STRAIGHT & LEVEL

RECHARGEABLE SOLDERING IRON

Cirkit has introduced a new rechargeable soldering iron, which is ideal for soldering CMOS and other static sensitive devices and for site work where no mains supply is available.

Rated at 12W, with fast warm-up time and small 2mm diameter tip, the unit comes complete with mains charger, wall mounted socket and a 12V car charging lead which is connected via the vehicle's cigarette lighter. Up to 200 standard joints can be made from one charge of 12 hours.

Featuring an illuminated tip, for which spares are readily available, the soldering iron also has a safety hood for protection during operation.

For further information contact: *Cirkit Holdings PLC, Park Lane, Broxbourne, Hertfordshire EN10 7NQ. Tel: (0992) 444111.*

REPLACEMENT TIPS

A range of replacement tips, with diameters of 1.0, 2.4, 3.2 and 4.8mm have been announced by Freetrade (TEP) Ltd for the Portasol portable gas powered soldering iron.

The tips are easily fitted and include the patented catalytic converter that generates heat right at the tip for maximum efficiency. Powered by gas cigarette lighter fuel, the Portasol has a variable temperature range of up to 400°C – equivalent to an electric iron's output power from 10 to 60W. One filling of gas gives up to 60 minutes of continuous operation.

No larger than a felt-tip pen, Portasol can be carried in a top pocket and has a clip-on cover with a built-in igniter. The powerful gas-operated heater gives a stable output that is superior to battery-operated portable types. This frees the user from having to work near a mains power point or bother with extension cables.

For further information please contact: *Freetrade (TEP) Ltd, Moor Lane, Witton, Birmingham B6 7HH. Tel: (021) 356 2582.*

ANTENNA SWITCH

Telecomms have announced the release of yet another UK manufactured product. The CASA2 remote coaxial antenna switch has been designed and manufactured in the UK to enable the remote switching at the masthead of two antennas from one feeder. The unit is fully weatherproofed and of the highest quality, using Greenpar Silver Plated N type connectors. It has a low insertion loss and may be used up to 1000MHz, with a maximum power of 150 watts PEP. The unit requires dc at 11-14 volts, fed by a supply wire through a fully RF decoupled dc input to the relay.

Although initially intended for the 934MHz personal radio band, this unit will appeal to a wide variety of commercial, amateur and PMR users.

The unit is selling at £59.95 and the specifications are:-

Frequency Range – dc-1000MHz.

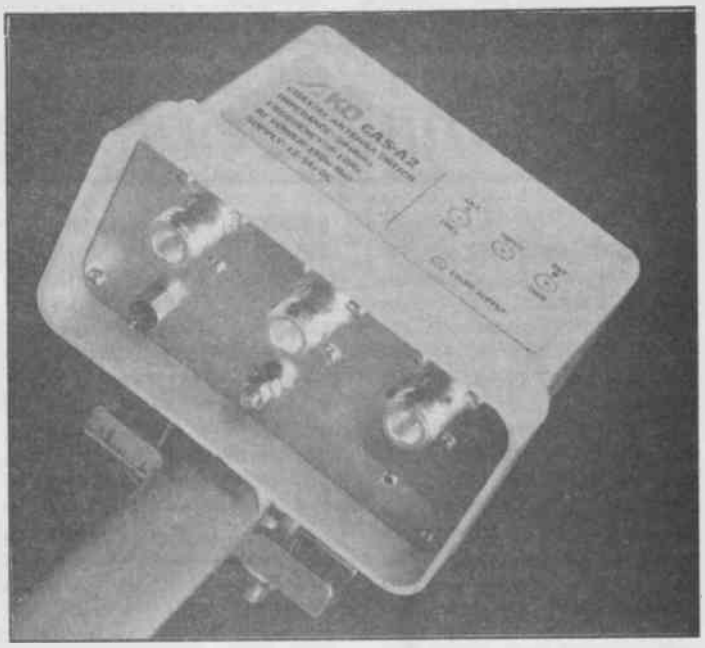
RF power – 150 watts PEP.

Insertion loss – better than 0.25dB at 934MHz.

Connectors – silver plated N types.

Mounting – on masts up to 2in with V bolt and saddle clamp (supplied).

For further information contact: *Telecomms, 189 London Road, North End, Portsmouth, Hants PO2 9AE. Tel: (0705) 698113.*



PORTABLE SIGNAL GENERATOR

Now available from Electronic Brokers is the Marconi Instruments 2022A, a lightweight, rugged RF signal generator which has a 10kHz to 1000MHz frequency range.

The 2022A is ideal for radio service and maintenance applications, and is also suitable for use in education, training and production. The instrument's wide frequency range includes all the radio communication bands from HF to UHF including IF stages. Measurement on narrow-band receivers is enabled by a 10Hz carrier frequency resolution. Amplitude, frequency, and phase modulation are available for comprehensive tests on most types of radio; external modulation extends these facilities.

Features of the RF signal generator include harmonically related signals of typically –35dBc; non-harmonically related signals of better than –70dBc at offsets greater than 3kHz from the carrier; and sub-harmonics of –20dBc for carriers above 500MHz. The residual frequency modulation is less than 10Hz equivalent peak deviation in a 300Hz to 3kHz bandwidth at 499MHz.

The 2022A also has a frequency modulation resolution of 10Hz up to 9.99kHz and 100Hz above 9.99kHz, and a phase modulation resolution of 0.01 radians (both figures accurate to within ±5% of deviation). The amplitude modulation has a depth of 0-99.5% with a 0.5% resolution, and an accuracy of better than ±4%.

Other features include a non-volatile memory with 100 settings; logical, colour-coded keys to enable easy fixing of parameters; and a large liquid crystal display (LCD) readout to show all settings. The output level is set up and displayed in a variety of units for operator convenience, with single key conversion of units. Parameters may be incremented in user-defined steps, thus enabling rapid manual measurements.

Easily portable, the 2022A RF signal generator measures just 152 x 256 x 367mm (excluding handle), and weighs 7.5kg. A range of optional accessories are available including GPIB module, RF connecting cable, GPIB lead, and double and single rack mounting kits.

For further information contact: *Electronic Brokers Limited, 140-146 Camden Street, London NW1 9PB. Tel: 01-267 7070.*

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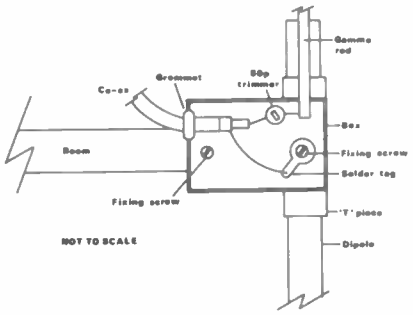

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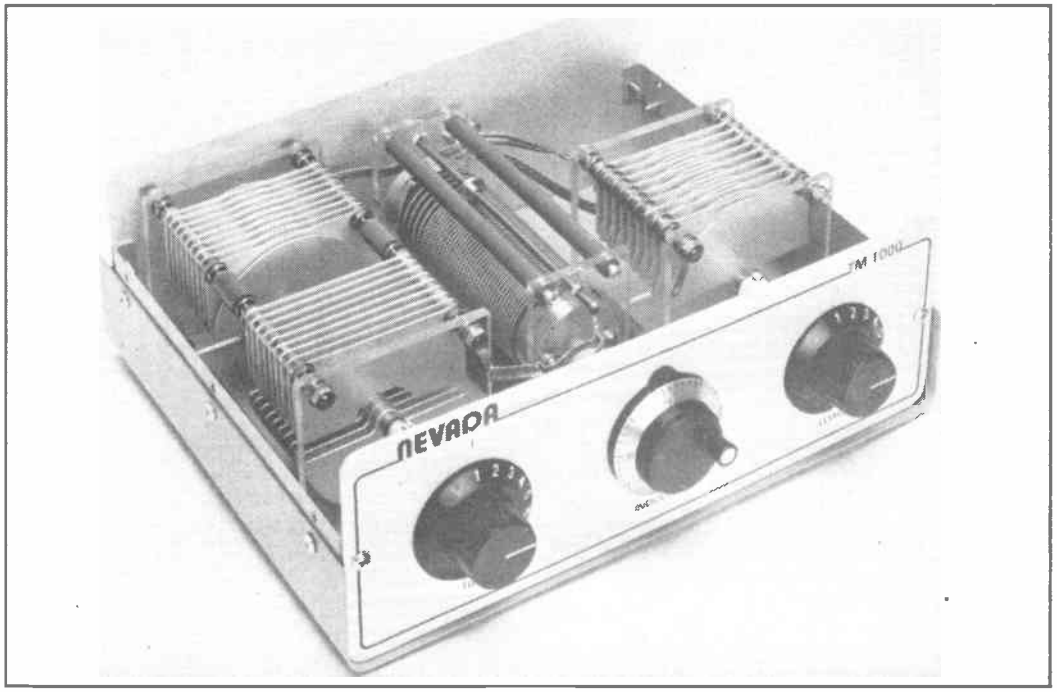


1kW ATU

Telecomms are pleased to announce the launch of their new Nevada 1kW all band ATU, model TM1000. The unit is a natural extension of their Nevada Professional Series of discrete ATU components, ie the roller coaster, turns counter and variable capacitors, that they have released over the last nine months.

The ATU is continuously variable from 1.8-30MHz and uses a transmatch circuit that allows for maximum flexibility. The unit can handle a wide range of antenna impedances.

At £125 (including VAT), the TM1000 is priced very competitively.

For those who still wish to construct the ATU, Telecomms are offering the unit in kit form, which includes: the empty case (pre-drilled), 2 capacitors, 1 roller coaster and 1 turns counter, at a cost of £100 (including VAT).

Telecomms have already received many enquiries from around the world for this unit, and one sample has already been sent to the Flying Doctor service in Australia where it will be used for emergency communications.

For further information contact: *Telecomms, 189 London Road, North End, Portsmouth, Hants PO2 9AE. Tel: (0705) 662145.*

IMPROVED FT767

Ray Withers Communications Ltd have done it again with another World first with their popular series of modifications. The FT767 is a very attractive set, giving a host of features at an economical price when compared to its competition. It is, however, let down by its lack of dynamic range due to synthesizer phase noise (see December 1986 review). This now means that the RWC FT767 Mk2 has the best performance for a multiband base station radio in this class.

Extensive laboratory development work has resulted in an add-on PCB modification improving the dynamic range by up to 20dB. This results in better DX receiving capability in the presence of heavy QRM, which of course is very important on today's crowded bands. The modification at present is not available in kit form. Normal warranty is not affected on sets purchased from RWC Ltd.

Latest SMD type 'chip component' technology has been employed in the modification board to provide the required performance and reliability. This mod is now fitted as standard to all FT767s supplied by RWC, and may be fitted at a cost of £49.50 (including return carriage) to models previously also purchased from RWC.

So now discerning radio amateurs can have the ultimate in performance as well as a host of operating features without needing a sympathetic bank manager!

For further information please contact: *R Withers Communications Ltd, 584 Hagley Road, West Oldbury, West Midlands B68 0BS. Tel: (021) 421 8201.*

REPLACEMENT NICADS

Withers have also brought out a new range of cost effective replacement NiCad battery packs, empty cell cases and desk-top chargers for the Icom, Kenpro, and CTE range of hand-held transceivers.

Two fast charge fully compatible models are available for business and professional uses, designated 10AF (10V @ 800mAh) and 12AF (12V @ 550mAh). These are directly

All the latest news, views, comment and developments on the amateur radio scene

equivalent to the Icom range of NiCads and can be fast charged in the Icom BC35 and BC60 chargers.

The new Raycom NC580 desk-top charger has been designed to charge all Icom type NiCad packs over 400mAh capacity, and has two switchable charging rates available as standard.

The empty cell cases have a capacity of up to ten AA/HP7 size cells, thus enabling users to build a NiCad pack with a number of cells ranging from six cells (7.2V) upwards; this also offers a very cost effective solution for amateur radio enthusiasts.

The ready built units are imported from the USA and are now available exclusively from Ray Withers Communications Ltd.

For further information contact: *R Withers Communications Ltd, 584 Hagley Road, West Oldbury, West Midlands B68 ?BS. Tel: (021) 421 8201.*

PROFESSIONAL DMM

The M3560 digital multimeter offers an unusually wide range of measurement ranges including voltage, current, impedance, continuity, transistor hFe, frequency and capacitance.

Very competitively priced, it is now available from Electronic & Computer Workshop Ltd and is ideal for use in all types of electronic and electrical testing. It is a professional quality instrument with an ergonomic and attractive design. Its front panel has a single 30 position range selector switch and it features full protection for all ranges, together with autozero and surge protection from 1.5 to 3kV.

The measurement ranges include voltage up to 750V ac, 1000V dc, dc/ac current up to 20A, resistance from 200 ohms to 20Mohms, LED/audible continuity testing, transistor hFe, capacitance from 2000pF to 20μF and frequencies up to 200kHz.

The 3½ digit '1999' LCD has a range of annunciators, including a low-battery indication, and shows the units selected. The operating temperature range is from 0 to +40°C and the M3650 measures 90 x 176 x 36mm.

For further information please contact: *Electronic & Computer Workshop Ltd, Unit 1, Cromwell Centre, Stepfield, Witham, Essex CM8 3TH.*

CAPACITANCE METER

Levell Electronics are pleased to announce the new digital capacitance meter, type 7705, which has 0.1pF resolution and is priced at £49 plus VAT.

The hand-held capacitance meter has a 3½ digit, 0.5in high, liquid crystal display with ranges from 200pF to 2000μF. Accuracy on most ranges is ±0.5% reading + 1 digit. The test voltage is 3.2V peak with input protection fuse and a measurement rate of 2 per second. The meter is powered by a PP3 type battery. Indications of low battery and overrange readings are provided on the display.

The 7705 weighs only 350gm, has a high impact ABS case, 180 x 87 x 42mm, and is provided with a tilt stand for bench use.

For further information contact: *Levell Electronics Ltd, Moxon Street, Barnet, Herts EN5 5SD.*

HAND-HELD MULTIMETER

Electronic Brokers offer the Fluke 8060A series of hand-held digital multimeters, the first digital hand-held test instrument to offer frequency measurement capabilities. Ranges include 200Hz, 2000Hz and 200kHz, all of which are fully autoranged thereby enabling easy servicing of a wide range of communications equipment. The instruments are also suitable for other applications in design, manufacturing and field servicing.

With a basic dc accuracy of 0.04%, the multimeter measures ac and dc voltages and currents, resistances, and continuity, and includes a diode test function. The 8060A has a 10μV, 10nA and 10mΩ sensitivity with excellent stability to the least significant digit. A wideband true rms ac capability enables accurate measurements of non-sinusoidal signals from 12Hz to 100kHz.

The 8060A DMM also features a relative reference capability that provides for relative or offset measurements in any function or range. Readings are displayed as a + or – deviation from the stored value. The 8060A will remember the proper function and range for the value stored, even if the user changes functions.

Other features include overload protection to 1000V dc, or 750V ac and to 500V (resistance); a sophisticated self-diagnostics procedure; and the ability to display ac or dc voltage measurements directly in dB, dBm (referenced to 600Ω), or relative dB, thus allowing simplified amplifier gain tests.

For further information contact: *Electronic Brokers Limited, 140-146 Camden Street, London NW1 9PB. Tel: 01-267 7070.*

CLUB NEWS

National car boot sale

The National Amateur Radio Car Boot Sale is being held at the Shuttleworth Collection, Old Warden Aerodrome, on Sunday 13th September.

Each year Dunstable Downs Radio Club organises and runs the event, which has become a very popular rally. Although termed as a rally, it is really quite different from other rallies throughout the year. One of the main reasons for this is that although there are many traders, the event caters mainly for amateurs selling to amateurs.

Over 250 stalls were present last year, and with more than 2,500 visitors a great atmosphere has been created with people selling almost every conceivable item from new transceivers, computers and televisions, to components, kits, aerials and yes, some plain old 'junk, but all at real bargain prices. Two comments heard were that 'It's a true amateur radio rally, not just a shiny black box sale', and 'Just how rallies used to be, it's great'.

In fact the Dunstable Downs RC has managed to provide a great day out for the whole family, as the event is held at one of this country's famous aircraft and motor museums – 'The Shuttleworth Collection', located at Old Warden Aerodrome, near Biggleswade, Bedfordshire. The museum has aeroplanes dating back to the pioneers of aviation, and many of these planes are still in regular flight today. Combine this with a restaurant, souvenir shop, bar, and children's playground all set in the Bedfordshire countryside and you only have to ask those who have attended this event previously to see that it is one of the most unique, interesting and probably the largest event of its kind in the country.

This is now the fourth year that the event has been run, and it will be open from 10am till 5pm, and admission is only 50p (parking free). Old Warden is about 2 miles west of Biggleswade and is easy to find as it is well signposted from all major routes.

Enquiries about the event can be made to Wendy on (0582) 451057, or Clive on (0582) 27907.

29th Harlow Mobile Rally

This year the Harlow Rally on 27th September returns to its traditional date on the last Sunday in the month, and will take place as usual at the Harlow Sports Centre.

Expansion at the sports centre will mean better facilities for this year's rally. A new second hall has been added that will enable a larger number and a greater variety of traders to be accommodated. They have also been promised that the catering facilities will be much improved over last year.

The sports centre has easy access from either the M11 (Junction 7) or the A414, and will be fully signposted with talk-in by G6UT on S22. As usual, ample free parking will be available adjacent to the sports centre.

As last year, Morse tests will be available and there will be exhibits by a number of special interest groups. There will be reserved parking for the disabled and also the separate entrance for bring and buy sellers.

The entry price has been held at £1 for the third year, with accompanied children free. Details are available from G4KVR (0279) 22365 (daytime) and G3UEG (0279) 27788 (evening and weekends).

Midlands VHF Convention

The RSGB Midlands VHF Convention is being held on Saturday October 10th 1987, at Madeley Court Centre, Telford, Shropshire. The main part of the Convention will start at 1100.

The Convention program includes the following:

1200-1330, RSGB RMG Open Forum.

1330-1345, Opening Address by Malcolm Appleby G3ZNU.

1345-1455, Advanced Long Yagi Design by Ian White G3SEK.

1455-1605, Design of Commercial Equipment for The Amateur Market.

1605-1715, The Ins and Outs of Microwave Amplifiers by Barry Chambers G8AGN.

1715-1900, VHF Forum.

The Forum will be followed by an evening buffet with bar until 2200. There will be lunchtime catering (snacks and bar).

There will be a small trade show, bring and buy stall and book stall. Admission is £1.20, and evening buffet tickets, price £5.50, are available by advance booking. There is ample free parking.

The Convention site is readily accessible via the M54 motorway, and talk-in will be provided (details later). A how-to-get-there map is available from the organisers for a stamped, addressed envelope.

The RSGB Midlands VHF Convention provides an excellent opportunity to meet fellow VHF (and UHF/Microwave) enthusiasts in comfortable, uncrowded surroundings.

Further details, etc are available from the secretary to the organising committee at 18 Langley Road, Merry Hill, Wolverhampton WV3 7LH.

The Sheffield Award

The Sheffield Amateur Radio Club is going on a day trip to the Lincoln Hamfest on Sunday 13th September, finishing a busy day with a meal at the Old Barn Restaurant, Dunham Bridge. Later in the month it is hoped that Peter Sheppard G4EJP will be able to give a talk on Raynet.

The club is also announcing the reintroduction of the Sheffield Award, originally introduced in the mid 70s, and avaiable to both licensed transmitting amateurs and short wave listeners.

To obtain the award one of the following requirements must be satisfied, and proof given in the form of a copy of the log entries. The copy must then be examined by a licensed amateur in your area, who should verify that the log submitted is a true and accurate copy of the original. The entry should be dated and signed by the operator and verifying amateur.

The requirements for the Sheffield Award are, for UK stations, to establish two-way contact with 30 Sheffield stations. SWLs should log the same number, and must include in their log extract the calls of the stations being worked by the Sheffield operator.

Stations outside the UK but in Europe should establish two-way contact with 15 Sheffield stations, following the above procedure.

Stations outside Europe should contact 10 Sheffield stations. SWLs should follow the rules outlined in the UK section.

If the Sheffield station worked/heard is at that time a member of the Sheffield Amateur Radio Club then he will count as two contacts towards the Award. A contact with any Special Event Station organised by the club will count as five contacts.

The Award will also be given to any station who has worked five Sheffield stations on the bands from 1.3GHz up.

Sheffield stations are those found within the Metropolitan District boundary. Club meetings are held every Monday at 8pm in the Firth Park Pavilion, Sheffield.Tuition takes place between 7 and 8pm.

SMC OPEN DAY

On 30th August SMC are holding a special open day to celebrate the opening of their new premises. Although they have held open days annually in the past, this will be an event not to miss, as the opening of new premises is not likely to occur annually.

To celebrate the occasion, SMC are offering 10% off of all new equipment of cash purchases (except masts), and there will be many ex demo and secondhand bargains and odd lengths of cable at half price. There will also be a car boot sale, to which you are invited to bring your redundant items to sell, and a free radio specification check between 1.8-430MHz.

There will be an opportunity to win an FT290R and numerous other prizes, and a licensed bar will be available for refreshments. All this coupled with numerous local attractions make it a good opportunity for a day out with the family. Talk-in will be available on S22.

For further information contact: *South Midlands Communications, SM House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hampshire SO5 3BY. Tel: (0703) 255111.*

Wimbledon quiz

Wimbledon and District Amateur Radio Society is holding its annual bazaar on September 11th. A quiz with CATS is scheduled for

September 14th – this is an away meeting. G3JUL is giving a talk later in the month, on September 25th, on 'The Science Museum Radio Station'. All WDARS meetings are held on the second and last Fridays of each month at 7.30pm in St Andrews Church Hall, Herbert Road, Wimbledon, London SW19. Enquiries should be referred to the hon secretary, George Cripps G3DWW, tel 01-540 2180.

FT102 users group

Those who own the Yaesu FT102 HF rig may be interested to know that a user's group has been formed. Don Quinn GI4PCQ explains that this is intended to provide an information exchange for fault diagnosis, maintenance hints and so forth. The group hopes to have an occasional newsletter and a regular net on-air. Anyone interested should write to Don at 58 William Alexander Park, Belfast BT10 0LX.

Desert Rats calling

Special Event Stations will be on the air at the El Alamein reunion of the 8th Army veteran's association. This is taking place at the Great Hall, Town Hall, Hove, Sussex in the presence of the Mayor of Hove and Brighton.

The callsign is GB8EAR, which will be operating on 144MHz. This event takes place on October 24th, and all ex-service personnel are welcome. Send a remittance of £4.00 per person and an SAE for tickets to EJ Pretty, The Garage, Partridge Green, Horsham, West Sussex, RH13 8JS or D Dacey, 87 Staplefield Drive, Brighton BN2 4RH.

A further special event station will be set up at the Winter Gardens, Blackpool on October 31st, again run by the Royal Signals Amateur Radio Society to work other RSARS/RAFARS/RNARS members. The callsign will be GB8AER.

Rainbows and doves

An attractive event is being organised by the Loughton and District Amateur Radio Society, who are holding their Rainbow and Dove weekend at Hastingwood Common, Harlow, Essex on September 5th and 6th. On a more down-to-earth note, an HF DF hunt is taking place on September 11th, from 7.30pm for a 7.45pm first call. The frequency is 1.905MHz ± QRM. The callsign is G4ONP. An informal night on the air is also scheduled for September 25th, club callsign as above.

All events are held at the Loughton Hall, Rectory Lane, Loughton, Essex (unless stated otherwise). Details can be obtained from John Ray G8DZH, 9 Albion Hill, Loughton, Essex IG10 4RA.

RSGB key-in

The RSGB is holding a Straight Key Day on Saturday October 10th, which is sure to be popular with many radio amateurs. The HF Committee is keen to encourage the use of CW by newcomers to HF amateur radio, although it is hoped that 'oldtimers' will also participate.

The event will take place on 80 metres to ensure full UK coverage. Participants are asked not to stray into the DX portion of the band, nor into the QRP area around 3560kHz, though QRP operators are welcome to participate in the event. Normal QSO information will be expanded to include details of the key being used, such as its age and any interesting history. Photos of keys used would be welcome for inclusion in any later write-ups. The event takes place from 8am to 9pm, 3515-3555kHz.

For further information contact Don Field G3XTT on 01-631 2002.

BARTG AGM

BARTG are holding their AGM on Saturday, November 7th at 2pm in the Churchill Room, London House, Mecklenburgh Square, London WC1 (close to Kings Cross). All members are welcome, one topic for discussion being the annual subscription rate, which is currently £7 for UK members, £10 for Europe and overseas surface post and £16 for overseas airmail. To apply for membership, contact Mrs Pat Beedie GW6MOJ, 'Ffynnonlas', Salem, Llandeilo, Dyfed, SA19 7NP.

GB1RLD

Four members of Radio Link – Derby Hospital Broadcasting – will be operating the special event station GB1RLD from the outside broadcast caravan at the City Hospital, Derby on the 2m band on the 19th and 20th September from 1000 to 1600 hours.

Representatives of local organisations will be visiting the station during the weekend, and John Huddlestone, the secretary/press officer stated that they hope to contact over 400 amateur radio enthusiasts within Great Britain during the event. Each person contacted will receive a special QSL card via the Radio Society of Great Britain mailing service.

Radio Link broadcasts every day to the City and Kingsway Hospitals, the Derbyshire Royal Infirmary and the Derbyshire Children's Hospital, from their studios at the City Hospital. Radio Link was formed in the April of 1974, and now broadcasts for over 40 hours a week.

For further information please contact John Huddlestone G1UJX, Secretary/Press Officer, c/o 8 Wilmot Avenue, Chaddesden, Derby DE2 6PL. Tel: Derby 676822.

Limerick liaison

The Irish Radio Transmitters Society recently held their AGM in the Limerick Inn Hotel, Co Clare, hosted by the Limerick Radio Club. It was announced that, following negotiations with the Irish Department of Communications, permission had been granted to all B licensees to use CW and RTTY on VHF bands in Eire. More good news was that AREN (Amateur Radio Emergency Network) has been given full Department of Communications approval.

To contact the society write to PO Box 402, Dublin 9.

EI3DY (left), outgoing president, congratulates EI6BUB, the new president of the IRTS

London Morse tests

Since the Radio Society of Great Britain began administering Morse tests for radio amateurs, on behalf of the Department of Trade and Industry, it has been difficult to find suitable accommodation in central London.

Consequently, many amateurs have had to travel long distances to sit the examination.

However, the BBC Club's Ariel Radio Group has now been able to negotiate with the Senior Examiner and arrange for tests to be conducted in Shepherd's Bush on a trial basis, commencing in about eight weeks, subject to official confirmation between the RSGB and the BBC.

Bob Simmons, Ariel's station manager at Woodlands, Wood Lane, W 12, said he 'was delighted that this facility was available, not only to BBC Club members, but to other amateurs living in London. I am very pleased that the BBC Premises Department has been able to assist like this' he said.

Bob had to travel some distance to take the test himself, and decided that he could take some action to help others in the same predicament.

The RSGB will be advertising the details in due course, although it is expected that the tests would run from 9.30am to 4pm one Saturday a month, and that all candidates' tests would be by prior appointment.

Further details about the Ariel Radio Group are available from the hon secretary, Trevor Butler, Room 333a Broadcasting House, London W1A 1AA. Tel: 01-927 4372 and 01-747 0624.

Kent Repeater Group

The Kent Repeater Group was formed in 1974 and supports the following repeaters GB3KN and GB3KS on 2 metres and GB3CK, GB3EK, GB3NK, GB3RE and GB3SK on 70cm.

GB3RE was commissioned on July 5th 1987 and is sited at Chattenden near Rochester to give coverage of the Medway Towns. Reports would be welcome to G4AKQ, the repeater manager.

The recent Annual General Meeting saw some changes on the committee with G4RVV taking over as Chairman and Kelvin Fay G0AMZ Secretary.

Further information on the group is available from the secretary on (0634) 376991.

Belle Vue exhibition

Readers will probably be aware of the Belle Vue exhibition which is organised each year by over 40 amateur radio societies in the North West of England. This year marked the Silver Jubilee of the exhibition and was an overwhelming success, with an attendance of more than 3500 people.

