MAY 1989 £1.30

ISSN 0141-0857

Practical Wireless

The Radio Magazine

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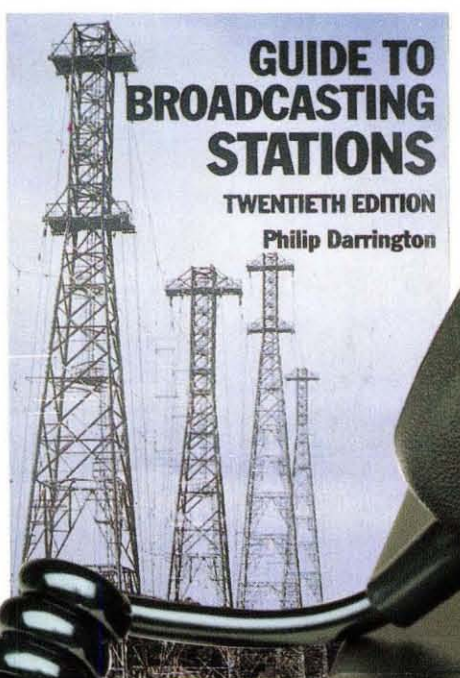

A NEW BREED OF CB

The Team TRX/404 Reviewed

Plus

Experimental HF Loopstick Antenna

Wireless Goes To War - the first time

Yaesu's FT-736R. Because you never know who's listening.

Why just dream of talking beyond earth?

With Yaesu's new FT-736R VHF/UHF base station, you can discover some of the best DX happening in ham radio. Via moonbounce. Tropo. Aurora. Meteor scatter. Or satellites.

You see, the FT-736R is the most complete, feature-packed rig ever designed for the serious VHF/UHF operator. But you'd expect this of the successor to our legendary FT-726R.

For starters, the FT-736R comes factory-equipped for SSB, CW and FM operation on 2 meters and 70 cm, with two additional slots for optional 50-MHZ or 1.2-GHz modules (220-MHz North America only).

Crossband full duplex capability is built into every FT-736R for satellite work. And the satellite tracking function (normal *and* reverse modes) keeps you on target through a transponder.

The FT-736R delivers 25 watts RF output on 2 meters, 220-MHz, and 70 cm. And 10 watts on 6 meters and 1.2-GHz. Store frequency, mode and repeater shift in each of the 100 memories.

For serious VHF/UHF work, use the RF speech processor. IF shift. IF notch filter. *CW Narrow Optional and FM wide/ narrow IF filters. VOX. Noise blanker. Three-position AGC selection. Preamp switch for activating your tower-mount preamplifier. Even an offset display for measuring observed Doppler shift on DX links.

And to custom design your FT-736R station, choose from these popular optional accessories: Iambic keyer module. FTS-8 CTCSS encode/decode unit. FVS-1 voice synthesizer. FMP-1 AQS digital message display unit. 1.2-GHz ATV module. MD-1B8 desk microphone. E-736 DC cable. And CAT (Computer Aided Transceiver) system software.

Discover the FT-736R at your Yaesu dealer today. But first make plenty of room for exotic QSL cards. Because you *never* know who's listening.

YAESU

*CW narrow optional

UK Sole Distributor ***South Midlands Communications*** *S.M. House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hants SO5 3BY. Tel: (0703) 255111*

Prices and specifications subject to change without notice. FT-736R shown with 220-MHz option installed.

Practical Wireless
The Radio Magazine

MAY 1989 (ON SALE 13 APRIL 1989) VOL. 65 NO. 5 ISSUE 986

THIS MONTH

We are sorry that, due to pressure on editorial space, "Practically Yours" and Part 14 of "Understanding Circuit Diagrams" have had to be held over until our next issue

Regular Features

NEXT MONTH

COMPETITION
Win a Mizuho HF QRP SSB/CW Transceiver

The Ten-Tec Paragon HF Transceiver reviewed

Feeder Loss and dBW

and
All the usual features

Don't miss it—place your order with your newsagent now!

On sale May 11
Contents subject to last-minute revision

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WSE — HAM RADIO STORE

ALINCO 2M FM ALR22E

The budget 2m FM rig that is low on price but high on spec. 25 watts with a rx coverage that extends from 140-170Mz (optional). Hundreds in use. For the full spec. see last months advert or send for full colour brochure.

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AZDEN PCS-6000 2M FM + AIRBAND!

This rig is unique. It provides 25 watts of FM on 144-146MHz plus full receive coverage from 108-180MHz AM/FM. 20 memories any duplex split in any memory, auto tone-burst, listen on input etc. etc. The airband section has been purpose designed for the job. Send today for colour brochure.

£329

ALINCO DJ-100E 2M FM

DJ-100E 2M FM

NEW

IN STOCK

Latest rig from the ALINCO stable, this handheld has been developed from the successful ALX-2E. Now incorporating LCD display and 10 memory channels it will fit into even small pockets! The extended receive range cover 140-170MHz and there are no extras to buy. Chris Lorek says in Ham Radio Today, "a lovely little transceiver with a very impressive technical performance.

£219

ALINCO ALD-24E Dual Bander

If you thought that dual band rigs were expensive, then look again at this one. It gives true duplex operation with a single antenna output. Basically 2 rigs in one box, it has a superb specification covering 2m & 70cms FM. Extended receive coverage is possible upon request. Probably the most cost effective rig on the market. Send for full details today.

£449

QRP HF TRANSCEIVERS

SSB/CW

***£179**

Single banders for 80; 40; or 20m with 2 Watts output SSB/CW. Fits into the pocket but can work the DX. These rigs have provided us with some fun recently, and they could do the same for you. Ideal for holidays, hotels or just a new challenge. Go anywhere, no TVI and beautifully engineered. VXO control, IRT, and a host of other features. We got 569 from LA2 on 80m with an indoor wire and W's on 20m! Send for specification. *80M Model **£189**

BOOKS & FREQUENCY LISTS

THE BOOKS THAT ARE USED BY THE PROFESSIONALS, NEWS AGENCIES, RADIO STATIONS, ETC.

UK Listeners Confidential Frequency List 1.6 to 30MHz **New 1989 Edition**	Phone
Complete Guide to VHF/UHF Frequencies 25 to 2GHz	£5.95
VHF/UHF Airband Guide to Commercial & Military. Pub Aug 1988	£5.95
HF Oceanic Airband Communications 1988	£3.50
The Secret of Learning Morse Code	£4.95
Pocket Guide to RTTY & FAX Stations	£2.95
Marine Radio Frequency Guide HF & VHF (available end of February)	£495
Airband Radio Handbook Second Edition	£5.95
Air Traffic Control by D Adair	£6.99

DIAMOND POWER METERS

A superb range of VSWR & Power meters from a very famous stable! All with new styling and RMS/PEP readings.

SX-100 1.6 to 60MHz up to 1kW	£95.00
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SX-1000 1.8 to 1300MHz up to 200W	Phone

Send for spec. sheet.

ADONIS MICROPHONES

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AM-303G

Used by many stations to provide that distinctive voice quality on either FM or SSB. A switch selects the correct response for each mode. Touch buttons provide the PTT and the omni-directional microphone gives the distinctive quality that hand mics just can't match. Works with any rig and includes up/down controls.

AM-503G As above but with speech compressor. **£65.95**

NEW! MARINE FREQUENCY GUIDE

This is the latest addition to our frequency guides. It covers LF, HF, and VHF, and lists all the UK coastal and port stations, with simplex, duplex and channel numbers together with traffic list times, channel designations etc. Full editorial is included about the marine service including emergency channels, SSB/RTTY/CW. Also listed are the world phone channels normally receivable in the UK. Most HF coastal stations listen on quite separate frequencies to those that they use for transmit. Its all in the guide. Super value as ever!

Marine Radio Frequency Guide £4.95 + £1

NEW! 730V-1 HF ANTENNA

Designed for DX operation on 10, 15, 20, and 40 metres, this aerial is highly efficient and yet easy to install in most situations. Full 1kw rating on SSB and full bandwidth performance at the 2:1 VSR points. No radials and single pole support point makes it ideal for even small OTH's. The robust construction and simple assembly makes this antenna a delight to use. Dimensions: Each element = 5.8m; Total span = 8.3m; Total height = 4.1m from base point to element tip line. 2" mast mounting and full instructions. **£149. Carriage £6 via Securicor.**

SONY COMMUNICATIONS

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ICF7600DA	150kHz - 30MHz AM + FM	**£127.00**
ICF7600DS	150kHz - 30MHz SSB/AM + FM	**£157.00**
ICFSW1	150kHz - 30MHz AM Compact	**£147.00**
ICFSW1S	As above with full kit etc	**£247.00**

ICFPRO80	150kHz-225MHz SSB/FM	**£297.00**
ICFAIR7	108-174MHz + FM Broadcast	**£227.00**
AN1	Active short-wave antenna	**£49.00**
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"THAT MUST HAVE BEEN 20 YEARS BEFORE MARCONI"

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TS440S

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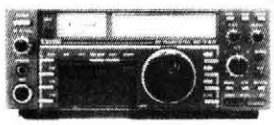
IC735/725

For the ICOM enthusiast, the IC735 is probably the most popular HF transceiver available under £1K. Still available at a very competitive price. Phone for details.



Icom have now introduced the new IC725 as an economy version. Available from stock at only £749.00

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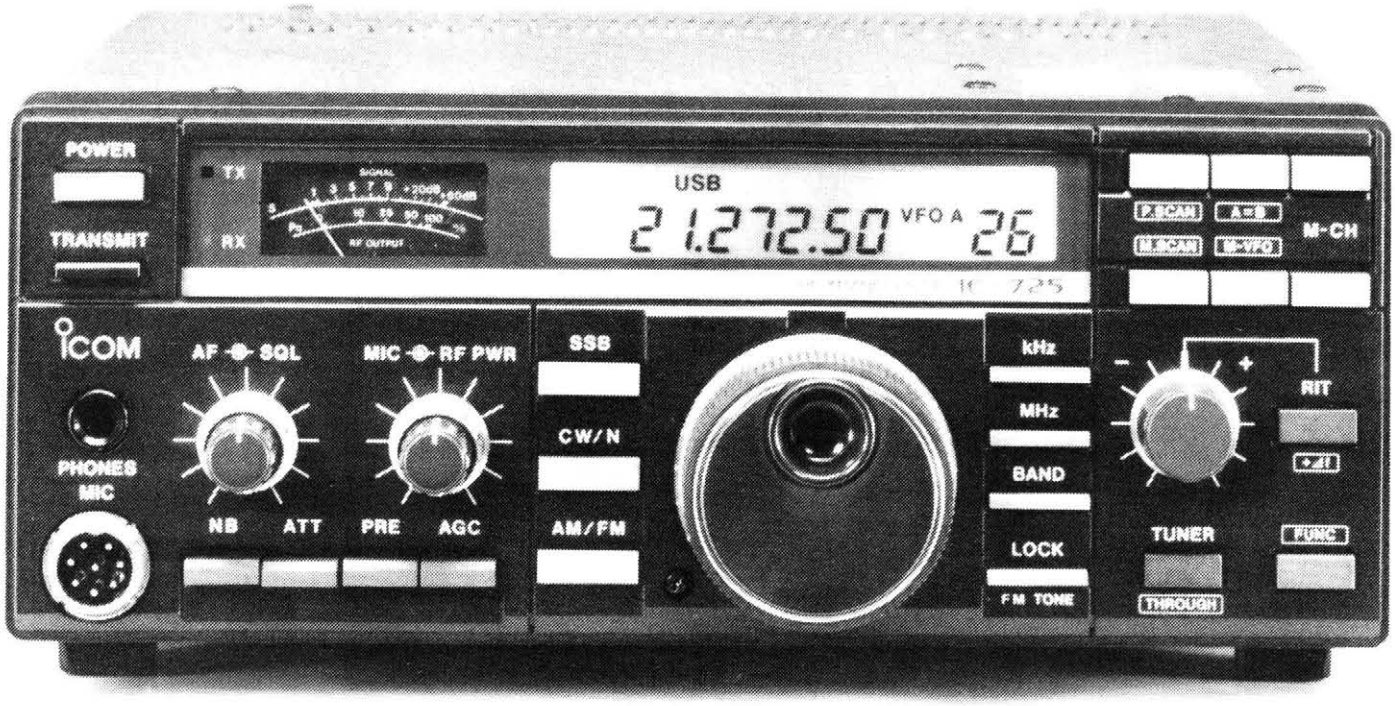
ICOM

IC-725 Budget HF



- General Coverage Receiver
- 105dB Dynamic Range
- 100W Output
- DDS System
- 26 Memories
- Scanning
- CI-V Computer Control
- Semi Break-in

The ICOM IC-725 budget H.F. has been produced due to the demand for a simple, high specification transceiver. Despite the limited features, compared to more expensive equipment this set retains a superior level of technical performance necessary to operate on the H.F. bands today.

Additional features include Noise Blanker, Pre-amp, Attenuator, AGC and RIT. The DDS Sytem (Direct Digital Synthesizer) ensures fast Tx/Rx switching times, ideal for Data Communications. An A.T.U. controller is built into the IC-725 for use with the AH-3 H.F. Automatic Antenna Tuner for mobile or base station operation.

Accessory options available are the PS-55 20A P.S.U., AH-3 Auto Antenna Tuner, UI-7 AM Tx. FM Tx/Rx Unit, FL-100 500Hz CW Filter, FL-101 250Hz CW Narrow Filter and SP-7 External Loudspeaker.

For more information on the IC-725 budget H.F. and other ICOM amateur equipment contact your nearest authorised ICOM dealer or phone us direct.

Icom (UK) Ltd.
Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

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ICOM have a winning line-up for fixed, portable and mobile operations. The deluxe "75" series of transceivers offers a new standard of excellence from VHF to UHF communications. Each compact all mode unit delivers maximum performance, reliability and ease of operation.
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These transceivers can be used in a variety of ways, for propagation experiments, satellite communications, moonbounce, D'xing or straight rag chewing contacts.
When high speed digital systems such as PACKET or AMTOR data communications are used then the ICOM DDS system provides a lock-up time of just 5msec.

2 Meters

ICOM's 25 watt IC-275E is a superb transceiver for contest operating and for general DX working. This prestige 144MHz multimode is also available as a IC-275H 100 watt version, which requires an external AC supply.

70cms

Enjoy 430MHz operation with the 25 watt IC-475E, or go high power using the IC-475H. An optional CT-16 Satellite Interface Unit is available for combining ICOM "75" transceivers for easy tuning.

6 Meters/10 Meters

The 10 watt IC-575 covers 28-30MHz and 50-54MHz and includes the AC supply. Join in with the recent openings to the U.S.A. with this superb transceiver. Also to be released soon is the IC-575H 50/100 watt high power version, which will operate with an external AC supply.

With the introduction of the "75" series you now have all the technical quality you'll need to enjoy VHF and UHF communications. For more detailed information on these transceivers contact your local ICOM dealer of ICOM (UK) Ltd.

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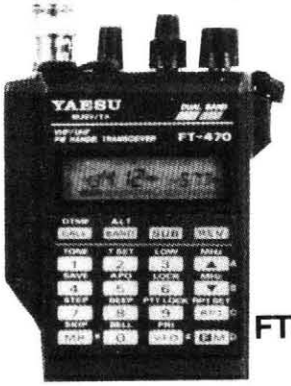
CSC23 (FNB10)	£10.58
CSC24 (FNB12/14)	£10.58


FT23



FT470

FT470

Cases

CSC35 (FNB9)	£10.00
CSC36 (FNB10)	£10.00
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MH18A2B	Mic/Speaker small	£31.05
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FT290R2/690R2/790R2

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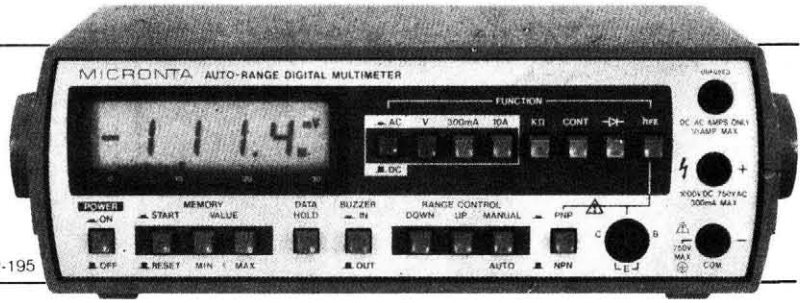

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* Liquid crystal display
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* Nicads, charger & BNC whip antenna included in the price

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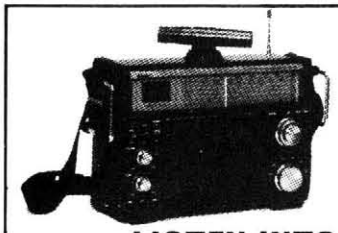

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WRITE ON... *the page where you have your say*

Impractical?

I have been an avid reader of *Practical Wireless* for nearly 20 years, and during that time I have built many projects, 99 per cent of them successful, I may add. If anyone asked me what was the best construction magazine, without hesitation I would have said *PW* every time, until now.

Just what has happened to *PW*? It seems that ever since you acquired *Short Wave Magazine* the constructional aspect of *PW* has deteriorated. I, like my friends who were under the impression that *PW* would become **the** Number One constructors' magazine, with *SWM* being the theorists' bible, feel sadly let down. Where are all the major projects that were promised to us? Fair enough, it's nice to have an occasional one-nighter—remember "Take 20"—but personally I would like something to get my teeth into, something worthwhile relating to the hobby, for example the *PW* "Meon". This in my opinion is one of the best projects that you ever produced.

Is *PW* now following the trends of the other radio mags and becoming what I would call an occasional browsing mag, of limited interest and not worthy of a regular subscription? I sincerely hope not, it would be a crying shame to have to cancel my subscription after 20 years. Maybe I am making a mountain out of a mole-hill, let's hope I am wrong. Maybe a change of title—how about "Theoretical Wireless" perhaps?

No doubt this letter will not be published as it is a criticism of *PW*, but at least I feet better for airing my views and the views of many of my radio amateur friends.

C. R. Dermott G6YPU
Blackpool.

See this month's Comment.—Ed.

Free-loaders?

Over the past couple of years, I have read with ever-increasing incredulity the many and varied letters from would-be "Free-loaders" into the world of h.f. amateur transmitting. Most of the letters showed the writers to be devious, certainly lacking in initiative, but on the whole just plain lazy.

However, the letter from G1FBH in February's *PW* really takes the cake. Why the devil should he assume that any licensed amateur would wish to entertain some half-cocked dabbler in his shack for a couple of years, with a real risk of ending up with damaged equipment, plus the added bonus of having his licence revoked if, to quote G1FBH, "things go amiss"!

Don't misread me. Over the past 30-odd years I have helped many an aspiring amateur to get his ticket, and each one of them worked very hard to obtain a callsign.

Perhaps the latter-day merchants who spend so much time and effort just whining for easy access to the h.f. bands should take a leaf out of the book of G3MUM and his compatriots of the Radio Amateur Invalid and Blind Club. If anyone deserved an easier access into amateur radio then these gentlemen certainly did, yet they didn't ask for it, neither did they get it, and there's not a whiner among them.

Basically it boils down to this. If you want to use 150, 100 or even 5 watts on the h.f. bands, then you need to get off your backside and work for the privilege to do so. If you're not prepared to do that, then you certainly don't want it enough.

H. N. Kirk G3JDK
Rotherham.

Rallies

Regarding the glut of radio rallies (Comment, January *PW*), the number could be almost halved by making them biennial as at Maidstone (May 28 this year). It's certainly much better for everyone and helps keep standards up, although there don't seem to be many rallies in Kent anyway.

P. J. Pickering G3ORP
Chairman
Maidstone (YMCA) ARS.

PW COMMENT

Impractical Wireless?

IN OUR STAR LETTER THIS MONTH, G6YPU highlights a problem which is facing a number of technical magazines at the present time—a shortage of the right sort of articles.

Talking particularly of the radio hobbyist magazines, the number of copies of any title sold in the UK simply does not support the employment of a full-time development engineer on the editorial staff, as happens in other countries with a larger radio amateur population. This means that we are almost totally dependent upon outside contributors—keen constructors who are able to write clearly and interestingly about their latest pet project. Unfortunately, by no means all of the people developing their own circuits are willing or able to devote time to organising, checking and writing up the details of what they've done, for the benefit of other enthusiasts. Remember, for every "developer", there are many more "constructors", who enjoy getting stuck in with a soldering iron, following the instructions of others, but who do not have the technical background necessary to develop their own projects. The financial rewards for writing up a constructional project for publication don't compare with the sort of salary a professional R & D engineer would receive, of course, so to some extent it's a labour of love.

It might be argued that there are too many amateur radio magazines in the UK at the present time, competing to attract the right sort of articles. Here on *PW* we sometimes try to help potential authors by providing them with assistance in producing p.c.b.s, making performance measurements, or even in buying components where it seems worthwhile. It is not unknown for us to continue to support an attractive project for several years, only to see it eventually come to naught.

In some ways, designing equipment for home construction is more difficult than designing for manufacture. First of all, the project must use components which are available on the hobbyist market, not always an easy task where radio components are concerned. Secondly, it must be remembered that many readers likely to be tempted to build even quite complex circuits will have no test equipment other than perhaps a multimeter and an absorption wavemeter at their disposal. So, we have to try to ensure that any design published can be correctly aligned, without perhaps filling the ether with harmonics and "sproggies", yet without need for a lab costing many hundreds or even thousands of pounds.

On the question of large projects versus small ones, opinion among our readers is divided. The majority seem to favour the smaller, less expensive items, but to try to satisfy those who prefer something more substantial to get stuck into, we try to have occasional big ones too. Unfortunately, it is usually these bigger ones that tend to fall by the wayside during development, to the intense disappointment of all concerned.

There is no shortage of some types of article, in particular on historical topics. Though these are popular with many readers including, encouragingly, the more youthful, there is obviously a limit to the number of pages we can devote to developments and happenings in those bygone days. Constructional articles are a different matter altogether. We're crying out for them!

On G6YPU's final comment, we're always prepared to publish constructive criticism in *PW*. I guess he must have been thinking of some other journal.

Geoff Arnold

The Future of Amateur Radio—the RSGB Replies

As you so rightly state in your March Editorial, Tony Nailer does paint a gloomy picture of the future in his letter in that issue. He bases his view on four main assertions, namely (1) the Government order affecting 28MHz equipment, (2) the lack of home construction, (3) EMC problems and how they are dealt with, and (4) the increasing cost of equipment.

Tony Nailer is quite right to be concerned about these and other matters. Indeed he shares the concerns of the RSGB, which was founded by enthusiasts such as himself to unite UK radio amateurs in an effort to maintain and develop amateur radio and to ensure that it had a bright future.

One of the most marvellous things about amateur radio is that it is such a diverse activity. To some, home construction is everything, to others, skilful on-air operating gives the most pleasure. There is therefore no typical or average radio amateur since everyone derives his or her own pleasure from some different aspect of the hobby. Long may this continue. The RSGB wishes to encourage every single positive aspect of amateur radio. That includes the fun, pleasure and skill in operating both home-made and commercial equipment. Some commercial equipment is expensive, but I am not convinced that it is more expensive than it was 20 years ago in absolute terms. The costs of manufacture, sale and servicing are always going to be dictated by supply and demand, but the use of commercial equipment is not the only way of enjoying amateur radio on the air. The RSGB's "Project YEAR" (Youth into Electronics via Amateur Radio) is making the Society re-examine the value of simple home-built equipment. We certainly aim to encourage more home-brew, especially for beginners, many of whom will have to work with a very low budget.

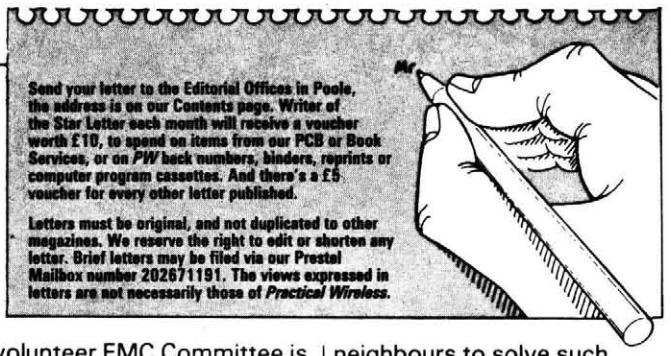
Of course, the RSGB exists in order to create and enhance the basic framework in which every UK amateur can achieve their own personal goals and objectives with the minimum of restrictions. New bands, new privileges and new licence conditions do not just happen; they are fought for and won. Changes in society as a whole and new Government, European Community and International Telecommunications Union legislation and regulations are not of the RSGB's making. Neither is the heavy demand for frequencies from other spectrum users and the commercial exploitation of the spectrum caused by the Society. However, the RSGB needs to react as positively as our resources will allow, using both volunteer and staff talents, to any threat posed to the Amateur Service(s). For that reason the RSGB seeks to encourage all caring amateurs to join its ranks because the more support there is the more likely the Society is to be able to counter the problems that will face radio amateurs in the future in an ever increasingly complex environment. The simple truth is that there is more safety in numbers.

Tony Nailer's fears about 28MHz equipment are well founded, but he has overlooked the fact that the RSGB is there to act on behalf of all UK radio amateurs. In fact, as a result of action from the Society, and support from many members, the DTI now plan to issue special orders to alleviate most of the problems which were originally envisaged by radio amateurs—a satisfactory outcome. Hopefully, the new DTI authority will have been published by the time this letter appears in print.

On the question of EMC problems, great inroads have been made in recent years, particularly in making radio amateurs more aware of likely problems and in the Society attempting to provide better advice to its members more quickly. Some EMC cases are very complex and require much patience, but that does not mean to say that the RSGB's volunteer EMC Committee is not prepared to give advice. In fact, one piece of very complex European Community legislation—known as the EMC Directive—looms large on the horizon. There are some potentially negative aspects of this legislation which the major National Societies in Europe, including the RSGB as a prime mover, are grappling with at present. But on the positive side, we can eventually expect better immunity to radio signals from the mass of domestic electrical equipment and lower levels of radiation from thermostats, time switches and computers. While all this is in the future, the increased awareness about EMC has generally been welcomed. Procedures for dealing with EMC problems have also been discussed at great length with the DTI/RIS and should any member have a problem here then the benefit of the RSGB experience will be passed on whenever possible. To avoid any misunderstanding, let me reiterate that some EMC problems are very complex involving social and technical problems; great patience is often required both by amateurs and their neighbours to solve such problems.

Of all the problems facing amateur radio in the future, there is none so drastic as the potential loss of our precious frequency bands, for no bands equals no amateur radio. If our numbers decrease in the UK or worldwide and the commercial pressures on the spectrum do not abate, then the argument for transferring amateur allocations to other services will become irresistible. Without the constant vigilance and activity of the RSGB at national level, and the IARU (of which RSGB was a founder and most active member today) at international level none of the eight new amateur bands, including 50MHz, would have been allocated in the UK during the past 10 years. The RSGB does have a fine record of achievement, but none of its work can be maintained without the support of the membership. To those who are genuinely concerned about the future of amateur radio, membership of the RSGB represents the best of investments at only 40p per week.

David A. Evans G3OUF
RSGB Secretary.



Satisfied Customer

I feel I should write to say what excellent service I received recently from Barenco.

I purchased from them at the Blackpool Rally a 25m length of coaxial cable. The weekend following the rally I unrolled same to fit to a new antenna, only to discover I only had 20m. Early the following week I phoned Barenco to inform them of the error. I was asked for my name and address, apologies were made and later the same week I received from Barenco a 25m length of replacement RG213, and asked to keep the 20m length with their compliments.

In these days of much adverse comment aimed at traders, I feel the foregoing worthy of attention.

Trevor Davies G0JIX
Shrewsbury.

FOR *PW* SERVICES SEE PAGE 46

WRITE ON . . . *the page where you have your say*

Packet

Reading Mark Flett's letter in March *PW*, I found the story of cliques a bit hard to credit. Surely, I thought, radio amateurs **not** wanting to talk about a new mode . . ?

Then I thought about my own experiences of the last two months—I bought a Kantronics KPC-2 in December—and began to wonder.

When I moved to this area in January 1988 I was already interested in packet since a lecturer at the Aylesbury Vale club had given a demonstration. He also mentioned that all the RTTY boys were now on packet. I had recently discovered the micro and home-brewed myself onto the empty RTTY waves so this remark had some impact!

I spent some eight or nine months trying to make my own TNC (well, I enjoy doing it myself) to no avail. It was just too complicated, although it does seem that Beeb owners can do it for about £40. Alas, I have an Einstein.

But, to get back to the point, in two months of operating I have yet to have a packet conversation with anyone. I have made Connects on half a dozen occasions but never received any but a pre-recorded reply, which, frankly I do not know how to deal with. It's rather like dealing with a telephone answering machine except that no instructions are given.

I have called CQ and individuals but never a response, though my equipment appears to function normally on 'phone. I have met local operators who are great chaps and have offered me lots of software—for the Beeb—but I cannot at present attend the local club for personal reasons. I have not, obviously, met a packet operator.

My TNC, and I believe most others, allow the "locking out" of unwanted calls, and by listening with the well-known ears I can clearly hear ten times as many packets as ever appear on my screen. What sinister conclusions am I supposed to derive from these facts?

What does appear on the screen is far removed from what the manual tells me to expect. The same station seems to have two, three, five or more callsigns and none of them seems to be manned.

Finally, I sent off my 95p plus 20p post and packing for BARTG's *Beginners Guide to Packet Radio* to find it no help and in fact an inferior version of *The Lowe Packet Guide* which is free when requesting TNC details from Matlock!

I can well understand packeteers giving up after a short while. How about (especially in the Humberside area) a few packet enthusiasts starting a 'phone net for the benefit of newcomers? There seems to be plenty of space on both f.m. and s.s.b.

Ted Cawkwell G8VEL
Winterton, S. Humberside.

What about it, you packet buffs? There certainly seems to be a need for local help-groups in some areas to aid the newcomers.

When thinking of computerising any process, the recommended procedure is always: 1. Decide exactly what you want to do. 2. Find the software to do it. 3. Buy the computer that runs that software. This is all very well until you decide you want to do something different, when all too often you'll find there's little or no software to do that task on your chosen computer.—Ed.

Packet—2

I was interested in G3LDI's article (March *PW*) on packet, especially at h.f. It seemed to me that a number of questions were well begged, and the conclusions dubious.

1. "Packet doesn't work at h.f." If it works that well, and is so suited to h.f., why does it have to have an **exclusive** sub-band? We all know h.f. packet is not a robust communications medium, so let's not pretend that it is. Of course it works on a clear channel—it's getting the clear channel that's the problem!
2. Why is 20kHz needed? 1200 baud packet using minimum shift keying and suitable filters in receivers should get about 16 channels into 20kHz (perhaps more, depending on equipment). Currently, s.s.b. bandwidths are used, which isn't very spectrally efficient. So if you need 20kHz exclusive with current receivers, packet only needs about 10kHz if the r.f. technology used was up to the same standard as the digital technology.
3. A 20kHz exclusive sub-band would leave over 200kHz on each band. Unfortunately, 200kHz of s.s.b. stations gives about 70 channels. The proposed 20kHz for packet gives 10 channels at the moment. To justify this, one in seven QSOs would have to be on packet.
4. Most packet operators are gentlemen—the inference being that they stay within the bandplan. This they definitely have not—just listen in the 14.100–14.110MHz segment. Yet Roger is saying that because their mode didn't work in the RTTY segment, they were justified in moving out. Perhaps inferring is more accurate. The packet argument appears to be that they have a mode which isn't robust, they have successfully hi-jacked a band segment by ignoring the existing bandplan, and now they want the odour of sanctity to descend upon their actions. That's a bit much!

Still, progress is necessary, and personally I would support a 10kHz exclusive packet allocation on 14MHz, with 20kHz on 21 and 28MHz. But I do think in return that packet operators should upgrade their r.f. technology to make the best use of the available spectrum.

Peter E. Chadwick G3RZP
Swindon.

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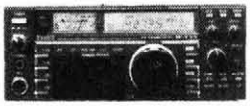

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FRT 7700 Yaesu tuner	~~£69.95~~
CC701 TNC RFI filter 3-pack	£4.50
R300XL rotator	£39.95

PACKETEERS CORNER

AEA PK-88 TNC	£109.95
AEA PK-232 7-mode TNC	£279.95
MFJ-1278 7-mode TNC	£218.84
PC-PAKRATT for PC/PK-232	£19.95
PK-FAX for PC/PK-232	£19.95
PK-232/BBC	£26.95
COMM-PAKRATT for CBM64	£59.95
COM-FAX for CBM64	£59.95
MFJ1284 for PC	£22.95
MFJ1282 for CBM64	£22.95

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At RAYCOM we are particularly proud of our scanner expertise and this has resulted in being able to offer a fine selection of scanners, some exclusive to RAYCOM. Don't take our word for it, come on in and see for yourself. We stock handhelds, base scanners and extended coverage mobiles including the unique RZ-1 mobile scanner. Check out our stocks of Bearcat 200XLT's, you might be in luck and get one at the best price around, only £199.99 complete with nicad and charger. Don't delay, we can't repeat this offer! By the way, don't forget to ask for your free 'Where to Listen' guide when you pick up your scanner! 73.

Bearcat 200XLT	£229.99
Bearcat 100XLT	£189.99
Bearcat 100XL	£169.99
Bearcat 70XLT	£159.99
Bearcat 50XL	£95.00
Challenger BJ-200	£189.00
Sony AIR-7	£229.95
Sony PRO-80	£299.95
Sony SW1S short wave kit	£245.00
Sony 2001D HF/Air Band	£295.00
Sony ICF-7600	~~£199.95~~
MARCII 0.15-950MHz	£375.00
AOR AR2002	£469.00

YAESU

FRG9600 Standard	£529.00
FRG9600 Mk2 60-950MHz	£545.00
FRG9600 Mk5 0.1-950MHz	£599.00

* all the FRG9600 packs include a free **ROYAL 1300 discone worth £59.95** and a free mains PSU.

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* including free **ROYAL 1300 discone!**

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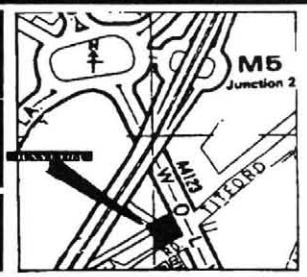
COMMUNICATIONS SYSTEMS LIMITED



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NEWS DESK ... compiled by G4LFM and G8VFH

TM1000 ATU

Nevada have recently introduced a new MkII version of the TM1000 antenna tuning unit. This version covers 1.8 to 30MHz continuously and is now capable of handling 2kW p.e.p.

The input impedance of the unit is 50Ω (resistive) and the load impedance is 50–500Ω with a v.s.w.r. of 10:1 or less. The unit measures 330 x 114 x 267mm. The price is the same as original unit, £168.

For other details, contact:
Nevada,
189 London Road,
North End,
Portsmouth,
Hampshire PO2 9AE.
Tel: 0705 662145.

Clean Connection

Whether it is a specimen to be cleaned, a connection to be made perfect or two components to be made clean for adhesion, you do need some method of providing that cleanness.

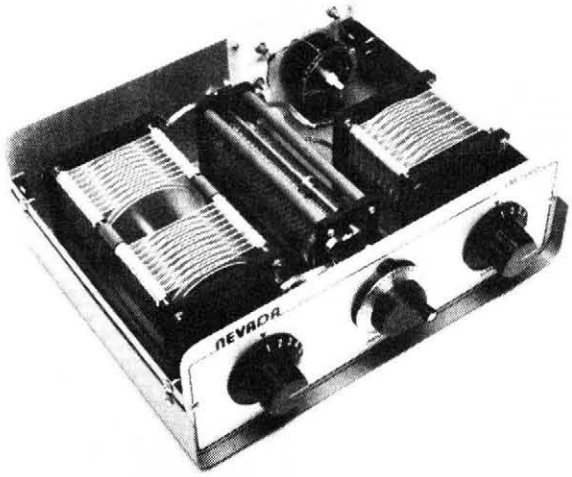
Gunson's Speedplate pencil uses a tip made up from a bunch of glass fibre strands. It is in a propelling type case so that only a small piece of the 300mm refill is exposed.

It's actually very easy to use, you just gently rub the offending area and it removes the dirt and grime to give an oxidisation-free surface. It worked very well on some old components I had in the junk box.

The Speedplate pencil is available from car and accessory counters of many high street shops. It costs £3.34 which includes two refills and packs of ten refills cost £2.99.
Gunson's Ltd.,
Pudding Mill Lane,
London E15 2PJ.

Berlin Video Fair

The Video Fair will take place from August 25 to September 3 in Berlin. Flights and accommodation can be booked through the organisers. For enquiries and reservations telephone: ***01-408 0111.***



HMS Plymouth Group

Members of the Royal Naval Amateur Radio Society living in the Devon and Cornwall area have formed an HMS *Plymouth* Group to be responsible for amateur radio operations from the Falklands veteran HMS *Plymouth* based at her namesake city.

The ship will be open to the public from March 29 until October. There will be a charge for admission.

The intention of the radio amateur group is to provide—as far as possible—a replica radio room (W/T office) and at the same time carry on radio contacts which will be seen and heard by visitors. Frequencies in use will be the usual h.f. and v.h.f. bands and QSL cards will be sent to all contacts via the bureau. The callsign has yet to be allocated, but it is hoped to re-issue the old Devonport signal letters GUZ and the ship would then be using GB3GUZ.

Members of the RNARS both at home and abroad are invited to join the group at an annual subscription of £2. This should be sent to the ***Hon. Treasurer, Chris Harper, 24 Cunningham Road, Tamerton Foliot, Plymouth PL5 4PS***. Other financial offers would be gratefully accepted and applied to the provision of additional equipment.

HMS *Plymouth,* the last of the Type 12 Frigates, is at present "in retirement" and was heading for a watery grave as a missile target. Since then the Warship Preservation Trust and a strong team of volunteers have worked small miracles to open the ship for public display.

Collins Owners Club

The objective of the Collins Owners Club is to bring together owners of Collins amateur radio or related equipment who would like to contribute to maintaining the marque.

The membership is mostly within the UK, but some are from Europe. It isn't intended that the club has a world-wide membership, nor that it provides a service facility or spare parts. The club does provide a copy of the list of members, their addresses and equipment and a newsletter published three times a year. They hope then that members will communicate amongst themselves on specific problems/details or through the newsletter in the case of sales and wants, etc.

