HRT

HAM RADIO TODAY

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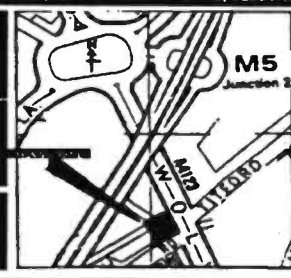

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HAM RADIO TODAY

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VOLUME 8 NO 12 DECEMBER 1990

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REGULAR COLUMNS

REVIEWS

FEATURES

NEWS AND VIEWS

ILLEGAL CB RADIO APPARATUS

Licensed radio amateurs are reminded that in accordance with the provisions of the Wireless Telegraphy (Citizens' Band and Amateur Apparatus) (Various Provisions) Order 1988 it is an OFFENCE to possess non-approved CB set(s) (ie NOT marked CB27/81 or PR27-) unless under an authority issued by the Secretary of State.

If you are a licensed radio amateur and already possess a non-approved CB set which you intend to convert or which has already been converted to amateur frequency bands but in respect of which you do not hold an authority to possess then you *must apply to the RADIOCOMMUNICATIONS AGENCY for an authority by 31 December 1990* if you have not already done so.

Failure to apply by this date will render the apparatus liable to seizure by the RADIO INVESTIGATION SERVICE acting under Section 79 of the Telecommunications Act 1984 and forfeiture by order of a Court under Section 80 or 81 of the Act.

Applicants should write giving the make, model and serial number of the apparatus together with their full name and call sign to:

Radiocommunications Agency
Room 102
Waterloo Bridge House
Waterloo Road
LONDON SE1 8UA

The 1988 Order also makes it an offence to sell non-approved CB apparatus and radio amateurs are therefore advised not to purchase such sets.

Issued by the Radiocommunications Agency of the
DEPARTMENT OF TRADE AND INDUSTRY

CQ de G8IYA

How did you become interested in amateur radio? Amateur pioneers may well have been excited by the thrill of experimentation in new technology as it was then, keen to discover new techniques. Mature amateurs who came into the hobby much later will probably have become introduced by overhearing amateurs on the short wave bands, particularly 160m ('Top Band') AM. The days of Sunday morning Top Band AM nets and other AM contacts on the HF bands introduced many new amateurs into the hobby. During my younger days in Lancashire, the East Lancs Amateur Radio Club net on 1930kHz AM each Sunday was fondly awaited by a certain SWL, a low cost 'all-wave' receiver coupled to a long wire running down the garden offering good reception of these 'alternative' stations to the usual broadcasters.

New Blood into Amateur Radio

Recent Years

Time passed by, and the most significant influx during recent years has been through the CB explosion of the 1980s, where keener individuals made the effort to pass the RAE and possibly the Morse test. What a pity certain factions did not appreciate this new influx, some even tried to ignore these potential new amateurs! The growth in CB has now steadied out, and less newcomers are apparent. Fewer members of the public are happening to tune into amateur contacts on HF and thus becoming interested that way. Two-way radio communication is nothing new in today's age of international communication by simply picking up a telephone.

Instead, new toys such as computers are taking over, youngsters are writing programs to do wonderful new things, they're dialling up landline 'Bulletin Board Systems' and downloading files, sending text messages to each other, and catching up on the latest information on the 'special interest' boards. A 'space' board for example could give information on the Space Shuttle, the Russian MIR Space Station and the latest communication satellites, together with Kepler information so they can use their computer to calculate where these craft are at any given time. These enthusiasts pass messages of common interest between themselves, often conscious of running up their parent's phone bill too much. Few may be interested in stringing up wires across their parent's garden, and building things using components that look like they may have come from someone's ancient junk box, then struggle to get some form of a contact.

Suddenly, certain factions are worried that amateur radio isn't now growing as fast as it should!

Education

Why not give them the perfectly correct idea that amateur radio can be exciting. As well as finding out what the MIR cosmonauts and Shuttle astronauts are up to by logging into their local packet radio bulletin board, they can have a packet QSO with the MIR or Shuttle space station – and get a QSL card to prove it! Posted from space as well, I bet you didn't know there was a post office on the MIR space station, complete with it's own postmark. Wouldn't that excite a potential newcomer to amateur radio? In HRT, we've shown how to get a station going on packet for less than £50, the price many youngsters pay for a personal stereo.

The novice licence allows them to send and receive worldwide error free messages using low power on VHF and UHF. With just a few Watts of 70cm into my local node they can work through satellites, HF gateways, access DX clusters, Bulletin Boards, even use a remote amateur satellite uplink/downlink station with its own automatically tracked aerials. To counter the pessimists who think 'UHF means expensive black boxes', HRT have been pioneers in giving details on surplus PMR conversions, even in this very issue you'll find one. Ready built gear? Well my local amateur radio store is selling brand new 70cm 3W packet transceivers at £25 each. It needn't be expensive.

You may not be interested in all these new exciting directions amateur radio is taking, but *they* will be! So why not get out there and tell potential newcomers that amateur radio can be fun, it can be interesting, and it isn't just old fogeys moaning about the decline of amateur radio.

I met my husband through amateur radio, the very day we were both helping younger people become interested in the hobby through our work with a Scouts 'Jamboree On The Air' station. We were both teenagers.

This month, we received a letter from a group of similarly minded teenagers in Thanet, we're pleased to have placed this as our 'Letter of the month'. But what about the other letters, many of which we couldn't publish. Well last month we had amateurs moaning, the same this month. What will happen next month? Is this an example of what amateurs do, if so then count me out. Let's have some constructive, dynamic actions instead!

If we can be constructive, maybe in the future we'll no longer be regarded by our neighbours as eccentrics living in a house with strange looking aerials, but instead as someone at the forefront of communication, someone to be respected, someone who knows what they're talking about!

ASP — Pioneers in Radio Publishing

We're doing our bit, in the pages of HRT you'll see we're trying to practice what we preach. As well as 'traditional' branches of amateur radio, we're showing you what Ham Radio is about, *Today*. In our sister publication *Scanners International*, we're showing that radio can be different, it can be exciting, and it isn't just for eccentrics. And these days, the public are more likely to overhear amateurs on 70cm FM than HF AM or CW.

Argus Specialist Publications, who publish more radio magazines than any other UK publishing house (true, just count them all!), have been publishing radio articles (although it was "wireless' at that time) since the beginning of this century. As such, we've been pioneers in radio publishing, in 'Model Engineer' we showed your grandfather how to make his one valve set to listen to 2LO with. As such, we've been at the game longer than the likes of any other UK publisher!

***We're* not resting on our laurels. We're trying that bit harder. We're continuing our pioneering tradition! So why not help us, write in with your views!**

LETTERS

Letter of the Month

Dear Editor,
We have a Electronics and Radio Club for youth here in Thanet, which has been going for a number of years with Dr. Ken Smith who works in the university, as our leader. So here is a report about the new session and what the boys want to get done.

The average age of members is 13 years, and a lot of people say youth is not interested in radio and electronics, but that is certainly not so with our band of young people. Some of us went with Ken on a week's youth hostels cycle tour round the New Forest and Isle of Wight (yes, we do that too). We visited the "Wireless Museum' at Arreton Manor, and were most impressed with the interesting things there. Our leader is so keen on collecting and giving talks on old wirelesses, we can see why now!

The main project this term will be everyone building RDF receivers, for club outings to 'find the hidden transmitter'. Also, as quite a lot of old members passed the RAE (and GCE/ GCSE) from the clubwork over the years, some of us will study that course this year. Others are interested in the new RSGB 'novice licence'.

We have a mag, or newsletter called the 'TECnician'. We don't think many 13 year olds will be reading your mag, but what is important is older people such as teachers, dads, uncles etc. who might read it, could mention our club to any young person who could be interested. But they must be keen, and help to run the club, as it is very 'democratic' (we have a members committee who run things.)
Thank you, Yours sincerely,
Ross Collins of Ramsgate, Kent.

Editorial comment;
It's great to see an active interest in amateur radio fostered amongst young people, I remember when I was 13 there was so little information available to a budding young engineer keen on learning about radio. I hope many of our readers will take note of your letter, and that offers of useful help and assistance will be forthcoming. RDF, or radio 'fox-hunting' as it is commonly called, is very popular in many countries, being almost a form of 'radio orienteering', and I'm sure with it's sporting aspects and the new novice licence conditions which allow unattended RDF transmitters it could be the beginning of something very popular over here as well! As a small measure on our part, you'll be receiving our £10 cheque for the 'letter of the month', maybe it could be useful towards component parts for your RDF receivers. Good luck for the future, and enjoy the hobby!

£10 FOR THE LETTER OF THE MONTH

You've got a gripe about the bandplans, or you're sick of being wiped out by next door's microwave. Or maybe you've been bowled over by the excellent service from you local radio shop.

Whatever you've got to say about amateur radio say it here in the letters column and you could win yourself £10 for writing the letter of the month.

Send you epistles to: Letters Column, Ham Radio Today, PO Box 73, Eastleigh, Hants SO5 5WG

Dear Editor,
I have just read your constructional article, the 'Sub Tone Controller'. Maybe tone controlled squelch is a good idea for PMR operators, I can't see it being much use to amateurs, in fact it could well escalate the "I was here first" arguments we hear from time to time.

Consider the following scenario;

A net of stations, all using tone squelch, are standing by on let's say 144.725MHz. I and another station arrive on the frequency for a QSO, but being good boys, we ask if the frequency is in use before we start chatting. The net stations don't hear us, because our tone-less signals don't open their receivers. Therefore, we carry on with our QSO. The net only become aware of our QSO when one of their own tones opens their squelch. This is also the point when we get interference to our QSO. "We were on this frequency first" say the net stations. "Rubbish" say I, "I asked at xx hrs and received no response, it's our frequency!". Well who's right?

To my mind, any kind of selective access system is all wrong for amateur applications, and will lead to yet more exclusive 'cliques' using amateur radio as a kind of telephone, where 'outsiders' are not welcome.
A.J. Howlett, Dukinfield

Editorial comment;
In answer to this, need to decide whether sub-tone should be used or not, then if so exactly how it should be used.

The first is easily answered, as many amateurs already need it for access requirements to their repeater, e.g. GB3PE. The use of sub-tone overcomes many operational problems on repeaters experienced due to co-channel reception. It wouldn't be very satisfactory if a mobile station at the scene of a serious accident in the middle of nowhere couldn't get a message through his local repeater because distant operators had placed it into timeout. We at HRT are showing that we don't all need to buy expensive black box transceivers with CTCSS facilities to allow us to use these repeaters, and with the circuit's use in converted surplus PMR rigs we're continuing to be pioneers in promoting this form of low-cost amateur operation. My shack 2m rig is a synthesised British ex-PMR job costing a few pounds, how much was yours?

Getting back to CTCSS, we need to ensure that some form of selective calling through devices such as repeaters is available if needed to amateur groups involved in, say, emergency communications. This allows them to be alerted to a call–out without the need to be constantly listening intently to all the activity on the frequency, day or night. Again the HRT pocket 2m pager receiver project (the unit costing typically £1) in the June 87 issue is an example of this.

So having defined a need, and being the only magazine to make it cost effect for those without bottomless pockets, maybe we'd better look at how it's used which I feel could really be the point of Mr. Howlett's letter.

Similar arguments can and do occur in some cases by amateurs in a net tuning their squelches up high and using high power to overcome signals from other users, it's not just CTCSS that can be used. What is needed though is consideration, and the need to check a frequency before simply transmitting on it. This simply means using common sense by defeating the CTCSS circuit and taking a listen. Many of us have come across the "No you can use this channel, this is the such and such frequency and we're going to use it tomorrow" syndrome. No–one owns frequencies, although some users may like to think they do. Using CTCSS, they can listen out for other users of their existing 'clique', or to put it another way their special interest group, without the need to constantly try and defend 'their' frequency.

But amateurs do need to be considerate and listen out before transmitting, this being common sense. Special interest groups are human nature, and we can't change that, but we can endeavour to reduce their hostility to outsiders by the use of CTCSS in this application. What do other readers think?

Dear Editor,
I am writing to point out an error in the October 1990 issue of HRT. It is in the article 'An Accurate Bidirectioal Watt Meter' by A. Greenfield G4TPB. On page 26 it is stated that:–

$$SWR = \frac{\text{Forward Power} + \text{Reflected Power}}{\text{Forward Power} - \text{Reflected Power}}$$

This is incorrect. 'SWR' or as most commonly written 'VSWR' is given by:–

$$VSWR = \frac{1 + \sqrt{\frac{\text{Reflected Power}}{\text{Forward Power}}}}{1 - \sqrt{\frac{\text{Reflected Power}}{\text{Forward Power}}}}$$

for power meter use.
Bernard Spencer C.Eng. MIEE. Marlow, Bucks.

Editorial Comment;
You're quite right, and HRT now has a new technical editor!

Dear Editor,
The saga began in January this year when I took my 2m transceiver to my local amateur radio dealer for repair, the symptom being low output. After three months of repeated requests about the repair, I was told it had been to another of their branches. Five and a half months later, again after repeated request about the radio, I finally gave them the ultimatum "Return the radio dead or alive within 7 days". It duly arrived, with a 'request' for £87.19 which I paid. When I asked for a detailed account, they said they didn't have one and didn't know what had been done to it. After another week they still had no information, I therefore phoned their other branch myself asking for details of the work carried out. I was told there was no point telling me as I would not understand anyway. End of story as far as I'm concerned, and the end of my dealings with that firm!
J. Roughhead GM1ZUY

Editorial Comment;
You do seem to have had a long delay with your transceiver, however from the accompanying documentation you sent it does appear that the dealer provided a written apology for the delay as they had trouble identifying your set due to lack of serial number identification, adding that the repair was indeed a difficult one. As well as that it looks like they only asked you for £5 towards the carriage! Two hours of labour at a labour charge of £35 per hour does, to be quite honest, seem similar to what you'd have to pay any well equipped electronic workshop manned by staff who know how to use spectrum analysers and the like. The repair of a video recorder for example would cost £45 for the first hour from my local distributor's service centre, and a £350 electrical appliance of mine would recently have cost me over £200 to repair (I bought a newer replacement instead, and I had to wait over 8 months for my video to be returned from another outfit, unrepaired).

Amateur radio firms are in business to make a profit of course, and after inquiring amongst other firms to yours, the above labour rate really doesn't seem to be unreasonably different to the 'norm'. As with any repair, readers must note that labour costs do have to be paid for, it's the dealer's livelihood even though it's our hobby! Very simple, if you can't repair it yourself, and you choose instead to pay someone the 'going rate' to repair it instead, don't argue when the bill comes! Even then, it was a long wait.

RADIO TODAY

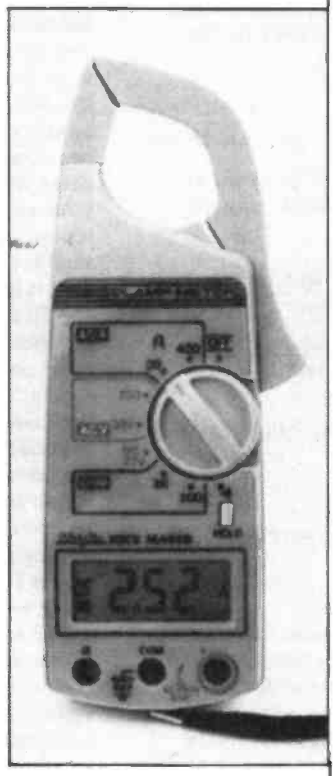
you build' cassette based learning courses. Meanwhile extended product ranges include batteries, books, cable, protection devises tools and projects.

Other highlights of the catalogue include the Casio digital diary and personal organiser, Breeze air ioniser, Nicam TV tuner and the multi satellite receiver system. Maplin are also giving away an all–weather heavy duty torch with purchases of over £15 plus the coupon from the catalogue.

Maplin 1991 Catalogue

The new Maplin catalogue for 1991 is now available at W.H. Smith, Maplin shops or by mail order, priced at £2.45 (+ 50p if ordered direct, UK price). There are over 600 pages, prices and quantities are highlighted in colour.

Of significance to the amateur world is that following the recent marketing agreement between Waters and Stanton Electronics and Maplin, several amateur radio products such as receivers and transceivers, packet radio TNCs and the like, in addition to the Heathkit range of amateur equipment, are also available. Maplin also tell us there are many other famous brand products featured such as Black and Decker and Minicraft tools, and Big Cat eminence loudspeakers. Other new product lines include Kodak films and Olympus cameras, Pro–sound car radio/cassette/speakers, satellite receivers, and 'watch as



Digital Clamp Meter

Maplin have also recently introduced a new digital clamp meter which measures AC currents up to 400A without having to break the circuit under test. The sheathed current carrying conductor is placed within the jaws of the clamp, and inductive coupling is used to measure currents in the conductor without need for direct connection to the cable. The meter also measures AC, DC and resistance in the conventional way with leads and probes. The 3.5 digit LCD display includes over–range and low battery indication with data hold. The clamp meter is supplied with instructions, test leads and probes, temperature probe and one PP3 battery.

QSL with a difference!

This nicely carved hardwood QSL was presented to Cyril, G3YY, by his friend Dusko, YU2ZR, on a recent holiday to Yugoslavia. It was hand carved by Dusko, and features the coat of arms of Opatija together with his QSL card. The plaque is about 270mm high, 200mm wide and 20mm thick. A very nice gift that I'm sure will be remembered by Cyril for years to come, a true mark of east–west friendship through amateur radio.

Yaesu FT-990

Just in time for the Leicester exhibition this year, Yaesu announce the forthcoming launch of their new FT–990 HF DX transceiver. With a general coverage receiver and a 200W transmitter, it provides multiple receiver bandwidths and operation modes together with the facility of adding a Digital Voice Storage option, this automatically recording and replaying received and transmitted speech at the touch of a button. Yaesu's Representative Seiji Yokoi is planning to fly over with the transceiver especially for display at the exhibition. Needless to say, HRT have already been offered the very first UK review opportunity which is currently planned for next month's issue.

Techical Excellence Award

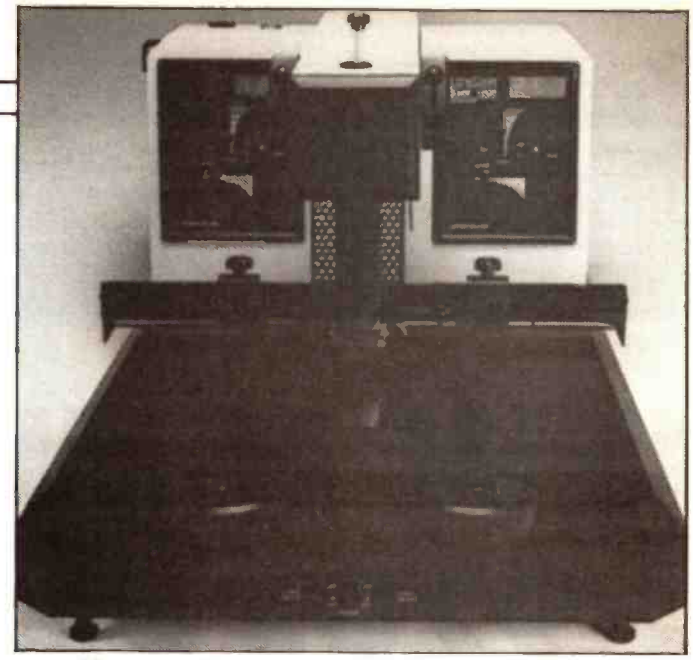
At this year's Dayton HamVention, packet pioneer Bob McGwier N4HY was presented with the Dayton Amateur Radio Association's Technical Excellence Award, the second year on the run a Dayton award has been presented to a packet radio developer.

The Dayton Amateur Radio Association tell us that Bob is a member of the original team that pioneered the Microsat series of Oscar satellites in late 1987. His specific contributions involve writing command, telemetry and control flight software for all of the Microsats, designing the Digital Orbiting Voice Encoder (DOVE) and managing software and computer hardware design for the Microsats.

N4HY is the author of the well–known satellite tracking software known as Qwiktrak. For seven years, this software has been the single largest source of revenue for Amsat. Bob has co– authored several American magazine articles, and has written several papers that appeared in the proceedings of the ARRL Computer Networking Conferences. In his free time, Bob and Tom Clark W3IWI have championed the cause of digital signal processing (DSP) in amateur radio applications. It was the HRT's privilege to meet and chat with Bob during his recent visit to the UK.

Powerbreaker Safety RCD

Powerbreaker tell us that a safety 'Residual Current Device' is a device that provides added protection against the risk of electrocution. Unlike a fuse or circuit breaker, which is designed to protect the electrical appliance, an RCD protects the user by automatically cutting the power before you get a serious shock. Powerbreaker units are available not only as adaptors but also as protected 13 Amp plugs and single or twin wall sockets. The adaptors simply plug in, requiring no additional wiring, so they can be moved around easily between appliances and are available from high street stores priced around £20.



New surface mount re-work station from Ungar

Ungar, the soldering and de–soldering specialists have announced the Ungar SMR 1000 surface mount re–work station, now being launched in the UK. This self contained, E.S.D. safe unit features a hot air heater system with closed loop temperature control. The top and bottom heaters warm both sides of the board (useful for warming multi layer boards), components are automatically removed as soon as the solder flows. The components are thus removed and replaced quickly, without damage to the board or the components. Ungar tell us the controls are simple and warm up is rapid, the unit taking approximately 3 minutes from switch on to the ready state.

Enquiries about the SMR 1000, also other products such as hand tools, solder masks and soldering aids, should be made to Ungar, Eldon Industries UK Ltd., Unit 1, Clifton Road, Shefford, Beds SG17 5AB. Tel. 0462 814914

Stolen Property

An Icom IC–R1 scanner receiver, serial number 89001213, was stolen from Characteristics. 44 Hilderthorpe Rd, Bridlington, Yorkshire YO15 3BG at the end of August. If you are offered this radio you can contact Norman Bedford. G4NJP, at above address or Tel. 0262 670568, or of course your local police.

Tandy 1990-91 Catalogue

The Tandy 1990–91 catalogue is now available free of charge from your local Tandy store and authorised dealers. The 140 page catalogue features a complete section by section showcase through the product range, and gives details of all Tandy stores and dealers. Tandy stores have a range of audio, video and specialised electronic products and accessories as well as their "Realistic' range of scanner receivers.

The DTI Announce

Industry minister Douglas Hogg recently welcomed the introduction of a new computer misuse act as further support for computer security. The computer misuse act 1990 creates three new criminal offences:

Unauthorised access to computer material,

Unauthorised access with intent to commit or facilitate the commission of a serious crime, and

Unauthorised modification of computer material.

Mr. Hogg said, "Computer misuse is a growing threat, and users must take the protection of their computers seriously, adopting the appropriate level of physical and technical security. I welcome this valuable Act which provides new avenues for prosecution where misuse has occurred".

With this 'tightening up of landline computer 'hacking', maybe we could persuade these dedicated computer experts to become involved in the wonderful world of digital communication by radio!

ICOM

NEW MULTIBAND
IC-970E Base Station

Designed for the serious operator on the 144, 430 and 1200MHz bands, Icom's new IC-970E has up-to-date technology for DX, digital and satellite communications.

The IC-970E is supplied as an all mode dual-bander for 144 and 430MHz bands. Optional units expand its capabilities to 1200MHz or wideband receiving from 50-905MHz.

Communications via satellites has never been easier. The IC-970E automatically tracks uplink and downlink frequencies as the tuning control is rotated also, ten specific memory channels for satellite frequencies.

The dual-band watch allows you to receive both MAIN and SUB band audio simultaneously, multiple scanning systems on the MAIN and SUB bands plus 99 memories, an easy to read central display and Icom's DDS sytem make this one of the most comprehensive multi-band transceivers available.

For more detailed information on the IC-970E Base Station or any other Icom radio equipment contact your local authorised dealer or call Icom (UK) Ltd.

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

AS FROM THE 1st SEPTEMBER OUR SHOWROOM OPENING TIMES WILL BE:
MONDAY—FRIDAY 0900—1300 AND 1400—1750.

Count on us!

DUAL-BAND FM TRANSCEIVERS

IC-2400
144/430MHz
2mts 45W
70cms 35W

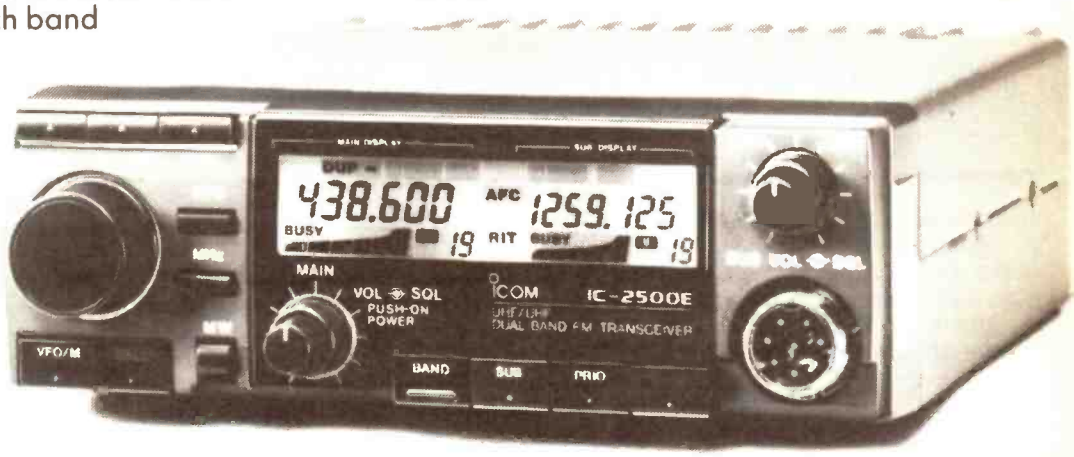
These new models from ICOM add a new dimension to the mobile scene. Enjoy the freedom of the open road and experience the advantages of simultaneous dual-band operation.

They are capable of receiving on both MAIN and SUB bands at the same time. While operating on one band, you can monitor a second band for activity. It is very easy to switch between the MAIN and SUB bands allowing you to reply immediately to calls received on either bands.

Full duplex operation lets you transmit on one band while receiving on the other for telephone style contacts. Each band can be independently regulated using separate volume and squelch controls.

Both models incorporate 20 memory channels and a call channel for each band, these memory channels store all the information needed for repeater operation.

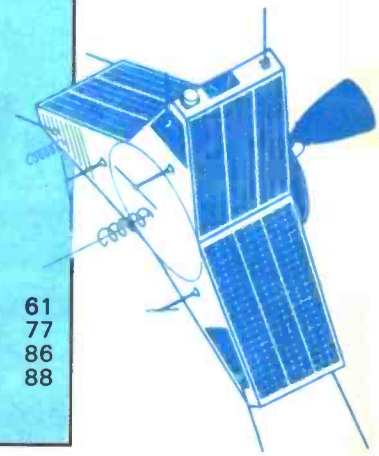
For 23cms operation the IC-2500 features a AFC function which automatically tunes the receive frequency to the transmit station frequency. The AFC function eliminates the need to retune if a stations transmit frequency is off centre.



IC-2500
430/1200MHz
70cms 35W
23cms 10W

Helplines: Telephone us free-of-charge on **0800 521145,** Mon-Fri 0900-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.
Datapost: Despatch on same day whenever possible.
Visa & Mastercards: Telephone orders taken by our mail order dept. instant credit & interest-free H.P.

