynchronous serial fashion, as shown in **Fig. 1.** Normally the signal is in the 'mark' or high logic state, and the start of the character is indicated by it going to the 'space' or low logic state for a certain period of time (the start bit). After the start bit has been detected, the receiving equipment must check the state of the input signal at regular

Table 1 Baudot Codes

LETTERS	FIGURES	CODE NO.
A	-	3
B	?	25
C	:	14
D	$	9
E	3	1
F	%	13
G	&	26
H	½	20
I	8	6
J	'	11
K	(	15
L	)	18
M	.	28
N	,	12
O	9	24
P	0	22
Q	1	23
R	4	10
S	bell	5
T	5	16
U	7	7
V	;	30
W	2	19
X	/	29
Y	6	21
Z	"	17
not used	not used	0
Line Feed	Line Feed	2
Space	Space	4
Return	Return	8
Figures	Figures	27
Letters	Letters	31

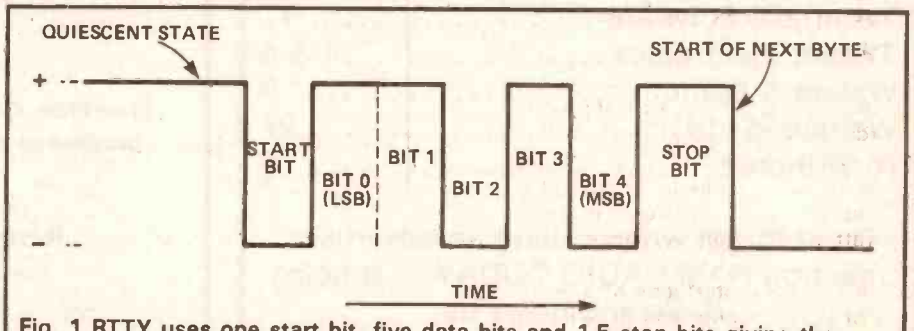


Fig. 1 RTTY uses one start bit, five data bits and 1.5 stop bits giving the type of wave form shown here.

intervals to determine the states of the five data bits. These are transmitted with the least significant bit sent first, running through in sequence to the most significant bit. Finally, a 'stop' bit is added at the end of the data stream. Its main purpose is simply to provide a reasonable gap between one character and the next. This is 1.5 times longer than the other bits, although correct operation can be obtained if a stop bit of one or two bits in duration has to be used.

With a system based on accurate timing it is essential for the rate at which bits are transmitted to be the same as the rate at which they are sampled at the receiving end. There are several standard transmission/reception or baud rates. This is the number of bits transmitted per second with continuous transmission. Commercial RTTY is mostly sent at 50 or 75 baud, but amateur RTTY is standardised at 45 baud — 45.45 baud to be precise. This seems set to gradually change to 50 baud and some amateur RTTY is already sent at 50 baud.

The serial signals are transmitted using a simple tone encoding system, where one carrier frequency represents the mark signal and a slightly different frequency the space signal. This is known as 'FSK' (frequency shift keying). Direct frequency modulation of the carrier can be used, but these days it is more common for a two tone audio signal to be fed to the input of an SSB transmitter. With the carrier and one sideband suppressed this gives an output signal which is indistinguishable from a frequency shifted carrier. RTTY signals received in the SSB mode produce the warbling sound that will be very familiar to most short wave users.

Most RTTY signals are transmitted with one of three standard frequency shifts, but only one of these (170Hz) is commonly used by radio amateurs. Shifts of 425 and 850Hz are also used for commercial RTTY. There is no standardisation of the audio tones used — there is no need for it since by tuning the receiver it is possible to obtain any two audio tones (within reason) that have the correct spacing. In practice, the audio tones are made quite high (about 1-2kHz) so that they are well above the modulation frequency, and simple decoder circuits will suffice.

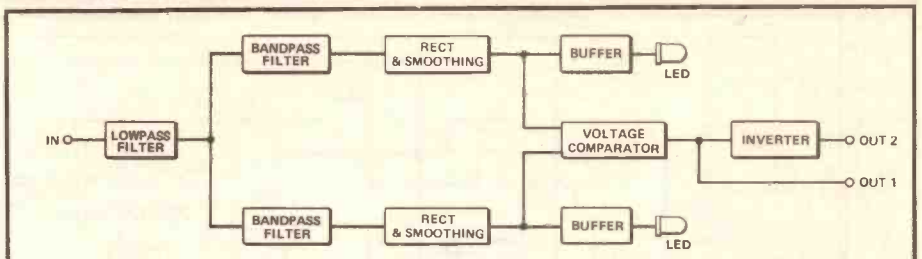


Fig. 2 The block diagram for the tone decoder.

Decoder Operation

Fig. 2 shows the tone decoder block diagram which helps to explain the method of operation. The first stage is a low pass filter, which attenuates signals below about 1kHz. The decoder only requires a pass band from just over 1kHz to a little under 2kHz and the low pass filtering helps to avoid problems with adjacent channel interference. In particular, there is a danger of strong signals below 1kHz being clipped and producing harmonics in the 1kHz to 2kHz range.

The output of the low pass filter is split with the signal being fed to two practically identical circuits. These are band pass filters feeding into rectifier and smoothing circuits. The only difference between the two circuits is the filter frequency, with one filter having a fixed operating frequency of just over 1kHz. The other filter has three switched operating frequencies set at 175, 425, and 850Hz above the centre frequency of the first filter. The unit can therefore accommodate all three standard shifts.

Each smoothing circuit produces an output voltage that is fairly high when the tone is at the operating frequency of the preceding filter, and close to zero when the tone switches to the frequency of the other filter. This gives a see-saw effect at the two outputs as the input signal alternates from one tone to the other, and a voltage comparator is used to provide a logic output level that varies according to which circuit provides the higher voltage.

The output from the comparator is, of course, the decoded serial signal, but it might be of the wrong polarity. The polarity of the signal can be changed by switching the receiver's mode switch from one sideband to the other, but this is an inconvenient way of doing things as it normally requires retuning the set. It is easier in use to have an inverter at the output of the decoder so that a signal of either polarity can be provided. Incidentally, the convention has the 'space' as the lower carrier frequency, but not all stations conform to this convention.

Tuning RTTY signals accurately can be difficult, some form of tuning indicator makes things very much easier. In this case each smoothing circuit drives a LED indicator via a buffer stage. When a signal is tuned accurately the two LEDs should flash on and off as the input signal switches from one tone to the other.

Decoder Circuit

Low pass filtering is provided by IC1 and its associated components which form a standard 18dB per octave active low pass filter. The fixed frequency band pass filter is based on IC2a, and uses what is another standard configuration. It only differs from the normal type in that the single input resistor has been replaced by R5 and R6. These form an attenuator which is needed to counteract the high voltage gain through the filter. The rectifier and filter circuit is a simple half wave type using D1 and D2.

The other band pass filter is of the same basic type, but three sets of filter capacitors switched by SW1 provide three different operating frequencies. Also, one of the filter resistors has been replaced by three switched presets so that the filter frequencies can be trimmed to precisely the correct figures.

IC3a acts as the voltage comparator. The two input signals will contain a small amount of ripple, and R15 is used to introduce a certain amount of hysteresis to prevent this from giving spurious pulses during transitions from one signal level to the other. IC3b is the inverter stage. An opto-isolator is used at the output. There are two reasons for doing this: one is to avoid any direct

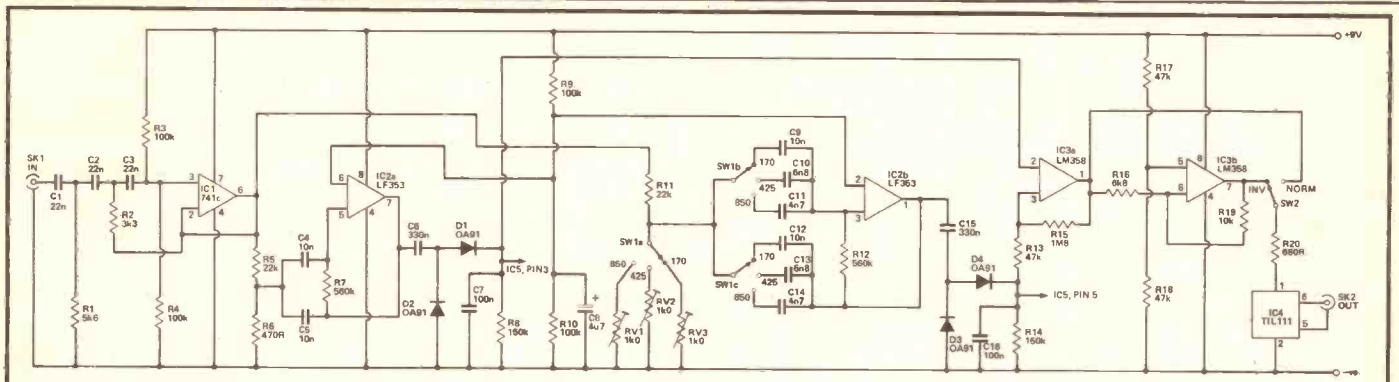


Fig. 3 The main tone decoder circuit diagram.

connection between the receiver and the computer which could couple noise from the computer into the receiver. There can also be a substantial voltage difference between the chassis' of the receiver and computer and a direct connection between the two could result in damage to either or both (I have a damaged CBM64 this way, so it is a real rather than a theoretical risk). An output at normal 5 volt logic levels is easily achieved, by simply taking the signal from the pole of SW2 and using a 5V1 zener diode across the output to prevent excessive output potentials.