Unfortunately, the Belle Vue site has been sold, requiring a new venue to be found for 1988. The search for a large enough complex has been undertaken by NARSA and only one site in the North West has proved to be suitable for all aspects of the exhibition. This is the purpose built centre at the Norbreck Castle Hotel, Blackpool.

The NARSA exhibition is normally held in mid-March but this is not possible next year due to prior bookings of the new venue. Therefore it has been necessary to bring forward the date by six weeks, just for 1988, to January 31st.

Further information is available from Peter Denton, G6CGF, Tel: (051) 6305790.

Verulam trip

Dunstable Downs Radio Club's Verulam trip is going to take place on September 8th, starting a hectic month which continues with the fourth National Amateur Radio Car Boot sale, on September 13th. G3WLM is giving a talk on Op-Amps on September 18th, and on September 20th there is a DF Hunt. Certainly there is plenty to keep club members busy!

Meetings are held every Friday at 8pm, at Chews House, 77 High Street South, Dunstable, Beds. Details are available from the Secretary, Tony G0COQ on (0582)508259.

Worthing workshop

Worthing and District Amateur Radio Club has recently introduced Workshop evenings, arranged by G3YHM, which have covered subjects such as capacitors, resistors, inductors and even valves. Future programmes include a surplus equipment sale, a visit by Microwave Modules, and a treasure hunt.

The club meets every Wednesday at the Lancing Parish Hall, South Street, Lancing. Details can be obtained from G4GPX QTHR, on Lancing 753893.

Stockport RAE courses

Readers living in or near Stockport may be interested to know that a Radio Amateur's Examination course will be held again this year starting in September. The course has proved highly successful in previous years and caters for students of all abilities. The course is run on Tuesday evenings.

Following a number of enquiries a Morse course is also planned for beginners and also for anyone wanting to improve their abilities 'on the key'. This course will run on Monday evenings.

Enrolment will take place at Avondale Evening Centre, Heathbank Road, Edgeley, Stockport, from Monday 14th to Thursday 17th September 1987 (1915-2015 hrs).

Further information is available from the Evening Centre Principal, Mr G R Franklin, tel: (061) 477 2382, or from the Course Tutor, Rik Whittaker G4WAU, tel: (061) 427 4730.

More Stockport courses

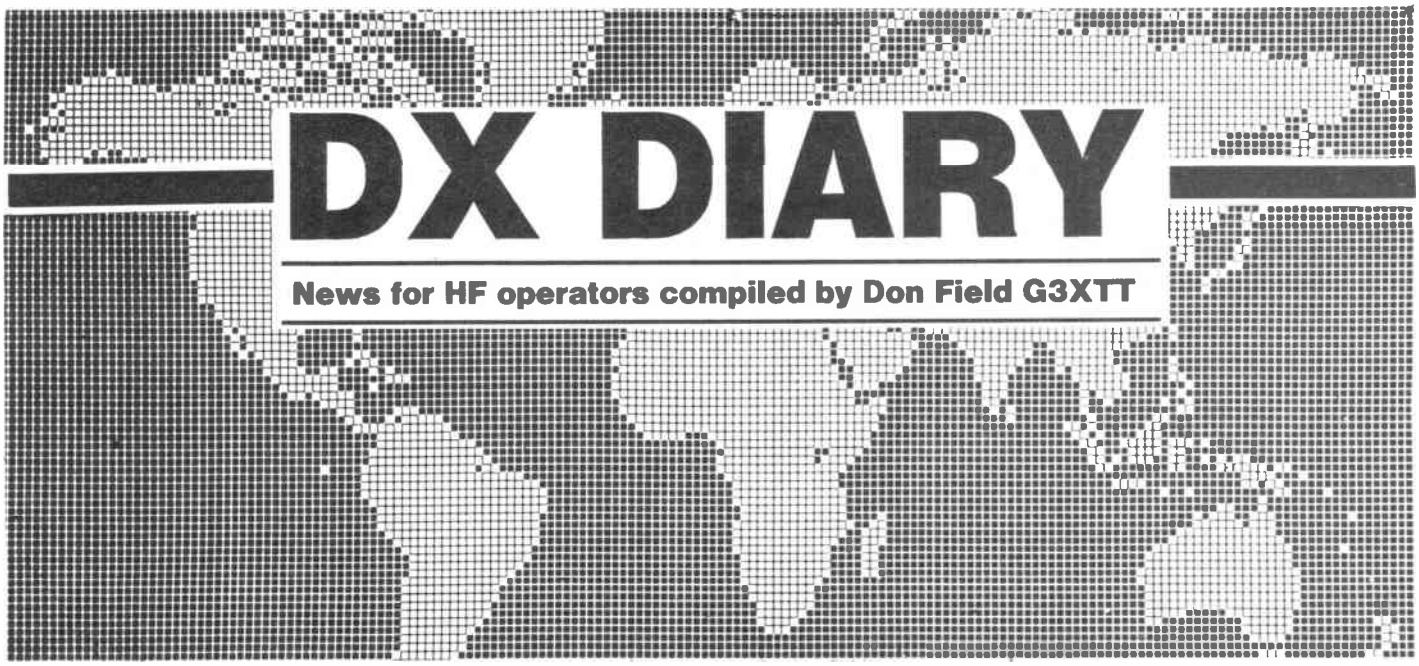
Two courses of interest to radio enthusiasts in the Greater Manchester area are being run this year.

Both of the courses will begin at the start of the September term at the Reddish Vale Evening Centre, Reddish Vale Road, Stockport SK5 7HD. Enrolment for both of the courses will take place on 14th, 15th and 17th September between 7pm and 9pm.

The RAE Exam Course, a course of 25 sessions, leads up to the exam in May 1988, but facilities will be available to sit the December 1987 exam as a re-sit, or for those wishing to obtain the licence quickly. The lessons will run on Monday evenings between 7pm and 9pm.

The Morse Code Course of 25 lessons is for all levels of ability up to about 17wpm. Several tutors will be available to assist. The lessons will run on Thursday evenings from 7pm to 9pm.

Further details can be obtained by phoning (0606) 41511 between 12.30 and 1.00pm and asking for Dave Wood (course tutor).



DX DIARY

News for HF operators compiled by Don Field G3XTT

Fortunately, radio propagation has been rather better than the weather over the summer period, with plenty of DX to be worked on all bands. I write this piece as the Market Reef expedition is in full flow, using the special callsign OF0MA. I have heard lots of G stations working them, especially on ten metres, which is very gratifying. In fact, during late July the sunspot count went well above the 100 mark, and Central and North American stations were being worked quite regularly on ten.

X-Head?

At the time of writing there was some uncertainty about the S0 expedition which I have mooted in earlier columns. If you remember, there was an expedition planned to the Saharan Arab Democratic Republic by the Lynx DX Group of Spain, in the hope that this disputed area of southern Morocco would be recognised as a separate country for DXCC purposes. During July, much to everyone's surprise, a German group, including well-known DX operator DJ6SI, travelled to Algeria with the intention of beating the Spanish group to their goal. Callsigns S0DX and S0CW had been issued to the Germans, but in the event their gear was impounded in Algeria so they were unable to go ahead with their operation.

Subsequent to this, the Lynx group announced that it would delay its operation, even though much of the gear had already been assembled at Madrid Airport. Apparently, the abortive attempt by the Germans had queered their pitch with the authorities. Whether they will have managed to carry out the operation by the time this appears in print remains to be seen. On the other hand, even if they do it seems highly unlikely that the ARRL would count it for DXCC, although OH2BH, who was involved with the planning of this operation, is known to have travelled recently to the ARRL HQ in Connecticut, presumably to put the case for it counting.

Meanwhile, the saga continues. The moral, as always, is that if you hear an S0 callsign on the bands, work it first and worry later.

Walvis Bay

While on the subject of what may or may not count as a DXCC country, how about this one? Walvis Bay is a small South African enclave on the coast of West Africa, completely surrounded by Namibia. Walvis Bay is a valuable port, and has been administered directly by South Africa for many years. As such, being separated from South Africa by 'foreign land', Walvis Bay ought to count separately for DXCC. The ARRL is reluctant to do this, on the basis that Namibia itself is not fully independent but its government is very much under the influence of South Africa.

The ARRL can't have it both ways. It recognises Namibia as a separate country, so ought to recognise Walvis Bay as separate. Meanwhile, according to the US *'DX Bulletin'*, the ARRL is taking a head in the sand attitude and pretending that Walvis Bay doesn't exist. QSL cards for contacts with it are rejected as not counting for anything!

Still on the subject of new countries, I see from the press that India and Sri Lanka are talking about granting independence to the Tamil area of Sri Lanka which, were this to happen, would mean that this area would presumably count as a new one. However, that's still some way into the future.

Satellites

The new Russian amateur radio satellite carrying the RS10 and RS11 transponders has been at the centre of some controversy since it commenced operation in July. This is due to one of its modes involving an uplink on 21260 to 21200kHz, a fairly heavily used part of the 15 metre band. The downlink operates simultaneously on 29360 to 29400kHz and 145860 to 145900kHz. There are four modes of operation, three of which involve the 15 metre uplink.

Presumably, the idea of the satellite was to generate increased activity on fifteen and ten during the sunspot minimum. As such, it seems to have arrived about a year too late.

Straight Key Day

To encourage CW operation in the traditional way (ie, with a straight key), the RSGB HF Committee is sponsoring a Straight Key Day, to be held on 10th October from 0800 to 2100GMT on 80 metres (3515 to 3555kHz). As well as the usual QSO information, participants are encouraged to exchange details of the key being used. No awards are planned, other than the satisfaction of having taken part, but comments, especially on the best 'firsts' heard during the event,' are welcome and should be sent to Colin Turner G3VTT at his callbook address.

HF Convention

I am delighted to be able to confirm that LA1EE will be coming along to the HF Convention (see last month for details) to talk about the 3Y1 operation from Peter 1st Island. There will also be a buffet supper after the event at your scribe's QTH, for those wanting to rub shoulders with the great man (LA1EE, not me!). Cost will probably be £4, and tickets must be obtained from me beforehand as numbers will be limited.

The latest news release from the 3Y operators makes interesting reading. About 1000 QSL cards had to be returned to sender as 'not in the log', apparently due to some pirate 3Y stations which were on the bands at the time. Of the cards which did pass scrutiny, a large number had the GMT time incorrect by one or more hours, and some even had the date out by one day. None of this makes the QSL manager's job any easier, of course.

Incidentally, and I don't know whether it applied to this operation, many UK amateurs are getting a bad reputation by sending self-addressed envelopes to QSL

managers (implying that they want a direct reply) but not enclosing return postage. This is extremely selfish, to say the least.

To raise some cash to pay off the remaining bills, the 3Y group are selling Peter 1st coffee mugs and stamped postal covers which were flown to the island by helicopter to be franked. These various items are available from the LA-DX-Group, c/o B Eriksen LA4HF, Likollen 51, N-1481 LI, Norway.

New allocations

Maltese amateurs now have use of the 18 and 24MHz bands and, from 8th July, Romanian amateurs have been able to use Top Band on a regular basis (the occasional contest operation has been permitted previously).

Anniversaries

This seems to be a year of anniversaries. Apart from the Jubilee of the DXCC, several other anniversary awards have been announced.

The Danish National Society celebrates its 60th anniversary this year and is issuing an award for working Danish stations. Score 1 point for every ordinary Danish station worked and 5 points for each club station. 60 points are required in all to qualify. Send log details and 6 IRCs to OZ1ACB.

The DL60 Diploma is for obtaining 60 points by working special anniversary stations operating from Germany. These stations are signing /60, and count 5 points each towards the award. Club stations (ie, those with prefixes DB0, DF0, DK0, DL0 and DP0) count 1 point each. Send log details and 12 IRCs to DL9XW for the award.

The Luxembourg Society celebrates its 50th anniversary this year. Score 10 points for their award by working LX stations (1 point each) and the special stations LX0RL and LX50RL (5 points each). The award costs 5 IRCs and is available from The Awards Manager, PO Box 1352, L-1013, Luxembourg.

A real newcomer is the Royal Omani Amateur Radio Society, which celebrates its 15th anniversary in November. Work A4XXV on two different bands between 0200GMT on 5th November and 2000GMT on 8th November to qualify for an award. To obtain the award send log details plus 10 IRCs to The Awards Manager, PO Box 981, Muscat. Sultanate of Oman. The society also sponsors an award for working A4X stations in the Sindbad Net which meets on 14200kHz on Tuesdays from 1200 to 1400GMT. Work 5 different A4X stations on 5 different days on the net to qualify. The address and cost are as for the other ROARS award.

In recent years the number of awards available to radio amateurs seems to have increased considerably. Many seem to be sponsored by clubs as an easy way of raising funds or, at least, of generating some publicity for the club. However, with so many awards around, the effect tends to get rather diluted. Only a limited number of major awards stand the test of time. DXCC itself is the main one, of course, plus the *CQ Magazine* Worked All Zones awards. In the UK, the RSGB awards are popular, as are the WAB awards.

In fact, I sometimes find myself in great demand on the bands because I am the holder of one of the earliest WAB books. I remember in my college days running the WAB net on 40 metres during my vacations using my DX-100U AM transmitter. The net had to follow me up and down the band as my transmitter drifted. Those were the days!

Expedition time

Now for news of forthcoming DX operations. Richard G3CWI/CE8 hopes to operate from Wollaston Island off Chile from 14th September to 11th October. G3ZAY will handle the QSLs.

The Indian group who operated from the Andaman and Nicobar Islands earlier in the year have tentative plans for a further operation some time after 1st September. They have funds set aside to assist any Indian amateurs who are available to take part in the operation. These amateurs will have to be proficient in both SSB and CW operating, and will also be expected to give radio training to some of the residents of the islands. It is hoped that some suitable candidates will come forward.

KA2IJ hopes to lead a 3 man operation to Iwo Jima (JD1) starting on 2nd September. As well as himself, the operators will include 7J1ADJ and HL9TM. At one time, KA callsigns were restricted for use by US servicemen in Japan – but are now also used on the US mainland, which causes a certain amount of confusion. Apparently, those KA amateurs who do operate from Japan are rather restricted in terms of the power they can use and also by the fact that they cannot work regular Japanese amateurs.

Incidentally, the frequencies announced for the operation from Iwo Jima are somewhat unusual. For example, on 20 metres the group plans to transmit on 14140kHz and receive between 14240 and 14250kHz.

An early warning now, with the news that F6CZB (ex-J28EI) will be the next operator on Amsterdam Island (FT8Z) from December and plans to be operational on all nine HF bands, mainly on CW. If his excellent operation from Djibouti is anything to go by, he should be much in evidence on all bands, enabling everyone to get FT8Z in the log.

Look out for the Liverpool and District Amateur Radio Society from the Isle of Man from 4th to 14th September. This will be their 7th operation from the island, and will include RTTY on 10-80 metres.

Other news

Several stations seem to be active from Iran at the moment, with EP2DL being particularly in evidence. QSLs have been received from these stations, but it is not yet known whether they will count for DXCC.

DX News Sheet reports that the only stations active from the Vatican are HV1CN and HV3SJ. Similarly, the only stations active from Saudi Arabia at the moment are HZ1AB, HZ1HZ, HZ1FM, HZ1TA and HZ1HA.

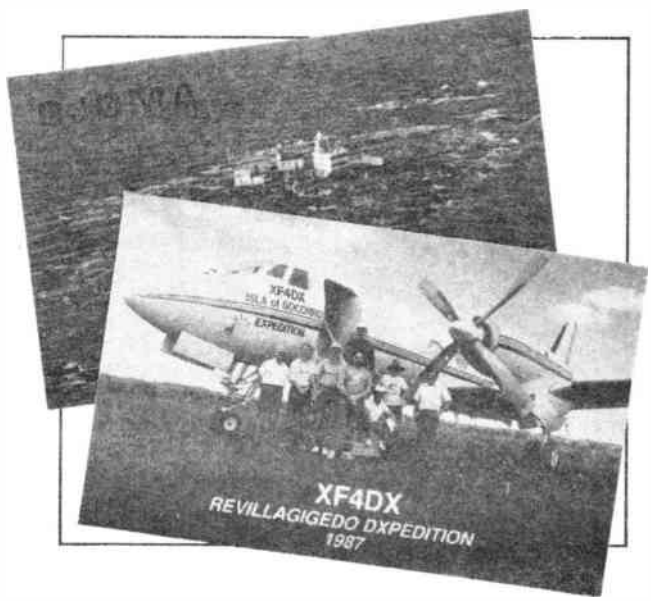
KC7UU, who was very active from West Africa last year, is now based in Cyprus for two years and has been much in evidence on 20 metres CW as KC7UU/5B4. However, he still manages to get around and has also shown as JY5AD from Jordan.

W2MZV, who used to be the QSL manager for 4U1UN, has become a silent key. The QSL chores have apparently been taken over by W1XX.

Contests

Finally, remember that the major contests in September are the Worked All Europe SSB Contest (on 12/13th) and the Scandinavian Activity Contests (CW on 19/20th and SSB on 26/27th). The latter ones run for 27 hours each, from 1500GMT on the Saturday to 1800GMT on the Sunday. Remember also the new CQWW RTTY Contest on 26/27th September, which I mentioned in the July column. Full details of known expeditions scheduled to coincide with the CQWW SSB Contest in October will appear next month. Until then, 73 and good DXing.

Attractive cards from the recent Revilla Gigedo DXpedition (bottom) and the earlier Market Reef operation site as seen by the operators (1981)



HF ANTENNAS FOR SMALL GARDENS

Don Field G3XTT offers some practical information on antenna design and construction in the first of a series for the HF band operator whose aerial space is at a premium

Quite frequently I get letters from readers of my *DX Diary* column asking what antennas I recommend for the small garden. Some readers think that, from the typical British garden, it can't be possible to work the various DX that is mentioned in my column.

What I aim to do in this and subsequent articles is to show that, even where space is at a premium, quite surprising results can be achieved on the HF bands. Certainly, when I have lectured on the topic, my audiences seem to have gone away with plenty to think about! These articles, then, are a response to enquiries I have received, and draw upon feedback from those who have heard me speak on the subject, to whom many thanks are due.

Before starting on this series of articles, I looked back at what has previously been published here in *Amateur Radio*. G3BDQ, G3AAG, and others have provided some useful material, especially on wire antennas, and I don't intend to duplicate what they have done. What I will do is to give some practical information on antenna design and construction relating particularly to the more ambitious antennas for the HF bands. Just because space is at a premium doesn't mean you should set your sights too low!

Just to give you some idea of what can be achieved, I worked my first 200+ countries on HF from a typical housing estate plot with 30ft square back garden, and came within a whisker of achieving 5 band DXCC from the same site before my job forced a change of QTH. Admittedly all this was around the last sunspot peak, but band conditions over the next few years should improve quite rapidly to allow similar achievements. I know of several UK amateurs who have worked 300+ countries with wire antennas from small plots, admittedly taking many years in the process.

What targets?

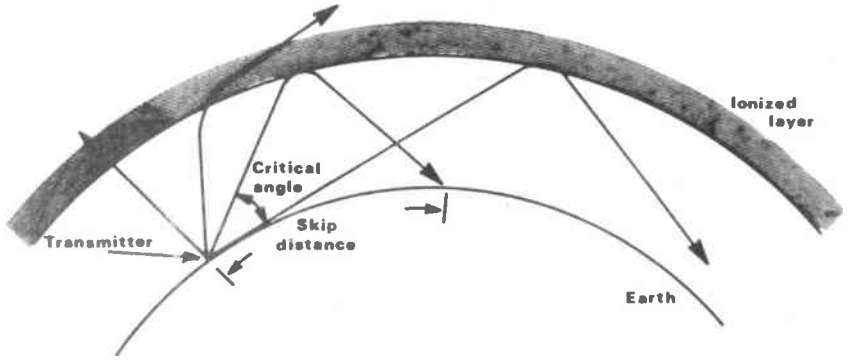
The first question to ask, though, is what you hope to achieve on HF. This question is vital when space is at a premium. If you have acres of land, then it is quite possible to put up a variety of antennas for each and every band without any significant interactions. From a small plot, putting up a multitude of antennas will not only look unsightly (!), but will be counter-productive because they will tend to interact with each other, causing a drop in performance.

Now, there are some folk who sell their services to the amateur radio community, offering to design the optimum antenna system for your QTH. I intend in these articles to put those folk out of business by giving you enough basic information to do the job yourselves. So let's make a start with a few examples.

Let's suppose, firstly, that you are interested in working new countries. At the present state of the sunspot cycle this probably indicates concentrating on 40, 20 and, to a lesser extent, 15 metres. Fifteen will become more important over the next few years, and ten will probably be your best DX band in 3 or 4 years time. In fact, at the moment 40 might be the band to concentrate on. Why? Because even those with room for an HF beam often have to resort to simple antennas on the lower bands, so you will be able to compete on an equal, or almost equal, footing, whereas on 20, unless you have room for a beam, you may find yourself losing out more often in pile-ups. Either way, for DX working you are looking for an antenna with a low angle of radiation in order for your signals to propagate as far as possible between reflections from the ionosphere (*Figure 1*). A high dipole, a small beam of some kind, or a vertical antenna might be appropriate.

Fig 1 *Sky wave propagation*

Long distance HF propagation relies on reflections from the ionosphere, primarily from the so called F layer, which can be at a height of anything from 130 to 260 miles above the earth according to the season, time of day, latitude and solar activity.
The highest angle at which signals will be reflected is known as the Critical Angle. For maximum distance per hop, though, radiation should be at an angle close to the horizon. In this case signals can travel up to 2500 miles before returning to earth. Greater distances are by multiple hops or by ducting within the F layer



A different example

Let's take a different example. Suppose you want to chase squares for the Worked All Britain Award. This involves working around the UK, so a high rather than low angle of radiation is the order of the day. A low dipole on 80 metres would probably be favourite, even if the ends had to be bent to fit it into the space available.

Thirdly, let's suppose that you are keen on contest operating. Now, this opens up a host of possibilities. Even the longest contests only last for 48 hours, so in this case it is possible to contemplate putting up antenna systems on a temporary basis, the kind of antennas that you wouldn't dare to leave up all the time! I remember one American who, while living over here, showed the Gs a thing or two by taking this approach. He lived on a housing estate in one of our 'new' towns, where antennas were restricted but, on the Friday before the contest, up would go the aluminium lattice tower, light

enough to put up single-handed, but strong enough to support a triband beam plus various LF wires. With this arrangement he was able to put in some very creditable scores.

Before I go on, I should say that I am taking it for granted that you are prepared to put some effort into making the most of your small garden. This may mean running full legal power to make up for any deficiencies in the antenna system, and being prepared to tackle any TVI problems which rear their heads. It may mean having to go ahead and get planning consent for a tower of some sort, and I am in the process of writing an article for *Amateur Radio* about this very subject.

It may mean being prepared to put in a lot of work on a good earth system. Just remember that nothing comes free in this life, and if you want to put out a decent signal a little effort will be required. You can't be a successful fisherman if you are not prepared to sit out in the rain occasionally, and you can't be a successful radio operator without putting some effort into the station.

Full-size systems

What I will do is to cover various types of full-size antenna and then go on to describe how size reduction can be achieved while not compromising too much on performance. Remember, though, that the laws of physics are inviolate, despite the claims made by some antenna manufacturers! When all is said and done, a half wave dipole on 20 is 33ft long! Yes, of course it is possible to load up a dipole of less than a half wave or a vertical of less than a quarter wave, but matching will become more difficult and resistive losses will start to become more significant.

This will not be too important for a receiving antenna, and there are some very nifty little active receiving aerials around these days. They incorporate an amplifier to make up for losses due to the small size and low radiation resistance of the antenna. For transmitting aerials, though, the degree of size reduction which is realistically achievable is a lot less.

Anyway, enough of this preamble. Let's get on to some practical antenna systems. When talking about full sized antenna systems, the three basic types are the half-wave dipole, the full-wave loop, and the quarter-wave vertical. *Table 1* shows the dimensions for each of the HF amateur bands. These dimensions are calculated on the following basis:

Length of half-wave dipole (in feet) = 468/frequency in MHz. Length of full-wave loop (ft) = 1005/frequency in MHz. Height of quarter-wave vertical (ft) = 234/frequency in MHz.

Remember though that with all antenna work calculated dimensions are only a starting point. When space is limited this inevitably means that your antenna will be close to other metal objects, such as drainpipes or TV antennas, and this will affect the resonance. So the best approach is to cut the antenna to slightly greater than the theoretical dimensions and then trim it a little at a time, watching the SWR meter for resonance (ie lowest SWR). Even better, use a GDO or a noise bridge and receiver to determine the resonance (more about this approach in a later article).

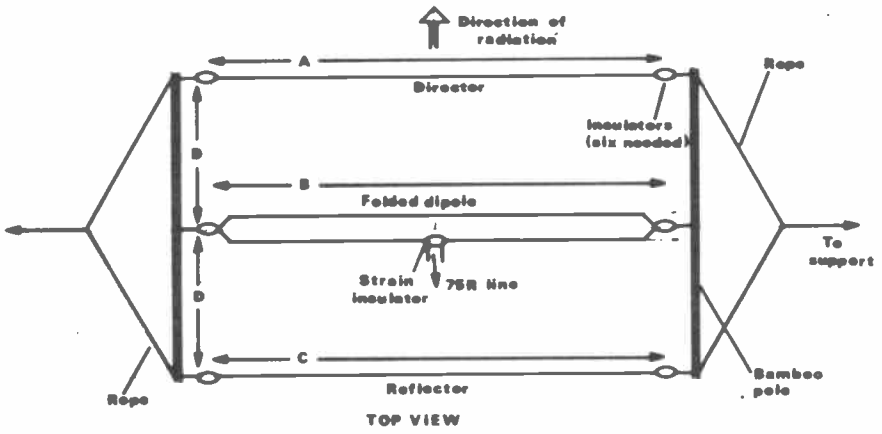


Fig 2 *Construction of a wire beam*

The humble dipole

Starting with the humble dipole, this can be supported at either end as a horizontal dipole, or can be supported at the centre so that it becomes the classic inverted vee. The height at which you erect a dipole may well be determined by practical considerations of what supports you have available. Remember, though, that a dipole will need to be at least a half wavelength above ground to achieve a reasonable amount of low angle radiation, as needed for DX working. For short haul (up to, say, 1000 miles) a lower dipole will actually be more effective.

The radiation pattern of a dipole is well known. Maximum radiation is broadside to the antenna, with minimum radiation from the ends. So when siting your dipole it is important to consider what will be your preferred directions. For most people this will be East-West, given that the majority of HF operators are concentrated in Japan, Europe and the USA.

A wire beam

Now, a dipole is all very well, but some 3dB of gain is possible by adding a parasitic element. This will have the effect of concentrating the power in one direction. For maximum gain, this parasitic element will be a reflector where the spacing is around a quarter wave but, when close spacing is employed, the use of a parasitic director is preferable.

Adding a parasitic element doesn't necessarily mean having to go to the trouble and expense of making or buying a traditional plumber's delight Yagi. It is quite possible to make a wire Yagi which will perform as well as a beam made out

Table 1

Dimensions for Basic Antennas

Frequency (MHz)	Half-wave dipole	Quarter-wave vertical	Full-wave loop
1.825	256ft 5in	128ft 3in	550ft 8in
1.9	246ft 4in	123ft 2in	528ft 11in
3.525	132ft 9in	66ft 5in	285ft 1in
3.65	128ft 3in	64ft 1in	275ft 4in
3.795	123ft 4in	61ft 8in	264ft 10in
7.05	66ft 5in	33ft 2in	142ft 7in
10.125	46ft 3in	23ft 1in	99ft 3in
14.05	33ft 4in	16ft 8in	71ft 6in
14.2	32ft 11in	16ft 6in	70ft 9in
18.1	25ft 10in	12ft 11in	55ft 6in
21.05	22ft 3in	11ft 1in	47ft 9in
21.2	22ft 1in	11ft 0in	47ft 5in
24.94	18ft 9in	9ft 5in	40ft 4in
28.05	16ft 8in	8ft 4in	35ft 10in
28.5	16ft 5in	8ft 3in	35ft 3in
29.5	15ft 10in	7ft 11in	34ft 1in

of tubing and which will be much less visible to the neighbours. Of course, it won't be possible to rotate it, but with a little imagination it should be possible to arrange to 'flip' it over when required in order to change the direction of radiation by 180 degrees.