Table 1	Attitude		Sun Angle	Sun's Position		Eclipses		
DATE	ALON	ALAT	SA	SEL	SAZ	min	in	out
1990 Oct 27 (Sat)	10	−3	−61	−24	199	21	254	6
1990 Nov 3 (Sat)	9	−2	−54	−29	203	16	0	6
1990 Nov 10 (Sat)	9	−2	−48	−34	209			
1990 Nov 17 (Sat)	8	−1	−41	−39	216			
1990 Nov 24 (Sat)	7	−1	−34	−43	223			
1990 Dec 1 (Sat)	6	−1	−27	−46	232			
1990 Dec 8 (Sat)	5	−0	−21	−48	241		Should be	
1990 Dec 15 (Sat)	4	−0	−14	−50	252		OK to use	
1990 Dec 22 (Sat)	3	0	−7	−50	263		AO−10	
1990 Dec 29 (Sat)	2	0	−0	−48	273		here.	
1991 Jan 5 (Sat)	2	1	6	−46	283			
1991 Jan 12 (Sat)	1	1	13	−42	291		Listen to	
1991 Jan 19 (Sat)	0	2	20	−38	299		Beacon.If	
1991 Jan 26 (Sat)	359	2	27	−34	305		warbling	
1991 Feb 2 (Sat)	358	3	34	−28	311		please	
1991 Feb 9 (Sat)	357	3	41	−23	316		don't use.	
1991 Feb 16 (Sat)	357	4	48	−17	320			
1991 Feb 23 (Sat)	356	4	54	−12	324	31	50	61
1991 Mar 2 (Sat)	355	4	61	−6	328	80	48	77
1991 Mar 9 (Sat)	354	5	67	−0	332	92	52	86
1991 Mar 16 (Sat)	353	5	72	5	335	76	60	88
1991 Mar 23 (Sat)	352	6	76	11	339		Don't	
1991 Mar 30 (Sat)	351	6	77	16	343		use	



Satellite Rende

The latest Amsat-UK information, courtesy of Richard G3RWL

Oscar

I was recently told that Oscar−10 could no longer be commanded due to its damaged memory. However it is using the Mode B transponder at all times and thus provides a very useful service. The apogee lies close to the Equator, like it was at launch, and the attitude is 'back to front', i.e. Earth pointing at perigee.

The accompanying list (table 1) from James G3RUH shows the relevant operational parameters. James tells us it's important to realise that the current attitude (and hence Sun angle) is extrapolated from the last known attitude, which was in January 1987, nearly 4 years ago. However the true attitude isn't far off. If the Sun angle exceeds 45 degrees, then the solar panel illumination is too low, the battery voltage falls, and the beacon starts to warble. Hence the approximate time when AO−10 is expected to be healthy again commences later this month, from around November 17 until February 09 next year. Listen to the beacon to make sure.

Note that ALON/ALAT are the spacecraft's attitude in orbit plane coordinates, and SEL/SAZ are the Sun's position, also in orbit plane coordinates. Eclipses occur when SEL is around 0 degrees, i.e. the Sun lies in the orbit plane. SA is Sun angle, the angle the Sun makes with the solar panels. Illumination (%) = 100 times SIN(SA)

New Microsat Command Stations

Amsat−NA have just announced the appointment of two Microsat command stations. At the request of Microsat software developer Bob McGwier N4HY, WB9ANQ and WD0E have received assignments for AO−16 satellite maintenance, operation, and characterisation. This event marks the beginning of the transfer of the Microsats from engineering development to routine operational control. The move corresponds to the transfers of control of WO−18 to Weber State University and LO−19 to AMSAT−LU which have already taken place.

TNC Telemetry

Some stations using their TNCs KISS mode for decoding telemetry have had problems getting back to command level. The way to get a TNC out of KISS mode is to send it the following hexadecimal characters: C0 FF C0. On a PC you can generate them with the numeric keypad by holding down the ALT key, typing the decimal number and releasing the ALT key between each number. The decimal sequence is 192, 255, 192. I'm not sure how to do it on other machines but you will find that this method is part of the KISS spec. Thanks to Dave G4WRW for this information.

Oscar 13 Mode S Users

From Toshe JR4BRS comes the latest Mode S user list, with inclusions of ON, G, etc. added by Freddy ON6UG. If you are active on mode S them drop Freddy a message on the Fuji Oscar−20 BBS.

JA; JA1ANG JA1AUH JA1SYK JA1UHY JH1LVN JH1PEF JR1WZI JA3GCT JF3HUC JA4BLC JA4CMZ JA4HZN JR4BRS JR4AEP JA6AUX/1 JA6GZH JA7EC JA7BLS JH7JKW JA8PL JA8ERE JR8XPV
ON; ON4DY ON6UG ON4AOD
OE; OE5BKL
G; G2BFO GW3XYW G4JY G4KLX G2HIO

DL; DK2ZF DF5DP DL9GU DB1DI DJ9PC DL8NL DF2BX DC9DU
I; IN3HER I6PNN I7UGO I7FKO I7LIT IK1COA IW2DCQ I8CVS
HB; HB9AQZ HB9OAB
YU; YT3MV
VE; VE2LI VE4MA
SV; SV3KH
W; WB5LUA WA7ABP WA7DES W4FJ WB0QIY W4ODW W1NU N4HY K0KE KB6BQQ WA8WBP K8TL WA3ETD WB7ABP KA9LNV K8YAH W9FMW WA3ETD K0RZ

Pacsat Protocol Specification Released

At the 9th Annual ARRL Computer Networking Conference, held in New London, Ontario a few days before this should appear in print, software developers will have had an opportunity to examine the Pacsat file transfer protocol specification document written by NK6K, G0/K8KA, and N4HY. This document will have a profound affect on all Pacsat users because it will state in very precise language the rules that terminal communication programs will have to implement in order for amateurs to use the BBS capability of the PACSATs.

This is in contrast to BBSs such as FO-20 which work with ASCII as provided by any of the popular communications programs. For example, using a regular computer terminal program an FO-20 user can, using a station equipped with a PSK modem, TNC and appropriate VHF/UHF aerials and transceivers, access the FO-20 BBS mailbox and download files or read mail, etc. This can all be done using a simple terminal program.

For the Pacsats, it will be necessary for the user to have a specially written program for the computer which will be used in their Pacsat station. This program must follow all the rules specified in the Pacsat file transfer protocol. The basic reason for using this new protocol is to allow for more efficient file transfers.

Although users may initially may find this a burdensome requirement, it was Amsat's goal to release this file transfer protocol far in advance of BBS operations on the Pacsats, so that software developers can start to work immediately on terminal programs for the various computers found today in Pacsat stations. Also, there will be 'shareware' programs which will provide examples for software developers, we'll keep you informed here on the latest developments of course. The protocol is a 50 page long document by the way!

Shuttle Packet Hints

A number of publications reported earlier this year that the SSID for the SAREX packet robot would be -1, i.e. WA4SIR-1. Tom Clark W3IWI reports that both the HK21 robot TNC and the operational software for the 'grid' laptop computer have the calls defaulted to WA4SIR, i.e. an SSID of 0, and this call should be used unless, for some unanticipated reason, the defaults are over-ridden. Tom continues, the best advice is for you to *monitor* the downlink signals from STS-35 and use whatever call you *see* on the downlink. The robot TNC code uses only one SSID at a time.

Because the WA4SIR SAREX robot will be bombarded with signals from tens or hundreds of ground-based users when STS-35 is flying over populated areas, it is not possible for the robot TNC and radio to use normal half-duplex packet procedures, the CD (carrier detect) signal will simply never drop! The robot will instead be running in a modified full-duplex mode. When the robot copies a valid packet frame (or when it is time to send a beacon), the data to be sent is put into a buffer and a timer (called the FUDtimer) is started. The robot firmware then queues all other outgoing transmissions in the buffer until FUDtimer expires 3 seconds later, and all downlink frames in the queue are sent in one long transmission. You may discover that the response time while running in this mode is sluggish when compared to normal packet operation.

Since the SAREX handheld radio cannot receive when it is transmitting, users should ensure that they remain silent and only listen when the shuttle is transmitting. In other words, **don't run full duplex on the ground!** Leave your TNC in half- duplex mode (FULLDUP OFF) with CD active just like you do for normal VHF packet operations.

As of this time, the launch of STS-35 has been delayed somewhat with modified dates given, but to paraphrase Yogi Berra "... it ain't orbiting 'til it's orbiting".

Short Bursts

NASA has finally stopped confusing Fuji Oscar-20 with the Debut satellite in their Kepler lists. JARL advise that the current Fuji Oscar-20 eclipse season is over until May 1991.

The latest keplers are reproduced here, again in the two line format which may be read in by popular computer tracking programs. An SAE to the editorial address gets you a listing of a conversion program written in Basic if you need one.

That's it for this month. For further information about Amsat-UK contact Amsat-UK, c/o Ron Broadbent G3AAJ, 94 Herongate Rd, London, E12 5EQ. A large SAE gets you membership info, and SWLs are welcome.