In the tuning indicator circuit IC5 provides the two buffer amplifiers. Often the input signal will be predominantly in the 'mark' state as few people can type consistently at something approaching 45 baud. This can result in little indication from the 'space' LED. To combat this, a smoothing circuit is used ahead of each LED to provide pulse stretching and give a clearer indication.

The Interface

The circuit diagram of the serial interface is shown in **Fig. 5**. Most of the work is done by IC6 which is a 6402 industry standard UART (universal asynchronous receiver/transmitter), or the almost identical AY-3-1015D device. Many commercial RTTY systems rely on machine code software to provide decoding of the serial signal. However with a suitable computer, a UART offers a perfectly practical alternative, a more interesting project for those more interested in hardware than software. Some software is still needed, but only in the form of a simple Basic program.

Here we are only using the receiver section of IC6, which detects the start bit and then clocks the data bits into a serial register bit by bit. When a complete character has been received the DR (data received) output at pin 19 goes high. This is detected by a software loop which monitors this output via line PB6 of the user port. The 5 bit code is then read from IC6 via lines PB0 to PB4. Line CB2 of the user port then provides a negative pulse to an input of IC6 to reset the DR output. This whole process is repeated each time a character is received.

The transistor in the opto-isolator at the output of the tone decoder requires a load resistor, R25. If the interface is to be fed from an alternative decoder which provides standard logic levels, the only modification needed is to connect the earthy side of SK4 to the negative rather than the positive supply rail. C19 and R23 provide a reset pulse to IC6 at switch-on. D9 is driven from the framing error output of IC6, and this will flash on and off if the baud rate is wrong or the signal is of the wrong polarity. If this does not come on and the data on the screen is unintelligible, this is probably due to the signal being coded or just in a foreign language.

The 6402 requires an external clock signal at 16 times the baud rate. The BBC model B and the two Commodore computers have built-in timer/counters that can be used to provide a wide range of frequencies from line PB7 of the user port. This facility is used to provide the clock signal, and it enables any standard baud rate to be decoded. Although the BBC machine has an RS423 serial input, it is unsuitable for the present application as it can not

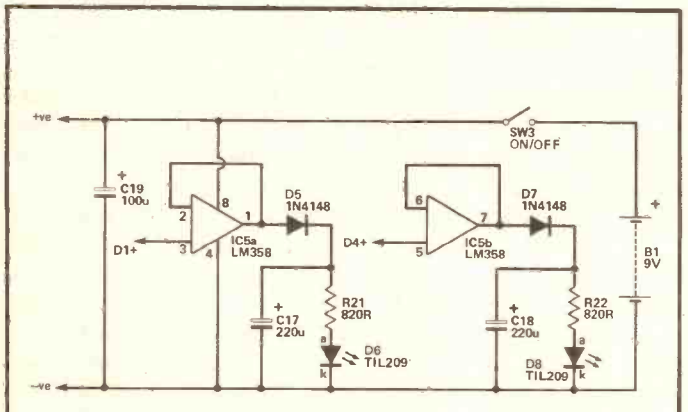


Fig. 4 The tuning indicator circuit.

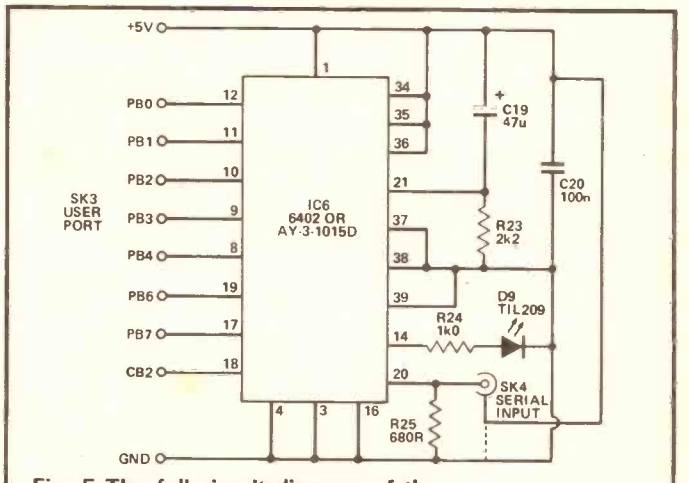


Fig. 5 The full circuit diagram of the UART RTTY decoder.

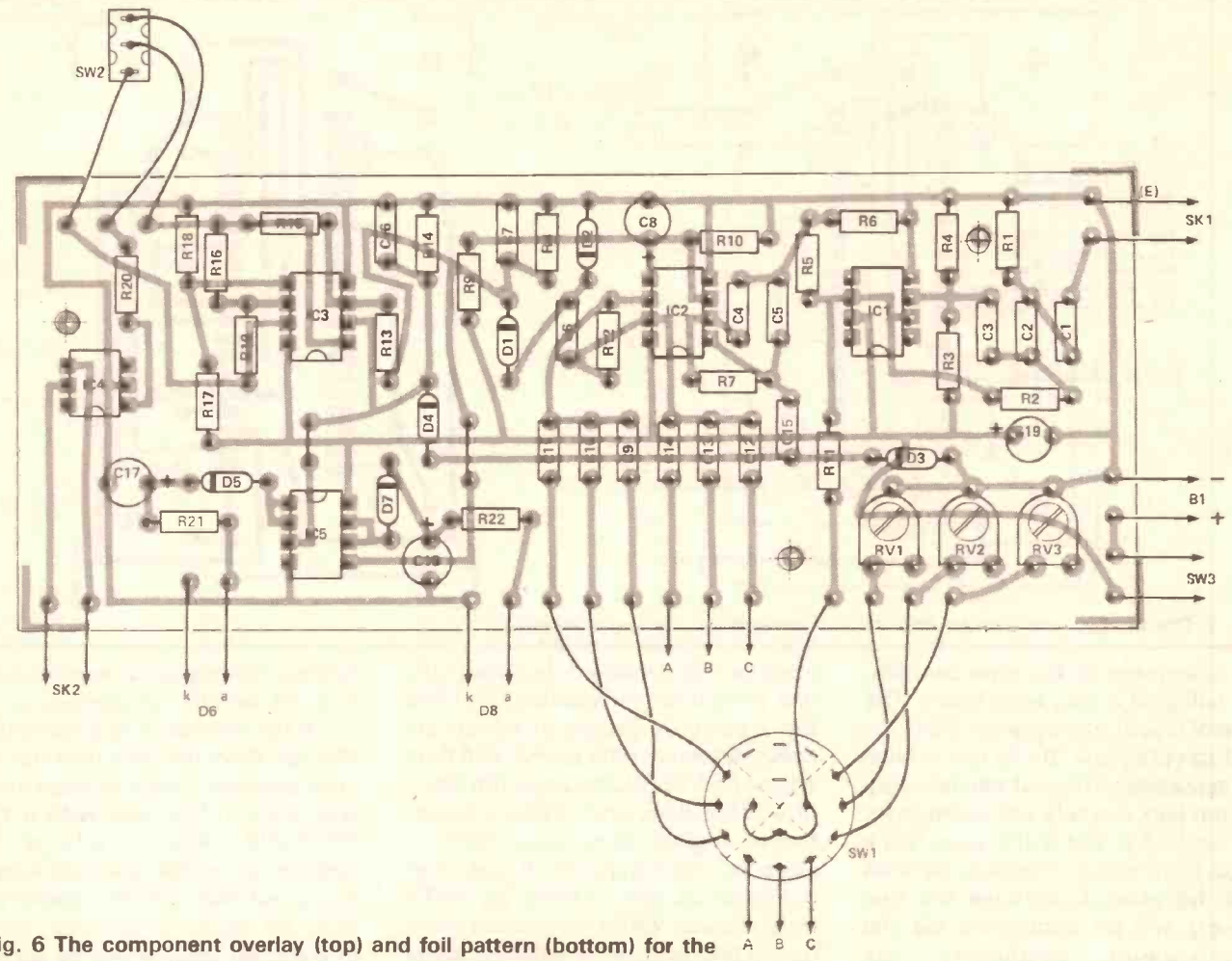
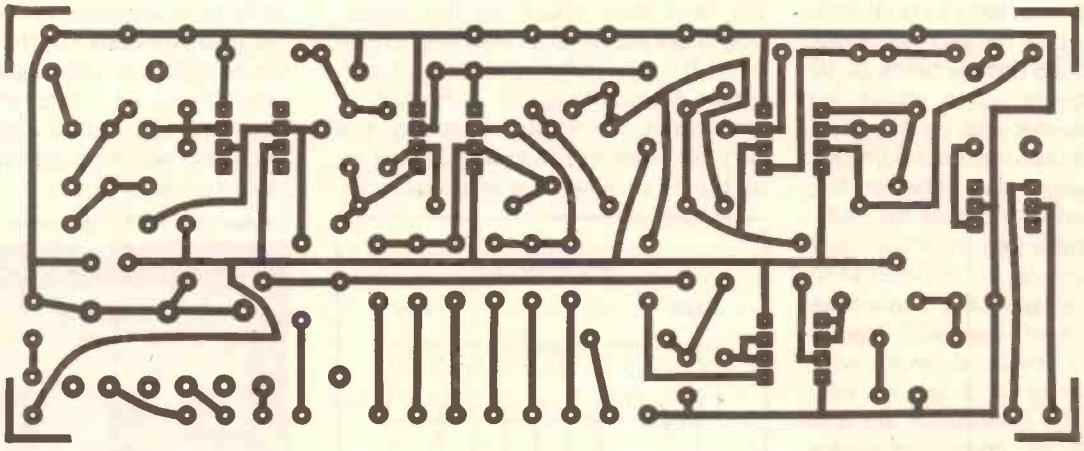