If you are interested in joining the club, all you need to do is send a number of **first class** stamped self-addressed A5 size envelopes and your details to the address below. By return you'll get a copy of the list of members and the latest newsletter. The remaining envelopes will be used to send you subsequent newsletters.
Collins Owners Club,
4 Leam Crescent,
Solihull,
West Midlands B92 8PD.

Young Amateur of the Year

The DTI have announced their sponsorship of the Young Amateur of the Year Award for 1989. Anyone who is under 18 and:

is keen on d.i.y. radio construction **or**

is interested in using radio and gaining operating skills **or**

is using radio for a community service, such as helping the disabled or in emergency communication networks **or**

is good at encouraging interest in amateur radio **or**

is involved in amateur radio in any way, such as in a school scientific project, is eligible for the 1989 Award and its £250 cash prize.

The prize, for the most outstanding achievement between 1 April 1988 and 31 July 1989 will be awarded by the DTI and presented at the RSGB HF Convention in October.

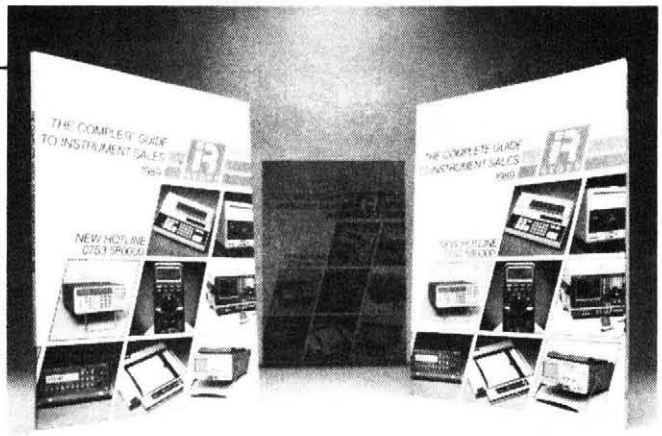
The DTI will also send every genuine entrant a copy of the coloured chart of radio frequency allocations. The winner gets to see the DTI's radio experts at work at the RIS at Baldock in Hertfordshire.

The closing date for applications is 31 July 1989. Entrants **do not** need to be a radio licence holder to enter. The competition is open to anyone in the UK, the Channel Islands or the Isle of Man, who is under 18 on July 31.

Applications or nominations for the Award must be sent to:
The Secretary.
RSGB,
Lambda House,
Cranborne Road,
Potters Bar,
Herts EN6 3JE.
Tel: 0707 59015.

Rare WAB Squares

Two rare squares in Essex will be activated by G0KSY/P and G6XOU/P on the 7 and 144MHz bands on the following dates:
Square TR09 on Saturday May 13 from 0930 to 2100UTC.
Square TM00 on Sunday May 14 from 1030 to 2100UTC.



Catalogues

The IR Group has produced its 1989 instrument sales catalogue. It's a 110-page publication featuring a comprehensive range of test and measuring instruments. Many products in the catalogue are also available under a rental or leasing agreement.

Products in the new catalogue include oscilloscopes, signal sources, multimeters, power supplies and logic analysers. There is also special-purpose test equipment for TV/audio, datacomms and fibre-optic applications.

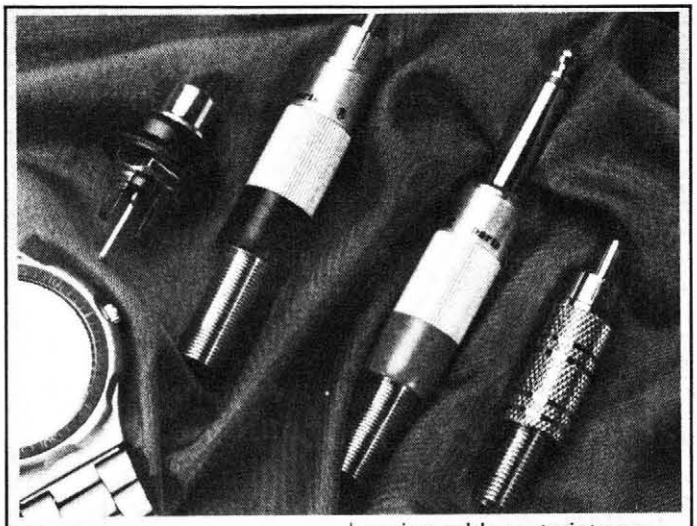
The manufacturers featured are Tektronix, Philips, Marconi, Hitachi, Grundig, Thandar, Racal and Stag.

IR Group,
Dorcan House,
Meadfield Road,
Langley,
Slough SL3 8AL.

Unitel have recently published their 56-page catalogue on capacitor ranges from AVX, Beck, Kemet, Murata-Erie, Philips, Siemens, Syfer, Thomson and Wimpey-Dubilier.

Fully illustrated, the publication is free-of-charge and provides technical and pricing details on a wide variety of products. For further details, contact:

Unitel Ltd,
Unitel House,
Fishers Green Road,
Stevenage,
Herts SG1 2PT.
Tel: 0438 314393.



Gold Connectors

Rendar have recently introduced a range of gold-plated jack plugs and RCA phono connectors.

Standard and miniature jack plugs are available with two and three-pole options allowing both mono and stereo operation. RCA phono connectors include cable plugs and panel-mounting sockets. Coil-spring cable restraints are featured for both types of connector. Red or black plastics coding rings make visual channel identification quick and easy.

For further information on these products, contact:

Rendar Ltd,
Durban Road,
South Bersted,
Bognor Regis,
West Sussex PO22 9RL.
Tel: 0243 825811.

Antex Literature

Antex (Electronics) Ltd, have just published a new brochure called ***Precision Soldering***.

Apart from details of their product range, this brochure also covers soldering topics, temperature controlled soldering benefits, safety in education and other topics.

The booklet is available from:

Antex (Electronics) Ltd.,
2 Westbridge Industrial Estate,
Tavistock,
Devon PL19 8DE.
Tel: 0822 613565.

Adventure Expedition

Anyone interested in an adventure expedition to the rainforests of Belize and Guatemala in 1990?

It is hoped that the expedition will include some major firsts, not least an altitude traverse of a little explored mountain range. Therefore, communications will be a vital part of the success of this trip. Those on the trip so far have little experience of radio communications, and are looking for someone who does. A domestic, mobile and international radio network needs to be worked out.

So if you would like more details of what's involved in this trip, contact:

Mart H. Hughes,
47 Monksbury,
Bath BA3 9HR.

Packet Shop

Andrews Computer Services Ltd (ACS) have recently opened a packet radio and computer shop. The address is 35a Chalk Hill, Watford, Herts., which is just under Bushey Arches. The shop is open Monday to Saturday from 9am to 5.30pm.

There is a live packet station form demonstration of various TNCs as well as a wide range of computers, printers and other peripherals. They also hold a range of public domain amateur radio software. This is available for a small charge to cover the cost of disks and duplication (free if you purchase a computer!).

All enquiries are now dealt with on the Watford shop telephone number which is: 0923 229222 (the FAX number is: 0923 242102).

Rallies

April 23: The Swansea ARS Rally will be held in the Swansea Leisure Centre from 10.30am to 5pm. There will be trade stands, bring & buy, bookstall, h.f. & v.h.f. demo stations, catering and talk-in via GB2SWR on S22. Further details from ***Roger Williams GW4HSH on 0792 404422.***

April 30: The Kelso ARS will be hosting the 6th Anglo-Scottish Rally in the Tait Hall, Kelso. The rally is open from 11am to 5pm. There will be the usual stands, talk-in on S22, Morse tests (booked through the RSGB), bar, hot and cold snacks, raffles, etc. The entrance fee is £1, junior ops, YLs and XYLs are welcome and admitted free. For further information, contact: ***Bruce Cavers. Tel: Kelso 24654.***

April 30: The British Amateur Television Club will be holding their 1989 rally in new and larger premises. This year they'll be using the Founders Suite at the Coventry Crest Hotel. This is located on the A46, about 450m south of junction 2 of the M6. There will be the usual wide range of trade stands and demonstrations covering all aspects of both amateur and satellite TV equipment. The hotel training centre has been made available for technical lectures which are to be given in the afternoon. There is ample parking and the rally opens at 10am. Admission is free to BATC members who bring their ticket from *CQTV* and 50p to non-members.

May 7: The Southend & District Mobile Rally will be held at Roach Way Youth Centre, Rochford, Essex. Doors open at 10am. More details from: ***Ted G4TUO. Tel: 0702 202129.***

May 21: The "Hobbies Fair" is the first event in the Science Museum's Wroughton 1989 season. As well as radio this event covers a wide range of interesting hobbies and also offers the rare opportunity to see some of the Science Museum's stock of aircraft and other transport items which are stored in the hangars. Wroughton Airfield is south of Swindon, Wiltshire and easily reached by road.

May 21: The Parkanaur Rally, organised by the Mid-Ulster Amateur Radio Club will be held at the same venue as last year, the Silverwood Hotel, Lurgan, Co. Armagh. Doors open at 12 noon and the entrance fee is £1. The usual trade stands, bring & buy, bookstall, QSL Bureau will be there and talk-in will be on S22. Proceeds from this rally go to the Stanley Eakins Memorial Fund, Parkanaur, near Dungannon, so the club hope for a really good turnout of everyone interested in all aspects of radio and electronics.

May 28: The 13th Annual East Suffolk Wireless Revival will take place at the usual venue of the Civil Service Sportsground, Straight Road, Bucklesham, Ipswich. That's between Bucklesham Road and Felixstowe road, (now the A1156) and adjacent to the Suffolk Showground. There will be the usual traders, an RSGB book stand, and antenna testing range, bring & buy, car boot sale, transceiver clinic, etc., plus non-radio stands, a children's play area and a model flying display. Doors open at 10am. Further information from: ***Colin Ranson G8LBS, 100 Stone Lodge Lane West, Ipswich IP2 9HR. Tel: 0473 464047.***

May 28: Plymouth Radio Club are holding their mobile rally at Plymstock School, Church Road, Plymstock. Doors open at 10am and there is a large, free car park, refreshments, raffle, trade stands, demonstrations and talk-in on S22. Full details from: ***Joe G1RXR on 0752 509855.***

May 28: The rally will be at the Maidstone (YMCA) Sports Centre on the A229 at Loose Village. Admission is £1 at 10.30am, but disabled visitors can get in free at 10am. There is also free overnight parking with a snack bar, showers, etc., available. There are children's videos and a playroom, GB2YSC active on all bands, ATV demo, a beer tent and all the usual trade stands. For more details, contact: ***G6FZD. Tel: 0622 50709.***

May 29: The Doncaster Radio Rally will be held at the Bircotes Sports Centre, near Bawtry, Doncaster. This rally is organised by the Doncaster RAYNET Group and they rely on this rally as a source of income to keep the group running.

***June 11:** The Royal Naval Amateur Radio Society's Annual rally is scheduled to be held at HMS Mercury again this year. More details nearer the date.

June 11: The Mid Lanark Amateur Radio Society are having their open day at the Community Education Centre, Newarthill, by Motherwell. This is on the A723, 12km south of the Newhouse interchange on the M8. There will be trade stands, bring & buy, demonstrations of packet, RTTY and QRP together with lectures and the award of the Society's annual EHI Trophy. Talk-in is on S22 and refreshments will be available.

June 25:** The 32nd Longleat Amateur Radio Rally will be held as usual in the grounds of Longleat House, Warminster, Wiltshire. This rally is always popular as it offers something for the whole family. More details from: ***Shaun O'Sullivan G8VPG, 15 Witney Close, Saltford, Bristol BS18 3DX.

July 9: The 1989 Droitwich Strawberry Rally will take place at the High School, Droitwich. There will be trade stands, a bring & buy, family entertainment and strawberry fields (weather permitting). There is both free entrance and car parking. Details from: ***Derek Batchelor G4RBD. Tel: Worcester 641733.***

July 15: The Cornish Radio Amateur Club rally will be held at Richard Lander School, Truro. There will be the usual trade stands, a bring & buy, computer displays/demos and refreshments. There is plenty of free parking as well as attractions for all the family. More details from: ***Rolf Little. Tel: 0872 72552.***

July 23: The Burnham Beeches and Maidenhead & District ARC's are staging the sixth McMichael Rally at the Haymill Centre, Burnham, near Slough. Doors open at 10.30am (10.15 for disabled visitors). The CAMRA bar will again be attending. Tea, coffee and food will also be available. There's ample car-parking on site and the car boot sale will be staged again this year. Attractions include radio-controlled cars, ATV groups, packet station and the h.f. station GB4MR. Entrance fee is £1 and the car boot area will be £5 per car and driver for the day. Contact: ***Bob Hearn G0BTY on 0494 29868.***

July 30: The Hilderstone Radio Society are holding their rally at Hilderstone College, St Peters Road, Broadstairs, Kent. There will be trade stands, a bring & buy, a talk-in station, raffle, refreshments, a licensed bar, etc. Contacts are: ***Alan on 0832 593072 or Ron 0304 812723.***

July 30:** Scarborough ARS are holding their annual rally at the Spa, on the South Shore Seafront, Scarborough. This is close to the beach and all the entertainment, so there will be something for all the family. Doors open at 11am. There will be trade stands, bring & buy, refreshments and bar, with talk-in on S22. Details from: ***G4UQP on 0723 376847.

August 13:** Hamfest '89 will be held at the Flight Refuelling Sports Ground, Wimborne, Dorset. Gates open at 10am and there's free car parking as well as overnight camping facilities. The day will feature radio and electronics trade stands, field displays and a craft and gift fair. More details from: ***Rob G6DUN. Tel: 0202 479038.

August 28: The Huntingdonshire ARS are holding a junk sale at The Medway Centre,

Coneygeare Road, Huntingdon. Doors open from 10.30am to 5pm. Food and drink will be available all day and you can rent a table to get rid of all your junk for £5. The contacts for the day are: ***G1YVS on 0487 830212 or G8LRS on 0480 56772.***

September 10: The Preston ARS 22nd Annual Mobile Rally will be held at Lancaster University, as in previous years. It will be in the Great Hall, Nuffield Theatre, Minor Hall and A35 (for the bring & buy). The licensed bar and snack bar will be located in the Great Hall foyer. A separate restaurant will be available at lunch time, too. Contact: ***Godfrey Lancefield on 0772 53810.***

September 10: The 6th National Amateur Radio Car Boot Sale will be held at the Shuttleworth Collection, Old Warden Aerodrome, near Biggleswade. Trading starts at 10am. Fly-in is available and permission can be obtained on Northill 288. Further details on the boot sale can be obtained from: ***Tony Kelsey-Stead. Tel: Luton 508259.***

October 1: The Great Lumley Radio Rally will be held at the Community Centre, Great Lumley, Chester-le-Street, Co. Durham. More details nearer the date.

November 19: The Bridgend & District ARC will be holding their 1989 rally at the Bridgend Recreation Centre, Angel Street, Bridgend, Mid-Glamorgan. Doors open at 11am.

* *Practical Wireless* & *Short Wave Magazine* in attendance.

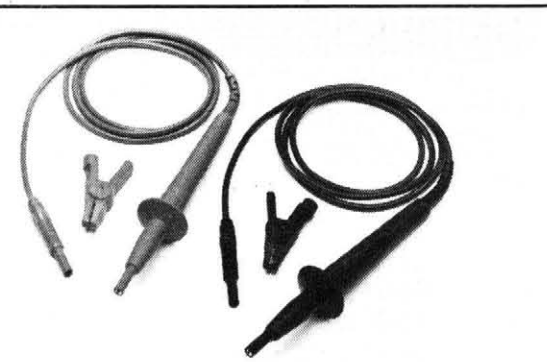
If you are organising a rally and would like it mentioned in *Practical Wireless*, then drop us a line, preferably as soon as you have fixed the date, but no later than 6 weeks in advance (marking your envelope Rally Calendar) and we'll do the rest. Please make sure that you include all the details including such essential information as the venue, starting time, special features and a contact for further information.

QRP Power Meter

Hamgear Electronics intend to increase their product range to cater more for the QRP transmitting amateur. Their first design is a power meter.

The Hamgear QRP Wattmeter is designed for those amateurs who enjoy QRP transmitter construction. It is basically a non-radiating 50Ω load for use on transmitters, driver stages and v.f.o.s. It has five switched ranges: 0–10W, 0–1W, 0–100mW, 0–10mW and 0–1mW. A further switch position gives field strength only. Provision is also made to couple in an oscilloscope so that waveforms may be observed at the same time that power is read.

The cost of the meter is £36 including postage and details are available from: ***Hamgear Electronics, 125 Wroxham Road, Sprowston, Norwich NR7 8AD. Tel: 0603 405611.***



Fused for Safety

TMK Instruments have announced the availability of fused test prods as part of their current safety campaign. They comply with the requirements of Guidance Note GS38 from the Health and Safety Executive and the Electricity Council's Engineering Recommendation M.15/4 CEGB Standards.

Manufactured using a tough, high-impact nylon casing, both the red and black prods have moulded finger grips and guards for additional safety. Internal contacts, assemblies and tips using solid brass, phosphor bronze and silver plating.

The 4mm banana plugs have safety shrouds with a smooth spring-loaded action which helps when changing over to the moulded crocodile-clips.

Easy multi-turn access to the fuse assembly allows simple replacement of the recommended 500mA fuse. They are supplied as a pair of test prods in a wallet for £24.95 excluding VAT. Croc-clips are available at an extra cost.

TMK Instruments Ltd., Building 3, GEC Estate, East Lane, Wembley, Middx HA9 7PJ.

Special Event Stations

GB2TVC: The Thames Valley College will be operating this special event station from April 14 to 28. This is to celebrate the college's launch into the new Polytechnics and College funding council sector. From April 1 they will be independent from local authority control. The station will be operating on all h.f. bands and 144MHz using RTTY, AMTOR, s.s.b. and c.w. They welcome contacts especially from Universities and other higher Education Institutions worldwide and a special QSL card will be sent to all contacts.

GB2NTS, GB2NTU, GB2NTW and GB2NTE: On July 29/30 four stations will be on the air from different National Trust properties, one each in Scotland, Ulster, England and Wales. Hopefully Ireland will make up a fifth country (EI). If you live overseas and can contact two of these stations, or if you live in the UK/Ireland and contact three stations there is a Commemoration Certificate available. Overseas the cost is $1 or equivalent return postage by Air Mail, UK/Ireland it requires a 19p s.a.e. You need to send QSL cards or log extracts to: ***Scottish Tourist Board (Radio Amateur) Expedition Group, PO Box 59, Hamilton, Scotland ML3 6QB.***

GB2WW & GB4BOB: During 1989, the Bedford & District Amateur Radio Club plant to commemorate the outbreak of the Second World War by operating several Special Event Stations using the callsigns GB2WW and GB4BOB.

The locations will include a number of former RAF and USAAF stations in and around the Bedford area which were in use during the hostilities.

Further details can be obtained from the Special Events Manager: ***Ray G0EYM, 30 Cotswold Close, Putnoe, Bedford MK41 9LR. Tel: 0234 244506.***

VHF Comms in the UK

Many will have heard of *VHF Communications*, but not so many will have seen a copy in recent years.

Due to problems in the past, it has been several years since a UK agency existed. Consequently, obtaining the magazine, back issues, binders, kits, p.c.b.s, etc., has been somewhat difficult. A full service is now available through Mike Wooding.

VHF Communications contains constructional articles on transmitters, receivers, demodulators, test equipment, r.f. amplifiers and pre-amplifiers. In fact, on all subjects to do with v.h.f., u.h.f., and s.h.f. communication in the amateur bands.

The subscription rate for 1989 is £8.75 including all postage costs. If you're interested, send a cheque, payable to M. Wooding, to: ***Mike Wooding. 5 Ware Orchard, Barby, Nr. Rugby CV23 8UF. Tel: 0788 89-365.***

What is Happening to Our Society?

Those of you who are "into" packet radio and watch the bulletin boards may well have seen displayed there the text of a letter written by Trevor Preece G3TRP, recently appointed Editor of *Radio Communication,* to Ken Willis G8VR, the VHF/UHF Columnist of that journal for the past seven years.

It is, of course, the job of an Editor to organise the material in his publication in the way which he considers will appeal to the readership. Sometimes that may involve making major changes, perhaps with a contributor being replaced by someone new—not a pleasant part of an Editor's job, but a responsibility which goes with it. There are, however, right and wrong ways of dealing with such matters.

We are not in the habit of publishing correspondence between third parties in *PW,* but in view of the publicity which this particular letter has already received on the BBS, and its indication of a disturbing attitude within the RSGB, I feel that it deserves a wider exposure. It has been suggested that the letter must be a hoax; I am assured that it is quite genuine.

On several occasions in recent years, at times when dissatisfaction with the workings of the RSGB has become more widespread than usual, it has been suggested that an "alternative" national society should be formed. Not surprisingly, that idea is being mooted again now. Although I share the concern about the present state of the Society, my personal feeling is that it is better to try to change it from within. Having two competing societies could very rapidly degenerate into total chaos, which would certainly not be good for amateur radio in the UK.

It would be interesting to know how many *PW* readers would support an alternative independent society, and how many would have nothing to do with it. What is your feeling? Your vote of "YES"—in favour, or "NO"— against, on a postcard or the back of a sealed-down envelope, addressed to our editorial offices and marked "RSGB", would help us to gauge the strength of feeling. No letters, please!

Geoff Arnold G3GSR

RADio COMmunication

Journal of the Radio Society of Great Britain

Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE TEL: 0707 59015

4 February, 1989

Ken Willis, G8VR
6 Lerryn Gardens
BROADSTAIRS
Kent
CT10 3BH

Dear Ken,

VHF/UHF COLUMN

I shall have to admit, in my first sentence, that the content of this letter will not please you. I always hate to cause upset to anyone, and if I could take the easy way out, I would do nothing. But life is not like that.

As you know, I have recently been taking stock of RadCom, and its "sectional conflicts". You mention in your latest letter the problems which you experienced with John Nelson upstaging you, and I am acutely aware of the fact that this sort of thing cannot go on any longer. I decided to keep the band activities together, and get this under some "central control", in order to iron out duplications and ambiguities. I want hot news moved into the front-end news pages – something which you do not appear to be too happy with. But I really do think that this is the more logical approach, even though it's going to be a nightmare to control at first.

Decisions have to be made, and I have now resolved to structure the band reporting in a "tree" fashion, with John Nelson at the top of the "tree". John will be amalgamating reports from the principal areas of HF, VHF, UHF and MICROWAVES. He will take the copy in, by "wire", from principal contributors, who in turn will take as much in by the same process as possible. Telecom Gold mailboxes will be flourishing. John will pass the tidied-up copy down the line to David Gough for page-makeup. Norman Fitch has offered to compile the VHF and UHF sections, and I am coming to an agreement with him for his contributions to start with effect from the June issue.

I must – in personal vein unhappily – ask you to stand aside as columnist after contributing your May column.

How you accept this I have no idea, but clearly it will be with great disappointment, and maybe with anger. I sincerely hope that the latter is not the case. But I will understand.

You have served RadCom faithfully for many years, and that will, I am certain, be appreciated by many readers. You may not wish to labour the end of your "term" in print, but should you wish to pass comment in your column, I will be happy to print it. You may even appreciate a suggestion from me that someone include a "vote of thanks" – apart from anything which I could put into print. If you can nominate a colleague who has known you and your column well who could prepare such a notice, do let me know.

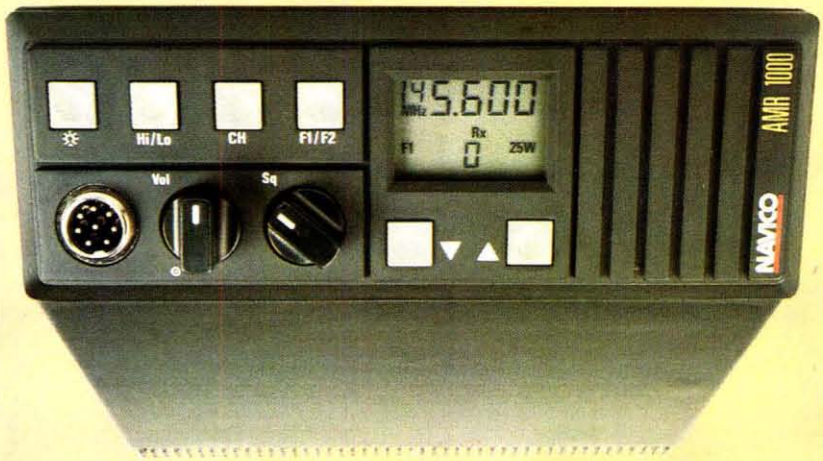
One thing is certain in my mind – I do not wish to see the end of your contributions to RadCom. You will be in receipt of valuable information, and I would like to propose that you be one of the first to be on my list of "Information Providers", who sleuth out copy for our news pages and provide items for publication. I have in mind a fee for such published items, plus a monthly fixed, but nominal, retainer, for keeping your eyes open. Please let me know if you would like to discuss this further.

I mentioned before that I have in mind to include some for of column for beginners. That is in addition to D-i-Y Radio. Would you be interested in helping in its inauguration? You experience and knowledge would help considerably, and it might work to the common good if you were able to liaise with another contributor I have in mind – a young and literate (though maybe blase – I haven't met him yet) amateur who has potential. We need to do more for the newcomer and young amateur. I append some correspondence from him for you to peruse.

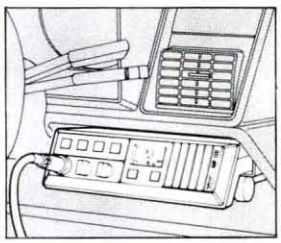
I am sorry to steal your thunder, Ken. I do hope that we shall not fall out over it.

With kind regards.

Trevor Preece, G3TRP
Editor



The new AMR1000/S
It checks out from every angle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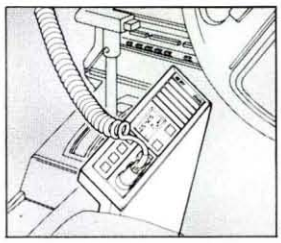
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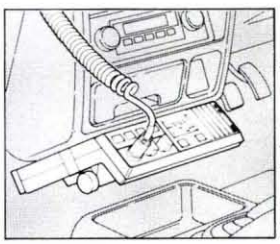
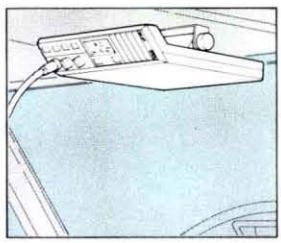

Under dash (central)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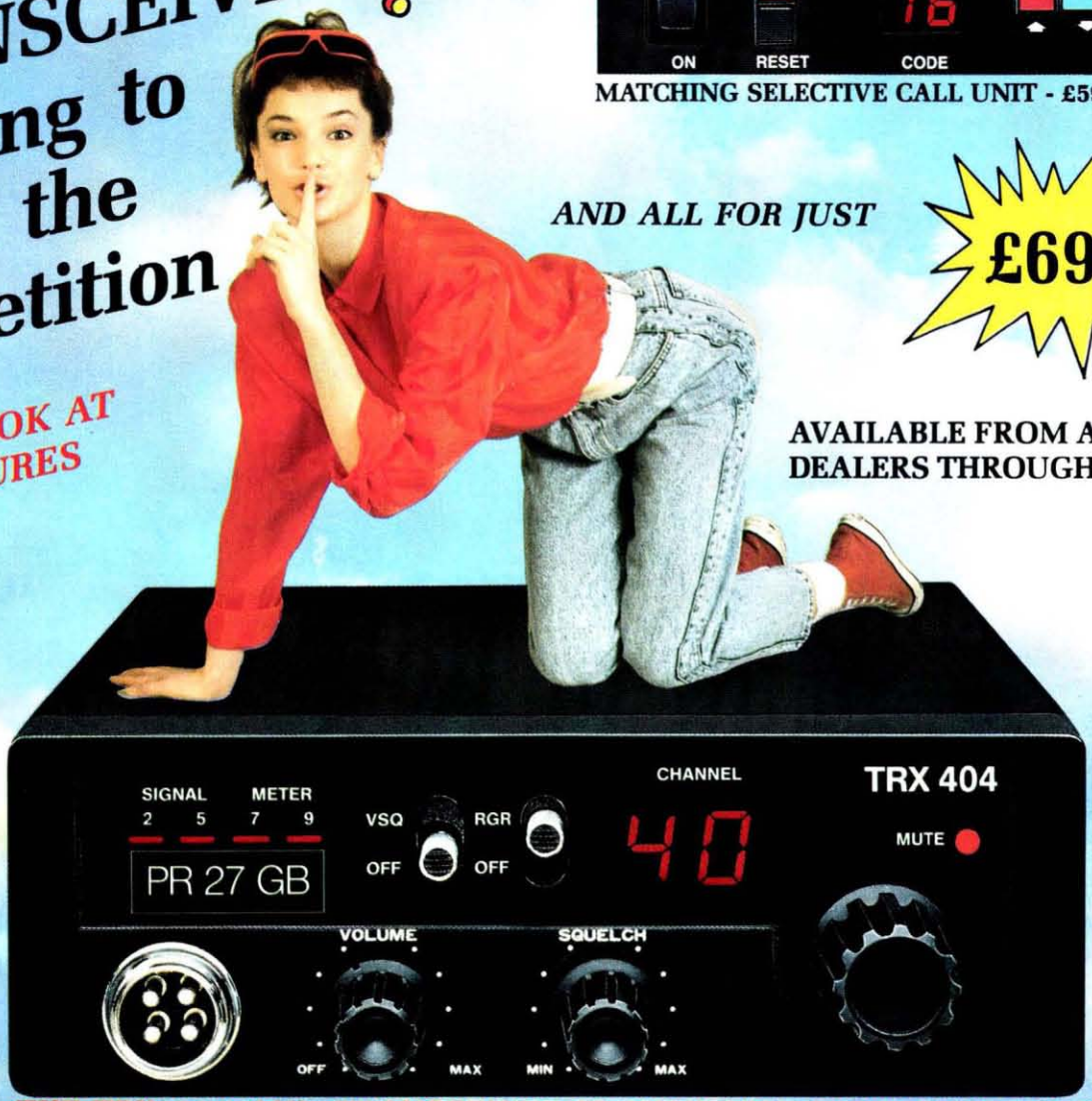

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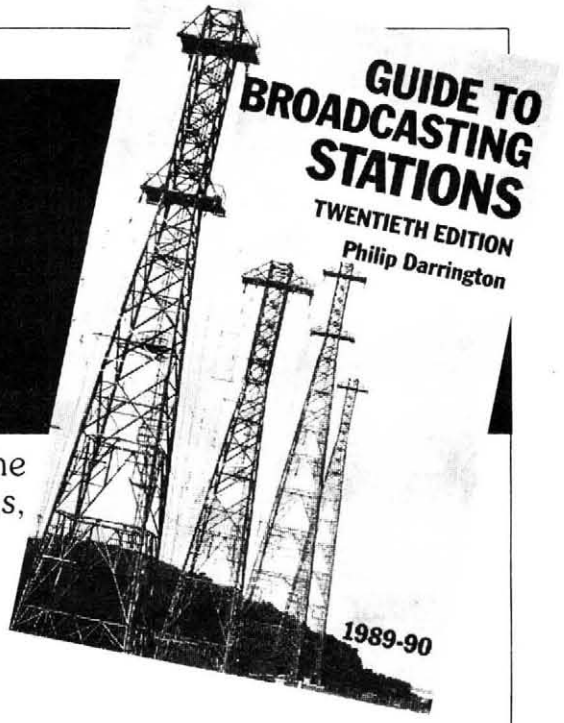

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Guide to Broadcasting Stations
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May 89

A Two-tone Oscillator

Test Equipment—Backbone of Amateur Radio

In this second part of his article on transmitter testing using a two-tone signal, Roger Alban GW3SPA describes the design process for the Wien Bridge oscillator and the low-pass filters, and concludes with a description of the complete unit.

The Wien Bridge Oscillator

One of the simplest audio oscillators to construct is the Wien bridge oscillator. It consists of a series CR circuit in one branch of the bridge and a parallel CR circuit in another branch. In the oscillator circuit shown in Fig. 2.1, these components are R1, R2, C1 and C2. The circuit will oscillate at a frequency of F_o when the phase of V_i is identical to the phase of V_o. The frequency of F_o in terms of the circuit component values is given by:

$$F_o = \frac{1}{2\pi(R1\times R2\times C1\times C2)^{\frac{1}{2}}}$$

If R1 is equal in value to R2 and C1 is equal in value to C2, then:

$$F_o = \frac{1}{2\pi RC}$$

If C is made to be a preferred value such as a 0.047μF (47nF), then the value of R will be given by:

$$R = \frac{1}{2\pi F_o C}$$

For the oscillator to produce a 700Hz sinewave, the value of R will be:

$$R = \frac{1}{2\pi\times 700\times 0.047\times 10^{-6}} = 4.86k\Omega$$

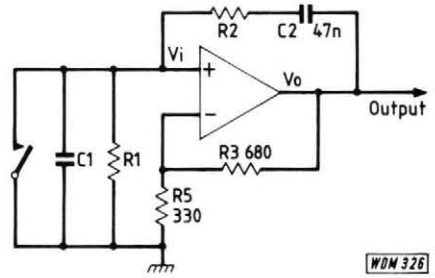
Using preferred value resistors, the value of R can be obtained by placing in series a 4.7kΩ resistor and a 100Ω resistor.

For the oscillator to produce a 1900Hz tone, the value of R will be:

$$R = \frac{1}{2\pi\times 1900\times 0.047\times 10^{-6}} = 1.78k\Omega$$

Careful selection of the 1.8kΩ resistors will result in the Wien bridge oscillator operating at 1900Hz.

Fig. 2.1



Oscillation cannot be sustained unless the positive feedback through R2, C1 and C2 is equal to the forward gain controlled by R3 and R5. The gain through the Wien bridge at the frequency of oscillation Fo is:

$$AF_o = 1 + \frac{R2}{R1} + \frac{C1}{C2}$$

If R1 = R2, and C1 = C2, then:

$$AF_o = 3$$

The forward gain of the operational amplifier at d.c. is:

$$A_{dc} = 1 + \frac{R3}{R5} = 1 + \frac{680}{330} = 3.06$$

If A_{dc} is greater than 3, then the output waveform of the oscillator will not be a sinewave. It is therefore essential to select a suitable 680Ω resistor to produce a nice sinewave output.

Low-pass Filter

The waveform produced by the Wien bridge oscillator will contain a percentage of distortion. The two-tone test is dependent for accurate results upon the two tones being pure sinewaves. The distorted waveform produced by the Wien bridge oscillator is made up of a large number of harmonically related waveforms. If the output from the oscillator is fed into a low-pass filter whose cut-off frequency is just above the operating frequency of the oscillator, then it is possible to remove the harmonically related waveforms to end up with the fundamental waveform which will be a pure sinewave. To make a low-pass filter out of passive components would result in a rather large, bulky filter. However, it is possible to enlist the advantages of an operational amplifier to produce an active low-pass filter which gives unity gain. There is no lack of active low-pass filter designs to be found in many books in the subject. The problem is choosing a design that allows the filter to be designed in a short period of time without going through many different equations. The design must also contain good feedback stability, and must be constructed using the minimum number of components. The shape of the filter response is also important if the unwanted frequencies are to be removed from the wanted audio tone. The frequency response for three typical third-order filter circuits is shown in Fig. 2.2. The slope of the three filters rolls off at 60dB per decade. The author chose the 3dB Chebyshev design because of its sharp cut-off frequency. The circuit diagram of a single third-order low-pass filter with unity gain is shown in Fig. 2.3.

Fig. 2.2

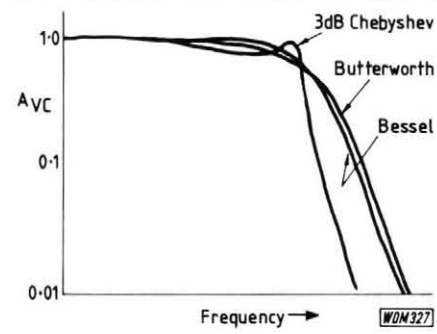
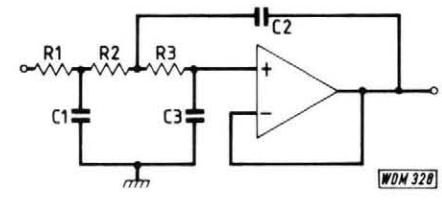


Fig. 2.3



Design Procedure

There are at least two simplified design approaches that are possible to calculate the component values for the third-order low-pass filter. One method is to assume that:

$$R = R1 = R2 = R3$$

Solve the equation for R using pre-determined values of capacitance. The other method is to let

$$C = C1 = C2 = C3$$

and solve for C using pre-determined values of R. The author has found that the first method is quite simple and straightforward.

The unscaled capacitance values for the circuit shown in Fig. 2.3 for a 1dB peak Chebyshev filter are as follows:

$C''1 = 2.567$ $C''2 = 16.18$ $C''3 = 0.06428$

The next step is to choose the corner frequency Flp required for the cut-off frequency and perform the following frequency scaling:

$$C'1 = \frac{C''1}{2\pi Flp} \quad C'2 = \frac{C''2}{2\pi Flp} \quad C'3 = \frac{C''3}{2\pi Flp}$$

Next, choose a suitable value of R = R1 = R2 = R3 which will produce convenient values for C1, C2 and C3 according to the following equations:

$$C1 = \frac{C'1}{R} \qquad C2 = \frac{C'2}{R} \qquad C3 = \frac{C'3}{R}$$

The above equations assume that the gain of the operational amplifier is greater than 100 at the chosen corner frequency.

Practical Circuit

If we use a 741 operational amplifier, the gain of the amplifer at the oscillator operating frequencies will exceed the gain requirements of the design criterion. The cut-off frequency or corner frequency, Flp, will require to be set higher than the operating frequency of the oscillator.