Table 2 - Keplers

```
OSCAR 10
1 14129U 83 58 B 90238.61357863 -.00000014 00000-0 00000 0 0 5476
2 14129 26.0406 187.8479 5952609 170.7338 209.0516 2.05880945 26187
UoSat 2
1 14781U 84 21 B 90248.58465124 .00001795 00000-0 33854-3 0 7765
2 14781 97.9445 298.4935 0012840 357.8666 2.2471 14.65634608347741
AO-13
1 19216U 88 51 B 90233.10507939 .00000146 00000-0 99999-4 0 1444
2 19216 56.9230 139.8507 7012370 234.0055 39.5251 2.09695679 16766
UO-14
1 20437U 90 5 B 90247.73613164 .00000625 00000-0 26437-3 0 2039
2 20437 98.6920 323.5953 0010783 285.7121 74.2846 14.28702551 32222
PACSAT
1 20439U 90 5 D 90244.42881742 .00000624 00000-0 26369-3 0 1057
2 20439 98.6999 320.4480 0010735 295.6429 64.3635 14.28801476 31758
DO-17
1 20440U 90 5 E 90244.42236293 .00000666 00000-0 28008-3 0 1142
2 20440 98.7005 320.4573 0011018 296.3190 63.6848 14.28851493 31752
WO-18
1 20441U 90 5 F 90244.68652978 .00000612 00000-0 25776-3 0 1086
2 20441 98.7001 320.7491 0011535 295.1838 64.8146 14.28943119 31796
LO-19
1 20442U 90 5 G 90243.62556929 .00000600 00000-0 25287-3 0 1106
2 20442 98.7011 319.7147 0011883 298.9505 61.0485 14.29011597 31648
FO-20
1 20480U 90 13 C 90237.47999198 .00000011 00000-0 52704-4 0 1024
2 20480 99.0343 270.8937 0540177 251.6210 102.5464 12.83159072 25637
RS-10/11
1 18129U 87 54 A 90248.01674093 .00000212 00000-0 22195-3 0 3102
2 18129 82.9217 269.5464 0010380 255.9239 104.0775 13.72106928160397
BADR-1
1 20685U 90 59 A 90248.53120415 .00227831 -76439-5 44724-3 0 632
2 20685 28.4982 326.3886 0467875 317.3975 39.1627 15.14230368 7754
Mir
1 16609U 86 17 A 90248.72344750 .00021031 00000-0 24759-3 0 9109
2 16609 51.6125 283.8097 0023995 342.2417 17.7736 15.61017685260696
Salyut 7
1 13138U 82 33 A 90248.72318842 .00048706 00000-0 38510-3 0 4844
2 13138 51.5986 254.5411 0001817 67.0187 293.0979 15.70856366477486
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Kenwood TH27E Review

European Exclusive — Chris G4HCL checks out Kenwood's new 'Designer Portable'.

When I first saw a photo of the TH–27 series in a foreign amateur magazine, I knew this was the first step towards the *'portable design of the future'*. I was honoured and overjoyed when HRT were offered the only review sample in Europe.

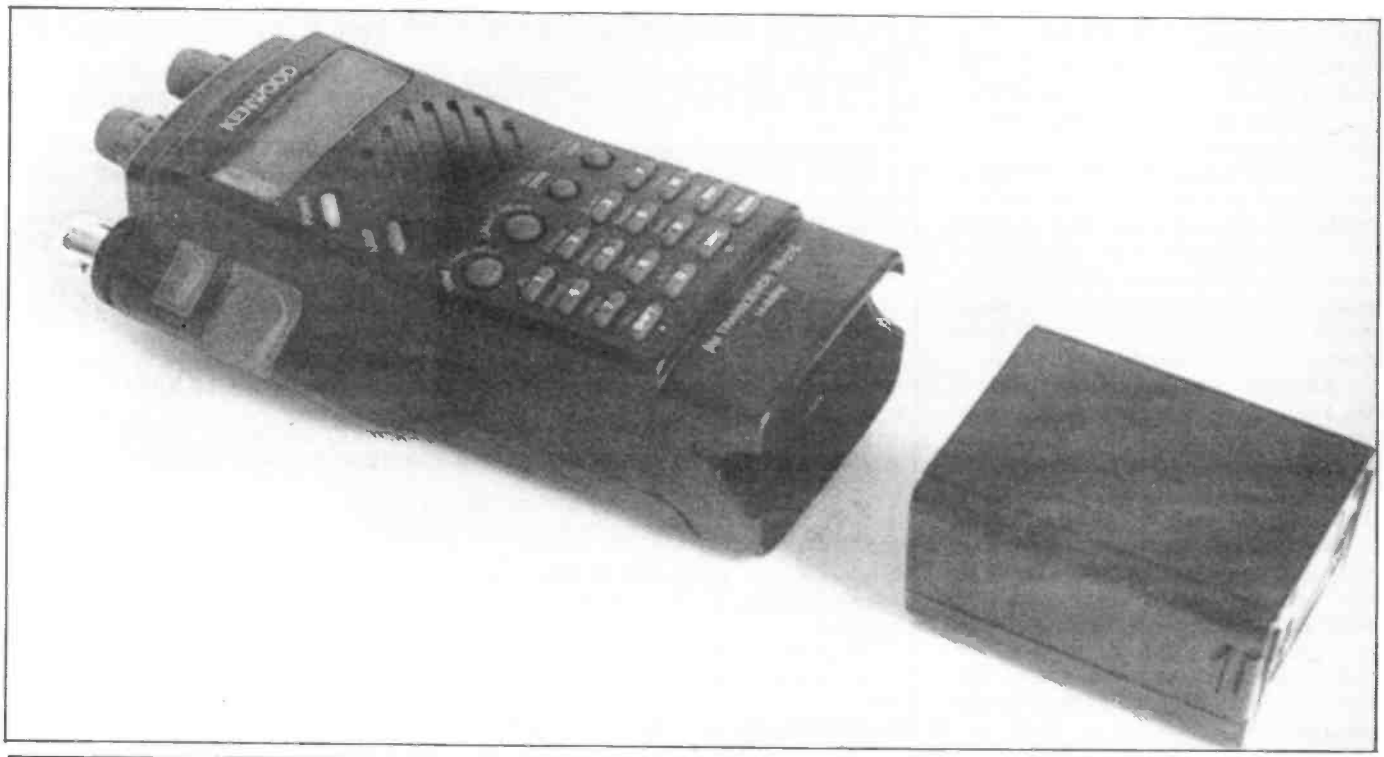
Styling

As you may see, the transceiver isn't just the usual *'rectangular box'*, instead it's made using an angled body together with a curved and gently moulded PTT section, the PTT button itself being a flexible 'S' shaped moulding. As a result, the set fits into your hand like the proverbial glove. The nicad battery fits into an internal section of the set, a small bar on the rear being used to extract the battery 'cartridge' in a similar manner to a revolver clip. Even the set–top helical aerial is a moulded *'designer'* style, a fashion–conscious set! The rubberised controls and buttons allow it to survive the odd shower or two as well, and for water enthusiasts the transceiver can even be fitted into a purpose made waterproof bag.

Features

The set measures a compact 49 (W) x 121 (H) x 38 (D) mm, weighing in at a light 360g. In fact, when I took the fitted 7.2V 700mA nicad out, there hardly seemed to be any weight left. The transceiver covers the usual 144-146MHz in selectable tuning steps, and besides the keypad letting you enter frequencies in directly, the top panel rotary click–step tuning knob allows you to step through the channels one by one.

With the supplied nicad, the set gives around 2.5W output power. A set–top mounted socket also lets you plug in an external 13.8V DC supply which, as well as charging the nicad, boosts the maximum transmitter output to over 5W – useful for when you're either mobile or operating from home. The set–top aerial unplugs to reveal a normal BNC aerial connector, again allowing you to connect



an external aerial when you're in a position to do so.

To conserve your battery life, or indeed so as not to cause too much spectrum congestion when operating locally, the transmit output power can be switched to no less than four levels, High, Medium, Low and 'Economy Low', these being around 5W (with a 13.8V supply), 1.5W, 0.5W and 20mW respectively.

Using the set's internal nicad, the 'Economy Low' power level of 20mW is specified as providing around 15 hours of continuous operation, as opposed to 2 hours on high power. This could indeed be very useful for local communication around a given site such as a radio rally, or indeed when using the set to command a remote transceiver on the same site as allowed under the latest UK licence conditions (more of this next month).

Controls

Rather than an On/Off switch being combined with the volume control, this set uses a separate push-button on the front of the case, you press this for about half a second to switch the set on or off. Below this is the 'lamp' button, this illuminates the LCD panel so you can see what frequency you're on when out on a dark winter's evening. Concentric rotary volume and squelch controls allow you then keep to your preferred settings, and the rotary channel knob next to these gives you an easy method of selecting the operating channel.

The two larger circular buttons on the top row of the facia array act as the *'Toneburst'* and *'Call Channel'* selectors, the first giving the usual burst of 1750Hz transmission for repeater access, the second quickly selecting your pre-programmed *'Call'* channel for quick access. Other buttons, both circular and rectangular, control the many other features of the set which if I described them all here would fill about five pages of the magazine! Suffice to say the set gives you all the normal features such as repeater shifts and memory channels (40 of them) combined with scanning facilities of either your selected channels or any pre-programmed section of the 2m band. Scan *'halt'* modes may be switched between a timed halt on each active channel, a halt followed by a short time delay after the squelch closes on each active channel, and a *'stop'* mode where the set stays locked onto the first active channel it finds.

Selective Calling

Some 2m and 70cm operators may wonder what is going on when on listening to their local repeater a call is sometimes preceded by a small number of *'touch tone'* digits. This is because the operators are using a system of DTMF (Dual Tone Medium Frequency) selective

signalling, to *'open up'* the other party's receiver. Regular readers will know how this works from the HRT article in the Feb 1989 issue, where we showed how you could use a DTMF controller to automatically wake your receiver up. The TH-27E has a DTMF encoder and decoder built in, to allow the use of this system with other similarly equipped stations. When this is enabled on the set, the receiver squelch opens up only when a pre-programmed 3-digit DTMF sequence has been received, this sequence may even be stored in all the memory channels as well as the VFO.

One step further from this is the TH-27E's *'Pager'* facility. Here the set uses digital codes to open the squelch, using a 3-digit calling/group sequence followed by an additional 3-digit *'private'* code. When received, the private code and the group or calling code of the calling station are shown on the set's LCD panel and held there, so you can even see who's called you if you weren't around at the time.

Options

The set comes with a belt clip and carrying strap, together with a plug-in 14 hour charger for the supplied nicad. A 51 page user instruction manual is also included, this gives comprehensive operating details on all the set's many functions together with block and circuit diagrams of the set's innards.

An internally fitted CTCSS (Continuous Tone Controlled Squelch System) is available as an option for the set, for use in operating through some UK repeaters as well as for quiet monitoring of club channels and the like. A *'monitor'* button above the PTT lets you defeat the CTCSS to listen out on the channel before transmitting.

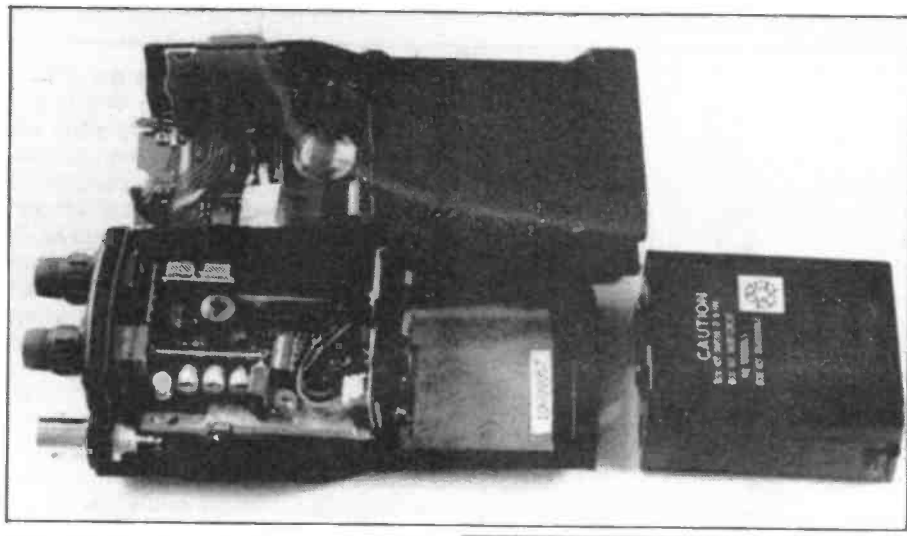
A number of speaker microphones are also available, including the SMC-33 model which gives you remote control of a selection of the set's functions, i.e. selection of the first three memory channels and any three other functions such as up/down channel control, tone, reverse repeater, call channel access and the like. A VOX (Voice Operated Transmit) headset is also available, so you can wander round the rally or whatever chatting away to your QSO partner whilst carrying boxes full of radio goodies (or indeed keeping hold of the kids).

Further options include a rapid nicad charger, a soft carrying case, an empty battery case for AA size batteries, and various external DC cables.

Insides

Referring to the block diagram shows that the usual arrangement of a double conversion superhet is used on receive, the TH-27E using a high 1st IF of 45.05MHz to provide a good degree of image rejection. On transmit, again the usual final frequency VCO (Voltage Controlled Oscillator) is used together with a block PA module. A single chip synthesiser is used, fed by the VCO through a buffer only with no external dual-modulus prescalar being used.

A metal rear cabinet die casting is used to provide rigidity as well as a heatsink for the power amplifier, another die-cast metal inner section acting as a further heatsink and providing screening between the RF circuits. The plastic front



panel houses the control circuitry, flexible PCB links being used to connect the various boards together. A further flexible PCB terminated in a tiny multi-way plug is fitted to the control PCB for use with the optional CTCSS unit.

In Use

After taking a look at the set's many features and modes, it took me a while with the instruction book to understand if not remember the many operating modes provided by the set! Memory channel programming was quite simple, the recall of channels then being a single button push of the relevant key to access channels 0-9. I found that many pre-set second functions and default operating settings could be altered by clever use of various *'start up'* button push operations whilst the set is being powered on, or by extended presses of the 'M' button followed by other function keys, these all being detailed in the manual. I could thus tailor many features of the set to my own preferences, for example the upper and lower limits of the tuning range within the confines of the 2m band - this I set to 144.5 - 146MHz, and the memory recall mode to either one or two digits.

Walking Around

Whilst out and about, I was pleased to find there was plenty of undistorted receive audio available from the small front panel speaker, and I could happily walk along without needing to hold the set up to ear level in normal use. On transmit, reports on my audio were normally quite good, although I did receive the odd report of compression when I used the set through my semi-local 2m repeater. At first, I often received reports of an intermittent transmission, this I later found was due to use of the set with my right hand, my index finger not quite keeping the PTT held down all the time due to the set's curved moulding. Switching over to my left hand, with my thumb operating the PTT in all cases, restored normal operation, maybe my hands are too small for the rig!

Base Station Use

At home, operating the set from a 13.8V DC power supply and plugged into an external aerial, showed the set was nicely sensitive with a corresponding *'punch'* on transmit with it's slightly higher power in this mode. I did however find during long transmission periods that the rear panel became quite warm, sometimes hot, and I often switched down to *'Medium'* power to keep the set cool. Sharing my station with no less than three 2m packet nodes gives me a good idea of the strong signal handling capabilities of 2m equipment under test. The TH-27E was certainly no worse than other portables I have tried, although I found it did suffer from de-sensitisation to a worse degree than a purpose made base station, although this would of course be expected.

Flexibility

Around the house and indeed when out in the garden, I appreciated the large number of operating modes offered by the rig. It even has a built-in clock and timer, and one particularly useful feature of this allowed me to set the transceiver to bleep away whenever the squelch raised, together with displaying the actual time in digital format when the squelch had lifted. This was quite useful for example when awaiting a pre-arranged call from the XYL whilst on her way home from a business trip. By using the pre-set DTMF decoder I could even listen out on the semi-local 2m repeater for her whilst getting on with other jobs around the house, knowing the set would burst into life when needed. To give a further idea of the flexibility, the transceiver could even be set to automatically switch on and off a given times, again for pre-arranged calls, the wonders of microprocessors!

At the end of the review period, I was still discovering new ways of operating the set. Although I did little operation at night, I found even though the LCD illumination was very good there was no illumination of any of the buttons on the facia, however the *'Scan'* button was sensibly placed on the bottom right hand 'corner' of the keypad array for easy use. Likewise the *'Tone'* button for repeater access was well placed, but I sometimes found that due to the large number of operation modes I often pressed the wrong button by mistake. Yet with the large number of memory channels available I found by using these alone together with just the top panel tuning knob allowed me to get where I wanted, thus providing the best of both worlds.

Laboratory Tests

The measured receive sensitivity was quite good, the strong signal handling in terms of blocking and the like was again good for a handheld although as expected understandably not up to that of a mobile or base rig. The adjacent channel rejection was a little on the asymmetric side probably due to the high IF used, this was noticeably so at 12.5kHz offsets but the set still gave good performance at 25kHz channel spacing offsets. The S-meter bar graph gave a useful dynamic range, far better than some FM only equipments, although I found the upper segment at each level nearly always tended to flash rather than stay constantly displayed.

On transmit, the higher order harmonics were extremely well suppressed, these being below the -90dBc mark, and the frequency accuracy was very good. The transmit power with a 7.2V supply was around the 1.75W mark, although substituting a freshly charged nicad bought this up to over 2W in all cases. I found that with the set operating from an external 13.8V DC supply, the *'High'* level of output power tended to 'slump' as the PA warmed up, although this always remained above 5W. The transmit deviation was set above the 5kHz absolute maximum level for 25kHz spacing, although this could easily have been a *'one-off'* example.

Conclusions

Kenwood's latest portable represents a new step not only in a deviation away from *'traditional'* styling, but also providing a large number of features, many of which can be user-programmed as *'start-up'* conditions to virtually personalise the set to the user's individual needs. The DTMF selective calling can be quite a useful feature for operators who need to listen out for specific calls from similarly DTMF-equipped stations, and I can see this to be potentially very popular in future times if frequency congestion gets the better of us - emergency net users and the like could then have little excuse for demanding *'sole use'* of various frequencies!

I did find that, due to the large number of features offered, it was

sometimes difficult to fully comprehend every mode of operation of the set, although by storing the various operations and DTMF sequences into the memory channels allowed a degree of easier use. The TH–27E could thus be a very appealing set for the techno–freaks such as myself, but I'd advise just staying with the memory channels on the set if microprocessor operations get you baffled.

I'm now just visualising what the next *'style'* of Kenwood portable will look like!

The TH–27E is currently priced at £249, and our thanks go to Lowe Electronics Ltd. for the loan of the review transceiver.

LABORATORY RESULTS

RECEIVER

Sensitivity: Input level required to give 12dB SINAD:

144MHz: 0.150μV pd
145MHz: 0.145μV pd
146MHz: 0.150μV pd

Image Rejection: Increase in level of signal at first IF image frequency over level of on-channel signal to give identical 12dB SINAD signals:

83dB

Maximum Audio Output: Measured at 1kHz on the onset of clipping.

3ohm load:	155mW RMS
8 ohm load:	113mW RMS
15ohm load:	89mW RMS

Squelch Sensitivity:

Threshold:	<0.06μV pd (<2dB SINAD)
Maximum:	0.13μV pd (9dB SINAD)

Blocking: Increase over 12dB SINAD level of interfering signal modulated with 400Hz at 1.5kHz deviation to cause 6dB degradation in 12dB SINAD on-channel signal:

+100kHz:	85.5dB
+1MHz:	92.0dB
+10MHz	95.5dB

Intermodulation Rejection: Increase over 12dB sinad level of two interfering signals giving identical 12dB sinad on-channel 3rd order intermodulation product:

25/50kHz spacing:	61.0dB
50/100kHz spacing:	63.5dB

Adjacent Channel Selectivity: Measured as increase in level of interfering signal, modulated with 400Hz at 1.5kHz deviation, above 12dB SINAD ref. level to cause 6dB degradation in 12dB on-channel signal:

+12.5kHz:	21dB
–12.5kHz:	36dB
+25kHz:	64.5dB
–25kHz:	76.0dB

S-Meter Linearity:

Indication	Sig. Level	Rel. Level
1	0.40μV pd	0dB ref.
2	0.66μV pd	+4.1dB
3	1.07μV pd	+8.4dB
5	2.27μV pd	+15.0dB
7	6.80μV pd	+24.5dB

Current Consumption:

Standby, economiser operating:	12mA average
Receive, Mid Volume:	76mA
Receive, Max Volume:	114mA

TRANSMITTER

TX Power and Current Consumption:

Freq MHz	Power	7.2V Supply	13.8V Supply
144	High	1.66W/920mA	5.09W/1.47A
	Mid	1.58W/915mA	2.11W/940mA
	Low	0.43W/550mA	18mW/102mA
	E. Low	17mW/97mA	18mW/102mA
145	High	1.70W/925mA	5.16W/1.47A
	Mid	1.60W/915mA	2.07W/945mA
	Low	0.43W/555mA	0.36W/550mA
	E. Low	17mW/98mA	19mW/102mA
146	High	1.75W/925mA	5.19W/1.48A
	Mid	1.62W/920mA	2.01W/945mA
	Low	0.42W/555mA	0.36W/550mA
	E. Low	18mW/99mA	19mW/102mA

Harmonics:

2nd Harmonic:	–68dBc
3rd Harmonic:	–79dBc
4th Harmonic:	<–90dBc
5th Harmonic:	<–90dBc
6th Harmonic:	<–90dBc
7th Harmonic:	<–90dBc

Peak Deviation:

5.82kHz

Toneburst Deviation:

3.78kHz

Frequency Accuracy

–150Hz

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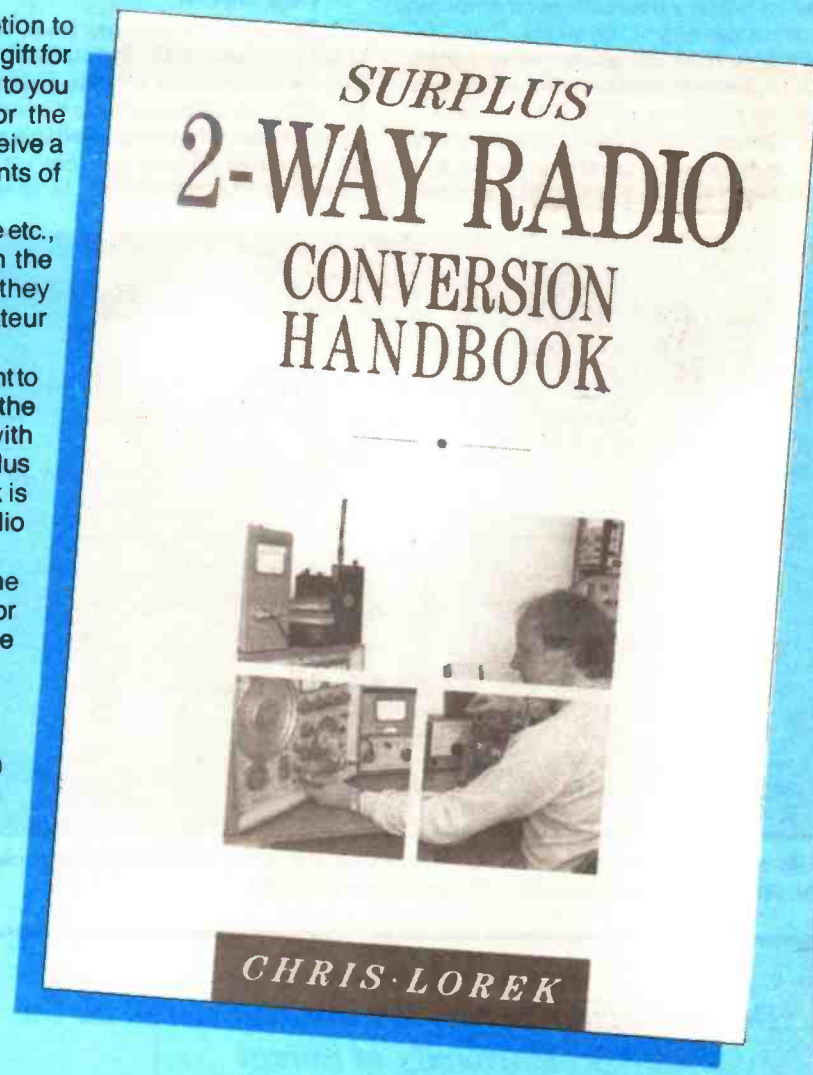

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Amsat-UK Colloquium

The Amsat-UK Colloquium took place over the 'long weekend' of 26th – 29th July, a central focus for forward thinking amateurs of the world to come and give information to others through lectures, or listen to what others are up to, and in all lead to better communication amongst amateur nations of the world. Over 200 delegates from 29 countries attended, with significant names in the worldwide satellite field very much in evidence.

The lectures included topics such as *Microsat Packet Operations* by Dr. Bob McGwier N4HY, *Fuji-Oscar 20 operations* by Fujio Yamashita JS1UKR, *RS-14 and Rudak-2* by Peter Gulzow DB20S, *Pacsat Communication protocols* by Jeff Ward GO/K8KA, *a Phase-3D overview* by Dr. Karl Meinzer DJ4ZC, *Shuttle Amateur Radio Experiments* by Doug Loughmiller KO51, *New Soviet RS Satellites and the Moscow Adventure Club* by Leo Labutin UA3CR, and *I haven't got a callsign, but* ... by Geoff Perry OBE of the Kettering Group. One amusing result to come out of the lectures was the fact that the US Norad agency were once tracking the 'Debut' satellite when they thought they were tracking Fuji Oscar-20, Bob N4HY had to put them right! Yours truly wonders who's satellites they try their target practice out on. During the lectures, other announcements of possibly more use to the amateur fraternity were of course also announced;

Fuji Oscar

The Japanese Amateur Radio League (JARL) represented by Fujio JS1UKR, said they have initiated a satellite 'Fuji' award for Mode JA operations, up till now only three amateurs have achieved this award. UK operators pointed out that we could do with some more mode JA time over here, Fujio said he would attempt to make arrangements for this, and hopefully also for the FO-20 operating schedules to be published in future. Watch this space! Also whilst the delegates took photos of Fujio presenting his paper, Fujio introduced much humour by taking a couple of photographs of us from his end – saying that he liked to be different!

New Satellite — Arsene

F6BVP gave a comprehensive presentation about the long awaited French satellite. ARSENE (Ariane Radioamateur Satellite pour l'ENseignement de l'Espace) will be mounted inside the Ariane rocket's separation collar on the September 1992 flight carrying the Telecom 2B payload. The final orbit is expected to be equatorial with an apogee of 36,000km and a perigee of 20,000km, with a period of 17 hours 30 mins. Visibility figures for the UK for this type of orbit are 'interesting' to say the least, the longest pass is around 31 hours with gaps of 48 hours between passes occurring from time to time.

A solid fuel rocket motor will be used to raise the perigee after launch into a Geostationary Transfer Orbit. The spin-stabilised satellite will carry three deployable solar panels, and will be earth-pointing using nitrogen gas for its attitude control, its lifetime is expected to be in the order of five years. The six-sided body will measure 900mm in diameter with a height of 880mm, the whole bird weighing around 140kg before the kick motor fires.

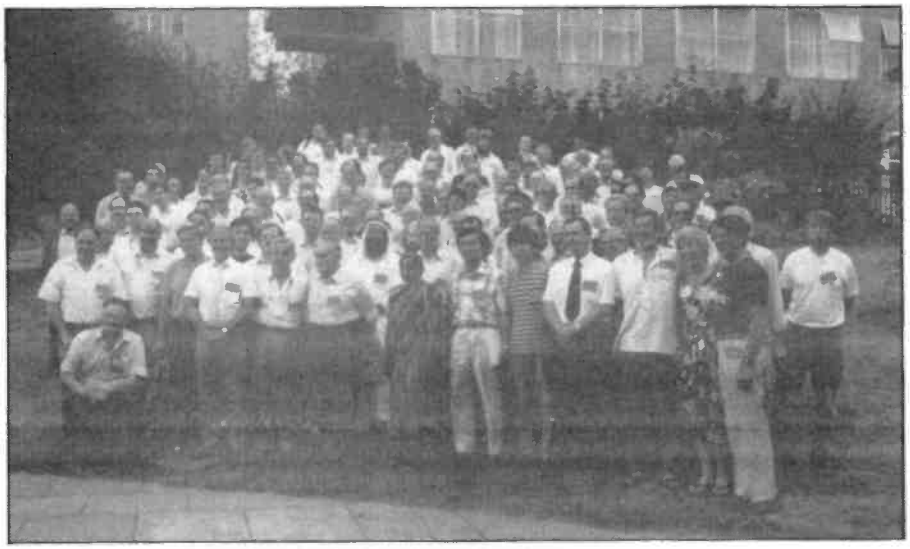
The communications payload will

The UoSat Command Station.

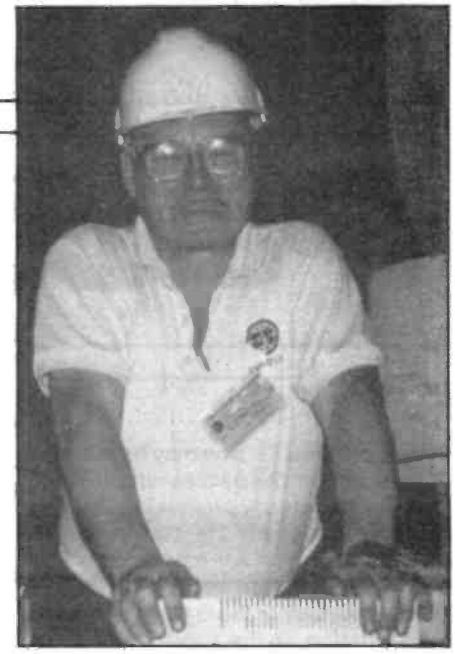
HRT correspondants Chris G4HCL and Richard G3RWL (centre) accompanied by personalities such as Leo UA3CR and Junior PY2BJO.

Delegates from across the world centered on the University of Surrey

Fujio JS1UKR decides to get his own back!



Delegates from all nations attended the colloquium.



Ron Broadbent G3AAJ dons this protective helmet.

have a 70cm uplink together with downlinks on 145MHz and 2445MHz, however the two modes B and S won't operate simultaneously. Mode B operation will use FSK packet with three uplink channels and one downlink, and mode S will employ a linear transponder.

Other New Satellites

Also at the Colloquium, *Amsat-Israel* announced that they are to follow the example of universities abroad and launch a satellite project. Plans are currently in hand for a small store-and-forward spacecraft, perhaps also carrying scientific experiments. A launch by Ariane is being explored.

Phase 3D

During the convention, design requirements for the Phase-3D satellite were also discussed. The plan is to improve communication links by greater than 10dB over AO-13 by using greater power and greater antenna gain together with measures to guard against uplink stations using excessive power. The preliminary specification of the satellite describes a 3m diameter 'bird' weighing 400kg, carrying a 250W PEP transmitter. There is also a possibility that it may carry 10GHz experiments, these being favoured by Amsat-DL, as well as the more usual communications transponders and beacons.

UoSat-F

The AMSAT-UK Chairman (and HRT contributor) Dr. Arthur Gee G2UK announced a proposal for a UoSat-F spacecraft to be launched on an Ariane flight in April 1991. If the proposal is realised, Amsat-UK will donate £25,000 to the project which is hoped to carry a Mode A transponder. This will have a 2m uplink and a 10m downlink, to show prospective newcomers to satellite operation that complex gear certainly isn't necessary.

Tours and Meetings

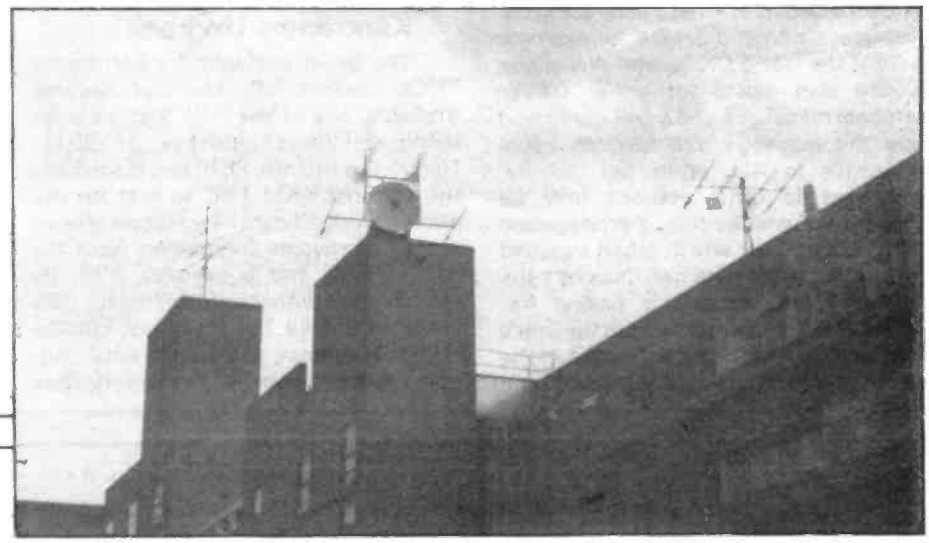
During spare periods in between convention activities, staff from the University of Surrey gave colloquium delegates the chance to see around the UoSat Mission Control station together with a tour of the extensive satellite research laboratories in the University. This was quite an eye-opener, showing how advanced amateur communication can be. At the same time, various informal 'workshops' were held, where delegates shared their skills and experience with others during 'mini-lectures' on specialist subjects.

On the Saturday evening, the Amsat-UK AGM was held and members re-elected the current committee, apparently it was deemed the committee had done such a good job in the past! This was followed by the annual Amsat-UK buffet dinner where we all had a chance to chat informally with other satellite personalities throughout the world. Following this, a marathon junk sale took place with Ron Broadbent G3AAJ as 'master of ceremonies' ably assisted by HRT contributor Richard G3RWL. The star prize in the raffle was the Toshiba T1200 portable computer used at the radio command station of the recent North Pole expedition, a very valuable as well as unique prize.

As the evening progressed, hilarity became the order of the day with surplus gear sometimes being virtually given away, and at one memorable point in the proceedings Ron actually donned a protective helmet, supposedly to guard against junk being thrown back at him! By midnight we had all just about finished, yours truly going back to his University Residence accommodation laden with goodies.

As well as the lectures and meetings, the opportunity of minds working together was put to good use. To this end, during the 'Colloquium Week' Harold Price NK6K and Jeff Ward GO/K8KA spent much time in loading and testing the 210 kbytes of forward communications software on UO-14. By the Saturday after five reloads and many tests, several software 'bugs' had been ironed out and the 'alpha tests' were declared complete. This cleared the way for release of the file transfer and broadcast protocols together with other information, and this should be available to satellite enthusiasts by the time this comes into print.

Well done chaps, thanks for a great convention and all the work, and here's to next year's get-together!



The extensive array of UoSat tracking aerials.

Packet Radio Roundup

G4HCL looks at the DX PacketCluster and Kantronics' latest upgrade

DX PacketCluster – you may have heard of this used on the packet network but what does it actually provide? Well if you attended this year's HF convention in Daventry, then you will have seen a first hand demonstration of the powers of packet, courtesy of Ian G4LJF who gave a presentation on the subject of the DX PacketCluster. As promised in last month's *Roundup*, here's a brief description of what it's all about.

As it's name suggests, the system is designed to be used in a 'cluster' of stations, all linked together via. the packet network to carry the latest DX information as provided by other users of the cluster. At the time of writing there are several PacketCluster stations in operation around the UK, and undoubtedly this number is sure to grow. Another PacketCluster will shortly spring up in Chandler's Ford for example, linked to the multiple TheNet nodes already in operation. The cluster acts as a 'share' of DX information, any station connected to a 'host' PacketCluster can enter a piece of information, such as the DX station callsign, frequency, and other information such as the operator's listening frequencies and QSL information.

The host PacketCluster station then automatically relays this to all the other connected users, as well as to other PacketCluster 'nodes' spread around the UK, each node storing the information into memory. To take a typical example, on the GB7YDX PacketCluster more than 100 different stations have logged in from around the North Midlands and Northern England, and several PacketClusters in the UK have also been successfully linked together. Work is currently progressing to improve links between these nodes.

In typical usage, you can connect into your local PacketCluster node and request a display of what's been going on. The user command *SH/DX* for example will list the last 5 DX 'spots'. A mailbox facility also exists for either DX or personal messages and a *DIR* command lists the message directory, as usual messages to *ALL* or indeed 'private' messages to other stations may be entered. As well as this, a propagation routine is present which when supplied with appropriate data can calculate the minimum and maximum usable frequencies at any given time from the user's QTH to any other chosen location in the world. Beam heading information and sunrise/sunset times can even be provided.

DX enthusiasts will immediately recognise this as a powerful tool, the ability to pass on information about a 'rare one' on 20m say, to all other stations in the Cluster by simply tapping a line or so into their terminal can be a very, very useful DX aid. So much so, that in the USA a single operator using this during an ARRL contest is classed as a special case – that of 'assisted operation' i.e. similar to having a second 'DX – spotting' station operator at his or her side! In fact, for contest use PacketCluster can be linked in with a simple communication terminal program to a contest logging and duplication checking program such as *CT*. By typing one keystroke (ALT–F4) in *CT* the Cluster DX spot is automatically placed into the CT log's callsign field, the computer even changes your transceiver's frequency through the remote port to the frequency of the DX spot. Needed multiplier prefix stations and the like can easily be searched for, automatically. Is it any wonder it's classed as 'assisted' operation!

The software author of DX PacketCluster is Dick Newell AK1A, a 39 year old consulting software engineer for the Digital Equipment Corporation. So now you know who to blame for the DX pile-ups once the word gets around about a 'rare one' over the PacketCluster! It's a commercial program, and if you're interested you can get details on the purchase of it from Pavilion Software, Box 803, Hudson, Massachusetts 01749, USA.

Kantronics Upgrade

The latest software for Kantronics TNCs, version 3.0, has just become available, one of the very first samples being delivered courtesy of Siskin Electronics (thanks, Phil!) and placed into the editorial KAM TNC to test for our readers. A significant new feature offered is that of reverse forwarding from the user's PBBS into a network BBS, by arrangement with your local friendly BBS sysop of course. For those not familiar with this system, you simply enter outgoing mail into your TNC's memory, then at periodic intervals your local network BBS 'polls' your TNC to see if there is any outgoing mail. If so, it uploads this, also downloading any stored mail from the network addressed to your station callsign.

A 'software DCD' may be selected, where your radio can be run in unsquelched mode or indeed for the TNC to be fed with 'raw' audio straight from the discriminator for better performance on packet. Host mode is added which allows special programs to be run to speed up operation, and the PBBS may now be accessed by issuing a connect request to the PBBS Call sign itself just as you would do on air but without the TNC acutally transmitting. For the KAM, NAVTEX mode is also supported to allow processing of the various navigational bulletin messages, together with the 7 character selcal AMTOR 625 mode and an 'Autostart' mode of up to 7 characters for RTTY and ASCII use.

9600 Baud

Another new product from Kantronics is the 9600 baud plug–in modem for their Data Engine. This one is based on the famous G3RUH design, thus allowing compatibility with the many other systems in use around the UK on 2m and 23cm. In the internal linking details described in the USA manual, 'popular' transceiver details such as the ex–PMR Pye Europa, Pye F460, and Pye R461, Cirkit 23cm kit, Storno CQM700, Storno CQM663 and the like must get the American amateurs thinking what they're missing out on! In next month's Roundup I'll describe how the unit works in practice, after I've given the unit a good trial used into my local 9600 baud 144.625MHz user–access network node as well as with the other half dozen or so 9600 baud 2m stations in my area. This one comes from Lowe Electronics who are the UK Kantronics distributors.

Packet Group News

The **British Radio Teledata Group** (BARTG) who cater for the needs of UK amateurs interested in digital communication modes, will be holding their Annual General Meeting this month. This takes

place at 2.00pm on November 10th, and it will be held at the Churchill room, London House, Mecklenburgh Square, London WC1. London House is close to the junction of Grays Inn Road and Guildford Street, a few minutes walk from the Kings Cross/St. Pancras BR and underground stations. You can get further details from Ian Brothwell G4AEN, 1, Dale Close, Breaston, Derby DE7 3AZ.

Maxpak the Midland AX25 Packet Group, continue to go from strength to strength, their latest quarterly 'Digicom' magazine having a total of 40 pages and being very professionally produced. An interesting article by Hayden G8AMD in the issue I have sitting here is entitled a 'Network Strategy Paper', which certainly gets sysops thinking about the future growth potential of packet and ways in which to ease the congestion that occurs due to packet's popularity! If you use the Midlands Nodes and BBSs, you can get information on this active group from Richard G1NZZ @ GB7MAX.

New Salisbury Node

At a meeting held in Fordingbridge on the 21st September, amateurs from no less than three repeater and packet groups got together with a view to getting a packet node on the air from the Salisbury area. It was proposed to pursue an initial system on 4m using a horizontally polarised two or three element yagi, with the future objective of a 23cm system. The site rental and electricity costs will shared between the groups, and you can get further details on the packet side of things from Dave G4WPT @ GB7BNM.

Tiny-2 State DCD

If you'd like to be able to run your Tiny–2 with the receiver squelch open, to catch those stations with very short TXDelay settings which you otherwise miss due to the squelch opening time of your receiver, the latest Pac–Comm 'State DCD' board could be of interest to you. I recently added one to the Tiny–2 used on my 70cm node (one of a line of several Tiny–2s!), the results being remarkable. Previously, stations connecting to the node sometimes had to extend their TXDelay slightly as, guess what, the 70cm node receiver squelch took a couple of hundred millisecond to open. Coupled with a possible transmit power–up delay at the remote end sometimes meant zero results, now however no more problems!

Costing £19.95, the fitment is simply a plug–in job. You first remove the existing plug–in TCM3105 IC on the TNC PCB, plug in the DCD board, then plug in the TCM3105 IC into the socket on the DCD board. In practice, I found I had to bend the two legs of a PCB link over to be able to fit the PCB fully home, however once this was done the overall unit worked very well indeed. My thanks go to Siskin Electronics who are the UK Pac–Comm distributors, for the speedy provision of this board.

If you fancy making your own state DCD board up as a kit, a larger version, i.e. 'non–chip is available from the Tucson Amateur Packet Radio Corporation (TAPR) in the USA, costing your credit card the equivalent of £20. You can reach them at PO Box 12925, Tucson, AZ 85732 USA, Tel. (010) 1 602 749 9479.

CTRL-Z End of Message

That's it for this month, please do keep your messages coming, I'm always glad to give *your* packet group's activities a mention or indeed let other readers know what packet activities you get up to in your area of the world. I can be reached either at the editorial address and phone/fax numbers, or via, packet via the GB7XJZ BBS.

Until next month, 73 de Chris G4HCL @ GB7XJZ.

Tereleader Data Terminal - Exclusive Review

At this year's BARTG Data convention, the Tereleader TNC – 24 caused rather a stir. With facilities for HF and VHF terrestrial packet, a built–in PSK modem for satellite use with normal and Fuji Oscar 20 modes together with auto doppler–shift tuning, RTTY, AMTOR, CW TX/RX with training mode and built in keyer, message stores for 'rubber stamp' QSOs and an automatically incrementing serial number for contests if needed, Weather Fax printer and computer output, it looks most interesting. It was even described on the exhibition stand as 'Microwaves frozen food in under a minute' and can also double up as a data equipment for other 'household names' in amateur circles. This time the importers have chosen to retain the original name rather than just 'badge engineer' it as is often the case. In true HRT tradition we managed to get our hands on the only model in the UK prior to bulk shipments, to publish just in time for when the units appear on sale!

Compact

Measuring 222 (W) x 33 (H) x 135 (D)mm it's 'footprint' is around half the size of an A4 sheet, in other words fairly small! It operates as usual from an external 13.8V DC supply, drawing a maximum of 330mA, an internal lithium battery is used for memory retention of the TNC's start–up parameters as well as the various internally programmed message memories. Front panel LEDs show various functions such as Power On, TX status, CW and PSK modes and the various STA, CON and DCD indicators familiar to packet users. A further bar–graph array of LEDs above these acts as a tuning indicator for various modes such as HF packet, CW and RTTY.

Exclusive — G4HCL tests the all-mode terminal that even talks to satellites

teasmaid!'. At just under £300, we at HRT thought we'd take a closer look for our readers.

Exclusive

The name 'Tereleader' may not be as familiar as some others, but the manufacturing firm of Tasco certainly makes

Rear Panel Array

On the rear of the unit are several connectors in addition to the usual computer RS – 232 and DC input sockets. A multi–pin 'radio' connector handles the receive and transmit audio together with the transmit keying line, this also provides outputs for the transceiver up/down frequency control when used in PSK mode with AFC selected under software control, for use with low earth orbiting satellites for example. Next to this are a pair of 3.5mm and 2.5mm jack sockets for Speaker and Mic/PTT respectively, with ready–made leads provided to interface with handportables for packet operation. An external modem connector is also fitted to allow you to simply plug in an external packet modem such as a 9600 baud affair if required, and CW key 'In' and 'Out' jacks are fitted for Morse use.

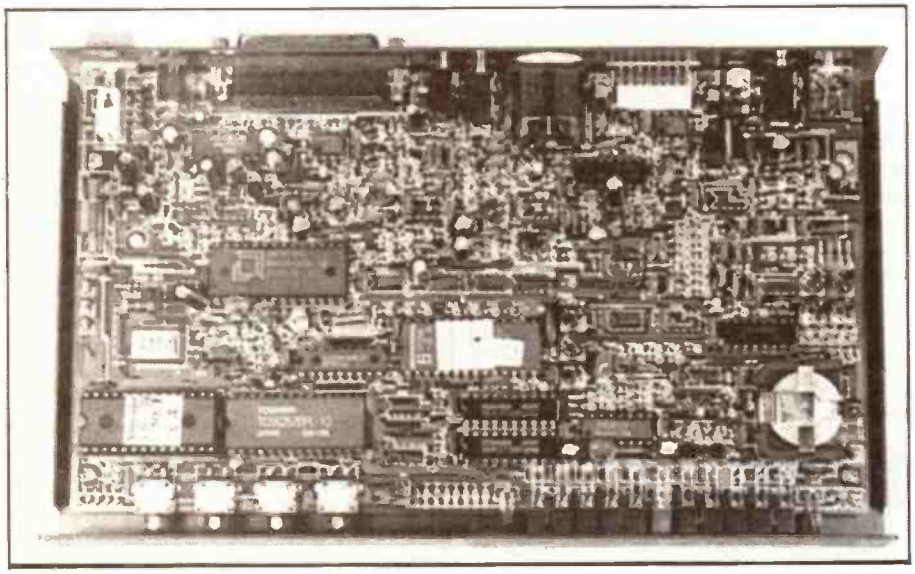
Packet

The latest AX.25 packet protocol is used, with the common TAPR command set to allow the 'normal' TNC commands to be used, an important point with there

being so many of them! A 'KISS' mode is also available for computer-driven terminal applications if required. For terrestrial VHF and UHF use, the normal AFSK tones are used at 1200 baud, and for HF 300 baud packet use the normal Bell 103 tone pair is employed, the front panel tuning bargraph coming into action here.

For the first time to my knowledge an internal PSK (Phase Shift Keying) modem is fitted inside the TNC, rather than an accessory unit for this being needed, usually an expensive external option. This PSK modem operates at the usual 1200 baud with two-phase modulation of 1600Hz, a Costas Loop demodulator being used. For operation with the Fuji satellite 'orbiting BBS', Manchester encoded PSK is handled with a special 'JAS' PSK mode selectable on the TNC.

The external modem connector on the rear panel lets you plug in an alternative packet modem, with connections for TX and RX TTL level data, PTT, modem selection DC, and an X32 clock output for modem synchronisation, the external modem being software-selectable from the terminal program used. Following a manufacturing agreement, James Miller G3RUH tells me that Tereleader are also producing a purpose built G3RUH 9600 baud modem to plug into the TNC-24.



Mailbox

A personal mailbox is fitted, with a message storage capacity of up to 14000 characters. A sub-set of the usual WORLI/WA7MBL/JAS-1 BBS commands are used, and by arrangement with your local network BBS operator these also allow for the unattended reception of auto-forwarded messages from your local BBS to your personal mailbox. Hence by leaving the TNC and radio switched on, the system has the capability of automatically accepting and storing messages addressed to your callsign, these having been forwarded through the international BBS packet network.

The third party message storage capability can be toggled on or off to comply with UK license requirements where needed for an individual station, yet still allowing for 'communal use' in countries or other circumstances where this is allowed. Likewise, an internal CW ID allows for automatic periodic identification of your station to comply with UK license requirements.

A real-time clock is fitted to the TNC, the internal battery keeping this running even with the TNC switched off, thus received and stored messages and the like can be time and date stamped as required without you needing to reset the internal clock each time you switch the TNC on.

Morse

The unit will send and receive Morse using a computer screen and keyboard or manual means, with automatic speed sensing of received CW and software selection of the transmit speed between 4 and 50 WPM. Side tone is provided by an internal transducer acting as a speaker with its volume controlled by a rear panel pre-set adjustment, a 'tone on/off' software control can be used to switch this on or off. This sidetone may also be used on receive as a 'regenerator' of received CW signals, hence allowing you to listen to 'pure' decoded CW from the TNC in the midst of background QRM, the TNC thus acting as a filter/decoder.

For manual CW transmission as opposed to keyboard operation, either a straight key or paddle may be used, the unit having a built-in iambic keyer for paddle use. Ten user-programmed memories, each of up to 240 characters, may be used for 'rubber stamp' details such as Name, QTH and the like, and four of these may be initiated directly from the front panel of the TNC using the push-buttons provided. As well as this, an internal incrementing counter may be used for contests, to automatically add the QSO number to each contact, this for example may be set to follow your pre-programmed '599' signal report that everyone seems to give! Just to complete the line-up, a random code generator is also provided, complete with on-screen display of sent characters to give you or your class a bit of Morse training whenever required. A modulated audio output is available for 'FM Morse' use, for on-air practice in the channelized sections of 2m or 70cm for example.

RTTY/Amtor

The usual five unit Baudot RTTY code may be used with speeds of 45.5, 50, and 75 baud, together with 100 baud AMTOR using all the usual FEC, ARQ and 'Listen' modes. The American standard tone pair are used for the modem, to make the TNC compatible with transceivers that only provide filtering for these tones. An 'RXReverse' command lets you quickly swap tone frequencies without needing to switch sidebands and retune your transceiver. As well as this, straight 7-bit ASCII transmission and reception can be handled at speeds of 75 and 110 baud.

Fax

Remote imaging enthusiasts may like to know that the TNC will accept fax signals with selectable drum speeds of 60, 90, 120 and 240 RPM, thus handling most transmission standards. Two shades are used, i.e. black and white, corresponding to received audio of 1900Hz +/-400Hz, with auto start and stop on reception. The unit may be connected to an optional printer for reception, and Tereleader also provide an MS-DOS disc with a fax program C source code stored so that computer whiz-kids can tailor the software to their individual needs for on-screen display.

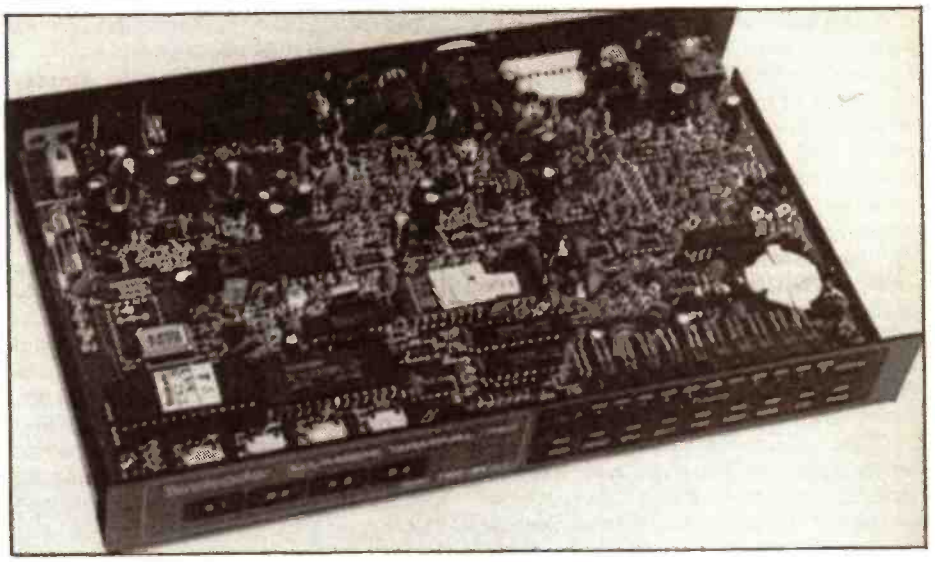
The TNC is provided with a pair of handbooks, one detailing the hardware and connections, the other detailing the many commands used by the TNC. Connectors for the radio port, CW key, handportable microphone and speaker leads, and a DC power lead are supplied in the box, together with the computer disc with the fax source code stored.

In Use

With all these modes of operation, it was really a case of where to start! The first thing I needed to do of course was to get my computer talking to the TNC, so in went a shareware 'dumb terminal' emulation program which I then set to the default settings of 8 bit data, 1 stop bit, and no parity. Connecting the RS-232 leads up and switching the TNC on then nicely brought up the usual sign-on message similar to that shown in Fig.1.

Typical sign-on text — Fig. 1.