Fig. 6 The component overlay (top) and foil pattern (bottom) for the decoder.



handle 45 or 50 baud signals, or 5 bit types. The Commodore computers have built-in software for serial decoding, and this accepts 5 bit codes with 1 or 2 stop bits, and baud rates of 50 and 75 are both available. Unfortunately, 45 baud is not, and 50 baud at best gives poor results with 45 baud amateur signals.

The circuit requires a single +5 volt supply with a current consumption of only a few milliamps, supplied by the computer.

Construction

Although I built the prototype system as two separate units, it could easily go into a single unit if preferred. In either case the printed circuit layouts of **Fig. 6** and **7** can be utilized. Both boards offer little that is out of the ordinary and are quite easy to construct. Bear in mind though, that IC6 is a MOS type and is not particularly cheap. An IC socket should be essential and the other normal antistatic handling precautions should be observed. 40 pin devices are often difficult to fit into their sockets and take care to avoid buckling any of the pins.

Assuming the system is built as two separate units, a Verocase measuring about 180 × 120 × 39

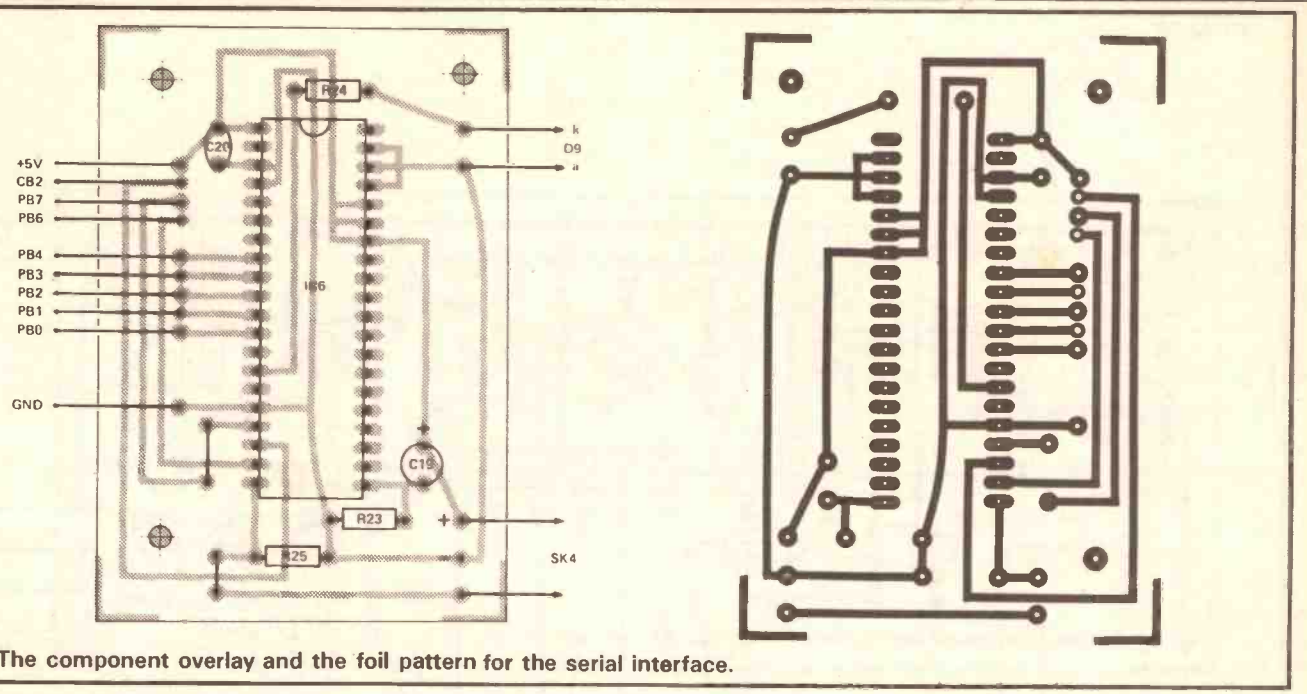


Fig. 7 The component overlay and the foil pattern for the serial interface.

mm is suitable for the tone decoder, and will give a very neat finish. The general layout can be seen from the photographs, but this is not critical and any sensible layout can be used. 3.5mm jack sockets are suitable for SK1 and SK2, but if the case has a metal front panel insulated sockets must be used. Otherwise the two sockets will be connected via the front panel, bypassing the opto-isolator.

The serial interface is built into an aluminium box measuring about 133 × 102 × 38 mm. A piece of 10 way ribbon cable up to about 1m long connects the unit to the computer. This cable can be taken out through the slight gap between the top and bottom sections of the case. An exit slot must be cut in the case if this is not possible. Connection to the user port of the BBC B machine is by way of a 20 way IDC header socket. The two Commodore machines require a 2 by 12 way 0.156 inch edge connector. As it is unlikely that an edge connector fitted with a suitable polarising key will be available the top and bottom edges of the connector should be clearly marked as such to avoid confusion. Connection details for both types of connector are provided in Fig. 8. Note that with the CBM64 line PC2 of the user port is used instead of CB2.

Setting Up

Adjustment of the three tuning presets is quite easy if suitable audio test equipment is available. First find the precise frequency at which the fixed frequency filter peaks, and then adjust RV1 to RV3 to peak the other filter 850, 425, and 170Hz (respectively) higher than this. Without suitable test equipment it becomes a matter of first finding an RTTY transmission with the required shift, tuning the receiver to make the lower tone give maximum brightness from D6, and then adjusting the appropriate preset to give peak brightness from D8 (and what should be a correctly decoded signal). If no output is obtained you are peaking the tunable filter at the same frequency as the other filter. A strong and interference free signal is needed to carry out this process properly.

If the receiver has a 'line-output' this can drive the tone decoder without problems. The prototype system was used in this way with a Yaesu FRG8800. Alternatively a loudspeaker or headphone output can be used, but the volume control must then be given a suitable setting. Inadequate volume will be apparent since the tuning LEDs will either fail to light, or be very dim. An excessive volume will result in the LEDs tending to light up quite brightly almost regardless of the input tones present. In either case proper decoding would be difficult or impossible to obtain.