For example, set the corner frequency say 30Hz higher than the frequency of oscillation. The filter which follows the 700Hz oscillator will have a corner frequency of 730Hz. We now have sufficient information to be able to calculate the component values and complete the design.

$$C'1 = \frac{C''1}{2\pi Fcp} = \frac{2.567}{2\pi\times730} = 0.056\times10^{-3}$$

$$C'2 = \frac{C''2}{2\pi Fcp} = \frac{16.18}{2\pi\times730} = 3.527\times10^{-3}$$

$$C'3 = \frac{C''3}{2\pi Fcp} = \frac{0.06428}{2\pi\times730} = 0.014\times10^{-3}$$

To obtain convenient values of capacitance, let us make R = R1 = R2 = R3 equal to 100kΩ, then:

$$C1 = \frac{C'1}{R} = \frac{0.56\times10^{-3}}{1\times10^{5}} = 5595pF$$

$$C2 = \frac{C'2}{R} = \frac{3.527\times10^{-3}}{1\times10^{5}} = 35300pF = 0.0353\mu F$$

$$C3 = \frac{C'3}{R} = \frac{0.014\times10^{-3}}{1\times10^{5}} = 140pF$$

For practical reasons, C1 was made to be 5400pF (5.4nF) by shunting three capacitors together. A 2200pF was connected in parallel with another 2200pF, which in turn was connected in parallel with a 1000pF capacitor. In a similar way, C2 was made to be 0.034μF by shunting a 0.033μF capacitor with a 1000pF. For C3, the nearest preferred value of 150pF was used.

The corner frequency for the low-pass filter which follows the 1900Hz oscillator was made to be 2000Hz.

$$C'1 = \frac{C''1}{2\pi Fcp} = \frac{2.567}{2\pi\times2000} = 0.2042\times10^{-3}$$

$$C'2 = \frac{C''2}{2\pi Fcp} = \frac{16.18}{2\pi\times2000} = 1.2873\times10^{-3}$$

$$C'3 = \frac{C''3}{2\pi Fcp} = \frac{0.06428}{2\pi\times2000} = 0.0051\times10^{-3}$$

To obtain reasonable values of C, the value of R was made to be 100kΩ. Then:

$$C1 = \frac{C'1}{R} = \frac{0.2042\times10^{-3}}{1\times10^{5}} = 2042pF$$

$$C2 = \frac{C'2}{R} = \frac{1.2873\times10^{-3}}{1\times10^{5}} = 0.012873\mu F$$

$$C3 = \frac{C'3}{R} = \frac{0.0051\times10^{-3}}{1\times10^{5}} = 51pF$$

For practical reasons, C1 was made up by connecting two 1000pF capacitors in parallel, whilst C2 was made to be 0.0122μF by connecting in parallel a 0.01μF capacitor and a 2200pF capacitor. For C3, the nearest preferred value of 47pF was used.

The resulting sinewaves obtained at the outputs of the two active low-pass filters are combined using a 741 operational amplifier configured as a variable gain audio mixer.

Complete Circuit

The complete circuit of the instrument is showin in Fig. 2.4. Either audio oscillator can be stopped from oscillating by grounding the non-inverting (+) input line to the operational amplifier. The output from the 730Hz low-pass filter (IC1b) is taken via a 2kΩ pre-set to ensure that the audio levels from the two oscillators arriving at the inverting input of the variable gain audio mixer (IC3a) are the same.

The gain of the audio mixer is varied by a 1kΩ linear potentiometer which is a front-panel control. The output from the audio mixer is fed to a 10dB step attenuator. It is assumed that the input impedance of the unity gain buffer (IC3b) is high. The design of the step attenuator uses preferred values of resistance such that the total resistance of the resistor chain (R21–R26) will be 10 001 ohms. The voltage drop across the 33Ω resistor R26 will be:

$$V_{33} = \frac{V_{out}\times33}{10\,001}$$

Therefore the voltage attenuation will be:

$$-20\times\mathrm{Log}_{10}\frac{V_{in}}{V_{out}} =$$

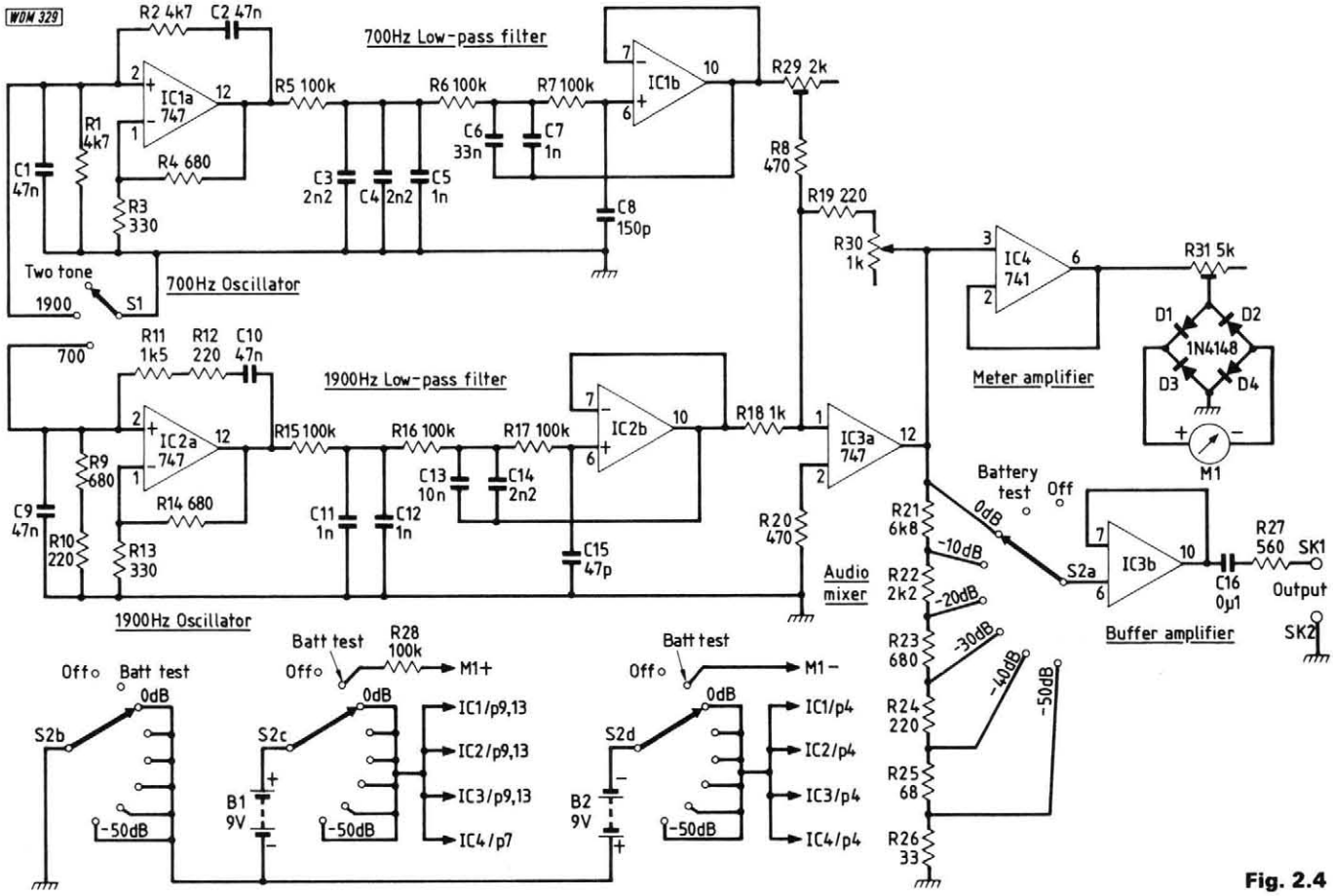
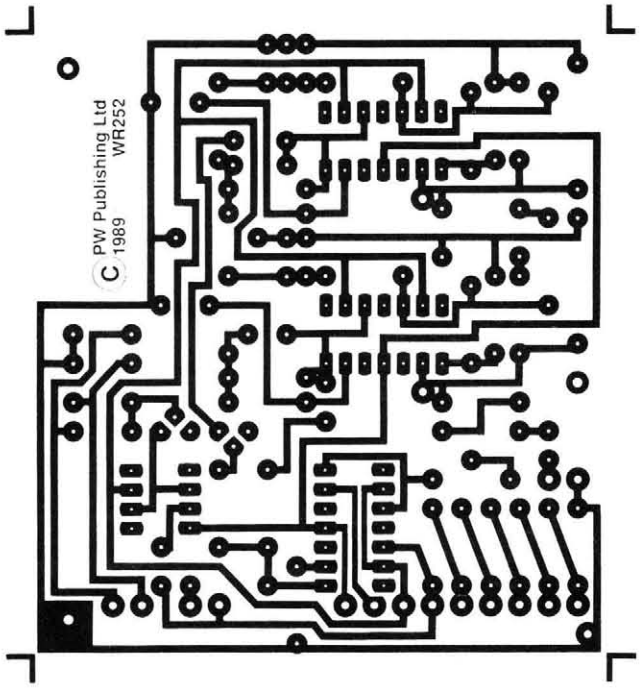
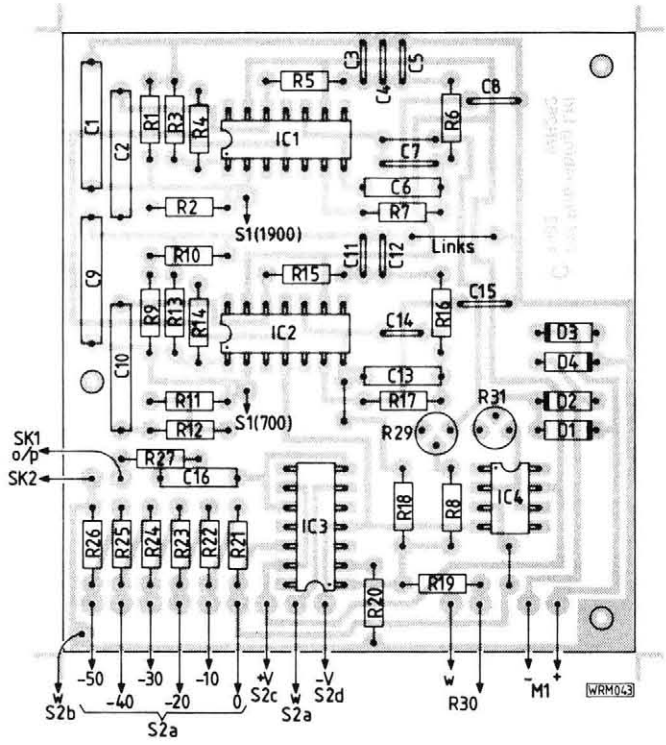
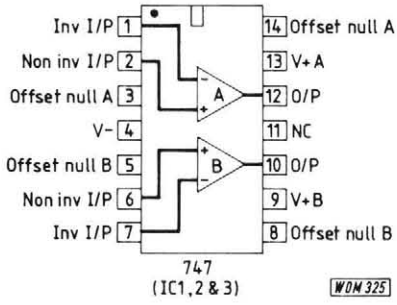


Fig. 2.4







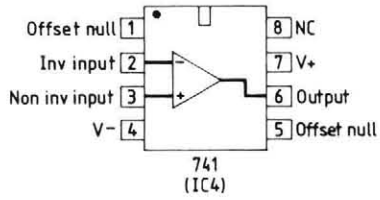


Fig. 2.5

$$-20\times\text{Log}_{10}\frac{10\,001}{33}=-49.63\text{dB}$$

The same exercise can be repeated for the voltage drop across the 68Ω resistor in series with the 33Ω resistor, and the attenuation figure obtained will be 39.91dB. Try the calculation for the other attenuator step values for yourself.

The output impedance of the unity gain buffer amplifier is quite low. It is common practice to make the output impedance of the audio oscillator around 600Ω. It will therefore be necessary to place a 560Ω resistor, the nearest preferred value to 600Ω, in series with the output of the unity gain buffer amplifier.

You may recall that one of the aims was to build a piece of test equipment inside a scrap mobile CB set. This set, like most others, had a front panel meter which was used to measure output power and signal strength. The author decided to make use of this meter to monitor the ouput level applied to the 10dB step attenuator. Another unity gain buffer utilising a 741 operational amplifier was employed. The input of this amplifier (IC4) is connected to the output of the audio mixer. The output of the buffer amplifier is fed via a 5kΩ pre-set to a bridge rectifier employing 1N4001 or equivalent low-current diodes. The output from the bridge rectifier is connected directly to the meter.

The meter used in the vast majority of CB sets is the miniature edge type. The scale calibration will require to be amended. The author carefully removed the clear plastics top which exposed the strip carrying the artwork for the meter scale. This strip was removed and wiped clean using a small piece of cloth soaked in nail-varnish remover. A new scale was added using rub-down transfers after the strip had been painted white using a car touch-up aerosol spray. The shape of the scale calibration will depend on the meter used. It is best calibrated in volts peak-to-peak, with 20V at full scale. A battery-check mark should be added at the 18V point on the scale.

Construction

The prototype circuit was constructed on Veroboard, as shown on the front cover of April *PW*, but has been redrawn as a printed circuit board as shown in Fig. 2.5. The operational amplifier integrated circuits are mounted in sockets to ease construction and any subsequent fault-finding which may prove necessary. The wiring, layout and voltage checks should be carried out prior to installing the i.c.s.

The scrap CB set being used to house the instrument was completely gutted of all components and a 122mm square aluminium plate fitted in place of the original p.c.b. Onto this plate was bolted the new p.c.b. and the two PP9 battery holders as shown in the photograph. A second aluminium plate measuring 48mm by 123mm was attached by two bolts to the inside of the back panel to hide the holes left after removing the power and antenna sockets.

The front panel was redesigned by inserting a 50mm by 127mm aluminium plate into the front plastics cover. The square hole required for the panel meter, holes for the control knobs and output terminals can be scribed onto the aluminium plate by following the outline of the holes in the plastics front panel using a sharp pencil. The three-way rotary switch used to select the operation of the internal audio oscillators was fitted just above the output terminals by enlarging a hole formerly occupied by the radio/PA slide-switch. The variable output level potentiometer was located on the front panel in place of the microphone socket. That hole was too large in diameter to mount a standard potentiometer, and therefore two large washers were manufactured out of thin-gauge aluminium sheet to obtain a grip of the plastics front panel.

The holes to accept the control shafts were drilled in the aluminium front panel and it was then painted white using a car touch-up aerosol. The paint was allowed to dry hard over several days and the front panel sign-written

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68Ω	1	R25
220Ω	4	R10,12,19,24
330Ω	2	R3,13
470Ω	2	R8,20
560Ω	1	R27
680Ω	3	R4,14,23
1kΩ	1	R18
1.5kΩ	2	R9,11
2.2kΩ	1	R22
4.7kΩ	2	R1,2
6.8kΩ	1	R21
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2kΩ	1	R29
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1kΩ	1	R30

Capacitors

Ceramic plate

47pF	1	C15
150pF	1	C8
1nF	4	C5,7,11,12
2.2nF	3	C3,4,14

Metallised polyester film(1)
400V d.c. working

10nF	1	C13
33nF	1	C6
47nF	4	C1,2,9,10
0.1μF	1	C16

Semiconductors

Diodes

1N4148	4	D1–4

Integrated circuits

741	1	IC4
747	3	IC1–3

Miscellaneous

M1 100μA f.s.d. miniature edge meter (1); SK1, 2 4mm insulated terminals; S1 Rotary switch 1p. 3w; S2 Rotary switch 4p. 8w; two-part aluminium project box; 6–F22 (PP3) battery clips 2; p.c.b.; knobs 3; p.c.b. fixers 4; connecting wire

(1) Electromail, PO Box 33, Corby, Northants NN17 9EL. Tel: 0536 204555

using rub-down lettering transfers, sealed and protected with a layer of clear lacquer spray. Whilst waiting for the lacquer to dry hard, all the front panel controls may be attached to the original plastics front panel. Finally, using a contact adhesive, glue the aluminium front panel onto the front of the old plastics front panel. Cut the control shafts to the required length to take the control knobs using a small hacksaw. The two output terminals are attached directly to the aluminium front panel. Solder the connecting wires between the p.c.b. and the front panel controls.

First Checks

To correctly set up the two-tone oscillator you will need a calibrated oscilloscope which will be connected to the output terminals. Before inserting the operational amplifier integrated circuits into their sockets, connect the two 9 volt batteries and check the battery test facility for a reasonable needle deflection on the front panel meter. With the output level control in the −50dB position, check for the correct voltages on all i.c. sockets.

If you are satisfied that all the wiring is correct, switch off and insert the integrated circuits into their respective sockets, checking that you have them the right way round.

Calibration

Turn the variable level control fully clockwise and connect the oscilloscope to the output terminals. Switch the Select Oscillator control to 1900Hz and switch the output level control to 0dB. Measure the amplitude of the output signal using the oscilloscope and adjust the meter amplifier 5kΩ pre-set to obtain the correct meter reading. Now check the frequency of oscillation by observing the periodic time of the resulting output waveform. For 1900Hz, the periodic time for one complete cycle should be approximately 0.53 milliseconds. Check also that the periodic times of each half-cycle are equal. If the periodic time is incorrect, you will need to change the values of C and R in the oscillator circuit. Remember that you are not using close tolerance components. Exchanging the 0.047μF (47nF) tuning capacitors for others of the same marked value will possibly cause the frequency of oscillation to change because of the tolerance of the capacitors. The author used miniature metallised film capacitors which have a tolerance of plus or minus 20 per cent.

Next, switch the Select Oscillator control to 700Hz and adjust the 2kΩ balance pre-set to obtain the same peak-to-peak amplitude on the oscilloscope display as given by the 1900Hz oscillator. Check the frequency of the oscillator by measuring the periodic time of the waveform, which should be approximately 1.4 milliseconds. Also check the symmetry of the waveform. If the frequency needs to be adjusted, again exchange the 0.047μF tuning capacitors to obtain the correct periodic time.

Now switch the Select Oscillator control to two-tone and observe the oscilloscope trace. You should see that both the 1900Hz and 700Hz oscillators are operating, producing a continuous interfering pattern. Next, switch the 10dB attenuator from 0dB to −10dB, and observe the reduction in amplitude of the output signal. Continue to rotate the step attenuator and observe the continuing reduction of the output level. Check that in the Battery Test and Off positions, there is no output signal, thus ensuring that the wiring is correct and that the batteries will not be discharged when the instrument is switched off. The unit should now be fully calibrated and ready for use.

Conclusions

In its short working life, the two-tone tester has proved its worth within the radio shack. A multi-mode CB rig converted by the author for use on 10m was checked, and it was found that the power amplifier bias control needed to be adjusted to produce the desired linear output. The author also discovered that a number of transistor CB linears retuned to operate on 10m were anything but linear! The situation was improved by reducing the input level to the linear amplifier. In fact, the author modified the design of the linear amplifier to produce a linear output when being driven by a converted CB set. The two-tone tester has also found use within the radio shack as a general-purpose audio test oscillator.

I wish you all the best with this construction project, and look forward to hearing your linear signal on the air.

PW

Antenna Clinic

Session 5

In the course of a year, antenna specialist F. C. Judd G2BCX receives many queries from radio enthusiasts, both about his own designs and about antennas in general. These come not only from various parts of the British Isles, but also from as far afield as Australia, New Zealand, Indonesia, Sri Lanka and several European countries.

Often, several people will ask a very similar question, highlighting a point that may be widely misunderstood. This series aims to explain some of these.

Q I am using a discone antenna and a "Slim Jim" (this operating on 144MHz (2m)) for general reception. Is there any way I can combine these and use one coaxial cable in order to obtain the best reception characteristics from both antennas. I am also using a "Slim Jim" scaled to operate on 900MHz. This works well, but can it be modified to improve its performance at this frequency?"

A First, the two antennas cannot be connected together and then coupled to the receiver via a single coaxial cable. Each antenna must have its own coaxial feeder, connected to a changeover switch near the receiver. In this way either antenna can be quickly connected to the receiver. Use only a special coaxial switch, available from most radio dealers.

It would appear that this reader has constructed his "Slim Jim" for 900MHz to the correct dimensions, as he feels it is working reasonably well. Only specific measurements could reveal how well. At this frequency it is essential that high-grade insulating material be used in construction. Very low-loss coaxial cable and "N" type connectors should be used to keep r.f. losses and v.s.w.r. to a minimum. Apart from this, there are no additions or modifications that can be made to improve performance.

To obtain a small amount of gain (in the region of 3dB), a double Slim Jim (operating as a 2m collinear) is not difficult to construct. Details of such an arrangement were given in the first session of the "Antenna Clinic' in *PW* January 1989 (copies available from the Post Sales Department at Poole, price £1.40 including post and packing).

Q "I am using a 3-band vertical antenna with a 50Ω coaxial cable joining it to the transceiver. The v.s.w.r. is not the same on each band. The makers quote not greater than 1.5 to 1, but it is nearly 2:1 on the highest band and less than 1.5:1 on the others. I am told that a high v.s.w.r. means some loss of power but how much I don't know. The antenna seems to work alright but I am concerned about the power being lost with a v.s.w.r. as high as 2:1."

A Standing wave ratio (s.w.r.), or more correctly voltage standing wave ratio (v.s.w.r.), is a "voltage ratio" derived from forward power (to the antenna) and any reflected power (from the antenna), usually due to a mismatch between the antenna and the feed cable. A v.s.w.r. of 2:1 is considered to be a bit on the high side, and whatever the reason for it, it represents a power loss of about 11 per cent. This assumes no less whatsoever due to the coaxial cable, coaxial connectors, poor insulation, etc. Attenuation due to the latter will cause additional power to be lost to the antenna.

The high v.s.w.r. mentioned by this reader could be caused by the antenna being in close proximity to another antenna, or by its height above ground, by wrong length radials if these are used, wrong coaxial cable impedance, and so on. If it can be proved to be the result of poor design then consultation with the makers or suppliers is advised.

NOTE — Whilst F. C. Judd is always willing to answer letters from readers about problems with antennas generally, he cannot deal with queries relating to the performance of commercially made products, which should be addressed to the manufacturer or dealer concerned.

Q "I have constructed the 12-element "ZL Special" which has an almost 1 to 1 v.s.w.r. at band centre on 2m. The transceiver S-meter has a mark to indicate when its 10 watts r.f. power is being fed to the antenna, and it reads to the mark when transmitting.

I have since included an antenna tuning unit in series with the antenna, but with this in use the v.s.w.r. is much higher and the r.f. power indication is less than 10 watts, as the meter reads below the mark. Why should this be so?"

A There is no necessity whatsoever to use an a.t.u. with any antenna that has adjustment for close matching to its feed cable. This reader has carried out the necessary adjustment to obtain a v.s.w.r. of nearly 1:1 in the first instance, but even if the v.s.w.r. had been, say, 1.2:1 there would still have been no need for an a.t.u. since the power loss at such low values of v.s.w.r. is almost nil.

The inclusion of an a.t.u. has the effect of creating a mismatch between the transmitter output and the antenna feed cable, some of which may be attributed to the numerous PL259/SO239 ("UHF") connectors in use. The overall amount of reflected power is probably the reason why the transceiver r.f. power output is indicated as being low.

If the v.s.w.r. could not have been adjusted to an acceptably low value when the antenna was first erected, this would have indicated some error in construction, or that the antenna was too close to some other conductor, e.g. another antenna. Whilst the use of an a.t.u. might well then have produced a low v.s.w.r. at the transmitter, the "mismatch" at the antenna would **not** have been corrected.

As described in the published articles concerning the ZL antennas, provision is made for matching the cable to the antenna with a small variable capacitance across the feed points.

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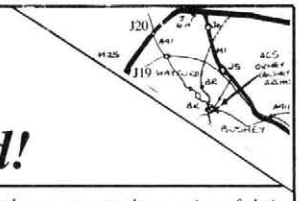

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PW REVIEW

Team TRX-404 CB Transceiver

It's been many years since a CB rig review has graced the pages of PW. However, we felt that equipment capable of meeting the very high and exacting standards called for in the new European CEPT Specification PR27 was worth a mention. Armed with one of this new breed of CB transceiver, Richard Ayley G6AKG decided to go back to his roots and find out what this equipment had to offer.

Since the UK CB bands were allocated back in 1981 there has been a steady increase in the number of sets available for the UK's odd non-standard set of frequencies. At first the British CB specification seemed to present a chance for our indigenous manufacturers to try their hand at supplying the home market. However, since then a great many rigs and companies have come and gone, leaving just the oriental black boxes on offer. The early UK rigs were relatively expensive but as more and more of the illegal a.m. CBers changed to the new frequencies, equipment prices dropped, ending up at around £60–70 per rig.

To start with, the UK government rather grudgingly gave us two sets of frequencies, one in the upper end of the 27MHz band and the other in the now ill-fated 934MHz band. It would seem that the British government has had a change of heart and lo and behold, we have two 27MHz CB allocations! Not bad ah? All this no doubt has something to do with 1992 and the final unification of all EEC member countries. To this end, one may surmise that everybody in Europe will have to conform to the same CB regulations and standards, CEPT PR27. As it happens the frequencies allocated to this new band are the same as the old FCC ones, but now the mode of modulation has changed from a.m. to narrow band f.m.

Time for a Change

Maybe it's time to go out and buy a new CB. Well, things could be worse, prices could be sky high, but they're not and in fact the new gear represents much better value for money. The CEPT equipment has to conform to a much higher and tighter specification, so their overall performance should be better.

I hear you say "who the hell will I be able to talk to on this new band"? Well for a start there's all the European and World-wide F2 DX and during the evening you can have a nice quiet chat with all your new found friends, because fortunately the new band is free of the wall-to-wall wallies that inhabit the old UK band. This new band could be the rebirth of something really useful to the community, if only policed correctly. Another added advantage with the new CEPT equipment is that it can be used in any of the EEC countries. Just the thing for all the people who enjoy caravanning holidays on the continent.

TRX 404 Manufacturers Specification

	General
Power Supply	13.2 volts nominal
Current consumption	RX 100-150mA standby TX 900mA
Weight	1.04Kg
Dimensions	192 × 145 × 50mm
	Receiver
Sensitivity	f.m. 1μV/1.5kHz dev. (20dB S + N/N)
First i.f.	10.695MHz
Second i.f.	455kHz
Selectivity	Conforms to CEPT
Audio output	2W into 8Ω
	Transmitter
Output power	4W f.m. into 50Ω
Deviation	2kHz max. f.m.
Harmonic radiation	$\leq 4 \times 10^{-9}$W (−90dB ref 4W)
Spurious radiation	$\leq 2.5 \times 10^{-7}$W (−72dB ref 4W)

Nevada

So what's all this about? Well two of the new CEPT rigs recently arrived on my desk, fresh in from Nevada Communications at Portsmouth. I guess the need to get on to h.f. without passing the Morse test got the better of me and I made off home with one of the new rigs. Also supplied by Nevada was a brand new DV27 antenna. For those among you that have never used this trusty antenna (illegally), it was to my mind one of the best top-loaded compact antennas ever made. When home, I feverishly removed the packing, noting that the rig was supplied with not only its original German langauge manual but also a very comprehensive English leaflet supplied by Nevada. The original manual to my surprise included a full circuit diagram, compo-

nent overlay and parts list, not to mention a functional block diagram. My German being non-existent the block diagram made little or no sense, but the circuit diagram told all.

Receiver Technology

In my experience the one thing that lets down most CB transceivers is the receiver. This is a big failing when you consider how crowded the CB bands are world-wide. The faults range from poor i.f. filtering to lack of a.m. immunity, high noise figures caused by ill-designed synthesisers and front ends; in fact the list is endless. Well what can you expect for the money! If you compare the price of a CB equipment with p.m.r. or amateur, there is a very large differential.

However, as I mentioned earlier the new European CB spec is seen to demand much better performance from CB equipment than previously expected. This is reflected in the design of the Team TRX-404 transceiver. In this rig you get a relatively well designed receiver with no less than three stages of filtering plus one of the latest dual-conversion f.m. receiver chips from Motorola. The first filter is situated between the signal frequency r.f. stage and the mixer, operating at 27MHz. This device is very similar to those ceramic filters used in the front ends of radio control equipment. The second set of filters, in this case two crystal types, are to be found in the first i.f. stage, operating at 10.695MHz. Last but not least, a 455kHz ceramic filter is used in the last i.f. stage.

Two squelch options are provided on the receiver and having used both commercial and amateur v.h.f. equipment I think the preset squelch on this unit is the best I have ever come across. Even when the band was full of a.m. and s.s.b. hash the only time the squelch lifted was when it came into contact with a bona fide f.m. signal. This piece of circuitry looks for both speech within a specified audio pass band and a preset level of carrier; only when both criteria are met does the squelch lift.

The settable squelch, which works very well on a reasonably quiet band, senses both carrier level and audio quieting. However, when band conditions become noisy this squelch has to be set so heavily, to stop false triggering, that only signals over approximately three or four S-points will lift it. This is where the pre-set squelch comes into its own. The received signal strength along with the TX power output are shown on an easily-read, four-segment l.e.d. bargraph display.

Transmitter

The transmitter circuitry is pretty standard. The audio from the microphone is fed through a two-stage amplifier and then through a peak clipping circuit. This not only gives some speech processing, but also a means of limiting the peak f.m. deviation that can be achieved. From the clipper the audio signal is fed through a frequency tailoring stage and then on to the transmit voltage controlled oscillator (v.c.o.). The TRX-404 is a little unusual in the fact that is has two separate v.c.o.s, one for transmit and the other for receive. This I can only speculate, was done in an effort to keep the spectral purity of the frequency synthesiser as high as possible. The frequency control circuitry is pretty standard using an LC7132 phase-lock-loop chip, the reference oscillator of which also forms the receiver's second local oscillator source. The signal from the TX v.c.o. is then fed to a six-stage power amplifier strip, terminated in a three-stage low-pass filter. Another unusual feature of the TRX-404 is that the unit is fitted with an antenna change-over relay, a luxury only afforded in much higher priced equipment, run-of-the-mill CBs using diode switching which often degrades reveiver performance.

Added Extras and Appearance

The TRX-404 looks much the same as any other CB, although it has some nice touches that set it apart from others. For starters it has a built-in, front panel selected "roger" bleep as well as a dedicated socket for a selective calling unit, the Team SR-316 D. Selective calling enables the user to put out a coded call at the press of a button, to alert another suitably equipped station. This call will lift the selected station squelch and also sets a warning light to let him know that he has been called, if the rig has been left unattended. Every selective calling unit supplied is factory set to respond to selective calling code 1.

The SR-316 unit has the facility to send one of 16 user-selectable codes. Suppose, for instance, you intend to use the selective calling to run a small delivery service having one base station and six mobile units. Each of the six mobile selective calling units will need to be dealer coded to respond to one of the 16 codes available i.e., 2,3,4,5,6,7. The base station selective calling unit can be left set to code 1. Therefore if any of the mobiles wish to call the base station, provided both mobile and base are using the same frequency (channel), the mobile just sets code number 1 on his selective calling unit and presses the call button. If the base station is not busy then his squelch will lift automatically and the message can be passed. If on the other hand the base station wishes to contact mobile 5, then the base station sets code 5 on the selective calling unit, presses the call button and instantly the squelch of mobile 5 will be lifted and the message can be sent. As previously mentioned both mobile and base stations must be using the same channel, both must be in normal communicating range and the system will only operate if both stations are not busy with other calls.

As you can see selective calling could be a great asset to a small company wishing to use several CB radios for local commercial communication. It saves on all the aimless chat that one might have to undergo to contact a specific mobile out-station.

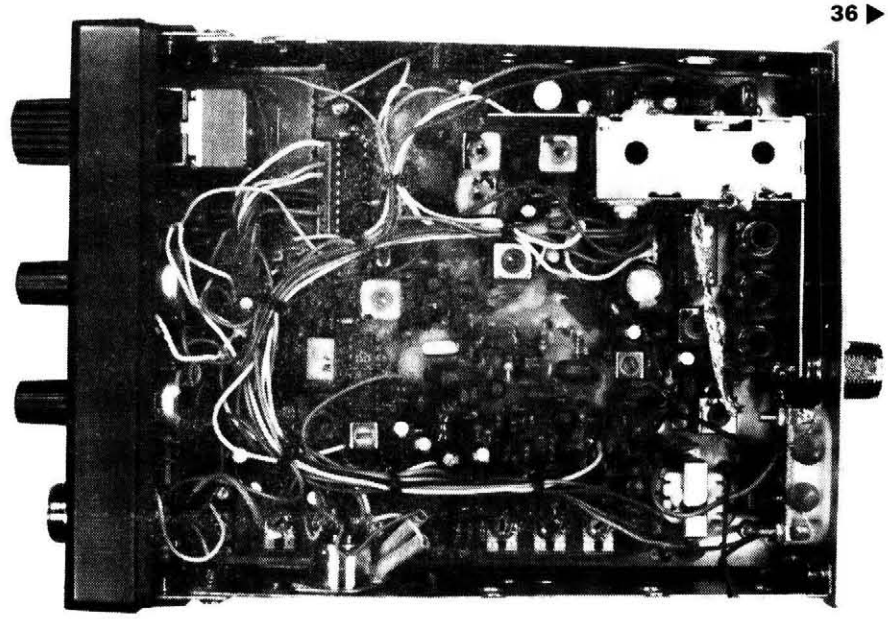
Another fine point on the TRX-404 is a mute light, this goes out when the squelch is lifted, giving you a visual indication that the channel being monitored is in use.

Looking at the inside of the rig one is reminded of the older type sturdily-built Japanese amateur equipment; a rather pleasant surprise I might add.

In Use

The unit didn't get an air test while mobile as I have an aversion to having any communications equipment in the family car. However, it was felt that if the rig performed well at home with an indoor antenna and that man-made electrical noise, then it should have no problems in a mobile environment.

36 ▶



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Wireless Goes To War – The First Time

Tim Wander tells the story of how wireless communications were used in the Boer War.

By early 1899 the British Admiralty, commanding the largest Navy in the world, was desperate for some means of reliably communicating with ships at sea. The growing success of the young Guglielmo Marconi's "wireless" communication system, especially in the recent sea trials between the East Goodwin lightship and South Foreland lighthouse, led the Navy authorities to invite Marconi to demonstrate the uses of radio at sea.

In July 1899, the cruiser HMS *Juno* was fitted with a wireless set at Devonport Dockyard and a second set was stowed away for installation on board the battleship HMS *Alexandria* in Torbay on July 16. During trials of the *Juno*'s equipment on July 14, Marconi clearly heard the Needles wireless station on the Isle of Wight over a distance of 140km and the Navy agreed to the installation of wireless equipment in a third ship, HMS *Europa*, in preparation for the August 1899 manoeuvres. The extended war games in the English Channel commenced with the *Europa* leading a squadron of seven cruisers in a "B" fleet dispatched to hunt for a convoy at a given rendezvous. With Captain Henry Jackson in command and Marconi himself aboard the flagship HMS *Alexandria*, the wireless systems allowed the *Juno* and *Europa* to maintain regular contact over 95km in poor seas. The *Juno* was detailed to act as a link to shore and to scout for the "enemy" "A" fleet while the flagship remained with the slower moving battle squadron. Continual signalling in all weathers by night and day saved many hours of steaming for the entire squadron. On one occasion a fleet signal was relayed through the *Juno* to the *Europa* over a distance of 170km and the overall result of the manoeuvres was a decisive victory for the "B" fleet. They won the day through wireless co-operation and this convinced the War Office to officially accept Marconi's wireless equipment for ship-to-shore and ship-to-ship communication.

Ultimatum

On 10 October 1899, the British Colonial Secretary Joseph Chamberlain had received a Boer ultimatum demanding the withdrawal of British forces from the South Africa frontiers and the return of 10 000 troops sent as reinforcements (mainly from India) to police the already troubled country. When the ultimatum was rejected, war became inevitable.

In theory, the British forces should have had an overwhelming superiority, mobilising some 450 000 trained troops against just 60 000 Boer irregulars. However, the Boers were excellent horsemen, masters of field craft and riflery, knew the terrain intimately and were to prove a handy, resourceful and dangerous enemy. The Boers also had the latest artillery with German trained gunners and provided an extremely flexible and manoeuvrable foe. Their supply wagons also made them independent of the railways.

The British forces entered the Boer War with tactics and organisation unchanged from the Crimean War, some fifty years earlier and possessed little military intelligence or map making facilities that were essential in such rough terrain. To match the mobile Boer forces the British army was forced to rely on infantry as it had inadequate cavalry, and to fight a war with antique arms, archaic medical services and a class ridden officer system. Faced with the Boers' tactics and locked into a vicious hit and run war of attrition, the British Army looked hopefully to wireless to provide the means of co-ordinating the massed ranks of British infantry and providing immediate information on Boer attacks.

At the commencement of hostilities the Boer forces attacked west, besieging the towns of Mafeking, Kimberley and Ladysmith. As news broke in England, the eminent British scientist Sir Oliver Lodge wrote to the Press suggesting that an electrical method of communicating with the besieged towns should be used. However, Lodge was publicly rebuked for not raising the matter secretly with the authorities as plans were already in progress. As war was declared, the Marconi Company had quickly suggested that wireless could be used at Cape Town, Durban and other ports handling disembarkation of troops and supplies for the Boer Campaign. In November 1900, five portable wireless stations were constructed from assorted Marconi apparatus and promptly dispatched by sea to South Africa. The original plan as suggested by the Marconi Company was to use this equipment to cope with the daily arrival of troop and ammunition transports that were causing severe congestion in Durban's docks and roadsteads. The equipment was accompanied by a small team of Marconi engineers to install and operate the systems and train the Army personnel. Their arrival at Cape Town was greeted with a change in plans and the Marconi staff were "invited" to volunteer for service in the field. Within a short space of time, each found himself in charge of a "unit", consisting of soldiers drawn

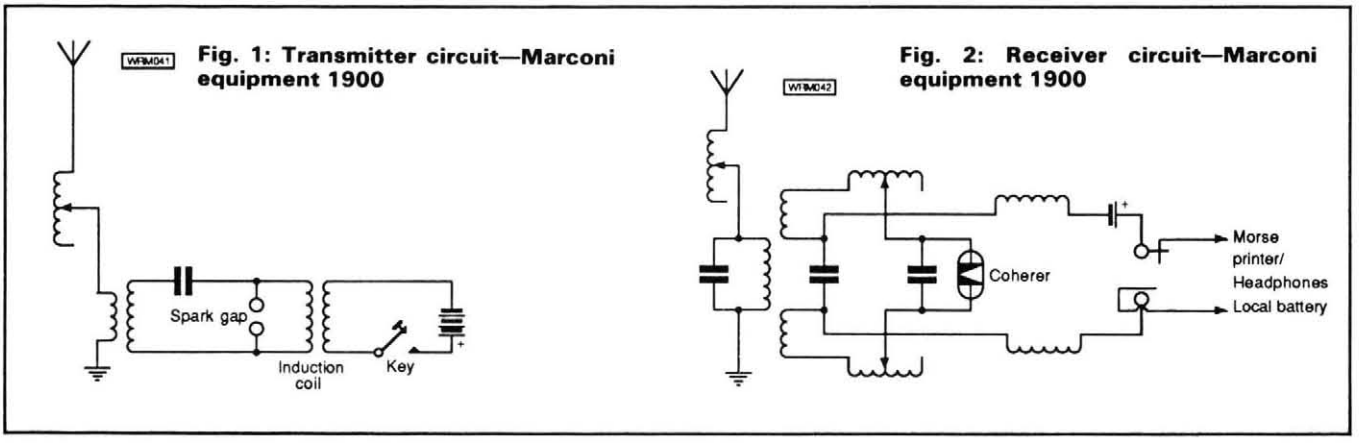


Fig. 1: Transmitter circuit—Marconi equipment 1900

Fig. 2: Receiver circuit—Marconi equipment 1900

from a newly formed Wireless Telegraph Section of the Royal Engineers, under Captain Kennedy RE. Each unit was then issued with a horse-drawn wagon in which the apparatus and its power supply of large capacity dry cells and jelly accumulators was somewhat crudely mounted.