```
TASCO data controller TNC-24
AX.25 Level 2 Version 2.0
message board Ver 1.26J
Release 19-Aug-90
Checksum $24
cmd:
```



The 'cmd:' prompt showed that all was well, I then entered the command 'MODE FSK' to switch to VHF packet, then tried a quick experiment to see if the TNC was 'idiot proof'. For this I tried an off–air 'connect' without doing anything else, to see what the unit would do as I had not told it yet what my callsign was! I've lost count of the number of 'NOCALL' callsigns I've seen around on packet, their owners wondering why they were having no luck, simply because they had not read the instruction book. Full marks to Tereleader, as a message automatically came back from the TNC telling me to set my callsign – very good!

Following my entry of this, without any further modifications I plugged in a 2m rig, switched to FM and tried my first 'on air' connect to my local packet node. The "***CONNECTED' response came back almost instantly, and I was 'in', without any further changes to the numerous pre–loaded default settings. Idiot proof? – Yes!

After accessing the local network BBS and downloading streams of messages, I disconnected and tried the personal mailbox. After entering my selected callsign for this and switching the mailbox 'on', I tried a self–connect again through the local node. The mailbox greets the connected user with the response shown in Fig. 2, a short menu

Personal Mailbox Sign-On Text — Fig. 2.

```
Welcome to G4HCL's message board
TASCO system Ver 1.26J TNC-24 14197 Bytes free