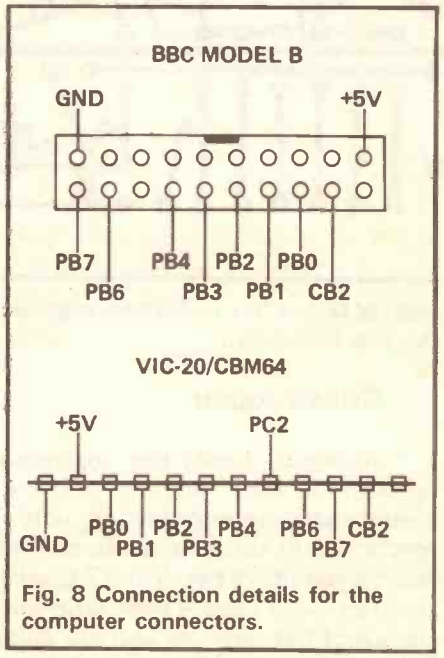
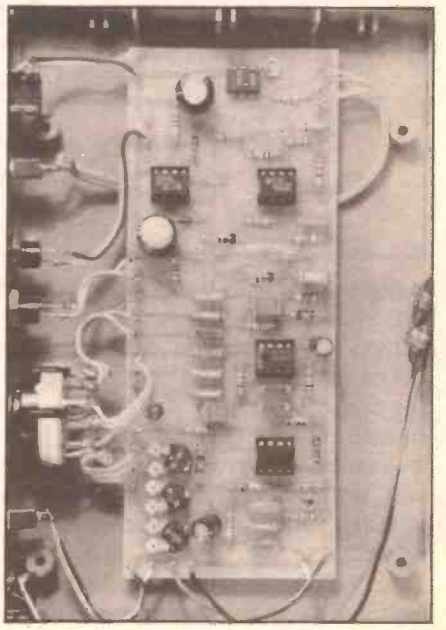


Fig. 8 Connection details for the computer connectors.

Inside the RTTY decoder.



In Use

When 20 metres is open it is usually possible to find a few RTTY transmissions around 14.090MHz. If conditions are not favourable then 80 metres at around 3.585MHz might prove to be better, though not all the RTTY transmissions within the 80 metre band are amateur stations. There are numerous commercial RTTY stations to be found if you have a general coverage receiver, and the system is capable of handling many of these, but it could be illegal to receive them. Also, many RTTY transmissions are coded these days anyway, and will not provide any meaningful output.

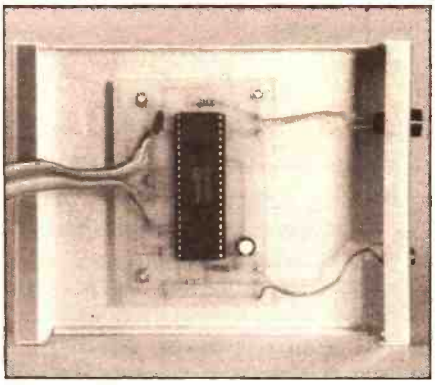
Tuning in an RTTY signal accurately can be quite difficult, especially when you first try out the system. However, when a signal is tuned accurately, the two tuning LEDs should both light quite brightly (assuming the carrier is being modulated). Any slight flashing of the LEDs should be in antiphase. If they flash on and off in unison the tuning is just slightly to one side of the correct setting. If the wrong frequency shift is selected it will be impossible to peak both LEDs at a single tuning setting.

If an oscilloscope having an X input is available this can be used to monitor the outputs of the filters, with IC2 pin 7 feeding the X input, and IC2 pin 1 driving the Y input. When correctly tuned the display should have two elipses at right angles to one another, give a "+" type cross pattern. Spot-on tuning is then very easy, and any problems such as a tuning error or the selection of the wrong shift frequency become immediately apparent. Probably few users would wish to tie-up their oscilloscope permanently as an RTTY tuning indicator, but it is a good idea to use this method when first trying out the unit if a suitable instrument is to hand.

Software

There is insufficient space available here for a detailed description of the software, but the basic method of operation is to first set up the user port for the appropriate mode of operation and to provide the correct clock frequency for the selected baud rate. When fresh characters are detected they are read from the user port and the look-up table method used to convert the code numbers to the corresponding characters which are then printed on-screen. Actually two look-up tables are required, together with a simple routine to detect shift codes and to switch to the correct table.

Pressing the 'L' key (or CTRL 'L' in the case of the BBC machine) clears the screen. Similarly, the 'R' and 'S' keys are used if you wish to change the baud rate or toggle the shift. Again, use the CTRL key as well in the case of the BBC computer. With the latter the usual CTRL 'B' and CTRL 'C' commands can be used to enable and disable (respectively) the printer port.



Not much to see in the serial interface box.

Unfortunately, we are unable to reproduce the listings for the three computers mentioned. However, we will supply a copy of which ever listing is requested to anyone who sends us an sae. Please address your envelope to 'Listing', Ham Radio Today, 1 Golden Square, London W1R 3AB stating on the envelope whether you want the BBC B, CBM 64 or Vic 20 listing.

Components List For The Tone Decoder

RESISTORS

R1	5k6
R2	3k3
R3,4,9,10	100k
R5,11	22k
R6	470R
R7,12	560k
R8,14	150k
R13,17,18	47k
R15	1M8
R16	6k8
R19	10k
R20	680R
R21,22	820R

All resistors 1/4W 5% carbon film

POTENTIOMETERS

RV1,2,3	1k hor sub-min preset

CAPACITORS

C1,2,3	22nF poly
C4,5,9,12	10nF poly
C6,15	330nF poly
C7,16	100nF poly
C8	4u7 63V radial elect
C10,13	6n8 poly
C11,14	4n7 poly
C17,18	220uF 10V radial elect
C19	100uF 10V radial elect

SEMICONDUCTORS

IC1	741C
IC2	LF353
IC3,5	LM358
IC4	TIL111 opto-isolator
D1,2,3,4	OA91
D5,7	1N4148
D6,8	panel LEDs

MISCELLANEOUS

SK1,2	Insulated 3.5mm jack sockets
SW1	3 way 4 pole rotary
SW2	SPDT sub-min toggle
SW3	SPST sub-min toggle

B1 9 volt (PP3); case about 180 × 120 × 39 mm; PCB; four 8 pin DIL IC holders; control knob; battery connector; wire, solder, etc.

Components List For The Serial Interface

RESISTORS

R23	2k2
R24	1k
R25	680R

CAPACITORS

C19	47uF 10V radial elect
C20	100nF disc cer

SEMICONDUCTORS

IC6	6402 or AY-3-10150
D9	panel LED

MISCELLANEOUS

SK3	20 way IDC connector and cable
SK4	3.5mm jack socket

Case about 133 × 102 × 38 mm; PCB; 40 pin DIL IC socket; wire, solder, etc.

The Met Office

Ken Michaelson, G3RDG, takes a walk around the Met Office at Bracknell and outlines just one of the many systems they use for forecasting our weather.

I have always been interested in weather forecasting and at one time optimistically hoped to be able to predict whether the sun would shine on our annual holiday although I never got it right! Originally, I tried using the five figure groups of information which are transmitted from Bracknell, callsign GFL26, and from other stations around Europe. My appetite was further whetted by an article by Paul Richards in the BARTG quarterly newsletter, (July 1982, page 9), but I was never able to obtain any accurate results.

For a while I gave up. Then at the RSGB Convention I saw a stand displaying pictures and printouts recorded from orbiting space craft and I was hooked again. After tentative enquiries, I obtained an interface and an EPROM, both marketed by Timestep Electronics of Newmarket, and a receiver covering 137/138MHz with a bandwidth of 30kHz. I already had the necessary BBC computer with monitor, and the required pair of crossed dipoles. With this system, I obtained some very satisfactory pictures and my interest was renewed. Since the official use of the data imagery is weather forecasting, I thought that a visit to the Meteorological Office at Bracknell would be useful.

The Meteorological Office

The Met Office administration and computers are based in Bracknell although the rest of the equipment, including the antennas, is down at Lasham in Hampshire. The Met Office receives a wide range of information from a variety of sources, however, I shall be concentrating on the *Autosat* system which obtains its information from the orbiting satellites, including the geostationary ones. The *Autosat* system is concerned with the acquisition of satellite image data for dissemination over the facsimile network, known as *Satfax*, which is illustrated in Fig. 1. It is by no means the only system in the Met Office that deals with satellite data, but it does directly relate to how amateurs receive weather satellite pictures.