Adding a close spaced parasitic element will reduce the feed impedance of the antenna to quite a low level, so the answer to this is to replace the dipole element with a folded dipole, which will bring the feed impedance back to a suitable level to match to co-ax. You can use 300 ohm ribbon to make the folded element, or any other method which is convenient. The spacing of the two wires in the folded dipole is by no means critical. Using a two element wire beam of this kind on twenty, I have been very pleased with the results, even when the antenna was only about a quarter wavelength above ground. I have also used a forty metre version from the G6UW contest QTH and, beamed on the USA, this has helped us keep up an excellent QSO rate while the band was open to the West.

A third element can also be added without too much trouble, and now you have a full size, 3 element Yagi which will out-perform a commercial tribander with its lossy traps. Of course, you have only a single band antenna, and cannot rotate it to all points of the compass, but think of the money you have saved! And if, for example, your main interest is in morning skeds to Australia, then a fully rotatable system would be an expensive luxury.

G4ZVB described a 20 metre wire beam along the above lines in this journal in November 1985. For convenience, though, *Figure 2* shows the basic constructional details, and *Table 2* gives the dimensions, not only for 20 metres, but for some other bands too. At the moment we are not allowed to use 'gain' antennas for transmitting on 18 and 24MHz, but hopefully the time will come when this restriction is lifted.

Of course, even where space is limited it is often possible to put up a full size rotary beam for 10 metres. A two element version is not much bigger than some VHF antennas and can be turned by a VHF grade of rotator. So don't discount beams just because space is short. Ten metres may not be doing much at the moment, but in a year or two it will once again be carrying the majority of DX traffic. My most successful 10 metre Yagi was built from the damaged parts of a commercial tribander. As a monoband beam it outperformed (on ten metres of course!) any tribander I have ever used and was much lighter, smaller and easier to handle.

Enough, then, of Yagi antennas. Next time I will turn to quads and to vertical arrays, both of which offer useful amounts of gain, while not demanding too much in the way of space.

Table 2 *Dimensions for a wire beam*

Band	Director (A)	Dipole (B)	Reflector (C)	Spacing (D)
40	62ft 9in	66ft 5in	70ft 7in	16ft 0in
30	43ft 8in	46ft 3in	49ft 1in	12ft 0in
20	31ft 3in	33ft 1in	35ft 2in	8ft 0in
17	24ft 5in	25ft 10in	27ft 6in	7ft 3in
15	20ft 10in	22ft 1in	23ft 6in	6ft 6in
12	17ft 9in	18ft 9in	19ft 11in	5ft 0in
10	15ft 6in	16ft 5in	17ft 5in	4ft 0in

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KENWOOD TW4100E

Dual band high power FM mobile

This innovative rig is the successor to the TW4000A, which I reviewed very favourably nearly four years ago in this magazine. The 4000A's main competition was the Yaesu FT2700 and the Icom IC3200E. There are very considerable differences between these three models, and you may find it convenient to refer to my *Buyer's Guide to Amateur Radio* (published by the RSGB) or back issues of this magazine for comparative details. I have actually used a TW4000A for four years now, and have always been delighted with its performance. I found two snags with it, however; the lack of 12.5kHz channelling on 2m and a memory to VFO function, which are occasionally rather annoying.

There was considerable talk about the Kenwood TW4100E over six months ago, and it is not altogether clear why its release was held up. However, I suspect that it may have been due to an original lack of 12.5kHz channelling, despite this requirement having been mentioned time and again to Trio Kenwood in Japan for four years. Note that modifications have also had to be made by Kenwood to the TH215E for it to incorporate 12.5kHz channelling. At the time of writing, Lowe Electronics are putting in the modifications for this on request, but fairly soon, I understand, they will be put in by Kenwood at the factory.

It is quite clear to me that this rig has been well worth waiting for, and I have been able to work it very hard indeed over the extended period of my holiday in Scotland and the North of England.

The rig's facilities

The rig covers 2m from 144 to 146MHz, and 70cm from 430 to 440MHz. Other versions can provide complete coverage to 148MHz for the US market for example, and also the US 70cm band, which is different to ours. Considering the size of the unit (only 150mm W by 50mm H by 214mm D [including projections] and weighing 1.8kg excluding mobile mount), the maximum available output power of 50W on 2m and 35W on 70cm is quite astonishing.

The front panel facilities include push-button microprocessor control for selecting the single VFO or memory channel operation, selectable tuning steps with the normal tuning knob and a 1MHz button which allows 1MHz steps to be given for quick band QSY. A row of five buttons is used for writing into memory or placing a memory channel into the VFO, selecting scan mode, toggling between repeater shift on or off, switching 1750Hz auto toneburst on or off and selecting reverse repeater or duplex frequency changeover. An additional row of five buttons is used for programming and operating the standard Trio Kenwood DCL system, which by now is almost certainly known to the reader, and which this time I will not bother to detail.

Just above the tuning knob is a 'select' key button for cycling through various presetting modes. These allow the user to select the normal repeater shift of – or + or, for duplex operation when shift is chosen, 2m and 70cm channelling, which can be set separately on each band at 5, 10, 12.5, 20, 25 or 50kHz steps, plus the repeater frequency shift for each band (0, 0.6, 1.6, 5 and 7.6MHz).

When changing one of these preset modes, you first cycle the 'select' button to the appropriate mode to be changed and then rotate the tuning knob clockwise to go through the different possibilities. Having selected the required one, you then press the 'select' button until you see the frequency displayed normally and hear a long toneburst simultaneously.

There are 10 memory channels, memories 0 to 7 being conventional, holding frequency, toneburst on-off and repeater shift information, while memories 8 and 9 can have any required separate Tx and Rx frequencies inserted. Memories 2 and 7 also have special functions when DCL is in use. Normal up and down scanning can be selected, and when a busy channel is found, the rig can stay on it and then resume scanning a few seconds after the channel becomes vacant. A touch of the PTT, etc, stops scanning. If the memories are selected, then memory scanning occurs when the scan button is depressed. There is provision for locking out any unwanted channels during memory scanning.

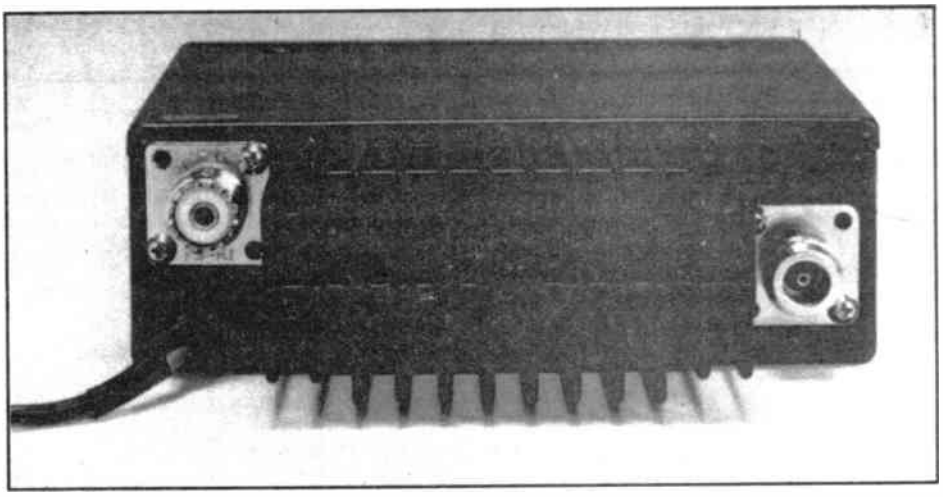
Duplex operation can be selected by means of the mode selector button, and in this mode you can receive on one band while transmitting on the other. This works extremely well in either direction from band to band with the rig on low power, but I found that when on high power, noise and harmonics from 2m Tx could more easily block the 70cm receiver, especially if a single dual band antenna was in use with a duplexer or the antennas were fairly close together.

The small volume control includes the 13V dc on/off switch, and also a push changeover switch which selects low or high power operation. In the low power position, the rig delivers approximately one tenth of full power. By its side is the squelch control which, when lightly pressed in on a spring-loaded switch, causes a speech frequency readout to occur, provided the optional speech board, type VS-2, is fitted.

The front panel display shows frequency, memory channel, shift, tone and other status functions. The display is black on a green background and is easy to see over a fairly wide angle. The normal Kenwood 8 pin mic socket is fitted on the front, and a hand mic is supplied with the rig, having up and down buttons and a PTT lever.

Case and rear panel

The internal speaker is mounted underneath the rig, so you will need to use an external speaker if you use the rig as a base station, unless you raise the front quite a lot. A mobile mount is supplied, and it is quite easy to slide the



rig out of this mount. The back panel includes a fixed N socket for 70cm antenna connection and an SO239 for 2m. It is, perhaps, a pity that they did not follow the new convention, in which short captive leads are fitted with the appropriate line sockets, as these are much easier to cope with when taking a rig in and out of a car quite frequently.

It is unfortunate, but one has to do this all the time nowadays because of the serious increase in car break-ins. The 13V dc connection, however, is with a short captive lead and special socket, the supplied extension lead (just under 2m long) having 20A fuses in positive and negative connections. The only other interfacing is a 3.5mm jack socket for connecting an external speaker. Across the back of the rig is a very substantial heatsink, but unfortunately there is no cooling fan internally and frequent use of high power on a long journey causes a considerable heat build-up.

A 'secret' facility

One extremely interesting mode of operation was found in which the rig will behave as an automatic repeater from either band to the other. This mode is not allowed under our present licence regulations, but it could be used for Raynet purposes in an emergency by providing amazingly effective talk through repeating. To enable the mode to work, an interconnection has to be made on one of the circuit boards which provides a connection between the received audio path and an appropriate stage in the transmit audio before the modulation stage.

If the modification has been fitted, the auto repeater mode can be selected, and is operated as follows. Select a 70cm simplex frequency and place it in one of the memories 0 to 7. Check that it is in this memory without toneburst. Then select a 2m frequency on the VFO without toneburst and check that the 2m band repeater shift is on 0kHz and the mode is duplex for 2m. Unplug the microphone from the rig, adjust the volume control to a fairly quiet level, and also the squelch control so that it does not open on band noise on either band. Turn the rig off with the volume control, depress the reverse button and keep it depressed whilst turning the rig on again, setting the volume to its original position. Release the reverse button and you will hear three long dashes like a letter 'O' in CW.

You will notice that the rig is switching between the 2m and 70cm frequencies around twice a second. The first signal it picks up which opens the squelch will be retransmitted onto the frequency for the other band. When the original received carrier drops, the rig returns to the dual band switching Rx mode, and once again a carrier on either band will cause the rig to switch so as to retransmit onto the other band.

This could be amazingly useful in an emergency as it would permit a group of 70cm walkie-talkie portables around the scene of an accident, not only to contact each other, but to be retransmitted via the TW4100E mobile auto repeater onto the Raynet 2m local simplex frequency. Any instructions received on 2m would, of course, be retransmitted to the low power portables.

The system would work superbly well only if discipline was extremely strict, and it would have to be remembered that any 2m station on the 2m frequency would be retransmitted onto 70cm and perhaps block the 70cm hand-held stations from talking to one another.

There is one slight snag once the board linking has been carried out to enable the auto repeater function. If you use the rig in the normal duplex mode, the received signal which you will be hearing on the set's loudspeaker, or the external one, will also be injected into the transmit modulator in parallel with your modulation, via the mic. This is very convenient for someone listening who would like to hear both sides of the duplex QSO, but you will have to be extremely careful to avoid retransmitting any callsigns. Release your Tx PTT when the other station is identifying; he should also do the same when you are giving your callsign.

I have heard that several county councils and Raynet areas have already had demonstrations of this auto repeater facility, and should be planning to use it on some exercises.

Subjective trials

I used the rig over a two and a half week period in late June and early July, almost always with the Kenwood duplexer and MA4000 dual band antenna, which was gutter-mounted above the front passenger seat. The rig had been fitted with the optional speech frequency readout board and the DCL system.

I had the opportunity of using the rig on virtually all of the 2m and 70cm repeater channels as our journey took in the Midlands, the North and most of Scotland, just excluding the West region and North of Inverness. I noted a number of annoying spurii on both bands, the frequencies of these including 144.475, 144.7, 144.925, 145.625, 145.85, 431.3 and 438.7MHz. By far the most serious of these were of course 144.7 and 145.625, the latter being absolutely maddening as it frequently almost obliterated the Isle of Man repeater which I was picking up fairly weakly when we were staying in Cumbria. I had to put the squelch on quite hard if I was monitoring this repeater channel, but not actually in QSO.

It eventually turned out that the problem was due to pick up from the DCL modem option board, and when this was removed all the sprogs disappeared. Lowe Electronics have now designed a fix for the problem, but this was not available in time for my subjective trial.

I did not have the rig in a well ventilated position in the car, and it did get rather hot if I was on high power in a ratio of 50/50 Rx/Tx for more than 40 minutes or so. The heat build-up first showed up as crackles on the speech readout when it was recalled, but a minute or two later the crackles changed to complete gobbledegook, which I could only describe as speech from outer space! It was totally incomprehensible, and not even Japanese, which one can actually intentionally select with an internal link!

The artificial speech board is supplied with instructions for altering the speech rate, and we found after much fiddling that the instructions were incorrect; funnily enough this has always been the case with earlier Trio boards. In order to get the fastest speech speed we found it necessary to join 1, 2 and 3, representing numbered tags on the board. Many friends of mine find this fastest speed almost unintelligible, but I am used to it and find it superb, as it gives the information so quickly. As supplied the speed is ridiculously slow and ponderous.

The sensitivity on both bands seemed excellent, but it was just as good on the TW4000A. The extra power was very useful indeed, and greatly helped when we were in hilly terrain. The low power position gave just about the right amount of power for normal QSOs and was thus well chosen. Speech quality was considered excellent on Tx and received audio was also very good. I did not have any problems with the front end under simplex or repeater operation and the selectivity seemed very good for 25kHz

channelling, although a little marginal for 12.5kHz spacing, the rig being fitted with an F filter. However, the sample might have been slightly on the wide side of the specification.

I found the operation of the memories and the facility of transferring from memory to VFO to be much better than the facilities of the TW4000, but there were one or two strange changes in ergonomics that were less easy to accept quickly. There is only one VFO, and if you have accessed a particular repeater channel with its appropriate negative or positive shift, auto toneburst and amount of shift into the VFO, and you then use the MHz button and retune the tuning knob up or down for the other band's repeater, you will find that you cannot get into them immediately.

When you push the PTT, you will find that the repeater frequency shift is correct, the toneburst is there, but the shift direction is incorrect, eg minus instead of plus. A swift reach for the shift button reveals that this cycles between shift on and off, and you actually have to access the select button function, rotate the tuning knob to the appropriate shift direction, then push the select button several times to re-engage normal operation. This is absolutely maddening, but after struggling with it for some time I realised that I had been prejudiced by the operational technique that I had been using previously with the TW4000, which of course has two running VFOs.

I had to rethink the ergonomics and settled for putting a 2m repeater in memory 0, a 70cm one in 1, 145.5 simplex on memory 2 and 433.5 simplex on memory 3. If I wanted to change band I would select memory mode, and the appropriate memory, and then press the memory button, which transfers the memory to the VFO if you are in the memory mode already. Since the memory retains the appropriate shift and toneburst info, I had no further trouble. The buttons on this rig were not quite so tightly packed as on the 4000, so it worked out somewhat easier in the long run.

Another snag which could not be overcome was that the Kenwood mic supplied was not able to remotely control VFO/memory selection, the 1MHz up/down facility, nor command the speech readout, all of which is available on the earlier model. This is rather a shame, and I cannot see why Kenwood could not have wired up the mic socket to take either the old or new types of mic, perhaps supplying the old mic as an optional extra.

What a superb idea it is to have all the different channel spacing selections available to the user, except for 15kHz which is the standard now in the US. You have at least got 5kHz, though, but this is slightly more annoying than having the correct one. It was also an excellent idea to be able to select different channelling for the two bands and, whereas I used 25kHz channelling in the North of England and Scotland, I returned it to 12.5kHz on 2m on my return to London.

The different repeater frequency shifts are not necessary on 2m (other than 0kHz for the auto repeater function as well as the normal 600kHz). However, various different repeater shifts are in use around the world on 70cm, eg Germany uses 7.6MHz. It is a very simple matter to change the settings if you take the rig to Europe.

I found I became used to the operation of all controls more quickly with this rig than some of its predecessors, and so I feel the ergonomics are basically very good. One or two minor problems did crop up, though, when I used duplex modes. Obviously, when transmitting on 2m and receiving 70cm, one has to avoid trying to receive on, or near, harmonics. However, I found that there was considerable densensitising when I was using high power on 2m, and the slightly poor intercept point on 70cm is probably the culprit here. Even so, I found that it was possible to use low power duplex with the external Kenwood duplexer and dual-band antenna, and the performance was quite impressive. It was only necessary to use the reverse button to swap Rx and Tx over, and the performance was generally better when transmitting on 70cm whilst receiving on 2m.

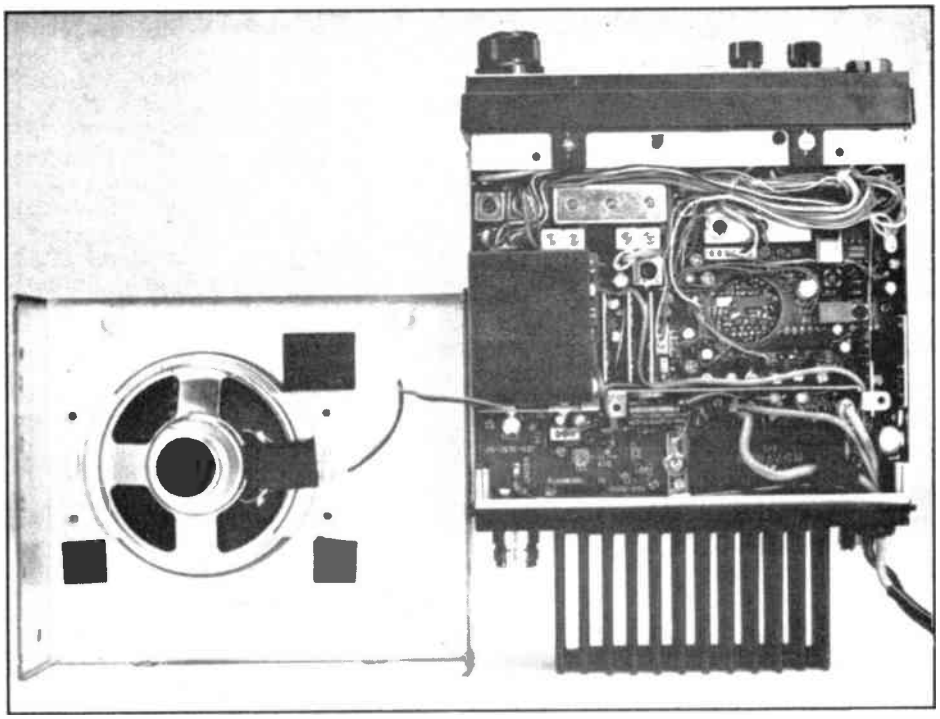
I tried out the auto repeater function, and found that it worked superbly well when receiving 2m and transmitting 70cm, but for some extraordinary reason, the review sample only seemed to want to receive 70cm and transmit 2m when it was very cool. After just a few minutes of operation, it would hunt continuously when receiving a 70cm carrier and send rows of the letter 'O', refusing to lock into the retransmit mode. Lowe Electronics informed me that a modification has been sorted out in Germany for this, which occurs with just the odd sample, and so the problem can be solved.

All the scanning modes worked well and I found the reverse repeater switching particularly useful as it could be set one way or the other, rather than just reversing when the button was held down. I found that memories 8 and 9, the channels that accept separate Rx and Tx frequencies, could be set to Rx and Tx on different bands. I tried to use these memories for strange functions, including duplex, but I could not find a way of doing it.

Working out the problem

Returning to the auto repeater mode, it actually took me a considerable time to work out how to avoid a ridiculous situation which occurred when I first used it. Having set up a 70cm simplex frequency and dialled in duplex on 2m as instructed, I found that the transfer from 2m to 70cm was normal, but from 70cm to 2m (when it worked) the 2m shift came in and so the transmission was 600kHz low. It took me a long time to realise that one had to temporarily put the repeater shift frequency at 0kHz specifically for this operation and I feel Kenwood should have avoided this problem with more suitable internal software, as the facility itself is obviously of very great use in an emergency, and may well be used by many amateurs with extremely low power hand-helds on 70cm, especially if we are one day officially allowed to transmit on more than one band at once.

Even allowing for the many improvements in this model as compared with the earlier TW4000A, and after considering everything, I still miss a second running VFO, which could have been selected by a simple in/out button. This would have allowed immediate change of band, and would have made the setting of duplex frequencies much quicker and simpler. One has to concentrate much harder when setting up duplex etc with the rig as



it is, and there are more operation steps required to set up duplex working.

I am also surprised that Kenwood have omitted a rear multipin socket which could have had receive and transmit audio pins, as well as other control lines, to give the rig much more flexibility, especially in an emergency. How convenient it would be to be able to interface the gear with an external data set-up or a telephone line using the usual external patching circuits. Perhaps these facilities may be introduced soon in a new Kenwood dual-band multimode base station – we will just have to wait and see.

I did not do any lengthy tests on the DCL system as it seems that very few users are interested in it, and I have never heard anyone actually using it myself, other than one or two friends of mine who have been trying it out with me and who quite like it. Maybe it could be useful one day, but the big drawback is the lack of standardisation between Kenwood, Icom and Yaesu. It is just like quadraphonic discs – they never really took off because there were at least three systems being marketed, and the mass confusion eventually resulted in quadraphonic sound virtually disappearing from the marketplace. Many of us are getting thoroughly fed up with the NIH ('not invented here') attitude of so many Japanese manufacturers.

As far as I can ascertain, Kenwood were the first to market a DCS/DCL system on amateur radio equipment, but Yaesu and Icom went their own way. I do feel that Kenwood's DCL system is a very good one, however, and could be most useful to Raynet, so you may find it worth investigating.

Laboratory Measurements

Receiver tests	
RF input sensitivity, level for 12dB sinad DCL board fitted	
144.025	−123.4dBm
144.95	−122.5dBm
145.975	−123.5dBm
432.025	−123.6dBm
433.4	−123.6dBm
435.975	−123.6dBm
439.975	−123.3dBm
As above, dc board removed	
144.025	−123.7dBm
144.95	−123.2dBm
145.975	−123.6dBm
(430MHz band figures as before)	
RF input intercept point 100/200kHz spacings	
144MHz band	−16dBm
430MHz band	−26.3dBm
IF selectivity mod on wanted and unwanted	
12.5kHz spacing average	+6dB
25kHz spacing average	+69.5dB
Capture ratio	3.3dB average
3dB limiting point	well below −127dBm
S meter	
S1	−118dBm
S3	−114
S5	−109
S7	−106
S9	−104
S9+	−103
S9++	−102
S9+++	−101
FM discriminator distortion 1kHz mod,	
3kHz deviation	1.5%
5kHz	2.4%
Max audio output power for 10% THD	
8 ohms	2.6W
4 ohms	4.1W
FM quieting at 12dB sinad sensitivity point	12.6dB
Transmitter tests	
Output power high (13.8V dc)	
144.025MHz	52W
144.95	52W
145.975	50W
430.5	36W
433.5	35W
435.5	34W
439.5	32W
Output power (low) typical	
144.95MHz	4.5W
433.4	3.5W
NB taken with 13.8V dc	
Max deviation typically	4.8kHz
Transmitted s/n ratio	47dB
Maximum Tx frequency error	
144.95MHz	240Hz
433.4MHz	330Hz
Typical heat frequency drift	200-300Hz over 20 min
Typical dc current consumption Tx	
High power	10-11A
Low power	approx 4A
Channelling capability	5, 10, 12.5, 20, 25, 50kHz
Repeater shift capabilities	0, 0.6, 1.6, 5, 7.6

Receiver lab tests

The RF front ends are very sensitive, although they are no more so than the TW4000 was. The RF input intercept point is somewhat inferior to the TW4000 on 2m and a long way inferior on 70cm, and the measurements were quite a surprise to me. In practice, they should be good enough for normal use, but duplex working may produce more desensitisation than usual under some circumstances. The selectively measurements were excellent for 25kHz channelling, but it seemed that the F filter in this review sample was a little wide as measurements with modulation on both the wanted and unwanted carriers gave fairly poor figures, although the test is a very difficult one for close channelling. The selectivity was in any case very slightly uneven close in.

The S meter gave 14dB difference between S1 and 9 and required only a 3dB increase to hit the top of the shop, so although this is not the worst FM S meter, there are many better ones indicating a much better range. The meter is in the form of pairs of black bar segments appearing on the display just above the S meter scale. These were quite clear and easy to read, and the sensitivity was about the same for S9 etc on both bands.

The capture ratio measured unusually well, indeed as well as I have yet measured on any narrowband FM system rig. This coincides with excellent limiting, showing very good discriminator design. The effect will be that the set discriminates better than usual between stronger and weaker stations on the same frequency.

Audio distortion was at fairly low levels, and the maximum audio power available, whilst being average into 8 ohms, showed a useful and substantial increase into 4 ohms which might be useful. The received overall audio response on a pre-emphasised signal showed an extremely good compromise, low frequencies rolling off very rapidly below 350Hz or so, whilst the high end only started significantly rolling off above 3kHz, being 12dB down at 5kHz. The pre-emphasis used was 750μS so the responses indicated show the system response.

We did not note any significant improvement to sensitivity when returning the signal generator slightly off channel, and so receiver frequency accuracy was good.

Transmitter tests

We had a long look for any transmit spurii, first looking close in, and then on harmonic frequencies of both bands. No sprogs were noted above a level of −75dBc and harmonics were all below −70dB, the limit of the analyser used.

Maximum power output was reached between the bottom and the centre of the 2m band, at 52W, well above the specified 45W. Low power was just below 5W, an excellent compromise. On the 70cm band, high power averaged 35W in midband, but was very marginally higher below 431MHz, and by 439MHz power had dropped just a little to 32W. Low power was typically 3.5W across the band. These measurements were taken at 13.8V dc and the average current was 10 to 11A on high power.

The frequency accuracy on both bands was excellent, and even after 20 minutes of transmission time the worst error noted was 240Hz on 2m and 330Hz on 70cm. The repeater shifts were very accurate, and the toneburst frequency well within specification. There was no way of holding the toneburst on continuously, and it was not long enough to allow easy measurement of precise frequency and deviation, but I did not have any problem with it in the UK.

Maximum deviation on 2m was around 4.6kHz at 1kHz audio. Higher modulation frequencies limited at lower deviations, which is excellent as it will avoid transmission spreading. Transmitted distortion was only 1.7% at 3kHz deviation, but rose rapidly by 4kHz deviation (15%), the distortion being primarily that of the limiting system. At lower levels, distortion was very low indeed. Modulation characteristics were very similar on 70cm, most of the measurements actually being taken on 2m. The transmitted signal-to-noise ratio approached 47dB ref 4kHz deviation, and this is satisfactory.

The transmitted audio response was checked with a Marconi 2305 modulation test set, the Hewlett Packard audio analyser generator feeding into a mic socket adaptor. There was a fairly rapid bass roll-off below 300Hz, which is most appropriate, whilst the response was remarkably flat between 300Hz and 3kHz. Above 3kHz the response was attenuated very rapidly indeed, and could hardly be more satisfactory, once again helping to avoid any splatter. This should help a lot when the rig is used with 12.5kHz channelling, although you might have to take down the deviation a bit.

Conclusions

Although I am impressed with this new dual bander, as most of the performance parameters measured up very well and it is the most powerful model of its type so far, it is not quite ideal. However, I have to admit I am rarely completely satisfied. The biggest surprise was the poorer front end intermodulation performance, especially on 70cm, as compared with some of the competition, although the sensitivity was very good.

The rig's relatively small size will allow it to fit into spaces that are not large enough for other dual banders, but you will most certainly have to provide excellent ventilation at the back to avoid serious heat build-up when you are on high power.