CMD (F/K/M/R/W/B/H/?)>
```

of commands being offered. Although the TNC lists commands such as 'File' and 'Write', I found it would also accept the more usual 'L' and 'S' commands for 'List' and 'Send' as used on network BBSs. Front panel LEDs show the state of the personal mailbox, and whether any messages to you are stored, waiting to be read.

Entering a message either off air was fairly straightforward with the mailbox requesting the usual 'Subject:' and 'Message:' texts, terminating the message again with the usual CTRL–Z or '/EX' even gives the user a 'Thanks for your message' text to confirm it has been stored. If a user connects and has mail waiting for him to list and read, the personal mailbox gives a 'You have mail waiting' message, subsequently disconnecting from the personal mailbox with a 'B' command even causes the TNC to send a cheery 'Thank you CU AGN 73 & 88' message prior to the mailbox issuing a 'disconnect' command, very user–friendly!

CW

The rear panel 3.5mm key jack may be used for either a 'straight' key or a paddle key, the paddle key mode being enabled under software control by entering 'CW ON' when in CW mode. As well as variable sending speed, the 'weight' of automatic sending i.e. the dot/dash ratio, both from the paddle or from the keyboard, could be varied again under software control in true automatic keyer tradition.

I found the CW memories very handy indeed, by pre–loading these with 'CQ CQ etc.', another with my station details, and so on, I found I could give my brain a slight rest occasionally. As luck would have it, one weekend during the review period a HF contest was in full swing, thus loading one of the memories with my call, region and signal report followed by a '£'symbol, the TNC nicely placed an incrementing CW serial number in place of the '£' each time that memory button was used! Combined with automatic logging of QSOs from my computer terminal program, with the screen displaying and the computer storing my transmitted and received text for each contact, the chances of 'human error' were much diminished!

In practice I found the TNC to correctly detect even very badly sent Morse, rather than being limited to 'perfect Morse'. As an experiment I used a pair of pliers shorting out the key contacts off–air, to send a section of 'terrible' Morse at a constantly varying speed. The TNC decoded every symbol correctly which really surprised me! On air, I did however find that I needed to be careful with my receiver tuning and the setting of the receiver volume control, hence controlling the 'threshold' of audio input to the TNC. Not surprisingly under heavy QRM conditions I found the trained human ear was rather better at decoding!

RTTY

A test of other modes also proved worthwhile. Selecting RTTY as the operation mode, followed by the usual entered 'k' command to place the unit in converse mode, brought forth plenty of RTTY activity filling my screen. I found the receiver tuning was again fairly critical as would be expected, the LED bar graph together with the 'DCD' LED being useful here to make sure I was spot–on. By entering 'Command' mode again on the unit I could halt the decoding of received text, this I found quite useful to prevent the screen filling up with random characters due to received noise in the absence of signals. As with CW, I found RTTY and AMTOR needed a reasonably 'clean' signal for the unit to decode. However the FSK crystal filter in my usual transceiver, this being centred on the high 'American' tone pair rather than the normally used 1275/1445Hz tones, was in this case very useful.

Inside the Box

The TNC board itself is housed in a light grey metal enclosure, this keeping down the level of RF radiation from the unit. A single PCB contains all the circuitry, this may be removed complete with all its connectors and switches, by undoing four screws. Discrete, i.e. leaded,

components are used on the topside with just a smattering of surface mount ICs on the underside. An AM7911 'World Modem' IC under microprocessor control using Z80 software commands handles all the tone encoding and decoding functions.

The operating firmware is stored in a plug-in EPROM hence this can be changed when the time comes for an upgrade to provide new operating modes or whatever. The lithium memory backup battery is even housed in a plug-in enclosure, again making this easy to replace in years to come if the need arises, the battery type and replacement being described in the manual.

Four stick-on feet are fitted to the bottom of the unit, however the internal acoustic transducer is secured to the bottom panel by a couple of screws, these project though the panel and could I feel be a nuisance if one or more of the panel feet became unstuck due to the ravages of time, however I understand this arrangement may be modified in the future.

Conclusions

The Tereleader TNC-24 seems a very powerful tool for today's digital age, with its built-in PSK modem and plug-in RUH 9600 baud modem soon to come it looks like offering a very comprehensive package for the amateur who likes a 'taste' of operating several digital modes. For satellite use, the cost of the unit at a shade under £300 compares very favourably when considering the cost of a 'normal' TNC plus an add-on PSK modem. But it'll take you quite a while to read through the manual! I'm now off to try Fuji-Oscar 20, with the TNC automatically controlling my receiver frequency.....

Our thanks go to South Midlands Communications Ltd. for the loan of the review equipment.

Personal Mailbox Commands Fig. 3.

W(rite)	= Type W (callsign)<cr> to begin message entering.
Subject:	= Header (max 32 characters) are entered after the prompt: "Subject:", ending the header with a carriage return <cr>
Message:	= Message are entered after the prompt: "Message:". Ending each line with <cr>. You terminate with either a <cr>/EX<cr> or <cr><ctl-Z><cr> to the indicate end of your message.
B(ye)	= Type B<cr> to DISCONNECT.
F(ile)	= Type F<cr> to show the latest 10 messages.
M(ine)	= Type M<cr> to show latest 10 messages (to or from you). Subsequent F or M command will show next 10 active messages.
R(ead)	= Type R n<cr> to show the number n message.
K(ill)	= Type K n<cr> to delete the number n message (only to or from you).
H(elp)or ?	= Type H<cr> to display this.

Typical Message Listing Fig. 4.

Msg#	Size	TS	Date	Time	From	To	Subject
1	213	P	23-Sep/	1348	G4HCL	ALL	Hello

13958 Bytes free
Next message Number 2

CONVERSION PRO
Burndept UHF Portable

Tony Skaife G4XIV guides us through the innards of the set.

The Burndept portable range of equipment has now been around for about 15 years in one form or another. Operating on UHF, they have been the workhorse of many a PMR system and now they are finding a new life on the amateur bands.

Preliminaries

The UHF transceiver range covers model numbers BE439 to BE470, there are some slight differences to these model types but they basically all operate in the same manner. It must be borne in mind that normally some degree of test equipment will be required to re-tune the set onto a different frequency range. However, this article should also help understanding of the circuitry and allow minor servicing or adjustments to be carried out if required. Additional alignment comments have been added by G4HCL.

Removal of the transceiver chassis from the outer case is done by removing the large rear screw together with both of the side screws below the volume and channel controls, then carefully sliding off the case. On some models, a separate battery base plate will also need to be removed.

Crystals

The easiest process is where the transceiver is fitted with crystals for one channel only and it is to be re-crystalled to another single frequency. It becomes more complex if all three channels are to be installed from scratch, however details of this will be described later.

To calculate crystal frequencies I have reliably used the following method;

For the transmitter, take the final UHF frequency required and subtract 12kHz, call this value 'FT'. Call the TX crystal 'XT' and use the formula;

$$XT = \frac{FT}{9}$$

As an example, the crystal for SU16 (433.400MHz) would be 48.15423MHz, it is a third overtone type that should be ordered.

Similarly for receive, an adapted formula is again used. Take the final 70cm receive frequency and again subtract 12kHz, call this 'FR'. Apply it to the formula using 'XR' as the receive crystal.

$$XR = \frac{FR + 10.7}{9}$$

Again for SU16, this crystal frequency is 49.3433MHz. This formula is not the one quoted in official technical manuals but it is a system that I have always found reliable.

Circuit Operation

Assuming you now have appropriate crystals fitted, I shall explain the circuit arrangement at block level, treating transmit and receive sections separately.

The PTT (push to transmit) switch when pressed serves two functions. As well as acting as an aerial change over switch, it removes the supply voltage (9V) from the receiver and places both 9V batteries in series to generate 18V to power the transmitter units. Therefore, a point to remember is that in transmit mode, both batteries are in use and thus both must be in good order.

Diode D3 is across one of the batteries, so beware of D3 going short circuit. The position of D3 on the circuit board can vary depending on which model is in use, but it can easily be found and tested. D3 incidentally is fitted to provide isolation between the batteries on receive. So far I have mentioned only battery power for use, but a mains power supply unit can be useful for bench testing or battery charging, several designs have of course been published for these. Note that if you use this in place of batteries, you will need either a double output type, or a pair of power supplies, for the transmitter tests.

Transmit

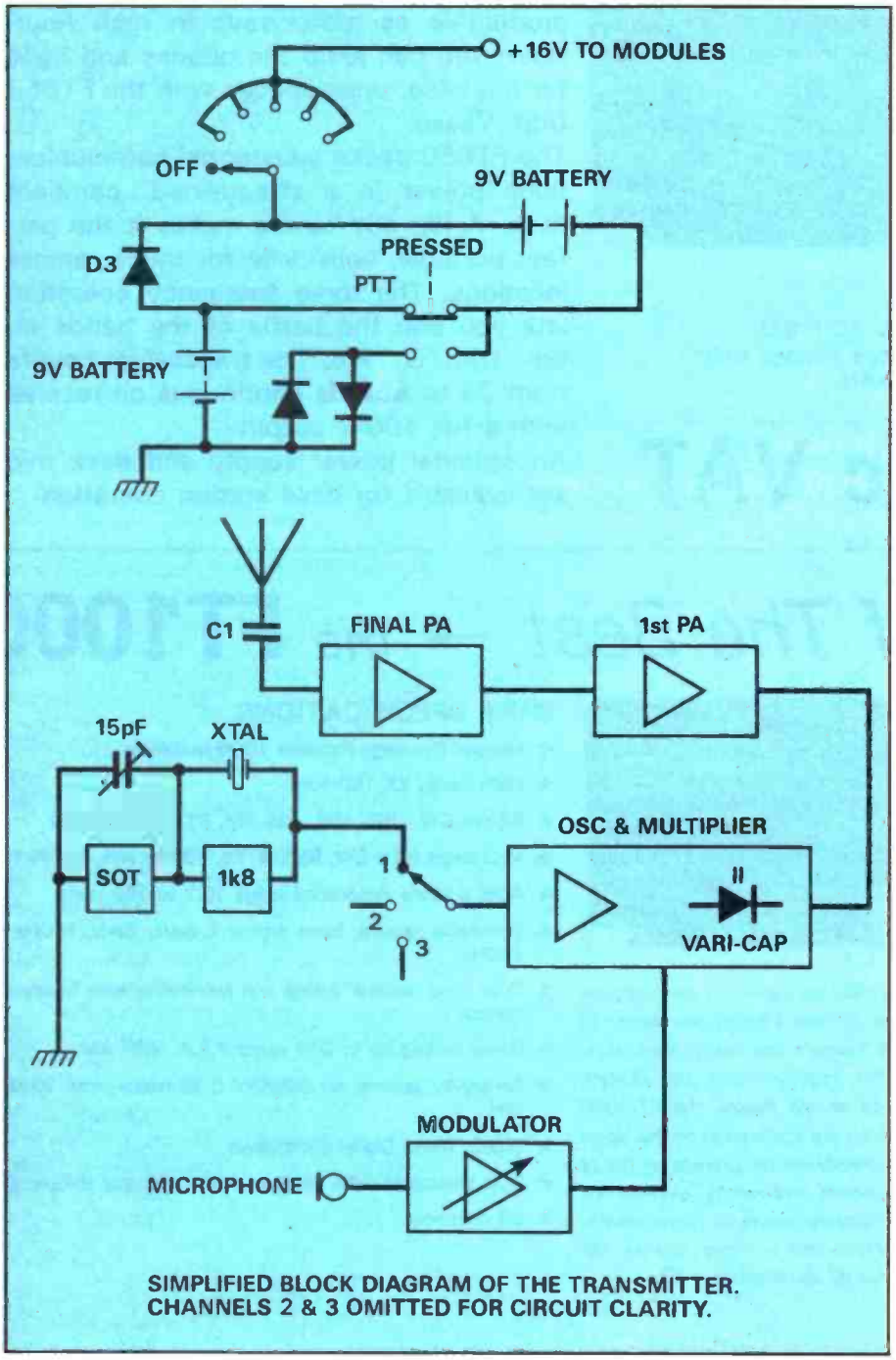
With one of the channels selected, its transmit crystal (approx. 48MHz) is tuned by the associated 15pF trimmer, the output being fed to the TX Osc/Mult unit. Audio from the built-in microphone is amplified in the modulator unit and then fed to the varicap diode in the TX Osc/Mult unit, hence FM is generated and the crystal frequency is given a 9 times

multiplication here. The resulting UHF signal generated is about 8–10mW.

Further amplification takes place in the TX 1st PA stage, this single stage unit producing 50mW. The TX 2nd PA, also a single stage unit, boosts the output to approximately 350mW. The output to the built–in aerial is via C1 (5p6) so it is vital that this capacitor is not damaged or poorly soldered.

TX Alignment

Alignment of the transmitter power consists of carefully adjusting the variable capacitors and coil on the multiplier unit for maximum 70cm signal, an absorption wave meter or frequency counter is useful here. Ensure you use a suitable non–metallic trimming tool, and make sure the core is not broken before you commence this.



SIMPLIFIED BLOCK DIAGRAM OF THE TRANSMITTER. CHANNELS 2 & 3 OMITTED FOR CIRCUIT CLARITY.

After the appropriate crystals have been fitted and the set tuned you'll need to set the deviation on the transmitter. Each crystal will have its own performance characteristics, because of this if a crystal is changed the resultant deviation is likely to differ from the one originally fitted. The deviation is reset by adjusting the potentiometer on the modulator unit, as shown in the accompanying diagram, to suit the new crystal. This can be performed by comparison to other signals such as a repeater, or of course by using a suitable deviation meter if you have access to one.

Where more than one channel is used the solution is a little more difficult. On the circuit side of the board are 3 resistors R17, R18 and R19, these are soldered across each trimmer for the transmit channels. Remove the resistors and check each channel for it's level of deviation, using an adjacent receiver for example and noting which one has the lowest level of audio. The channel with the least deviation should have its resistor replaced by one with the value of 100k. The other channels with their higher deviation levels should then be adjusted to the correct deviation level by using lower resistance values, typically between 12k and 82k. It can be a little daunting at first, but with patience one can set the deviation levels to match, the overall setting is again adjusted with the deviation control on the modulator unit.

On the TX Osc/Mult unit can be seen a resistor having a 'Select On Test' (SOT) resistance value. By increasing this SOT resistor value, a reduction in battery current drain can take place although the output power is likely to reduce. By reducing the value of this resistor it may increase both power out and battery current. So the final value of this depends on the right balance of power out to power used. It is not much use to increase output power by 10% and your find battery life reduced by over 30%. A typical SOT value would be 180R, the usual range being from 120R to 390R. Selecting the right value should give 350mW out for 120mA or less.

Receive

Releasing the PTT removes the power (18V) from the transmit circuitry and allows 9V to power the RX units. Hence only a single 9V supply is required for receive only test purposes, thus just a single battery or power supply may be used.

Starting again with the crystal, it is tuned by the adjacent trimmer C3, C4, or C5. The first local oscillator multiplies this by a factor of nine and feeds it to a mixer in the RF Amp. Received UHF from the aerial passes through C1 and is amplified in the RF amplifier, then fed to the first mixer to beat with the LO output.

The output here at 10.7MHz is filtered through the crystal filter and is amplified by the first IF amplifier. Further IF gain takes place in the 2nd IF Amp with its final stage being a mixer, into this is fed the 2nd LO which is a crystal controlled

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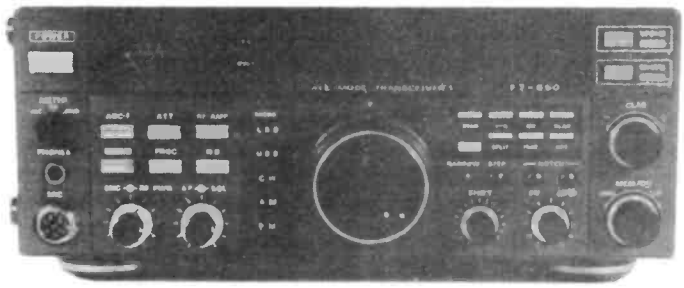
DX-PEDITION SPECIAL



OPTIONS

FP-22 Internal 240V AC P.S.U.
DVS-2 Digital Message Storage Unit
XF455m CW Filter 600Hz

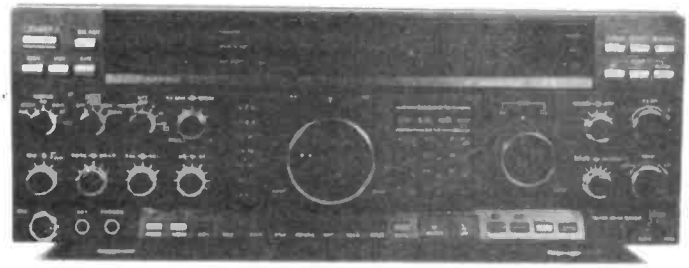
£995 inc VAT

Noisy, crowded frequencies are about as productive as motorways in rush hour. Now, you can jump the queues and head for the wide, open spaces with the FT650 from Yaesu.

The FT650 packs substantial communications power in a streamlined, compact case. A flip out handle makes it the perfect portable, especially for those remote locations. The three frequency operation lets you win the battle of the bands on 6m, 10m, & 12m. The transceiver covers from 24 to 56MHz continuous on receive with a full 100W output.

An optional power supply and desk mic are available for base station operation.

The Best of The Best — the FT1000



Designed with no spared effort or expense for optimum performance and operability, the FT-1000 is the fruit of over 25,000 man-hours of intensive research and development by Yaesu's top design engineers. Instead of merely offering incremental improvements on existing designs or adding bells and whistles to an old model, the FT-1000 project involves a wholly new approach to the application of the latest digital and RF technologies to today's most demanding needs on the hf bands. Extensive surface-mount component technology allowed six microprocessors and five Direct Digital Synthesizers to be harmoniously integrated with a simple operator interface into a highly reliable full-featured transceiver optimized for serious hf applications.

BRIEF SPECIFICATIONS

- ★ General Coverage Receiver 100kHz-30MHz
- ★ Ham bands TX 160-10m
- ★ Modes CW, USB, LSB, AM, FM, RTTY and Packet
- ★ VFO steps 10Hz CW, SSB, RTTY, 100Hz, AM, FM, PKT
- ★ Auto antenna impedance range 16.7 to 150 ohms
- ★ Selectable receiver band widths 2.4kHz, 2kHz, 500Hz, 250Hz
- ★ Dual band receiver tuning and monitoring with balance control
- ★ Power output up to 200 watts P.E.P. 50W AM
- ★ Sensitivity preamp on SSB/CW 0.25 micro volts 10dB S/N
- ★ D.D.S. Direct Digital Synthesiser
- ★ Dual Selectable noise blankers with adjustable threshold
- ★ 99 memories

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Leeds (0532) 350606
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Closed Sat afternoon

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SMC (Midlands)
102 High Street
New Whittington
Chesterfield
Chest. (0246) 453340
9.30-5.30 Tues-Sat

BIRMINGHAM
SMC (Birmingham)
504 Alum Rock Road
Alum Rock
Birmingham B8 3HX
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9.00-5.00 Tues-Fri
9.00-4.00 Sat

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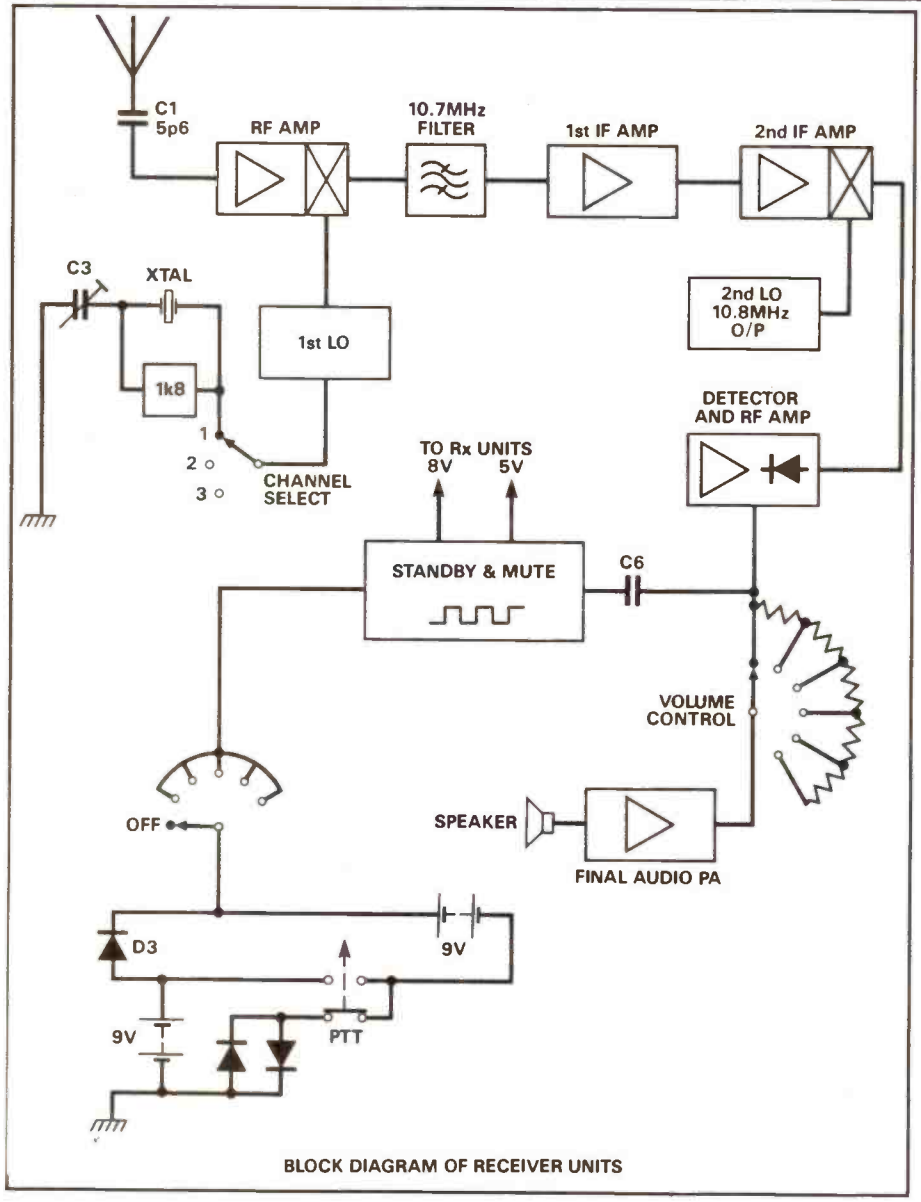
VISA

SOUTHAMPTON SHOWROOM open 9.00-5.00 Monday to Friday, 9.00-1.00 Saturday. Service Dept open Mon-Fri 9.00-5.00.



BLOCK DIAGRAM OF RECEIVER UNITS

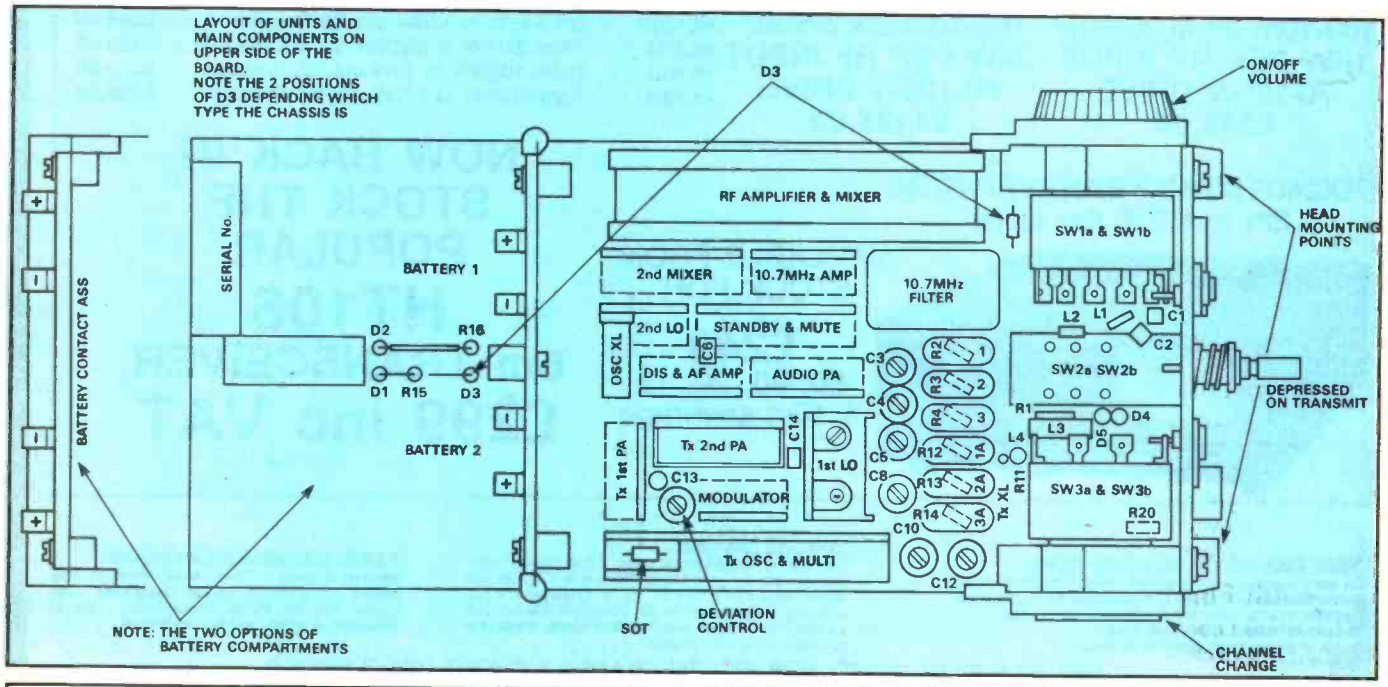
oscillator running at 10.8MHz. This results in a second IF output of 100kHz which is demodulated in the discriminator and AF Amp unit. The resulting audio is fed through the volume control and amplified by the audio PA unit, then fed to the head unit which houses the speaker/microphone.

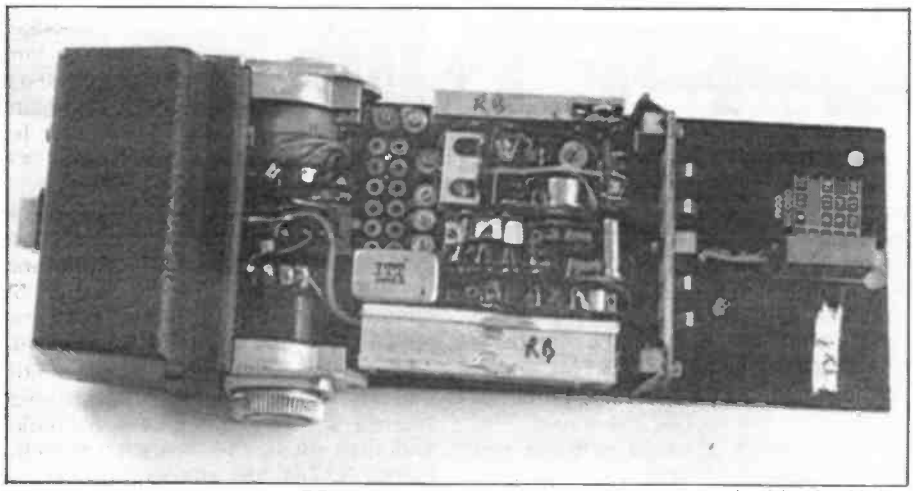
There is still one unit remaining which I have deliberately left until last, this is called the *'Standby and Mute'* unit. One purpose of this unit is to provide 5V and 8V supplies to sections of the receiver circuitry. Another function of this unit is to provide a battery save function. Part of the unit is an oscillator which switches the receiver on and off until a signal is present, and while it's there the receiver stays on. When no signal is present the receiver reverts to its On/Off state thus using less battery power than if it were to be on permanently. On some sets, this oscillator can be heard faintly in the speaker as a ticking sound. The presence or absence of this sound is not important but I think one should know that it could be there.

RX Alignment

Turning the set with its printed circuit uppermost, C6 can easily be identified as it is in the centre of the board. It is the value of C6 that determines the squelch setting and once set it should not need altering again. The value of C6 can range from 56pF to 270pF, and any values significantly outside that range should make one suspect the IF units. Remove C6 to open the squelch while aligning the receiver.

After you have inserted your receive crystal and initially tuned onto frequency using a strong local signal, you will need to adjust the coil and trimmer capacitor on the RX 1st LO unit, followed by the three



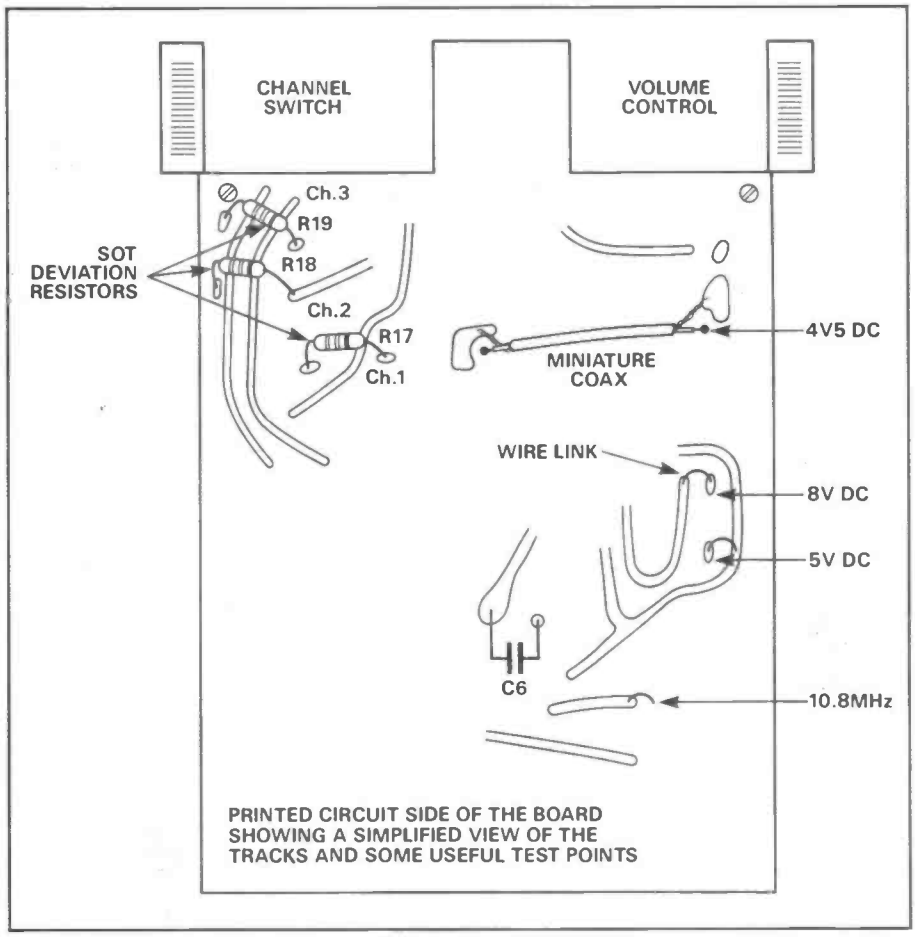


Inside the Unit

trimmer capacitors on the RF Amp and Mixer unit for best reception using a 70cm signal source of a variable level. The methods of achieving this have been well documented in previous HRT PMR conversion projects, and thus will not be dwelled on here. You'll find by adjusting the bottom left, bottom right, then the top right trimmers on the RF Amp should eventually provide you with a working set, providing no faults exist.

Fault Finding

Before I continue, let me stress the importance of cleanliness as many a *'poor receive'* problem has been cured by giving the board a good scrub with a stiff stencil brush and solvent. It's amazing how the board can pick up small pieces of debris after years of use, also I'd recommend placing the chassis on a piece of paper kitchen roll while working on the set to guard against further problems.



PRINTED CIRCUIT SIDE OF THE BOARD SHOWING A SIMPLIFIED VIEW OF THE TRACKS AND SOME USEFUL TEST POINTS

As I've briefly explained the circuitry, I'll continue with some useful monitor points and show what to expect. Earlier on, C1 was mentioned and this is found on the component side of the board between a socket in the top frame (aerial) and the central pin of the PTT switch. On the adjacent pin to C6 is the inner of a miniature coax, which being quite stiff can break, thus giving no receive. This may not be apparent as the coax rigidity will hold it close to the pin, so a careful check here could prove useful.

If either of the rotary controls become intermittent, a proprietary switch cleaner may be applied along their shafts, but this cleaner should contain a lubricant or the contacts will soon wear again. If in doubt, a brief spray test on a non-porous surface will determine if yours is the correct type, as an oily residue will be left.

On the inner of the miniature coax running between the local oscillator and the RF amp is a DC voltage of 4.5V, if this value is nearly 8V then there is a good chance the local oscillator has developed an internal short circuit. This may be proved by unsoldering one end of coax inner and measuring the voltage again. Two points further along on the RF Amp are where the 8V and 5V supplies can be found. The two supplies are routed to the RF Amp by small link wires which can break without this being apparent, a careful check with a test meter will soon identify any fault here.

A little further along the board is a length of track that joins the 2nd Local Oscillator and the 2nd IF Amp/Mixer, this carries the 10.8MHz signal. Therefore, a check with a frequency counter will prove if the Local Oscillator unit is working. If an RF voltmeter is available then one should be able to measure something in the order of 125mV RMS here.

Spares

It is a good idea to keep a look out for 'scrap' sets which may be acquired very cheaply, as these may be used for spare parts if needed. Another outer case, even if cracked and marked, can have holes made in it and used as a *'test case'*. With holes in the appropriate places, internal adjustments can be made while the set is in the case with batteries fitted. It is worth mentioning that although the case is plastic there can be a subsequent slight shift in the frequency when a set has been tuned with no case present.

On the subject of spares from scrap sets, the battery terminals from these can be mounted on pieces of wood or the like to hold batteries for charging. If the head unit containing the speaker/microphone and aerial becomes suspect, then a spare head can be swapped with the original to prove the fault.

That's It

The Burndept portable isn't a high power all singing and dancing transceiver, but under the right circumstances it's ideal for working through a local repeater or for locating a lost chum at a rally. (Ed's note – why not give one to your youngster when they've passed their Novice test!).

HF HAPPENINGS

Steve Telenius-Lowe G4JVG shows 10m DX is within easy reach

After the frenetic activity on the HF bands during the spring, with activity from such rare countries as Spratly Islands, Conway Reef (off Fiji), South Sudan, another Vietnamese operation and culminating in two superb operations from Yemen in the summer, I feel that things have been pretty poor during the last month or so. True, conditions usually do take a dive in July and August, the familiar summer doldrums, when you can tune across 10 metres and hear no signals at all (even now, at a sunspot maximum), while 15 and 20 metres have plenty of strong Europeans but not a lot else. If you are a DXer, and are primarily interested in working new countries rather than having a ragchew with someone in Germany or Italy (or, these days, the Soviet Union), this is the time to be out in the garden doing some antenna farming.

The British team in the World Radiosport Team Contest. Left Steve G3YDV, right Dave G4BUO, Centre hosts John KA7MCX and his XYL.

Winners of the World Radiosport Team Contest, KA1AR (left) and K1DG (right).

Radiosport Stations

In last month's 'HF Happenings' I wrote about a unique amateur radio operating occasion which took place in Seattle USA, in July, the World Radiosport Team Contest. Dave Lawley, G4BUO, one of the two British competitors in Seattle, says that the teams were allocated their stations and the callsigns to be used at the last minute and in random fashion – so the British team used the station of KA7MCX but used the callsign K7SS. This call was lucky, for not only is it a short snappy call, just the thing you want in a contest, but also K7SS is a well recognised contest callsign all over the world. Dave goes on to say that John KA7MCX and John's wife made them feel very welcome and they both had a great time, if a rather exhausting one, over there.

The antenna used at KA7MCX was a 6–element TET tri–bander at about 8m high above the roof of the house. The winning station operated by K1AR and K1DG used a different 6 element tri–bander, the KLM KT–34XA, which was mounted about 16m high. Although conditions seemed to be poor before the contest started, the contest itself generated a lot of activity and the pile–ups and QSO rates were always good. Despite being on the west coast of the USA conditions were very poor to Japan, and far more Europeans (generally a more difficult path) were worked than JAs.

Treshnish Expedition

In August, Andrew G0HSD was one of a group of intrepid operators who activated the rare Treshnish Islands (EU108 for the Islands on the Air awards) as GS6UW/P. Unfortunately the operation did not quite go as planned, as Andrew's ancient MG broke down several times on the M1 and the ferry from Oban was missed. When he eventually met up with the remainder of the group (who'd had no such transport problems), the boatman who had been persuaded to take them out to the Treshnish Islands had been contacted and had agreed to take them out 24 hours later than originally planned. Andrew says "The boat, Puffin II, was a diesel ferry about 45 foot long and took tourists to visit Fingal's Cave on Staffa and then on to the Treshnish Islands. Martin G3ZAY had arranged for him to stop there and drop us off and then collect us on Wednesday. While loading, the First Mate was heard to say something about a kitchen sink, but we eventually got loaded up!"

"We arrived on Lunga, the largest of the islands, after having had a great time on Staffa. We set up the tents first due to impending rain, and got on the air by 1645 GMT. I manned the TS120S running barefoot on a 15m dipole at 20 feet, I still worked KH6 Hawaii though, and Martin got on 20m with the FT101ZD and KW1000 to our trusty Butternut vertical. We were on the air solidly until about mid-night, then we closed down for the night. We had been on 15–80m and had worked around 700–800 stations in that time. The call GS6UW caused quite a stir, I was asked repeatedly if we were a new country. Perhaps not, but we probably were the first people to air the GS6 prefix."

"Lunga is about 2km in length and 500 feet at its highest point. From the top we could see Skye to the north, Staffa and Mull to the east and Coll and Tiree to the west. Our camp far below us was almost at sea level, a heavy 1.5kw generator being the reason for this. The camp was 50 yards from the sea, but to get the rigs, food, whisky glasses etc. ashore we had to scramble over very slippery seaweed, not ideal with valve equipment. Impending storms caused an early return by the boatman, so the GS6UW operation

Andrew G0HSD operating as GS6UW/P from the Treshnish Islands.

was over only 26 hours after it had begun."

Andrew has recently moved house and wasted no time in getting up a 2 element Gem Quad for 10 and 15 metres. A full–size quad for 20m is a pretty big beast, but when 'cut–down' to cover just the two higher bands it becomes far more manageable, because the size decreases in all three dimensions. The Gem Quad uses a centre 'spider' arrangement, with no boom, thus ensuring the correct spacing between the elements on both bands, it is in effect a monoband, no compromise, beam on both 10 and 15 metres. Andrew says he is amazed by its performance compared with the three element tri–band yagi at the former QTH, he is now working DX in the Pacific that he just could not get through to before.