All data used on the *Satfax* network is acquired from meteorological satellites by the ground station at Lasham. At present data is taken from two US polar orbiting satellites, NOAA8 and NOAA9, the US geostationary satellite GOES-E which is located at 75° west, the European Space Agency (ESA) geostationary satellite *Meteorsat 2*, and, indirectly, from US GEOS-W. (For the uninitiated, 'geostationary' means that the satellite appears to stand still in the sky. It rotates at the same speed as the earth and takes photos of the same area. The data is then passed to Bracknell using two private telegraph lines).

The polar orbiting satellites transmit on a frequency of

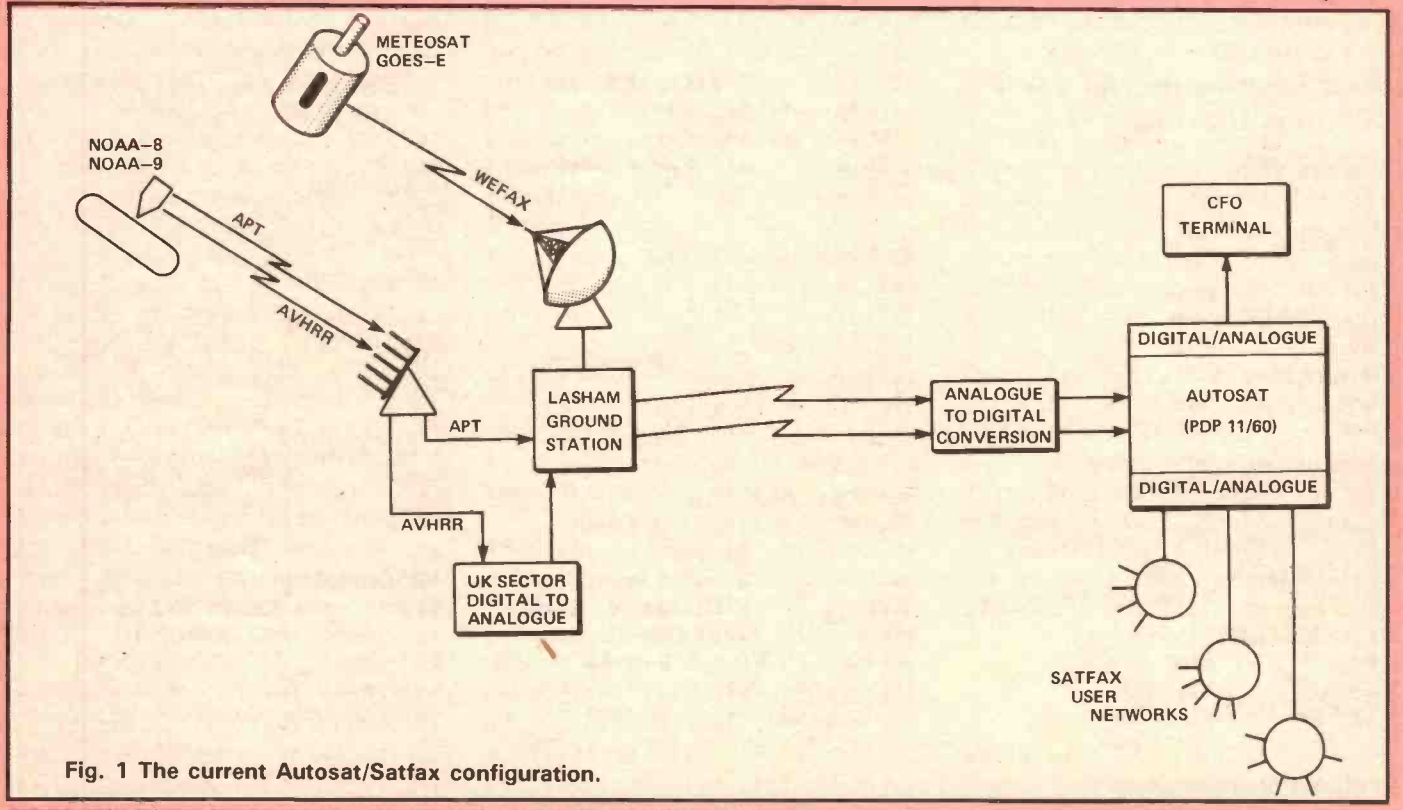


Fig. 1 The current Autosat/Satfax configuration.

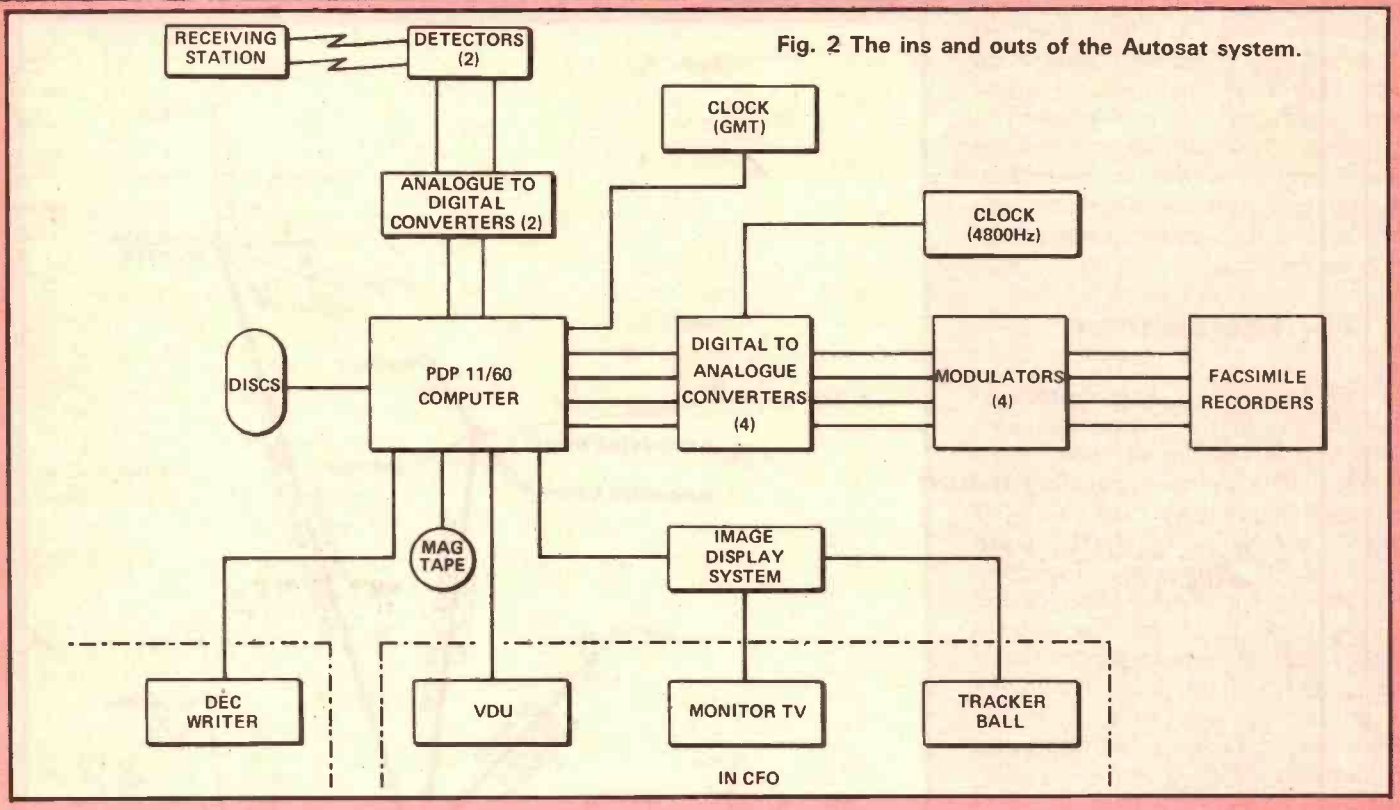


Fig. 2 The ins and outs of the Autosat system.

137.500MHz and 137.62MHz and have an orbital period of approximately 102 minutes. The average height above ground is 835km. NOAA9 crosses the equator in a northerly direction during the day and NOAA8 in a southerly direction during daylight hours. The two channels, on each satellite, transmit information derived from scanning 'radiometers'. Channel 'A' is in the near infra-red spectrum and channel 'B' has its radiometer in the visible range. The resolution of the data is 4km.

As far as the geostationary satellite *Meteorsat 2* is concerned, both the latitude and longitude are 0 degrees and the height above the earth is 35, 780km. The frequencies of the two channels are 1694.5MHz and 1691MHz respectively, and down converters from these two frequencies to 137.5 are commercially available. *Meteorsat 2* was launched in June 1981, and provides pictures, normally every half hour day and night over an area which includes Africa, Europe and the North and South Atlantic oceans. As with all geostationary satellites, the view near the horizon is too oblique to yield much information.