The rig includes some unique features and is very highly recommended for Raynet members. If you want the auto repeater function, don't forget to specify it when you purchase it and to check that it operates properly when repeating from 70cm to 2m. The normal duplex working will also be useful for Raynet because it could be used for talk through from one band to the other continuously, the operator's microphone mixing in with the talk through signal. I very much enjoyed using it for a prolonged period, and I conclude by giving it a warm recommendation.

Very many thanks to Lowe Electronics for the loan of the review sample, and to Fiona for all her help with the review.

SONY ICF Pro-80

World coverage radio

Last year I gave a recommendation to a previous Sony 'World Radio', the ICF2001D, as it was reasonably priced and offered quite a good performance for what it was, although I did explain that it could not come up to the performance of a proper communications receiver.

Sony's 1987 effort, the ICF Pro-80, breaks interesting new ground, for one only has to look at its facilities to realise how much Sony have crammed into such a small case. The radio is easily portable, and is supplied with a carrying strap, a plug on VHF converter and a large pull out whip antenna fitted, most unusually, with a TNC plug and socket arrangement, which is like a BNC but with a screw thread instead of a bayonet fixing. The radio tunes from 150kHz to 108MHz with continuous coverage, and the VHF converter then enables the combination additionally to tune 115.15 to 223MHz.

Facilities

The radio incorporates a large matrix button pad on the front, which is laid out slightly haphazardly. There are 40 memories, arranged in four switchable banks of 10, and you can place frequency and mode in memory. On most frequencies you can select AM narrow or wide, SSB and narrowband FM. Wideband FM is also available for selection between 50 and 76MHz and 165 to 223MHz. Frequencies in the range 76 to 108 and 191 to 223MHz can only be received on wide FM. The set is synthesizer controlled, the step being 3kHz on long wave, 9 or 10kHz (switchable internally) on medium wave, 5kHz on short wave and VHF, and 50kHz on wide FM where applicable. Almost all of the facilities are selected by the appropriate use of 'enter', 'function', 'programme', 'direct', 'priority', 'key', and 'execute', usually used in combination with second functions of the numerical matrix pad keys.

On the top of the radio is the TNC socket for the antenna (there is an internal ferrite rod for long and medium wave) and miniature 3.5mm jacks for connecting an external loudspeaker or headphone. Also, independently, there is a feed for a tape recorder, which unfortunately is at a very low audio level. The main rotary volume control introduces a degree of HF cut when pushed into its recess, and by its side is a variable squelch level control which can be set to auto squelch when recessed. To the right is a four position rotary switch for selecting one of the memory banks, and concentrically mounted with this is a small pot which varies the frequency ± around 6kHz or so from the centre nominal. This can be set to operate either on AM or on SSB. This, therefore, allows tuning in between the 5kHz synthesizer steps on HF.

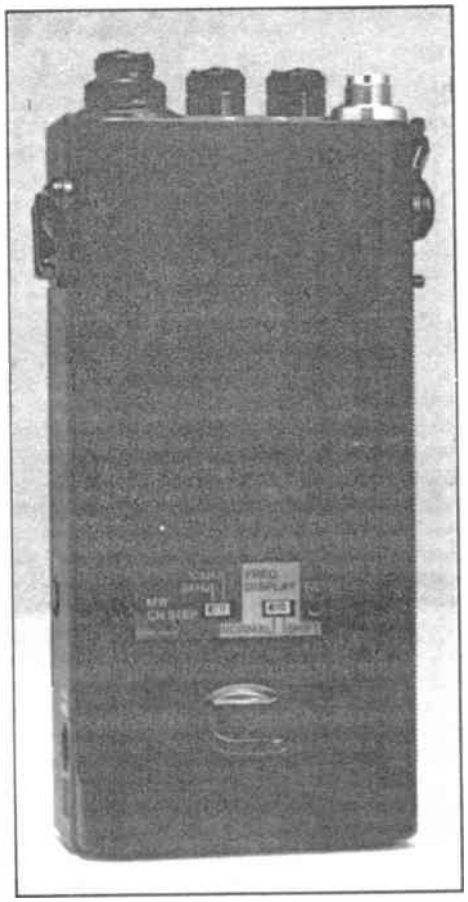
The radio is normally powered by four AA type cells which fit into the back panel within a battery box, which you

have to open up to insert the batteries. This can be rather awkward and the instructions make it quite clear that you only have three minutes to change the batteries before all memories vanish. In the most unbelievably inconvenient place, inside the radio and behind the battery box are two switches, one of them being extremely important, and labelled 'normal' or 'shift'. This switch has to be changed over when you want to go to VHF converter operation, or return to normal operation from it. The other switch selects 9 or 10kHz medium wave channelling for different parts of the world.

The VHF converter

The screw on converter connects to the top of the radio and a supplied whip then screws on to the top of the converter. There are two switches on it which turn a 30dB antenna attenuator on and off, and also select two VHF ranges, 115.15 to 174MHz or 174 to 223MHz. Note that there is a gap between 108 and 115.15MHz, but this frequency region is of no interest to most users.

In order to use the VHF converter correctly and to obtain the appropriate frequency display, you also have to go through an annoying rigmarole to programme in 115MHz so that the microprocessor can select the appropriate receiver frequency for the one entered in on the number pad. You have to do this every time you have plugged in the converter, as well as opening up the battery compartment and changing the internal switch. This is quite the most ridiculous piece of bad ergonomics I have encountered in years; Sony should have built the converter into the set, with a disabling 'secret' inner jumper to be used when the set is sold in some countries that do not allow VHF listening, eg Japan.



Memories and scanning

Entering frequencies into the memories and accessing the memories rapidly is very simple, and about the only part of the ergonomics that I can actually praise. It was splendid to have 40 memories available. There are three scanning modes selectable as a second function on the numerical pad, these governing the events occurring after scanning stops. Mode 1 is a complete stop when a station is found, 2 is a temporary stop for two seconds when a station is found and 3 is as 1, but with a scan restart when the carrier is dropped. You can also programme in scan start and stop frequencies so that the set will scan between them. It is also possible to select priority operation.

Modes and tuning

The matrix pad offers six operational modes, and you select these by first pressing and holding down the small 'function' button followed by numbers 4 to 9 as required. This allows you to select a normal or narrowish AM filter, NBFM, wide FM, SSB and fine tuning on/off for use with AM. Two buttons control up or down synthesizer steps, and of course you get search if you hold one of these buttons down. If you have also switched on the squelch and you push one of the up/down buttons, the set tunes until it receives the next station.

Entering frequency is quite simple once you know the form, and you always have to press 'direct' first, followed by numbers, then 'key' and 'execute'. This is rather laborious, and I intensely dislike up and down buttons rather than a proper tuning knob, as found on the 2001D. However, it is convenient that you can tune away from an accessed memory frequency.

Subjective tests

I used this set in many parts of the UK, and found it very useful indeed because of its wide scope, but despite my being delighted with its coverage I was constantly infuriated by the dreadful ergonomics, and I am totally unable to understand how the Sony engineers could not have applied more thought to operational convenience. For a start, the frequency display is dreadful, being extremely difficult to read, and you also have to learn the meaning of various combinations of symbols.

There is a push-button which is supposed to brighten up the display, but this is completely useless unless you are in almost total darkness. Sony should take a leaf out of one of the Japanese amateur radio manufacturers' books to see how good displays can be.

It was fun being able to hold a little

portable and tune up and down the HF bands while listening to SSB. The snag is that the very small range of adjustment of the fine tuning knob meant that I was for ever moving up and down 5kHz steps, while at the same time twiddling the fine control. This is absolutely maddening if you are trying to find a precise frequency. The SSB filter is far too wide, and there is no discrimination between the upper and lower sidebands, requiring more twiddling to get the pitch correct.

The sensitivity, even on the ordinary pull out whip, was surprisingly acceptable, but when I put the rig on an external aerial it almost jumped off the table! I was surprised to find that the overload performance was quite good on an external aerial, and excellent on the internal ferrite rod or the screw on whip. The VHF converter seemed very sensitive.

On the RSGB VHF field day, I tuned around the 70MHz band whilst I was relaxing at G3JYP's QTH in Appleby, Cumbria, and at ground level I picked up over half a dozen SSB and CW stations in just ten minutes of tuning. Down in London, I have picked up many 6m stations on the set, whilst on 2m the set seems to have about the same sensitivity on SSB as the Mk1 FT-290, despite the bandwidth being around double that of the Yaesu. This rather infers that the VHF noise figure is actually better than the Yaesu's.

I was at first baffled when trying to receive Radio 4 in the Scottish Highlands when I wanted to hear The Archers (for I certainly did not want to listen to Gaelic on Radio Scotland!). I could not get the set to go to 200kHz, and it kept selecting 198, the new frequency that the BBC long wave transmitters will be changing to early next year. A quick perusal of the 'destruction' book showed me that I should select second function 6, which allows fine tuning, and I was then able to tune in R4 LW very well.

The AM bandwidths offer a good compromise between selectivity and quality and I was impressed with the sound of AM, although the set excluded the synchronous AM detector that Sony

incorporated in their 2001D. SSB also sounded good, apart from the AGC speed being much too fast. This produced a lot of pumping, and I am surprised that Sony did not provide an attenuator switch for use on the HF bands.

NBFM was not quite narrow enough for CB, but was satisfactory around 29.6MHz. It was easily good enough for 25kHz channelling on VHF, but the set's performance on 12.5kHz channelling was very poor as there was no facility for fine tuning between the 5kHz steps, and the filter was too wide anyway.

Wide FM on Band II broadcasting was quite adequate, but not only is there rather a lack of available volume, but there is a complete lack of bass frequencies as well. The tiny loudspeaker is mounted behind a narrow grille running across the lower end of the front panel. The set sounded a lot better into an external speaker, but this has to be a very sensitive one because of the limited audio output power capability.

The set received air band and PMR frequencies very clearly, and it was very useful to be able to switch mode. The unit could make a very good interference source detector because of its wide frequency coverage and switchable modes. It would be quite simple to make a variable attenuator for use in the aerial feed, but there is no S meter, so you would have to use your ears.

I was not happy with the set's performance on 1.9MHz when using the whip, as the sensitivity appeared to be very low here. This was probably due to a complete lack of input matching on the LF bands but, strangely, matters were much better on 80m and up. There did not seem to be too many spurii around and it was useful to be able to access amateur bands and modes direct from memories, which made the set very flexible in its operation. The battery life was acceptable, but was not particularly long.

Brief lab checks

The average RF sensitivity on SSB between 3 and 60MHz was very similar to that of the average modern communications receiver with the latter's pre-amp switched off. However, sensitivity dropped off quite rapidly below 2.5MHz, and whilst it would be adequate with a long wire antenna on Top Band, the set's own input sensitivity fell far short of ideal when used with its own whip. Sony have clearly made a bad design mistake here, for it is obviously due to the ferrite rod/antenna socket crossover filter being much too gradual. There should have been a very steep high pass filter switching in and out when tuning either side of 1.8MHz, and this could have allowed for a much higher sensitivity around 1.9MHz.

The 50MHz band sensitivity was remarkably good, but by 70MHz it had fallen quite a lot, although it was quite good again on Band II wide FM.

The sensitivity of the VHF converter was surprisingly good, and roughly comparable to that of the AOR2002 and the other better quality scanners. The set worked well with a discone external antenna and also with its telescopic whip.

I thought I had better have a brief look at the RF input intercept point and this actually measured quite well on the HF bands, rather better than many amateur radio transceivers of a few years ago, because of the incorporation of a high first IF and not too much gain in front. It is, of course, much poorer than today's better rigs, but one would not normally be using this set with huge external antennas.

You should not have any troubles on HF when using the whip, but on VHF you might have some RFIM problems if you are close to strong stations, for the VHF intercept point is only as good as that of average VHF hand-helds. Audio distortion at average levels was around 1% THD on WFM, and the set did indeed prove to have a very limited power output. I was, however, surprised that the frequency response through to an external speaker on WFM was actually very good indeed, being within ±1dB or so from 30Hz to 10kHz ref 1kHz.

I was astonished to measure as much as 70dB signal-to-noise ratio on WFM ref 45kHz deviation when the input RF level was at 300μV. This was measured in the band 10Hz to 30kHz, showing no breakthroughs of the nasty synthesizer tones which beset some scanners.

Conclusions

This set is, for the time being, unique as a portable with its amazingly wide frequency coverage, and I must therefore give it very high praise, especially as it is a multimode. The problem is that I rapidly lost enthusiasm (as you might) once I actually started using it in earnest, for Sony seem to have completely ignored ergonomics at the expense of marketing 'specmanship' and facilities.

If one bears in mind that the 2001D was a lot better than its immediate predecessor, which left out flywheel synthesizer tuning, then I am tempted to suggest that you should wait for the 1988 or '89 models from Sony, which might put matters right, or alternatively some other make, which is almost bound to appear one day. On the other hand, I am sure that thousands of short wave enthusiasts and radio amateurs the World over will be tempted to buy this set, for it does work well. I admit to having had a lot of fun with it and it will be very useful to have around.

Although I recommend purchase of this set, if you require all its facilities I urge you to play with it for some time before making your final decision, for you may find the tuning ergonomics and display problems so annoying as to put you off. What at first may seem to be rather swish looking front panel button positions will in time become an irritation. Be careful to avoid an impulse buy, for the set, priced at £350 inc VAT, is, I feel, overpriced as it stands, although I would have been a lot happier with this price if I had not had to niggle about the lack of a tuning knob, etc. However, this is an absolutely fascinating product that certainly deserves attention.

Very many thanks to Sony UK Ltd for the loan of one of the first samples to come into Europe, and to Fiona for helping with the review and for suffering my occasional bad temper when using the set initially!

Sony ICF Pro-80 Measurements

Sensitivity 12dB sinad (NFM)	
118MHz	−118dBm (0.3μV)
145MHz	−120dBm (0.22μV)
170MHz	−121dBm (0.2μV)
RF sensitivity (30dB IHF) wide FM	
88MHz	−103dBm (1.6μV)
98MHz	−103dBm (1.6μV)
108MHz	−105dBm (1.25μV)
220MHz	−105dBm (1.25μV)
RF sensitivity 12dB sinad SSB	
200kHz	−89dBm (8μV)
1.9MHz	−109dBm (0.8μV)
2MHz	−111dBm (0.65μV)
2.5MHz	−115dBm (0.4μV)
3.76MHz	−116dBm (0.35μV)
14.2MHz	−114dBm (0.45μV)
28.4MHz	−117dBm (0.3μV)
50.2MHz	−120dBm (0.22μV)
60.2MHz	−118dBm (0.3μV)
65MHz	−112dBm (0.55μV)
70.2MHz	−107dBm (1μV)
75MHz	−105dBm (1.25μV)
144.4MHz	−121dBm (0.2μV)
RF input intercept point	
14.2MHz	−6dBm
144.4MHz	−23dBm
Maximum audio power into external load for 10% distortion	
8 ohms	0.32W
4 ohms	0.45W

SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

As a result of writing this column for over two years, I have had many letters from readers asking how one gets into the hobby of short wave listening and what sort of equipment is needed, etc.

On the surface, simple enough questions, but ones that require careful consideration before answering as there are various fields within the hobby that affect the type of equipment that is needed, and depend on the time and effort the newcomer is prepared to put into the hobby. Probably the main consideration is the type of listening to be undertaken, and there are a number of choices.

Casual listener

The casual listener is the easiest to cater for. Usually mainly interested in the broadcast bands, the equipment need not be expensive and, quite often, the normal 'domestic' receiver can be utilised if the required bands are covered. Many have only the medium and VHF/FM bands, sometimes long wave and, if short wave is covered, it is only to a limited amount. Even so, a lot of interesting stations can be heard with such basic equipment and it shouldn't be shunned out of hand.

However, if a domestic receiver is not available, or is part of the family entertainment, a reasonably cheap receiver, such as the Russian Vega or the MBR 7 that have been previously mentioned in this column, would provide a good start to listening and will pay back the small cost in enjoyment over the years.

Although this type of listening is done in a random manner, maybe due to domestic or work considerations, it can still be interesting and made all the more so by making up a logbook of the stations heard. Over a period, reference to the log will give an insight into the habits of stations using certain frequencies at certain times of the day. Using the standard reporting codes (see panel), changes in propagation conditions and how they affect reception can also be observed.

The monitor

The monitor is the chap who takes his listening very seriously. Once more, usually broadcast band biased, he gets the utmost from whatever equipment he has. Station equipment can also vary from the simple communications receiver, often secondhand to cut initial costs, to very sophisticated set-ups, with some stations having receivers set up for specific frequently monitored frequencies.

Logging procedures are religiously followed and regular schedules of stations are always to hand. All this means having a lot of spare time or regular periods that can be set aside for monitoring. Some broadcast stations encourage regular reporting and appoint official station monitors from senders of regular reports on their broadcasts.

The DXer is the listener who is interested in logging those stations situated in far off locations or in areas that are rarely heard, such as exotic islands or usually uninhabited areas. Many of these listeners are more interested in the amateur bands, but not all of them are, by any means. Successful DXing results from careful planning, not only in the station itself, but in studying propagation conditions and information available from publications or DX orientated broadcasts. Many broadcast stations, such as HCJB (Quito, Peru) and Radio Sweden have weekly programmes giving details of stations likely to be heard during the coming weeks, and amateur 'nets' often give similar information.

Accurate log keeping is essential in DXing, as is accurate reporting. The simple report or QSL card is just not good enough. From the volume of reports these stations receive, they are well aware of where their signals are being received, so it is far better if the station is logged over a period, so that comparisons can be made, and your own comparisons of that station's signals with others in the same area can be of interest to the operator.

Whatever area you choose as your particular interest, the most important item in the station is the aerial. Whether it is a simple end fed wire arrangement or a sophisticated multiband beam, it must be suitable for the frequencies to be monitored, and it doesn't matter how super your receiver is, unless you can get the signals to it efficiently, you've wasted your money.

Aerials are affected by external influences, not least of which is the ground over which they are erected, so what may appear to be the 'cat's whiskers' down at Fred's place, may be next to useless at yours. Moist ground is far better than well drained soil, and it is a lucky DXer who lives over a salt marsh! However, even the flat dweller can improve his situation by careful siting of the aerial itself and provision of a good earth and counterpoise wires to complement it.

Experimentation

Experimentation with different configurations or positioning of the aerials over a period of time pays dividends. The use of an antenna 'tuner' is essential, particularly when experimenting with random lengths of wire, so the investment in a good ATU, either home brewed or ready made, is money well spent. They are not difficult to make, and can make the difference between a mediocre log and one filled with interesting stuff.

Every station, whatever the interest, should have a couple of books that I would consider essential reading for anyone interested in listening seriously. They are *The Complete Short Wave Listener's Handbook* and *Simple Low Cost Wire Antennas* (from RSGB), but these are expensive to buy. If you are on a thin budget alternative titles to consider are *An Introduction to DXing* and *Aerial Projects* by Babani (from Maplin or other dealers). Also get a proper log book to record those details.

30th Longleat Rally

This year, the Bristol and District RSGB Group celebrated their 30th Longleat Rally. This is one rally that I haven't missed for years and this year was no exception.

Despite a few hiccups, Vernon GW0DST and myself made it by 0930 and were quickly ushered to a vacant spot in one of the marquees, right by the entrance to the tent so we couldn't easily be missed. The stand for the International Listeners' Association was set up and our plan was to take turns in manning it while one of us did the rounds. My son had come along to take some pictures and have a look around Longleat itself... he's not into radio like dad!

The Longleat Rally is one of those rallies where there is something for all the family, so the XYL and the children can leave dad to dig in the endless line-up of boxes and piles of junk to his heart's content. This rally was up to its usual high standard and well organised but, as at Swansea earlier this year, the many stalls seemed lacking in good secondhand receivers. There were some overpriced Eddystones and RA17s but little in the way of general coverage stuff.

As far as the ILA stand was concerned, it was a great success. We had a modest show consisting of a display of our awards and maps showing the distribution of our membership. We also had the MBR 7 receiver monitoring the local airports. As a result, membership increased to over 220 and we had some nice chats to members, other listeners and licensed amateurs. To all those who

visited us, thanks for stopping for a chat. To those who missed the rally ... see you next year.

Prefix Award claims

So to our *Amateur Radio* Prefix Award winners this month. Roy Clayton G4SSH made the Gold this month for working 1000 prefixes on CW only. Amongst the logs were AA1, AB2, AC2, BY2, BY5, CG9, CR7, J28, J42, KN7, KP5/K51, LU/K5, T26, VP2, VQ8, Z23, 3XO, 5AO, 5N26/KC7, 7S6, SP9, 9N1 and 9Y/J61. Roy stated that he thoroughly enjoyed the scheme and regards prefix hunting as an excellent basis for most of the amateur radio awards and has DXCC, SJDXCC, CQDX, WAE, EU-DX-D, WPX and EU-PX-A, as well as our awards. His equipment consists of the Century 21 with the HF5 vertical, which he has used since starting the prefix hunt, but he now has an FT757GX to give general coverage.

Joan Slater ILA185 of Matlock claimed the Silver award for mixed bands and Bronze for 20 metres, and included AD1, AH6, AZ6, CO2, HK1, KH6, KZ1, PP1, PS8, TJ4, VP9, VK9, YW7, ZP9, 5J4, 5L6 and 5N9 amongst a couple of super lists. As she says in her letter, 'it's a nice feeling to have achieved something'. I understand she's taking up award framing at the local tech, so I fully expect her Gold claim very soon.

So to Marc Domen ONL6945/ILA053 from Belgium, who claimed the Gold award this month with a superb list including 3B8, 3X0, 4M0, 4S7, 4X85, 5N22, 5T5, 6W2, 6Y5, 7S3, 8P9, 9U5, AP2, BV2, CQ7, CX9, DU9, FY7, HP3, HW5, J37, J41, LX50, RT0, SW2, V44, XJ2, YT9, ZD7 and ZZ5.

Colin Blunn G1RFL, of Stoney Stanton, was next in with his claim for Bronze on Morse only. He has been listening to the Morse to help with his mastering of the code for the test, so thought he'd put the time to good use. Amongst the catches were WP4, YC3, FM5, PJ2, P21, PT2, PP5, LU1 and TF3. Good luck with the test, Colin.

Another multiple claim this time from Dave Stott of Fishburn, who claimed Bronze and Silver for all bands and Bronze for twenty metres. Dave uses a GEC 402F general coverage receiver which he says was a wise choice as it was cheap, works well and is too heavy for the XYL to throw out! Included in the loggings were A22, A61, AC7, BV6, BY4, C31, CP7, DU7, DX9, HH7, HP6/MM, J37, PR8, VS6, XE3, YC6, ZB2, 3A2, 5T5, 8P6 and 9J2.

Stan Taylor ILA070 of Hartlepool also got his Silver claim in. He was particularly interested in getting confirmation from 4U1VIC whom he'd heard before on 80m, so logged him at 1820 on 18/4/87 on 20m and sent his card off. He had his confirmation back within seven days! John, the operator at 4U1VIC deserves congratulations on a quick and courteous service.

Also worthy of mention were the Easter special event stations from Israel, 4X2J, 4X3N and 4X9B. A few days later, 4X39ID was logged celebrating the 39th anniversary of Israel's Independence. Nice logging Stan!

Too quick for me

It's funny, as soon as I introduce a new award, there's always one who has to get a claim in before I've had a chance to dry the ink on the certificates! Chris Gibbs ILA086 of Camberley was the guilty party this time with a claim for the Medium Wave DXers Award. Chris sent in a superb list of stations logged on this band ... and all verified too! Apart from the *seventeen* Canadians and *nineteen* Americans, Chris offered Andorra, Antigua, Azores, Canaries, Cayman Islands, Madeira, Monaco, Oman and St Kitts. Not satisfied with getting that one, Chris also claimed the Gold Prefix award for twenty metres only (just to fill in a gap on the wall!) ... OK, Chris, I surrender!

A new book has just been released by Heinemann/Newnes which is of particular interest to those into broadcast receiving. It is the nineteenth edition of their *Guide To Broadcast Stations*, which has been completely updated and a very useful book it is too. Apart from the obvious listings of the World's broadcast stations, both geographically and in order of frequency occupation, the book also contains a wealth of other information supplied by such well known names as Pat Hawker and Jonathan Marks, and an excellent article on choosing a receiver by Richard Lambley.

The book also covers reception reporting, computer usage, aerials and a list of clubs. At a cover price of £6.95, this is one of the best books of its type available and is highly recommended for serious broadcast monitors.

From books to computers. It's a fact of life that, when you make a comment about something, someone will get the wrong end of the stick and start to beat you over the head with it. Such, unfortunately, was the case in my review of John Pearson's SSTV transceive program which I reviewed recently. The offending comment, which a couple of readers pointed out, was that, in my opinion, using computers in this way was not real SSTV.

Apologies due

Before explaining my comment, I must apologise to John for any adverse effect this comment may have had regarding his program. As an SSTV program, it is the best which I and other reviewers have had the pleasure of testing.

Since the review, I have had many QSOs using it and conducted many tests with DJ0KD which were monitored by G8PX, and I thank Clarence for his patience during some horrible conditions over the couple of days we were testing.

Clarence was using a Robot 400 'clone' and our exchanges of pictures were received and re-transmitted to each other with G8PX acting as receptor of both sides, despite conditions that meant that either I lost him or Clarence lost him so we were relaying messages in all directions. Suffice to say that the G1FTU program performed faultlessly throughout and with excellent results.

My view

So to my comment. Technical progress being what it is, many of the old methods of doing things are forgotten to the extent that newcomers don't get to use them. RTTY was normally sent and received using the old Creed type teleprinters and the smell of hot oil was normal in shacks at that time, somewhat reminiscent of old steam engines. However, progress brought the microcomputer and gone were the Creeds. The early days of SSTV meant lash-ups of real television cameras that were bulky and frequently decided to go on the blink just as a contact was made, but that was all part of the game. With the introduction of video security systems, smaller cameras were made available and these are still in use by many amateur stations.

The point is that computers are fast taking over in communications, with Packet radio and regenerated Morse as well as computer derived video pictures, and some of our newer radio enthusiasts have never experienced the 'hands on' pleasures of using a real Morse key, except when taking the test, or had to grope around the shack for a screwdriver to adjust a Creed. I'm all for progress, as my shack bears witness, but let's not forget the basics as they were and still are the foundation of our hobby (end of soapbox for this month!).

That's the lot

Well, that just about wraps it up for this month. Thanks again to all those who visited us at the ILA stand at Longleat and to those who sent in listening reports ... please keep them coming in. Good listening until next month. Please address all mail to 1 Jersey Street, Hafod, Swansea SA1 2HF.

Standard reporting codes

	1	2	3	4	5
S	Barely audible	Poor	Fair	Good	Excellent
I	Very strong	Severe	Moderate	Slight	Nil
N	Extreme	Severe	Moderate	Slight	Nil
P	Extreme	Severe	Moderate	Slight	Nil
O	Unusable	Poor	Fair	Good	Excellent

FRIEDRICHSHAFEN 1987

Over 15,000 people were estimated to have attended this year's DARC Amateur Radio Exhibition held at Friedrichshafen on 19th-21st June, 1987. Visitors were mainly from Germany, but included people from the USA, Austria, Italy, France, Switzerland, Scandinavia and the UK. The total floor space at the show was an outstanding 5,000 square metres, with much more for the 'flea market'. Over 100 exhibitors from several European and overseas countries showed and ably demonstrated their latest products.

Friedrichshafen is a beautiful, quiet town of just a few thousand population, being the home of the ill-fated GRAF Zeppelin of bygone days. There is even a Zeppelin Museum next to the show's venue.

Nestling on the shores of picturesque Lake Constance, close to the border with Switzerland, it is an area of scenic beauty for the European holidaymaker and a popular weekend retreat for wealthy Germans. Enhanced by the snow capped mountain peaks of NE Switzerland, which are clearly visible from the harbour area, it is an excellent venue for the visitors from adjacent countries.

The writer travelled by jet (Heathrow-Zurich), train (to Romanshorn) and car ferry to Friedrichshafen across Lake Constance. If you consider it next year, British Airways do a weekend special for around £125 (return).

For the UK radio amateur it is a must. A vast wealth of both European, German and overseas manufactured equipment is available – with over 100 manufacturers – you've quite a choice!

Why is it the Germans seem to have an obsession for aerials and experimenting with them? It may well be something to do with the theories of Max Planc (Institute of RF Technology) in West Berlin. Suffice it to say that at Friedrichshafen there must have been just about every configuration, size and shape you can think of – with a predominance of VHF/UHF antennas.