Your Own DXpedition

Andrew's experience shows that you don't have to go half way round the world to put on a DXpedition and to get pile–ups. They can be achieved from the United Kingdom, and especially now that club callsigns can use GX, GS, GC etc. prefixes, there are all sorts of possibilities, some of Britain's more remote islands have always attracted would–be DXpeditioners. Places like Lundy Island and Flat Holm Island have been activated several times over the years, but strangely some other islands, such as the Isles of Scilly are only rarely activated, despite the fact that they are relatively easy to get to, have a permanent population, and holiday accommodation is available. The Isles of Scilly count separately for the IOTA awards (EU–11) and although the Cornish Radio Club was due to activate them as GX4CRC/P at the beginning of September, it was only planned as a short single day operation and the demand by IOTA hunters will still be there.

HF Conditions

I started by saying that things had been fairly poor the last few weeks, and certainly there have not been as many expeditions recently as during the spring. However, conditions usually improve in September, and this year was no exception. After several weeks of poor propagation on 10m, it was good to hear the band in good shape again at the beginning of the month. During the worked all Europe contest, the band was full of strong JA signals for hour after hour, with at times Africans and North and South Americans coming through simultaneously. The other bands have been in good shape too, with signals from the Pacific being very strong some mornings on 15m and 20m.

One morning I worked KH6FKG at 59 each way on 20m, followed a few minutes later by AH3C, Pete, on Johnston Island in the Central Pacific at the same strength on 15m. Apparently AH3C was worked by several British DXers on 10m SSB later that same morning (a pretty rare path from Britain to Central Pacific, long path, on 10 metres), but I was at work and missed him! Pete also has a large 40m beam and has been working into Europe at 0500 – 0630 GMT on 40m, although again, so far I have not heard him on that band.

Paclfic DX

Einar LA1EE, famous for his DXpeditions to Peter 1st Island and Bouvet Island, was also active from the Pacific during September. Along with Kare LA2GV, he was operating from the Republic of Belau (formerly the Western Caroline Islands) as KC6EE and KC6GV respectively. Fortunately his trip coincided with this period of good propagation, and I worked him using but 10W PEP to a vertical. Although he had some problems to copy my details, he came back to my first call, so conditions must have been good. Einar is also one of the star attractions at this year's RSGB HF Convention and will be giving a talk on his expedition to Bouvet Island in the Antarctic area.

Marion Island

Another small, desolate island in that area is Marion Island, home for Gerard ZS8MI. Gerard is very active on 10, 15 and 20m at present and his QSL manager Margaret, at P.O. Box 13077, Jacobs 4026, South Africa sent along some interesting information on this inaccessible spot. Marion Island is at about 47 degrees south, 32 degrees East. Originally purely a meteorological station, it has since been developed into a research station for biological and geomagnetic experiments. It is one of a group of two islands in the Prince Edward islands group.

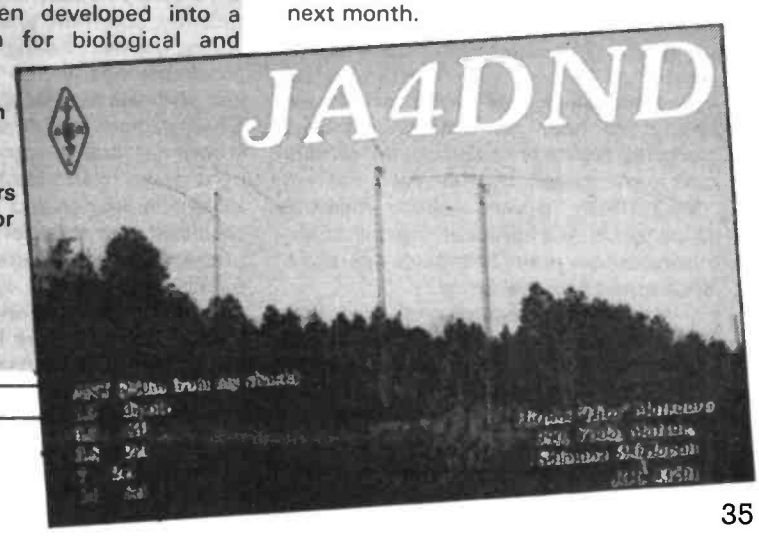
Marion is the larger of the two, at about 22 x 14km, rising to a height of 1186m ASL. Apart from a fringe of grass on top of the cliffs, the foothills only have a covering of soft, spongy and mossy vegetation which, together with the high rainfall, create swampy conditions, making walking difficult. The climate is cold, cloudy and windy. The average temperature is about 5 deg. C, but temperatures as low as –6 deg. C can occur throughout the year, the annual rainfall is about 2500mm, with frequent gales. The few beaches abound with great elephant seals and hundreds of thousands of penguins, especially the king penguin. Many birds visit Marion Island, including albatross, skuas and petrels. The operators at ZS8MI stay on the island for 14 months at a time, so work Gerard now, because when he leaves it may be a long time before ZS8 is activated again, if there is no amateur in the group to replace him.

10m Constest DX

Finally, with 10m band conditions as good as they are at the time of writing, the ARRL 10m contest should he worth a go this year. It takes place on 8th–9th December, from 0000 GMT Saturday to 2400 GMT Sunday. Lots of DX should be workable, especially American amateurs on DXpeditions, typically those to the Caribbean. It is also an excellent opportunity to look for those rare States such as New Mexico or Montana which are not often heard except during ARRL contests. At the last sunspot maximum, I worked all USA States except Hawaii in the first 12 hours of operating in this contest. Let me know how you get on!

It looks very likely that I may be active from Papua New Guinea early in 1991, at the time of writing nothing is very definite but if all goes well expect to hear me from P29 (callsign unknown at present) in January or February.

Let me know how you get on in the ARRL contest, and any other input to this column would also be most welcome. Please send it to: *Steve Telenius-Lowe, G4JVG, 'Penworth', Tokers Green Lane, Tokers Green, Reading, RG4 9EB.* See you next month.



QSL of the month from JA4DND, Hiro in Shimane, Japan. The towers support a 2 ele for 80m(!), a 2 ele for 40m, and a 6 ele for 20m.

VHF/UHF Message

The 2m Band

From comments heard at club meetings and on the air, the general view seems to be that activity on the 2m band has been at an all time low for a long time. One well-known VHF DX operator went as far as to say that newcomers to the band these days must surely be left wondering whether the large investment needed to buy a rig for the band will ever pay dividends? Certainly to the casual listener, for much of the 24 hours the band can seem to be dead apart from packet radio, repeaters and the occasional beacon, leaving the 'bottom end' where there used to be much DX chasing and scrambling for clear channels, wide open.

forming over the UK, he found that on average there had been fewer tropo openings on 2m than in those years. The moral here of course is that it takes more than a hot day to produce it's share of VHF DX, and when the nights stay hot don't expect much in the way of exotic calls on the band. The folklore among the real old time VHF operators in the USA decreed that if you gave the mast a shake or in two at sundown, when a few drops of moisture fell off you should head for the shack because a temperature inversion with good ducting was a possibility. If everything stayed dry, however you could make for the sack in the certain knowledge that there would be no tropo that night.

Ken Ellis G5KW details propagation in his roundup this month.

From Ken Willis G8VR:

I asked my very good friend Ken Willis G8VR from Broadstairs, who for some years wrote the VHF column for Radcom, to give his opinion. Ken is mainly to be heard on 6m, although these days he regularly also monitors other VHF/UHF bands. Before 'emigrating' to 6m he worked 50 countries and more than 250 grid squares on 2m, making use of all the available modes i.e. tropo, aurora, Es, meteor scatter, plus a single EME contact with the USA to reach these totals. Ken looked up his logs for the early 1980s – an interesting period because in 1979/81 we had reached much the same point in solar cycle 21 that we are at today in the current cycle, number 22. He said that he certainly got the impression that there was much greater daily activity on the 2m band at that time, with the low end of the band well populated with SSB and CW signals. Groups of weak-signal operators, several of whom one never seems to hear on the band today, gathered regularly to discuss conditions and participated in the VHF net on 144.350MHz, a very popular meeting place for UK and European 2m operators. I wonder how many of today's operators are aware of its existence?

Ken also commented on the fact that although we have had two very good summers with stable high pressure areas

Solar Activity

Those who follow the progress of solar activity will know that there have been an unprecedented number of quite major solar disturbances of late which have at times been disastrous for HF band propagation. But these are exciting for VHF operators because they often result in radio auroras, with resultant DX conditions on 2m. What is surprising is that the recent solar activity has not produced many more auroras reaching down to more southerly latitudes. It is generally assumed that in the peak year of the cycle, auroras tend to be less frequent than in the years either side of the peak. But if the cycle really peaked around the middle of 1989, as now seems to be the case, then on past form we should have had some very good auroras recently, and there should be a lot more during the next twelve months or so.

In his logs for the 'equivalent years' just after the peak of the last solar cycle, G8VR experienced several quite massive auroras including some which reached right down to the Mediterranean giving Italian, Hungarian and Yugoslav stations their first ever experience of this type of propagation. So is something happening outside our present knowledge which affects VHF propagation, or is it just a hiccup which will be lost amongst the statistics in the fullness of time? Some think the poor 'conditions' have gone too long to be ignored but I wonder if the 2m band is as flat as some people think. Or are people not using it as much as they used to? Maybe the more mature operators feel that they have achieved all that they can from it and have gone to pastures new.

There are over 4,000 operators now on 6m in the British Isles, but what about newly licensed operators? Don't they start up on this band as in the past? Is the microcomputer and data transmission making us mike-shy? Questions indeed, and I hope you will write and give me your impressions of what was for many years our primary VHF band.

23cm

Apparently it is not only 144MHz which is affected, for just as this was being written came a comment from Brian G6JHR (Higham, Kent) saying that he finds his favourite band, 1296MHz equally empty compared with a few years ago, with frequently only beacons to be heard suggesting the band is open but with no takers! Here on the south coast I would like to operate on 432 MHz but the new channels for Syledis transmissions which were announced some time ago don't seem to be implemented down here because the band is often full of the hated 'chirpings' which means that we should pick a channel between them like walking through a minefield!

YO2IS, Rumania

In a *'thank you'* letter to Ken Willis G8VR, who had paid YO2IS's joining subscription to the UK Six Metre Group, Sziggy who had recently been granted permission to operate on six writes; "I am grateful to the UK six metre group for accepting me as a member. Thank you also for the Six News. Regarding 'six', I did build the rig (Handbook '77) with parts coming from the 'gold mine' i.e. the junk of old TV sets. It took less than a week of afternoon work to be ready for QSOs, the first was with OH2TI on 19th July at 1800 GMT. Until now 24/8/90 I have had more than 400 QSO's in 22 countries and 101 locators. I would certainly like to visit GB. We are free now to go anywhere but it seems hard to get a visa for most of the EU countries."

50MHz Comment

Ray Cracknell G2AHU of the RSGB Propagation Studies Committee writes; July 1990 was characterised by very good Sporadic-E conditions with

Ken Willis G8VR Chairman UK Six Metre Group (left), Ken Ellis G5KW (right)

propagation from Britain on 50MHz on every day of the month, although very little on the 8th, 20th, 29th and 30th. The increase in the number of European stations permitted to operate on 50MHz tends to give a distorted impression and must be set off against the incidence of transatlantic openings which this year have been in the main of short duration and very localised in extent. Compared with 1983–87 (the sunspot minimum period) when there were 100 permits only for most of the period against an estimated 3000 this year in Britain, this year's results on transatlantic circuits can only be described as disappointing. Similarly on 28 MHz where beacons such as DL0IGI have provided a consistent signal source over several solar cycles, it is evident that Sporadic–E is independent from the solar cycle except in as much as it is a form of propagation which is disrupted by magnetic storms and prominent solar flares, and these tend to maximise at or just after the peak of the solar cycle. This is a very important consideration especially for those countries with short term permits if the mistakes of 1949 (when the 50MHz band was given up without much more than a murmur of protest after the 1947 maximum) are not to be repeated.

Other longer distance circuits from Africa and South America opened on several days mainly to the south and west which could be reached by F layer propagation (by TEP or otherwise) and to the rest of the British Isles with a final hope of Sporadic–E. From the midlands it was apparent that these occurred when stations in the south of France were also being received very strongly.

50MHz Report From Ted Collins G4UPS

Sovereign Military Order of Malta; The first major opening into UK for IA0KM, operated by I0AMU, took place on September 1st. I worked him at 1609 but gathered he had started operations shortly before this. The locator was JN61FU and QSL information is via I0AMU. Later during the opening, Alfredo informed me that he had worked 49 G stations and 51 European stations. This surprise operation was a way of saying 'Thank you' to Geoff GJ4ICD who had paid for the four July operators to be enrolled into the UK Six metre group.

VO1MUN Beacon; This beacon which is being heard extensively all over Europe and W land is located in Newfoundland, the measured frequency is 50.0375MHz. Power is 10W to a vertical aerial, 50m AGL. Reports are invited, sent to the Memorial University Amateur Radio Club, P.O. Box 51, St John's, Newfoundland A1C 5H3.

OH0BNP; Ed OH0BNP, who when at home is OH2BNP, has just spent a few days on Aland Island, returning home on September 3rd. QSL via his home QTH.

4U1ITU; QSL via IK2CFR, Mr. Maren Pavia, Via Mozartz 28, I– 20052 Monza Italy.

Back Home; Arnold Mynet ZB6BMS is now back home and we should be hearing him soon on the band as G3BBW. Arnold was a very active member of the 1957 IGY group and VHF manager of SARL.

Turkey; Nick G3KOX and Nev G3RFS who recently gave many Europeans their first CU contact on six have received a permit for 6m operation from Turkey, this commencing mid–November.

Trans–Equatorial Propagation (TEP); TEP normally takes place during the periods around the Spring and Autumn equinox i.e. 21st March and 21st September. Although we had a reasonable opening during the Spring season, here in the northern hemisphere the only activity reported was by F1JKK with 7Q7JA on 14th of September, but there have been regular daily openings from Italy to South Africa.

DXCC on 6m; On 20th Sept Geoff GJ4ICD worked Swaziland, 3DA0BK, during a brief opening between 15.00–18.00 GMT, this was his 97th country on 6m. Geoff has now 91 countries confirmed, of the balance at least two do not QSL.

Next Month

To summarise, it has been a very disappointing period recently for VHF DX. It is hoped to include 70cm news in future months, so please send me your reports for inclusion in this column, to Ken Ellis G5KW, 18 Joyles Road, Folkestone, Kent. CT19 6NX. Until next month 73 and good DX on the bands.

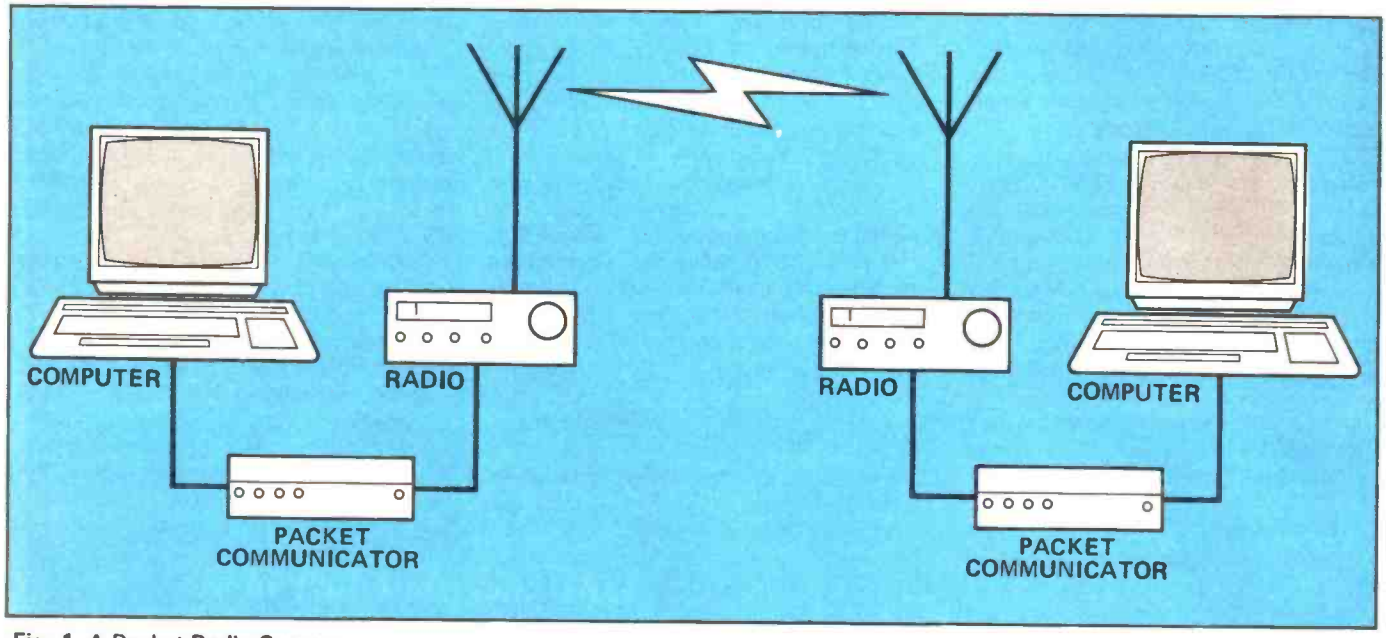


Fig. 1. A Packet Radio System.

Packet P

by Phil Anderson, W0XI

One of the world's packet pioneers tells us what packet can do.

Five years ago another CW fan told me about Packet Radio. After he described it, I said what many have probably said, "Sounds a bit crazy, probably won't ever get off the ground. It'll just stay with the fringe crowd." Guess who was wrong? Today packet breaks squelch more often than voice on FM.

In fact, packet has evolved as a useful mode for more than just packet experimenters! In recent years, DXers evolved what is called the DX Packet Cluster; this system consists of packet stations linked together to share current DX information and conditions. Connect to your packet cluster and you can find out about activity on 15 meters for example; you can see what others locally have heard or worked, a real-time DX bulletin board!

In addition, HF enthusiasts have added packet to their arsenal to forward international messages error-free. With packet it is possible to pass long messages from say the UK to Kansas, USA without error! You see, packet is by nature error free, it just takes the automatically controlled stations longer to send the message when conditions are poor. And packet is used on VHF to support message forwarding and bulletin boards across the nation. Hundreds of bulletins are available on all sorts of subjects, right on your local bulletin board system.

Tremendous Activity

Yes, packet breaks squelch more often then voice on FM! On a recent trip to Minnesota from Kansas City, about a seven hour drive, I alternately listened to the most common VHF repeater frequencies and our central packet frequency, 145.01 MHz. You know we've got loads of VHF repeaters over here, but I didn't hear much voice when compared to the amount of packet! "Probably won't ever get off the ground." Oh Well! I suspect the same is true on both sides of the Atlantic. Still at many rallies, I meet fellow amateurs who haven't been caught by the packet bug, or they just don't know about packet. Perhaps they prefer DX? Maybe computers don't interest them. But usually, I find they just haven't had the time to take a look, and maybe you're in that group. Come along, take a quick look at packet. You might just find another fun mode. As a CW operator, I did!

So what is this packet stuff anyway?

A typical dictionary identifies a packet as 'a small package, a little parcel.' In nautical terms it is a vessel conveying dispatches, mails, passengers, goods, and having fixed sailing days. When wrapping, to package would be to make up into, wrap or put up in. While all these definitions are close, none really describes the packet we are seeking.

That would be just too easy. It would be like describing RTTY as if it were amateur radio. Yes, RTTY is a part of amateur radio, but just one of many modes. In the same way, packets are a part of packet radio, but just one of the many parts of packet. Now you think I've gone off my rocker? Here's the point. Like

amateur radio in general, packet has grown to have many areas of interest, both technically and operationally. Hence, a simple dictionary definition simply doesn't do the mode justice.

Packet is interesting simply because it has so many applications and areas for exploration. If you like to send bulletins, packet is ideal. If you like writing programs and integrating your computer with amateur radio, packet is it. If you like to experiment with VHF or UHF radios in sending data, packet fits the bill. If you're interested in networking, packet does that too. If you want to communicate error-free, leaving a message for later automatic delivery by the amateur radio packet network.

That's packet too

But let's skip all that, let's get down to the basics. What's in a packet station? Why do we call this mode packet radio? How do two stations communicate? OK, one step at a time.

Primer

Why do we call this mode 'Packet'?

It's because the messages you type are automatically sent in little packets. A line of text that you type on your computer is wrapped up into a package or package, including the text with 'TO' and 'FROM' addresses in callsign form. That's the job of the packet Terminal Node Controller, or TNC. Some other stuff is added to the packets, but let's leave that detail for another time.

What's in a Packet Station?

A basic packet station consists of a computer, your VHF radio station and the packet controller, as shown in Figure 1. Yes, if you are like 67% of amateur households, adding packet means you only have one piece of equipment to add, the packet controller.

In the early days of packet, the controller was mysteriously called a terminal node controller or TNC. This term, a sort of double-speak, comes from packet radio's origins, a computer networking. Let's not bother further with that!

How do two stations communicate?

Once you type a line of text on your computer, it's packaged and sent by your packet controller. Then, when another station hears the packet, it's controller looks for its own callsign within that packet. If it finds it, it takes the packet and passes it on to its own attached computer.

But that would mean that all packet stations can hear all packets? Yes, if the signal is strong enough, of course. But, 'TO' and 'FROM' callsigns are embedded within each packet. Your station will print only those intended for you. Other types of packets can, of course, be monitored.

What about computer needs?

Well, of course, questions lead to more questions. What kind of program does your computer need? How is the computer wired to the packet controller? For that matter, what does the inside of a packet controller look like anyway? And while we are at it, how many packet stations can we get on one frequency? Rumours have it that more than two can operate 'simultaneously' on the same frequency! If you believe that, then I can sell you my gas-fired perpetual motion machine that Uncle Harry invented to grind corn. Again, let's hammer at these one at a time.

What program does my computer need!

That's kind of like asking 'What kind of car do you need?', it depends upon what you plan to do. If you just want to chat with another amateur, then all you'll need is a simple terminal program, a freely available public-domain terminal program will do. If you haven't used one of these, it's a program that allows your computer to talk to a modem by sending and receiving data via your computer's RS-232 serial port.

If you are a bulletin handler, then you'll want a program that allows editing, saving, and transmitting or receiving. If you want to run a packet bulletin board system, then you'll need one of the popular amateur radio written BBS programs.

In basic terms, your computer needs a program that allows you to type at the keyboard or view the screen information that is to be sent or is received via your computer's serial port.

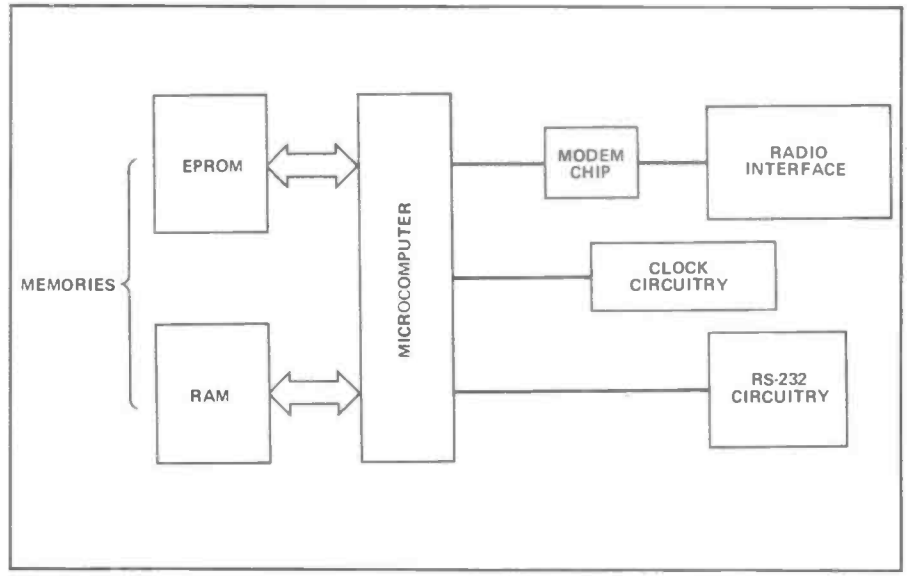
How is the computer wired to the controller?

All packet controllers are attached to a computer at the computer serial port. While some computers, such as the C-64 require a 'TTL' interface, the vast majority have serial ports that meet the RS-232 standard. This standard dictates required voltage levels for signals and also assigns the various required signals to specific pins in the standard DB-25 connector. Get the detail out of a packet communicator manual.

What does a Packet Communicator look like inside?

Figure 2 shows a typical arrangement. A packet communicator is made up of a microprocessor, memory, a

Fig. 2. Block Diagram of a packet communicator.



modem chip or two, RS-232 interfacing circuitry, crystal clock, a bit or radio interfacing circuitry and some logic 'glue'. A typical physical size is around the size of a 2m mobile rig.

How many packet stations can use one frequency?

Boy, we're getting ahead of ourselves already! That's a question about packet networking. Let's stop a minute and summarise where we are. First a packet station consists of your aerial, radio, a packet controller (TNC), and computer. Once you are 'connected' to another station, lines you type on your computer are assembled into packets by your controller and sent via your transceiver to your partner at the other station. His station copies packets for him because his packet controller sees his callsign embedded within the packet received. And finally, each controller is able to do all this because it is a smart controller, it contains a microprocessor and memory and runs a packet program stored in its EPROM (a special read only memory chip).

Now we can kind of answer the question, how many packet stations can use one frequency?

As long as we don't try to stuff too many packets on one frequency during an interval of time, we can easily have several groups of stations carrying on conversations at the same time on the same frequency. But how is this possible you say? It is not done with mirrors as some might expect. Instead, basically, each station listens to all other stations. Then, when it has a packet to send, it waits until the channel is clear and then simply sends the packet. In other words, the channel is time-shared. A combination of carrier detect circuitry and controller times in each unit allow this to happen. For more detail, dig into the manual of a packet controller.

That's all well and good, but what about the radio side of things. How do we interface the controller to an amateur FM transceiver? What kind of signals are sent? What does packet sound like?

What about the radio interfacing?

This part is actually very straightforward, good job! It just takes two steps; replace your microphone connection with the transmit cable from the TNC, and attach the receive audio lead to the external speaker output of your radio. The TNC provides signals for push-to-talk (PTT) and the data transmit signal. Received packets are coupled from the audio of your FM transceiver into the controller for processing.

What kind of signals are sent?

Like RTTY, packets start out as a string of 'ones' and 'zeros', i.e. the text is converted into a digital signal. The 'ones' are then converted to one audio tone while the 'zeros' are converted to another. This results in a signal designated as Audio Frequency Shift Keying or AFSK for short. If you slowed a packet down with say an audio tape, you'd hear a sound like a two-tone police siren: blu-blow-blu-blow- if you can visualise that.

That's it for now

Well, we made it. We made it through from computer, through the packet controller, and via the FM transceiver to the antenna and back again in reverse order. That's the path a packet takes. In a nutshell that's packet, a typical station consisting of computer, TNC, and radio. Next time we'll dig into details about the makeup of individual packets, digipeating with packet radio, working a packet bulletin board, and so on, in other words expanding your horizons for worldwide error free communication. If you can't wait now, just dig into past issues of Ham Radio Today. You'll find packet articles everywhere!

QRP CORNER

Dick Pascoe G0BPS tells us about the G-QRP club

In last month's QRP corner I gave a brief introduction into how to operate using QRP, i.e. low power. I could fill endless pages of hints and tips on how to get your worldwide DXCC, but for the beginner then the more 'local' 80m or even 160m band is the place to start.

Activity

On 80m, the centre of CW QRP activity will be found around 3.560MHz, and many G–QRP club members will be found around this frequency. If you hear a signal report of 559 2559 then don't despair, that is the RST report and the station's G–QRP club membership number, in this instance mine. My number unfortunately often causes problems because the other station often thinks I'm just repeating the RST!