Picture This

All available APT (automatic picture transmission) data and some AVHRR (automatic very high resolution radiometry) data is used, but only a limited amount is taken from the geostationary satellites. When the data arrives at Bracknell it is digitised and stored in a DEC PDP 11/60 mini computer, (which is in fact called *Autosat*). The computer is programmed to accomplish the following tasks:—

a) To improve the grey scales. (On my system there are only four grey scales. This is sufficient for me but obviously unsuitable for a commercial undertaking). The program in the computer adjusts the grey scales according to the time of the day, with the constants changed during the year.

b) To select pictures for output to the various channels.

c) To project pictures and a grid onto a polar stereographic projection at a scale of approximately 1:20 million. These pictures are then assembled as a composite picture which contains the outputs for 2, 3 or 4 consecutive passes. This is the sort of thing we see on television.

d) Storage. At present the APT pictures are stored for about 4 hours and the AVHRR ones for approximately 12 hours. The projected pictures are stored until the start of the corresponding set of orbits on the next day. The pictures from the geostationary satellites are stored for up to 24 hours, but if the same area is covered by several pictures during the day then the storage time may be reduced.

Where To Now?

The output from the PDP 11/60 computer is then taken to the CFO (Central Forecasting Office) where amongst other things, the forecaster can change the 'grey scales' to improve contrast and brightness of the picture). A sequence of up to 20 pictures is available, and if required, can be repeated. The time limit between pictures can be selected by the forecaster with a minimum of 0.2 seconds. In practice an interval of between 0.5 and 2 seconds is used.

Fig. 2 shows the layout of the hardware controlling the input of data from the receiving station. The output is then distributed to the various interested users, shown in **Fig. 3**, the *Satfax* network, through a network of dedicated British Telecom telegraph lines and display on facsimile recorders at the receiving stations. These produce the imagery, messages containing operational information and 'grey-scale' to assist in the tuning of the recorder.

There are four outputs from *Autosat* plus a TV display in the CFO which can be used to display any picture stored in *Autosat*. In addition

there is a facility to output selected pictures, via magnetic tape, onto film. This is used to build up a 'quick look' archive of the projected pictures. The routine operational control of this network is undertaken by the duty staff at the Meteorological Telecommunications Centre (Met TC) at Bracknell.

For The Layman

We can, of course, receive at least some of these transmissions which are known as slow scan images. The receiver covering the required frequencies of 137-138MHz with a bandwidth of 30kHz, is not difficult to come by. Timestep Electronics, Microwave Modules and Cirkit Holdings all make a suitable unit. A pair of crossed dipoles needs to be erected for receiving NOAA satellites (a parabolic dish for *Meteorsat 2)* and a masthead preamplifier is strongly recommended, especially if your coax feeder is more than five metres long. The pictures will have to be stored in some form of memory — either a dedicated framestore unit or a home micro with a suitable software and interface. Finally, you will of course need a monitor!

Unfortunately, it is not so easy for radio amateurs to receive pictures as for the Met Office. You need to know the position of the satellite you want to receive. After several unsuccessful attempts I contacted AMSAT UK who put me in touch with a group. This group have written a suite of programs which enable you to locate the position of any satellite, including those of high orbital eccentricity, and to plot its ground track. It displays the information in a variety of forms including tabular, whole earth Mercator projection and European Theatre projection. It can even operate 'real time' control of a tracking aerial. The program is called Satpack and is available from AMSAT UK (see address box).

The visit to the Met Office was a very rewarding experience and put a new dimension on the reception of satellite signals. Should you wish to receive the five figure groups of the Met broadcasts from any Met Station, GFL26 included, then an application must be made to the Met Office (Licensing) MO17, London Road, Bracknell, RG12 2SZ giving the following information:—

1. The transmissions to be received.
2. The proposed frequency (frequencies) to be used.
3. The apparatus to be used.
4. The location of the apparatus.
5. The purpose of taking the broadcasts, eg amateur interest in the weather.

If the purpose of taking the broadcasts involves some commercial activity, a fee of £5 is payable. Once this permission has been obtained, it must be sent to the Department of Trade and Industry at Waterloo Bridge House, Waterloo Road, London who may charge a fee unless you are an amateur with a current licence.

Finally, there is now a group called the Remote Imaging Group who produce a newsletter at frequent intervals. If you are thinking of taking up this interest seriously, I would advise you to join them.

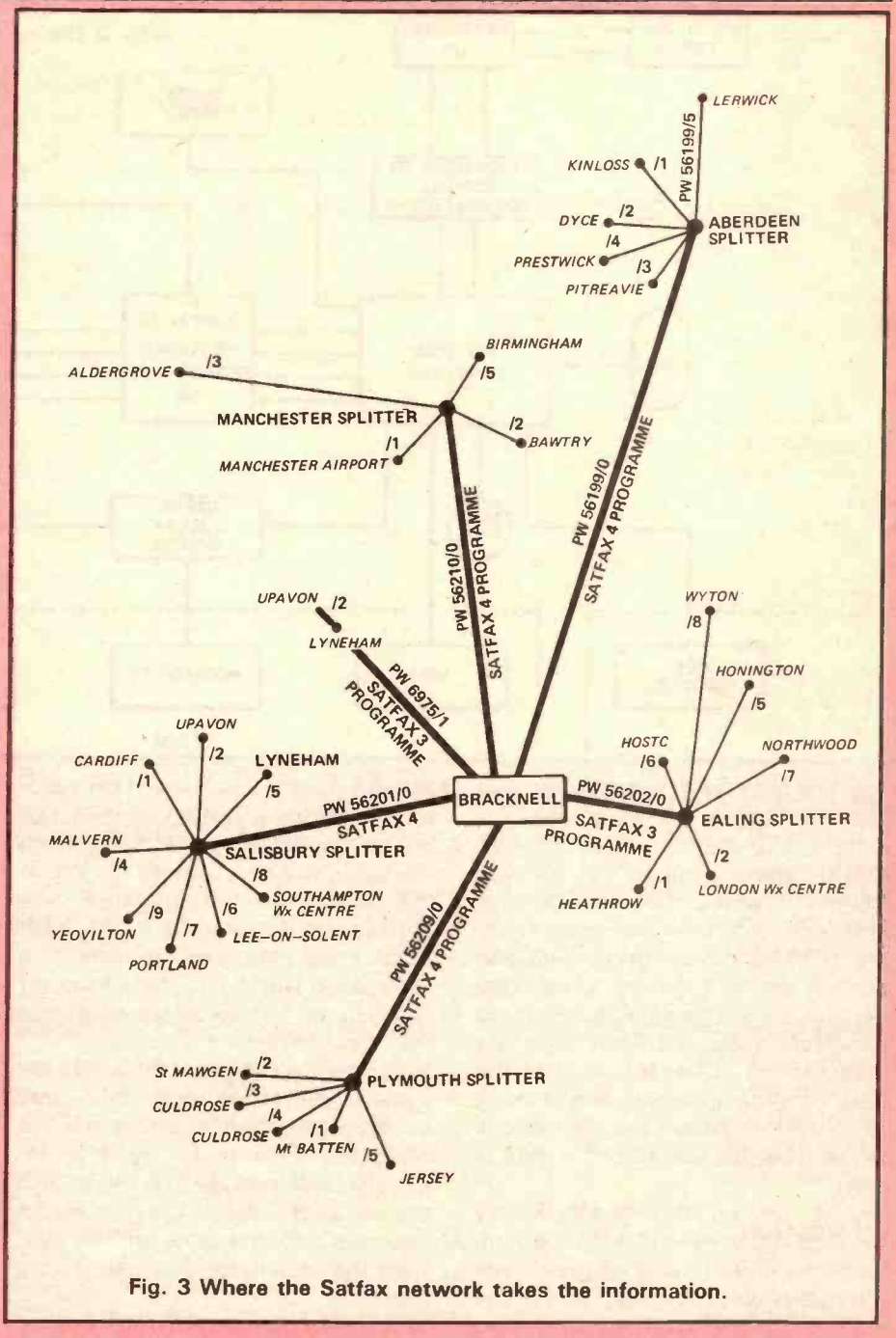


Fig. 3 Where the Satfax network takes the information.

Address Box

AMSAT UK 94 Herongate Road, Wanstead Park, London E12 5EQ enclose an SAE please.
Remote Imaging Group, Mr P Seaford, 12 Jupiter Close, Leighton Buzzard, Beds LU7 8XA.