Verticals, Rhombics, Quads, Windoms, and just about every variation on a theme you could conjure up were there! Many at crazy prices; high and low. There seems however to be a noticeable lack of 5RVs in Germany – they just don't seem too impressed with them.

There was the usual formidable display of the latest state-of-the-art equipment from Japan viz Yaesu, Icom and Kenwood, each having stands with equipment ready to try, with private headphones provided.

I particularly liked the Ham Radio Manfred Neugebauer stand, which had a compact section devoted to products from the Japan Radio Company (JRC); notably their JST125D all band transceivers for 160m-10m, including the latest WARC bands. A whole host of first class options were available, such as an auto antenna tuner which facilitates all band operation on one antenna, plus the RS232C interface for remote control by personal computer.

In addition to the regular Tokyo imports described above a number of other stands offered products which were in a sense 'innovative' or a good alternative to equipment available from the UK's regular sources.

Interest at the RSGB stand was evident. They even managed a profit!

SSB Electronic

Another German based producer whose wares must include the VHF/UHF/SHF enthusiasts dream. Precision built pre-amps, linears, converters, transverters, Yagis, plugs, mobile antennas, portable antennas and many other accessories and equipment were on view, all made in West Germany.

The company, run by DK8DD and DK1VA, also produce a range of satellite receiving equipment with associated options. Their brochure of 170 pages lists all products with photographs and circuit diagrams etc, which is available from SSB Electronic, Pan Zermacherstrasse 5, 5860 Iserholm, West Germany.

WIMO Electronic

Although a fairly unobtrusive stand together with a poorly produced brochure, I felt this company had some very interesting and practical products on offer – obviously of high engineering standards.

Some examples include a 2m/70cm stick-on window car antenna, BNC 2m antennas starting from just 5cms long(!), various centre loaded whips, a clip-on mobile antenna tuning indicator – a clever gadget that clips on the radiating whip, and makes various measurements.

The company also manufactures various antenna co-ax switches and associated accessories. Further details are available from Hans Geraldystr 14, 6742 Herxeim, West Germany. Tel: (07276) 8978.

Kurt Fritzel

Obviously the king of the HF antenna scene (certainly at Friedrichshafen at any rate) is the Fritzel Company. Run by Kurt Fritzel, they offer a fascinating range of single element, vertical and

more importantly beam antennas (up to 6 band and 7 element).

Two massive trapped beams were on display inside the exhibition hall – a standard trapped rotary beam and its (very much smaller) equivalent version with folded elements – thus dramatically saving space. Fritzel's 3 band 2 element folding beam sells at approximately 516DM (£170).

For further information, contact Kurt Fritzel, Siemenstrasse 2, 6708 Neuhofen/Pfalz, West Germany.

Rather surprisingly there were a number of Italian exhibitors marketing high power linears mainly for HF use. RAKE is one manufacturer who utilises 3CX800A7 tubes creating 2kW for between 160 and 10m.

For details write to RAKE LINEARS, 51019 Ponte Buggianese, Italy. Tel: (0572) 636196.

Fibreglass Teleskop mast

If you have problems of space and nothing to tie your antenna to, or nothing high enough to mount it on, this company is for you! Walter Speith DK9SQ has a really super light weight fibreglass mast that can go above 12m on offer.

These excellent telescopic masts with associated multiband centre and fed trap dipoles are ideal for field days. Selling them 'off-the-back-of-a-lorry' possibly didn't do justice to this organisation, but it was the first item that caught my eye at the show on walking through the entrance gate.

Write to them (they speak English), and the modest prices start at around DM26 (£8.50) plus postage etc. The address to contact is: Walter Speith DK9SQ, Fibreglass-Teleskop-Masten, Antennentechnik, Plochingerstr 160, 7300 Esslingen, West Germany. Tel: (0711) 314099.

Wrasse

I was very impressed with this company's products and with their promotion material. The company specialises in weather satellite receivers which are less expensive, easier to set-up and better in quality than you thought.

Official weather forecasts, if available, can never be as up to date and detailed as your own critical eye, watching the momentary weather development at your location viewed and transmitted directly from space.

'Sky-Scan/C Package' is a complete system package with all cables and a high resolution colour monitor, ready to receive METEOSAT and all polar-orbiter weather satellites. With weather-in-motion capability!

The package includes: parabolic dish antenna; low-noise S-band converter; VHF-satellite receiver; omnidirectional VHF antenna; videoconverter model; and high-resolution colour monitor. The package sells at 6,980.00DM, so perhaps this will have to wait until next year!

For details of this and a range of other Satellite/FAX/SSTV equipment contact: Wrasse, Kronsberg 10, D-2300 Altenholz/Kiel, West Germany. Tel: (0431) 32528. It must be good equipment, the US Army have just made a major purchase.

BNOS flying the flag for Britain and looking very pleased with themselves

My special thanks go to the very co-operative and helpful staff of the DARC, especially to Heinz Camper DL4EI of Head Office for giving me a 'potted' guide of the show. Heinz says there are approximately 50,000 German radio hams compared with the UK's 37,000 plus.

The West Germans really do it in style, which was especially evident at Friedrichshafen. Superb organisation, impeccable standards, and fine engineering. What really was a noticeable point for such an exhibition was the ability to move around so easily. There was lots of space and no queues, even in the massive flea market.

Judging by the interest at the special RSGB stand, it was well worth the trip made by David Evans (Secretary) and Joan Heathershaw (President). It was so good to see a well organised, friendly and efficient RSGB stand flying the flag for Britain. The Austrian, Omani and Swiss equivalent of RSGB were also present with stands.

One well known British company present was BNOS, with Andy Sharpe, the 'S' of the BNOS acronym, was looking very pleased with himself and the response received.

On my way back to the hotel, while waiting in the rain for the bus, I heard the unmistakeable voice of an Englishwoman (with a Lancashire accent). It was none other than our own Joan Heathershaw (G4CHH) RSGB President, who was also waiting for the never arriving bus with SM0HDP, Sweden's Club President. Quick thinking made me suggest a shared taxi, and in the process I gave my captive audience a brief interview.

Mrs Heathershaw obviously has the interests of RSGB members at heart, and I was impressed with her enthusiasm for what must be a very demanding job. In the brief time I had to speak to her she briefly mentioned that although the RSGB would like to run an equivalent exhibition at the NEC, we've not yet got the same support as the Germans have. However, she hopes to press for the possibility of camping nearby the RSGB National Exhibition/Convention as the Germans have. It is also hoped that next year, the RSGB's 75th Anniversary will contribute to a 'real show' at NEC, possibly with Prince Philip (RSGB Patron) opening the event.

She is also very concerned to encourage more young people into the hobby, with perhaps some form of 'novice licence' to help in this direction. At present amateur radio is seen as the older persons hobby (ie few young people attend the clubs), and she would dearly love to change this view.

The ultimate aim would be to encourage novice licences initially to take the RAE and then the Morse test to gain full Class A status.

All in all I felt that my trip to Friedrichshafen was most worthwhile and I thoroughly recommend it for next year. Remember, this is Europe's largest convention. You'll be surprised at how many exhibitors speak good English. It's an ideal opportunity to make new friends, enjoy stimulating conversations with people of a similar interest and . . . who knows who you'll meet on the way home!

'Tech Talk' from ICOM

IC-AH2 Mobile Antenna System.

Reduced size yet high performance HF antennas are becoming increasingly popular among today's radio amateurs and ICOM is proudly responding to those needs with a deluxe antenna system. The AH-2. This all band and fully automatic antenna package is especially designed for luxury style mobiling portable activities such as vacationing or operating from environmentally sensitive areas such as apartments.

Mobiling in top fashion hasn't been more attractive and ICOM's all in one design boasts numerous advantages over conventional mixed components type setups. Whether pursuing fixed station or mobile activities the flexibility and convenience of this fully remote controlled and automatically tuned antenna opens new horizons in limited antenna HF operations. Since the AH-2 system is packed with unique features and is a relatively new idea we would like to discuss its innovative designs in a step by step manner.

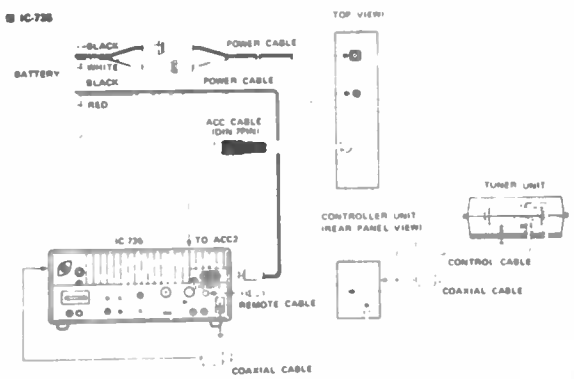
There are five components in the ICOM AH-2 system. The package can be purchased complete or minus the mobile mount and whip for auto or fixed station use as desired. The full system consists of a small rig attached control unit, a remote actuated and microprocessor controlled antenna tuning unit, an approximate nine foot stainless steel whip, a universal and heavy duty auto frame mount and an interconnecting cable set.

An optional OPC-137 cable interface is available for the IC-751 or IC-745 HF transceivers. When using the system's stainless whip operation on all amateur bands between 3.5 and 30 MHz is possible. When the radiating whip is replaced with a random wire 40 feet or more 1.8MHz operation is also possible. During operation you merely select a band and frequency, push the remote unit's 'tune' button and one of over 260,000 LC combinations is digitally selected for optimum transmit antenna performance. Tuning actions require only ten watts of RF power, and the resulting SWR is 1.5:1. Usual tuning time is less than six seconds. The antenna tuning unit's microprocessor stores that LC data in one of eight internal memories so that information is recalled in less than two seconds when the HF transceiver retunes a preselected range. An additional microprocessor in the rig attached remote control unit handles automatic transceiver tune mode switching and RF power output control.

Notice the tuner's capabilities are used during both transmit and receive. Its four sensors (impedance, phase, forward and reflected power) are designed to optimize both single long wires and whips or random wires shorter than 1/4 wavelength, a difficult task for many automatic tuners. Notice also the precise use of microprocessor selected fixed capacitors rather than motor driven variables. This overall concept provides superb antenna tuning and the highest possible performance.

The system's whip and mount truly gives new clarity to the terms 'universal' and 'heavy duty'. They can be quickly installed on a TV mast, boat or car. The mount's bracket bolts to an existing hole in an auto's rear frame, a very strong pipe bolts into the bracket and the antenna's base section bolts to the pipe's remaining end. The pipe's length is fully adjustable to fit various cars. The antenna base section, incidentally, stands 15 inches tall and weighs approximately nine pounds. Rugged is truly an understatement.

Whether assembled as an all band mobile system or employed in fixed station use when large arrays are unfeasible, ICOM's dual microprocessor controlled AH-2 will keep you communicating in high style. ICOM is bringing new advances in communications and wants you to enjoy this exciting new era in modern technology.



Telephone us free-of-charge on:

HELPLINE 0800-521145.

Mon-Fri 09.00-11.00 and 14.00-17.00

This is strictly a helpline for obtaining information about or ordering ICOM equipment. We regret this service cannot be used by dealers or for repair enquiries and parts orders. Thank you.

Where to find ICOM in the U.K.

You can find ICOM Amateur radio in use throughout the world. Here in the U.K. ICOM is available from an extensive dealer network across the country. Just visit your local emporium and you will probably find that they are ICOM dealers. Authorised ICOM dealers will provide information on the entire ICOM range of Amateur equipment backed-up with good after-sales service.

If you are a licensed Amateur or short wave listener ICOM have a complete product range from HF to Microwaves to suit your needs. Should you have difficulty in locating your nearest ICOM stockist contact us at the address shown at the bottom of this page.

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A COMPLETE 13.8V 20A PSU

Over the years there have been many articles in the radio/electronic journal's dealing with fixed voltage high current power supplies. Most of the articles have been excellent when dealing with the theory and specifications of such units, but are badly let down when describing the construction, and often suggest that most of the components needed are available in the reader's junk box. This may be so for the minority, but many readers are left wondering whether a particular component he or she may have is suitable for the circuit described.

Most readers of this magazine are only interested in the 13.8 volt 20 amp PSU which is suitable for powering the average solid-state HF rig, or 100 watt VHF/UHF linear. Not wanting to purchase a commercial unit, which would cost about £150, I set out to build such a supply to power my TS440S HF rig. I wanted it to incorporate the following features:

- Capability of producing 20 amps continuous output at a steady 13.8 volts.
- Over voltage protection.
- Under voltage protection.
- Short circuit proof.
- Current limit.
- Most of the smaller components to be mounted on a single PCB.
- All components to be available off the shelf, including a 16.5 volt 40 amp transformer.

I estimate the total cost of this power supply to be in the region of about £90.00 when buying brand new components, but a considerable saving can be made by purchasing most of the components at local rallies.

The Circuit

A block diagram of the full supply is shown in *Figure 1* and the full circuit diagram is shown in *Figure 2* and *Figure 3*. The heart of the power supply is the main control board which contains the main regulator, over and under voltage protection, current limit, short circuit protection and the circuit breaker relay, which will remove the mains supply in the event of a fault ocurring.

Once the main control board has been made up, it is up to the constructor how big or how small the final power supply will be. The final choice of transformer, rectifier, smoothing capacitors and pass transistors will determine the final current rating of the supply. With the transformer, bridge rectifier and smoothing capacitors specified and using six pass transistors the supply should be capable of producing 25 to 30 amps at 13.8 volts output.

What follows is a brief circuit description and some notes to help the constructor when choosing components. It will help to refer to the block and circuit diagrams and each will be described in box form, also see the component notes for stock numbers, suppliers etc.

Fig 1 *Block diagram*

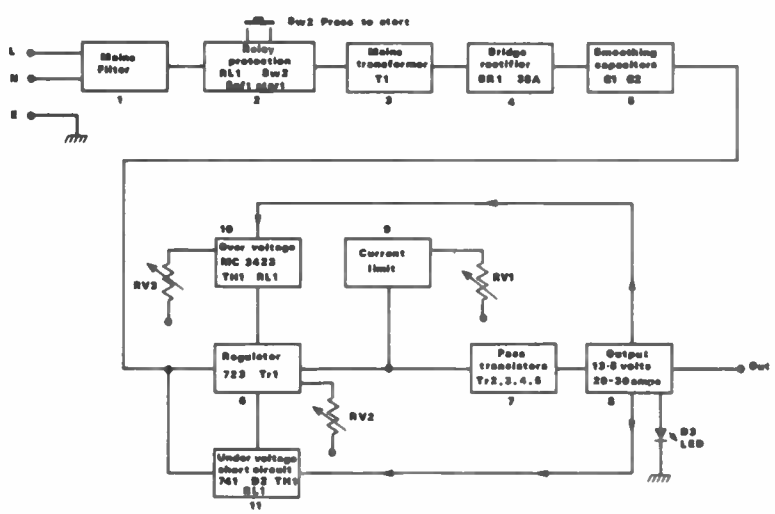
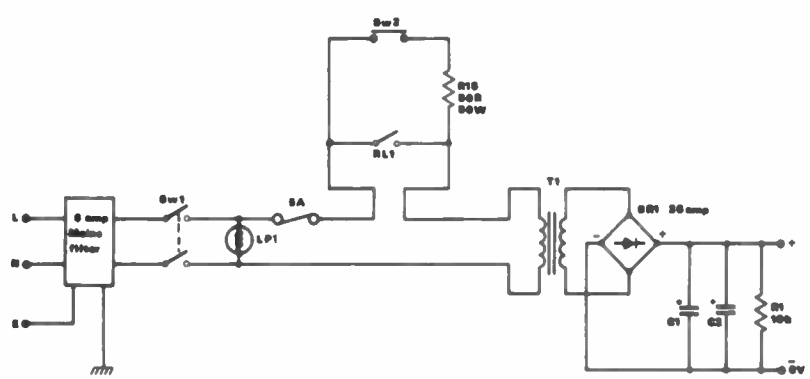


Fig 2 *Circuit diagram*



Box 1

The mains input can be taken to a 6 amp mains filter. This filter is optional and was not used in the prototype. The filter is designed to filter any interference on the mains supply, and the RS type 238-536 will operate over a frequency range of 600kHz-100MHz and provides approximately 30dB attenuation.

Box 2

Protection for the PSU is provided by a relay, which in the event of a fault, will disconnect the mains supply. This relay must have a 24 volt coil, and the recommended type is a Vero 258-51195F, which is rated at 16 amps at 380 volts ac; this will also fit the PCB layout. In the event of a fault the thyristor TH1 grounds the coil, opening the relay contacts and disconnecting the mains, in turn the smoothing capacitors are discharged through R13 and TH1.

To start the supply, SW2 is pressed. This is a push to make switch and must be of a good quality type. When pressed it shorts out the relay contacts and mains voltage is allowed to flow to the mains transformer T1 via the 50 ohm resistor R15. The job of R15 is to limit the in-rush of current on switch on. The in-rush of current happens because the smoothing capacitors are empty of charge and R15 allows charging to take place slowly thus protecting the bridge rectifier BR1.

Box 3

The recommended mains transformer is rated at 16.5 volts, 42 amps, and is of the toroidal type. It is made up of two 21 amp windings which must be wired together to provide 16.5 volts at 42 amps. A considerable saving can be made here by purchasing a mains transformer from a local rally. I would not recommend a secondary voltage of more than 18 volts, because the more the secondary voltage is, the more the pass transistors will have to drop to provide the 13.8 volts needed at the output. When high current is drawn, a lot more heat will have to be dissipated by each transistor if the secondary voltage is high. With the recommend transformer and four pass transistor, the heatsinks only run warm to the touch when running 100 watts of SSB from my TS440S.

Box 4 & 5

The output of the transformer is passed onto the bridge rectifier BR1 which converts the voltage from ac to dc. The rectifier can be of almost any type as long as it is rated higher then the expected current output. In the prototype the type used was a 35 amp 200 volt bridge RS 262-523. If wished individual power diodes can be used, but in either

case a heatsink will be needed. The bridge rectifier can be bolted to the chassis, and the output from the bridge rectifier is passed onto the main smoothing capacitors C1 and C2. A good rule of thumb here is to use 2000 to 3000μF per amp, so for a 30 amp PSU a value of approximately 60,000μF should be ample.

Box 6

Voltage regulation is provided by the very popular LM723, which has appeared in many power supply designs over the years. It has a maximum input voltage of 40 volts, and very few external components are needed to get the IC up and running. It is also capable of providing current limiting, and the IC is supplied in a 14 pin DIL package. The 723 is only capable of supplying about 150mA, so a pre-driver transistor is needed to ensure that there is enough current gain to drive the pass transistors. This is taken care of by TR1, which is a TIP3055. The output voltage is set by the resistor combination R3, R4 and VR2. R3 is connected to the output to sense any voltage drop and VR2 is used to set the output voltage, the output voltage swing should be in the region of 12 to 15 volts.

Box 7

All the current provided by the power supply is handled by the pass transistor TR2, 3, 4 and 5, although in practice, for a 25 to 30 amp supply, six transistors are recommended. It is up to the constructor how many transistors are used, and in turn this depends on the output current required. For example, in a 10 amp supply, only two devices need be used.

The transistors used are 2N3055s, which can handle a maximum current of 15 amps. The bases and collectors of each transistor are wired together, and each emitter has a 0.1 ohm 3 watt resistor in series with it to ensure current sharing. The devices need to be bolted to hefty heatsinks to ensure cool running, but it must be said that when drawing 20 amps or more continuously they will run fairly hot. The 0.1 ohm resistors are made up from two 0.22 ohm 3 watt wirewound resistors wired in parallel.

Box 8

The outputs from the pass transistors are taken to the output terminals on the front or back panels of the case. The outputs can be taken to *red* and *black* terminal post, and Maplin or RS Components both stock suitable types. A red 'ON' LED indicator is also wired to the front panel and this is taken from the main PCB. There is also a 0.1μF capacitor wired across the output. Sense wires are also taken back to the over and under voltage circuits.

Box 9

Current limiting is controlled by VR1, and this facility is offered by the LM723 voltage regulator IC. Current limiting

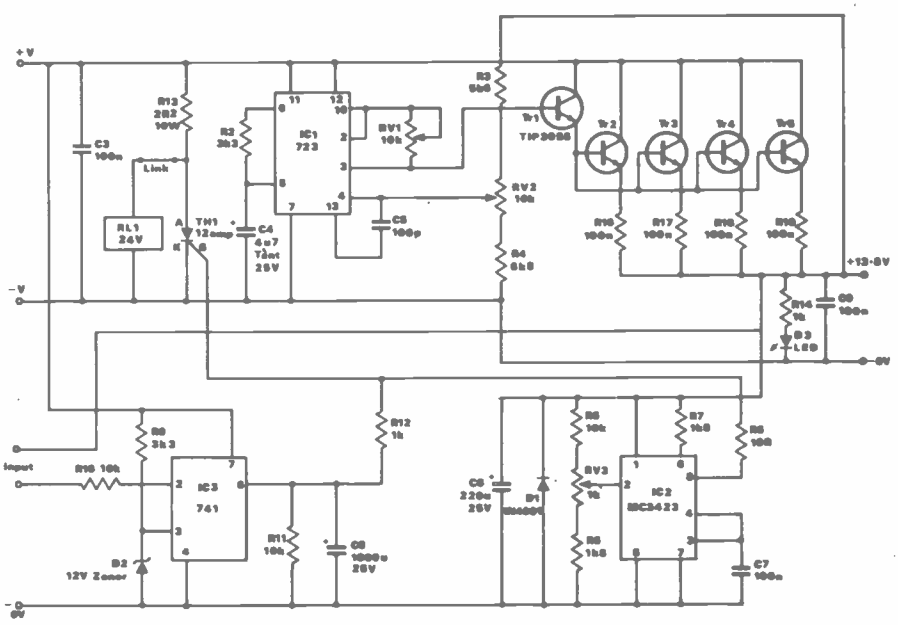


Fig 3 *Circuit diagram*

sets the maximum amount of current that the power supply will deliver, and protects from excessive currents.

Box 10

If there is a short circuit between emitter and collector on any of the pass transistors, then the un-regulated supply will appear at the output terminals. Therefore, it is important we have some form of overvoltage protection. This is provided by IC2, an MC3423 overvoltage crowbar protector, RS 307-890. Voltage is fed back from the output to pin 2 of IC2 via the resistor network R5, R6 and VR3. The setting of VR3 determines the firing voltage, usually 15 volts for a 13.8 volt power supply.

To prevent false tripping the MC3423 has a programmable delay feature. C7 determines the minimum duration of the overvoltage condition which will trip the overvoltage protector, with the value in circuit this will be about 1mS. A value of 0.01μF will give a delay of about 0.1mS. When voltage rises above the pre-set level, pin 8 goes high and fires the thyristor TH1, which in turn grounds the relay coil, removes the mains supply and C1 and C2 are rapidly discharged via R13.

Box 11

An under-voltage circuit has been added to detect any drop in output voltage, which could indicate a fault in either the power supply or the supplied equipment. It will also detect a short circuit on the output, and in turn switch the supply off. The detector is built around a 741 op-amp, IC3. A reference voltage is generated via R9 and D2 and applied to pin 3, the non-inverting input. The output voltage is sampled by R10 and applied to pin 2. When the voltage drops below the reference voltage set by D2, pin 6 goes high firing the thyristor TH1.

Component notes

A full list of components for a 20 amp power supply is shown in the table. Most components are easily obtained, and to help with some I have given the RS/Electromail, Maplin Electronics or the Verospeed stock number.

The Electromail catalogue can be obtained from Electromail, PO Box 33, Corby, Northants NN17 9EL. Tel: (0536) 204555. Price £2.50. This company stock a full range of RS components.

The Maplin catalogue can be obtained from Maplin Electronics Supplies Ltd, PO Box 3, Rayleigh, Essex SS6 8LR. Tel: (0702) 552911. Price £1.50. This can also be obtained from W H Smiths.

The Verospeed catalogue can be obtained from Verospeed, Stansted Road, Boyatt Wood, Eastleigh, Hants SO5 4ZY. Tel: (0703) 644555. This catalogue is *free*.

The transformer can be obtained from Jaytee Electronic Services, 143 Reculver Road, Beltinge, Herne Bay, Kent CT6 6PL. Tel: (0227) 375254. The price is £35.45 including VAT and postage: This price drops to £23.15 for six or more, but contact them first.

A 350mm long × 230mm wide × 160mm high case may be obtained from Minford Engineering, Sun Street, Ffestiniog, Gwynedd LL41 4NE. Tel: (076676) 2572. Contact them first.

The following notes may be of some help.

Resistors: All resistors are ¼ watt 5%, apart from R13, R15 and R16 through to R19. R13 is a aluminium clad 2R2 25 watt resistor, Vero 90-36606E. R15 is also aluminium clad, but rated at 50R 50 watts, Vero 90-36678F. The current sharing resistors R16, 17, 18, 19 are made up from paralleled pairs consisting of two 0.22R 2.5 or 3 watt resistors available from Maplin or Verospeed.

Capacitors: All the capacitors are of common type. Smoothing capacitors can be obtained from local rallies, and failing that RS can supply 33,000μF at 40 volts, RS 105-420. It must be said that the final value of C1 and C2 will depend on the final current rating of the supply.
Semiconductors: There should be no problem getting hold of any of the semiconductors for the project. Shop around for the MC3423 overvoltage chip as this can range in price. 12 and 13 amp thyristors are available from both RS and Maplin, Vero also stock a suitable item.
Miscellaneous: The 6 amp mains filter is an optional extra, and was never fitted to the prototype. Make sure both switches are of a good quality. The relay RL1 must have a 24 volt coil, I used a 16 amp SPCO which is available from Vero, but RS stock a 10 amp relay, RS 347-836. Most PCB type relays of the same size should fit the board, and the PCB layout has taken into consideration the possible different pole arrangements.

The mains transformer T1 is available from Jaytee Electronics Services, stock number 9T845 'Marchwood' transformer. The solder eyelets and push on connectors are available from RS (see page 150 of the Electromail catalogue). They are used to connect wires between the transformer, bridge rectifier and smoothing capacitors. The PCB is homemade and an easy way to make this will be described later on.

References

Fixed Voltage High Current Power Supplies by Roger Alban GW3SPA. *Amateur Radio*, August 1986.
Power Supplies On A Shoe String by John Case GW4HWR. *Radio Communication*, July and August 1986.
Marchwood Power Supply Unit by Nick Allen-Rowlandson BSc G4JET. *Practical Wireless*, June and July 1983.
RS Data Sheet 1303, July 1983, L723 voltage regulator.
RS Data Sheet 3396, March 1985, MC3423 overvoltage crowbar protector.

Construction

We have now outlined the basic needs of the high current power supply and dealt with the protection circuits needed for safe operation. We will now deal with the construction of the unit itself, including PCB layout, wiring diagrams and testing.