Joining the Club

What is gained by joining this G–QRP club then? Well, apart from the friendly atmosphere generated by meeting fellow QRPers, there is the constant challenge of doing what a lot of amateurs consider impossible, by working fellow club members using very low power levels. Another benefit of the club is the quarterly journal, 'SPRAT'. This small magazine is not only of interest to those interested in low power operation, as it has items of interest for all. The journal has a very strict rule, at least two thirds of the magazine is circuit diagrams and circuit ideas.

If you are interested in joining, then write to D. Jackson, G4HYY, Castle Lodge West, Halifax Road, Todmorden, West Yorkshire for details.

Achieving Low Power

Most modern rigs have a front panel control for reducing the transmitter power, but for those of you who have rigs without this adjustable drive level there is an alternative method that may be employed. It is difficult to be specific because of the multitude of rigs available today, but suffice to say that if a variable negative voltage is fed to the transmitter ALC line, this often being available via the rear panel accessories socket, then variable output power will be available by varying this negative voltage. If you don't have such an input, then a study of the set's circuit diagram will help. However if you are not certain of your rig, or unsure of carrying out any mods then don't do it, take the rig to a reputable dealer instead.

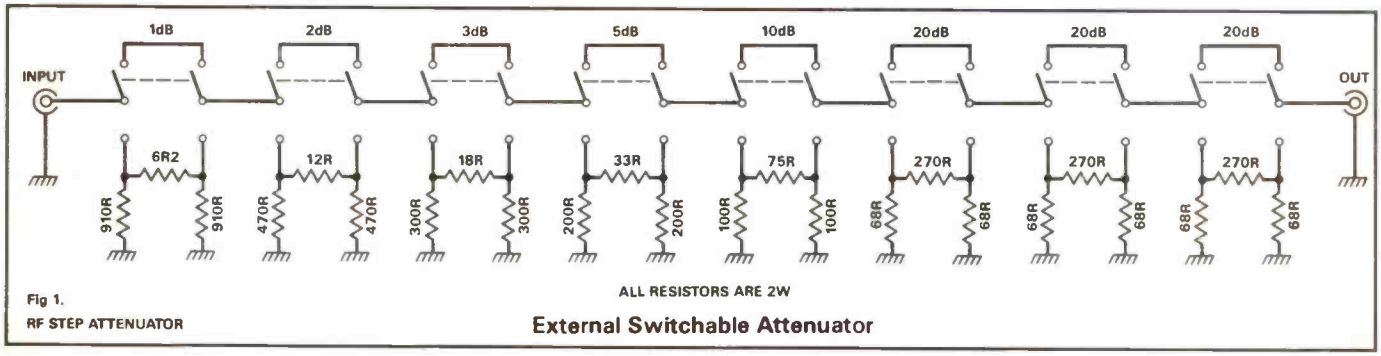


Fig 1.
RF STEP ATTENUATOR

External Switchable Attenuator

External Attenuator

Even with external ALC, getting below the 2W level is sometimes difficult. If you're in this position, or if you don't feel like performing internal modifications to your rig, the circuit arrangement described here is a simple method of attenuating your transmitted signal. A power of 2W into the unit can be attenuated in steps of 1, 2, 3, 5, 10, and 20dB. As each step is switchable, the exact amount of attenuation required can be selected.

If 2W carbon composite or film resistors of 5% tolerance are used then reasonable accuracy will be obtained. After all, if the resistor value is the maximum of 5% in error and the calculated power is 200mW, the actual power out will be between 190 and 210mW. Make sure you don't use wirewound resistors, as these are often significantly inductive at radio frequencies.

The more astute of you will immediately recognise that there is no facility for switching the path of the signal, so the received signal will also be attenuated by the same amount unless of course we switch the received signal to bypass the attenuator. In this case, remember that many transceivers have external receive inputs either on the rear panel or accessible inside.

QRU

That's it for this month, ideas to me please, either through the HRT editorial address or on packet to the GB7SEK mailbox. I hope to see many of you at the rallies, so do come and chat. **BCNU es 73 de G0BPS**

Geoff Arnold's Notebook

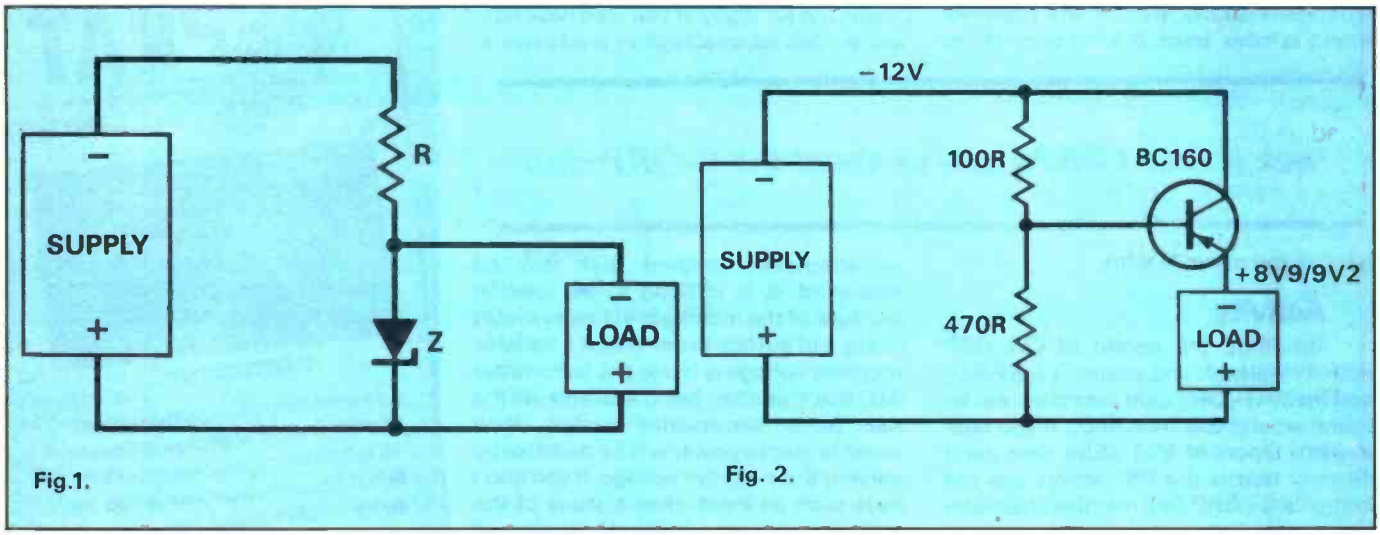


Fig.1.

Fig. 2.

In last month's article, I talked about the simplest forms of voltage regulator circuits used to provide stable low-voltage DC supplies. The circuits shown there were all arranged to provide a stabilised positive supply rail, but could just as well provide a stabilised negative rail by reversing the polarity of the input voltage, and reversing the Zener diode, for example as Fig. 1. In the same way, the circuit using a transistor as a regulator element can be adapted to provide a stabilised negative rail by reversing the polarity of the input voltage and using a PNP transistor instead of an NPN device, as shown in Fig. 2.

Polarities and their effects are this month's subject

We are lucky in these days when almost all contemporary circuits use solid-state devices requiring only low voltage supplies to power them. In earlier days the occasional need to provide a stabilised negative supply rail (for a transmitter bias line, for example) could involve some quite complicated circuitry, because unfortunately no-one ever invented what might be called a PNP valve, i.e. one which passed current when its anode was negative with respect to its cathode!

Supply Rails

Maybe this idea of positive and negative supply rails could do with some further explanation, because the topic of supply polarity and the labelling of supply rails is something that often baffles the beginner. It really boils down to that old problem of an unstated convention, i.e. things that are assumed as understood, and not actually quoted. All very well for the 'old hand' or professional, but most confusing for the poor beginner.

The particular convention we're talking about here is one that says that one of the supply rails in any equipment is considered to be a 'common' rail, meaning that the line on the circuit diagram which represents that rail goes through from the input to the output without a resistor or any other component such as a transistor in series with it. In equipment with a metal chassis or frame, the common rail is often connected to that metalwork too.

Earth Connections

Thinking back to earlier days once more, in mains powered equipment such as radio receivers the 'common' rail and chassis would usually be connected to earth, because reception on medium and long waves using the old fashioned outside wire aerial is better when an earth is connected too. The exception of course was in receivers where the supply was taken directly from the electricity mains, without the safety benefits conferred by a mains isolating transformer. Such an arrangement, called live-chassis working, was common in the so-called AC/DC radio receivers, where the requirement to work on DC as well as AC mains meant that you couldn't use a mains transformer. It's also been used more recently in TV receivers.

In a portable battery-powered item such as a transistorised receiver or tape-player, there's no real need for an earth connection, nor any convenient way of providing it. Apart from anything else, you'd keep tripping over the wire! So, although it would be nice to have a simple convention which says that the common rail is one that is earthed, it's just not possible. The common rail may be earthed, but then again it may not. For example, none of my circuits last month had an earth connection. In those circuits, the negative rail was the common rail in every case, i.e. it was common to the supply, the stabiliser and the Load. All the work that was done to the supply, in

reducing it or stabilising it, was done in the positive rail.

Zero Volt Rail

A very useful convention which I first encountered some thirty or forty years ago, though I'm not sure where or when it originated, is to call the common rail 'zero volts' or 'nought volts', identified on circuit diagrams as '0V'. It's specially helpful where you have several supply rails, either of different voltages or of different polarities, or perhaps a mixture of the two as are required for some families of logic and linear integrated circuits.

If we look at the simplest sort of DC supply, a 9V dry battery for example, we shall find that it has terminals marked '+' and '–'. The beginner sometimes thinks that the '+' terminal supplies +9V and the '–' terminal supplies –9V. Not so; what the markings mean is that the difference between the terminals is 9V. If you connect the '–' battery terminal to the 0V or common rail of a piece of equipment then the '+' terminal will be at +9V, but if you connect the '+' battery terminal to the 0V rail you will get –9V on the '–' terminal.

Reference Point

How can you tell that this is so? By making measurements with a simple multimeter or DC voltmeter. Any test meter needs to be connected to two points in a circuit, not just one. Usually, you connect one of the leads from the meter to the 0V or common rail of the circuit, which provides the reference point against which the measurements are made. If you are using a traditional analogue (i.e. pointer and scale) meter to compare voltages in a piece of equipment with those quoted in a circuit diagram or table of readings, you will connect the negative (black) lead of the test meter to the 0V rail when measuring positive voltages, but the positive (red) lead goes to the 0V rail when measuring negative voltages. Otherwise the pointer will go off the bottom of the scale. If, on the other hand, you use a digital test meter, the display will generally indicate a 'reverse' connection of the test–prods by putting a minus sign in front of the voltage value.

Loading Effects

Very occasionally, you may come across a voltage measurement which has to be made with both test meter leads connected to 'live' points in the circuit, rather than one to a live point and one to the 0V rail. This is generally done where there is a need to reduce the loading effect of the meter on the operation of the circuit. The current drawn by a test meter can totally upset the operation of a high–impedance circuit when the test–prods are applied, so that the reading indicated on the meter bears no relation to the normal state of the circuit. Trying to measure the voltage between the emitter and base of a transistor is a typical example. This is a topic I plan to return to in a later 'Notebook'.

By now, you may well be thinking along the lines of 'If something like a portable transistor radio or tape player has its own built–in power source (the battery), and has no connections to the outside world, does it matter which power supply rail we call 'common', or indeed whether a voltage stabiliser is in the positive or negative supply rail.' The answer is almost certainly 'No', providing the equipment remains in glorious isolation, never being connected to any other item, or to an external power supply, especially one that is shared with the other equipment. Otherwise, you could be in real trouble!

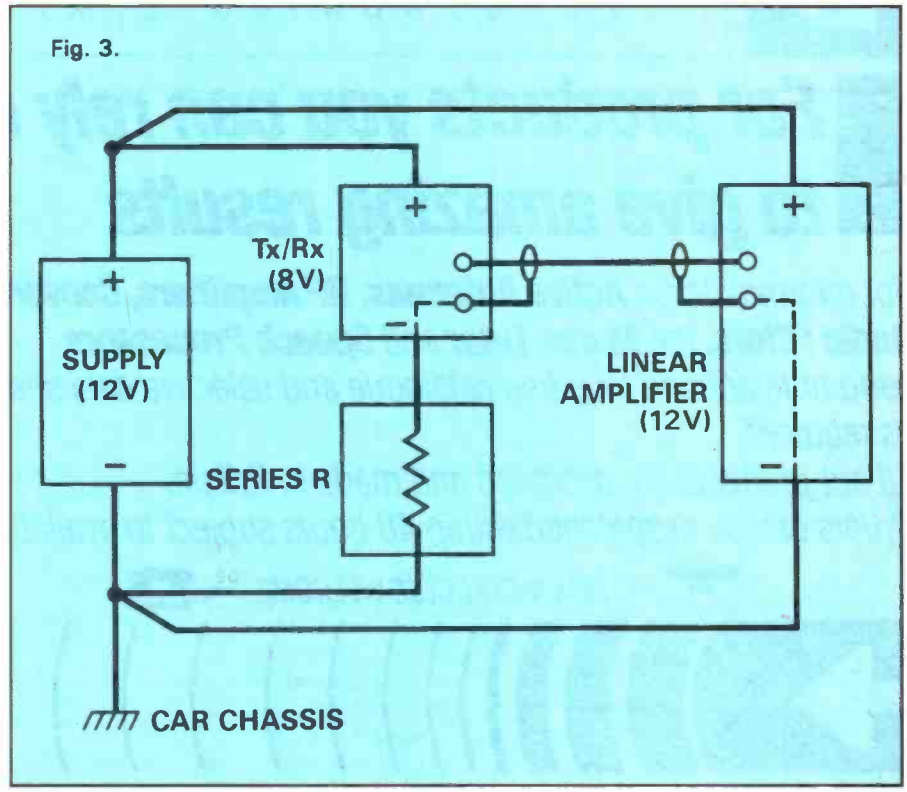
Shared Power

The most dangerous situation comes with two pieces of equipment, one feeding a signal to another, and both powered from the same DC supply. This is often the case in an amateur shack, where a nominal 12V stabilised supply is used to power several items of equipment which are quite likely to be inter-connected. The same thing can happen in a mobile installation in a car, with a transceiver and its associated linear amplifier both powered from the car electrical supply. There's a real danger of fire in that situation, because of the enormous energy that can be drawn from a car's lead–acid accumulator by an accidental short circuit. The electrical systems in modern cars are reasonably well protected with fuses in most circuits, but it's not too many years ago that cars were being made in which the only fuse fitted was the one feeding the flasher for the turn indicators!

A look at Fig. 3 will soon show the possible risk of short circuiting all or part of the power supply arrangements for a 'home–brew' mobile installation. Picture the scene. Our home–brewer, let's call him H/B, has a 1 watt handie–talkie 2m rig which he plans to use in his car with a nice little 25W linear amplifier he bought from a fellow member up at the club. The linear is designed for a nominal 12V supply, probably specified as 13.8V (this allows for the fact that each 2V cell in a lead–acid accumulator will usually give more like 2.2 to 2.3V when fully charged). No problem there. The handie–talkie though normally runs off 8V NiCads, but H/B decides it would be less hassle to drop the car's 12 volts supply down to 8V in some way. For simplicity, I've shown a simple series resistor, but this wouldn't be at all satisfactory in practice, because of the difference in the current drawn from the supply when the handie–talkie is on receive and that required on transmit, producing a different voltage drop across the resistor. Anyone who read last month's 'Notebook' will know what H/B ought to have done!

When H/B wires up the system in his car, he fits a coaxial lead between the output socket of the handie–talkie and

Fig. 3.



the input socket of the linear. He then connects up the supplies to the linear and the handie-talkie, but foolishly inserts the dropper in the negative lead to the rig.

Connecting Up

Connecting two items of equipment together may well involve the use of screened leads, as in our example. The plugs and sockets used for screened leads are usually designed so that the screening braid is connected to the body of the connector, and more often than not, that body is bolted to the chassis. Can you see what's going to happen to the equipment in the circuit of Fig. 3. The link between the body of the coaxial connector and the common rail in each item is shown by the dotted line.

When H/B switches the handie-talkie on, if he's lucky a fuse may blow. It's quite possible, though, that there will be a deafening silence from the rig, maybe even a wisp of smoke! Even before he switched the linear amplifier on, his series dropping resistance had been shorted out via. the outer braid connection of the link between the rig and the linear, putting something in excess of 12V onto the handie-talkie. If he'd put the voltage dropper in the positive lead, all the 'common' rails, of the supply, the handie-talkie and the linear amplifier, would have been safely at the same potential.

That, of course, is what is done by equipment manufacturers who produce DC to DC converters to reduce a 12V bench or mobile supply to the necessary level for their handie-talkies. Also in the so-called 'docking boosters', i.e. desk-top units incorporating a linear amplifier and its power supply, along with a supply at the correct voltage for the handie-talkie, which slots into a recess on top of the unit.

It is quite practical to produce equipment whose signal or control inputs and outputs are totally isolated from the power supply rails, but the more complicated design and engineering required will undoubtedly increase the price. It is therefore a method to be avoided unless absolutely necessary. Equipment such as receivers or audio amplifiers intended for DC mains operation used to be designed in this way, sometimes with a metal case which was earthed for safety, but with internal wiring, even a metal chassis, connected to the negative side of the DC mains and totally isolated from the case. Woe betide the service man who touched both at the same time, or dropped a screw or other metallic object which bridged the two!

Car Polarities

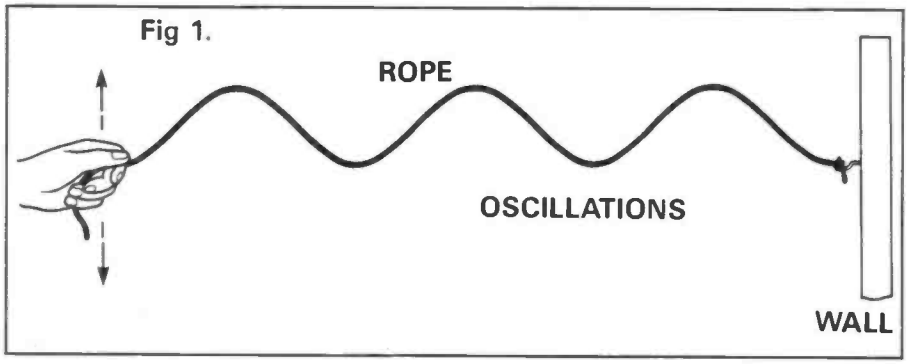
As another example, in the days when car electrical systems were either positive earth or negative earth according to the whim of the designer, car radio receivers were sometimes made with a movable shorting screw or wire which could be set to link either the positive or negative supply rail of the set to its case. It meant that a single design of receiver could be used in either situation, rather than having to produce two different versions, but now that cars are made universally with negative-earth systems, car radios come with the negative rail firmly strapped to the case.

Do It Properly

Providing you understand the risks involved, and the precautions you should take, it is quite possible to do unconventional things with power supplies for the sake of convenience, and get away with it. However, there is always the risk that someone else may have to use or do work on your unconventional arrangements and connections at some time in the future. That person may not realise what has been done until it is too late, i.e. *you* could be the cause of damage, injury, even death. If you feel you must connect something up in an unusual way, at least put a clear and permanent warning label on the equipment. Better still, do it the proper way.

See you next month.

NOVICE NOTES - SWR fact or fiction



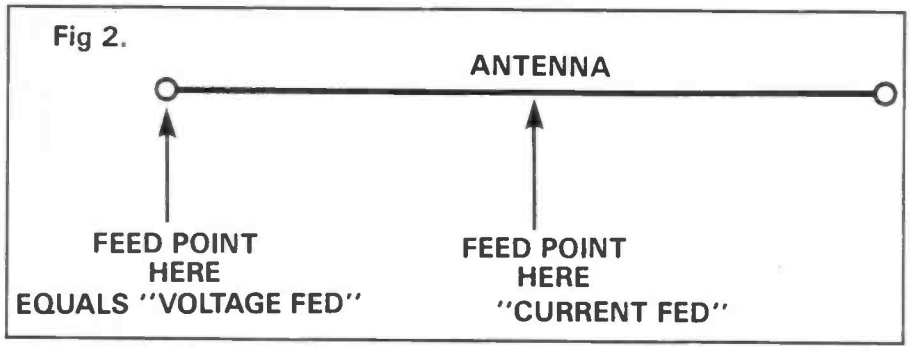
The secrets of SWR revealed by Dick Pascoe G0BPS

Over the years many amateurs, and others, seem to have got a fixation on achieving the lowest SWR possible. Whilst to many it may seem that an SWR of unity is the best, this may not be totally true. What most people require from an aerial system is for the maximum amount of generated signal is radiated, i.e. that the aerial system acts with the maximum amount of efficiency. Now it must be accepted that in any mechanical device 100% efficiency can only be a dream, but can we get close?

Standing Waves

When an aerial is energised from an RF source, as happens when it is coupled to a transmitter, standing waves appear on the aerial. One way to visualise this is to take a length of cord, about 8m long and tie one end to a solid point. Pull it fairly tight and then wave it gently. We have all done this as children and the wave movement can be clearly seen as in Fig 1. This oscillation is an exact replica of an electrical oscillation in an aerial. As the cord is moved, the strongest pull will be felt when the cord is at the extremity of the swing. At this point the cord is coming to rest and reversing its direction, and at this instant of reversal it has no energy or motion. All the energy is in the form of a force at the ends of the cord.

This analogy shows exactly how the current in an aerial flows, whilst the force being applied represents the electrical force or voltage at the ends. The energy could equally be fed to the cord from the centre or any other place in the line (try it) and so it can be seen that a resonant aerial can be fed at any point. If fed at the end it is said to be voltage fed, and if fed at the centre it is said to be current fed as shown in Fig 2. The ratio of the voltage at any point to the current at the same point is called the impedance, and this will obviously change from being a high ratio at one end to a low ratio at the centre.



Radiation Resistance

It is not possible in this short article to give a complete account of how the energy leaves the aerial, but it should be noted that a fundamental requirement for an efficient system is the presence of standing wave system on the aerial itself. As energy moves about on the aerial, alternating between voltage and current forms, each interchange of current and voltage causes a quantity of energy to be lost, in the form of electrical and magnetic forces. These are 'pushed forward' by the next oscillation and thus travel out into space.

The electromagnetic waves leaving the aerial represent a flow of power, the same as a current flowing in a circuit. Many of us know the formula to calculate power, i.e.

P = I x I x R

Where P is the power, I is the current flowing and R is the resistance. But in an aerial it is rather more difficult to calculate, as it is *not* a closed circuit. So we introduce a *fictional resistance* which we call radiation resistance to help define the radiating properties of aerials. The power radiated in Watts is equal to the radiation resistance times the square of the current flowing. It can be determined at any part of the aerial but it is more usual to refer to the point of maximum current.

In an electrical half wave dipole, this resistance is normally about 75 ohms at the centre feed point, but this does not take into account any internal resistance of the material used to construct the aerial itself. You may note a slight problem here, as most modern transmitters are set for an impedance of 50 ohms. But more on this later.

Impedance Matching

When a transmission line is terminated with a resistance equal to its characteristic impedance, power is absorbed by the resistance as fast as it can be supplied. There are no standing waves along the feeder, but the current is uniform along its length. The loss along the length is also at a minimum and the impedance at the transmitter end is the same as at the aerial end irrespective of its length.

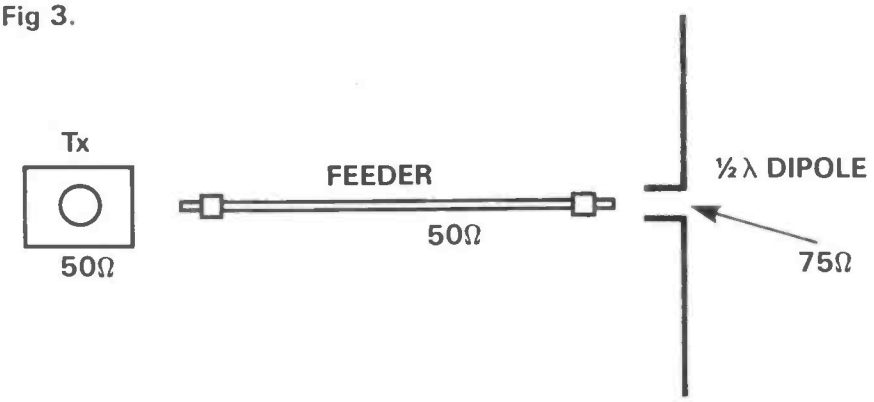
If the load is not of the correct impedance then we can say that the line is mis-matched. This means that power sent down the feeder does not all go to the load, some of it is reflected back from the point of mis-match down the feeder. This causes waves to build up on the line in the same way that they build up in the aerial (remember the cord). The standing wave ratio is the ratio of the maximum and minimum values of the standing

waves existing along the line.

In operation, the amount of power reflected from the point of mis–match (normally the feed point at the aerial) will travel back down the feeder. This feeder may or may not match the impedance of the transmitter, although it should match the line impedance if the correct feeder has been used. Subject to a further mis–match at the rig, the reflected power will be re– reflected back along the line towards the load (the aerial). This will continue until all the power is absorbed in the load, providing that the mis–match at the aerial equals the mis–match at the rig and there are no feeder losses. Confusing isn't it!

It should be remembered by all those who swear by their aerial tuner units that the SWR of a line is dependant on the amount of match or mis–match of the aerial against the feeder, and nothing done at the transmitter end can alter this standing wave ratio. All that is done is to fool the transmitter that it is looking at a better match.

Fig 3.



The effects of SWR on transmitted power.

SWR	Power transmitted	Reflected power
unity	100%	.0%
1.05	99.9%	.1%
1.1	99.8%	.2%
1.2	99.2%	.8%
1.4	97.2%	2.8%
1.5	96.0%	4.0%
1.6	94.7%	5.3%
1.8	91.8%	8.2%
2.0	88.9%	11.1%
2.5	81.6%	18.4%
3.0	75.0%	25.0%
5.0	55.6%	44.4%
10	33.1%	66.9%

The Perfect Setup

Let's for example consider a perfectly tuned electrical half wave dipole aerial, fed from a commercial rig with, say, a nominal length of UR67 feeder as in Fig 3. The aerial, ignoring mechanical losses, has an impedance at the centre feed point of 75 ohms, the feeder is nominally 50 ohms and the rig would also be nominally 50 ohms Using the formula

SWR = Zt/Zs or Zs/Zt

where Zs is the line impedance and Zt is the aerial impedance, with the larger of the two values above the lesser to determine the SWR ratio. We can now see that 75/50 = 1.5. Thus the SWR in an almost perfect situation is not 1:1 but 1.5:1

You can now see that our supposed 'perfect' SWR is almost an impossibility. If we look at the added impedance of some of the connectors used today and we include the impedance of the material used in typical aerial construction, we're very lucky to get a typical SWR of less than 2:1.

One thing we users of 'black boxes' must remember is that in the 'old days' of valve output stages, these could withstand quite a high SWR on the aerial. But now with circuit protection fitted to look after those expensive output transistors and modules, a low SWR is a necessity. Don't forget, the more reflected power the modern rig sees the more it cuts back on the power delivered.

For those who cannot get a low SWR, a chart of the losses in power in relation to varying SWR's is shown here to provide a degree of information as to exactly what you're losing! So it can be seen that even with an SWR of 1.5, of your 100W a total of 96W is, in theory, reaching the aerial and being radiated. But those who operate with a higher SWR of, say 2.5, are loosing over 10% of their power and creating more standing waves in their feeder which could also be the cause of EMC problems. But that's another story.

Coming Next Month

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METREWAVE

Use the 70cm repeater chain to maximise your mobile coverage suggests JACK HUM, G5UM

At almost the northernmost tip of Scotland there is a 70cm repeater, GB3NU (North Uist) on RB10. And at almost the westerly tip of Wales there is one at Pembroke, GB3SP on RB4. In mid–Wales itself, deep among the green hills, GB3CW (Central Wales) at Newtown is another, providing a remarkable order of coverage on RB6. All these 'boxes' are sited in fairly remote and, except at tourist-time, low population areas. Others which come to mind in similar districts are GB3AN peeping away on Anglesey on RB4, north Norfolk GB3AH on RB11 and at Barnstaple in North Devon GB3ND is to be found on RB14.

The enquiring mind will ask itself how much 'trade' the repeaters in the more remote parts of the UK actually enjoy? The outsider may well wonder whether or not they repay the considerable organisational and design effort entailed but the 'insider' may equally well reply that "...we wouldn't have done it if we didn't expect our repeater to be used once its services had become available". Metrewave persons in remote areas who wonder if it is all worth the effort (if ever they do) are surprised indeed when they have the opportunity to sample activity on the 70cm repeaters in more populous areas. They find it lower than they had anticipated. It is a fact of amateur radio life that many a repeater, commissioned with great enthusiasm, enjoys a first fine careless rapture of great activity during its first few weeks on the air but little in the subsequent months and years. A few minutes before this article was due to go through the typewriter, a local operator had described to your G5UM his experiences when operating mobile in the London area. Anxious to escape the congestion on the 145MHz repeaters he decided to transfer his RF to the 433MHz ones. He was startled and disappointed at the response, there was virtually none.

The right investment

The immediately obvious explanation for this situation is simply that far fewer mobile operators invest in 70cm transceivers than in 2 metre ones. Many of them are heard to say that they are put off by the cost, no excuse at all when the modest price of a 70cm handheld is taken into consideration, such as £25 each from SMC, and handhelds work wonders when provided with an adequately gainy aerial atop the vehicle. Other operators tell you they don't propose to invest in 'Seventy Cems' "... because there is nobody to talk to", which invites the rejoinder that if you don't put out a call you can't expect an answer.

The sceptical may also be asked if in fact they have ever tried 433MHz for themselves, or are they allowing themselves to be influenced by operators who allege that they have tried it and found it wanting? This is a widespread state of mind fostered by one simple fact; that those who have tried out 70cm all too frequently did so with quite inadequate aerials, often useless adaptations of some of the low gain types which provide results-of-a-sort on 145MHz. The old adage that you should get as much metal aloft as you possibly can applies even more to 70cm than it does to the lower frequency metrewave bands.

The corollary; when installing that 433MHz FM rig get yourself the best possible, highest gain aerial which your supplier has on offer. Thuswise you will be giving the band the best chance to return positive results. Note the above term; FM rig. It is a fact of electronic life that single-mode transceivers come much less expensively than multimode ones. If your 70cm rig (either mobile or base) incorporates CW and SSB facilities, you will find that these seldom get themselves used and in any case require a horizontal aerial. All the run-of-the-mill activity on 'Seventy' is in the FM segment. And it is vertically polarised.