Antennas

The stations were also issued with jointed bamboo rods supplied by the War Office to form 15m high antenna masts, together with two 2m linen Baden-Powell box kites and several 4m balloons as emergency antenna carriers. The photograph of a sketch by H. M. Dowsett shows the camp at Enslin with the balloon storage pit on the left, and the bamboo sectioned mast and instrument wagon in the centre.

Three of the wireless stations, complete with Marconi engineers and RE personnel, were immediately attached to Lord Methuen's column of 13 000 men marching to relieve Kimberley and Mafeking. The two remaining stations and personnel were sent to General Sir Redvers Buller's column of 18 000 men marching to relieve Ladysmith. However, the baptism of fire for wireless telegraphy on the battlefield did not have an auspicious start.

The Marconi engineers were given little time to set up or calibrate the equipment, nor confer amongst themselves before being sent into the field. They also had no time to train the Royal Engineers personnel or personally adjust to the rigours of wartime service life. It quickly became clear that the harsh climate and conditions of war-torn South Africa were to prove more than the embryonic communications system could cope with. Continual shocks, vibration, exposure to dust and extremes of temperature often rendered the equipment unuseable. Static discharges from sand storms and cyclones also desensitised the coherers, several severe storms wrecked the bamboo masts and the kites carrying antenna wires aloft were difficult to synchronise at the two stations. The 4m balloons tried as alternatives were torn adrift and lost, the wagons continually broke wheels and axles and the Marconi engineers had to contend with inexperienced teams at both ends of any link.

Criticism

Faced with these problems, Marconi was swift to spring to the defence of his engineers and the equipment. On 2 February 1900, in a paper he read to the Royal Institution in London, he criticised the War Office for supplying unsuitable antenna masts. He also stated in the *Times* newspaper on February 5 that the Marconi engineers had volunteered to take wireless equipment through the Boer lines to the besieged towns but had been refused permission to do so. Marconi further

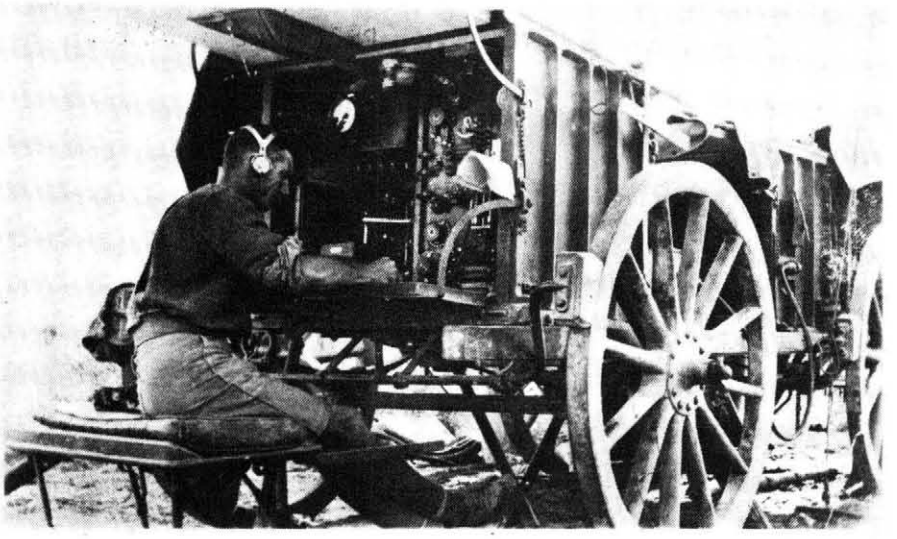


Fig. 3: Marconi wireless equipment of the First World War

Photograph by kind permission of GEC-Marconi

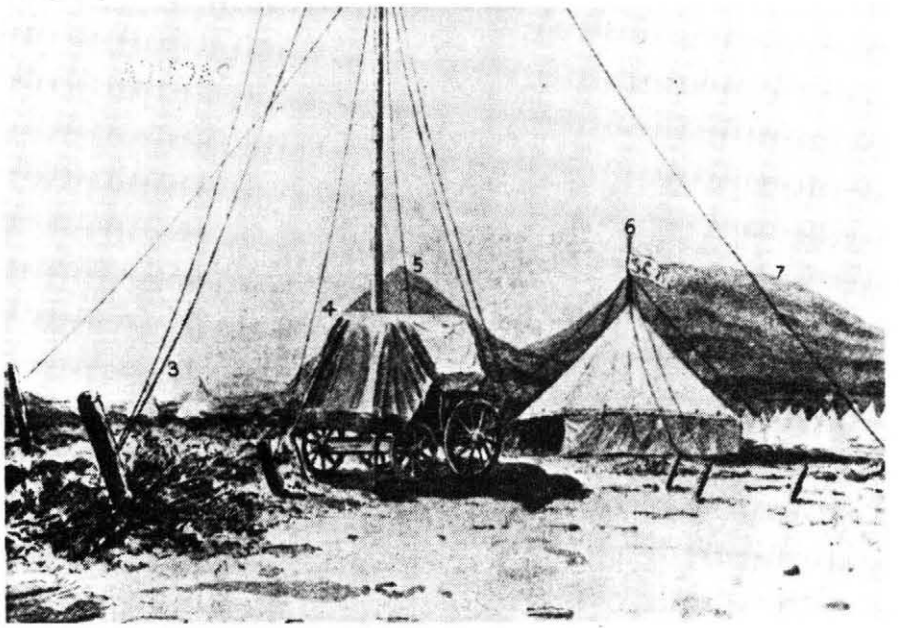


Fig. 4: Enslin Camp 1899, from a sketch by H. M. Dowsett

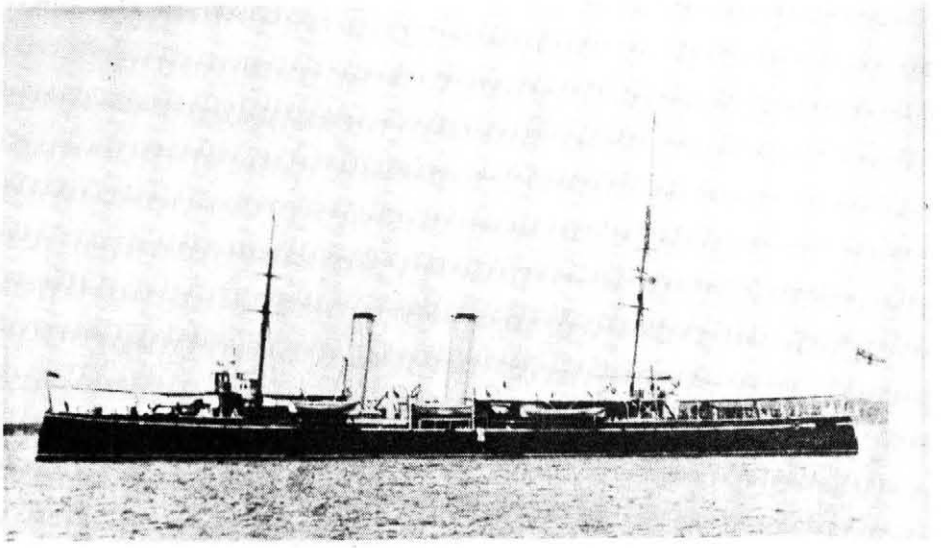


Fig. 5: HMS *Thetis* in Delagoa Bay in 1900—with antenna mast

criticised the Army for not supplying Ladysmith, Kimberley and Mafeking with wireless apparatus before hostilities began. Marconi assured the audience that he thought it extremely unlikely that the Boers had any wireless apparatus and could therefore never listen in to any British military communication. Marconi was convinced that the Boers did not possess any Marconi equipment and some German sets destined for the Boers had been seized at Cape Town but had been found, by the Marconi engineers, to be unworkable.

Dismissal

Marconi's criticism of the War Office met with an immediate hostile response and ten days later the Director of Army Telegraphs gave orders for the mobile stations to be dismantled and withdrawn. The Army's curt dismissal of wireless as an aid to wartime co-operation was not echoed by the Admiralty who immediately stepped in and asked for use of three of the five installations. These were soon installed on the *Forte, Thetis* and *Magicienne* of the Delagoa Bay squadron that was carrying out blockade duties and searching merchantmen for contraband intended for the Boers on the South African coast to the north of Durban.

A young engineer called Charles Samuel Franklin was one of the Marconi installation team who followed the wireless equipment from the Army into the Navy squadron. He later became a respected and prolific inventor and was the "architect" of the beam system of radio communication. Franklin noted that the ship-borne equipment was a great success, especially with the officers making their private arrangements when returning for shore leave. In service with the Navy, the wireless apparatus became a useful tool and on several occasions fast blockade runners were captured by the slower naval vessels converging on them from different points, acting in unison by use of wireless.

Most historical accounts record the experience of wireless in the Boer War as being a complete failure. In hindsight it was perhaps an ill-judged decision to throw a system hardly out of the experimental laboratory into a conflict on the scale of the South African War. But, Marconi built his Company, reputation and a viable system of wire-less communication on a series of calculated gambles and the Boer War provided his Company with much valuable practical experience in all aspects of wireless communication.

The Navy used their systems extensively and managed to overcome numerous practical difficulties involved with wireless operation at sea. During patrols as part of the Delagoa Bay Squadron, the crew of HMS *Thetis*, with Captain Stokes-Rees in command, extended her mast to a height of 44m above the water-line. The ship managed to keep her spirit and antenna up and in use at all times, in all weathers and when "steaming" at full speed. Unfortunately, two masts went over the side in fifteen days, mainly due to the stretching of the hemp guys as no wire rigging was allowed near the antenna at that time. However, the crew rigged a jury-mast and the station carried on while a third mast of full height was being built, which in due course was erected whilst the ship was still at sea. An experimental twin-wire horizontal antenna was also rigged on the *Thetis* which was proved so successful that it eventually became a standard feature of later ship-board installations. During the Delagoa Bay "experiments" the Marconi engineers proved that wire guys for antenna masts were practicable and any possible screening or absorption effects were prevented by breaking them at intervals with porcelain insulators.

Large Order

There can be no doubt that the British Admiralty were impressed by the Captain's reports from the Delagoa Bay Squadron, as they had been by the performance of the wireless apparatus used during the 1899 manoeuvres. On 4 July 1900, the Admiralty placed a large order for wireless telegraphy equipment with the Marconi Company when they contracted for the installation of wireless in 26 warships and six Naval coast stations. In addition the Admiralty also agreed to take over the three Boer War sets it was still using. Subsequently the remaining two sets of equipment were brought into service with the Army, and Warrant Officers and signal ratings were successfully taught how to operate the equipment.

The large Navy contract did demand that before delivery could take place, the Marconi system must be able to demonstrate that test signals could be exchanged between ships moored in Portland and Portsmouth harbours. The distance to be covered was 100km with the added problem that the Dorset hills lay directly between the two points, but the tests all worked perfectly and the system was accepted. The first ship to have the new apparatus installed was the *Diadem*, but by the end of 1900 the Navy had 42 ships and eight shore stations equipped with wireless telegraphy apparatus.

Jutland

Within five years, the Navy had doubled this figure and was totally dependent on wireless for its operations. By use of the "transatlantic" station at Poldhu Point, the wireless systems that grew out of the Boer War experience allowed the Admiralty to reliably communicate with any ship of the British Navy throughout the Atlantic, North Sea and Mediterranean. Wireless was no longer a laboratory experiment forced into a battlefield environment for which it was neither suited nor designed. Wireless had gone to war for the first time and the lessons learnt paved the way for the historic Naval battle of Jutland in 1916 and the British Navy's eventual domination of the sea during the First World War. **PW**

▶ 32

The DV27 was firmly fixed to the radiator in my radio shack and a good v.s.w.r. was obtained without much trouble. After the antenna had been installed I had a quick tune up and down the channels. Being around 5 o'clock in the afternoon every one of the 40 channels was packed with hash from the states. This is when I discovered the usefulness of the preset squelch. As the evening wore on the band got quieter and several stations were heard calling from Germany and Austria obviously using CEPT rigs.

As regards working DX, well I was acknowledged by a station in Northern Ireland, although once word got out everybody was trying to work him so I gave up. I was surprised by the number of licensed amateurs using these frequencies for local chat nets. I made contact with two or three people waiting on the result of the last radio amateurs exam, which just goes to prove that CB is still providing a useful route into amateur radio. I think the real proof of the pudding was when I made contact with a continental lorry driver in Southampton. Living in Poole, some 28 miles away from Southampton, this may not sound much of a feat, but in my experience using three times as much output power as the CB, I can't work stations on 50MHz over that same path.

Overall the reports on transmitted audio were very good even on a noisy band. However, I did find the received audio a little thin at times. This probably wasn't the fault of the rig, more likely my ears, they've been spoilt with the relatively wide-band f.m. signal on the 145MHz amateur band. One has to bear in mind that the spec calls for a maximum deviation of 2kHz which is very small indeed, in fact it must be getting on for the smallest usable deviation possible for normal voice communication. My final opinion of the rig and the new band is that I liked both, my only real grouch about the rig was that if you're a compulsive knob twiddler like myself, you may find the channel knob a bit woolly and flimsy. However, if you're Mr normal then this control should stand the test of time. **PW**

Valved Communications Receivers

The Collins 75A-2

Appearing just after World War 2, The Collins 75A series of receivers were purpose-built for American radio amateurs. They are high quality double-superhets of unorthodox design, covering only specific amateur bands with excellent frequency stability and very accurate tuning. Chas E. Miller examines this memorable receiver.

The original 75A series models cover the 80m, 40m, 20m, 15m, 11m and 10m bands, whilst later versions incorporate the 160m band and various other minor modifications. This article is based on the representative 75A-2 model, for which the following general data is applicable

Frequency coverage is in seven bands: (1) 1.5–2.5MHz; (2) 3.2–4.2MHz; (3) 6.6–7.8MHz; (4) 14–15MHz; (5) 20.8–21.8MHz; (6) 26–28MHz; (7) 28–30MHz. The i.f. passband is variable from 4kHz down to approximately 200Hz in five steps. As to sensitivity, 1μV r.f. input will provide 1W of a.f. output, and the maximum audio output is 2.5W. The cabinet measures 536 × 314 × 332mm ($21\frac{1}{8} \times 12\frac{3}{8} \times 13$in), and the receiver weights 22.7kg (50lb).

Sockets are provided for long wire and dipole antenna inputs, and for 4Ω and 500Ω outputs. Internally, there are sockets for the addition of n.b.f.m. adaptor and crystal calibrator units.

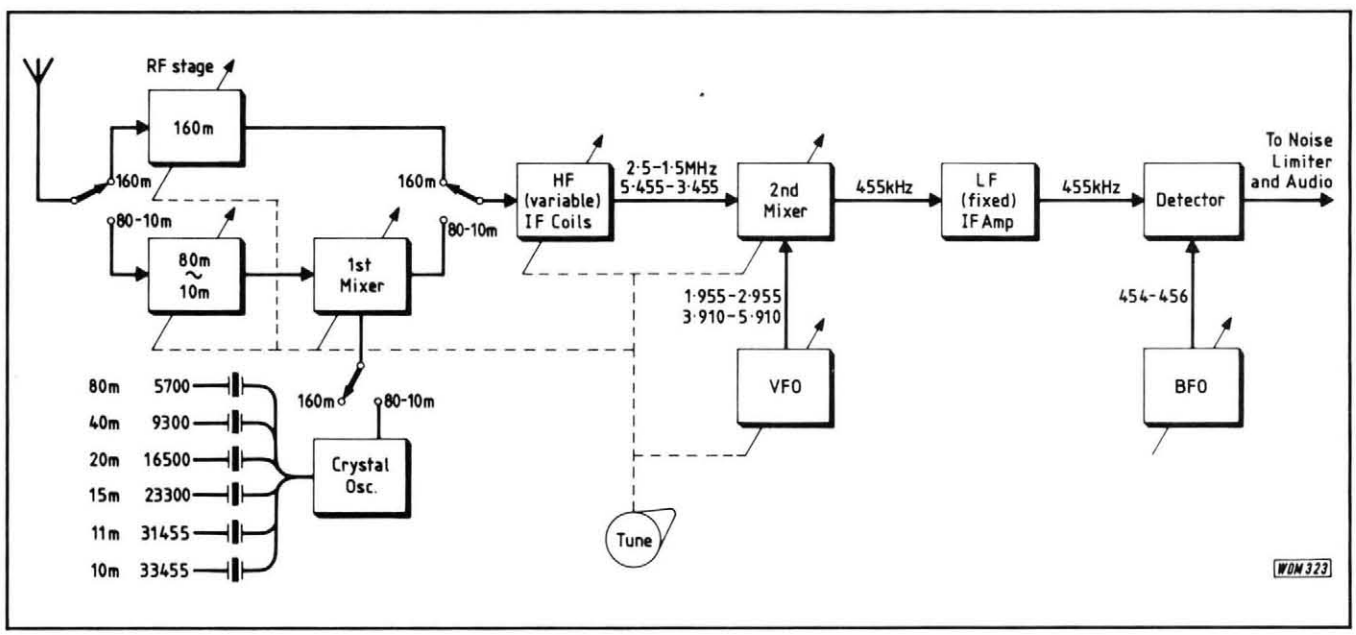
The receiver line-up is: r.f. amplifier stage, 1st frequency changer stage; crystal-controlled 1st local oscillator, 2nd f.c. stage, high-stability 2nd l.o. with buffer stage, three 2nd i.f. amplifiers, demodulator/a.g.c./1st a.f. amplifier stage, audio output stage; automatic noise limiter for a.m. signals, c.w. noise suppressor, tuned b.f.o., a.g.c. amplifier, built-in power supply unit. The built-in S-meter registers S9 at approximately 100μV r.f. input.

The above specification is impressive enough, but when the circuit is examined in detail one realises that here is a receiver of very careful and intricate design. So complex is the circuitry that it is recommended that the following description be read with reference to the block diagram, below.

Circuit Description

The 75A-2 operates as a double superhet on Bands 2–7 and as a single superhet on Band 1. The latter will be treated separately after the tuning of Bands 2–7 has been described. Note that Bands 2–5 are precisely 1MHz wide, and Bands 6 and 7 are 2MHz wide. For convenience the bands will be referred to as low (L) and high (H) respectively.

In order that the difference between the 75A-2 and any conventional double superhet shall be made clear, with the reader's indulgence a brief description of the latter will be given first. The usual example has one or more r.f. amplifier stages followed by a 1st frequency changer with a local oscillator working in step with the r.f. tuning to provide a constant i.f. (typically around 1.6MHz). This 1st i.f. is taken



to a 2nd f.c. with another local oscillator operating at a fixed frequency to provide a 2nd i.f. at around 450kHz. Stages of i.f. amplification, demodulation and a.f. amplification follow.

In the 75A-2, however, the r.f. amplifier is followed by a 1st f.c. with a local oscillator working at one spot frequency for each r.f. band. Thus, as the tuning is varied over the 1MHz or 2MHz of the r.f. tuning range, the 1st i.f. varies also to that amount. The crystal controlled frequencies of the local oscillator are, from Band 2 to Band 7: 5.7MHz; 9.3MHz; 16.5MHz; 13.3MHz; 31.455MHz and 33.455MHz. Subtracting the r.f. limits of frequency for each band from its local oscillator frequency gives us the amount by which the i.f. varies over that band. For example, on Band 2, (3.2 to 4.2MHz) the i.f. will vary between 5.7MHz–3.2MHz = 2.5MHz, and 5.7MHz–4.2MHz = 1.5MHz. Note that the i.f. is lower at the high end of the band and vice versa. In fact, the crystals are chosen to provide the same i.f.s for all the L bands, whilst for the H bands they provide i.f.s of 3.455MHz to 5.455MHz.

It will be seen that the coupling between the 1st and 2nd frequency changers must be tunable over 1MHz for the L bands and 2MHz for the H bands, in step with the r.f. tuning. In addition, the 2nd local oscillator must be variable by the same amounts to provide the 2nd i.f. which is, in this case, 455kHz. The 75A-2 employed a Collins special unit, type 70E-12, which after factory alignment was dehydrated and hermetically sealed. Its actual range of tuning is over 1.955 to 2.955MHz, the second harmonic of 3.91 to 5.91MHz being used for the H bands. Thus all bands have a 2nd i.f. of 455kHz, with the local oscillator being higher in frequency in all cases.

It is evident that tuning of all relevant circuits just mentioned must be of great accuracy both in frequency and in the ganging process. The 75A-2 dispenses with the usual tuning capacitor and employs permeability tuning. Moreover, matters are arranged so that only the Band 2 r.f. coils need to have variable cores; on the other bands the inductances are selected so that when applied in parallel across the Band 2 coils, the tuning of the latter effects the tuning for the other band selected. All the other coils that have variable cores are fitted on a movable platform with the r.f. coils so that cores move in unison with great precision. Ten turns of the vernier tuning knob cover each band, divided into 100 divisions representing each 1kHz (L) and 2kHz (H). Thus the visual accuracy of the dial is well within the ranges just mentioned. Paralleling of inductors is also used to obtain the higher ranges of i.f. frequencies for the 1st–2nd f.c. coupling.

For the 160m (1.5–2.5MHz) band the antenna input is switched to a separate r.f. tuning coil, and thence to the variable i.f. coils, which cover, of course, that precise band. Likewise, the output of the 2nd local oscillator is just right to produce the usual 455kHz second i.f.

Turning to the i.f. amplifier section, the selectivity switching is accomplished at the first i.f. transformer, which includes a crystal filter. The actual switching process involves placing resistors in series with the crystal to reduce its Q and thereby widen the acceptance band. For the narrowest bandwidth the series resistor is nil, whilst for the broadest the crystal is shorted out and the bandwidth determined solely by the tuned circuits.

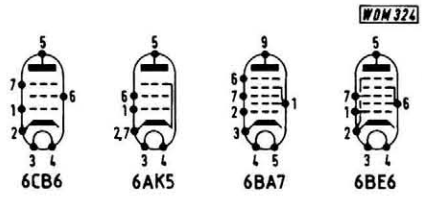
The valves used in the r.f. and i.f. stages are as follows: r.f. amplifier V1, 6AK5 or 6CB6 (see Table 1); 1st mixer V2, 6BE6 or 6BA7 (see Table 1); 1st local oscillator V3 12AT7; 2nd mixer V4, 6BE6 or 6BA7 (see Table 1); 2nd local oscillator V14, 6BA6; buffer V15, 6BA6; 1st i.f. amplifier V5, 6BA6; 2nd i.f. amp. V6, 6BA6; 3rd i.f. amp. V7, 6BA6.

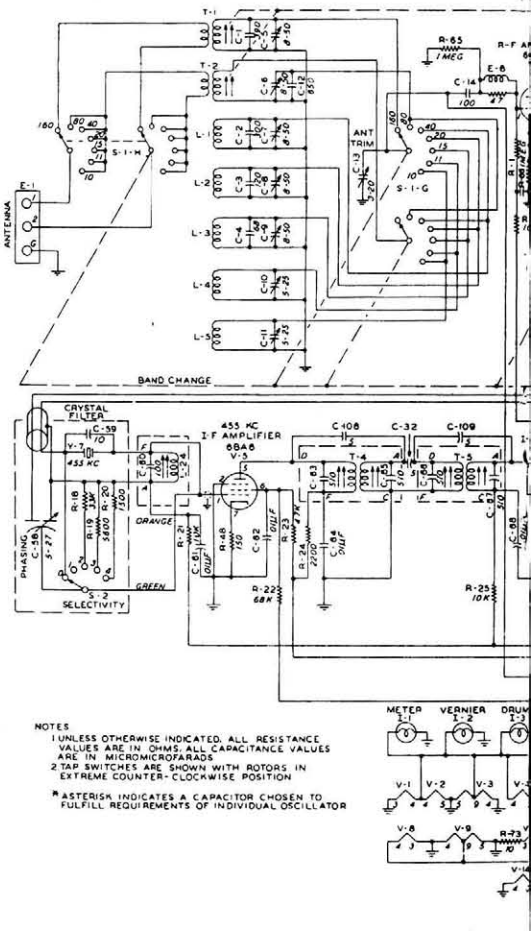
For demodulation one half of a double-diode (V8, 6AL5) is employed in a conventional manner. The resulting a.f. signals are taken to the automatic noise limiter, which is one half of another double-diode (V10, 6AL5) and thence to the 1st a.f. amplifier, one section of a double-triode (V9, 12AX7). Amplified signals are resistance-capacity coupled to the output pentode (V11, 6AQ5) via yet another double diode (V16, 6AL5) acting as c.w. noise suppressor. The limiting action is controllable by a variable

TABLE 1

Valve		Pin Numbers								
No.	Type	1	2	3	4	5	6	7	8	9
1.	6AK5*	-1.42	0	0	6.3ac	160	100	0		
2.	6BE6*	0	1.16	0	6.3ac	145	82	-1.72		
3.	12AT7	133	0	1.3	0	0	133	-1.1	1.8	6.3ac
4.	6BE6*	-2.9	2.23	0	6.3ac	175	69	0		
5.	6BA6	-1.55	0	0	6.3ac	168	72	0.6		
6.	6BA6	-1.55	0	0	6.3ac	175	90	0		
7.	6BA6	-1.55	1.25	0	6.3ac	168	93	0		
8.	6AL5	-56	-0.6	0	6.3ac	0	-56	-46		
9.	12AX7	-1.5	-53	-46	0	0	132	0	1.3	6.3ac
10.	6AL5 (lim on)	-0.3	0	0	6.3ac	0	0	0.4		
11.	6AQ5	-12	0	0	6.3ac	190	175	-12		
12.	6BA6 (bfo on)	-7.7	0	0	6.3ac	23	70	0		
13.	5Y3GT	0	208	0	200ac	0	200ac	0	208	
14.	6BA6	-2.2	0	6.3ac	0	50	50	0		
15.	6BA6	-2	0	0	6.3ac	100	70	0		
16.	6AL5	23	0.1	0	6.3ac	0	23	0		

Main h.t. line 180V. Bias line (across C94) –50V.
Table prepared with aid of official handbook but correcting errors found therein.
*The later version of the 75A-2 which is shown in the circuit diagram (kindly supplied by Rockwell Collins), uses valve type 6CB6 in place of 6AK5, and 6BA7 in place of 6BE6.
The table is based on the 6AK5/6BE6 version. The base connections for the alternative types are shown here.





resistor. The output of the b.f.o. (V12, 6BA6) is coupled to the demodulator diode.

The other half of V8 is used for a.g.c. rectification, but in reverse to the orthodox arrangement to give a more positive bias with an increase of signal input to the receiver. The positive bias is applied to the grid of the a.g.c. amplifier (other half of V9) to oppose a negative bias obtained from a resistor inserted in the line between h.t. negative and chassis. As the steady bias is overcome by an increase in a.g.c. action, the triode is able to conduct and thus pass an enhanced negative bias to the controlled valves, which are the r.f. amplifier and the three i.f. amplifiers. The appropriate degree of a.g.c. delay is obtained by the initial bias on the triode grid.

The Collins model 148C-1 n.b.f.m. adaptor unit employs a 6AU6 r.f. pentode as a limiter and a 6AL5 double-diode as discriminator. Input is received from the a.m. detector anode, the latter valve being disconnected for f.m. reception, and a.f. to the amplifier stages taken from the n.b.f.m. unit. The 75A-2 has the necessary switching provided as standard, and labelled CW-AM-FM.

The 8R-1 crystal calibrator unit employs a 6BA6 in a Pierce oscillator, providing the usual 100kHz markers. Again, all connections are ready-fitted, and the unit is brought into operation by an extra position on the LIMITER ON/OFF switch. The output of the calibrator is injected into the grid of the r.f. amplifier valve via the capacitance between two of the pins on the connecting socket, a neat idea that minimises any stray capacitances when the unit is not fitted.

Possible Circuit Variations

A number of small changes were made from time to time in the production run or as the result of factory-advised modifications. After the passage of nearly 40 years it is unlikely that one might encounter an unmodified set, so the majority of the differences may be practically ignored. Those that may with advantage be checked out are:

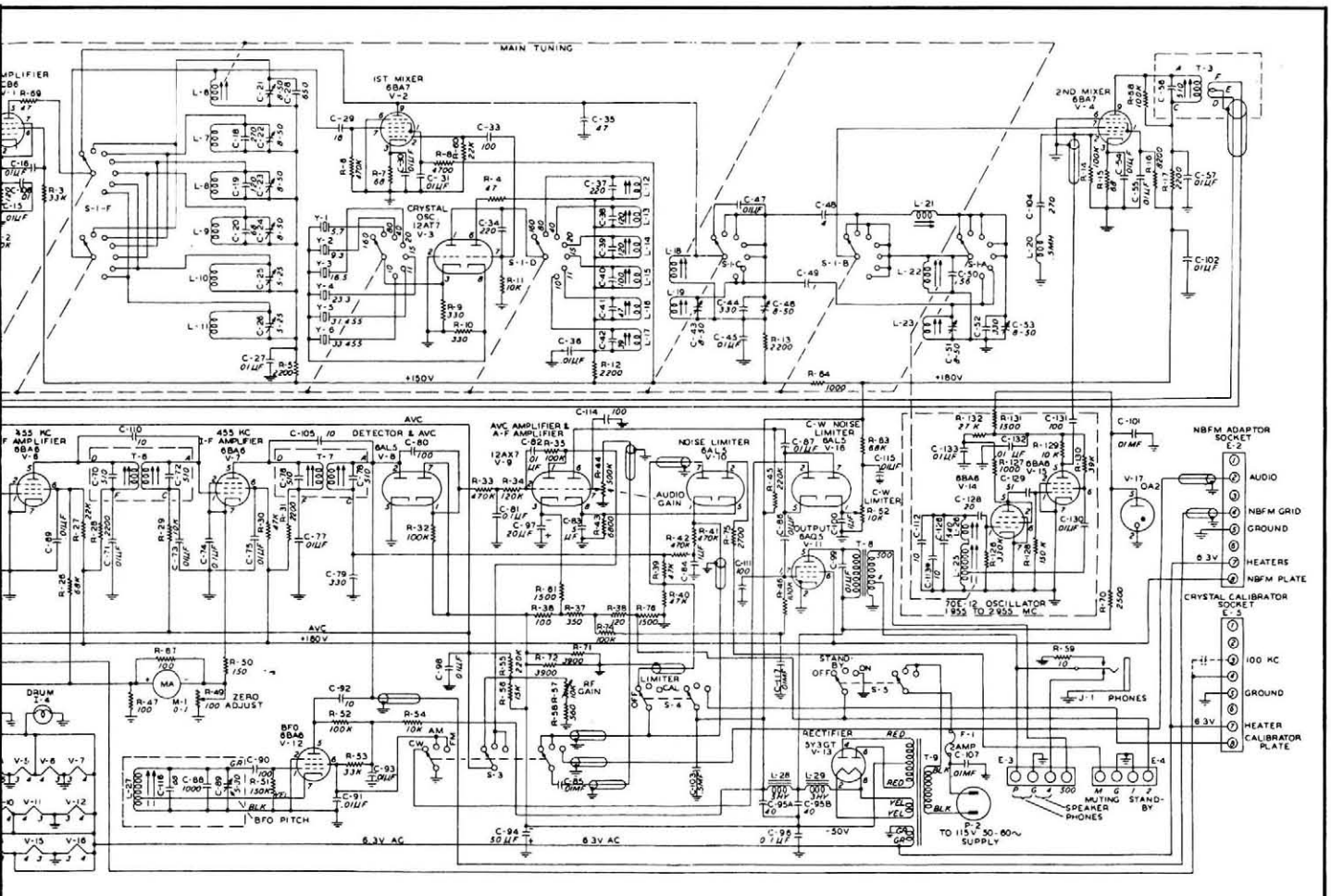
1. Presence of a voltage-regulator tube for the anode supply to the 2nd local oscillator. An OA2 is used for this purpose and is wired in thus: The existing h.t.+ lead is disconnected from the oscillator and an extra 2500Ω resistor inserted in its place. The OA2 is connected from the lower end of this resistor to chassis. Its nominal regulation voltage is 150V, and whilst these devices are normally very reliable it might be as well to measure the actual h.t. voltage on the oscillator as this will have some bearing on its stability.

2. Re-alignment of the 2nd i.f. stages for narrow bandwidth. When an extreme of selectivity is required it is possible to re-align the 2nd i.f.t.s to give approximately 2.4kHz bandwidth. To achieve this, four small components are removed from the i.f.t.s, thus: R68 100kΩ, from the secondary of T4; C108 7pF, from primary-secondary of T4; C109 7pF, from the primary-secondary of T5; C110 5pF, from the primary-secondary of T6. The presence or absence of these components will indicate whether the bandwidth is standard or narrow. Conversion one way or the other is simply a matter of deletion or addition, followed by a relatively simple alignment procedure. At this stage it is pertinent to remark that at least 50 per cent of the receivers that come into the writer's hands are in urgent need of i.f. realignment, not because of any inherent drift within the i.f.t.s, but due to "tweaking" on the part of unwise or unequipped previous handlers. It is as well to search for signs of interference with trimmers, since misalignment in a set such as the 75A-2 can bring about a disappointingly poor performance. Otherwise, the motto of leave well alone is apposite!

Alignment for Narrow Bandwidth

Equipment required: Accurate signal generator with good attenuator; valve voltmeter; insulated trimming tool (screwdriver bit).

Connect the signal generator to the grid of the 1st mixer, V2, and the voltmeter to the demodulator diode load at the junction of R39 and R42.



Set the selectivity control to its "0" position, the CW-AM-FM switch to AM, the RF GAIN control to maximum, and the AUDIO GAIN control to minimum.

Inject a 455kHz modulated signal, at a level where the valve voltmeter begins to respond. Adjust the cores of T3, T4, T5, T6 and T7, in that order, for maximum meter reading.

Change the SELECTIVITY switch to "4" and re-tune the generator very carefully for maximum meter deflection, keeping the input low to avoid a.g.c. action. Then return the SELECTIVITY switch to "0". Re-tune the i.f.s as before for maximum meter deflection.

Change the SELECTIVITY switch to "1". Reduce the generator tuning by 3kHz and adjust its output level to obtain a 5V meter reading. Tune the i.f. input coil L24 for maximum on the meter. At this stage the crystal PHASING control should be at its centre-scale position for minimum "hiss". If this is not so, loosen its grub screws and adjust as required.

Alignment for Standard Bandwidth

The same equipment as above is required, with the addition of a damper consisting of a 10nF capacitor in series with a 1kΩ resistor, terminated with crocodile clips.

Connect the generator and valve voltmeter as for narrow band. Set the SELECTIVITY switch at "2" and the RF GAIN and AUDIO GAIN controls as before. The generator output is set to achieve an initial reading of 5V on the meter, and is reduced progressively as alignment proceeds to maintain that reading.

Adjust T3 for maximum meter deflection. Place the damper across the primary of T4 (avoiding shocks!) and tune the secondary for maximum. The secondary has the lower core. Change the damper to bridge the secondary winding and adjust the primary (upper core) for maximum. Follow the same procedure for the other i.f.t.s, T5, T6 and T7.

Note that for both narrow and standard bandwidths, it is possible for the degree of initial misalignment to be so great as to prevent a signal from passing through the complete stage. If this should be experienced the generator should be connected to the grid of the last i.f. amplifier, V7, for tuning of T7, and gradually worked back to V4 via the other i.f. amplifiers as the i.f.t.s are brought into tune.

RF Alignment

The r.f. alignment should not be disturbed unless there are definite grounds for suspecting that it has been seriously mis-tuned. The degree of accuracy attained by factory alignment cannot be reproduced unless equipment of a very high standard is available. Certainly, the 2nd local oscillator must remain inviolate unless it stops functioning altogether. Should the action of the DIAL CORRECTOR prove to be insufficient to correct drift on the part of the oscillator, some adjustment is possible as follows. With the receiver tuned to a frequency standard of 2MHz and the b.f.o. operating, release one side of the mechanical coupler on the oscillator control shaft. Turn the shaft for zero beat, and then re-tighten the coupler with the DIAL CORRECTOR control at mid-scale.

A check may be made on the tuning rate of the oscillator by noting the number of turns required at the main tuning control to cover any one scale. As an example, an accurate frequency standard might be set to give an output of first 3.2MHz, then 4.2MHz with the tuning moved across Band 2. The amount of travel should be 10 turns ± 3 dial divisions. Collins recommended that errors in excess of this should be treated by returning the 2nd local oscillator unit to the factory for adjustment. They issued a stern warning that home adjustment (involving breaking the hermetic seal) would inevitably worsen the error.

The full r.f. and b.f.o. alignment is a long process requiring (apart from the necessary know-how) a detailed information pamphlet several pages in length, and is thus beyond the scope of this article. As a service to readers who are in urgent need of these instructions they will be made available by the author upon application, via the *PW* Editorial offices at Poole.

Valve Voltages

To assist fault location, a list of valve voltages is shown in Table 1. They were taken with a valve voltmeter between the stated valve pins and chassis, with the set switched to the 80m band, no input, AM selected, RF GAIN at max., AUDIO GAIN at zero.