COMPONENTS LIST

Resistors

R1 – 10k	R10 – 10k	
R2 – 3k3	R11 – 10k	
R3 – 5k6	R12 – 1k	
R4 – 6k8	R13 – 2R2 25 watts	
R5 – 10k	R14 – 1k	
R6 – 1k8	R15 – 50R 50 watts	
R7 – 1k8	R16 etc 0.1R 3 watts	
R8 – 1k		
R9 – 3k3		

Capacitors

C1 – 33,000μF elec 40 volt	C6 – 220μF elec 25 volt radial	
C2 – 33,000μF elec 40 volt	C7 – 0.1μF disc	
C3 – 0.1μF disc	C8 – 1000μF elec 25 volt radial	
C4 – 4.7μF tantalum 25 volt	C9 – 0.1μF disc	
C5 – 100pF ceramic		

Semiconductors

IC1 – LM724 voltage regulator 14 pin DIL	
IC2 – MC3423 overvoltage crowbar protector	RS 307-890
IC3 – 741 op-amp	
TR1 – TIP3055	
TR2, 3, 4, 5 etc – 2N3055	
D1 – IN4001	D2 – 12 volt 400mW zener
LED red and holder	
BR1 – 35 amp high power bridge rectifier	RS 262-523
TH1 – 12 amp thyristor (C126D or BT152) or similar	RS 262-488

Miscellaneous

6 amp mains filter (optional)	RS 238-536
SW1 – mains on/off switch rocker or toggle	
SW2 – good quality push to make	
5 amp mains fuse and holder	
RL1 – 24 volt coil single pole changeover relay	Vero 258-51195F
T1 – 16.5 volt 42 amp mains transformer	Jaytee 9T845
IC holders – 2 x 8 pin and 1 x 14 pin DIL	
Heatsinks – 2 x 1.1° C/W 152mm x 130mm x 32mm	RS 401-807
Heatsink to suit TIP3055	Maplin FG55K
Semiconductor mounting kits TO-3	Maplin WR24B
High current wire red	Maplin XR59P
black	Maplin XR57M
green	Maplin XR58N
Terminal post red	Maplin HF07H
black	Maplin HF02C
Terminal block, 12 and 30 amp	Maplin HL55K
Push-on solder tags to suit bridge rectifier	
Solder eyelets to suit smoothing capacitors	
Mains cable, 6 amp	
Printed circuit board, PCB pen and etch	
Case, nuts, bolts, wire, etc	

The printed circuit board

Most of the smaller components are mounted on a single sided printed circuit board. I have had little experience of making PCBs, but during the construction of the prototype I developed a simple and sure method of producing reasonable quality home-made boards. *Figure 4* shows the component side of the board and the position of each component, it also shows the copper track pattern. The problem most people have is getting the track pattern off the paper and onto the board, whilst still maintaining a reasonable amount of accuracy. To make the PCB you will need a piece of single sided board 135mm long x 75mm wide, tracing paper, PCB pen and etch. The board was made using the following method:

1. Make a tracing of the pattern, and where a hole is to be drilled on each pad, mark with a pencil dot. Be careful to mark the positions of the ICs, preset resistors and relay accurately. When finished, turn the tracing paper over.
2. Clean the PCB with wire wool and then wash it in hot, soapy water. Fix the tracing onto the board using sticky tape at the top so you are able to lift the tracing up like a flap.
3. The next job is to mark onto the board the position of each hole to be drilled; this is done by using a scribe or sharp pointed instrument. With the tracing flat onto the board place the scribe onto the pencil dot on each pad and gently tap it with a small hammer, this will make an indent on the copper board and will clearly mark each drilling position.
4. With a blunt instrument, rub over all the pencil lines, this should reproduce a faint image onto the copper board. Every so often just lift the tracing paper up and check all is going well. It may be possible to place between the board and the tracing paper a piece of carbon paper and this produces a much better image.
5. When satisfied, remove the tracing paper and start to re-draw the pattern onto the board with a PCB pen. Be careful when drawing the IC pads and thicken up the lines as shown on the layout. A Staedtler Lumocolor 318 Permanent PCB pen, sold by Maplin Electronics, was used on the prototype board, but other types should work just as well.
6. The acid works from the edge inwards, and I would advise you to apply more ink to the tracks at the edge of the board than those towards the centre. When the ink has dried, etch the board following the instructions supplied with the acid. You will know when the acid is working as the uncovered copper starts to turn pink and slowly dissolves. When the board has etched, clean off the ink with wire wool and drill the holes.

The construction can be split up into four parts: 1. Wiring and testing of the transformer, rectifier and smoothing capacitors; 2. Construction and testing of the PCB; 3. Wiring of the pass transistors to the heatsinks; 4. Final wiring and testing.

The first job is to lay out the main components in the case to be used. Mark and drill all fixing points to the base, front and back panels; see *Figure 6* for

layout details. The mains filter, if used, is a surface mounting type, and room can be made for this at the mains input. The heatsinks are held in place on the back panel with long bolts and are allowed to stand off 40mm or so; a large hole should be drilled in the back panel to allow wiring to pass through from the pass transistors. The heatsinks will overhang the case on either side.

When the holes have been drilled and the case painted and labelled, bolt into position the following components: T1, BR1, C1, C2, R15, F1, and the two terminal blocks. To the front panel secure SW1, SW2, LP1, the output terminals and the LED. The PCB and heatsinks will be added later.

Transformer wiring and testing

We will start by wiring the secondary of the transformer, bridge rectifier and smoothing capacitors, but we will not be wiring the primary side yet. The secondary of the transformer used has two tappings, which must be wired together to produce 16.5 volts at 42 amps. I used a piece of plane Veroboard, and bolted to it a 30 amp terminal block, which was then fixed to the mounting bolt of the transformer. I then wired to it the output of the transformer as shown in *Figure 6*. Two heavy duty wires are then taken to the ac side of the bridge rectifier BR1, these are then fixed in place with push-on connectors. C1 and C2 must be wired in parallel, and this can be achieved by strapping the terminals of the capacitors together. I used two strips of aluminium, which are then bolted to the capacitor terminals. *Make sure you bolt Positive to Positive and Negative to Negative.*

The positive and negative sides of BR1 can be wired to the respective sides of the capacitors. I used solder eyelets to make the connections to the capacitors, and push on connectors for BR1. Remember to connect R1 across C1 and C2. All the wiring for this section is shown in *Figure 6*. That completes the wiring of the first section and it can now be tested.

To test this section you will have to temporarily connect 240V ac to the primary side of T1. First connect a voltmeter across C1 and C2, turn the power on and check the reading on the meter, this should read about 24 to 26 volts dc. If all is well, then switch off and allow the smoothing capacitors to discharge through R1. *Never* be tempted to discharge these capacitors by placing a screwdriver across them. A word of warning, you are now dealing with 240V ac which, if touched, could result in a very nasty accident. If in doubt get an experienced constructor to check your work.

PCB construction and testing

With the first part wired and tested we can now move on to the construction of the PCB. *Figure 4* shows the component overlay of the board. Mount and solder all the components as shown. Take care to mount the diodes, electrolytic capacitors and semiconductors the right way round. You may have to enlarge the mounting holes to take RL1.

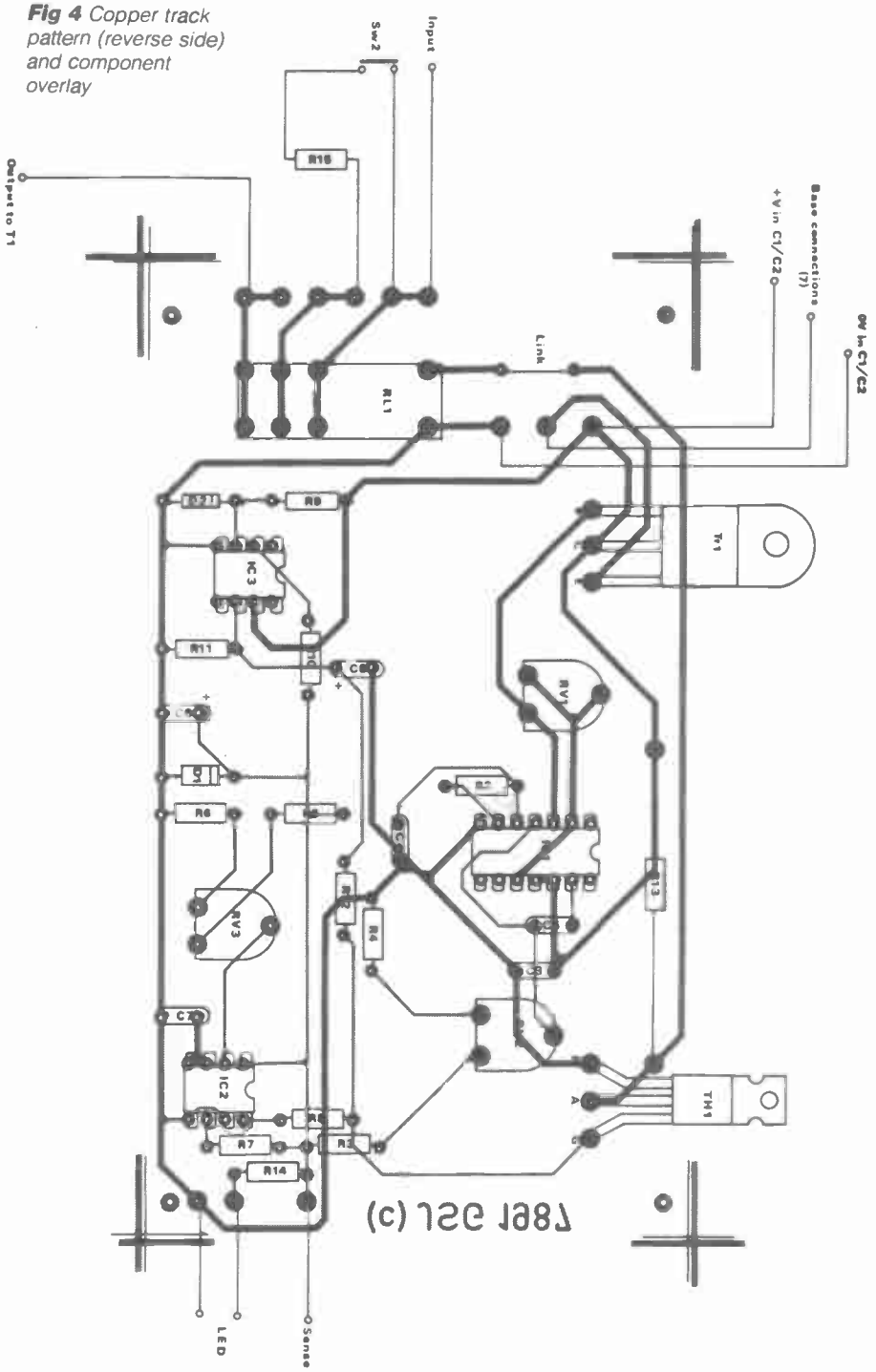


Fig 4 *Copper track pattern (reverse side) and component overlay*

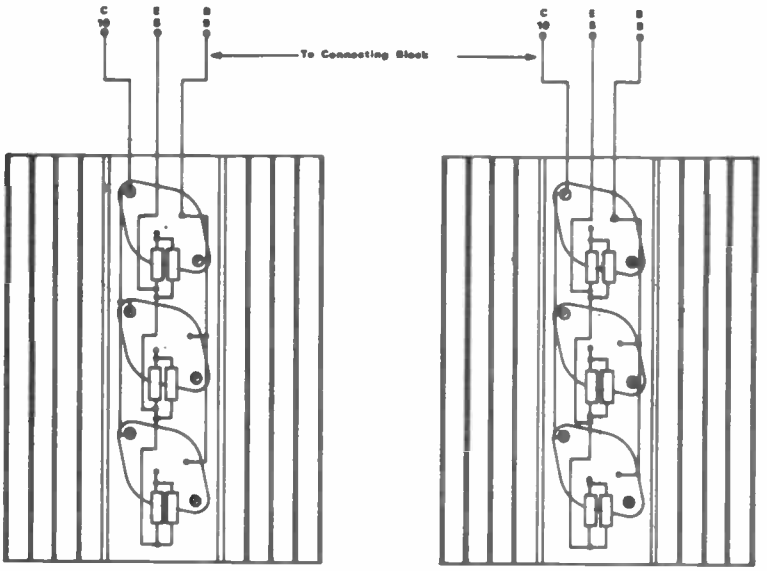
R13 is stood off the board and is held in place by thick copper wire. TR1 is best mounted in place with the heatsink already attached.

It is possible to test the board before finally wiring it into place. To test the board you will have to supply it with about 20 to 25 volts dc. *But under no circumstances* must you use the section already wired to supply this voltage. When testing the board you will simulate fault conditions, and at the moment there is no way of disconnecting the mains when a fault occurs; failure to remove the supply will result in the possible destruction of R13 and TH1. I used a 0 to 30 volt 1.5 amp variable power supply, which is based around an LM317K voltage regulator.

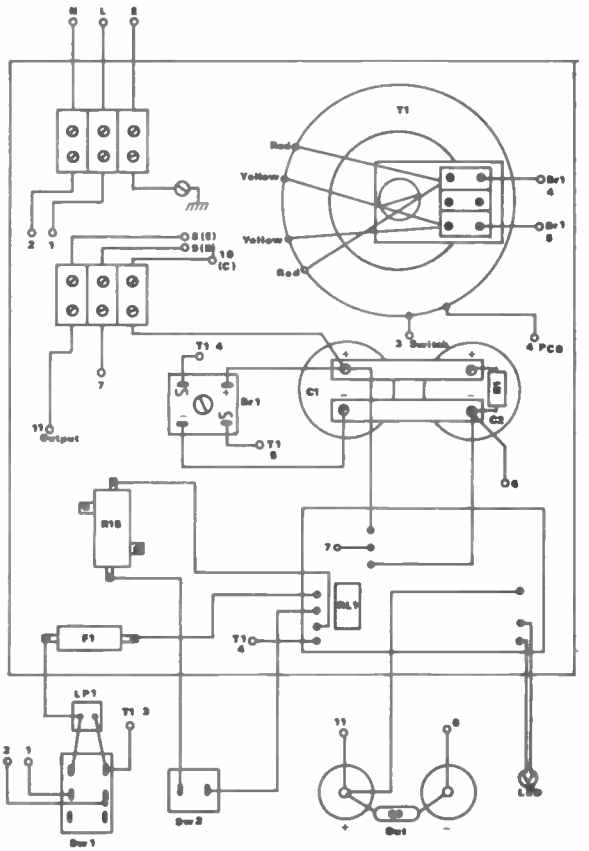
First set the preset resistors as follows: VR1 centre, VR2 centre and VR3 fully anti-clockwise. Next connect a wire between the sense output and the emitter of TR1. Bring in the supply wires and wire the positive to the '+ volts in' and the negative to '0 volts.'

Turn the supply voltage on, and if possible set the output to about 23 volts. The on board relay should 'pull-in', and if you check the output voltage at the emitter of TR1 it should read 13 to 15 volts. Rotating VR2 should adjust the output voltage. To test the under voltage stage, monitor the output and adjust VR2, when the output voltage reaches about 12 volts the relay should 'drop-out'. Under a fault condition the positive input voltage is almost shorted to ground via R13 and TH1, so make sure your variable supply is short circuit proof. Switch off and reset VR2 to about centre.

To test the over voltage stage, set the



▲ **Fig 5** *Detail of transistor wiring*



► **Fig 6** *Main wiring diagram*

output voltage to 15 volts, then adjust VR3 until the relay 'drops out'. Switch off your supply and re-adjust VR2 to its centre position again. Switch back on and monitor the output, start to increase the output voltage via VR2, when it reaches about 15 volts the relay should 'drop-out'. Switch off and re-adjust VR2 to its centre position. Remove the link between the sense and TR1 emitter. This completes the testing of the PCB.

The relay specified has a coil voltage of 24 volts, but under operating conditions it has been found that a voltage as little as 13 volts will 'pull' the relay in. The operating voltage at which the relay will open or close can be increased by placing a resistor in line with the coil. The board has a link close to the relay, and this can be replaced with a resistor, the value of which can be between 100 and 560 ohms; a good starting point is about 220 ohms. You may not feel that this resistor is necessary, but if you think that the relay is operating in a sluggish manner, then add it. If the value is too high, then the relay will not pull in when SW2 is pressed.

Pass transistors

Figure 5 shows the pass transistors mounted on the heatsinks. These must be mounted using TO3 mounting kits. The amount needed depends on the final rating of the supply, and the diagram shows the six transistors needed for a 30 amp supply. Start by marking the position of each transistor on the heatsink; you can use the mounting kit insulator as a template. Drill all mounting holes and bolt all transistors to the heatsinks using the TO3 kits. Using an ohms meter, check there are no short circuits between the case of each transistor and the heat-sinks.

Next wire the transistors as shown in *Figure 5*. As already stated, the 0.1 ohm current sharing resistors are made up of 0.22 ohm paralleled pairs, and this is clearly shown in *Figure 5*. Use heavy current wire for the collector and emitter wiring.

All wiring is then taken into the case and coupled together via a 30 amp terminal block, see *Figure 6*.

Main wiring

You are now ready to couple together all the parts of the power supply to make one complete unit. The main wiring diagram is shown in *Figure 6*. A good idea here is to start to use colour coded wire to identify the voltage rails, perhaps *green* for the un-regulated supply, *red* for the 13.8 volt regulated output and *black* for negative rail. Suitable high current wire can be obtained from Maplin Electronics (see components list). Also use colour coded wire for the mains supply, ie *brown* live, *blue* neutral and *green/yellow* for the earth.

The first stage of the supply should already be wired and working, so it is just a matter of wiring the mains input, PCB and front and back panels. Follow the diagram carefully and double check all wiring. Put insulated sleeving on both sides of R15 and F1. If you are in doubt get a friend with a little more experience to check your work. This completes the wiring and the supply is now ready for testing.

Final testing and setting up

Give all wiring a final check, and if satisfied you are now ready to test the full supply. Fit the mains plug with a 5 to 7 amp fuse. If the PCB has not already been tested, then set the pre-set resistors to the following positions: VR1 centre, VR2 centre and VR3 fully anti-clockwise. Connect a voltmeter to the output, plug in and switch on. Pressing SW2 should cause the relay to pull in and the front panel LED to light. If the relay pulls in and quickly drops and again, then this could indicate that the output voltage is below 12 volts and firing the under voltage circuit. If this happens, then turn VR2 up slightly. If all is well then the output voltage should read between 13 and 15 volts. To test the supply the procedure is similar to that already described in 'Testing the PCB', but I will go through it again in a little more detail.

Under voltage: To test the under voltage stage, monitor the output and adjust VR2, when the output voltage reaches about 12 volts the relay should drop out and the mains supply switch off. Re-adjust VR2 to its previous position and re-start the supply by pressing SW2.

Over voltage: To set the over voltage trip, the output voltage needs to be increased to about 15 volts, or to the level at which the trip is needed. For a 13.8 volt supply this is usually about 15 volts. First make sure VR3 is fully anti-clockwise and then adjust the output voltage to the required trip level, say 15 volts. Adjust VR3 until the relay 'drops-out' and the supply is switched off. Re-adjust VR2 to about its normal operating position and re-start the supply by pressing SW2. Monitor the output and start to increase the output voltage again, at about 15 volts the over voltage should trip and and the supply switch off.

The under and over voltage can be checked again if wished by simply turning VR2 down to about 12 volts, or up to 15 volts. At each level the protection circuits should trip and turn the power supply off. Don't forget to re-set VR2 to its normal position before re-starting the supply again. Finally, set the output voltage to the required level, ie 13.8 volts.

Current limit: The supply can now be tested on load and the current limit set. To do this you will have to find a resistive load which can draw the required

current. To do this I used a 0.68 ohm 50 watt resistor and water cooled it in a bowl of cold water! Using Ohm's law, a 0.68 ohm resistor will draw about 20 amps, and a 0.47 ohm will draw about 29 amps when supplied with 13.8 volts. If you are going to set the current limit properly, you will need a current meter that can measure at least 30 amps.

Turn VR1 fully clockwise. Switch the power supply on and then connect the meter and load to the output; make sure that the load is submerged in a bowl of cold water before starting. When the supply is drawing full load, adjust VR1 until the output current drops back to about 20 amps. A suitable current meter was not available when setting up the prototype, so I placed a voltmeter across the output and on full load I set VR1 so that the output voltage fell back to 13.5 volts. If you set the output to fall below 12 volts, this will turn the supply off.

Short circuit: To test the short circuit protection you will have to place a short across the output terminals. Momentarily shorting the output should have no effect, but leaving the short on for more than half a second should cause the supply to close down.

The power supply is now set up and ready for use. Before putting it into full operation leave the supply switched on for about two hours, and every so often draw about 20 amps from it using the 0.68 ohm resistor. This should show up any faults before connecting it to the main equipment. The equipment powered must have its own in-line fuse, as the power supply has no internal fuse of its own.

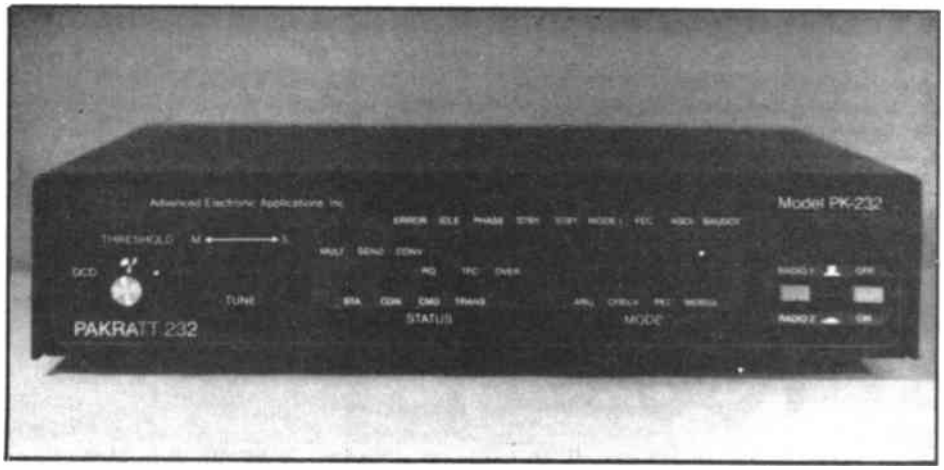
Conclusion

The prototype has been in daily use now for about six months and has been faultless in operation. The prototype only used four pass transistors and it easily powers my TS440S with 100 watts output on FM.

When finished and working the power supply is a worth while and very useful addition to the radio shack. The main control board is very versatile and could be adapted for other uses. By changing the resistor network R3, VR2 and R4 a variety of output voltages could be obtained.

PAKRATT PK232

multimode data controller



A user review by Ken Michaelson G3RDG

The PK232 is quite a box of tricks operating on transmit and receive in five modes: Packet, Amtor, RTTY, CW and ASCII, but for all that its dimensions are modest. It measures 11in (279.4mm) wide by 8.25in (206.6mm) deep by 2.5in (63.5mm) high, and weighs 3lbs (1.36kg). The LEDs on the front panels illuminate giving the particular mode/status operating at the time, and I found them very helpful in use.

A LED labelled DCD (data carrier detect) lit every time the unit detected any data. Next to it was a control marked 'Threshold'. To its right was the very important ten segment discriminator-type bargraph indicator for HF tuning. At the far right of the front panel were two push on/push off switches, the right one being power and next to it the switch controlling Radio 1 or Radio 2 input. The rear panel has ten different inputs and outputs, from left to right these being power (2.1mm socket), speaker for Radio 1 (3.5mm socket), special 5 pin male socket for Radio 1 input/output, special 5 pin male socket for Radio 2 input/output, speaker for Radio 2 (3.5mm socket) and a 5 pin 180 degree DIN socket for oscilloscope Mark/Space signals and FSK keying output (normal or reverse), to an HF transceiver if required. Next was another special 5 pin male socket for an external modem followed by two phono sockets for an external keyer. After this was the 25 way D type socket for the RS232 input/output and finally a screwdriver operated multi-turn pot for AFSK level.

I will describe, briefly, the technical specification of the PK232 which is impressive. It operates transmit and receive in the five modes mentioned above (and FAX which I will discuss later). It has a limiter-discriminator type demodulator which is preceded by an eight-pole Chebyshev 0.5dB ripple bandpass filter. The receive bandpass is automatically switched by the operating mode and frequency used, VHF or HF. The AFSK output from the modulator is a low distortion sine wave function generator, phase continuous, with an output of 5 to 100 millivolts, adjustable by the control mentioned above. The microprocessor is a Zilog Z80. There are 16 kilobytes of RAM available, and up to 48 kilobytes can be used in ROM. The HDLC is a Zilog 8530 SCC, and there are 39 integrated circuits used in all. The particular version of the unit I had for review was intended for Europe and was adjusted to give the European (IARU) tones of 1460Hz for mark and 1260Hz for space. The nine mode LEDs are all labelled with their particular significance, as are the eleven applicable to status. The power requirements are +13 volts dc (12 to 16V dc) at 700mA.

Now to the operation. There are several leads to be made up and connected before the actual switch-on. The RS232 lead with a 25 way D connector at one end and a 5 way domino DIN plug at the other end is supplied by ICS, together with the EPROM to drive the unit from my BBC micro. There are two other leads supplied by the manufacturers, each having at one end the special 5 pin male plug mentioned above. These two leads are intended to be connected to the two radios which I was using. Both the radios had the usual 4 pin type microphone socket, although the main rig for HF, (a Trio TS820S) had different connections to the VHF unit which was an elderly FDK Multi II.

In both cases I had to solder the wires onto the plug, but take the speaker audio out again with a separate wire to plug into the extension speaker socket of the respective rigs. This meant, of course, that I couldn't hear what was going on. This trouble was easily overcome, because there are two speaker sockets on the rear panel, one for VHF and the other for HF. It was only necessary for me to plug in a separate speaker to either of these sockets to hear everything. I decided to take advantage of the facility to use the oscilloscope output from the DIN plug also on the rear panel, and connected the output mark and space to the vertical and horizontal inputs of my 'scope and used the resultant display for tuning in addition to the ten segment bargraph in the PK232. The EPROM to drive the unit had to be inserted correctly in my Beeb using a spare socket. This, I find, is always rather a tricky operation.

Having carried out all these operations, the next one was a trifle more awkward. I had to add an extra cable to the D plug connecting the RS232 input. This was to connect up my Epson RX80 F/T printer for FAX. A 12 way screened cable had to be used ending in a 36 way Amphenol male plug for insertion into the printer. Following the circuit diagram of the PK232, the pin numbers of DATA 1 to 8, STROBE, BUSY and ACK were noted. An extra pin number which I had to remember was GROUND (pin 7). So having opened the D plug and carefully soldered the wires on to their respective contacts, I then turned my attention to the other end.

The Epson manual gave all the pin numbers for DATA 1 to 8 and the other three. The only awkward one was labelled LOGIC 0 and was pin 16. However, all these were soldered on and the covers of both the D plug for the RS232 on the PK232 and the Amphenol plug for the Epson were replaced. That operation concluded successfully, everything was ready to commence.

The operating manual describes in detail a sequence of operations called 'Loopback Test Circuit', and at this point, I must comment on the manual. I have seldom seen such an excellent set of instructions and information. There are 271 pages, clearly printed, with 12 appendices giving circuit diagrams, component values, parts pictorials etc. There is even a preface on Amtor by Peter Martinez G3PLX. All in all, this manual could serve as a bible for not only Packeteers, but also those who use RTTY, Amtor or CW. The baud rate from the PK232 has to be set at 2400 bauds, and in order to achieve this ICS supply a small handbook with their EPROM. In the handbook is a short 19 line program for insertion into the Beeb for this purpose.

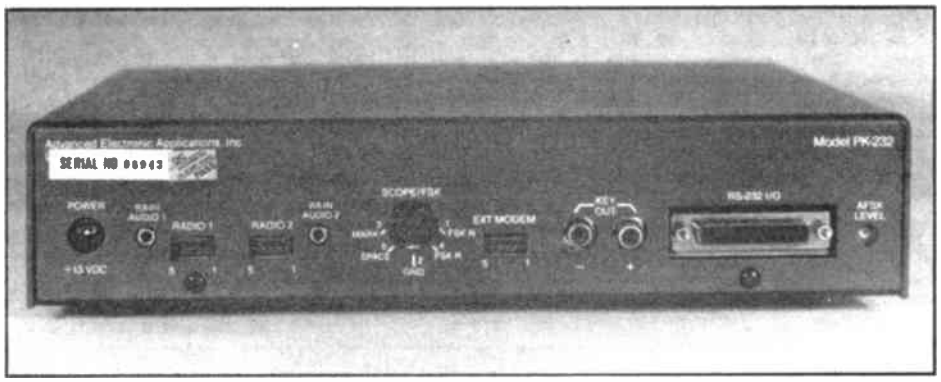
It should be noted here that one could control the PK232 with the simple program just mentioned, but there would be no split screen, memory or function key action. I altered the program slightly to account for the figure of 2400 bauds, but before doing this I had to insert three AA cells in a holder attached to the lid of the case. These were not supplied with

the unit, and act as a battery backup for the RAM. The RAM retains all the personalised particulars, such as your callsign, selcall, etc. In fact, it retains all the parameters except the time of day clock and the monitor heard list. These two functions are controlled by the microprocessor.

Next I loaded the program and ran it. I then switched on the unit, and typed 'TBAUD 2400←'. The procedure can vary then depending on whether you have a 'cold' start or there is information in the RAM. If the cells have been disconnected, then all the information is lost and one has to start from scratch, so the first switch on had no information there. Having typed 'TBAUD' with the unit 'on', I then switched it off and cleared the Beeb. Typing '*TNC' called up the EPROM giving a three-way split screen display.