Free Readers' ADS!

FOR SALE

TRIO R2000 Rx Gen cov. all mode one year old £350. Used with HQ1 triband minibeam 10,15,20mtr £80 Workswell on other frequencies, when used with ATU £420. for both ring Ely (0353) 61323.

FOR SALE 2 element quad DX24Q 2,10,15,20M antenna sell for £160, or exchange for Western DX33 Yagi beam in gwo. Tel Steve G4ZWY 0885 83428 after 6pm.

YAESU 757 GX uaesu 707 power supply Yaesu MD1 scan microphone £600 no offers. RS87112. Phone Rugby (0788) 812510.

FOR SALE FT708R plus accessories, inc mobile mount and speaker mike plus various 170cm ant. £180 ono. Tel. DFave G1DXM (QTHR) (0229) 56816 between 6-7pm.

19 SET Ganadiav russian markings complete with No2 RF amplifier £120. British 19 set £60. 1154 with matching 1155 £80 other 1155 £30 Racal 17L receiver £140 knob missing WW2 German radio eqwuipment offers. Ring for details and other military sets. 0258 880523.

HEWLEY PACKARD power meter 430C. Bolometer range 10 megs. 10GHx. £35. Marconi VTVM 1041C probe on AC good to 1GHz £35. handbook included G3BNL 0280 703512. Brackley.

YAESU FT209RH 5 meter hand held 5W extra power pack speakers mike etc. 6 months old. £245. Phone 0227 375168.

GW BRASS morse key £25. RAF typed key £20. Co-ax slide switch SPCD twoce £5. G3HSC morse records (three) £5. MWM preamp MAA 144V £16. FV101Z VFO for FT101ZD £70. Codar CR45 OV2 Rx £8. Postage extra G4IOT QTHR. Folkestone 76063.

TRIO 700G 2m multimode manual boxed excellent condition all supplementary crystals fitted SAE brochure £275 also Dragon 32 micro excellent condition manual trainer and games books used few times for RTTY/CW £35 software all sold. John G4WLD 01 857 8096.

FOR SALE Yaesu FT-290R and Yaesu FT-790R portable multi-modes. Both in very good condition any test welcome. Could deliver 60 miles round London for cash £210 each. Phone (07914) 2823 evenings/weekends. Brighton area going HF.

SHARP MZ80B CPM system computer, dual disk, printer parallel interface, serial interface, wordstar cost over £2000 will exchange for good base HF rig 10m-160m or sell for £700. Phone 01 953 3771.

Trio TS530 SP tvcr. Phone Kendal 24461.

EX ARMY No 88 set perfect inside apparently never used £40 38 set mark III £30, forces sender No 18 Mark III also its receiver counterpart £30 pair. Telephone 01 650 3686 (Beckenham) BR3 2PQ outer London.

YAESU FT707 ATU FC707, VFO FV707DM, PSUPP 707, mic YM35, boxed as new £640. 11m crystals if required. Oscilloscope Scopex 4D10 dual trace, solid state, one lazy trace, new condition £120. Datong ASP/A speech processor with PSU and leads £48. Frequency meter PFM200 plus leads etc 20Hz to 200MHz £48. Telephone Uxbridge 54116 (Middlesex).

SSTV and FAX transceiver, WRASSE SC1. All modes and speeds, cost nearly £900. Price £600 demonstrated (near Nottingham). Tel (0332) 762684.

MULTIMODE GW3SPA Eprom conversion to ten meters covers, 28.51MHz to 29.70MHz in 3 bands, 10kHz steps clarifier USB, LSB, AM, FM, with repeater shift £100 inclusive of postage. Contact GW3SPA QTHR. Telephone (0222) 707794 or telephone office hours (0222) 499022 ext 3156.

LOOK 2m station & Trio 9000 plus PSU 90 100 watt linear amplifier 9 ELE Tona and lots more, price around £400 please ring Bob on Keynsham 67737.

FC102 ATU 160-10m including power and SWR meters £120. 29MHz FM transceiver, 4 watt, RF gain etc, £40. Trio TR7800 2m transceiver, 14 memories, keyboard entry £160. 2m valve linear pair 4CX250B's 400 watt, 3/5 watt input, £480. (0772) 635560.

FOR SALE PRO 2003 scanner, 60 channel air ham, marine, utility, and FM broadcast bands, as new in original box, 6 weeks old, current price £300 will sell for £290. Telephone 228 4835 London.

FOR SALE realistic Pro 2002 50 – channel scanner receiver covers VHF-high VHF-low, UHF-High-Lo 12V DC mains operation, £125 or offer. Ring 01-692 0944.

COMPLETE electronic RTTY terminal, Radsoft terminal, interface, video, Genie computer fully featured transceive unit, £99. AR40 rotator, £40. Transformer 230V input 850V 480mA. 315V C 350mA, £12.50, TV game £7.50. Pioneer TS22A car stereo speakers, £15.00 G8VPG (QTHR) Tel Saltford 3098.

YAESU FL2100B HF linear amplifier in unmarked condition, little used with makers carton £350. No offers. Buyer to inspect and collect F.H. Watts G5BM, QTHR. Tel Newent (0531) 820960.

FOR SALE Yaesu YO-901 with bandscope £120 ono, Yaesu FTV-901R 2m Transverter £130 one, Yaesu FV-901DM VFO £130 one, or all for £360 ono, all in G.W. + manuals. Buyer collects. Tel 01-471 0669 after 5pm ask for Danny.

FAX Rank Xerox telecopier 400 with paper £20 or nearest offer Casio Fax 80 as new with paper £40 or nearest offer. Buyer to collect. Phone 01-845 4008 (Ruislip).

HAM International Concorde 26.965, 28.305 all modes £60 power mic, SWR meter antenna matcher, preamp £15 or £70 the lot or exchange for 2m linear or 70cm transverter or 2m beam and rotator. Contact Ian GM1RSV Bonnybridge (0324) 813300.

MARCONI audio signal generator TF1101 20Hz-200kHz in 4 ranges metered output lmV-20 volts sine wave £35. Airmec oscillator 50kHz-100MHz in 9 ranges output 10uV-20 volts £50 G4ULR QTHR 0603/51656, 220 Bluebell Road, Norwich NR4 7LW.

IC271E C/W mutek £550. BN05 12A PSU £70. KR500 elev rot + 40m cable £70. 40m LDF250 C/W skts £20. 4X 19 ele 2m mets £30 each. 4 way splitter £15. Carriage extra G4JBH QTHR (0935) 23873.

VHF TV aerial for caravan or boat or lorry £12. Stereo amplifier 30 watts per channel £45 made by Leak 8 track cartridge player £10. Various cartridges £1.50 each. Mike, 14 Doverfield Road, Brixton, London SW2 5NB. Tel 01-674 0513.

TRIO AT230 mint £123. DX160 gen/cov RX. 0.15-30MHz £31. Altai GDO KDM-6 mint £47. Altai headphones 2000 ohms £3. Supertester 680G multimeter 20K ohmsV, bargain £19. Miranda chassis punch set. new size 16/18, 20/25, 30mm £8. All ono, carriage extra. Tel 021 777 6086.

FOR SALE Yaesu YO-901 with bandscope £120 one, Yaesu FTV-901R 2m transverter £130 ono, Yaesu FV-901DM VFO £130 ono, or all for £360 ono, all in G.W.O. + manuals. Buyer collects. Tel 01-471 0669. After 5pm ask for Danny.

DATONG 2 metre converter with power supply unit £28. Drae 3-way antenna switch SO239 connectors £10. CB Harvard homebase £50. Zetag 27MHz aerial matcher 500 watts £12. Moonraker 25 watt linear amplifier £15. Mr Moore, 76 High Street, Ide, Exeter EX2 9RW.

R-2000 vgc boxed £320. Altai 12V, 3A PSU £10. G3XLL QTHR. Mellis 596.

FOR SALE Trio 9130 as new, 3 months old under guarantee. Recently passed morse going to HF £420. Tel. Nailsea 851608.

Yaesu FR6-7 Receiver excellent condition no modification £90 ono. Cummertrees 324.

CIRCUIT copies of Heathkit HW16, HG-10B, RAI, CLI, RG1 also Pye 1101A/3017A receiver and Pye Blackbox Hi-Fi record reproducer £2 each, plus stamp. Marris 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA.

GOING ABROAD, so homes needed for B40, KW Viceroy and CD711S.2 scope. Offers to G4DIX, QTHR. Tel 0732 455757.