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More Swaps on page 48

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DF96	1.15	ECF82	1.15	EL82	0.70	KT77**	14.00	PY82	0.75	UY85	0.85
DH76	1.15	ECF802	1.80	EL84	1.35	KT88**	25.00	PY88	0.60	VR105/30	2.45
DL92	1.70	ECH42	1.85	EL86	1.45	ML4	3.20	PY500A	2.10	VR150/30	2.45
DY86/87	0.65	ECH81	1.25	EL90	1.75	ML6	3.20	QQV03/10	5.95	X61M	1.70
DY802	0.70	ECH84	0.90	EL91	6.50	MX120/01	29.50	QQV03/10*	7.50	X66	4.95
E92CC	2.80	ECL80	0.65	EL95	1.80	N78	9.90	QQV03/20A	27.50	Z749	0.75
E180CC	11.50	ECL82	0.75	EL504	2.70	OB2	1.80	QQV06/40A	28.50	Z759	19.90
E1148	0.75	ECL85	0.75	EL519	7.70	OD3	1.80	QQV06/40A*	54.10	Z800U	3.45
EA76	1.60	ECL86	1.10	EL821	8.05	PCL82	0.95	QV03/12	5.75	Z801U	3.75
EB34	1.15	EF9	3.50	EL822	9.95	PCL84	0.85	SP61	2.50	Z803U	21.15
EB91	0.60	EF22	3.90	ELL80	4.50	PCL85	0.95	TT21	45.00	Z900T	4.30
EBC33	2.20	EF37A	2.15	ELL80SE	4.50	PCL86	0.80	TT22	45.00	1A3	3.80
EBC90	0.90	EF39	1.10	EM80	1.35	PCL805/85	0.95	UABC80	0.75	1L4	0.65
EBC91	0.90	EF80	0.65	EM87	3.00	PD500/510	4.30	UBF80	0.70	1R5	1.00
EBF80	0.95	EF83	3.90	EY51	0.90	PFL200	1.10	UBF89	0.70	1S4	1.00
		EF86	1.45								

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OUR SERVICES

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We will always try to help readers having difficulties with a *Practical Wireless* project, but please observe the following simple rules:

1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice **must** be accompanied by a stamped, self-addressed envelope (or envelope plus International Reply Coupons for overseas readers).
4. Write to the **Editor, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** giving a clear description of your problem.
5. Only one project per letter, please.

BACK NUMBERS AND BINDERS

Limited stocks of many issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.40 each, including post and packing to addresses at home and overseas (by surface mail).

Binders, each taking one volume of *PW* are available Price £3.50 plus £1 post and packing for one binder, £2 post and packing for two or more, UK or overseas. Prices include VAT where appropriate.

CONSTRUCTION RATING

Each constructional project is given a rating, to guide readers as to its complexity:

Beginner
A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.

Intermediate
A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.

Advanced
A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on his own.

COMPONENTS, KITS AND PCBS

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for our more recent projects are available from **CPL Electronics**, and from **FJP Kits** (see advertisements). The **printed circuit boards** are available from our **PCB SERVICE** (see page 53 of this issue).

CLUB NEWS

If you want news of radio club activities, please send a stamped, self-addressed envelope to **Club News, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** stating the county or counties you're interested in.

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Orders for p.c.b.s, back numbers and binders, *PW* computer program cassettes and items from our Book Service, should be sent to **PW Publishing Ltd., FREEPOST, Post Sales Department, Enefco House, The Quay, Poole, Dorset BH15 1PP,** with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders **must** be drawn on a London Clearing Bank.

Credit card orders (Access, Mastercard, Eurocard or Visa) are also welcome by telephone to Poole (0202) 678558. An answering machine will accept your order out of office hours.

SUBSCRIPTIONS

Subscriptions are available at £15.50 per annum to UK addresses, £18 to Europe, and £19 elsewhere (by Accelerated Surface Post). For further details, see the announcement in previous issues.

Experimental HF Loopstick Antenna

A ferrite receiving antenna to cover the h.f. bands has always seemed to be an attractive idea to Richard Q Marris G2BZQ. So he set-about experimenting with UK available ferrite materials, which provided good results up to 2MHz. Not content with this he looked further afield for more exotic materials and has finally come-up with this interesting experimental antenna.

The author had been aware for some time that high grade ferrite materials were being used in the USA for compact h.f. rod antennas. It took only a few well placed letters to US antenna manufacturers to locate their sources of supply. Various samples of material were obtained for experimental purposes and it soon became clear that the manufacturers quoted operating data was a little optimistic, at least as far as antenna work was concerned. Some samples were quoted to have an operating frequency of up to 70MHz, when in test it was found that these materials would only work as an antenna up to approximately 6MHz. Above 6MHz, the device looked more and more like an r.f. choke and what purpose it could serve up at 70MHz one can only guess.

Eventually some Amidon type 61, $7\frac{1}{2} \times \frac{1}{2}$ inch (non metric!) nickel-zinc composite rods were selected, whose antenna operating frequency was quoted to be as high as 10MHz. These rods could also be used for r.f. chokes right up to 30MHz. It later transpired that Amidon's claims were quite conservative and much higher antenna operating frequencies could be obtained.

A range of simple tests were conducted on the Amidon material and the results that were obtained had a marked contrast to those obtained using low grade UK materials. For example the low frequency antenna performance using the new material was far from good, while its h.f. performance started to degrade at approximately 17MHz. However, ideas now exist for improving this upper limit by using a different winding technique. Certainly at these higher frequencies the directional properties become a little confused.

Practical Design

The basic circuit of the final prototype antenna is shown in Fig. 1. It consists of L1 resonated by C1 and C2, a dual-ganged 500pF airspaced variable capacitor, connected in a balanced series arrangement. The capacitor type specified for C1 and C2 has a minimum capacitance of 10pF per section, with all integral padding capacitors removed. Inductor L2 is used to couple the antenna into the receiver via a length of RG58U 50Ω coaxial cable. This inductor consists of a 2-turn coil connected in series with a 350pF fixed capacitor, which helps to equalise the loading effects between the antenna and receiver. It was found in practice that the inductance of L2 was far too high to provide efficient matching at h.f., so C3 was introduced to provide the necessary compromise for both h.f. and l.f. matching, from 3.5MHz to 17MHz.

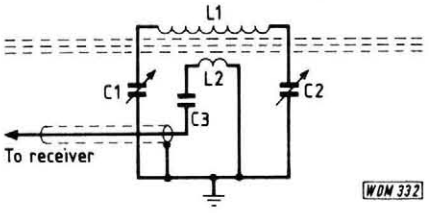

Fig. 1

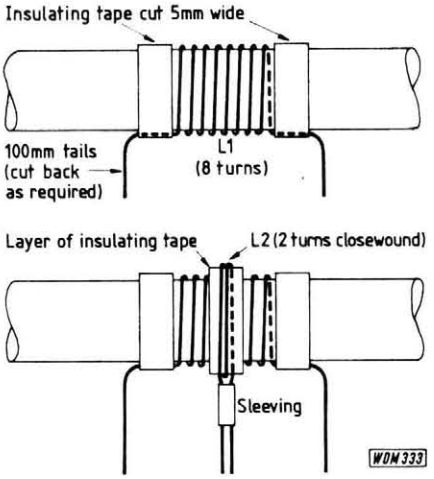

Fig. 2

The rod manufacturers recommend that to gain the best *Q* from the antenna the coil turns should be well spaced apart, with an air-gap between the winding and the surface of the rod. Suitably sized Paxolin tubing was sought to wind the coil on, but after much searching nothing was found. Eventually, the problem was overcome by using pvc covered single-core wire; the thickness of the wire covering giving a uniform spacing between the wire and the rod.

The antenna assembly is built on a piece of plain copper p.c.b. material measuring 140mm × 240mm, to which all earth connections are directly soldered, the copper plated side being uppermost. The rectangle of p.c.b. material is mounted on top of two 21mm × 9mm wooden battens. The ferrite rod is mounted on a 9mm × 21mm × 192mm wooden platform and held in place with two plastics coated Terry clips. The platform is supported above the main board by two 75mm × 15mm dia. dowelling pillars. The dual-ganged capacitor is mounted below the rod antenna where the ends of L1 come down vertically through two holes in the platform and connect to C1 and C2.

The dual-ganged variable capacitor is positioned centrally under L1, mounted on a small metal bracket, giving a symmetrical and balanced layout. An epicyclic slow-motion drive is fitted to the shaft of C1/C2 and an extension spindle taken to a large knob just outboard of the edge of the chassis. The two leads from L2 drop down to connect to a small 3-way terminal block, where C3 is connected, and in turn to the coaxial cable leading off to the receiver.

Inductor L1 consists of 8 turns of single strand 1/0.6mm pvc covered wire (1.2mm o/d), spaced one thickness apart, wound centrally on the rod. Long tails should be left on the finished inductor to allow connection to C1/C2. A narrow strip of self adhesive tape is then wound centrally over the top of L1, followed by two turns of the same wire, forming L2. It should be noted that L2 must be tightly wound over the dead centre of L1 and is finally held in place with a length of sleeving, see Fig. 2 for details.

While the physical size and overall layout of the antenna are not particularly important, for correct antenna operation the following points should be noted;

(a) L1 and L2 must be in the centre of the rod.
(b) L1 and L2 must be constructed as prescribed.
(c) The rod and windings must be mounted well clear of any earthy elements.

Ferrite Rod—type R-61-050-750 7½ inch × ½ inch diameter, price per order at time of writing $3.50 each plus $4.00 airmail and packing from: Amidon Associates, 12033 Otsego Street, North Hollywood, California 91607, USA.
C1/C2—dual-ganged, 500pF–10pF per section, variable air spaced capacitor, possible supplier J. Birkett. Tel: Lincoln 20767.
L1, L2—Single strand 1/0.6mm pvc covered wire with o/d of 1.2mm, construction see text.
Base board—140mm × 240mm single-sided copper-clad p.c.b. material.
Wood—240mm × 9mm × 21mm (2); 192mm × 9mm × 21mm (1) wooden battens; 75mm × 15mm dia. (2) dowelling.
Feed line—700mm RG58U coaxial cable with suitable plug to match RX.
Slow-motion drive—Epicyclic 1:6 drive fitted with extension spindle and knob.
Miscellaneous—3 way terminal block; screws, Terry clips; sleeving; insulating tape.

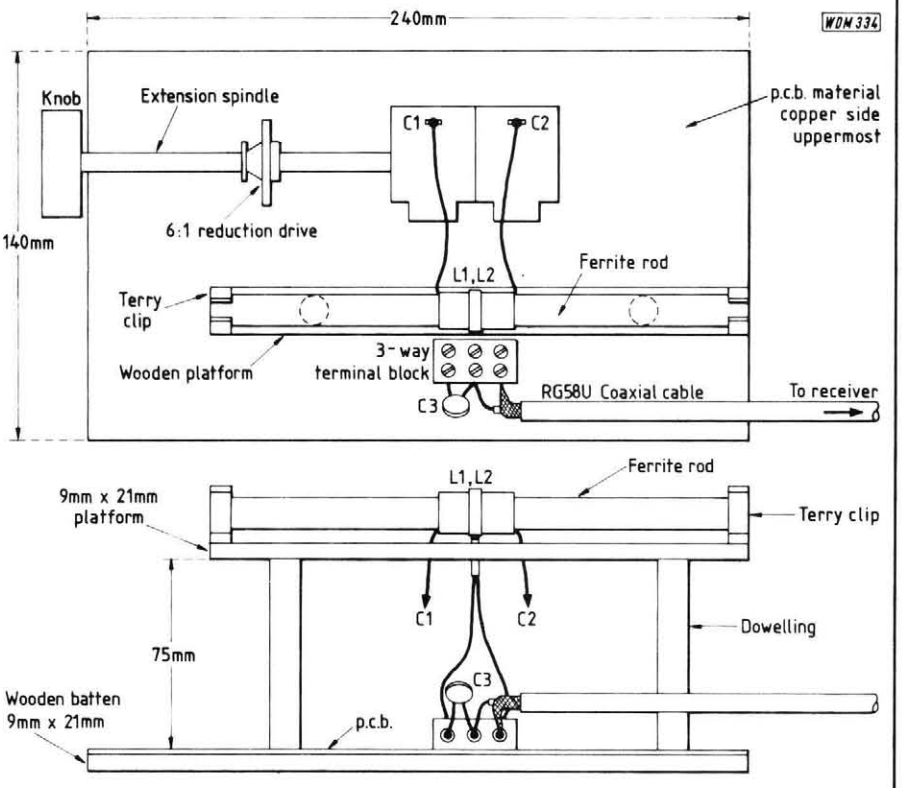

Fig. 3 ▶

(d) The configuration of C1/2 and L1 must be symmetrical with equal lead-lengths.
(e) Alternative types of 500pF dual-ganged capacitor can be used for C1/C2, although this may alter the h.f. performance of the antenna due to the minimum capacitance of each individual device.

The component layout of the prototype antenna is shown in Fig. 3 and although it's certainly not beautiful, it does at least provide an excellent test bed for further experiments. The latest design has now been in service for quite some time giving excellent results on the 14MHz, 7MHz and 3.5MHz amateur bands, as well as the domestic short wave bands below 18MHz.

Conclusion

This has proved to be an interesting project, well worth the trouble of tracking down and importing all the various types of ferrite material, plus all the hours of experimental work; which still goes on. It should be stated that the project described here is still very much an experimental design.

As yet the directional properties of the antenna seem ill defined, although when mastered, they provide a useful means of eliminating both QRM and QRN. However, the elimination of QRM seems to be dependent on the frequency of operation, the effect being far more pronounced on the l.f. bands, with received signals having a low angle of arrival (ground-wave) showing the most pronounced effect.

The antenna has now been used with three different receivers at the author's QTH and only one has needed extra r.f. pre-amplification. ***PW***

SWAP SPOT

Have Photoguide instruction manuals plus special tools, together with 45 typewriters including IBM electric and golf ball types, could be used for spares or working items after minor repairs. Must be collected. Would exchange for 144MHz/430MHz base station transceiver with antenna. Swapper disabled beginner. Ron. Tel: Torquay 0803 62942. *F525a*

Have Howes DcRx80, built, cased and working, also CSL4 filter kit unopened. Also have *PW* back issues 1977 to 1988 (almost complete) with 3 red binders plus 9 inch monochrome TV with loop antenna and 12V d.c. supply lead. Would exchange for 430MHz to 144MHz transverter or w.h.y? Roy Bailey G6WLE. Tel: 0488 39441. *F535*

Have Belcom Liner-2 144.1MHz-144.33MHz s.s.b. transceiver, v.x.o. controlled, 10W or 0.1W o/p. In g.w.o., complete with manual, mic., p.s.u. lead and mobile bracket. Ideal driver for transverter. Would exchange for dot matrix printer in g.w.o., with graphics function and Centronics interface, must take continuous stationery, or w.h.y? Richard G6AKG. Tel: 0202 678558 office. *IH01*

SNIPPETS

As the name suggests a "Snippet" is any small piece of information snipped from the rich fabric which makes up our hobby. If you've a useful idea, hint, tip or wrinkle, that you feel is worth sharing with your fellow amateurs, then send it to our Editorial address. Each lucky person to get his "Snippet" in print will receive a £5 *PW* voucher. The "Snippet" must be original information, and not duplicated to other magazines. We reserve the right to edit or shorten any "Snippet". "Snippets" may also be placed in our Prestel Mailbox 202671191. The ideas that appear in "Snippets" have not been tried by, nor are they necessarily endorsed by *Practical Wireless*.

Did you know that nine 35mm photographic film canisters fit snugly into a Maplin FG00A Double storage drawer? This fortunate combination makes an ideal storage system for all those short-lead prototyping components. Two drawers will give you enough storage space for all the common values of resistor from 10Ω to 9.1MΩ with the canisters marked 10 through to 91. For instance, the one marked 47 will take 4.7Ω, 470Ω, 4.7kΩ, 47kΩ, 470kΩ and 4.7MΩ resistor values. A Magic Marker can be used to mark the value on the lid of each canister. This storage idea can be used for all manner of small components. Empty film canisters are available free from most photographic processing shops.
R.A. *IH003*

PW REVIEW

In this user review, Ken Michaelson G3RDG looks at the features of a pre-production model of the latest rig from Kenwood, the TS-790E all-mode tri-bander. Production units will incorporate certain modifications to the receiver.

The maker's specification describes just the bare bones of the rig, pretty good bare bones nevertheless. It was only when I came to use it that I discovered what an excellent rig it is. This review rig was unfortunately not fitted with the optional UT-10 1.2GHz (23cm) unit, so I only had the 144MHz (2m) and 430MHz (70cm) bands to play with. However, taking the sensitivity as an example, it has a GaAs-f.e.t. r.f. amplifier and an improved type of antenna switching, which combine to give a greater operating sensitivity than I had come across for some time. My antenna system is not one of the best, being a discone which I used for 70cm and a pair of crossed dipoles for 2m, but the performance was excellent. Had there been a single antenna socket with an internal diplexer, I would have used the discone for both bands.

I understand from Lowe Electronics Ltd that the TS-790E can be modified to extend the receive range of the 70cm band, and to that end the review rig had an extra BNC socket on the back panel.

Controls

Emission modes are selected by a column of push-buttons beside the main tuning knob, a change of mode being indicated by sounding the initial letter of the mode in Morse, for example "F" for f.m., and displaying the letters in orange in the main display area. You could, however, select a single audio beep rather than the Morse code by pressing the CW/N button when turning on the power switch. The sound level of the "beep" is adjustable by means of a control under the rig's top cover, where there are also three other controls, for Main Audio Mute, Sub Audio Mute and CW Sidetone level.

The display area is quite something, with no less than 17 different displays surrounding the excellent 7-digit fluorescent frequency readout. The rig is also equipped with a "dual watch" system similar to that fitted to the TM-721E dual-band mobile transceiver which I reviewed recently (*PW* October 1988). This means that any two of the three frequency bands can be listened to at the same time. When using the "dual watch" system, it is possible to use a separate loudspeaker for the subsidiary channel, connected via a 3.5mm jack on the rig's rear panel, next to the usual extension loudspeaker jack. I found this facility very interesting as it was possible to monitor a repeater on one band waiting for a friend while having a contact on another band.

Either the "Main" or "Sub" band could be selected by means of buttons on the front panel, as could the "Band Exchange" function which instantly swapped the two bands over—Main to Sub, and Sub to Main. This is an excellent function, as it is not possible to transmit from the Sub band. The display on the Sub band is similar to the one on the Main band, but smaller, It is still perfectly readable, though.

Both the Main and Sub bands are controllable from the main tuning knob, giving a choice of direct or stepped tuning. The stepped method of tuning is enabled or disabled by pressing a button beside the tuning knob marked CH.Q (meaning "Channel Quick-step"), there being a further option in the alteration of the stepping rate when a key marked STEP on the keypad is pressed. The stepping rate is normally 12.5kHz for the 2m band and 25kHz for the 70cm band in the f.m. mode, and 5kHz for u.s.b./l.s.b. and c.w. on both bands. With the STEP key pressed, the stepping rate alters to 5kHz on f.m. and 1kHz on u.s.b./l.s.b. and c.w. on both bands. The tuning knob can be adjusted for "drag" by holding the outer knob and turning the inner ring, a very useful facility.

A high degree of frequency stability is achieved in the TS-790E by the use of a TCXO (temperature compensated crystal oscillator) as the reference source for the synthesiser. The specification quotes ±3 p.p.m. (parts per million). As an alternative to tuning by means of the main knob, the operating frequency can be entered directly on the keypad.

★ MAKER'S SPECIFICATIONS

GENERAL

Frequency range:	144—146MHz (2m) 430–440MHz (70cm) 1240–1300MHz (23cm)*
Emission mode:	J3E (l.s.b., u.s.b.) A1A (c.w.), F3E (f.m.)
Antenna impedance:	50Ω unbalanced
Supply requirements:	13.8V d.c. ±15%
Transmit:	12A (2m), 15A (70cm) 8A (23cm)*
Receive:	2.5A (standby)
Operating temperature:	−10°/50°C (14°/122°F)
Frequency stability:	(except f.m.) Better than ±3 p.p.m.
Dimensions:	342Wx134Hx369mm (including projections)
Weight:	9.2kg (20.2lb) approx.

TRANSMITTER

RF output power:	Band		
	2m	70cm	23cm*
s.s.b.	35W	30W	10W
c.w./f.m.	45W	40W	10W

Maximum f.m. deviation:	±5kHz
Spurious emissions:	<−60dBc (2m/70cm) <−50dBc (23cm)*
Carrier and unwanted sideband suppression:	>40dB with 1.5kHz mod.
Frequency response (s.s.b.):	400–2600Hz (−6dB)
Mic impedance:	600Ω

RECEIVER

Intermediate frequency (MHz):		Band		
		2m	70cm	23cm*
Main:	1st	10.695	75.925	287.175
	2nd	0.455	10.695	41.415
	3rd	—	0.455	10.695
	4th	—	—	0.455
Sub RX:	1st	10.595	76.925	287.075
	2nd	0.455	10.595	41.315
	3rd	—	0.455	10.595
	4th	—	—	0.455

Note: 455 kHz i.f. used in f.m. mode only

Sensitivity:	s.s.b./c.w.	<0.16μV for 10dB S+N/N
	f.m.	<0.22μV for 12dB SINAD
Selectivity:	s.s.b.	2.1/4.8kHz (−6/60dB)
	c.w.	0.5/2.0kHz (−6/50dB)
	f.m.	12/24kHz (−6/60dB)

Image rejection:	Band		
	2m	70cm	23cm*
	>65dB	>60dB	>55dB

IF Shift range:	More than ±0.9kHz
RIT range:	±1.9kHz (s.s.b./c.w.) ±9.9kHz (f.m.)
Squelch sensitivity:	<0.2μV (s.s.b./c.w.) <0.16μV (f.m.)
Audio output:	1.5W (8Ω,10% t.h.d.)

*The 23cm module is an optional extra.
dBc=dB reference to carrier level.

There is no r.f. gain control, instead two push-buttons labelled MUTE can reduce the gain of either the Main or Sub receivers by 12dB. Separate controls for squelch and audio gain are provided for the Main and Sub channels. The usual Kenwood IF SHIFT control is provided. As I think I have said before, I do not think that this is as efficient as the "passband tuning" installed on Icom rigs, but that is just my opinion.

Memories

There are 59 multi-function memory channels available, all of them backed up by a lithium battery. The memories store frequency, mode, tone information, offset, and information about "quick-step", as previously described. Memories 00 to 29 are single-channel ones, whereas 30 to 49 provide a split-frequency facility allowing the storage of separate transmit and receive frequencies, for repeaters for example. In addition to these there are special memories for each band to set the programmable scan limits, the alert facility, which monitors a pre-determined channel every six seconds, and the call facility, which allows selection of a calling frequency with just one key-stroke. Both memory scan and program scan are available for either the Main or Sub channel, and unwanted memorised channels can be locked out. It is also possible to scroll through the memory channels by turning the main tuning knob, without losing the existing receive frequency information.

Additional features include a reverse repeater switch, and a variety of scan modes including band, memory and programmable scans with the option of carrier operated (CO) or time operated (TO) scan stop. Carrier operated scan holds on the station as long as the signal is there, resuming scanning about two seconds after the carrier drops, and time operated scan stops on a busy channel for about five seconds, then resumes scanning. There is provision for automatic lock tuning (ALT) which is intended to compensate for frequency shift on the 1.2GHz band, but since the UT-10 module was not installed I was unable to check this feature.

The MC-34S 600Ω dynamic microphone supplied incorporates UP and DOWN buttons as well as the usual p.t.t. Using these buttons I was able to change repeater channels without even touching the rig. The review rig was equipped with the VS-2 voice synthesiser unit, which announces the tuned frequency. Unfortunately the pre-production model supplied spoke Japanese!

On The Air

I used the rig for about a month, and during this time I connected it to my Pakratt PK-232 modem for use on packet. This necessitated careful attention to the information given in the very well-presented Owner's Manual. The necessary 13-pin DIN plug to mate with the ACC2 socket on the rear panel is supplied with the rig. Having checked everything, I started operation on 144.650MHz. The TS-790E performed perfectly in this mode. In passing, apart from the normal complement of sockets on the rear panel, there is a control to adjust the "hang-time" on c.w. This altered the time that the rig would remain in the transmit condition after releasing the key. There was also a 7-pin DIN socket for connection to an amateur TV terminal unit.

The TS-790E is provided with a speech processor, but as far as my contacts were concerned, I did not find any reason to use it. I had a great many 'phone contacts all over the 2m band, both in f.m. and s.s.b., and found the rig easy to operate. Operating on 70cm was just as easy, with the added benefit that the band was much quieter. The rig includes the option of cross-band operation and full duplex facilities if so desired, and I tried this out with success. I had not done it before, and found the results quite intriguing. Without exception, I had reports of excellent speech clarity.

Overall, I would consider it an excellent piece of equipment. I well remember my original Trio TS-820 and how long that ran without any trouble, and I felt that this rig would uphold the Trio-Kenwood reputation. For those of you whose interest is in v.h.f. and u.h.f., not mobile but from home, I think this is a piece of gear that needs earnest consideration.

The price of the TS-790E at the time of going to press was £1495.00 inclusive of VAT and carriage. Thanks are due to **Lowe Electronics Ltd., Chesterfield Road, Matlock, Derbyshire DE4 5LE, telephone 0629 580800,** for the loan of the review rig. ***PW***

Packet Radio Update Part 3

This month, Roger J Cooke G3LDI gives us more details on the Eastnet Project as well as other projects in the pipeline

At the latest meeting of the Eastnet project, discussion centred on the equipment to be used and the costing. Actual investigation of the 1296MHz (23cm) linking has been held up due to the licence "procedure" and our original tentative deadline has come and gone. However, it is hoped that by the time this is being read, the link may be working.

The equipment favoured was the Cirkit receiver and a transmitter ending up with a Mitsubishi "brick" (a small black device giving about two watts output), *pin*-diode switching was in a separate box and finally James Miller's 9600 baud modem. Taking bulk buying of bits into consideration, the provision of labour for construction by several of the group, generous with their time, also alignmnent offered by some others with access to the necessary test equipment, it is still not a cheap exercise. By the time the TNC had been bought (along with ancillary bits and pieces such as die-cast boxes, plugs and sockets, antenna and cable, etc.,) the cost will be well over the £300 mark.

However, the resulting improvement in the efficiency of the network should justify the outlay and I think that all internodal linking will be this way in the future. At the time of writing this, we have just heard that the licensing has now come through. Paul G4VLS is at present working on the high-speed modem board, so hopefully the link will be working by the Spring.

New Projects

Several interesting new projects have been described in the Packet Status Register from TAPR, Tucson Amateur Packet Radio organisation in Arizona, USA. The PS186 is a 5-port, high-speed packet switch (>1Mbit/sec) designed by WB6HHV, KA6IQA and N6NKF. The full details are given in the ARRL 6th Networking Conference Proceedings.

Briefly, it is being released as a kit and AEA (Advanced Electronic Applications) have acquired the rights to produce the card commercially. It is built around an 8MHz 80186 processor and up to 1 megabyte of memory. The I/O support is provided by two 8530 SCC i.c.s which are interfaced with d.m.a. (direct memory access). This provides four HDLC/ASYNC/SYNC ports, the fifth being ASYNC only. Also provided are a SCSI port (for disk or multi-board interface), a real-time clock, a watchdog timer and a remote reset circuit. A UART has been added to the board for use as a control port. Kits will be available to those interested.

There have been several articles in the PSR devoted to digital signal processing. Much development work has been done in the USA by people like Lyle Johnson WA7GXD, Bob McGwier N4HY and Tom Clark W3IWI as well as in this country by James Miller G3RUH. Digital signal processing, d.s.p., is a means of processing a signal by digital means. The AMD 7910/7911 i.c.s, such as those used in the Kantronics TNC are examples of applying the d.s.p. technique to packet.

In general, anything you want to do to an audio signal—generation, modulation, filtering, etc.—can be done using d.s.p. The advantages include:

1: Uniformity and repeatability of design
2: One general-purpose hardware design that can be configured under software control to do many tasks.

Known as the TAPR/AMSAT DSP 1 project, it is hoped that it will be available soon. Initial applications will probably include radio modems for such tasks as h.f., v.h.f./u.h.f. and OSCAR packet systems using f.s.k., p.s.k. and other techniques. Secondary functions may include SSTV, WEFAX, RTTY and AMTOR.

Software Section

APLINK is a software system that runs on an IBM PC or clone. It provides an AMTOR mailbox via either an AMT-1 or PK-232 through the serial port. AMTOR users, via h.f., can either enter messages or bulletins to other stations. An additional feature of APLINK is that h.f. AMTOR users can enter messages to be distributed over the National Network. To do this, the sysop installs an additional serial port on the PC and connects this port to a TNC-2 or clone for a v.h.f. packet interface.

With this addition, AMTOR stations can enter messages for relay via v.h.f. packet. The converse is also true, i.e. packet users on v.h.f. can forward messages to h.f. AMTOR stations. APLINK was written by Vic Poor W5SMM and is available for amateur use without charge. Those interested can obtain a copy by sending a formatted 5.25in 360K floppy to Paul Newland AD71, PO Box 205, Holmdel, New Jersey, USA 07733 0205, not forgetting return postage and mailer. I feel that this could be a very useful feature to the international scene. I have been forwarding via packet on h.f. for about three years and have just conducted some tests with VE7DFW. Although he was 10dB over S9 on s.s.b., the only packet we could successfully exchange was the original connect. The polar flutter put paid to any further exchanges. This, of course, does not apply to other paths, but it would seem that AMTOR might have the edge on packet over difficult paths such as this.

Updates continue on both the WA7MBL and W0RLI BBS codes with 5.12 being the latest for MBL and 9.03 for RLI. Even these may be out-of-date by the time this is read, such is progress! W0RLI has two nice features in its latest release. These are a hierarchical addressing scheme and a White Pages server. The hierarchical addressing system looks very interesting and could be a useful system for h.f. operators to adopt world-wide. It uses a two-letter continent designator, three-letter country designator and a two-letter state, province, county or whatever designator. For example, VE3GYQ would be VE3GYQ.ON.CAN.NA. This means that VE3GYQ is in Ontario, which is in Canada, which is in North America. Routing can therefore be sent to an h.f. gateway, basing the routing on additional address information. This would help with forming the forward files.

My addressing would therefore be G3LDI.NK.GBR.EU, which would mean G3LDI in Norfolk (adopting, presumably, the code already used for counties), which is in Great Britain, in the continent of Europe. There are standard codes available for countries published by the International Standards Organisation, the ISO, accepted internationally. It is expected that WA7MBL will be implementing this system in the near future. It can even accept a lower level of designator, below the country level, in our case, so that my final addressing could look like G3LDI.#351.NK.GBR.EU, the hash being the recommended key character for designator below the country level. This would conflict with our

underscroll at present used in our own 1 system, but it's not an insurmountable problem.

Hints for Users

I have often seen mail to individuals from Michael at GB3UP regarding communicating via the DGE onboard UoSAT OSCAR-11. This is a very reliable means of posting mail and I make no apology for reproducing the information again. Hopefully it will save Michael some typing!

There is a regular exchange of mail between the ground-station in Guildford, Surrey (GB3UP) and Adelaide, Australia (VK5AGR), Johannesburg, South Africa (ZS6SAT) and ZL1AOX in New Zealand. The USA remains a problem at the moment (mail for the USA and Canada can be routed via G3LDI) although it is hoped to have a ground-station in California in the near future.

All you need to know is the local mailbox of the addressee. Then send it in the normal way, e.g. if you want to send a message to VK1ABC, whose local BBS is VK9XYZ, just enter SP VK1ABC @ VK9XYZ. All mailboxes in the UK know that GB3UP is the gateway to VK, ZS or ZL, so routing is no problem. Do not use @ DCE, it causes lots of extra work and the message is likely to be delayed in order that the sysop can find out where to send it. Please confine your messages to personal mail only, no bulletins, unless they apply specifically to all the DCE gateways, no REQDIR/REQFIL requests and NO adverts.

That's about it for this month, more next time including news and views from packeteers abroad relating especially to h.f. operation and progress in other parts of the world.

CONTINUED NEXT MONTH

On The Air
On The HF Bands

PLEASE NOTE CORRECTED POSTCODE SY16 1RA

Reports to Paul Essery GW3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA.

As far as my activity is concerned, this month has been all but a complete blank thanks to the intrusion of other, and alas, more urgent activities. However, my spies tell me that the bands have been doing as well as could be expected. At this stage of the sunspot cycle, the best conditions are in fact provided when the negative influences are least, a different situation to that prevailing a year or so ago when a new sunspot could lift things spectacularly.

Forthcoming Events

HA5PP and the XW expedition came unstuck somewhere along the line, so Laos remains well up the "wanted" list for many people. Various stories are circulating: they couldn't get a licence; they got a licence and actually got there with the equipment, but the antennas were misrouted by Aeroflot to Moscow; they got it all together and were then told that despite the valid licence and other documentation, they could not operate for security reasons.

Turning to the 3W DXpedition, it will be recalled that the gang were said to be going on to Spratly afterwards. Well, they certainly activated 3W, but had to admit defeat over the Spratly; but the Russians had the honesty to pass the word that they couldn't crack it in plenty of time for the rest of the world to relax. Overall, this Russian expedition was a good one.

The Laccadive operation seems to have been a bit less than perfect at least from the point of view of Europeans, partly from the point of view of the expedition's announced time-slots for Europe which were not the best, and partly because they didn't seem to have as big a signal as one could have expected.

Now for some better news. The 4W effort so far has been erratic, partly because Hans is inexperienced and has his work to do, and partly because of his antenna problems. However, word has it that the latter problem is in process of being solved and I also hear that QSL Manager PA3CXC is hoping to operate from there and take in at least one of the big contests.

VR6 hardly rates as really a rare one, but it is of interest to note that for the 200th anniversary of the Mutiny on the Bounty, there will be a little celebration. On April 28, between 0001 and 2359Z, all the licensed direct descendants of the mutiny will be operational on 14/21/28MHz. Look for VR6ID, VR6KB, VR6KY, VR6MW, VR6TC and VR6YL and exchange a report and contact number. Send this to: Bounty Mutiny Day, 7462 W Lawler Ave., Niles IL 60648, USA for a special QSL card.

April 11-19 are the quoted dates for a Revilla Gigedo operation signing XF4T; this one has 0H2BH in a team of XEs and OHs, so it should come off ok.

Macquarie Is will be back on the air actively in a few days from the time of writing when Graham VK0GC gets back at the end of March; YL c.w. operator Robin is only intermittently active mainly to work friends back in VK.

A possible new one is being looked at: Marquesas Is. is being worked on by F6EXV and F2CW, though at the time of writing I have neither dates nor callsigns. However, I understand that this one is being put into the sausage-machine for DXCC approval as a new country.

Readers of *The DX Bulletin* (PO Box 50, Fulton, California) now get, thrown in for nothing extra, a copy of the new monthly. *The DX Magazine*. Very definitely oriented to those who are interested in DX and operating techniques, the first two issues to hand are very good indeed.

Geoff Watts

Many people will be aware of the Geoff Watts World Prefix List, and I expect every DX chaser in UK already has a copy. However, Geoff also publishes a USSR Oblast Guide, which carries a map of each of the 184 oblasts, a list by number of the oblasts, a list of oblasts in prefix order, oblasts of three-letter suffix calls, oblasts of two-letter suffix calls, oblasts of single-letter suffix calls, oblasts of pre-1970 active calls, pre-1970 club station oblast list, pre-1984 club-station oblast list. "Victory-40" stations and oblasts, the R 100 0 worked 100 oblasts award, deleted oblasts that still count, future new USSR prefixes, CQ-M Contest Rules, R-150-S USSR Countries List, and CQ and ITU Zone list, on some 13 pages.

Another new one is Geoff's CQ and ITU Zone Guide, which is a companion to the Prefix-Country-Zone list most of us already have. This one lists the DXCC countries alphabetically in each CQ Zone and ITU Zone, including a cross-reference to all the other prefixes and special prefixes used in each country. The other, earlier, Geoff Watts offerings are of course the Country-Zone-Prefix List we are all familiar with, and the DXCC Countries Guide. The double-sided version of any one of the four costs £1, or 6 IRCs, or $3 for overseas airmail.

If you prefer to have the information in single-sided sheets so you can pin them to the shack wall, then the price is £1.25, or $4 or 8IRCs.

Alerting

I have mentioned Geoff Watts *DX News Sheet* and *The DX Bulletin* not because we are giving them a "puff" but rather to answer yet again the newcomer's everlasting question . . . how to get to know what is planned in the way of rare or new countries. Alas, our monthly status is such that we couldn't expect to mention everything; between me shipping the material to the office and the reader opening his copy, at least half the interesting ones have come and gone. Hence I was interested to notice that G3XTT has written to remind us that 144.525 is being used as a DX alerting frequency, just as for instance 28.665MHz tends to be used to alert 6 metre operators to an opening. This started in the Thames Valley years ago, and has spread to many other parts of the country. So—listen on this channel for the very latest in DX information, and of course, if you have spotted something of DX interest, pass the word along on this frequency; even if nobody seems to be on it there will be pairs of ears listening and the word will get round. What a pity, though, that those of us at the bottom of valleys can't make use of this, thanks to the mountains all round—but maybe someone will pass the word over the landline in such cases. The principle is important, as is the use of the given frequency, so that all get the message.

Letters

First, a nice one from **G4DYO**, better known as the Editor of *DX News Sheet*; this one mentions some QSL addresses needed by PA3CWN: HD8EX to PO Box DX, Cuenca, Ecuador; EL7U to OH2BN, Jarmo Jaakola, Killet 5 C 30, 00710 Helsinki, Finland; D44BC to Julio S Vera Cruz, Box 36 Mindelo, Cape Verde Is. Unfortunately, 3AOM was our old friend Slim. P4OR to K4UEE Robert C Allphin Jr, 4235 Blackland Drive, Marietta, GA 30067, USA; 6V6A was a special from Senegal for the contest, and was to F2CW, J. Calvo, Le Bois D'Essard, Nercillac, F-16200 Jarnac, France; SU1ER between Jan 31 & Feb 3 (1988) via WA7LNM, October 24/25 and the CQ WWCW to N6CW, otherwise to Ezzat Sayed Ramadan, POB 78 Heliopolis 11341, Cairo, Egypt; KP2A also to N6CW, Terry F Baxter 4639 Katherine Place, La Mesa, CA 92041, USA; and FM5BH via W3HNK, Joe Arcure Jr, PO Box 73, Edgemont PA, USA. Doubtless this list will have helped others too.