The top merely showed 'PK232 DRIVER PROGRAM @ ICS 1987'. The centre section, about three-quarters of the screen, showed the received information and also accepted the 'CONNECT' or 'COMMAND' instructions which had been typed and shown on the lower portion of the screen before 'RETURN' had been pressed. Any typing done on the Beeb keyboard would first appear on the bottom section of the screen and no action would be taken by the PK232 until 'RETURN' had been pressed. All nine function keys are programmed with various commands, and a copy of the overlay supplied by ICS is shown elsewhere. There are 28 different options when in the Packet mode and 25 options when in the Amtor/RTTY/CW/ASCII mode. The various modes can be brought into operation by pressing the 'cursor' keys. Left cursor = Amtor/FEC, right cursor = RTTY, up cursor = CW and down cursor = ASCII. To return to Packet one had to press 'COPY'. This was not clear to me at the start and I spent some time trying to work out what to do. I would suggest that a fifth line be added to the list at the top of sheet 2 of the booklet saying merely 'Copy key = Packet', which would greatly help newcomers.

There are two modes in which the display can be shown namely Mode 0 and Mode 3. When using Mode 0, I personally found that there was not enough space between the lines, but when in Mode 3 there was a great improvement. It has to be remembered that the various function key options applied to the mode in use at any time, and when the operating mode is changed out of Packet to any of the Baudot modes, the display alters on the Status line along the top of the lower section of the screen. In the Packet mode there are five function displays, namely MONITOR, ALARM, MCON, CMSG and PRINTER, but only three, MEMORY 1, MEMORY 2 and PRINTER when in the Amtor/RTTY/CW/ASCII mode. There is an alarm facility enabled by pressing 'shift' and 'F1', which sounds a siren when anyone calls the callsign inserted as 'MYCALL'. A speech connect operation is also available, but the Acorn speech synthesizer has to be fitted to the Beeb in order for it to work.



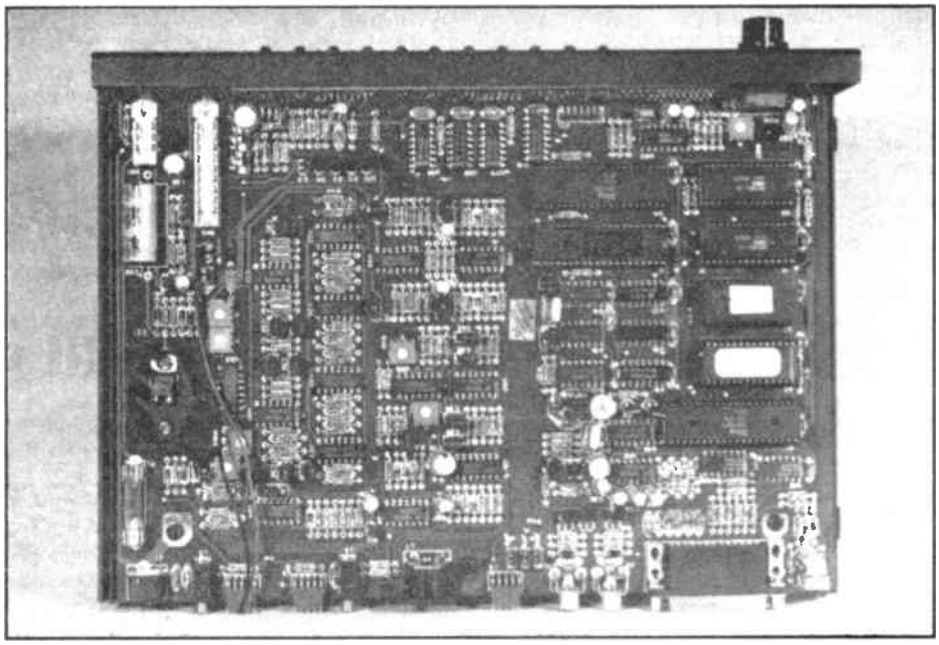
Switching on the unit displays the sign-on message, 'AEA PK232 Data Controller' etc. Typing 'MYCALL←' results in 'MYCALL NOCALL' being shown, so the first thing was to insert my own callsign by keying 'MYCALL G3RDG←'. This time the PK232 showed 'MYCALL now G3RDG MYCALL was NOCALL', showing that the command had been accepted. The next thing to do is to check the baud speed. This is done by typing 'HBAUD'. The word appears on the lower section of the screen and as soon as 'RETURN' is pressed, shows in the middle section followed by the speed setting at that moment. In this particular case the display read 'HBAUD 1200', which was what I required for VHF. It was also necessary to check that the Radio 1/Radio 2 switch was out, indicating that the unit would receive VHF frequencies. This switch has to be depressed when operating on HF.

Next, I entered the day/time sequence. Two digits have to be entered for the year, month, date, hour and minute, following the typing of 'DAY space'. If any of the parameters consist of only one digit, then a leading zero has to be added to it.

The unit always starts in the Command mode with the CMD LED lit in the status panel and the 'PKT' LED lit in the mode panel, so if I decide to try RTTY I would have had to change the mode with a cursor key. Since I had decided to try VHF first and I was already in Packet mode, I entered 'VHF←', and saw the words 'VHF ON' appear. Had VHF been OFF then the words 'VHF was OFF VHF now ON' would have been shown, indicating that the command had been accepted and the instruction altered from the previous setting. All the 143 commands can be accepted in a shortened form, for example 'HBAUD' can be entered as 'HB', followed by the figure you require, and so on.

I now had the PK232 set up for operating on 2 metres in Packet mode, on a frequency of 144.650MHz. This is the commonly used frequency for Packet radio although some operators have migrated to 144.675MHz. As described above, the function keys of the Beeb are used to perform certain operations, and F7 toggles the monitor on or off. At commencement the word 'MONITOR' on the status line merely has a series of question marks following the word, but the action of the first pressure of 'F7' brought the state of the monitor on to the display. The same effect was observed with the other four displays.

There were a number of stations on the frequency that I could receive, including three Mailboxes, namely GB3KP, GB3UP and GB3HQ (the RSGB headquarters mailbox), and the first station I tried to contact was GB3KP. To do this I typed 'C GB3KP'. C is short for connect. Since my callsign and the day/date/time had already been entered into the RAM it was not necessary to do anything else other



Tech Talk from ICOM

IC-AH2 Mobile Antenna System.

Reduced size yet high performance HF antennas are becoming increasingly popular among today's radio amateurs and ICOM is proudly responding to those needs with a deluxe antenna system. The AH-2. This all band and fully automatic antenna package is especially designed for luxury style mobiling portable activities such as vacationing or operating from environmentally sensitive areas such as apartments.

Mobiling in top fashion hasn't been more attractive and ICOM's all in one design boasts numerous advantages over conventional mixed components type setups. Whether pursuing fixed station or mobile activities the flexibility and convenience of this fully remote-controlled and automatically tuned antenna opens new horizons in limited antenna HF operations. Since the AH-2 system is packed with unique features and is a relatively new idea we would like to discuss its innovative designs in a step-by-set manner.

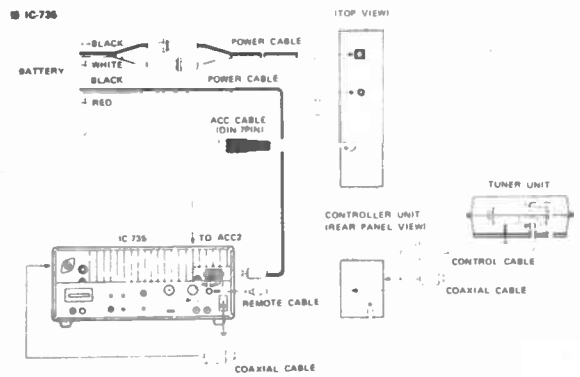
There are five components in the ICOM AH-2 system. The package can be purchased complete or minus the mobile mount and whip for auto of fixed station use as desired. The full system consists of a small rig attached control unit a remote actuated and microprocessor controlled antenna tuning unit an approximate nine-foot stainless steel whip a universal and heavy duty auto frame mount and an interconnecting cable set.

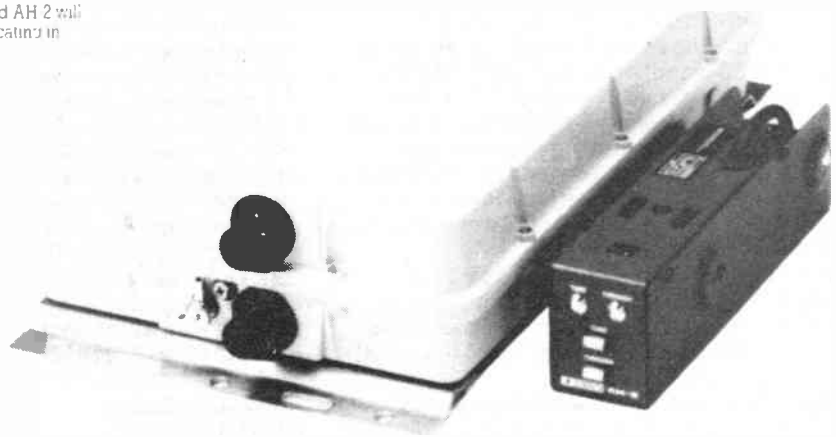
An optional OPC 137 cable interface is available for the IC 731 or IC 745 HF transceivers. When using the system's stainless whip operation on all amateur bands between 3.5 and 30 MHz is possible. When the radiating whip is replaced with a random wire 40 feet or longer 1.8MHz operation is also possible. During operation you merely select a band and frequency push the remote unit's tune button and one of over 260 000 LC combinations is digitally selected for optimum transmit antenna performance. Tuning actions require only ten watts of RF power and the resulting SWR is 1.5:1. Usual tuning time is less than six seconds. The antenna tuning unit's microprocessor stores that LC data in one of eight internal memories so that information is recalled in less than two seconds when the HF transceiver retunes a preselected range. An additional microprocessor in the rig attached remote control unit handles automatic transceiver tune mode switching and RF power output control.

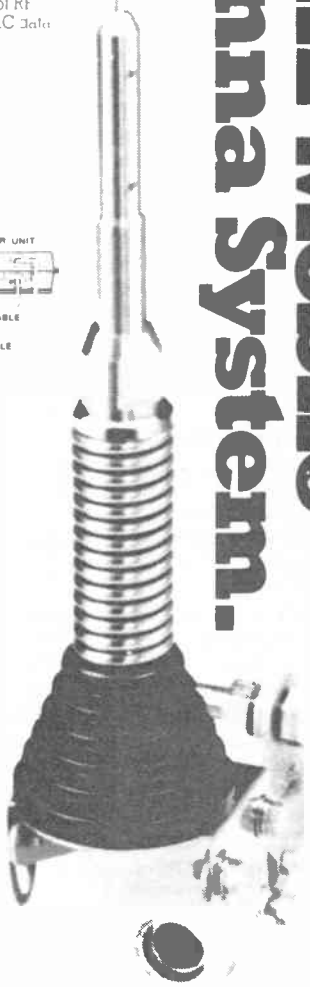
Notice the tuner's capabilities are used during both transmit and receive. Its four sensors (impedance phase forward and reflected power) are designed to optimize both single longwires and whips or random wires shorter than 1/4 wavelength a difficult task for many automatic tuners. Notice also the precise use of microprocessor selected fixed capacitors rather than motor driven variables. This overall concept provides superb antenna tuning and the highest possible performance.

The system's whip and mount truly gives new clarity to the terms universal and heavy duty. They can be quickly installed on a TV mast boat or car. The mount's bracket bolts to an existing hole in an auto's rear frame a very strong pipe bolts into the bracket and the antenna's base section bolts to the pipe's remaining end. The pipe's length is fully adjustable to fit various cars. The antenna base section incidentally stands 13 inches tall and weighs approximately nine pounds. Rugged is truly an understatement.

Whether assembled as an all band mobile system or employed in fixed station use when large arrays are unfeasible ICOM's dual microprocessor controlled AH-2 will keep you communicating in high style. ICOM is breaking new areas in communications and wants you to enjoy this exciting field in modern technology.







Telephone us free-of-charge on:

HELPLINE 0800-521145.

Mon-Fri 09.00-11.00 and 1400-17.30

This is strictly a helpline for obtaining information about or ordering ICOM equipment. We regret this service cannot be used by dealers or for repair enquiries and parts orders. Thank you.

pressing these two keys followed by 'SHIFT F6' caused it to commence transmitting and, calling up the message on disc, start sending the CQ sequence. At the end it sent the CW identity and returned to receive. If I didn't want the CW ID to be sent, I could merely toggle the CTRL TAB keys and return to receive in the normal manner.

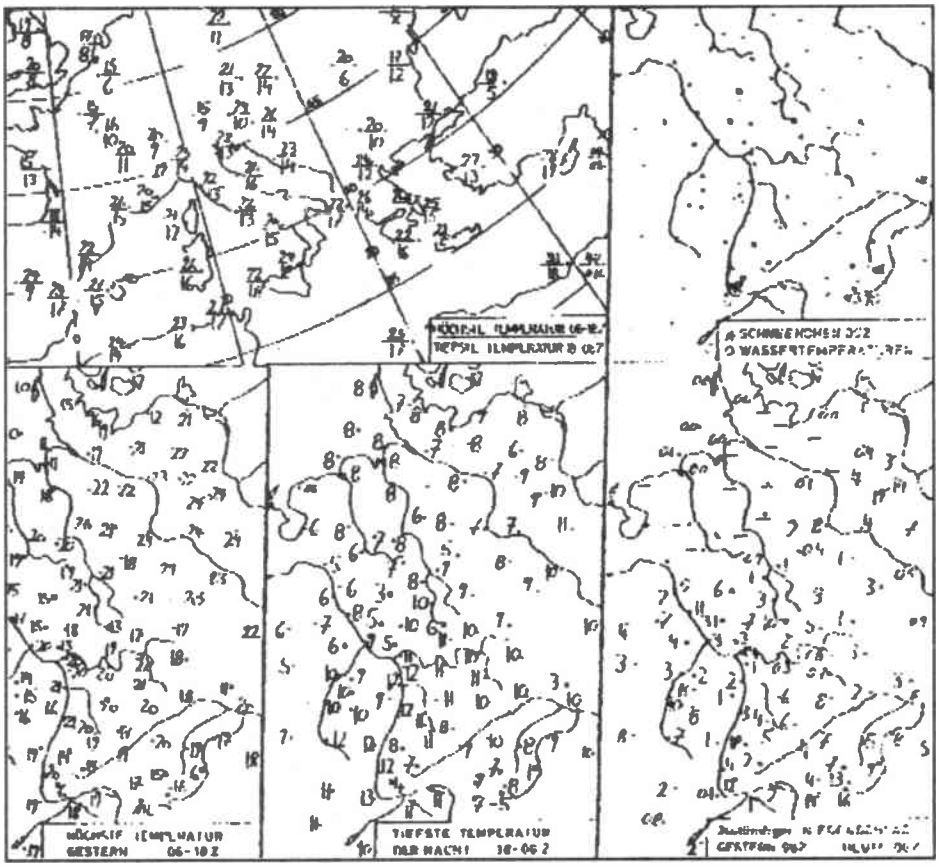
This was all very satisfactory, so the next thing was to actually contact a station. I had a good QSO with an Italian station, and found that I was becoming accustomed to the use the different keys required in the QSO. The commands 'RXREV' and TXREV' really explain themselves, but if one wanted to toggle the 'RXREV' from one sideband to the other, one would key in 'RXREV T ON' or 'RXREV T OFF' to achieve the desired result. Of course the same thing could be done by changing sidebands, but the command was there if needed. The command 'USOS' (unshift on space) was also helpful on some occasions when conditions were not too good, but it had to be used with discretion.

I was unable to find any ASCII signals at the times when I was listening, so I cannot comment on that mode, except to say that it was called into operation by the pressure of the 'DOWN' cursor and the illumination of the ASCII LED in the mode panel of the unit. The baud speed was altered with the command 'ABAUD', as opposed to the baudot (RTTY) adjustment with the command 'RBAUD'. The shift could also be altered between 200Hz, suitable for narrow shift, and 1000Hz which could be used for reception of weather stations etc. This could be accomplished with the command 'WIDESHFT' (abbreviated to 'WI') either 'ON' or 'OFF'. Normally it remained 'OFF' for the 170Hz shift of most stations.

The next mode to be set up was Morse. This is called up either by keying in the command 'MORSE (or MO)←', or in the manner made available by the program, pressure on the 'UP' cursor. In either case, the Morse LED lit on the mode panel. The PK232 had an automatic speed tracking facility in this mode which meant that it was only necessary to tune in a CW signal. The unit was in tune when the centre of the 10 segment bargraph tuning indicator lit and the lit bars shifted from the centre to the lefthand side of the display in rhythm with the Morse keying of the received station. A very simple job.

The same sequence of operations as was used in the RTTY QSOs was necessary, and one could use either LSB or direct keying using the output from the DIN plug at the rear of the unit which would key directly the FSK output of the transmitter. I used LSB, and it is worthwhile noting that a 1200Hz tone is being switched as the output in this case, but one is receiving an 800Hz tone, so that I had to use the RIT in the rig because of the offset between the transmit and receive tones.

Which brings me to the last two facets of this remarkable unit. With the insertion of the optional FAX EPROM it was possible to receive and send FAX, and also handle incidentally, Japanese Katakana Morse code and Cyrillic (Russian) Morse and baudot codes. The particular application, as far as I was concerned, was the reception of weather FAX pictures transmitted by the meteorological stations world-wide, and I started off by using it in that manner. This now explains the reason for the extra cable soldered into the 25 way D plug inserted into the back of the unit. It was to plug into the printer.



Example of FAX reception from Bracknell 4782kHz GFF21

The first thing to do is to go into the FAX mode and to do that one just types FAX, followed by 'PRCON ON', which disables the mode LEDs and connects the printer through the cable. Normally the command would remain as 'PRCON OFF'. The next command to be typed in is 'PROUT ON', which means that all text characters including terminal echoes will be sent to the printer.

The command 'GRAPHICS' followed by a number from 0 to 6 determines the horizontal print density, and I found that the default value of '1' (960 dots across), was perfectly satisfactory. Another command 'ASPECT', with numbers going from 1 to 6, specifies the number of FAX scan lines the unit prints out of every six lines received. The command controls the length of the picture, and corresponds to the CCITT IOC (index of cooperation), the international standard for FAX.

Most weather charts are transmitted with an IOC of 576, and in operation ASPECT 2 was so close to this that the charts were printed with no noticeable distortion. Press wirephotos responded to ASPECT 3 and WEFAX satellite transmissions were best using ASPECT 4. The printing of the charts could be reversed, (black where there should be white and vice versa), by the use of the command 'FAXNEG ON/OFF'. And finally, by using the command 'CODE' followed by a number from 0 to 5, one could receive and get decoded the following types of Morse code alphabets: International, US Teleprinter, Cyrillic, Transliterated Cyrillic, Katakana and transliterated Katakana. I shall not go into all the details of this unusual capacity because it is all described in detail in the release notes supplied with the EPROM.

I have no criticisms to make about the PK232, except for one very minor one. I would have liked to see the battery back-up situated somewhere else instead of attached to the lid of the case. I considered the position most inconvenient.

Other than that, I had a most interesting time operating the unit, and would consider that an owner of a PK232 would not need any other equipment for communication in what really amounted to six different modes. I endorse it and can only agree with a comment made in its regard, that 'It would be all one would need for amateur data communication'.

The PK232 is priced at £269.95 including VAT, postage and packing being £3.50 extra. The cost of the optional extra EPROM to receive and transmit FAX varies according to the particular release date of the main program and can be obtained by application to ICS, but it is only suitable to be used with Epson models MXIII, FX80 or RX80 at the moment. Thanks are due to ICS Electronics Ltd, PO Box 2, Arundel, West Sussex BN18 0NX, tel: (024) 365 590 for the loan of the equipment for the purpose of this review.

50MHz

Despite conflicting opinions over the last 12 months, the general consensus of opinion by world-wide observatories is now that Sunspot Cycle 22 probably started last September, and that the peak will be in 1991. George Williams, a research geologist in Adelaide, writing in the *New Scientist* on 25th June, 1987 refers to unique astrophysical data from the time of the earth's big freeze-up about 650 million years ago, and predicts that after the sunspot maximum of 1957, the amplitude of sunspot cycles should decline over the next six to eight cycles, so that by the mid 21st century sunspot activity should be lower than at any time in the preceding 300-350 years.

Intercontinental openings

During the last two months we have been favoured with one of the most interesting Sporadic E seasons on record, with many inter-continental openings and long distance QSOs which would do credit to the HF bands. This could not have come at a better time as it should give the class B operators and other newcomers to the band a forecast of what to expect in the future.

These outstanding conditions have been highlighted by a very successful DXpedition of historic importance. Ted Collins G4UPS, who is better known for his operations as ZD8TC with a total of over 80 countries worked on six metres, sent us a fully detailed report of his DXpedition to C30 and LX (Andorra and Luxembourg).

The C30DAW location was in Encamp, Andorra, JN02SM. The weather was very cold and cloudy, with two days of snow and heavy rain and hail. The equipment used was a TS600, with 8 watts o/p to a sloping dipole at 35 feet. The location was alongside a river, with the radials straight into the river.

Ted was operational from the evening of 29th May 1987, the first QSOs during the evening of 29th were on the HF bands, but six metres was dead.

30th May 1987 – 1440Z, QSO'd G4GLT on six, 579/559, ten dead; GM beacon in from 1445Z, London; beacon in from 1443Z; ten still completely dead; both beacons faded out at 1500Z.

31st May – 0821Z, strong radio-telephone on six metres from EA; ten opened at 1520Z. Six metres was completely dead up until 5th June and very little was heard on ten during that time.

5th June – six metre TV birdies from the South; Italian FM at 1230Z; worked I5CTE XB at 1300Z, also YO2IS at 1312Z; 1411Z QSO on six with DK2ZF, 559/529; both bands dead by 1500Z.

6th June – started hearing GW3MHW keyer from 1114Z; no G beacons audible, his calls lasted so long that by 1129Z he had faded out! He peaked 599+; 1129Z worked EA4CGN XB six/ten; 1215 London beacon in 1215Z QSOs on six metres with G3IMW, IJE, GW4TTU, 4LXO, 4EAI, 4HBK, G2ANT, 4LTF, PA0XMA, G4PJO until 1230Z; ten metres dead during this opening.

10th June – QSO on six with EI9Q, 599/579 and 59/53, ten open to UK after 1900Z but nil on six.

11th June – ten open to G at 0800Z; 0900Z GM3MHW keyed in, fades out 0914Z; 0920 GM beacon in, no London beacon; 0924 QSO six with EI6AS, 59/59; 1104Z GW3CBY, 599/579; 1110Z G3WCS, 599/599; 1112Z G3COO, 599/599; 1129Z GI8YDZ, 599/319; 1156Z GM4DGT, 559/559; 1244 GM beacon, still 599, fades out 1334Z but no GM activity, typical E opening; 1433Z EI9Q heard calling CQ on six, 569; 1438Z QSO on six, GW3MHW (at last), 57/57, DL stations XB; 1700 EI9Q on six, 579/579; 1705Z QSO six G3KOX, 599/339; 2030Z ten open to UK but nil on six.

15th June – ten metres open very early to UK, worked G stations on ten from 0639Z, no beacons on six, but QSO at 0756Z on six with EI9BG, 59+/59+; 0834Z QSO on six G3CCH, 579/559; 1008Z G3ICH, 599/599; 1009Z G6XM, 599/589; 1014Z G3MY, 59/59; band fades 1015Z, no beacons on six metres, ten remains open most of the day to UK.

Ted worked G stations on all HF bands 28-7MHz, throughout the day, the first QSO on six being at 1946Z, PA0XMA, then a pile-up until 2233Z. Over 200 stations were worked in G/GW/GM/GI/GJ/GD/EI/9HL, the last QSO being with GM3ZBE. A typical E opening with some additional propagation mode. The stability of the propagation suggests some F layer support? Both GM and London six metre beacons were in during the opening but nothing was heard from GB3SIX.

Ted understands that during this opening UK stations were QSOing YV0. He would like to know the overall picture during this time-frame. Was there much sporadic E during the day from G to DL etc? Or much XB working? Was the CT beacon heard? Did anyone hear the FY7THF beacon during the opening to YV0? Did the YV0 have a path before or afterwards to W/VE or PY/LU? (Some of these points are dealt with in the excellent appreciation by Charlie Newton G2FKZ which follows. We also hope to receive a report from Jim Trebig W6JKV who operated from Avis Island). If any of our readers can help in the propagation study over this interesting period their observations will be very much appreciated and recorded.

On 17th June Ted returned to C30 in the afternoon to purchase 'duty-free' items he had forgotten, and slung a dipole to a tree in Encamp and was lucky enough to work K1TOL and WA1OUB: 2054Z K1TOL, 569/519; 2103Z WA1OUB, 579/529. He heard one of these stations, but can't remember which one, working W6TZD and could hear TZD 339.

When Ted moved to Luxembourg to operate as LX/G4UPS, his location was JN29SX, 4km south of Luxembourg City. He had to use a 28ft high mast, from which a straggly G5RV, six metre dipole and ten metre dipole were slung. Not a very tidy array, but it worked! LX was far more interesting than C30. C30 was what one would expect, a mixture of southern France, CT-EA path. LX had constant, all day long TV from Eastern Europe, with lots of Russian/Polish FM on the band. For a shorter path into DL or G one would need to stop for a longer period, maybe at the beginning or end of the season, plus a wee bit of luck.

He arrived on 28th June and got the aerials and awning up to be on the HF bands by 1826Z. The first six metre activity, apart from constant TV, was on 30th June: F/G4JCC XB, 57/55, CT0 beacon very strong at 1712Z, EA1MO heard at 1727Z on SSB but he faded out, CT0 out at 1800Z.

The next activity was on 2nd July: 1647Z six metres, LA2AB, 599/559; 1650Z crossband, OH2TI, 59/559; 1745Z six metres, LA2AB, 59/59; 1810Z heard 9H1 stations but couldn't raise them, CT0 beacon in from 1649-2223Z; 2036Z six metres, LA2AB, 59/59; 2036Z, LA9DL, 57/45; 2048Z, 9H1CG, 59/57; 2056Z, 9H1BT, 59/57; 2152Z, GB3RMK beacon, 599+; 2157Z both 9H1 stations work LA2AB, still all 59; 2220Z some activity crossband, worked 9H1, GB3RMK fades out.

3rd July – ten metres opens up at 0530Z; 0902Z XB, YO2IS, 59/57; 1005Z six metres, EI2W, 59/54; 1011Z, GW4HXO, 59/59; 1014Z, EI6AS, 59/57; 1032Z, EI2W, 59/59; 1036Z, GI8YDZ, 59/53; 1040Z six metres, G4GAI, 59/59; 1140Z CT0 beacon in for over one and half hours; 1158Z crossband, EA4CGN, 59/519; 1220Z crossband, EA2JG, 59/59, nothing further except for CT0 beacon.

4th July – constant TV from about 0630Z, CT0 beacon very strong 1530-1745Z.

5th July – 1033Z F/G4JCC on ten metres working crossband; 1045Z CT0 beacon in for 45 minutes; 1430Z CT0 beacon in for just over one hour; 1935Z crossband, EI6AS, 59/57; 1937Z six metres, EI6AS, 59/57; 2004Z, GW4HXO, 59/59.

6th July – Nil on six metres.

7th July – 1160Z six metres, LA6QBA, 59/59; 1134Z ditto; 1301Z, 9H1CG, 579/579; 1325Z, GM4UPL, 59/59; GM beacon in from 1317-1400Z, TV fades out during this time, TV returns by 1405Z; 1635Z until 1717Z TV very auroral, returns to normal 1717Z.

Conclusions LX/G4UPS

Ted felt that he was very unfortunate in not having any really good openings whilst in LX, and would be interested to

know what propagation was like during this period. According to the locals the band there remained dead over the whole period. Ten metres appeared to be open very early every day to UB5/UA, YO etc, and he suspects that the TV was coming from SP land, as he was hearing a lot of Polish/Russian FM throughout the day, and the TV was on from around 0630Z-2300Z every day, but did fade out at times of other paths being open.