The amateur's best investment, then, will be to acquire an FM–only transceiver. Plenty of handhelds are to be had new. Plenty of used transceivers are to be found on suppliers' secondhand shelves to permit an inexpensive entree to be made to the band. When selecting a rig obtain if possible one with the reverse repeater facility on it to permit 'checking on the input' to decide if a simplex contact is possible. If it is, go simplex and leave 'the box' to the next comer.

Artificial boost

During the long hot summer of 1990, the anomalous propagation induced on the metrewaves caused some startling phenomena. Notable among them was the temporary availability of numerous repeaters on any one channel. From home sites using adequate aerials it was possible, particularly under dawn-lift conditions, to detect as many as half a dozen repeaters on any one of the RB channels, bleeping their Morse idents. A toneburst offered to the local one could well bring up several others in the same slot. Many mobileers reported the same kind of results even from hemmed-in sites; a low gear pull up a nearby hill adding a couple more 70cm repeaters for every hundred or so feet of height gained. Not typical, of course: if lifts occurred all the time, and they do in hot-weather countries, life would become positively exhausting. It is as well to bear in mind, then, that they are artificial boosts, not to be taken as the norm.

What, then, *is* the norm where 'Seventy' is concerned? It can be very simply described; it is the facility to sustain conversation over quite considerable distances when mobile, provided the next available repeater on the route is selected. This may call for a modicum of pre-journey planning. Look up the repeater list in the RSGB Callbook and jot down the locations and channel numbers of the 'boxes', which will be met on the journey. Record this information on a postcard; it travels better than flimsy paper that flaps in every draught turned on to it through the vehicle window or the air-conditioning blower. The card may be affixed to any easy to reach protuberance on the car facia, to be visible at all times with no handling. Operators who use rigs with press buttons that provide instant channel changing, may wish to add to the card a note of which button to press to bring up the next nearest repeater.

Extensive chain

From all the foregoing, the mobileer

may well conclude that he or she will never run out of repeaters on 433MHz. This is indeed true. More repeaters on prime sites exist on 70cm than on 'Two'. Because they use aerials which are electrically larger than those which can be conveniently erected for a 2 metre repeater, their service areas compare favourably with 2 metre ones and indeed often exceed them. For an available height of repeater mast, the designer can accomodate many more quarter wavelengths of metal on 'Seventy' than he can on 'Two'.

To date, congestion has invaded 70cm infrequently; and it is sociologically a 'clean band'. This is yet one more good reason for getting going there. Another is to take the weight off 'Two' though most operators will tell you that the weight on 'Two' is nothing like as heavy as is sometimes suggested, and that costly proposals to go for 12½ KHz channel spacing are, at this stage at any rate, misguided.

Any difficulty in finding a disengaged repeater channel on 'Two' is obviated when the operator turns his or her attention to 'Seventy'; although a conversation may be in progress it is characteristic of 'Seventy Centimentalists' that they always welcome others on to their local talk-box, and often take breaks between overs to give some of those 'others' a chance to join in.

'Maximise your coverage by using 70cm' suggests our title line. You'll not find this difficult; there are 150 repeaters on the band compared with 75 on 'Two' and the service and coverage they give is often superb.

Maximise your mobile range on 70cm with the help of this repeater list.

Channel number	Frequency in (MHz)	Frequency out (MHz)	Channels available
RB0	434.600	433.000	17
RB1	434.625	433.025	4
RB2	434.650	433.050	15
RB3	434.675	433.075	5
RB4	434,700	433.100	12
RB5	434.725	433.125	5
RB6	434.750	433.150	12
RB7	434.775	433.175	3
RB8	434.800	433.200	4
RB9	434.825	433.225	2
RB10	434.850	433.250	14
RB11	434.875	433.275	13
RB12	434.900	433.300	5
RB13	434.925	433.325	10
RB14	434.950	433.350	16
RB15	434.975	433.375	13

Note 1: The separation or receive frequency from transmit frequency is 1.6MHz. The separation between channels is 25kHz.
Note 2: The SU simplex channels (SU = 'Simplex-UF') are available in the frequency area between repeater-inputs and repeater-outputs.

Club News

The latest get-togethers

Bromley and District Amateur Radio Society meets on the third Tuesday of each month, 7.30pm for 8.00pm, at the Victory Social Club, Kechill Gardens, Hayes, Kent. Their forthcoming events include;
Nov. 20th Junk Sale
Dec. 18th Christmas Party

South Bristol Amateur Radio Club meets every Wednesday at the Whitchurch Folkhouse Association, Bridge Farm House, East Dundry Road, Bristol, Avon. BS14 0LN. Events include;
Nov. 7th 20 metre activity evening.
Nov. 14th Simple computer programming.
Nov. 21st Free Ice–cream evening.
Nov. 28th 20 metre DX, RX evening.
Dec. 5th Judging for Terry Dunsford Trophy.
Dec. 12th HF contest evening.
Events and dates often change, so for more information Tel. Whitchurch 832222 on a Wednesday evening.

Dragon Amateur Radio Club, North Wales, GW4TTA. Their contact man is Tony Rees, Tel. 0248 600963. They meet at the Four Crosses, Pentraeth Rd, Menai Bridge. 7.30pm, on 1st and 3rd Mondays.
Nov. 5th Sale of surplus equipment
Nov. 19th Talk by Dr David Last GW3MZY
Dec. 3rd Club talk
Dec. 17th Christmas party (ticket only)

Dunstable Downs Radio Club, meet in Room 3, Chews House, 77 High St South, Dunstable, Beds. Their events are;
Nov. 2nd Junk sale
Nov. 16th Components and their characteristics
Nov. 30th ERG race, (constructors contest)
Further details from Mike Spacey G1NWZ. Tel. 0582 30664

Fakenham Amateur Radio Society hold meetings on the first and third Tuesday every month at the Thursford Crawfish at 7.30pm for 8.00pm, all are welcome. All other Tuesdays there is a net on 145.375MHz which also starts at 7.30pm with the callsign G4LSF. Further details from Dave Jarrett, G4DCJ, on 048522 633. p73

Hastings Electronics and Radio Club, meets every third Wednesday, 7.45pm at West Hill Community Centre, Croft Road, Hastings. Also every Friday at 8.30pm in the club room at Ashdown Farm Community Downey Close, Hastings. During November they have a demo of vintage military wartime radio planned. For further details Tel. Stan Simpson G4ITM on Hastings 430579.

Halifax & District Amateur Radio Society meet at The Running Man, Pellon Lane, Halifax at 7.30pm every 3rd Tuesday.
Nov. 20th Tony G4UZN discusses the WARC Bands
Dec. 18th Christmas social with free pie and peas.
Details from David Moss on Halifax 202306

Keighley Amateur Radio Society meet at the Ingrow Cricket Club. Their programme for the next couple of months is;
Nov. 8th Night on the air, G0KRS.
Nov. 15th Films.
Nov. 22nd Natter night.
Nov. 29th 'The Sun' by L.M.Dougherty.
Dec. 6th Natter night.
Dec. 13th Natter night.
Dec. 20th Christmas buffet.
Further details available from Kathy, on Bradford 496222

Mansfield Amateur Radio Society meets on the 1st Thurs of each month at the Polish Catholic Club, off Windmill Lane, Wood house Road, Mansfield.

Midland Amateur Radio Society meet on Tuesdays at 7.30pm. at Unit 16, 60 Regent Place, off Caroline Street, Birmingham, B1 3NJ. Dates for October and November are;
Nov. 20th Rally Debrief (possible).
Dec. 4th Christmas party.
Details from Paul O'Connor G1ZCY Tel. 021 443 5157.

Midlands AX–25 Packet Radio Users Group (better known as Maxpak) meet on the first Monday of the month at 8.00pm at the Community Centre, Perton, nr Wolverhampton. Details from Greg Lewin, G0NEN, The Hawthorns, Wheaton Aston, Stafford ST19 9NG. Tel. 0785 840186

Norfolk Amateur Radio Club meet every Wednesday at 7.30pm for 8.00pm at 'The Norfolk Dumpling', The Livestock Market, Harford, Norwich. Dates to look forward to are;
Nov. 7th 'Real Radio' evening.
Nov. 14th Surplus equipment auction/Bring and Buy, 7.00pm.
Nov. 21st An introduction to power supplies, Mike Lemin G4UUB
Nov. 28th Informal & Committee meeting.
Furthur details from the Club Secretary, Steve Sewell, G4VCE, Medway, The Rosary, Mulbarton, Norfolk. NR14 8AL Tel. 0508 78258.

Northern Heights Amateur Radio and Electronics Society meet on the first and third Wednesdays each month at the Bradshaw Tavern, Nr. Queensbury, Bedfordshire, at 8.15pm. Events include:
Nov. 21st Radio alarm systems by Geoff Milner G8NNK.
Dec. 5th Alignment evening with Alan Robinson G3TQA.
For details contact Stan Catton G0IYR on 0274 673116

Reading and District Anateur Radio Club meet at The Woodley Pavilion, Woodford Park, Haddon Drive, Woodley, Reading, Berks. Meetings start at 8.00pm. Club events are:
Nov. 8th Club talk.
Nov. 22nd Construction contest and alignment evening, by G3WGV.
Dec. 13th AGM with cheese and wine.
Dec. 27th Christmas informal drinks party.
Further details can be obtained from the club secretary Mike Anthony, G4THN, Tel. 0734 774042

Stourbridge & District Amateur Radio Society meet on the first and third Monday of each month at the Robin Wood's Community Centre, Scotts Road, Stourbridge.
Programme of events;
Nov. 5th On air and natter night.
Nov. 19th Winter Surplus sale.
Dec. 3rd On air and natter night.
Dec. 17th Club talk.
Their secretary is Dennis Body G0HTJ.

Stoke On Trent Amateur Radio Society have a new venue and have changed the day on which they meet. They now meet at the Sacred Heart R.C. Church Hall, Jasper Street, Hanley, Stoke–on Trent, Staffs, every Thursday evening now at 7.30pm. For further details contact D. Wroe, G0MXD 31, Abbots Way, Westlands Newcastle–under Lyme, Staffs ST5 2EX. Tel. 0782 639476

Stratford upon Avon & District Radio Society meet at the Baptist Church, Payton Street, Stratford upon Avon, at 7.30pm. Club dates include;
Nov. 12th The Radio Investigation Service, by Bruce Davies.
Nov. 26th Antenna's and Baluns, by Dave Yates G3PGQ.
Dec. 10th Chaired discussion.
Dec. 24th No meeting.
Details from A. Beasley G0CXJ. Tel. 060 882 495.

Wigan and District Amateur Radio Club meet on the first and third Thursdays each month in the 'Old Pear Tree Inn', Frog Lane in the centre of Wigan. The club welcomes new members interested in all aspects of amateur radio from age 10 to 70. For further details Tel. Mrs M. E. Norton on Wigan (0942) 47416

Welwyn – Hatfield Amateur Radio Club meet at two venues.
Events at the Lemsford Village Hall, Brocket Road, Welwyn Garden City include;
Nov. 5th Construction contest.
Dec. 3rd AGM.
Events at Knightsfield Scout HQ, Knightsfield W.G.C.;
Nov. 19th I.Q. challenge.
Dec. 17th Christmas social event.
Details from Roger Curtis Tel. 0707 324958

Wimbledon and District Amateur Radio Society meet on the second and last Friday of each month at 7.30pm, in St Andrews Church Hall, Herbert Road, London. SW19
Nov. 9th Meet the committee
Nov. 30th Design of Direct Conversion Receivers by Steve, G8CYE
Dec. 14th Christmas social
Further details from Nick on 081 330 2703

Wirral Amateur Radio Society, G3NWR, Ivy Farm, Arrowe Park Road, Birkenhead, L49 5LW
Further details from Alec Seed G3FOO on 051 644 6094.

Yeovil Amateur Radio Society meets every Thursday 7.30pm at the Recreation centre, Chilton Grove, Yeovil. Dates for your diary are;
Nov. 1st Discussion night.
Nov. 8th A simple ATU by G3MYM.
Nov. 15th HF propagation this winter by G3MYM.
Nov. 22nd Ideas for club events in 1991 with G3MYM.
Nov. 29th Natter night.
Dec. 6th Low pass filters by G3MYM.
Further details from the Chairman, Adrian G4JBH. Tel. 0935 28341.
York Radio Club, G4YRC meets every wednesday at the Civil Srvice Club, Poppleton Rd, York. Hon Sec George Tweedy G0LOP (York) 656179

York Amateur Radio Society G3HWW, meets every Friday at the York City football ground, Bootham Cres. York. Hon Sec G3WVO QTHR

National and International

The Irish Radio Transmitters Society send out regular newsletters
giving details of local activities. The contact man for this is Dave Moore EI4BZ, 12 Castle Ave, Carrigtwohill, Co Cork.
Tel. (Eire) 021 883555
To include your club in this feature, make sure you send your events details to the editorial office address, then we'll make sure our readers know exactly what you're up to each month. You might even get some new members!

Rallies

Where to get the bargains

November 11th
Birmingham Autumn Rally
Stockland Green Leisure Centre Slade Road, Erdington, 2 miles from spagetti junction.
Details from Peter G6DRN. Tel: 021 4431189.

November 18th
Bridgend & Darc Annual Rally
Bridgend Recreational Centre.
Details from Don, GW3RVG, Tel: 0656 860434 after 5pm.

November 18th
West Manchester RC Winter Rally
Bolton Sports and Exhibition Centre, Bolton.
Details from Dave G1L00, Tel: 0204 24104 evenings.

November 25th
Sunny Dale Leisure Centre, Shildon, Bishop Auckland, Co Durham.
Details from Ernie, G4TYF, Tel: 0388 607500.

Starting on Satellites. Due to space limitations beyond the Editor's control, this series will commence in the next issue of HRT.

Free Readers Ads!

FOR SALE

Yaesu FRG 7700 receiver plus manual and listening guide. Excellent condition guaranteed. Little use. £270.00 Amtor ATU (for receivers) £15.00. Sumner 0902 737054.

Mutek TVVF144A 2m transverter £230. Yaesu FTT80R 70cm 10Watt all mode £300. Microwave modules 70cm amplifier MML432-50 £80. Tonna 19ele 70cm £20. Tonna 9ele 2m £10. Tonna 9ele crossed £10. Ring 0453 833411.

Pye Europa, 2m, 4m, 70cm. Commercial Quality and standard components! Fully synthesised, frequency readout. Either buy, or send in your old crystallised rig for modification! Demonstration given. Complete £155. Tel. 081 953 7984. 24h.

Kenwood R1000 communication receiver 150 kc/s 30 Mc/s, excellent condition, digital readout 12V DC and 240V AC £200 or with VHF convertor £225 G3OHV Crowborough 0892 664960 afternoon or evenings not QTHR.

SONY AN1 active antenna also Sony AIR7 air, PSB, FM, AM scanner with power pack etc. Both mint. Require comms receiver or anything interesting. Please phone Bournemouth (0202) 422273 after 6.30pm.

JAYBEAM 10 element 2 metre band Yagi aerial, never been used £15. Telephone Mick York after 7pm 0536-60189.

Collins 51J2 receiver VG cond £370. Marconi wide range RC OSC TF 1370A £40 includes spare set. Marconi valve voltmeter £12. Numerous valve radios pre and post war working cond £15 to £40. Manchester Phone 061 962 7577.

For sale Ex PMR equipment, Pye PF2s VHF low high and UHF bodyworn and handheld £35. VGC Burndepts 473 UHF £40. VGC Pye PF5000s 4 watt UHF £50. ITT Starphone £15. Motorola voice paging system £100. Telephone Sean 0347 21208.

For sale Icom 202s S.S.B. 2 meter transceiver £130. Yaesu FRG7700 H/F RX £300. FRT7700 ATU £40. Microwave modules 30Watt 2 meter amp 1-3Watt input + preamp £55. Mutek 2 meter preamp £25. B.N.O.S. low pass filter 70cms £15. Phone Pontypool 0495 757221.

DX TV; Thomson B/W 12 inch screen, POSS/NEG, VHF/UHF AC or DC working £55.00. carriage extra. UHF WB pre-amp, mains op, "WOLSEY MERCURY", 15dB gain, £10.00; SANYO RX portable mains/batt, SW-MW-FM analog tuning. Super Sensitivity, "S meter, slow/fast tuning, wide/narrow, dial light, plus many more features, £25.00.

Realistic PRO-32 handheld scanner, 200 channel memory, 68-88MHz, 108-136MHz, 138-174MHz, 380-512MHz, £110. Revcone discone antenna, model 2050, 50-500MHz range, unused, boxed as new £20. Tel 081 991 2608 evenings after 7pm.

Exchange my Matsui MR-4099 150KHz to 29.999 receiver A.M. U.S.B. L.S.B. narrow filter F.M. stereo, for scanner hand held must have air band. Phone Barry 0446 739734 between 09.00 & 10.30.

Have Amstrad PCW 9512 (Daisywheel printer) and Yaesu FT747GX H.F. rig. Exchange for best hard drive P.C. setup offered. Must include decent printer so will add 35A P.S.U. and/or S.E.M. A.T.U. for right deal. Phone Halifax (0422) 368021.

TS530S for sale original packing and manual v.g.c. £525. Call Roger G0FCH Swindon 0793 695226 after 6pm.

Frequency counter Solartron EM1616, good cond, working no ins. book £45. Oscilliscope dual trace telequipment model D54 (Kolster brandes) working but needs attention. no ins. book £30. Sale or W.H.Y. RX, etc. G1PVU Street 0458/47019.

Icom IC-25E handie with spkr mic, £220. Trio TR3200 70cm portable with packet freqs £90. Atari portfolio pocket PC with serial port, terminal program and 32K memory card, £220. Phone Julian on Colchester (0206) 210878.

Yaesu 7000 RX, 0–30MHz, £130, or swap for 2m handheld i.e. IC 2E etc. or scanner, must cover airband and 512MHz, anything considered i.e. Dragon computer disk drives. Still have 50MHz converted CB, full DTI authority. Tel. 0302 531927 (Doncaster).

Yaesu FT767GX. As new, complete with instructions, boxed, 10 hours use only. £1100. Tel. Steve on 0322 64292 (Swanley, Kent)

Yaesu FT2700 dual band rig. 2m/70cm, complete with mobile bracket, 340. Roy G4TOF, Tel. (Solihull, W. Midlands) 021 742 3822

100W linear amplifier, £50. Tel. (Sheffield) 0283 221870

Linear Amplifier, 2 x 813s, mil spec components, matching cabinet and PSU, £300 ono. Ex TU9B wide spaced capacitors, ceramic formers, £5. Roller coasters, £20. Rotator and controller, £50. Tel. (Kirkby–in–Furness, Cumbria) 0229 89635 any time.

Yaesu FT202R handheld, battery charger, xtals, £150. 10m–15m HF receiver, £80. 13.8V 5A PSU, £40. Graphic equaliser, £30. BNOS 2m 100W output PA, £60. 2m 2 ele beam, £30. The lot for £350. Tel. 0748 850430 after 1800 Hrs. (Richmond, Yorks)

Sony PRO80 HF/VHF scanner. 150kHz – 108MHz plus 115MHz – 212MHz with converter, AM/FM/SSB. Will swap for VHF/UHF scanner or sell for £195. Tel. 0827 250038, (Tamworth, Staffs).

Loops. Have two loops made from domestic copper pipe. Circular, no joins, one is 1.2m dia 28mm, the other is 1.4m dia 22mm. Will let them go for a lot cheaper than they cost to make. (Malvern, Worcs). Tel. 0684 560068 evenings.

Saisho world receiver, 16 waveband, new and boxed. Cost £90 will sell for £70. Tel. (Billericay) 0277 624410

Racal RA117 communications receiver, 1–30MHz continuous, plus RA218 sideband converter and fine tuner unit, Complete with operating and service manuals, VGC, minor attention needed. £140 ono. Peter G0HWQ QTHR (Crowborough). Tel. 0892 663061 evenings/weekends.

Digital Multimeter £50, small AVO £16, AC current Clamp meter £16, Megger £100, Valve tape recorder £50. Tel. (Greater London) 081 554 2913 6pm – 8pm.

Yaesu FRG8800 SW receiver, ATU, G5RV aerial, boxed as new £425. Tel. (Birmingham) 021 453 7997

FT202R 2m handheld, new nicads, charger, 6 channels S20, 21 and 22, R3, 5 and 7. Swap or sell for any 70cms transceiver with cash ajustment. Tel. (Hatfield) 07072 75920

Four 6JB6A valves, as new surplus to requirements, half current retail price. Tel. (Perth) 0738 87207

Pye Westminster 30. TX frequency 72.50MHz, RX frequency 86.00MHz, 5 units plus control boxes and leads, base station Cat No. W15AM and PSU cat no AT04404/1, 100V – 240V AC input, offers. Also if the young Ham selling ex–mod gear at the Wimbourne Ham Fest'90 on August 12th could please contact me, I would like to purchase some more gear from you. Tel. (Lambourn, Berks) 0488 71325

Uniden 28 – 30MHz £275 no offers. Frequency counter £45, Power pack 250V – 13.5V, 5A – 7.5A £18 ovno. PRO2005 Tandy programmable scanner cost £345, sell at £275 as new in box. Tel. 0283 221870

ERA Microreader with Morse tutor, reads CW and RTTY, £100 ono. Tandy Realistic IC1005 handheld CB transceiver as new 50 ono.

Maxcom 7E handheld £50 ono or W.H.Y. AM/FM handheld scanner etc. Tel. (Strathclyde) 0501 23493 after 6pm.

Trio TS830S immac condition, CW filter, deluxe knob, mic, and manual, boxed, £695 ono. Will exchange for IBM AT computer system Tel. (Coventry) 0203 450476

Microwave Modules 1296MHz transverter, 2m IF, want to swap for 6m transverter or 70cms handy. WHY. Tel. Chris Taylor G1FMH on (Watford) 0923 671024 after 6pm.

Spectrum 48k with disk drive interface and books £60. Disk drive for this will also work with Acorn BBC Computers, £60. Texas T199/4A computer, fully boxed £60. Tel. Bob on (Stevenage) 0438 720910.

ERA Micro Reader MKII, new and under guarantee, boxed, cost £154.99. Sell £100 for quick sale. Tel.(Congleton) 0625 273219 daytime.

Transformers very heavy, 2250V . 500mA, have two of these, £15 each. Also have transformer, filament type, for 4 – 250 valves 5V . 30A £10. Also push pull output transformer for KT88's rated at 100W £10. Contact G1LXW in Malvern, Tel. 0684 560068 evenings.

Chrome Bencher £75, Chrome Iambic Vibroplex £75, Chrome German marine precision junkers key £30. RAF type 'D' £20, Star MKII Masterkey £40, 1 pair LP Wight traps £5. Admiralty handbook, Volumes 1 and 2 £8. Contact B.J. Payne (High Wycombe). Tel. 0494 30018

Two Leak through line 3 FM tuners £20 each. Philips table stereogram, VHF, LW, and MW £25. BC312N 1.5–18MHz, 240V PSU included £35. Wharfdale VHF AM radio stereo, four speaker outlets etc. £30. Buyers collect. Contact G8BSK, 290 Priory Road, Southampton SO2 ILS. Tel. 0703 552247

FDK 750XX Multimode works well £180 ono. BBC B Twin discs CUB monitor 1431MS Z80 processor and software, offers. Also BBC B

051.2 RGB or green screen monitor any reasonable price accepted. Two 32K sideways rams for above 10 each. Tel. (Chorley, Lancs) 02572 73701

Yaesu FT200, recently overhauled, new PA valves etc. c/w mains PSU and speaker £250. Tel. (Bedford) 0234 750050

Racal AR17 MKII very good condition. AR117E overhauled 5 years ago, choice of two, £175 and £150. Tel. (Southall, Hanslow) 081 571 5759

Kenwood TS 830S nine band HF transceiver 160–10m. Also Kenwood AT230, VFO240, and MC50 mic, all items in pristine condition with original boxes and manuals. Tel Brian on (London) 071 515 5517.

FT411 Yaesu's latest mini 2m handheld, with extended coverage 140–174MHz, plus FNB10 nicad pack, FBA10 battery pack and SMC nicad charger, all in immaculate condition, £220. Tel. Andy on (Hitchin, Herts) 0462 712669.

Yaesu FRG7700 receiver, with FRT7700 ATU, FRV7700 A and C convertors covering 118–170MHz, FF–5 LF filter. All boxed and in mint condition with manuals £315. Write to V. Wainwright, 19A Harcourt Drive, Herne Bay, Kent CT6 8DJ. Tel. 0227 740093.

Kenwood TH215E 2m handheld, multiscan, ten memories, LCD readout with speaker mike, case, nicads, charger, original packing and manual. Just been checked by Lowe, £150 ono or swap decent ATU and cash adjustment. Tel. (Whickham, Tyneside) 091 488 2995.

Sony Air–7, AM/FM/AIR/PSB. One year old, Immaculate. £135. (New Malden, Surrey). Tel. Richard 081 949 2619 evenings after 6.30pm.

Yaesu FRG9600MkV Scanner, AM/FM/AMW/FMW/USB/LSB. Excellent condition, boxed, £350. Eddystone 840C, 500kHz-30MHz, vgc, £80. Philips PCRs 500kHz–23MHz AM, only £30. (Bracknell) Tel. 0344 428196

Yaesu FT726R 2m multimode £500, 6m module £199, HF module 180, satellite board £150, all in mint condition, £950 complete. FDK 750E 2m multimode with 70cms expander £350. Contact K. Greenough, G8BEQ, 2 Bexley Close, Glossop, Derbyshire SK13 9BG. Tel. 0457 855468

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WANTED

WANTED Cheap air band receiver and general coverage receiver by pensioner returning to hobby. Roger 0689 20281.

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Good Short Wave receiver, will exchange R216 receiver with power pack and a 62 set MkII with microphone and headphones. Clive Powis, Tel. 021 789 8447

Sommercamp TS788DX. Must be in good order inside and out. Tel. 0332 42394

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Ham Radio Today February 1987, June and August 1985 copies, Also ERA Microreader and Yaesu YD148 microphone SP901 speaker, Y0901 scope. Tel. Dave G7HWW on Norwich 745512.

Wishing to Make Contact with scanner operators and enthusiasts to exchange information and experiences. Special interest in railways and police where allowed. Genuine replies only please. Write to David, GPO Box 1707, Sydney NSW 2001, Australia.

WS19 rack, R1082/T1083 motor gen type C, smoothing unit type A, amplifier type B. Gee–H drive unit 114, switch type 220, indicating unit 237. AI MkVIII Junction box 67, scanning unit type 4, Aerial system 196. Buy or exchange 1155 B2 ETC. Tel. Phil on 0483 572653

Speech processor complete unit preferably RF clipping type. Tel. 0723 363825

Any **documentation on Philips** miniwatt open reel tape recorder which is needed for repair. Anyone who is prepared to help repair equipment or has any info please Tel. Richard on 0236 724604

TB3 MKIII or similar three element tri–bander, must be good, also SWR meter up to 200MHz or possibly 500 MHz, have MFJ 815 SWR cross needle as new for sale or exchange for UHF/VHF SWR meter, MFJ 815 as new, boxed. Tel. 0872 572429

Airlite 62s headphones, urgent. Tel. 0349 63952

70cms transverter which plugs into the FDK750X, must be in good working order. Tel. GW7GGW on 0239 811157 evenings.

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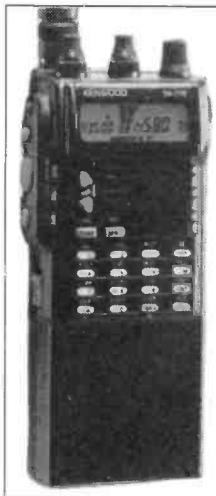

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Write or telephone for full and detailed information or, better still, visit one of our shops or approved dealers for a gool look and some handy hands-on evaluation! we think you will be impressed.

TH-77E . . . £389

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RF Output: From and Economy Low Power of 20mW to high power of 5W.
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Scanning: Both models offer a fully flexible scanning system, including carrier or time operated resume and busy channel scan stop.
Squelch: The built-in Dual Tone Squelch System (DTSS) provides selective reception using DTMF tones.
Other features: ★40 Multi-function Split Frequency Mempory channels ★Auto Battery Saver ★Repeater Offset and Reverse Offset ★Programmable VFO ★And more.
Options: ★Remote control speaker microphone which operates a whole range of transceiver functions ★Sub-audible tone unit ★Battery Packs ★Wall Charger ★Soft Case ★Many others.

The detailed information sheet does these little handhelds more justice, so write, phone or FAX for one and it will be sent immediately. Better still, seeing is believing, so why not drop in on one of our shops or approved dealers and get a feel for what we are talking about!

TH-27E . . . £249 **TH-47E . . . £269**

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A compact handheld transceiver with controls and readout on the top of the unit. Remove the battery pack and use an external power source when mobile and no other transceiver will match this one for small size and all the state-of-the-art features expected in a modern FM transceiver.

Size: 58mm wide, 30mm deep, 136mm high (excl aerial).
Weight: Less than 14oz (380g).
RF Output: Economy Low Power of 20mW up to a high power of 5W using the optional PB-8 power pack. Power pack supplied gives 2.5W.
Scanning: 20 Multi-function Memory Channels with Lithium battery back-up.
Other features: ★Auto-Battery Saving Circuit ★Repeater Offset and Reverse Switches ★Lamp Lock Key for continual illumination of the LCD display when mobile ★And others.
Options: ★Remote Control Speaker Microphone controls the most useful functions required by the mobile operator ★Headset with VOX/PTT ★Filtered cigar lighter cord ★Battery Packs ★Chargers ★Soft Case ★Many more.

A full colour specification sheet is available upon request and both models are in the showrooms of our shops and approved dealers. When you see the transceiver as a handheld, you will find it small. When you see it's profile in your car without the battery pack, we think you will be pleasantly surprised at the very small amount of space required to house a fully functional FM VHF/UHF transceiver.

TH-26E . . . £249 **TH-46E . . . £269**

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