Top Band

Anyone who can brew up a competitive signal on this band in a postage-stamp garden has to be pretty smart technically. **G2HKU** stuck to c.w. and found YT2R, PA3DQW, OK1KRG, GM3IGW, ON4XG, UQ2GM, I4EAT, UP1BWR, DL0FJ, OH0AM, HB9BIN/P, I4EML, HB9CIP, HB9CVQ, F1JDG, PA0LOU, UR2RGN, OK5TOP, ON6CW, EI9FK, GM3NCS, PA3CMG, PA3CEF, PI4DEC, PI4FRG and HG0D.

Nice to hear again from **G3BRD** (Seaford); various things have kept John's activity low, but he is now back on the band with a TS940S and all the filters, to add to his totals; J52US, UM8NC, UI8BDK, UD6DC, UF6FDR, UA0WX, UA0YA (Zone 23), UA1OT, VK5BC, VK6HD, 9M2AX, VU2IN, ZS5LB and PY1RO made the total countries within two years of starting on the band 132, with all CQ Zones but one worked—though the grapevine says John has in fact since completed the set! January 26/27 was noted for a very good propagation, with some 25 W states worked, including W6, YS1GMV, YV3AZC, KP2R and KX6DS.

Next we come to **G3MRS** (Cooden) who is making the effort to return to the bands after a 34 year layoff. Initially, activity will be on c.w. and, as Rex says, initial attempts at 7MHz c.w. reception on the BC reciever are good c.w. practice. However, the SPR4 is now being used and listening to Top Band on an antenna comprising a wire from the RX coupled to a bull-dog clip to a length of curtain rail; headphones are ex-RAF helmet type. On

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AX 700E

AT LAST – a scanner from Standard! For longer than I care to remember people have been asking why Standard do not make a scanner – well now they do. Unfortunately I only have a Japanese leaflet here in the shop, so I can't tell you too much about it, but you can see from the photograph that the AX 700E has maintained Standard's reputation for innovation. The strange looking liquid crystal display not only shows the frequency, mode and so on, it is also a panadaptor! For those of you who are new to scanning I had better explain what that is. The vertical line on the left hand side of the display is to show signal strength and the horizontal line along the bottom is the frequency range. This range can be set to 100, 250 or 1000kHz. The frequency displayed at the top is the frequency at the centre of the line. In other words, if the displayed frequency is 145.50MHz and the width of the display is set to 1000kHz, then the left hand side would be 145.00MHz and the right hand side would be 146.00MHz. Now comes the magic. Every time a signal comes up within that frequency range (i.e. 145-146MHz), it will show up as a spike on the display. The height will show the signal strength and the position will indicate the frequency. By simply turning the tuning knob a cursor can be slid along to line up with the new signal and its exact frequency will be displayed at the top of the screen! To receive the new signal, just press a button and that signal becomes the one that is heard and the display will shift to place it in the middle of the screen. The width of the spikes is governed by the setting of the step size (10, 12.5, 20 or 25kHz) so you can see that it is possible to monitor the activity on up to 100 channels simultaneously. If, for instance, you are looking for a specific signal but you only know the band that it is in and not the spot frequency, just set up the appropriate band edges and then sit back and watch the display. Any signals that then appear can be instantly spotted and tuned to in seconds. That's what a panadaptor can do for you!

As for the rest of the scanner, it covers 50 to 904.995MHz with AM and FM (wide & narrow), it is powered by 13.8V dc and it measures just 180mm W × 180mm D × 75mm H. There is a lot more to it but I can't decipher Japanese, but we should have some English leaflets by the time that you read this ad. and maybe even some radios, so come into the shop and see for yourself. You can even play with our new active antenna which should be ideal for use with this set.

Norman G4THJ

£575.00 (PSU EXTRA)

C5200

This new generation dual band mobile transceiver is virtually two radios in one box. 70cms and 2m each have their own displays showing frequency, S-meter and so on. Both bands can be heard simultaneously through the built-in speaker or through one or two external speakers. Each band has its own Volume and Squelch controls and there is also an Automatic Mute control that can mute the audio from one band while the other is being received.

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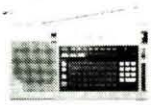

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NORMAN G4THJ

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Currently we have just 25 of these highly acclaimed 2m handheld transceivers left in stock. The original selling price was £239, but for this month the special offer price is £195.

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THIS MONTHS SPECIAL OFFER

s.s.b. G4PC and G3JEP have been noted, plus UA3PAU on c.w.

G3HZL uses his eighty-metre dipole strapped for Top Band, against earth; this yielded c.w. contacts with EA6ZY, EA8QO, CT1A0Z, LA2UA, OY3QN, UP1BWR, UQ2GM, UQ2RGN, VK4CY/MM off North EA, YU2TS plus plenty of small fry.

The 3.5MHz Band

If you can work DX on this band you know what it's all about. First you have to have the antenna, secondly you have to have a good attenuator in the receiver line and thirdly a pair of cast-iron ears. Of course you have to contend with conditions, absence of propagation, no rotatable antenna and umpteen other things, but these are inded just minor!

TF3EJ sticks to his key most of the time, and on 3.5MHz (80m) he mentions SM6PXJ and TF3GBN.

G0HGA (Stevenage) mentions many contacts on c.w. with her 20 metres of wire and 15 watts or less. Some thirty or so nearer Europeans, plus OK1ATT, SP3CCT, LA3X, HB9DGZ, LA0EP, SP9DBA, UC2AJF, LA9LE, HA3OD, CT1BQH, SM7PZX, the SM7GWF net, SM7KJH and HB9DLF; and of course some twenty-two G and GW stations.

Turning to G3HZL Don's c.w. went out successfully to CT3CU, EA6ZY, PJ9JT, SV0AA, TK5CW, K2LE/VP5 and lots of Ws, in all areas save W6/7.

Again c.w., this time from G2HKU who offers K4PQL, W1KM, K8HVT/1, KY1H, N2FB, W3LPL, W3BGN, K3OO, NR5M, W2RQ, W1FV, N3RS and N8UM.

The 7MHz Band

GI0KOW mentions a c.w. contact with UA1ZBM and OK2BOE, plus 'phone to VE3YJ, JX1UG, UI9BWE, UA4LCQ/UG, UZ9OWC/UG (Armenia), GU3EJL, HH7PV, RA9FCB, JY9LC, TG9AKE, HJs, CM5JE, YV, HK0NAF, HK0NZY (San Andres), the Pick of the Month in VP8BUO, YC0ODQ, PT7WX, VO1SA and many others.

TF3EJ mentions c.w. contacts with K3IK, KI1K, GM3BST, GM3LGM, GW4VIB, EA2NF, OZ1TL and SP3CUQ.

Angie G0HGA has a long list which included UB5LBG, CT1BQH, VO1BE, IK1JPW, HA1AG, YU2CKH, EC3CQL, UA1UBV, UA3UCL, I2RGF, OE5MSM, HA7UL, YU5DX, YT3GP and loads of nearer EU and UK stations.

Now to G3MRS's listener report; Rex mentions DLs, various Gs including G0GMH on QRP, a gaggle of Italians including IA0PS, PA3AXZ, SM1REJ, SP3BY, UW3EG, UB5CHB, UA9CM, YU4ETM, Y81ZH, YU4FRS and YU1TM. Considering the antenna arrangements currently in use, that is quite a collection!

G3HZL now; Don mentions CO2HT, CT3CU, EA6ZY, FY5YB, W5PWG/J8, PR7PO, PJ9JT, UA9MEA, all W call areas, VEs, V31BB, ZL1AH, ZL3ADX, ZL3GQ, SV0AA and all the usual EU stations.

Yet another c.w. addict; G2HKU stuck to this way to hook K2SHZ, CT3CU, K2LE/VP5, N3EA, W1WEF, K3ZO, N3RS, EA6ZY, K4EWG, K1SS, N2DAN, WB4CSK, N2UU, K8CW, K1AR, K2SG, VP2V/KG6WI, and VE2HQ.

The 14MHz Band

G3NOF notes the openings on the long path to VK and ZL, 0730-1000; Asians were noted between 1500 and 1900Z, with s.s.b. contacts registered to DL5UF/KH8, HC5EA, 3W0A, 3W4KZ, 5H3RB, 6T2MG and 9M2QR/P.

As for GI0KOW, Robert mentions C31LHK and OX3DD for a new one as his only contacts on the band.

Angie at G0HGA uses either a half-wave vertical or the end-fed. This and the QRP yielded K2UR, plus IK1ATK, DJ1TX/A, DL6ZBA, DL3BCR, DL8TQ, DK9UP, GB2SM, F6DLX, DL3IE and IK2ILI.

A very long "heard" list from G3MRS, which prunes down to AA4AX, CX1MG, EA9PNB, IS0XBL, JX1UG (Jan Mayen), J73EH, JE8KPQ, JA1ITU, KP2JA, K3RN, KP4L, K2JBD, K4FAD, LG5LG, NR1N, NB3Y, NS4L, PY2ZHV, PY2FR, PY2TN, TR8H, VK6GZF, VE2IB, VE3EJW, VO1WH, VE3MVP, VE1FW, VE3HI, VE3ICR, VE3UDX, VE1VAE, VE3YME, WA4UCI, W1CK, W3OG, W4JNE, W3FM, W7MG, W3LK, W2RSL, W6OUS, WB2ULI, W2EVW, W2HGX, W2RNH, WA1EFX, YU2SF on QRP, ZS1AU 4X6RA, all except the ZS on c.w.

Now to TF3EJ; Jakob found KI1B, SV4AAQ, LU3XPM (Cape Horn), KA1LWR, N4RTE and Europeans including several Gs on c.w., while on packet HB9BXZ was raised, plus RTTY to EI9CB and F8XT.

G2HKU used s.s.b. for his regular ZL3FV contact, but reverted to the key for contacts with JH0FFE, EA6ZY, W1RM, K2LE/VP5, VP2MT, K2SHZ, LU9DHT, HC3AV/5, VE3SRK, NQ6S, PJ2/W1WEF, NI6W and KO7N.

Once again it was c.w. all the way with G3HZL; Don hooked G4BUV/MM off Mexico/Gulf of California, JE1CKA, JE1CKL, KP4L, KL7PJ, W7R1/KH6, PR7PO, UA9AS, UA0BDO/UA10 (Franz Josef Land), VK2BPN, VK3QU, VK3RAN, VK2AXR, VK6ZE, VE6BPR, VE6AO, VE7XH, all USA call areas, ZC4JL, VK5AF, VK3XB, VS6DO, ZS5WT, ZK1XE, 4Z4OX, 9J2BO, ZL2TX and K2LE/VP5.

The 21MHz Band

G3NOF notes the short path to VK/ZL/JA has often been open 0900-1200Z. A few Africans were noted in the mornings, North Americans were around 1130-2130 and followed by a few South Americans. Contacts on s.s.b. were booked with DF2UU/KH8, FM5CW, HL5FEE, KM7E, UA1OT (Franz Josef again), VE8CB, VK2XG, WB7CHS, ZL1BQD and ZL4BMC.

Now to G0HGA; Angie is still at the 15 watts mark, and only netted YO8BOI, UA3ZJG, RB5MP and UA3LHA as a result.

Over in Armagh, GI0KOW found RA2FM, UC2BS, SV1AIN, KA8YSW, VE3PRL, KD8RP/TF, KS1T, 9J2BO, UI8AFN, UL7AAC, V47RF, VP5/G0AZT, ED0MA for a special-event station, and UA9UDC.

G3HZL has a few QSOs on offer; EA6ZY, CT3CU, PJ9JT, JA3IL, VK4XA, VP2EXX, VS6DO, all W districts and K2LE/VP5.

TF3EJ mentions F6GID, F6BAJ, OE3HM, various OHs, some G stations and N2EG on c.w., while on RTTY there were UT5RP, DL8OL, W4WEB, EA1ANT and YI1BGD.

Finally we turn to G2HKU: c.w. contacts with W1FJ, K3ZO, K1AR and W3LPL.

WARC Bands

More reports than usual. G2HKU keyed with W1BYH, W6ZO, K3KK and PY1RN all on 24MHz.

G3HZL offers on 10MHz: JA6GIJ, W5PWG/J8, VE3MFN, W1PL, W1FZY, K4CRF, W7EXR, K8DJF, KY9L, W1MK, VE8ID, WI6I/1, UA0BDU/UA10 (Franz Josef), ZL4QO and lots of EUs. As for 18MHz, there were EA6ZY (he must like Stan!), Gs, VE1BB, VE3FGU, N2DAN, N4OL and Europeans. On 24MHz, G3AZ, Ws, VEs and VK.

Turning to TF3EJ, Jakob found on 10MHz c.w. VK5FE, SM4IDB, GW3KFA, G3ID, F3IU and PA0CQ, while on 12MHz DL2ECQ, SM3CFV, HB9DGV, G2KI, GJ3EML and VE3FBG were raised. As for 24MHz, that gave him VE3WZ, W9SFB, K3DV, W1BFT, W0CM, K9CVM, EA8AB and EA6BD.

The 28MHz Band

Whilst I was listening to a couple of Gs discussing Spain for the holidays, and musing that for me somewhere like Iceland or OY would be much more interesting, the post arrived and a letter from TF3EJ (Gardabaer, Iceland). Jakob notes that his interests are c.w., RTTY and a bit of packet. On 28MHz his signals went out to YV5AE, Ws assorted, AB0M/QRP, EW2CFZ, IK2GOO all on c.w. Jakob may also be heard on occasion operating as TF3EJ/5. The rig is an FT-707 at about 25-30 watts, into dipoles or a vertical; a Cushcraft vertical is at hand but at the time of writing awaited better weather for erection. Jakob says he enjoys the WARC bands, 10, 18 and 24MHz and wishes more people would report on these allocations so he can compare his own results.

GM4ELV found, with five watts input, EW2AB which turned out to be UC2-land, SV7CO, JY9SR, IB8A, all W call areas, A22RA, VS6CT, VS6HF, DK8OT/C6A, 7X2SX, ZS6TLV, 3DA0BP, LU7JP, HC5CL, PJ2WG, HV3SJ, 8P9AF, VU2RX, VU2GUY, XX9CT (Macao, QSL via KA6V), YIs, 8P9EM, 3W8DX, DU1KT and of course plenty of smaller fry.

Having kicked off with the real QRP merchants, let us turn to **G3NOF** (Yeovil) back on the bands after a rig problem; Don found the band open around 0900 for short path JA/BY/BV. A little later some Pacific stations were heard, and on a few evenings KH6s were noted in the evening. North Americans were about from 1130 to sometimes as late as 2130Z; those below 28.5MHz often running low power and simple antennas. South Americans were noted around 1900Z. QSOs using s.s.b. were completed with CN8FC, FM5CW, FY4FC, HK0HEU, HP2/KC4BFK, JA3MDG, JA5QJD, JA7OWD, JH1IZA, JH3UHG, JH4XTN, JY5DL, K6MEF, K0GVB/C6, KH6IJ, KH0AC, KL7U, KW7E (Arizona), N6GJI, UA0WW, UZ0SXF, W5TIY/TI2, W6VIG, WA3KOG/KH6, WO6T, XX9CT, YI0VP, YJ8JS, YS1OD, ZD8JP, 4U1UN and 8P9AY.

A first letter from RNARS member G3HZL (Stoke-on-Trent) now safely operational from the new QTH and pretty active with 93 countries worked since arrival. He mentions c.w. contacts with CT3CU, EA6ZY, JA7NUZ, JF6TEI, PJ9JT, PT2ZDR, VP2MT, K2LE/VP5, VS6DO, OY3QN, VQ9DM, lots of W/VE, YB0BAQ, YC0UNC, Z23JO, ZS5BK, ZS6AL, UA9, UA0, XE2JNE, 9J2BO, plus s.s.b. to W, VE, Z21GU and ZS5DC.

Next **G0JBA** (Sittingbourne) who has been doing lots of overtime so little operating; however Phil did manage s.s.b. to K1IEK, N6DKP, NM5Y, PY3TD, RB0HZ, UB5JRR/RB8R, WA2YFB, WH6ACF, and ZC4RF; as for c.w. that turned the trick with KA4CLM, KA9HFF, OH8MDI and f.m. managed WD8BRZ.

GI0KOW (Loughball, Co. Armagh) comes next; again a new reporter to welcome. Robert mentions that he and others notice that there has been a tendency for stations to try to run high power on the band with consequent splatter. While it is generally true one feels that the main culprits are receivers of poor dynamic range on the one hand, and these horrible solid-state output stages which just aren't adequately linear at their rated output. Be that as it may, GI0KOW raised TG9NX, I5JHW/VP5, VP9BO, CU2BR, CX1PG, OY9JD, XE1PCP, WB7VMD (Washington), W6PAG, WA6BIL, AP5HQ, ON5NT/6W1, ZF1HJ, AP2JZB, OH0RJ (Aaland Is), UV3CC/UA1P (Franz Josef), UA9AKL, a raft of JAs where the propagation turned from long to short path half way through the string, VK4FWH at twenty over the nine, TN4NW under a king-size pile-up and hence a Gotaway, UA9BEK, BY5RT for a first Chinese contact, SV2ADP, more JAs, UD6, EA9KG, UF7, G4DUW/DU1, on both 'phone and c.w., KP4FR, OX1O for a first with Greenland, VE6VVS, VP5/G0AZT, CO7ER, V21YL (Antigua) and NP2CM (St. Croix) Robert's very welcome report also mentions that he now has some 130 countries worked on this band, 90 on 7MHz and a total overall of 147. That we reckon makes a pretty good start to a DX career

Now another QRP operator: G0HGA (Stevenage) has a maximum of 15-20 watts when the p.s.u. behaves, but with that she made it to RA3AOD, UW6NY, UA3PIP, YO5YJ, YT2ZO, 4N7EC, WB8JYF, W3ZX, NF5Z, W1UD and VP2BPZ.

For G2HKU (Sheppey) it was all c.w., LY2ZO, N4AR, K5MA/1, K6DC, TA7A, 9J2AL, HK3RQ, N9SW, K1HZ, WB4CSK, K4BAI, K8MFO, W6DU, K5MM, N3RS, PJ9JT, W5XJ, K4FU, K8EJ, K4FW (Mister Ten-Tec himself), K5ABW, K2LE/VP5, K4II, W4DHZ, LU9CV and WA1ZAC.

Points From the Post

G8PG refers to the G-QRP Club Winter Sports results. Some 35 countries were active with QRP, plus SM6YF using two watts from MV *Tosca*. On the h.f. bands many people got across the Herring Pond; G4BUE and AA2U worked each other directly on seven bands plus a cross-band on 18MHz not yet available to USA. VS6VT was worked by several Gs, despite the local hazards posed by fishermen who pump the output from a CB set into badly adjusted 1kW "linears" which sometimes manage to wipe out both 28 AND 21MHz! G3PDL got his three watts across on Top Band too. albeit with QRO at the US end. Shades of G3ERN's first transistor rig!

Now to an award. The G2DX Memorial Award is offered by Farnborough Radio Society. From within one's own continents, one must work 100 countries outside one's own continent. Only contacts after March 1986 to count. No QSLs required but the usual GCR list and certification by two licensed operators or a leading club official. No band or mode constraints but the award can be endorsed for single band, mode, QRP or whatever if required. Cost is £2.50, five US dollars or 8 IRCs, and applications go to IF Ireland G4BJQ, c/o Farnborough Radio Society, 118 Mytchett Road, Camberley, Surrey GU16 6ET. Cheques, etc., payable to Farnborough Radio Society.

In a letter from G3KPO, the curator of the Wireless Museum, Doug indicates that one of the Museum's needs is leaflets of the sort that manufacturers used to hand out at Radio Shows years ago . . . can anyone help, please? Send to D Byrne G3KPO, 52 West Hill Road, Ryde, Isle of Wight PO33 1LN.

Now a letter from WAB's G8XTJ. John says that the Overseas Bookholders Award has stimulated a great deal of activity on HF bands. The idea is that WAB bookholders outside Great Britain and Northern Ireland are to be worked; to gain the award you have to work ten of them. One good place to look is around 28.666MHz where there is frequently a WAB net active. Even if you don't hold a book, you can join in and maybe give someone a "rare" WAB square, for little more trouble than that of looking at your square in the AA Handbook map section —unless you are close to a borderline in which case it might be tricky. But—it's good fun and a good cause too.

Finale

Thanks for all the nice letters and news this time. Please keep 'em coming—I love it!! CUAGN.

The next three deadlines are April 26, May 31 and June 28

VHF Up

Compiled by N. A. S. Fitch G3FPK.

Many readers are very pleased with their v.h.f. results so far this year. After last month's deadline, tropo conditions continued to be much better than is usual for January. At the end of the month the pressure reached 1045 millibars. By contrast, on February 25 it was down to 952mb at G3FPK with a rock bottom value of 948mb a little further south, the lowest in the area for 120 years. The 50MHz band has brought some excellent DX and with it a few propagation puzzles.

VHF Convention

Usually by this time full details of the RSGB's popular VHF Convention have been passed to me but all I can tell you is the date, Sunday April 16. The venue is the Sandown Park Racecourse in Esher, Surrey.

Awards News

Congratulations to **Julie Yates G8MKD** from Warley (WMD/ZM41h) who was elected the 88th member of the 144MHz QTH Squares Century Club on February 1 with exactly 100 squares confirmed. First licensed in Sept 1976 when still at school, her first transceiver was an Icom IC-202E with a 20W amplifier until 1980. The present station comprises a Kenwood TS-770 and 50W Microwave Modules amplifier. Various antennas have been tried, the current one being a 9-ele Tonna Yagi at 6.1m a.g.l. The QTH is 200m a.s.l. with a good take-off from north, via east to southwest, but poor to EI and GI.

Commencing with July *PW*, "VHF Up" will be compiled by David Butler G4ASR, Yew Tree Cottage, Lower Maescoed, Herefordshire HR2 0HP

Ninety-eight QSOs were on s.s.b. and two on f.m. mode. Eighty-five squares were worked on tropo, including EA8BML (IL27) and EA8ACW (IL28) on 9 Sept '88, nine in Auroras and six in Sporadic-E openings. Julie is also QRV on 50MHz and 430MHz, including TV. Plans for this year include getting a telescopic tower, new antennas for all bands, Heliax feeder cables for 144 and 430MHz and the enabling of 4CX250B amplifiers once her antennas are clear of the local television ones.

Paul Pasquet G4RRA (SRY), member number 86 of the 144MHz QTHCC, has submitted 24 more cards to earn his 250 sticker. Seven QSOs were on tropo, eleven via ES, three each by Aurora and m.s. Sixteen contacts were on s.s.b. the rest on c.w. Most of the cards were for really good DX and I select UO50B (OF) on s.s.b. on 7 June '88, UO50IW (OG) on c.w. on 10 July '88 and YO2AVM on s.s.b. on 27 May '88, all via Es; HG1WD (IH) on c.w. on 20 Sept '88 by tropo; SK7JD (IR) on c.w. on 27 March '88 via Ar and TK5EP (EB) on s.s.b. on 12 Aug '88 by m.s.

Please do not send any more awards claims or requests for information to me. If I do receive any from overseas readers I will readdress them to the new editor of *VHF UP*.

Beacon News

The Winter Newsletter has been received from the Kent Repeater Group and I noticed a statement that permission has finally been obtained to put the 70MHz beacon GB7REB on the air from the GB3RE site. The latter is a u.h.f. repeater located in Rochester, G4AKQ being its manager. No other details were given but I thought the GB7 prefix was for packet radio relays.

In the January *VHF UP* I mentioned a 50MHz beacon in Greece. From the March issue of the IARU's journal *Region 1 News*, I see that SV1SIX has now been licensed for 50.040MHz. The power is 25W to an omni-directional antenna, horizontally polarised and the site is on top of a 1100m hill near Athens.

French VHF News

Clyde Hinton G1TCH (SXW) has struck up a correspondence with Pierre Redon FC1ADT (ZE) from whom he has obtained a good insight into v.h.f., u.h.f. and s.h.f. activity in France. After paying tribute to British operators for their good QSLing record, Pierre writes that he ". . . is looking for a competent person in England with whom he can exchange v.h.f./u.h.f. infor-

mation efficiently between our two countries."

The French national society REF has been reorganised and will be moving to new premises in Tours. A group of 18 volunteers from each area of the country has been formed and they meet several times a year at REF headquarters. All are keen operators, using s.s.b. and c.w. only, who activate rare and difficult squares on 144, 432, 1296 and 2320MHz. However they ". . . feel isolated from v.h.f. developments in northern Europe."

Pierre states that the Spanish v.h.f. operators also feel somewhat isolated, so a meeting of French and Spanish amateurs has been planned for April 30 and May 1 in San Sebastian to discuss joint activities. Some of these are covered in the following DXpedition Notes section.

Clyde has a list of the 18 correspondents showing the Departments and locator squares for which they are responsible and another of all the French contest dates from the January issue of *Radio REF*. The address of FC1ADT is Casseuil, F-33190 La Réole, France. I hope these notes will inspire UK v.h.f. enthusiasts to contact Pierre and his friends either direct or through G1TCH. Clyde can be contacted c/o 17 The Dewpond, Peacehaven, E. Sussex BN10 8EE.

DXpedition Notes

In his letter to G1TCH, FC1ADT mentioned that EA2AWD plans to operate -/MM in the Golfe de Gascogne in June from "wet" squares IN74, 75, 84 and 85 or XE, XF, YE and YF if you prefer. Pierre will be lending him his 1.3GHz station. 430MHz operation is contemplated and presumably 144MHz. At this time of the year tropo contacts into the southern region of the British Isles should be possible and Es propagation to more northerly latitudes is likely.

Looking ahead to next year a multinational team plans to activate IN52, 53, 63, 73, 83 and 93 in Spain and IN61 in Portugal. Pierre sent some photographs of previous DXpeditions including one to the Granada district in Spain. Amateurs pictured were EA7AYD, EA7XY, FC1ADT, F5WN, F6CIS and F6FHP. FC1ADT operates regularly from IN94 and JN15.

Amstrad Computer Programs

I have been getting a steady stream of inquiries for my amateur radio software for the Amstrad PCW8000 series computers. This has generated some interesting correspondence with readers from as far away as New Zealand. A recurring request is for RTTY and packet radio programs but I neither have nor know of any in CP/M Plus. Can anyone help?

I have extended the LLNGR program which works out the National Grid Reference from your latitude and longitude. This now displays the Maidenhead locator for anywhere in the world and the European locator if applicable. I am constantly adding new programs and improving existing ones so if anyone wants an up-to-date list please send an s.a.e. to my home address.

On looking through some back issues of *DUBUS* Magazine I found a short program for calculating receiving system performance which I have adapted for the Amstrad and call RSP. In spare moments I am typing in the High Performance Moon Tracking Program by WA1JXN from issue 1/86 which occupied nearly ten pages. The task should be finished by the time you read this, and I have identified it as MOONTRAK.

I have the latest 60 page *Software Source News* from the Public Domain Software Library listing PD and Shareware for IBM PC and CP/M. There is a two page "Ham Radio" section for MSDOS and IBM PC which includes various RTTY, Morse and packet radio programs. They offer a Disk Format Translation Service and can copy between most machines from Acorn to Zenith. If you send two first class stamps they will send you the catalogue; Winscombe House, Beacon Road, Crowborough, E. Sussex TN6 1UL is the address.

On the subject of disk translation, **Peter Hunter G0GSZ** (NOR) mentioned a program called MFU, a Multi Format Utility which reads the format of other machines' software such as the IBM and BBC series, and makes the PCW emulate them. It may be in the PD but I have not had time to go through the PDSL catalogue to see if it is available. Peter writes that there seems very little difference between Microsoft BASIC and Mallard BASIC and that programs written in the former can be entered in the PCW with few, if any, changes.

Nets on 144MHz

My very first use of 144MHz some 25 years ago was in net operation on one crystal controlled frequency using an old Pye Ranger on a.m. The purpose of this net was to alert each other about any exotic DX appearing on the h.f. bands. There are scores of nets, many of them once a week local club sessions or AMSAT ones, for example.

Don Field G3XTT (OFE) writes, "I have been charged by the RSGB HF Committee to increase the awareness of 144.525MHz as an h.f. DX alerting frequency. The use of .525 for this purpose started some years ago in the Thames Valley area and has subsequently spread to a number of other areas of the country."

Don says there is no "official" endorsement of this net and its users are certainly not laying any exclusive claim to it. However, its use is now being extended to alert people about any 50MHz openings in the same way that 28.885MHz is in the 10 metre band. He hopes that operators will inquire if the frequency is in use before starting a QSO in case there is any traffic in progress. This sounds very reasonable to me but prompts a few comments.

First the Band Plan recommends this part of 144MHz be non-channelised so why does the majority seem to adopt a 25kHz channel spacing? Second, packet radio activity is increasing a great deal and spreading up and down from 144.650MHz. Consequently f.m. users feel they are being squeezed out of it. Third, far too much deviation is being used by many f.m. operators while some of the packet transmissions are so dreadful that a T3 report would be generous; and they drift badly.

Deviation can be reduced by adjusting a preset control inside the transceiver—the handbook should cover this anyway. Rough notes and drift could result from an inadequate power supply. Some seem to either have little, if any, smoothing or perhaps they are being continuously float charged by a very crude and basic old charger.

Contest Notes

The 70MHz Fixed Station Contest is on April 23, 0800–1400UTC. The two sections are F for Single-op and O for All other, which must mean multi-op. Usual radial ring scoring with county and country multipliers. Entries to G8HHI at 43 Bartons Drive, Yateley, Camberley, Surrey GU17 7DW.

The May 6/7 weekend sees the IARU/RSGB 432MHz to 24GHz Trophy and s.w.l. events. Times are 1400–1400UTC and I assume the rules are the same as for 1988 but I cannot tell you where to send your entries. The second leg of the 10GHz Cumulative Contest is on May 14, but I regret details are still awaited.

Finally a reminder about the monthly Scandinavian contests. On May 1 there is the microwave session, on the 2nd the 144MHz event, and on the 4th it is for the 430MHz band. The times are 1800–2200UTC.

The 50MHz Band

The latest issue of **Hal Lund's ZS6WB** ZS VHF News received is number 89-02 dated Feb 19. He reports that Z23JO worked into 9H1 on Feb 12; T70A and T77C (San Marino) are active mostly at weekends 1300–1600 on 50.01MHz, coordinating on 28.885MHz. They are limited to c.w. in the lowest 20kHz of the band for three years; several Swedish stations have permits and are now active; TU2MA is a new West African station who appeared about Feb 11; TR8CA is QRV with 0.5W to a 5-ele Yagi with TR8BL probably on by now; 5H1HK is active but his beam is fixed on Japan.

Next a bit of history sent by **John Tye G4BYV** (NOR) cut from the *Short Wave Magazine*, "Flash—Six Metre Opening, 20–23 November 1947. During the period November 20–23, the 50 "megacycles" band gave several openings, promising good conditions for the week to November 30. VE1QZ was worked by G5BY, G5MQ and G6DH, and W7FS/MM, 1000 miles east of Cape Hatteras, by G5BY and PA0UN. On the afternoon of the 22nd, G6DH had a splendid contact with VE1QZ on 6 metres—the transmission was relayed to the Amateur Radio Exhibition, and VE1QZ was able to exchange greetings with those at the show. By 1540 that afternoon, G6DH had worked nine Ws, and several Gs are known to have had a very successful session. G5ZT had 35 two ways with Ws on the 23rd."

John also enclosed a clipping, "Five-Metre Firsts." Up to the start of World War II we had 56.02–59.98MHz and afterwards, till the advent of Band I TV, 56.00 to 60.00MHz. The list starts with G2FA/F8NW on 29/3/36 and then shows countries worked by G and GM stations as I, PA, FA8 (Algeria), HB9, SM, OZ, ON, OK, ZB1 (Malta) and ZB2. I really must disinter my old *SWMs* from the cupboard under the stairs and re-read the v.h.f. reports of the immediate post war era.

Now to your reports starting with **John Acton G1DOX** (AVN) who uses a Yaesu FT-690, B.N.O.S. amplifier with RX preamp and a 4-ele dual band 50/70MHz Yagi. He has 33 squares worked so far including two Ws on Jan 19.

Box Nixon G1KDF (LNH) reports VE and W contacts on Jan 22 when the activity was spread over 50.1 to 50.25MHz. Despite subsequent wind damage to his antenna, on Feb 11 he worked VE1APG (FN66) in New Brunswick and VE1BPY (FN86) on Prince Edward Is. Around noon on the 25th, ZS3 and ZS6 were heard and J52US at 1515. Next day Bob heard ZS4 and ZS6, TR8CA, VE1YX and at 1446

made a QSO with J52US after 45 minutes of calling. N3BBI was later worked with W2 and W8 heard.

Gerry Schoof G1SWH (MCH) worked WA3FAE on Jan 22 for the first USA QSO of the year and VE1APG on Feb 11. **Jim Whittle's G3EKP** (LNH) dual band beam shed two elements in recent gales and he hoped to repair it during March. **Mike Devereux G3SED** (HPH) sent a colour print of his tower with 6-ele N.B.S. Yagi at 20m. He has four acres on the side of a 122m hill overlooking the Solent, so obviously gets out very well.

On Jan 28, he managed to work T77C in a meteor burst after 30 minutes of calling. On Feb 1 he contacted ZD8MB at 1700 after hearing Mike's beacon for months. On the 8th, J52US, KP2A and FY5DG were working to Europe and the next day J52US was working Gs. CT4KQ and F6GNJ were on around midday on the 12th and an Aurora at 1845 brought GM0GEI but little else.

Russian TV was strong on the 18th, 0730–0900. Around 1225 on the 22nd, PA, F, ZS6 and 9H1 stations were peaking at 210°, very odd. On the 25th Chinese TV was up to S9+40dB from 0800. At 0910 Mike worked VS6UP who also worked Gs 4UPS, 3KOX, 4AHN, 3JVL and 4JCC plus PA0s. At 0935, JH4IUO and JA4MBM were heard for over an hour. The 5H1HK beacon was audible from 1123 to 1200 and many Gs worked TR8CA, J52US, G3GJQ/5N0 from 1255.

On the 26th JA4MBM was heard calling CQ at QTE 070° at 0950 and G3SED worked this high power station at 1010. Other Japanese heard were JA6TEW, JE3GUG, JI3OPA and JA6IML, all backscatter and S3 at 070°. At 1120, TR8CA was Mike's 38th country. ZS4s and ZS6s were worked till 1515 and from 1400 J52US was working dozens of Gs.

Welcome to new contributor **Neil Underwood G4LDR** (WLT) who uses a Spectrum transverter with an Icom IC-275, 20W amplifier and HB9CV antenna at 15m. His site is 100m a.s.l. **John Palfrey G4XEN** (NHM) found excellent tropo conditions on Jan 31 and worked PA3EUI. At 1224 on Feb 9, while beaming west, he called J52US on c.w. and got an RST559 report for a new country and continent. HC2K and HC2FG were heard on the 13th. He worked G3GJQ/5N0 at 1300 on the 16th and Roy was the strongest DX signal John has ever heard on the band. **John Lemay G4ZTR** (ESX) also worked Roy that day and J52US.

Ela Martyr G6HKM (ESX) worked the HCs on Jan 23 for a new country and on Feb 8 J52US (IK21) was new too. On the 22nd at 1309 she contacted LU5EZT/MM (3°N, 27°W), which cannot count as a contact with Argentina incidentally. She was amused to hear a subsequent exchange on 28.885MHz when a station asked VE1YX where the LU was; "Aqualand" was the answer!

Among **Bill Biltcliffe's G6NB** ten countries this year are HC5K on Feb 13 and ZS6XJ and J52US on the 22nd. When he wrote on Feb 3, **Dave Brown GD4XTT** was QRT on the band as his Yaesu FT-757, used to drive the transverter, had died.

Geoff Brown GJ4ICD claims the first GJ/TI QSO with TI2HL (EJ79) at 1434 on Jan 23. He was in his St. Helier workshop at 0215 on the 24th and was surprised to hear a few JAs for about eight minutes. Two were JA6s, the other possibly a JA8. On Feb 1 at 1645 the ZD8VHF beacon was S9 and at 1659 Geoff worked ZD8MB (II22) for another "first". He had a back scatter QSO with GI8YDZ (240° QTE) at 1150 on the 8th and at 1212 worked J52US at S9+30dB. More "firsts" from Jersey by GJ4ICD were Feb 11, 1142 T77C on c.w., 14th at 1251 9Y4VU on c.w. and 16th, 1234 TU2MA.

Paul Baker GW6VZW (GWT) heard G3GNQ/5N0 and TU2MA on Feb 16 and then worked J52US, his first non-European station. He remarks on the poor example set by one or two G4 stations who deliberately kept calling the 5N0 while other Gs were in QSO with him. After eventually being "patched through" by another station, one continued to chip in with unnecessary comments.

The 70MHz Band

G1DOX uses an Icom IC-271E, R.N. Electronics transverter and 100W B.N.O.S. amplifier with pre-amp. John's antenna is the dual band 4-ele Yagi. G1SWH is now QRV on 70MHz using a Kenwood TS-930 and transverter giving 8W. Gerry's antenna is a 5-ele by Elite. Before beam damage, G3EKP had worked eleven counties including G4IDQ (SPE) and G4RFR (DOR). G4ZTR took part in the Cumulatives and John's best DX was EI9FK/P. And that is all the 70MHz news this month.

The 144MHz Band

Welcome to **Ian McCabe G0FYD** (LNH) who enters all the tables for the first time. His station comprises an Icom IC-290H with Microwave Modules 50W amplifier and RX pre-amp, the antenna being a 15-ele Cushcraft Boomer at 8.2m a.g.l. He remarks on the excellent conditions in January and took part in six Ar events as well as working many continentals in tropo openings on Jan 24, 25, 30 and 31 and Feb 8.

G1DOX has a new Kenwood TS-711E, 50W amplifer and an 8-ele Jaybeam aloft with an MGF1302 GaAs-f.e.t. pre-amp. Best DX this year is OK2KZR/P. John has a 4CX250B amplifier but it has a fault so far untraced. G1KDF lists many Fs and a couple of OZs worked in the Jan 30–Feb 1 period. G1SWH worked all his nine countries in the first eleven days of the year.