EX-WD whip aerial base, NO10 Mk2 £3. Gardners choke 20H 100mA, 318 ohms £3. 50mA meter ex-wd round 2½" dia, res 1.71 ohm £3. Pocket barometer altimeter feet inches, mountain climbing, Japanese, New £6. Alan, Bury St. Edmunds. Tel (0284) 60984.

FOR SALE BCC 45G portable radio telephone with manual, ideal for person with conversion ability to convert to frequency required £10, with post and packing or £1. Buyer collects. Phone 0295 55488. Ask for Dave.

CR100 receiver surplus to requirements, goes to best offer or would exchange for good PSU, must be collected. Reg G1IHN. Phone 0533 889903 or 58 Horsewell Lane, Wigston Magna, Leicester LE8 2HQ.

COBRA 148 GTL-DX 11m multimode, ideal for conversion to 10m with 10w pep output. In good condition and includes circuit diagrams etc £110 one. Tel 045382 2759. Possible exchange for test equipment.

FOR SALE Yaesu FTDX401 in superb condition with manual and mic and ext-vfo with one full set of new valves for spares £230 ono. Buyer collects. Tel 0246 36496.

130S 180 watt compact go anywhere transceiver 80-10 inc warc digital readout, noise cancelling mike £375. G3MP Nottingham 602634.

BROTHER BP-30 colour graphic writer, only ten months old, still boxed and complete with instruction manual, good condition £120 ono. Sharp PC-1500 pocket computer and printer, plus PSU instruction book and applications manual £180 ono. Phone Tadley 4111 ext 6176 (Berkshire).

DIPOLE of delight 4 bands 40m-10m no ATU required too big for new QTH £30. 2m linear BNOS I10-100 as new £90. G4ILO Colchester (0206) 210878.

MULLARD valve tester cards £30. V/voltmeter RF £15. Distortion meter £20. Counters faulty complete £10 each. Telequipment 3 cope unit No-T/B-O/P £15. Solartron CD1015 not tube £20. Transformers, Turntables, Tape Recorders, VCR139A £15 5API £15. VCR97 £10. 3AKI £15. Tel 01-883 3474.

FDK 700E multi 2 mtr FM 25W VGC. Colin 0476 70887 evenings £120.

FOR SALE Cobra 148 GTL £95. Hy Gain 5 suitable for conversion to 28MHz £75. Phone 0283 221870. WANTED Nato 2000 in good working order. SMC transmatch urgent wanted rotator three system. Tel 0283 221870.

YAESU 101ZD excellent condition only used on transverter boxed manual fan etc, £425 or poss swap FT 221R, FT225R or TS700, TS770 why? Offers ring anytime 02572 60679 (Lancs). WANTED B/spread coils for HRO all bands and FRG7 un mod mint only.

FOR SALE Tokyo Hy-power all band universal antenna coupler mod HC200 as new £55+p/p. Wolfsen W-1200 VHF scanner with FO six crystals fitted £46 postpaid number of RSGB and ARRL publications for sale send SAE for list. Tel Avonmouth 828586.

FT790R 70cms multi-mode plus carrying case, strap, nicads, new charger and mobile 3 x 5/8 colinear-oscar 430E and rubber helical £270. Maidstone (0622) 672116.

YAESU FT707 USB, LSB AM, FM. 100W output full 11m fitted 26-28.500 vgc £395 ono. Tel Paul 01-961 4659 away time. Part X FT 757 or gen-cov.

YAESU FT101Z with ZD digital counter fitted. USB LSB AM, FM. Full 11m+10m fitted cover 26.000-30.000 recently overhauled by dealer £425 ono. Tel Paul 01-961 4659 away time, part x FT 757 or gen-cov.

SPC3000 antenna tuner. Bal coax, endfeed output 1.4 to 30MHz with operators manual £80. Heil mic equalizer wired for Icom range £25. G3KLV QTHR. Northampton 48091.

YAESU FRG-7 receiver 0.5MHz to 29.9MHz. Hardly used since new (mainly been in storage) excellent condition includes Jaybeam and Joymatch ATU £160 ono. Tel Frant (089 275) 638.

MM+KEYBOARD keyboard RRTY outfit £95 ono or exchange for 12" colour television. Also FOK RX40 2 mtr band receiver £60 ono. 101 ZD FM immaculate condition £500 ono. Special offer 101 ZD FM plus MM RRTY and keyboard £560 ono. Dave 06286 64567.

YAESU FT980 gen/cov HF tcvr one year old, c/w curtis keyer 300Mz cw filter manual service, manual full break-in suitable for AMTOR, recently realigned by importer, boxed as new £999 ono. G4WVX Bruce, QTHR. Tel 06286 64415.

TRIO R600 receiver, as new, with original packing, £195. Welz SP400 power meter, 130-500MHz 5/20/150W, 'N' connectors power + SWR, £50. Jaybeam 48 ele multi-beam for 70CM, £16. Tel: Warwick (0926) 498388.

BURNDEPT 3 channel UHF trans/rec, hand held, expensive unit, good order, offers. May exchange, what have you? 0480 300278 any time.

FOR sale. Murphy receiver, ex-Navy, B40, working, no longer required, £50. Tel: 021 360 6560, after 6 pm.

DSB80 QRP rig. Ready built in case with calibrated dial, plus fine tuning, CW sidetone, PTT switching, £40. Telephone, evenings, Ian, G4UWK (QTHR), 062 982 3072.

YAESU FT290 complete with Mutek batteries and charger. Also 30 amp linear, £260. E. Maybury, 27 Ballard Close, Basingstoke, Hants. RG22 6UQ.

FOR sale. 80M CW TX comprising CM Howes VFO and TX boards, used for many QSO's, power to 5 watts, £45 ono. Also Howes 80M RX board, still in packaging with TX to make QRP transceiver. Contact Tony on Bristol 719163.

TRIO TS520, fitted CW filter, immaculate, £300. Remote VFO, £30. Sagant EL40X 80/40M compressed dipole, £20. Azimuth 12/24 hour dual display LCD clock, £15. Wide-space variable capacitor and roller coaster, £25. Contact David, G3ZPF QTHR, tel: Brierley Hill 263020.

YAESU FT230R, boxed and as new, £215. G. Horwood, 01-561 6194 or 01-573 0442.

TRIO R-2000 receiver for sale, 150kHz-30MHz, VHF converter fitted, only four months old, little used, bargain, £450. Telephone: Derby 881840.

FOR sale. Standard C58 multi-mode with mobile mount, linear, batteries, charger and case, £250. Two 6-element Jaybeam quads, power splitter, £60. Telephone: 01-527 6775.

FT290R as new comes with mutek front end, carrying case, charger, manual, etc. All boxed, £220. Tel: (0734) 413656, ask for Jon.

TRIO R600 RX, as new, £235 ono + Trio TR7800 2M/25W RX/TX, excellent cond, £195 ono. Ring Paul, Tues evening after 18.30, on 061 682 5533.

SHIMIZU SS105S 9 band HF transceiver 1.5-28 full 27MCS FM 55B Kenwood mic Scarab RTTY tuner unit interface and programme for Spectrum. Exchange for any 934 MHz equipment, transceiver, etc. Slaley 043473 554, Northumberland.

TEN-TEC 228 ATU SWR bridge 1.8 to 30MHz, 200W intermittent, 100W continuous, switched for dummy load, bypass, coaxes, LW, twin feeder, VGC, GWO, £55. Derby 700610.

POWER supplies. Welz 30 amp variable voltage base PS, nearly new, £159 ono. Bremi 13.8V 3 amp PS £11 ono. Jaybeam 2 metre quad 6 ele. Beam plus rotator controller and some co-ax £59 ovno. Frank, G1DDF, 01-429 0381, Harrow.

TOKYO Hy-power 70cms linear 3W in 45W out, as new, £125 ono. NEC R6B 12" very high res colour monitor 640 x 400, perfect, £250. Also NEC 12" green screen monitor, composite video, perfect, £75. Phone Paul, G4XHF, (0293) 515201.

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EAGLE RX80 communications receiver £50, 2-30MHz preamp receive only £15, HF ATU £15, FRG 7700 receiver and matching ATV £295, two metre receiver base station xtalled £50. Mike, 01-674 0513, 14 Doverfield Road, Brixton, London SW2 5NB.

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YAESU FT209RH 5 watt 2 meter hand held extra nicad pack speaker mike charger, etc, 6 months old, as new condition, £245. Phone 0227 375168.

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