Matthew Cabban G1WPF (HFD) is a new contributor who is nearing the magic 100 squares worked already. Jan 24 brought good conditions to F, D and OE and DA4JA (EL) was busy collecting WAB squares. On Jan 26 he heard his first Ar event. The 30th was a memorable day with a couple of Fs and Ds worked during the day but with good DX from F and EI in the evening and night. He was at home the next day so was able to work more F, ON and D stations.

G4LDR uses his IC-275 at 25W to a 14-ele Yagi with masthead pre-amp at 16m. Neil's neat list shows EI3GE (WKW), EI6GF (WEX) and EI8EQ (KDR) worked on Jan 30 during the all round lift. G4XEN contacted SP1KAA and some OZs on Jan 25 and on the 31st SMs and more OZs. Feb 1 saw good tropo to the Black Forest area then for good measure, John caught the Ar and worked GM0EWX at 2052, the event continuing weakly for some time.

G6HKM worked Fs in ZH and CF squares on Jan 24 and the next day Ela found OE5MKN and OE5VRL/5, both in HI, also SM6ONH (GS), SM7IPZ (HQ) a new square, SM6DWF/P and some OZs. Jan 31 brought EI6AS (DBN), GI4OWA (LDR) and GI4GVS (ATM). G6NB lists QSOs with

QTH Locator Squares Table

Station	Band (MHz) 1296	430	144	Total
G3XDY	89	139	192	420
G3JXN	87	134	179	400
G3UVR	79	129	239	447
G6DER	78	110	183	371
G8PNN	63	98	128	289
GJ4ICD	59	119	254	432
G6MGL	59	89	141	289
G4RGK	49	119	280	448
G3IMV	48	124	410	582
G4DEZ	48	37	248	333
G8GXP	45	151	331	527
G6HKM	45	107	192	344
G8ATK	45	91	143	279
G3COJ	44	103	186	333
G8HHI	38	110	148	296
G1KDF	37	98	174	309
G1EZF	32	93	263	388
G4ZTR	30	43	44	107
G4MUT	28	90	149	267
G0DAZ	27	128	277	432
G6STI	24	69	130	223
G1EGC	23	80	198	302
G6MXL	16	45	91	152
G1GEY	11	77	168	256
G4WHZ	7	—	76	83
G8LHT	6	80	148	234
G6AJE	5	57	95	157
G1DOX	2	10	58	70
G2DHV	2	7	33	42
G4AGQ	1	41	104	146
G4KUX	—	120	372	492
G4XEN	—	111	272	383
G4RRA	—	80	255	335
G4SSO	—	93	229	322
G4TIF	—	110	200	310
G4DHF	—	—	307	307
G4SWX	—	—	293	293
G1LSB	—	133	150	283
DL8FBD	—	—	280	280
G4PCS	—	3	258	261
G3NAQ	—	80	175	255
G6DZH	—	87	154	241
G4IGO	—	—	238	238
ON1CAK	—	33	204	237
G3FPK	—	—	233	233
EI5FK	—	56	172	228
G0EVT	—	49	177	226
G0EHV	—	75	146	221
ON1CDQ	—	32	182	214
G4MEJ	—	—	213	213
G8LFB	—	—	209	209
GW4FRX	—	—	203	203
GJ6TMM	—	48	151	199
G4YCD	—	—	197	197
G8MKD	—	49	145	194
G4DOL	—	—	186	186
GI1JUS	—	—	181	181
GW6VZW	—	6	125	131
G7ANV	—	—	131	131
G1WPF	—	29	97	126
G0FEH	—	24	101	125
G4TGK	—	—	118	118
G1IMM	—	17	98	115
G8XTJ	—	—	110	110
GM0HBK	—	—	107	107
GI4OWA	—	—	103	103
G0FYD	—	—	98	98
GM0GDL	—	20	73	93
G1SMD	—	—	93	93
G1TCH	—	6	79	85
G8PYP	—	10	67	77
GU4HUY	—	—	73	73
G0HEE	—	—	73	73
G1CEI	—	—	68	68
G1CRH	—	—	62	62
G0HDZ	—	—	61	61
G1NVB	—	—	58	58
G1VTR	—	23	32	55
GM0JOL	—	—	37	37
G7AHQ	—	—	34	34
G7CLY	—	—	31	31
GM1ZVJ	—	—	24	24

Starting date 1 January 1975.
No satellite or repeater QSOs.
"Band of the month" 1296MHz.

F8SQ, FC1ECQ, DC6KI and DJ7KL on Jan 31.

Another new correspondent is **John G7CLY** (HBS) whose surname I could not read. He began operating last September and enters the tables but did not give any station or QTH details. GD4XTT caught a little of the German DX on Jan 24 but was out during the night. On the 30th and 31st Dave worked distant D, F and ON stations but missed out on the weak OZs and SMs.

GJ4ICD thought he would see what was happening on the band on Feb 1 and was delighted to copy SK4MPI at S7, the first time Geoff has ever heard this beacon. From 1400 he worked SM4KYN (HT), SM6RWY (FR), SM6SKY (GS), SM6MUY (GR), dozens of OZs, a new square SM6RRQ (GT) and over 100 Germans in EN, FN, FO, etc.

Clive O'Hennessey GW4VVX (GWT) is now running a Kenwood TR-751E and 150W B.N.O.S. amplifier, the antenna being a 17-ele Yagi. He is looking for someone in 1054, 64 and 95 squares and has never heard any GIs from four of the six Ulster counties. GW6VZW worked a number of PA and D stations on Jan 24/25 and DK3LL (JO54) was an all-time new square for Paul. He heard two OEs. On the 30th he contacted more Germans and FC1MOZ (JN29), another new square. The next day brought ON and D QSOs.

The 430MHz Band

G1DOX now has a 7-ele ZL-Special antenna outdoors but thinks he could do better with a conventional Yagi. He wants to limit the boom length to about 2.4m; a DL6WU design with eleven directors and a boom length of 2.27m would provide a gain of 13.3dBd, John. The rest of his station consists of an Icom IC-471E and 100W B.N.O.S. amplifier with RX pre-amplifier.

An indication of just how good conditions were in January is illustrated by **Don Stoker G1GEY** (TWR) who worked 102 different stations up to mid-February. There were three good openings, Jan 1–3 to F and EA2; 25th to OZ, SM, D and Y; and 30–31 to D, F, ON, PA and SM. In the Fixed Contest on Feb 5 he made 39 QSOs, all Gs. In a P.S. he wrote, "No Syledis QRM heard at all during the tropo."

G1KDF worked FC1EAN (AG) and FC1EZQ (CH) on Jan 30 and F6IPG (YH) for a new square the next day which also brought EI5FK and EI4AEB for Bob. G1SWH's list also includes F6IPG on Feb 1. Gerry operated in the contest adding ten counties for 1989 in the process.

On Jan 24, G1WPF heard OE2CAL at colossal strength but could not work him through the pile up. Matthew did contact DL0UD and DK3FB (DL) though. He has installed a 50W amplifier and this helped him work FC1EZQ for a new square on the 30th. The next day brought QSOs with ON1BLY (BK), F1DEO (BI), FC1LYV (DI), FC1MJC (AG), DB8KJ (DK) and F6GYH (CI). In the Feb 5 contest he made 38 QSOs including a couple of Dutch stations.

John Quarmby G3XDY (SFK) worked OE5VRL/5 and OE5VHL (JN68) for a new square on Jan 24, and on the next day OZ1GMP (JO56) and LX1JX (JO30). On the 30th he contacted OE2CAL and on the 31st F6CGJ (IN78). G4LDR also found OE5VRL/5 on Jan 24 and on the 30th Neil had QSOs with EI5FK (CRK), EI7FS (LIM) and EI8EQ. He operated in the Feb 5 contest which provided another eight counties for the table.

DC5NA (JN49) and F8ZW (JN38) were both new squares for G4XEN on Jan 24. In the Feb 5 contest John added ten counties but thought conditions "rough". G6HKM also worked the two above OEs on Jan 24 plus OE9ERC (JN47). On the 25th Ela had QSOs with OZ1DOQ (JO65) and OZ1BUR (JO46), while on the 31st, SM6ESG (GR) was another new square. In the Feb 5 contest she had 90 QSOs in "generally disappointing activity".

Colin Redwood G6MXL (DOR) worked OE2CAL, OE5VRL/5 and OE5MKM (JN78) on Feb 24 in what he describes as ". . . a truly excellent tropo opening to OE and DL." Then on the 30th he contacted F8ZW, DL5CZ and OE2CAL. GD4XTT had been limited to one watt from his Yaesu FT-790 but now has a 30W amplifer and 15-ele Yagi, so Dave should be in demand now.

The Microwave Bands

G1DOX reckons 1.3GHz ". . . to be rather a waste of time." John calls a great deal without replies. He uses an Icom IC-1271E, brass cavity 300W p.a. and a single 23-ele Tonna Yagi with GaAsf.e.t. pre-amp; he will probably add a second Yagi. He wonders if an activity night might be worth considering. On paper there are activity nights on different bands for different modes but I get the impression few bother with them. What will stir up some activity is a Cumulative contest so perhaps we should have more of them on 1.3GHz.

On 1.3GHz G3XDY contacted DK2LR (FH35h) and OE5VRL/5 on Jan 24, and F6EAS (ZJ75a) for a new square the next day. On the 30th John found OE2CAL and on the 31st F6CGJ (IN78), also new. G6MXL only runs two watts to a single 23-ele Yagi so was delighted to contact OE5VRL/5, a QRB of 1202km, on 1.3GHz on Jan 24. But Colin reckons much more could be achieved if there were more stations active. (Back to the Cumulatives idea.)

Lastly to G4BYV who used the higher bands in the Jan 24 lift. John worked DF1EQ, DC8VJ, DL1EBR all in DL square and PA0RDY (CM) on 3.4GHz. He also operated on 5.7GHz and contacted DF7VX (EL) at 541km. The German was only using 0.1W and was S2 in Norfolk. DF1EQ was also worked on this band.

Sign Off

I acknowledge a letter from **Ian Wright GW1MVL** (CWD) who reported on some DX worked on Jan 30/31 and Feb 2. Unfortunately no band was mentioned, nor could I understand the squares worked notes. So please make sure your reports are unambiguous, OM.

From the July issue you will have a new scribe compiling this feature so please do not send any more correspondence or awards claims, etc., to me from now on. The new address is in the heading of this piece. Nevertheless, I will be pleased to continue corresponding on a personal level with readers about Amstrad PCW matters.

Annual v.h.f./u.h.f. table
January to December 1989

Station	50MHz Counties	50MHz Countries	70MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Total Points
G1DOX	26	3	30	5	50	12	16	2	—	—	144
G6HKM	14	8	—	—	45	18	31	11	5	5	137
G4XEN	21	9	1	1	42	17	24	9	—	—	124
G1SWH	11	8	5	2	39	9	18	5	—	—	97
G0IMG	23	10	17	3	13	5	7	2	—	—	80
G4LDR	13	2	—	—	21	4	22	7	—	—	69
GW6VZW	21	3	—	—	33	8	—	—	—	—	65
G7CLY	—	—	—	—	46	14	—	—	—	—	60
G6NB	17	10	—	—	26	6	—	—	—	—	59
G3FPK	—	—	—	—	47	12	—	—	—	—	59
GD4XTT	18	4	—	—	23	7	4	2	—	—	58
G1GEY	4	2	—	—	—	—	34	8	2	2	52
G0FYD	—	—	—	—	30	13	—	—	—	—	43
G4ZTR	8	6	22	3	—	—	—	—	—	—	39
G6MXL	2	1	4	1	7	4	8	5	—	1	33
G3EKP	4	3	11	2	3	1	1	1	—	—	26
G1CEI	—	—	—	—	14	4	—	—	—	—	18

Annual c.w. ladder

Station	Band (MHz) 50	70	144	430	Points
G4XEN	7	—	57	5	69
G0FYD	—	—	31	—	31
GD4XTT	1	—	14	—	15
G3FPK	—	—	15	—	15
GW4VVX	—	—	5	—	5

Number of different stations worked since January 1.

The next three deadlines are April 26, May 31 and June 28

Remember to send future reports for "VHF Up" to David Butler G4ASR, Yew Tree Cottage, Lower Maescoed, Herefordshire HR2 0HP

Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS.

MacPAC

Having featured packet radio in South Africa last month, I thought it would be appropriate to move a little closer to home this month. I was spurred on by one of my regular correspondents, **Michael Greig GM1YSI**, who suggested that I might like to take a look at packet in Scotland. I took Michael up on the offer and he put me in contact with **Stuart Clint GM1VBE** who is secretary of the Scottish Digital Communications Group. As that is a bit of a mouthful they are affectionately known as MacPAC which is much easier to handle.

The implementation of a packet network in Scotland poses an unusual set of problems which results in very specific and sometimes odd solutions. The main problem is the geography of Scotland with its unique combination of mountains, deep valleys and remote islands. Although very pleasant to look at, these features are far from ideal for the transmission of radio signals. There is also a natural r.f. barrier between England and Scotland in the form of the Southern Uplands. To demonstrate how effective the barrier is, there is generally more contact with Northern Ireland than with England.

There have been many attempts to solve this particular problem, including links via the Isle of Man and Northern Ireland. The present most used link starts in Middlesbrough and routes via the GB7BMX mailbox in Alnwick. This mailbox is required as a store and forward post as quite often only part of the link is available and messages have to be held until the next link opens-up! As I'm sure you can imagine, this presents all manner of problems.

At this point, I ought to make a plea on Stuart's behalf. As you can see from my description, the route between England and Scotland is pretty tortuous and it is very annoying to find that the link is clogged up with all manner of local or trivial messages which have been wrongly addressed @ GB. So the plea is, please don't address messages @ GB unless it really is likely to be of interest to amateurs throughout the UK.

One of the major advantages that MacPAC have over many other packet networks is that most of the level 3 network nodes are under MacPAC control. This represents a significant operational advantage, as any network needs some form of common control in order to be fully effective. This task is made easier by the fact that there are, at present, only ten level 3 nodes though there are more on the way. MacPAC believe that they will need a total of somewhere near 20 nodes to give full coverage of Scotland.

MacPAC have also been very active on the technical front, their latest offering being a c.w. ident board. In the best amateur traditions, this was designed on the back of a cigarette packet and produced by a local amateur who enjoyed making p.c.b.s. The board proved to be very popular and is now produced by a commercial concern and distributed by MacPAC. The circuit sits between the TNC and the transceiver and includes its own timer, tone generator and some clever logic.

When the internal timer triggers a c.w. ident, the circuit first waits for a gap in the data transmission, then interrupts the p.t.t. and mic input to send the ident signal. In addition, it also sends a busy signal back to your TNC to prevent it attempting to send data during the c.w. ident. It all sounds rather clever and if you would like to get your hands on one, the bare p.c.b. and documentation costs £3.75 or alternatively a p.c.b. complete with an EPROM set up with your callsign is available for £6 (don't forget to tell them your callsign!). To obtain these goodies, send your cheque to Stuart[1] made payable to "Scottish Digital Communications Group". There is a slight profit from the sale of these p.c.b.s and this is used to help finance the development of the MacPAC network, which seems quite reasonable.

In addition to the problems linking with England there are tremendous difficulties in giving good coverage of the main populated areas. These areas are situated in the Central Lowlands from Glasgow to Edinburgh. Even this comparatively small area needs three nodes for adequate coverage. One of these nodes GB7CS, also known as MAC2, is on the IBA mast at Blackhill. This mast is some 300m tall and thanks to the Central Scotland f.m. Group, MacPAC have managed to obtain the use of an antenna at about 180m.

The main link to the remote Western Isles is achieved using an arrangement with the Fort William Repeater Group and their voice repeater GB3HI on the Isle of Mull. This voice repeater uses separate transmit and receive antennas and MacPAC have an arrangement where they share the transmit antenna for a packet repeater, GM0FRG.

In order to preserve the emergency use of the voice repeater, voice transmissions take priority over packet. Fortunately the voice repeater usage is generally fairly low so the sharing system works very well. Incidentally, the range from this repeater is quite impressive and it can be heard as far away as Glasgow, which is some 120km distant.

I'm sure you can see from this description that packet in Scotland offers some unusual challenges which MacPAC seem to be tackling actively. In England we are often dealing with path lengths in the order of tens of kilometres, whereas in Scotland hundreds are the norm!

My thanks to Stuart for his co-operation in preparing this report. Don't forget, if you have any bright ideas for improving the path between England and Scotland, drop me a line and I will pass-on details to all concerned.

Are you beavering away on a new or difficult packet problem? If so, drop me a line with the details and I will spread the word and possibly find a solution.

Contest News

Bo Ohlsson SM4CMG has sent me a copy of the results from the SARTG (Scandinavian Amateur Radio Teleprinter Group) New Year RTTY contest. The winner of the single operator section was SM5FUG with a total score of 1617 points, closely followed by OH1AF with 1508 points. The highest placed UK station in this section was John Jones G4PKP who came a very good sixth with 693 points. Moving on to the multi-operator section, it would seem that they didn't receive too many entries as there are only two stations listed, SK6LK first with 720 points and YU7KMN second with 168 points. The final h.f. section of this contest was for the s.w.l. and this was won by Gunter Wittig with 630 points and the highest placed UK station was D. R. Hare BRS27239 in eighth place with 104 points. The v.h.f. section was reasonably well supported and was won by SM6LKT with Frank Jensen G1HQQ flying the UK flag in fourth place. I haven't had any direct feedback on conditions during the contest but judging by the low scores and small number of contacts things cannot have been too good.

Scandinavian Award

Still with Scandinavia, Bo has sent me details of the SARTG WSRY (Worked Scandinavia RTTY Award). This award which is run by SARTG has four classes and can be claimed by any station working the appropriate number and mix of Scandinavian stations. For European stations outside Scandinavia the number of Scandinavian contacts required is 16 for the general class, 35 for bronze, 50 for silver and 75 for gold. For stations outside Europe the numbers are 8, 15, 25 and 50 respectively. In addition to the required numbers of contacts, for the gold award you must have at least one of the following prefixes; LA, SM, OH, TF, OX, OY and OZ. The fees for these awards are, 10 IRCs or $5US for the general class and 6 IRCs or $3US for each of the other classes. The Awards and Contest manager is Bo Ohlsson SM4CMG[2].

Computing News

Simon Lewis GM4PLM editor of the Commodore Radio User Group has written as a result of my recent plea for details of computer support organisations. This group known as CRUG was formed in Autumn 1987 specifically to give help to those who want to combine radio and Commodore computing. The group supports all Commodore machines and offers public domain software with librarians dedicated to C64, 128 and the Amiga. In addition to software the group produces a regular magazine featuring equipment reviews and general hints and tips. As with all user groups, the quality is directly proportional to the support of the members, so if you own a Commodore machine and use it for amateur radio why not join CRUG and pool all those valuable ideas? The current membership fee is eight pounds and full details can be obtained from Simon Lewis[3].

More computing news this time from **John Pearson G1FTU** of Pearsons Computing[4]. I have received many good reports concerning John's software and he has now supplied me with details of his current range. The programs are all for the Spectrum computer and cover RTTY, c.w. and SSTV. The prices for cassette based versions are £10 each for RTTY and c.w. whilst the SSTV program costs £12.

One of the main features of the Pearsons software is that all the programs run without an interface so they are particularly useful for the newcomer who wants a cost effective way to test the water. Despite this obvious appeal, I know of many experienced amateurs who use these interfaceless programs with great success.

The RTTY program has many useful features including the option to select either split or single screen working. There are the usual programmable memories, nine in this case, which can be saved to cassette or disk. The program can also handle baud rates between 45 and 110 in 5 baud steps which is very useful particularly for the short wave listener. Another advantage for the short wave listener is that it can receive all three of the most common commercial shifts i.e., 170Hz, 425Hz and 850Hz though it can only transmit using 170Hz. Last but by no means least there is an on screen tuning indicator which is very useful.

That's it for this month but please keep those reports coming in. I would particularly like to hear about FAX activity around the country so I will look forward to your reports.

1) Stuart Clint GM1VBE, Southsyde, Woodhead Ave., Bothwell, Lanarkshire G71 8AR.
2) Bo Ohlsson SM4CMG, Skulsta 1258, S-710 41 Fellingsbro, Sweden.
3) The Editor, CRUG, c/o Simon and Lyn Lewis, 22 Whiteford Ave., Bellsmyre, Dumbarton G82 2JT.
4) Pearsons Computing, 42 Chesterfield Road, Barlborough, Chesterfield, Derbyshire S43 4TT.

The next three deadlines are April 26, May 31 and June 28

Amateur Satellites

Reports to Pat Gowen G3IOR
17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD.

Satellite Update

OSCAR-10: In early March OSCAR-10 was still going strong, despite the loss of power production due to the declining angle of sunlight to the solar panels. Theoretically, it should have ceased to function on or near to February 15, when the solar illumination dropped to below 70 per cent, but thanks to modest use, it is still supporting contacts on the proviso that the uplink power is kept to a minimum and frequency pulling of the plain carrier 145.810MHz beacon is avoided.

On February 20 it was at longitude 96.7, latitude 27, which **Graham Radcliffe VK5AGR** calculates to a power efficiency of 60 per cent. On March 20 it was at A.Long 67.4, A.Lat -27, whilst on April 24 it will be at A.Long 63.4 and A.Lat -26.7. Graham finds that until May 1 the solar illumination is less than 60 per cent, when better than 70 per cent is really needed to support moderate use. No eclipses are threatened until late in April, so although the beacon and the transponder will undoubtedly be off when you read this column, it should be back and in good condition again after the first week of May, as the power production efficiency will reach 64 per cent again on May 8.

OSCAR-12: Despite the difficulties imposed in maintaining the short time-fuse schedules planned only a few weeks in advance for this power depleted satellite, **Heinz Hildebrand DL1CF**, who provided the Mode JD information in last month's column, continues to use it to maximum effect. His well equipped shack that covers all satellites is shown in Fig. 1. The uplink for FO-12, OSCAR-10 and 13, and the RS satellites is provided by the 25 watt TS-711E, the 25 watt TS-811E for OSCAR-13 mode B, and the 10 watt IC-1271E which goes to a 75 watt power amplifier for OSCAR-13 mode L. For the downlinks he uses the TS-711E plus a pre-amplifier for OSCAR-13 and the UoSAT pair, and the TS-811E with a pre-amp for FO-12 Mode JA and JD and also for OSCAR-13 modes L and JL.

The DL1CF az-el antennas used for both uplinks and downlinks are shown in Fig. 2, as a pair of 7-element 145MHz Yagis vertically polarised used for mode B and the UoSATs, and a pair of 435MHz 16-element vertically polarised Yagis used for modes JA, JD, JL and L. At 1269MHz, he has a single 44-element horizontally polarised Yagi, which has yet to be mounted.

For tracking up to the 18 different satellites he is keen on following, Heinz used the 1 megabyte RAM equipped ATARI ST-520 computer with the ATARI-ST tracking program written by DF5AI, which can provide the information needed in only two seconds. The high resolution monitor

Fig. 1

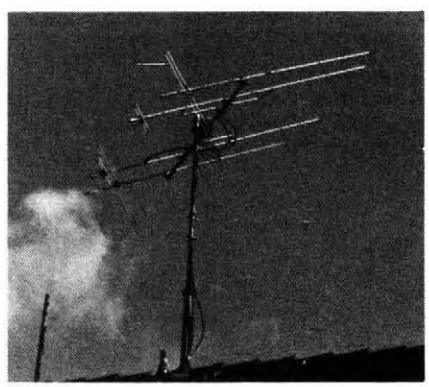

Fig. 2

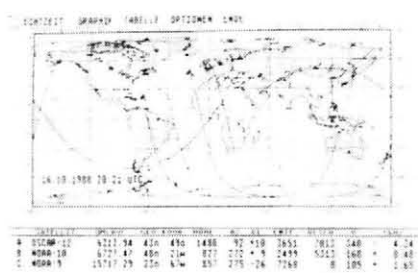

Fig. 3

screen output from this whilst tracking OSCAR-12, NOAA-9 and NOAA-10 is shown in Fig.3.

OSCAR-13: From Westbury in Wiltshire, **Jon Wheeler G0IUE** reports on the contacts that he has made from the station of his father, G1LJT, which antennas have now been equipped with elevation command. He reports up to RS 5 & 7 signals from G8XXJ, I10XZ, DF4TA and KK4UZ. In the meanwhile, Dad also got a look in and among others made good QSOs with VK6JJ, WB2TNL, JA3KM, JA5LG, JA8EPO and UA0ALA. They use a 50 watt uplink from a FT-276R to a pair of dual band 145MHz 9-element and 435MHz 19-element Tonna Yagis.

MIR: Lots of stations have been making contacts with Alex U4MIR on the 145.550MHz S22 simplex frequency that the cosmonauts now seem to have settled on. The favourite times appear to be late afternoons and early evenings throughout the mid-week period, usually between about 1530 and 1930, and throughout the late mornings, afternoons and early evenings of the week-ends. OH5LK made a QSO at 1640 on February 9, **OK3AU** worked him at 1550 on February 10, **ZS1EK** reports a QSO at 1814 UTC on February 11 and **VE3EFX** a QSO the following day. **G4UAM** heard good signals at 1641 and **G3IOR** made a short contact at 1816 on February 12 in the Russian language. The majority of stations have just had an acknowledgement of their callsign, but at least one station is now known to have received an actual report for the log.

Colin G1YIL of Bridport in Dorset writes, "I worked U4MIR from my coastal QTH here at 1643 UTC on February 12, on 145.550MHz using my FT-290R with my FL-201 10 watt linear amplifier to a 10-element horizontally polarised Jaybeam. I was very surprised at him coming back to me, especially as I was not particularly looking for him at that time. I just happened to have my beam pointing at 235 degrees west. It was a very short QSO, with RS 5 & 5 up, RS 4 & 5 down".

We are now informed that the new crew currently proposed to go up to MIR in late April consisting of cosmonauts Alex Viktorenko and Alex Serebrov will be pretrained in the art of amateur radio before they leave earth. A few delays on the new large modules to be attached to MIR have occurred, now postponing the launch of these till the latter part of 1989, so the crew may yet change to permit the mission specialists to phase the duration of stay with the new module requirements. It is not yet known if U3MIR, Valery Polyakov, will stay aboard or return in April, so we may have U3, U5, U6 or even U7MIR calls all on and active in May.

The New Microsats

As promised in last month's column, here is the latest information to hand on the series of satellites that should result in having the AMSAT spacecraft up to a serial number of OSCAR-20 by the end of this year.

The first information on the coming microsats appeared in these columns in the November '88, December '88 and January '89 editions. Now from Courtney Ducan N5BF, Doug Loughmiller KO5I and Jan King W3GEY via the information service of **Peter Guezlow DB2OS** comes the full and topical current information on the new series of AMSAT satellites due for launch this year.

Prior to launch, each satellite will be known by a letter designator and once in orbit, the name will become that of the

serial OSCAR enumeration. At this time, the BRAMSAT (AMSAT Brazil, under Junior Castro PY2BJO) spacecraft is termed MICROSAT-A, to be called in orbit DOVE-OSCAR-nn where "nn" is the series number. The AMSAT-LU (Argentinian AMSAT group under Carlos Huertas) contribution is currently MICROSAT-B, to become LUSAT-OSCAR-nn. The AMSAT-NA (North America, under Doug Loughmiller KO5I) satellite is MICROSAT-C, later to be PACSAT-OSCAR-nn, whilst the Center for Aerospace Technology at Weber State College, Ogden, Utah (CAST, under the direction of Robert Twiggs) is MICROSAT-D, soon to be WEBERSAT-OSCAR-nn. In addition to the dedication of the groups stated, considerable additional volunteer and financial support is being given by the Tucson Amateur Packet Radio Corporation (TAPR) and the ARRL.

Mission Objectives

The purpose and objectives of all of the satellites is multifold, but can be condensed to three statements: (1) to demonstrate to the ITU that amateurs from each of the organisations involved have a strong interest in the use of radio frequencies allocated to the Amateur Satellite Service for the improvement of amateur practices and in support of the international amateur satellite community.
(2) To provide a test bed for evaluation and validation of hardware technologies and software to be employed.
(3) The mission to build on user equipment, techniques and capabilities already utilised in the Amateur Satellite Service for digital or voice communications wherever possible. The costs of ground station construction or modification are to be minimised.

Some common constraints are shared by the mission:
(a) Both the satellite and the ground station equipment costs are to be minimised.
(b) The weight and size of the satellites are to be minimised, as many launch opportunities are potentially available for small, lightweight satellite packages, and one means could involve man-assisted launch from vehicles such as the Shuttle and MIR. The planned mass of the satellites is just 8.5kg, with the addition of a further 2.5kg due to the launch adaptor and separation hardware. The satellites will each be cubical, measuring only 230mm (9 inches) per side, discounting the antennas.
(c) The mission will build on current user techniques and capabilities already used in the Amateur Satellite Service for digital and voice communications.

Individual Mission Goals

The DOVE is intended to provide an easily receivable signal for educational and scientific use from a voice modulated beacon. Planned uses include transmission of current telemetry and amateur radio bulletins with spoken messages in several national world languages.

The LUSAT is intended to provide a demonstration of amateur radio commitment extending digital communication facilities fully into the Amateur Satellite Service. It will give an easily utilised satellite based facility for data storage and forwarding using amateur radio packet techniques and a demonstration of the feasibility of digital store-and-forward facilities within the amateur radio environment for educational and scientific purposes.

The PACSAT has essentially the same goals as LUSAT, but with the additional object of research and experimentation with specialised protocols for efficient access and utilisation of digital data satellites.

The WEBERSAT intention is to provide an easily utilised satellite based facility for video data acquisition and storage and transmission to amateur radio ground stations using amateur radio packet techniques.

Mechanical Structure

All of the series on microsats will have a similar structure plan, each composed of five aluminium frames, called modules, formed into a composite stack united by stainless steel tie bolts. This near to cubical 230 × 230 × 213mm (9 × 9 × 8.375 inches) structure is termed the "frame stack assembly". Four solar cell panels, each using the latest dual layer GaAs high efficiency solar cells, will be mounted on the four sides of the frame stack assembly, with additional solar cell assemblies on the top of the satellites. The thickness of these panels is critical and must be so designed to assure that no buckling of the side panels can occur, otherwise damage to the delicate individual solar cells responsible for the power production can result.

Each of the five frames of each microsat assembly will contain the electronic subassemblies, e.g. the receiver, the transmitter, computer, power supply regulator, plus any specialised modules such as the DOVE voice synthesiser, the WEBERSAT camera controller and picture storage RAM. The top and bottom panels will be used for mounting the u.h.f. and v.h.f. antennas in addition to the extra solar cell assemblies.

Electrical System

The modules are numbered from 01, starting from the -Z base of the satellite through to 05, the +Z top. Each functional module fulfils an important aspect in the overall operation of the particular spacecraft, and the separate content is as follows:

LUSAT and PACSAT
Module 01: BPSK Packet Transmitter
Module 02: Flight Computer
Module 03: Power Module
Module 04: Unused (This space available for rent!)
Module 05: FSK Packet Receiver, all channels.

DOVE (Brazilian AMSAT Peacemaker)
Module 01: FM Voice Transmitter
Module 02: D to A Buffer/Converter —Voice Synthesiser
Module 03: Power Module
Module 04: Flight Computer
Module 05: Command Receiver

WEBERSAT
Module 01: BPSK Packet Transmitter
Module 02: FSK Packet Receiver, all channels
Module 03: Power Module
Module 04: Flight Computer
Module 05: Camera Module

The interconnection of the individual modules uses a standardised bus arrangement to minimise the number of wires needed for all the satellite functions. It is implemented by an "AART", or Addressable Asynchronous Receiver Transmitter, board mounted to all modules apart from the Flight Computer which serves as its own interface. Each AART uses one 25-pin D sub-miniature connector for the interconnection with each of the others.

The Transmitter Modules

The BPSK Packet Transmitter modules for the LUSAT, PACSAT and WEBERSAT all use Binary Phase Shift Keying, or BPSK packet radio transmitters on the downlink to ground stations. All transmissions are digital, termed NRZ-I, BPSK, HDLC, and compatible with the packet radio AX.25 level 2 protocol now in general amateur radio use. When under flight computer control unconnected information packets which contain the telemetry and (in the case of the WEBERSAT) picture frames plus similar user function transmissions will be available.

The transmitters will employ the latest high efficiency mode of power amplifier giving better than 60 per cent d.c. power demand to r.f. output efficiency, and some 4 watts of output power. Although the mean average solar cell power production will provide at least 6 watts of available power over an average orbit under the worst case sun-synchronous conditions, at parts of the orbit and at certain times of the year, the demand could be greater than the supply. A means of power control will be incorporated to allow the transmitter to reduce its output power and hence supply demand from 4 watts even down to zero watts in 16 steps of attenuation. This can be set either by ground control or automatically by software control command from the onboard flight computer.

In practice, it is confidently anticipated that at the highest power level of four watts output, the d.c. demand to r.f. power output of the transmitters can be maintained at some 84 per cent on 145MHz and at 74 per cent on 437MHz.

Two transmitters will be flown in each of the transmitter "01" modules for reasons of both redundancy and experimentation. One will use normal p.s.k. modulation, the other a new form called raised-cosine modulation, which exhibits a lower information harmonic content. It is anticipated that user ground stations using high gain uplink antenna arrays may well find themselves able to lock on to side lobe energy from the normal p.s.k. transmission, as the second side lobes are only some 14dB down on the main lobe. The raised-cosine transmission should give a second side lobe 38dB below the main lobe, and should reduce the possibilities of false locking by ground stations

A further advantage is that the duality of transmitters gives the possibility of advanced protocol experimentation. As the number of users multiply, the uplink capability handling per user will degrade, so it is expected that specialised network schemes and protocols may evolve by experimental work to help to alleviate this situation.

The Argentinian LUSAT will use 437.150MHz, PACSAT 437.050MHz, and the WEBERSAT 437.100MHz, all selected so as to give minimal function interference and to occupy the little used section of the upper 70cm band. Secondary transmitter frequencies have yet to be given.

The antennas transmitting the downlink from the satellite will be 70cm turnstiles, and will permit the users to utilise linearly polarised antennas without sufferance from spin QSB. The data rate will be selectable as either 1200 or 4800 b.p.s., needing transmitted bandwidths of 4 and 15kHz respectively.

The DOVE will have a narrow-band f.m. voice transmitter, driven by a voice synthesiser, similar to that of UoSAT-2 (OS-

CAR-11) but with a far greater vocabulary and language range. It will transmit on 145.970MHz with 5kHz deviation using a 2m turnstile antenna, and will be on voice synthesised data at all times except when it is under access command by a control station, when it may go to 1200 baud a.f.s.k. compatible with Bell 202 tone standards. When the flight computer is returned to the "run" mode, the voice transmission downlink will resume. The DOVE power levels, efficiency and technology are very similar to those satellites already described.

Frequency List (to date)

Satellite	Downlink MHz	Uplinks MHz
DOVE	145.970	NONE
LUSAT	437.150	145.900, .880, .860, .840
PACSAT	437.050	145.900, .920, .940, .960
WEBERSAT	437.100	To be announced later.

Telemetry

At least 32 analogue telemetry parameters will be available from the onboard computer, the number of which is easily expandable, thus the number may change before launch. They will provide the housekeeping information relating to the health of the satellite. Analogue telemetry information will be converted to digital data that will in turn be available for transmission in unconnected beacon packets or to connected user stations. The DOVE telemetry information will be available as either spoken voice synthesiser or digital format.

Launch

AMSAT has made arrangements for the launch of all four MICROSATS as secondary payloads on the SPOT-2 mission, via an ARIANE-1 rocket from the ESA Kourou French Guiana launch site in mid-1989, possibly as early as June, but probably as late as November. Although not yet planned, it is confidently expected that AMSAT will provide an ALINS Launch Information and Network service on the usual frequencies, as performed before with earlier launches. The use of 14.282, 14.290/95, 21.280 and 28.580MHz is more than likely, usually starting some one hour prior to launch, to follow orbital injection and the first hearings. Follow up information on the latest TLM and orbital elements will occur on the following days.

The Orbit

The SPOT-2 satellite is sun-synchronous, with an apogee of 835km, a perigee of 817km and an inclination of 98.7 degrees. The ascending node time is approximately 2230 hours local time. Like RS-3, 4, 5, 6, 7 and 8, which were all put out as a series from a single COSMOS launch in 1981, all the MICROSATS will be deployed from the ARIANE-1. Although in the same polar orbit, they (like the RS series) will all have slight differences in their orbital parameters, due to the differences in the deployment speed and direction from the launch vehicle final stage. Thus, although generally available at about the same times of the day, their individual positions will appear to be random, changing from day to day to provide a wide spread of operating opportunities, with little mutual overlap.

Design a μ- Logo

Do you fancy having your own design concept flying over your head many times a day? AMSAT are inviting would-be artists to submit designs for both the logo for the coming micro-sats and for the decal on the ARIANE launch vehicle. No prizes, other than the prestige of your success are offered. Designs should be sent to John Champer K8OCL, 7800 Hartwell Street, Deerbourn, Michigan 48126, USA within the next two weeks.

Mort d'Oscar

Prizes are being offered for he or she that foretells the demise of AMSAT-OSCAR-9, alias the UoSAT-1 satellite, which is now dropping at an even faster rate of some 320 metres per day (and increasing!) and already down to 420km (and decreasing!)

In addition to the 308-page illustrated hardback book on the history of space travel offered by G3IOR for your input to this column plus that time closest to that when UoSAT-1 becomes meteor-scatter, additional prizes are available from other sources. The University of Surrey is offering space T-shirts and other useful winnings, and AMSAT-UK are giving prizes of satellite tracking computer software for the most accurate re-entry time also.

Send your entries, which must arrive no later than one whole month before the time of predicted incineration, to G3IOR, QTH at the heading to this column, and to Craig Underwood G1WTW, at the UoSAT Spacecraft Engineering Research Unit, Department of Electronic and Electrical Engineering, University of Surrey, Guildford, Surrey GU2 5XH. For the AMSAT-UK OSCAR-9 re-entry contest, send to Ron Broadbent G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQ. Remember, only one entry per person, and although you will undoubtedly probably prove to be far closer the later you leave your entry time to the fall-out time, a clear month must be between them.

A large number of readers have asked just how, other than a random guess, they even begin to tell when the satellite is coming down, and assess when it finally decays into earth's atmosphere. A number of factors determine the course of events. The fixed factors include the mass of the satellite relative to its aspect ratio and surface area, e.g. a light balloon will have little mass and lots of area, so the effective frictional co-efficient is greater than say a steamlined lump of lead. The further a satellite drops, the more friction it gets as it descends into denser atmosphere, and so the greater the drag, bringing it into even lower denser layers until it finally vaporises in the intense friction. It is almost, but not quite, an exponential curve. If we had a uniformly graded constant atmosphere, the sum would be easy, but it is not so, as elevating solar flux with increasing sunspot activity is heating earth's atmosphere causing expansion. The decay of a low orbit earth satellite varies in the long term with the mean solar flux, and in the short term with solar rotation, being maximised as the more active side of the sun faces earth.

One good practical way to explore the decay rate is to carefully plot the TCA, time of closest approach, by noting that exact time when the pass is at the close to centre nominal frequency without Doppler shift, e.g. 145.825MHz. Consecutive and daily passes can be measured to find the period, e.g. that time in minutes between each zero Doppler part of the pass. A mean value for these averaged over a week or so will show that the period is decreasing. It may then be plotted to predict that time when the period is that when it goes vertical to burn out. To give some idea, see past issues of *Short Wave Magazine* Info in Orbit column where the final periods prior to the demise of the infamous COSMOS-1900 nuclear fuel carrying RORSAT are supplied. Things will really start to happen at a period of 88 minutes. COSMOS-1900 was showing a 88.451 minute period and a drag factor of 0.00318463 on Julian Day 263 last year. On day 272 it had a 88.019 minute period and a drag factor of 5.81528E-3 On day 274.496 it showed a 87.90077 minute period and a drag of 6.9E-43, whilst later the same day at 274.740 it gave a 87.859 minute period with drag 7.3E-2, e.g. the drag had increased by a factor of more than 10! You know the rest from previous reports in this column!

If you want to see the changing UoSAT-1 period through time, look up our past bi-monthly mean motion values for OSCAR-9 and divide them into the number of minutes per day, e.g. 1440 to give the time of the orbital period in minutes. The associate drag factor should also be noted and applied until the next value. A plot of this value against an X axis in days will give you the slope curve toward final extinction. Below are some recent OSCAR-9 values for this current year so that you may get up to date until we print the whole new sets again next month.

A simple calculation, which may be easily turned into a small computer program, was given by **Nico PA0DLO**. The time of re-entry, with a statistical accuracy of plus or minus 1 per cent, may be found by subtracting the Mean Motion, 15.44699395 from 16.6666666 recurring, and then dividing this by ten times the drag factor. If this result is added to the Reference Epoch, the time of re-entry is given as the Julian day number of the year.

For our last finding above, 16.66666666 - 15.44699395 gives a round up 12.19673. If we then divide this by 10 x 5.8464E-04 (5.8464E-3 = 0.0058464) we get 208.61949 which when added to the Epoch Julian Day 048.55577078 gives day 257.17526, or, in real time, Thursday 14 September, at 04 hours, 12 minutes and 22.464 seconds. (The precision of the calculation is for your guidance, and does not reflect the accuracy of the prediction! — please remember the +/−10 per cent!)

Finally, beware your sources and means of applying the drag factor, alias acceleration, decay etc., in any programs you use, as at least five different versions of this have appeared in the past six years, few of which fit the standard pattern used by astronomers. Some can give the drag per day, some per orbit, nodal or anomalistic period. Stick to ours that emanate from NORAD, NASA, AMSAT and come to us via Birger Lindholm.

We have had a number of enquiries as to how to incorporate the drag decay into

Year	Orbit No	Julian Day	Mean Motion	Drag Factor
89	40735	028.59009558	15.42808258	3.6887E-04
89	40989	045.05722778	15.44274521	5.3918E-04
89	41043	048.55577078	15.44699395	5.8464E-04

computer programs and calculations that do not include it. **Andy Cawthorne G3TDJ** wrote from Taunton, "I wonder if you can throw any light on the inclusion of accurate correction for DRAG into satellite tracking software. It has been very evident over the past month or so, since the MIR two metre f.m. activity, that some tracking programs are coping with high drag factors much more accurately than others". As soon as space is available, this point will be covered.

Satellite Teach-in Net

Each Sunday at 1900UTC, **Viny WB2YGA** will be holding a space information net on 28.460 MHz u.s.b. The net will cover all aspects of satellites and the amateur radio space programme, will provide the latest news and all questions and queries will be answered. Following the fundamental text, check-ins will be taken and all questions arising answered. Your check-in, participation and input will be welcome. Later sessions will cover specialist space interests, and deal with specific matters.

The next three deadlines are April 26, May 31 and June 28

Propagation

Reports to Ron Ham
Faraday, Greyfriars, Storrington, West Sussex R20 4HE.

Using the Radio Telescope

Although the sunspot cycle was declining during the early 1980s, I recorded solar noise storms at 143MHz on Feb 6–8, 12, 16, 28 and 29; Mar 2, 19, 20, 28 and 29; Apr 13–15, 17, and 19; May 16 and 18–22; July 12, 19, 22, 23, 25 and 26; Aug 7–10, 16 and 18–21; Sept 12 and 13; Oct 9, 12–15, 18 and 19; Nov 2–12, 19 and 30 and Dec 12–15. I learnt from colleagues, that solar noise was also heard on 28MHz on Feb 6, Apr 27, May 16, Aug 21 and Sept 15 and that aurora, identified by tone-A signals, manifested on March 5, Apr 13, July 25, Aug 18, Oct 15, Nov 11 and Dec 29.

Auroral reflected signals were exchanged on 144MHz between stations in southern England and Scotland on April 13 and a massive blackout occurred on April 27. No doubt there were more, but I heard the BBC World Service report ionospheric disturbances on Feb 27, April 23 and Sept 20.

During the year, **Cmdr Henry Hatfield** (Sevenoaks) experimented with a second instrument running at 198MHz and he recorded noise at this frequency on Mar 19, 20 and 23; Apr 3, 10 and 26; May 14 and 18–22; July 12; Aug 7–10, 16 and 18–21.

Back to 1989, next month I plan to include more details of the 1298MHz equipment that Henry recently installed to work alongside his 136MHz system. That's as well as the v.l.f. observations, using electrostatic measuring equipment, being conducted by **Anthony Hopwood** (Upton-on-Severn).

On the subject of v.l.f, **Dave Coggins** checked the signals of a long-wave station 3 times per day during February and, although only just audible at his home in Knutsford, its signal increased on the 12th and 22nd when there was known solar activity. Keep up the monitoring Dave, this sounds interesting.

WRM045

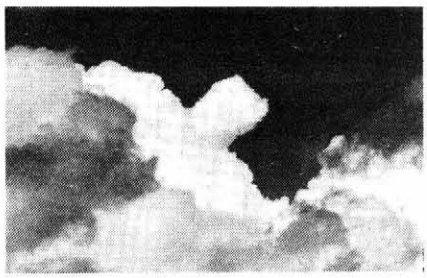

Fig. 1

Solar

"The graph for October shows an interesting feature. The sun did not shine for a week! Headline news? No, just with all the rough weather we had last month, the clouds covered the entire solar observing network. It is not often that this happens, as usually at least one observer between the Cape and Zimbabwe can see the sun," wrote **Jim Knight** (Boksburg). That was in his solar report in *Canopus,* the newsletter of the Transvaal Centre of the Astronomical Society South Africa. Any cloud cover, even fast moving, like Fig. 1, which I photographed over the South Downs last September, can hamper the use of projection apparatus for drawing sunspots. This emphasises the importance of having observers over a wide area.

The relative size and location of the sunspot groups observed and drawn by **Patrick Moore** (Selsey) at 0940 on January 26 and February 11 and **Mike Bennett** (Slough) on Ferbruary 8 can be seen in Figs. 2, 4, and 3 respectively. "While the airwaves have been fairly quiet these past few days, I dusted down my trusty old 2in refractor and had a look for sunspots. **Taking care as ever not to look at the sun directly,** I noticed some large sunspots in the sun's northern hemisphere," wrote **David Glenday** (Arbroath) on February 10. David also pointed out the large penumbra surrounding the spots. In Edinburgh, **Ron Livesey,** using a 2.5in refractor, located 9 active areas on the sun on January 15 and 8 and 6 on the 22nd and 28th respectively. At his observatory in Bristol, **Ted Waring** counted 45 sunspots on January 28 and 51 and 12 on February 10 and 20 respectively.

Henry Hatfield, using his spectroheliosscope on January 26 identified 3 sunspot groups (g), 18 filaments (f) and 8 quiescent prominences (qp) and on the 27th 3g, 22f and 7qp; 29th—3g, 21f, 6qp and 1 medium and 3 small flares; February 6—1g, 21f and 13qp; 7—2g, 21f, 10qp and a small loop prominence; 8 and 9—2g other observations spoilt by cloud; 11—3g, 27f, 12qp and 4 small flares; 12—6g, 21f, 6qp and a small flare; 14—4g, 34f, 10qp and a faint loop prominence on the NE limb and a large bright "chunky" prominence on the east limb; 16—5g, 13f and several qp (count is low owing to cloud); 20—3g, 15f and 8qp; 21—3g, 22f and 18qp and 23—3g, 26f and 10qp.

Henry also recorded individual bursts of solar radio noise, at 136MHz, on January 29, 31, February 3, 4, 5, 6, 8, 9, 12, 13, 15 and 21 and noise storms on days 13, 14, 15, 20 and 23. Recently, he installed a second radio telescope to operate on 1298MHz and recorded various sized solar bursts on February 9, 12, 13, 15, 20 and 21. At 1256 on the 9th a burst of radio noise at 1298MHz began 4 minutes earlier than its companion on 136MHz, Fig. 5. The downward spikes on the receiver noise line are the 10 minute time markers.

The monthly mean solar flux for January was 236 s.f.u. with a low of 192 on the 1st and a peak of 299 on the 16th. Details of the daily fluctuations can be seen in the computer print-out, Fig. 6, prepared by **Neil Clarke G0CAS** (Ferrybridge).

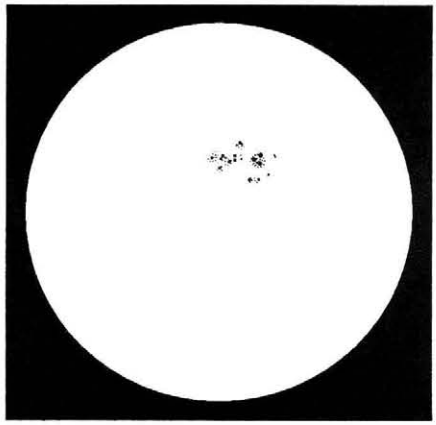

Fig. 2

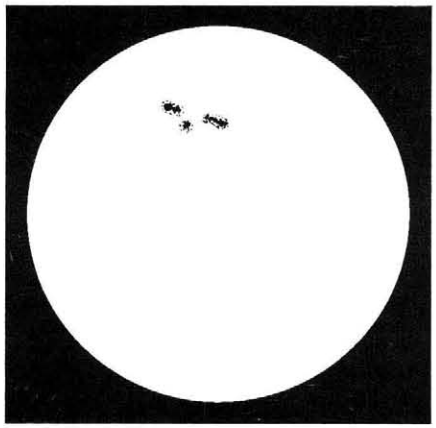

Fig. 3

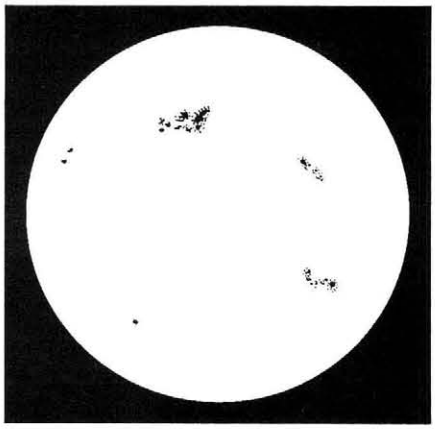

Fig. 4

Magnetic

Thanks again to Neil Clarke for the lower printout, Fig. 7, showing the variations in the Ap index for January. Neil's idea of placing the two graphs, Figs. 6 and 7, together should help readers to compare them at a glance with their own station logbook. Between 1800 and 2400 on January 15, 20, 21, 30 and 31, Ron Livesey's "jam-jar" magnetometer showed deflections of 32, 43, 21, 16 and 38 minutes of arc. From Saltash, **Karl Lewis** reported magnetic storm conditions, during the evening of the 15th, 1545 onward on the 16th, stormy variations on the 22nd and from 1900 on the 31st. The Hall Effect Magnetometer, built by Doug Smillie, (Wilshaw) detected large negative pulses on the 14th from 0200 to 2400; 17th/0900–2400; 18th/1930—2330; 19th/1100–2345; 20th/1000–1900; 22nd/0940; 26th/2130–2200; 27th/1500–2230; 28th/1100–2300; 29th/1100–1200 and 1930–2330; 30th/0900–2300 and 31st/0920–1620 and storm continuing to 2330. A large negative pulse between 0930 and 1030 was followed by a storm pulse on the 21st. Ron Livesey's report to the British Astronomical Association includes, from the American Continent, "Magnetic storm, mid and high latitudes and a solar flare" on the 15th, "Minor storm mid-latitude and flare 14 Jan" on the 16th, "Active" on 17, 18 and 23 and "Storm middle and high latitudes and flare 18 Jan" on the 20th and "South coronal hole" on the 23rd.

Aurora

Ron is the BAA's auroral co-ordinator and he received reports of radio signals being reflected by aurorae between 1730 and 1900 on the 20th and at 1800 on the 31st, from Gordon Hunter (Motherwell) and Doug Smillie, who logged reflections between 1910 and 1940 on the 20th and from 1620 to 1932 on the 31st. During the latter event, Doug heard tone-A signals from stations in Belgium, Denmark, Eire, England, Germany, Holland, Scotland and Sweden plus the v.h.f. beacons in Germany (DL0PR), Kent (GB3VHF) and Shetland (GB3LER). Visual displays, described as "active forms" were seen from Edinburgh overnight on days 15/16, 16/17, 17/18, 21/22 and "active storms" on 31/01. Around 1940 on February 3, Dave Coggins heard auroral signals on Band I TV channels E2 (48.25MHz) and Ia (53.75MHz and, on the 25th, **Ern Warwick** (Plymouth) noted "echoey" signals on the 28MHz North American beacon WA4DJS.

The 50MHz Band

I noted F2 openings producing "smeary" multiple images, on Ch. R1 (49.75MHz) during the mornings of February 18 and 25. On both days the signals were strong but unidentifiable. In India, **Lt. Col. Rana Roy** observed "multiple, smeary and fluttering" pictures on Ch. E2 between 0930 and 1010 on January 21 and regular F2 propagation, mainly from TV in Malaysia, between 1630 and 2230 from January 22 to February 1.

The 28MHz Band

During the last 4 days of January, **John Levesley G0HJL** (Bransgore) received signals from stations in a variety of countries ranging across the world from Canada and

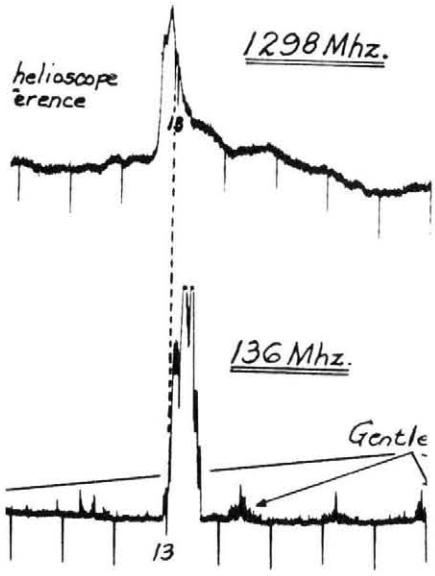

Fig. 5

the USA, Scandinavia, Europe, the Middle East, India, Japan and the USSR. From John's extensive log, I see that he heard signals from Argentina on February 21, Japan on days 11, 18 and 22 and Taiwan on the 11th. In addition he logged many f.m. repeaters from the USA on January 29 and February 19 and on the 19th the band was open until about 2100.

On the same theme **Fred Pallant G3RNM** (Storrington) wrote, "Am amazed that many W beacons are still audible at 2000". For the 11th, Dave Coggins said, "Stations on 28MHz s.s.b. were received from USA around 2130/2200 via N-pole. All signals had rapid fluttery QSB and some were very "raspy". Stations from the Michigan area seemed to be most prominent during the event."

Propagation Beacons

First my thanks are due to **Mark Appleby G4XII** (Scarborough), **Chris van den Berg** (The Hague), **John Coulter** (Winchester), **Vaclav Dosoudil OK2PXJ** (Kvasice), **Don Hodgkinson GOEZL** (Hanworth), **Ken Lander** (Harlow), John Levesley, **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), Fred Pallant, Ted Waring, Ern Warwick and **Peter Wessels PE1MLG** (Nieuw Beijerland) for all the details in their 28MHz beacon logs which I used to compile the monthly chart, Fig. 8.

On February 8, Peter Wessels and Ken Lander heard PT8AA sending "VVV de PT8AA PWR 5W ANT GP LAT 0958 S LONG 6748 W LOC FI60AC RIO BRANCO/AC". Ern Warwick copied "DE PT2UIT PWR 5W GP PSE QSL INFO" on 28.225MHz and "VE1MUF/B FN65NX" KESWICK RIDGE NEW BRUNSWICK 1 WATT PSE QSL TNX" on 28.282MHz. "VE2HOT within 200Hz," said Ern.

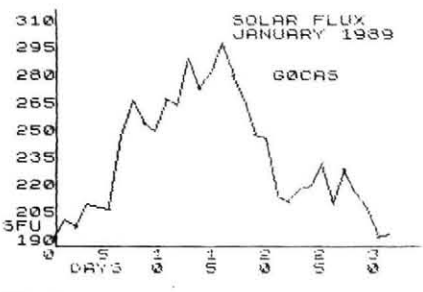

Fig. 6

John Coulter, Ted Owen and Ted Waring heard N2ECB, on 28.23MHz, sending "NJ USA 25W BEACON PSE QSL", W2DI on 28.295MHz and W8UR on 28.215MHz with 500mW from Mackinac Island. Mark Appleby usually hears the South African beacons just after 0700.

John Levesley and Ern Warwick copied SK5TEN on 28.900 and among the first timers for Don Hodgkinson this period were OA4CK—28.240MHz on January 25 and K0HTF—28.250MHz on February 23. "Not too much was heard from Australia this time and some of the more usual South Americans seemed to be missing most of the time," said Don.

In addition to their 28MHz logs, Ern Warwick frequently heard IK6BAK on 24.915MHz, CT3B, OH2B, JA2IGY, KH6O/B, 4U1UN/B, 4X6TU/B and ZS6DN/B on 14.100MHz DK0WCY on 10.144MHz.

Tropospheric

The slightly rounded atmospheric pressure readings for the period January 26 to February 25 were taken at noon and midnight from my own barograph. For the record, it is interesting to note that, except for 10 hours during the forenoon of January 6, the pressure was above 30.0in (1015mb) for 73 days from 0600 on December 6 to midday on February 17 and what's more, for 33 of those days it was at or above 30.5" (1032mb). However, I also scored, for me at least, a record low of 28.3in (958mb) during the evening of the 25th. In Essex, Ted Owen's barometer peaked at 1045mb at the end of January and was low at 1015mb on February 15. Tropospheric openings increased the range of signals from many v.h.f. radio and television stations during the period of January 24 to February 6.

934MHz

"934MHz also benefited from the high pressure period with improved copy from OD-93 (Middlesex) and MK-37 (Lancing, Sussex)," wrote **Les Jenkins GB-37** from Godalming. At midday on January 31, **Terry Wyatt UK-845** (Walton on Thames) worked stations in Biggleswade and Leighton Buzzard at 100km and Peterborough at 120km. The atmospheric pressure at Terry's location was 1043mb on the 29th and 1041mb on the 31st.

From his home on Bransgore, John Levesley (UK-627) worked GY-186, in Guernsey, around 160km, on January 29 and February 1 plus a "very scratchy" contact on the 3rd.

Armchair Astronomy

I am delighted with the astronomy program, called *STARTRACK*, which I purchased recently, for my Amstrad PCW, from Discovery Software, 262 Regents Park Road, London N3 3HN, price £14.95. I found the package educational and user-

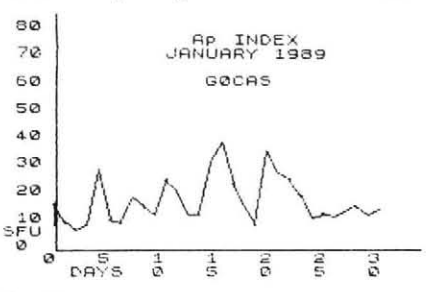

Fig. 7

friendly. The best feature for me, is the ability to imagine myself anywhere on earth, by keying in the longitude and latitude, and then having a sample of the night sky displayed before me. In addition, the positions of individual stars and constellations can be identified, the ecliptic, horizon and time and date of observation are selected as required, plus the option to watch the sky change as the program transports the user forward month by month. Detailed instructions are given in the easy to read handbook, supplied with the program disk, of how to set up STAR-TRACK on the 8256, 8512 and 9512 machines.

The next three deadlines are April 26, May 31 and June 28

	January 89						February																							
Beacon	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DF0AAB	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DL0IGI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EA6AU				X								X																	X	
EA6RCM				X																										
IY4M	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X
KB2BBW	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	
KB4UPI	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
KD4EC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
KE2DI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
KF4MS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
K0HTF																													X	
LA5TEN		X	X	X	X	X	X	X								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LU1UG																													X	X
N2ECB																	X					X						X		
N4LMZ	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OH1ZAA										X		X																		
OH2TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OK0EG											X					X	X			X	X		X				X			X
PT2UIT												X	X	X																
PT7AAC											X	X	X	X	X	X	X	X	X	X	X	X	X	X						
PT8AA																						X		X	X				X	X
PY2AMI	X	X				X	X	X	X		X	X	X	X		X		X	X	X	X	X	X	X	X	X	X			
SK5TEN																								X					X	X
VE1MUF		X	X	X	X			X		X	X	X	X	X	X	X	X	X	X	X			X		X	X	X	X		X
VE2HOT	X	X	X		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
VE3TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
VE6YF														X	X	X	X	X				X	X	X			X	X	X	
VK2RSY	X	X	X	X	X	X				X	X				X	X	X			X	X					X		X	X	X
VK5WI		X	X	X		X																								X
VK6RWA		X		X																										
VP9BA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
VS6TEN	X										X	X			X						X	X	X	X	X	X	X	X		
WA4DJS	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WB4JHS			X	X			X	X		X	X	X	X	X	X	X					X									
WB9FVR			X	X	X		X	X				X	X		X	X	X			X	X	X	X	X	X	X	X	X	X	X
WC8E		X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WJ7X															X															
W2DI														X																
W3VD	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W7JPI																	X	X				X	X						X	
W8VR																			X	X	X	X	X	X			X	X	X	
W9UXO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ZD8HF	X	X		X		X	X					X	X	X	X	X	X	X	X											X
ZL2MHF															X		X		X			X	X	X		X				X
ZS1LA	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ZS5VHF	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ZS6PW	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Z21ANB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5B4CY	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Fig. 8 ▶

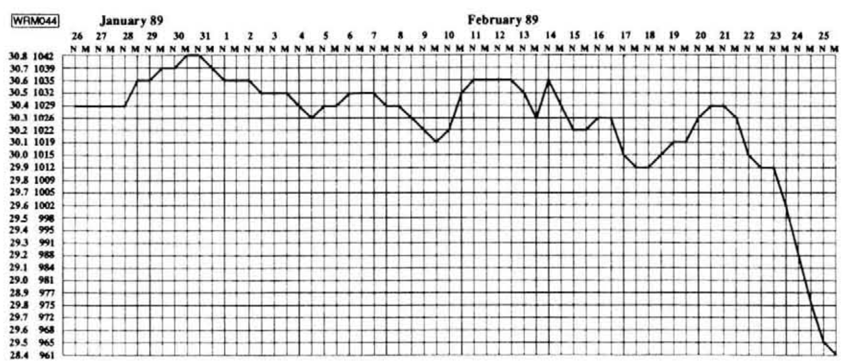

Fig. 9

Broadcast Round-up

Peter Shore

We have been covering in recent columns ongoing stories including the cessation of jamming by the Soviet Union of a number of western broadcasters, and on the sharing of h.f. transmitters by stations around the world. Further developments have occurred.

The Soviet regional press has been carrying articles on the end of jamming and asking what will become of the transmitters and of the staff who worked there. In one feature in a Byelorussian newspaper, the Minister of Communications was interviewed and said that five jamming centres had stopped work, releasing 89 transmitters which had been "ensuring the ideological defence of the republic and whole country". About 90 percent of the transmitters are to be used for the broadcast of the republic and national programmes on short wave, with a resulting improvement for listeners. The end of jamming has released around 100 people, engineers and technicians, who are now working for other communications organisations. We can only wonder whether these transmitters are going to be almost as annoying in the future, multiplying the number of Soviet radio signals, as they were when used for jamming . . .

Another story we have been looking at is the planned use of Radio Norway's transmitters by Danmarks Radio. Radio Norway had rearranged its programming into half-hour blocks from the May frequency changes, to release 30 minutes air time in every hour to its Danish colleagues. It now seems that Danmarks Radio is dragging its feet and will more than likely be unable to come to a final agreement with Oslo in time (finances are apparently a problem). That will mean that Radio Norway International will be faced with a reduced amount of programme time and wasted transmitter resources. Keep watching this column.

Continuing exchange news, Radio Austria International will be broadcasting to North America from April using the Radio Canada International Sackville transmitters between 0500 and 0600 UTC on 6.015MHz. RCI will also carry Radio Beijing from Sackville between 0300 and 0400 on 11.845MHz to South America and between 0400 and 0500 on 5.96MHz to North America.

Meanwhile, despite the end of jamming of RFE and Liberty, the stations continue to increase their transmitting capabilities. The French Thomson-CSF company was

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recently awarded the contract to supply three new 100kW transmitters to the Lampertheim and Biblis sites in West Germany, although it has been suggested that the two stations might actually reduce their usage of short wave frequencies now that jamming has stopped.

New transmitters will also improve reception of All India Radio: Home Service is now heard from Port Blair on a new 10kW transmitter using 7.180MHz during local daytime, and 4.76MHz during early morning and evening. At Khampur near Delhi, two 250kW transmitters will go on the air in the coming few months, to join four 50kW senders which have replaced ancient 20kW units and one 100kW transmitter.

At Aligarh, the 250kW senders are opening on reduced power (150kW) because of electricity supply problems, and six 500kW Marconi transmitters are almost ready at a site 60 kilometres from Bangalore and the first is expected to start testing shortly. New medium wave transmitters to serve Sri Lanka (100kW at Tuticorin) are being constructed.

In Italy, the IRRS in Milan has gone into commercial operation with a Sunday-only schedule, broadcasting on 9.86MHz beginning at 0800 UTC. Programmers include UN Radio material.

Deutschlandfunk in West Germany improves its coverage on long wave this Spring with the introduction of a new transmitter on its 207kHz frequency. The old 500kW transmitter in Munich is being replaced by a new 26 million DM unit at Deggendorf in Lower Bavaria and will improve coverage throughout East Germany and into other Eastern European countries.

European Stations

All times UTC (=GMT)

Radio Prague carries English programmes beamed to Europe:

1530–1625 on 21.505, 17.705, 15.155, 15.11, 13.715, 11.99, 11.685, 9.605, 7.345 and 6.055MHz.
1800–1830 on 7.345 & 5.93MHz
1900–2000 on 7.345 & 5.93MHz
2200–2230 on 6.055 & 1.287MHz

Interestingly, the 1900 programme on Saturday carries a feature entitled *Christian Comment from Czechoslovakia*—glasnost seems to be permeating everywhere in Eastern Europe.

The Voice of Greece is carrying its Greek service on new 9.375MHz at 2100, a change from 6.21MHz. The channel of 6.225 is used at 1930 for English, followed by French and German, and also for Italian at 1600.

Radio Netherlands has made a number of changes to frequencies from March 26. The complete English schedule is now:

0430 on 13.70 & 9.895MHz
(25 minutes to Mid East/Africa)
0730 on 9.715 & 9.63MHz
0830 on 9.77
(25 minutes to New Zealand ex Sun)
0830 on 21.485 & 17.575MHz
1030 on 9.675 & 6.02MHz
1130 on 21.615, 21.48, 17.575, 9.715 & 5.955MHz
1430 on 17.605, 17.575, 15.15, 13.77 & 5.955MHz
1630 on 15.57 & 6.02MHz
1830 on 21.685 ,17.605, 15.56 & 6.02MHz
2030 on 15.56, 13.70 & 9.86MHz
0030 on 15.315, 6.165 & 6.02MHz
0330 on 9.715 & 6.165MHz

Regular listeners to the 1830 broadcast here in Europe on 6.02 will notice that this has been dropped, because of appalling reception due to interference from other stations, and the propagation problems for short wave transmission from the Netherlands to the UK and Ireland (we're too close!). The 21 and 17MHz frequencies should provide reasonable reception in the UK. Radio Netherlands hints that a medium wave transmitter may be available for European coverage at some time in the future, but please don't hold your breath whilst waiting.

During April, *Media Network,* broadcast on Thursdays, plans to carry these features:

April 13—Local Broadcasting in West Germany;
April 20—all news with contributions from Andy Sennitt and John Campbell;
April 27—MN visits Brunssum near the border with Germany to look at the Canadian Forces Radio Service in Europe.

RDP in Lisbon has Portuguese programming at 1650 on new 15.285MHz, having dropped 11.74MHz.

R Sofia uses 11.735MHz for English between 2130 and 2200 from March 5.

Radio Moscow's English language World Service has been noted with a feeder on 7.925MHz u.s.b. at 1600, and a DX-type programme is heard at around 2245 on Wednesdays. Frequencies to try then are 15.425, 12.05, 9.84, 9.82, 9.79, 9.635, 9.625, 7.23, 7.17, 7.15, 7.115, 7.105, 5.98, 4.895, 4.86, 4.795, 1.494 & 1.143MHz.

Vatican Radio has English to Africa at 2045 on a new channel of 11.695MHz.

Middle Eastern Stations

Iraq has been heard in English on the new frequency of 11.97MHz from old 9.77MHz, with 15.23 remaining in parallel.

Kol Israel is to benefit from investment in new short wave transmitters. Meanwhile, its Georgian language broadcast at 1510 has been noted on new 17.685MHz.

Radio Jordan's English Service is using 13.655 between 0500 and 1420, a move from 11.955. From 1415, the frequency changes to 9.56MHz.

African Stations

The Voice of Ethiopia is heard between 1500 and 1600 on 9.56 and 7.165MHz.

ELBC in Liberia has been heard around 1900 on 3.255 variable with an English news bulletin. Reception is fair in the UK.

FEBA in the Seychelles is audible with English at around 1600 on 11.87. The programme runs from 1500 until 1610 in parallel with 9.59MHz, on which the English broadcast continues to Asia until 1625. On Sundays, a *DX Postbag* programme is broadcast at 0730, on 17.78 and 15.275MHz. English to Africa is heard at 1735–1805 on 11.81MHz.

Radio Tanzania in Zanzibar is heard on 6.015 and 11.735MHz variable during the evening in the UK with varying reception quality.

La Voix du Zaire carries a French language news bulletin at around 0430 on 7.10MHz, audible from at least 0400.

Any reports for Broadcast Round-up should be sent to the *PW* Offices

Asian and Pacific Stations

Radio Bangladesh has been heard on exactly 7.52MHz with English to Europe at 1815 until 1900, followed by Bengali from 1915 until closedown at 2000.

Radio Bhutan is to have a new 50kW transmitter in April, which may improve reception. The station broadcasts on 9.615MHz currently, with a listed alternative of 6.035, between 0600 and 0900 on Sundays, 1100–1400 weekdays.

Laos continues to benefit from a Soviet relay of its French service for Europe at 1100 on 15.19 and 11.87MHz. English is broadcast direct from the Asian country on variable 7.113MHz at 1300.

Mongolia has been heard recently in the UK, and announces this schedule:

1200–1230 on 12.015 and 9.615MHz
1445–1515 on 15.305 and 9.575MHz
1910–1940 on 21.77 and 12.015MHz
1940–2010 on 11.87 and 9.645MHz

A Japanese service has recently been introduced and includes the use of 12.015MHz (generally audible in Britain) at 1200.

Radio Pakistan has Turkish on 15.605 and 13.665MHz at 1645. The European services from Pakistan between 1645 and 1900 are on 15.545 and 11.57MHz at present.

R Veritas in the Philippines is using 15.46MHz from 1500–1530 with English including news at 1520. A parallel channel of 15.22MHz is also used.

Sri Lanka is heard after 1845 in English using 11.80MHz, although the station is scheduled to use this channel in Tamil between 1815 and 1845 closedown. This may be an additional broadcast.

North, South and Central American Stations

Argentina's complete External Service schedule for English is now:

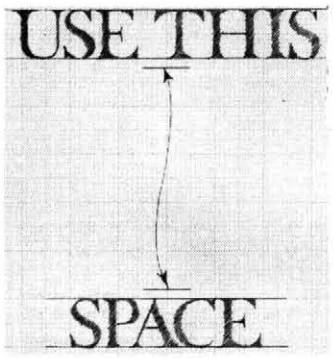
0100–0200 on 9.69MHz
0300–0400 on 9.69MHz
1630–1730 on 15.345MHz
2100–2200 (except Tuesday and Thursday) on 15.345MHz

HCJB in Quito, Ecuador has changed frequency again for its morning broadcast to Europe, now on 6.08, 9.61 and 11.835MHz at 0730. Paraguay is heard at around 2140 on 9.735MHz.

A frequency change for Radio Surinam International: from March 5, 17.765 will replace 17.835MHz for its transmission at 1700 until 1745, including English, Dutch and Sranan Tongo. The transmission is beamed from Brazil.

TWR in Bonaire, Netherlands Antilles, carries English programmes to the Americas at 0300–0400 on 11.93 & 9.535MHz (running until 0530 on Sunday and Monday); and 1115–1255 on 15.435 and 11.815MHz (to 1330 on Sunday and to 1405 on Saturday).

KJES in El Paso, Texas, is carrying out further tests. We mentioned last month that the station's transmitter is 5kW, but in fact it is 20kW, running on just 5kW at present. Listeners may call the station during these tests, and, most unusually, suggest frequencies for the station to use. The number to call is 915-533 2911.



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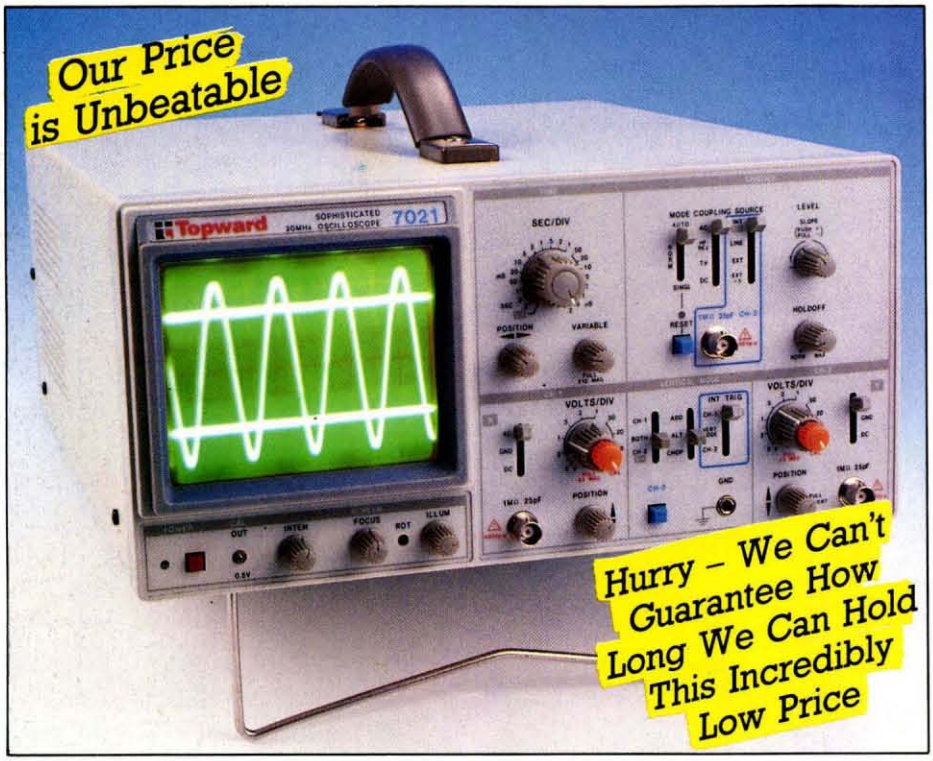

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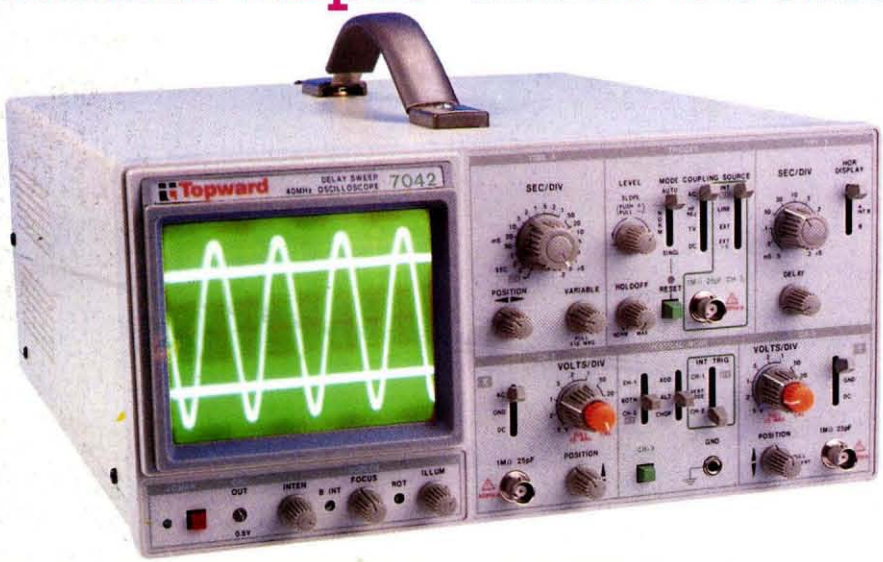

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