He intends to go to LX for a longer period next year, a little better equipped, and with a beam for ten metres and a DX TV set-up. He would like your comments on the LA/9H1 path with him in the middle, hearing/working both! (See Charlie Newton's comments).

E openings July 19th to 21st

Charlie Newton has plotted out the periods of blanketing E as recorded by stations, with the northernmost at the top. What strikes him most is that the E cloud can be very patchy and only be seen by one station at any one time, such as at South Uist at 10.00 hours on the 20th. But what is more obvious is that all or most of the stations see something. This means that we are not dealing with small isolated areas or patches of isolated E clouds, but rather massive ionic clouds covering vast areas of Europe. We must remember that the Ionosonde stations only look up vertically at the ionosphere, so although they may not see the cloud at their recording time, it could be only just off their recording edge. The 20th was, he felt, a case like this: from 07.00 to 08.00 the Slough station recorded 'O', meaning other phenomena, but could not be positively identified as blanketing 'E'. The cloud was a bit thin.

The other point of considerable importance is that the northern station South Uist has seen a lot of E, very much more than we would expect. Also it is very interesting that SF spread F appears prior to the E and at the end of the E. Spread F means that the ionosphere is spread and holes are appearing, can be horizontal or vertical or both. So we see the pattern, the intensification of the E layer from a patchy F2 and the disintegration of the E layer back to a patchy F2.

For the southern stations spread F is a rare event, so we would not expect it, but we would expect more sporadic E. It is therefore interesting to note that on the 20th, the southern station Poitiers had the least E. It would appear that the mid Europe band (latitude 54 to 57 degrees) was where the E or O (other) phenomena were. If we use just plain logic then contacts would have been possible to well north of South Uist latitudes, and to well south of 54 degrees. If we drop the frequency to 29MHz, such as for cross-band working, then this is what happens. If we now increase the frequency then it is only the denser parts of the cloud that can do the trick, so we are back to patches. If we go to the limit, say two metres, then we may only have one patch to work with. So contacts can be very widespread or very selective, it mainly depends on frequency. Also, of course, the clouds tend to spread more east west than north south, this is due to the earth's magnetic field causing an alignment that way.

From the mailbag

As could be expected after such an eventful period we have had a very long and interesting mailbag, and desirable as it may be, we unfortunately do not have enough space available to include all reports in full. My apologies.

Another long letter was received from Lefty, K1TOL, dated July 1st: 'As I write these lines I hear European video on 49.750 and 760, but I hear no European stations coming through. My CW keyer has been on memory-repeat mode, but no answers!

On 29th May I heard OX3VHF for 4 hours, then at 2020Z heard GB3SIX from S2-S9, but only for 4-5 minutes. On 5th June I had a QSO with CT4KQ at 2303Z. On 7th June the GB3SIX beacon was heard from 1244-1515Z, but no UK stations. For the last four days since 6th July I have heard Russian video at 1300-1400Z. I made many calls on CW, but heard no stations except from the USA. How frustrating!

'I wonder how far UK stations have worked into USA? Also, which stations in Europe have the most number of US statons worked? We have not heard any Europeans since June 20th, prior to that I had worked 150 Europeans, mostly Gs. I have also worked PA0XMA, DK1PZ, DJ3CY, CT0LN, CT4KQ, LA9UX, C30DAW and 9H1BT. I also heard 9H1CG, but failed to work him.

'I have now worked 75 countries on six metres since 1977, and I have just heard that ARRL has now authorised 50MHz DXCC; who'll be the first?'

Ray Cracknell G2AHU wrote a letter dated 28th July regarding the Reporting Club records, we are looking for the first intercontinental and then special modes, eg the first transatlantic Es; the first TEP etc. Hearsay reports of W6s being heard as well as 0 and 7s have been coming in, but when I try to get first hand information they become dubious. Indeed, the path to the West coast goes over the magnetic North pole, and I shall need a lot of convincing that it is possible by Es'. Can any of our readers help us in this matter?

Oving Aylesbury G6NB writes: 'Recent openings for me have been on 17th June when I worked my old friend Larry Nava at 2246Z, followed by K1TOL, WA1OUB and W5HUQ. This was followed on the 19th June at 20.00Z with W9IP/2, K1TOL and VE1YX. Lady Luck was with me on the 24th June when I worked W6JKV/YV0 at S9+ (also my son Richard G2BSJ worked him at S9+).

In the Contest News (page 614) of the August issue of *Radio Communication*, we note that a fixed station 50MHz contest is listed: 0900-1300GMT, 18th October, 1987, and further events with other formats will take place next year.

The 'Countries worked' ladder has been held over pending clarification/confirmation of status of some European countries, but please send your claims to me, Ken Ellis G5KW, 29 Stanbrook Road, Northfleet, Kent DA11 0JW. Many thanks.

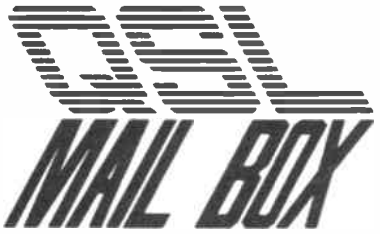
Table showing periods of blanketing E

Date – Time Chart	MD																		MN				
July	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5
19 SU																								
19 AP			E			E	E	E	E	E						O					O	O	O	
19 P									E															
20 SU		E	E	E	E							E	E	E	E	E	E			E	E	SF	SF	
20 AP	E		O			O	O	E	E	E	E	E	E	E	O						O	O		
20 PO	E	E	E	E					E	E						E				E	E	E		E
20 P		E	E																					
21 SU			E					SF	E	E		E	E	E	E		O	O	O		E		SF	
21 AP	E	E	E	E				E		E										O	O			
21 PO	E	E	E	E		E			E			E			E	E	E	E	E	E		E	E	E

SU = South Uist	57.37°N	352.67°E
AF = Slough	51.50°N	359.43°E
PO = St Peter – Ording	54.00°N	9.30°E
P = Poitiers	46.00°N	0.00°E

E = Blanketing 'E'
SF = Spread 'F'
O = Other

Compiled by G2FKZ



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Tony Smith G4FAI takes his bimonthly look at the world of dots and dashes

Moe Lynn VE6BLY has sent me details of the arrangements for the VE Morse test, effective from 15th October, 1986. Tests are administered by three appropriately qualified amateur examiners on behalf of the Department of Communications, although candidates still have an option to be tested by the department.

There are two levels of examination. The Amateur Class requires a sending and receiving speed of 10wpm for three minutes, including plain language, figures, punctuation marks, Q codes and emergency signals.

Candidates may send on a hand key, a semi-automatic key, or an electronic hand key. When receiving, the text must be copied legibly by hand or by typewriter. The Advanced Amateur test has similar requirements, but at 15wpm.

Licence conditions

Morse is the only form of communication permitted in the lower part of most bands up to 144MHz. For example, on 3.5 to 3.725, 7.0 to 7.050 and the first 100kHz on 14, 21, 28 and 144MHz. Holders of certain professional operators' certificates can operate on the amateur bands, and permitted powers are higher than in the UK. The maximum dc input is 1000 watts, or 750 watts carrier power measured across an impedance matched load.

There are a number of other noticeable differences between Canada and the UK. Third party traffic is permitted, and authorisation can be obtained in certain circumstances for amateur operation on ships and aircraft.

Several bands are considerably wider than ours, eg 3.5 to 4.0, 7.0 to 7.3 and 144.0 to 148.0MHz, and there are extra bands at 220 and 902MHz.

Overall, Canadian amateurs appear to have a better deal than we do. CW operating seems to have retained its status, including the right to use particular sections of the bands, not by 'gentleman's agreement', but by legislation. One can't help wondering where *we* went wrong along the way!

CW on 2 metres

In an earlier column I suggested that there could be more CW activity on 2 metres. Ian Cornes G4OUT near Stafford responded by telling me he had worked 217 CW stations on 2m during 1986, mainly ragchewing, representing 9 countries and 44 counties. On my reference to 'Monday night is CW night' he commented, 'This may have been the case a few years ago, but it is certainly not now.' He then gave me a detailed breakdown of his own activities over the year in which (excluding contests) the most active day was Saturday, followed in descending order by Wednesday, Sunday, Thursday, Friday, Monday and Tuesday.

Ian has clearly enjoyed 2m CW from the beginning. When he obtained the G-QRP Club's Novice Award, with an output of 2.5 watts, it was endorsed 'First 144MHz Class A'. Now he operates with 3 to 10 watts into a 12 element ZL Special at 40ft agl with a good take-off in all directions. He says, 'There are plenty of people to work on 2m CW if one cares to look'.

Another 2m enthusiast is Dave Ackrill G0DJA in Kings Norton who says, 'I spend most of the time I allow myself for amateur radio using Morse code on the 2m band.' He runs 2.5W into a 20 metre long wire via an ATU. With this antenna he regularly puts a signal into Liverpool, Manchester and Yorkshire under flat conditions, and has often heard the Scottish beacon, GB3ANG. When he wrote to me he was hoping to erect a rhombic and work even farther afield.

Keying speeds

Gerald Stancey G3MCK offers some interesting comments on keying. 'I think it is accepted that novices can send faster than they can receive. I wonder when, or if, the reverse is true? That is, at what speed does the brain become a limiting factor when forming and sending messages?

'I have different top sending speeds for ragchewing and rubber-stamping, due to the difficulties in composing my thoughts. One thing I think is different between now and 25 years ago is the degree of 'non-standard' abbreviations that were used then, and aren't now (eg, RU) omitting all vowels etc. I know that they are not uncommon today, but I don't think they are too widely used.

'I suspect this is because 25 years ago automatic keys were not too common and many CW operators could only physically drive their straight keys at 20wpm, having brain power to spare to use in abbreviating words. The same operators today use bugs, etc, and need this brain power to drive their keys at plus 25wpm; hence they don't abbreviate extensively. In fact, one well-known QRQ operator advised me not to abbreviate at high speeds to assist in minimising errors.'

Morsum Magnificat

Last November I announced the first issue of an English edition of *Morsum Magnificat* , or 'MM' as it has become known among its devotees. Some people expressed doubt when it began that it would be possible to fill a 48 page magazine four times a year. However, the reverse has been the case and an amazing range of Morse material has been coming in from a variety of sources.

The latest issue (Summer 1987) illustrates what I mean. There are twenty-six items, ranging from a few lines about the best high-speed operator in Europe, by G3OC, to the memories of Samuel FB Morse III W6FZZ, who says, 'I frequently boast of being much more proficient (as a telegrapher) than was my great grandaddy'!

An article on the heliograph by WA1SPM describes how this form of Morse telegraphy brought an end to the Apache wars in 1886. There's the story of a WW2 German spy-set, now in the Leith Police Museum, complete with circuits for those who want to try their hand at vintage reconstruction; a discussion on the importance of 'readability' in RST; a suggested approach to direct conversion reception without the disadvantage of hearing the signals on both sides of the beat frequency.

Add to that the tale of a Morse key which went down when the German High Seas Fleet was scuttled at Scapa Flow in 1919; information about the Scandinavian CW Activity Group; G8PG's question, 'Marconi – DXer or Con-man?'; G0EEG's memories of training as an interceptor in WW2; vintage keys for collectors; and more... and you can see what I mean! Even though I say it myself, there is nothing quite like it anywhere in the World! Produced by and for Morse enthusiasts, veteran or beginner, it costs just £6 a year for four issues. Just send me a cheque, QTHR, payable to *Morsum Magnificat* to join the fascinating world of MM!

Tony Smith is English Language Editor of Morsum Magnificat .

PROJECT BOOK

by Martyn Williams

The big interest at the moment is the recent release of the 50MHz band and the possibility of getting some intercontinental DX on the band as conditions improve. There have been excellent openings to the States in the last few weeks, which show what can happen even under flat, bottom of the sunspot cycle conditions.

During the next few issues we shall be describing a range of equipment to help get you on the band, and we start this month with a look at a suitable aerial system.

Yagi basics

The first thing that the VHF man is going to notice about any aerial for 50MHz is its size which, in round figures, is about three times that of the equivalent two metre array. There is nothing we can do to alter the laws of physics, but we can make sure we get the best possible results from a small aerial.

The smallest array would consist of only two elements and could be built in either a dipole and director or dipole and reflector configuration. Which is the better choice? At first sight the director array would appear to be the best as it gives around 0.3dB more gain, but the spacing has to be very tightly controlled to achieve this small amount of extra gain.

Advantages

The advantage of the reflector based array is that over a spacing of from 0.1 to 0.25 of a wavelength the gain varies very little and is set at about 5.5dB over a dipole. The importance of this point is that it then allows us to set the spacing to ease feed impedance problems and to get a reasonable front to back (F/B) ratio.

The F/B ratio in the following design is arranged to be around 15dB, which still allows you to hear strong signals off the back of the beam; too high an F/B ratio can mean that you actually lose contacts by not hearing people calling CQ.

Matching

The feed impedance of the array will be too low for direct connection to co-ax, and some form of matching section must be used. A common method is to use a folded dipole, but this is not easy to make, cannot be readily adjusted and presents a balanced load to the unbalanced co-ax cable. A better system is the gamma match, in which the outer of the cable is grounded to the centre of the aerial, and the inner is taken through a variable capacitor and matching line to a tapping on the element, in a similar manner to the well-known HB9CV aerial. This has the advantage of being inherently unbalanced, and it allows us to tune out both the capacitive and inductive reactances of the aerial, so allowing, in theory at least, a fully matched resistive load.

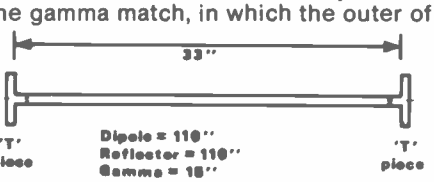
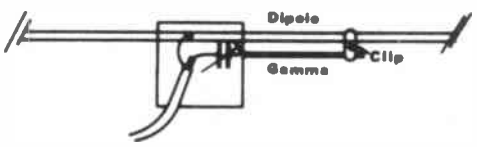


Fig 1 *Detail of boom and elements*

Fig 2 *Detail of Gamma match*



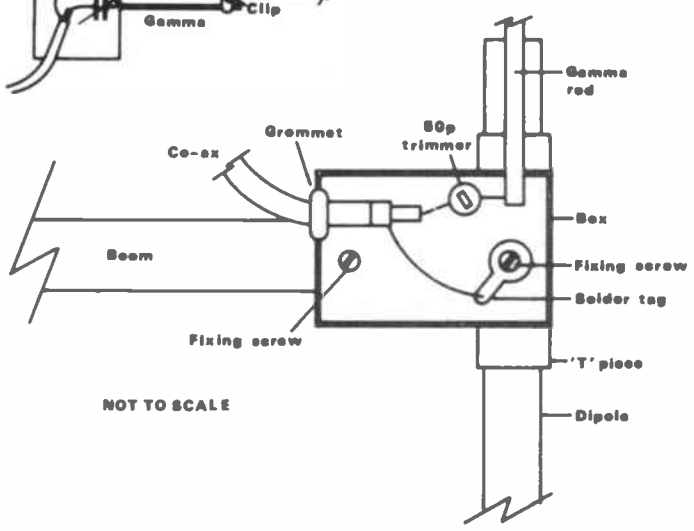


Fig 3 *Construction of driver element*

Construction

The beam is built by the method known as Plumbers' Delight, and everything you need is available from your local hardware store or supermarket. The boom and elements are all made from standard half inch (or 12mm) diameter copper water pipe and the element supports are normal 'T' joints. These *must* be of the soldered (not compression) types, so as to maintain good electrical continuity.

The boom is cut to a length of 33in and the 'T' pieces are then fitted at each end, making sure that they are square and in line with each other. The elements are first cut to a slightly longer length than is required, and are then soldered to the 'T' sections. They are then cut to give the overall length shown in the diagram.

Electrical

A small plastic box should now be mounted under the boom at the radiator end. This may be done by using either a couple of self tapping screws into the boom, or a couple of pipe clips mounted over it with fixing bolts taken through the box. A hole should be provided to allow the Gamma rod to emerge, and another hole should be made at the inner end of the box for the coaxial cable. When the rod and cable are fitted, these holes should be filled with a sealing compound to stop water getting into the box.

A solder tag should be fitted inside the box, making connection to the centre of the 'T' by means of a self tapping screw, and the co-ax braid should then be soldered to the tag. The Gamma rod may be made from a 15in length of water pipe and the matching capacitor is soldered from the end of this pipe to the inner of the co-ax cable. A shorting clip is then made up from a small piece of metal and fitted in place.

Tune up

The aerial should be mounted on a clothes post or similar support and should be as much in the clear as possible; an upward tilt will help to avoid ground reflection problems while adjustments are made. The SWR meter is connected in line and some RF power applied at about 50.5MHz.

Adjustments are now made by varying the tuning of the capacitor and altering the length of the matching rod until the lowest possible SWR is obtained. With patience it should be possible to get very close to the magic 1:1. The ends of the elements should be filled with corks or stoppers of some kind to prevent the very annoying 'organ pipe' effect in high winds. To finish the job the whole aerial should be well painted before it is finally fitted to the mast.

News and comment from Glen Ross G8MWR

Another report to hand from our intrepid mole brings news of some forthcoming licence changes. Some of these are concerned with Packet radio and will allow unattended operation under certain circumstances. The idea is to facilitate the automatic handing on of packets when the board operator is not present.

As far as is known, this will be the first time in our history that such operation has been permitted. It could also mean the opening up of a limited type of third party traffic to enable messages from originators other than the station licence holder to be forwarded automatically. There is also a proposal to allow local clubs and suchlike to run boards under a licensing system similar to the existing repeater network, using callsigns in the GB7 series.

More Packet news

The note in last month's issue on the proposed 350kHz section of 50MHz being set aside for Packet operation has resulted in a flurry of correspondence and a lot of publicity on various bulletin boards trying to explain it all. So what is really happening? The Packet Working Group (PWG) have quoted the RSGB position as being that there is no intention of forcing Packet operators off two metres. In other words, they still intend to use those frequencies as well as the six metre band, so proving the point I made last month.

It is expected that there will be around 300 mailboxes running within the next few years and that the two metre allocation for data comms between 144.625 and 144.675 is insufficient for this amount of usage. One could always argue that the use of SSB operation should be investigated with a view to getting more efficient operation and more stations in a given band.

IARU agreement

The PWG also point out that there is already a 100kHz allocation on six metres for Packet purposes (what happened to the 350kHz they were talking about?). They try to make this sound like an international agreement, but in fact it was introduced by the group itself. The next point made is that licences for operation of boards on 70cm could take up to two years to obtain due to the involvement of the MoD in the discussions. In contrast to this, similar licences for both two and six metres can be issued in a matter of weeks.

One of the major problems to be overcome is that of interlinking the various systems, because the IARU has an agreement that this shall not be implemented on two metres. It is also virtually impossible due to QRM problems to interlink on the same frequency as the mailbox traffic.

The solution

It is intended to run a system of units on six metres which will handle both mailbox and real time applications, and these will be interlinked at levels 3 and 4 on either 70MHz or 23cm. There will also be a network of gateway stations on two metres, allowing you to get into any mailbox irrespective of the frequency the mailbox is on. If you find a lot of QRM on the two metre input then you will have the option of trying the six metre input where conditions may well be less hectic.

All these points are only concerned with a formal mailbox system and normal person-to-person digipeating will continue in the same way that it does now.

More communication

It could be said that perhaps the PWG should communicate more, and they intend to do so once the bulletin system is running. This will keep operators informed, but what about Joe Ham? When there are proposals for using up a chunk of airspace which, in a sense, is public property, then surely everyone should know what is going on? If the PWG and, indeed, the RSGB would supply the various magazine writers with brief information about what is going on, even if these notes were not for publication – a sort of RSGB 'D' notice – it would at least stop what they refer to as 'ill-informed comment'.

Good things

Details have been received of the official Maltese licences which are available to all classes of licence holder. They have a power restriction of ten watts, but there seems to be no limitation on the gain of the aerial used. With any moderate size beam this will mean an ERP of around 50 watts, which equates fairly well with our restrictions.

There has also been a general allocation in Norway to replace the previous limited permit system. The allocation is from 50 to 52MHz with a power limit of 25 watts to an aerial of not more than 6dBd gain.

Illegal operation

Two strictly illegal operators are EA1MO in Spain and YU50MHZ in Yugoslavia. The first of these apparently operates under a friendly agreement with the local TV station that he can continue as long as he does not cause any interference, at least that is the rumour. There has also been some illegal operation from France when a visiting amateur could not resist the opportunity to provide some TVI.

Beacon news

Another good bit of news is that the Portuguese beacon, CT0WW, came on the air on 10th June. The frequency is 50.03MHz and it is running 40 watts to a dipole aerial. Several reception reports have come in from the southern part of England. To balance the numbers VE1SIX, a Canadian beacon, was struck by lightning on June 11th and is off the air. GB3NHQ, operating from RSGB HQ at Potters Bar, is still putting a good signal around in spite of running QRP, which must be a problem for HQ staff when they operate on six.

There is news of a proposal to put a 50MHz beacon on Grand Cayman Island, possibly using the callsign ZF2KZ with ZF1RC as beacon keeper. No more details are available at this time, however.

First contacts

Some notable 'firsts' have been recorded. On 28th May G3CCH made the first G/Malta contact with 9H1CG. This was followed on 6th June by the first GM/Malta contact, made by GM3WOJ and 9H1CG, the distance being around 2800km. Also on the 6th, 9H1BT was worked by GI8YDZ and EI6AS to give the first contacts between Malta and Northern Ireland and Eire. The following day, GI8YDZ made the first contact into Cyprus, when he contacted ZC4VHF. On 14th June G3KOX contacted W6JKV/P/V2A for the first G to Antigua contact.

On 24th June W6JKV had moved to Aves Island, signing W6JKV/P/YV0, and the first G contact was made by G4GLT. This opening lasted for about one and a half hours, during which W6JKV worked many British stations.

ON THE BEAM

Operating news

June 14th saw a big opening into the States on 50MHz with activity from at least six of the American call areas being reported, as well as CT and EA stations. Another opening on the 15th resulted in more American stations being worked and also a report that CT1WW worked into VP2; this contact may also be a first over the path.

The same day saw a lot of crossband activity with 4U1ITU in Geneva working hordes of G stations. On 18th June there was another opening into the USA in the morning and around midday a nice Es opening on two metres, with many YU, I, OE, YO, OK and 9H stations being contacted.

The biggest transatlantic opening so far occurred on the 19th, when the band opened to the whole of the Eastern coast area. Dozens of Americans were worked and even QRP stations were putting tremendous signals over here. Do not forget that the crossband frequency is 28.885MHz and regular monitoring can give early warning of good openings on six.

Up in space

Oscar 12 (Fuji) is now into the second year of operation, the mailbox facility coming into use in May. It provides AX25 access when the transponder is in operation. It can store up to 50 messages before the earlier ones get overwritten, but there is no message security; anyone can read your MBX. The callsign to use is 8J1JAS and the frequencies are 144.85, .87, .89 and .91 for the input and 435.91 for the output.

Oscar Phase 3

The latest ideas on Oscar phase 3, which may be launched in 1990, is that the transponder should have a downlink power of 250 watts PEP. That should need a few solar panels to keep it running! The launch of the phase 3C bird now looks likely for January 1988, always provided that the next couple of Ariane rockets go up the right way rather than the submarine mobile operation that one of them decided on a year or two back.

Do not forget if you are a mailbox enthusiast that if all else fails you can make use of the facilities provided on UoSAT Oscar 12, but to do so you first have to access the university's digipeater, GB3UP.

Microwaves

There has been a noticeable increase in activity on 10GHz this season and even 24GHz has seen about an extra 20 stations, mainly in the Midlands and the North, compared to last year. August activity from the Telford group's visit to The Old Man of Coniston and G8KQW's trip up Snowdon will have made some near 200km paths available on both bands.

Talk-back for microwave contacts is centred around 144.175MHz for SSB and, although there is no official FM frequency, many stations who do not have sideband capability are using 144.525MHz. Activity is no longer confined to the contests and there are operators out most weekends.

It is particularly pleasing to see some activity from South Wales, with groups in the Chepstow and Swansea areas making good progress. Tim G3KEU mentions the lack of 10GHz SSB operation, except in the south, although several Midland stations are known to have such capability. Perhaps they would make an effort for the September contest? GM4ISM is now operational on most bands, including 5.7GHz SSB and 10GHz FM and SSB, with a four foot dish from his new QTH at Larkhall. He has an excellent take-off to the south and is looking for skeds. Contact him on (0698) 886504.

Sign-off

Time to go. Please let me have all your news, especially on 50MHz which is creating a lot of interest. What a band that is going to be when the sunspot activity moves up the curve a little! QTH is 81 Ringwood Highway, Coventry or you could join in the fun on Prestel and use 203616941.

SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

There is nothing mopre calculated to depress your average repairman than to pick up a job with 'intermittent' written on it as the fault. Sod's law dictates that the thing will work like a good 'un, until returned to the customer, whereupon it will promptly turn up its toes. Sometimes it's the customer's fault – a legal CB set that came in described as 'dies after a few minutes' that had nothing wrong with it springs to mind. This particular set drove me to distraction, until I found out that the owner was secretly using a very naughty linear amplifier on the end of it, and powering the whole lot off a somewhat dubious 2 amp power supply that collapsed under the strain after a minute or two.

Another customer induced fault was a 2 metre rig that died after a minute or so. This turned out to be a very poor aerial installation giving a high VSWR. As the PA heated up the thermal protection circuit in the rig did its stuff and stopped the action. Even I cannot repair perfectly working equipment!

Assuming it's not a silly, like the above, sometimes the best bit of test equipment to find the fault can be a watch. Suppose you had the above working rig and duff aerial in your shack. When you go onto transmit, note the time it takes to drop out. If you release the push to talk then re-press it, does it now work for the same period of time or is it much shorter? If it takes exactly the same time (give or take, say ten per cent), then you probably have a system or 'housekeeping' problem. If it takes, say, three minutes for the first trip, then a few seconds every subsequent go unless you leave it for a while, then the trouble is probably thermal – turn it off and see what's getting hot inside!

If there is no noticeable time pattern, you have a full blown intermittency on your hands. You also have my sympathy! The only way out of something like this is proper fault-finding, working your way through stage by stage. Before leaving the subject of this type of fault, may I suggest that you run the rig up into a genuine, known good, decent dummy load before going in with the screwdrivers? If it will work till the cows come home on a load, but trips out on an antenna then, obviously it's time the resonant hardware (ie aerial system) was given a look over.

There are two types of the rather naughty 'transmit from 26 to 30MHz mode' boxes that will always reject a half wave dipole somewhere over the band. The reason is quite simple. A half wave resonant at say, 26MHz (naughty, naughty), will be chucking back more than it chucks out at 30MHz. Resonating it in the middle is no good either, the rig will still trip out, this time at either end. You can just about get away with a dipole resonant on 29MHz to give full coverage of the ten metre band.

Real intermittents

Here I am talking about the 'tap it and it crackles' sort of thing. Very irritating. Modern electronic gear is very reliable, so it's a good idea to check all the connectors to the gear first, power leads and aerial plugs etc. I then prefer to take the covers off, turn it on and then, with great care, gently tap my way all round the boards with an empty plastic biro. The reason I use an empty biro is that I once got a belt from a TV line output transformer up the ink bit!

The idea behind the gentle tapping across the board is to locate the area in trouble. When you are near the fault the crackling will be more pronounced (or less pressure will be required). This method will often lead you straight to the fault, look for nests of resistors, for example, where there might be lead out wires touching, ditto transistor legs etc. Either that or a dry joint lurks in the area.

One fault that I have come across very frequently in marine equipment concerns the lead out wires of axial capacitors. Very often the capacitor itself is made of aluminium, but the lead out wires are BTC (bare tinned copper). The lead out is simply crimped into the aluminium, see *Figure 1*. A gentle tap on a capacitor with a dodgy crimp will soon show up this fault. You can either replace it, or do the strong arm stuff with a pair of pliers. I think the fault is particularly prevalent in marine gear due to the dissimilar metals and the corrosive atmosphere, though I have come across this fault in some amateur rigs.

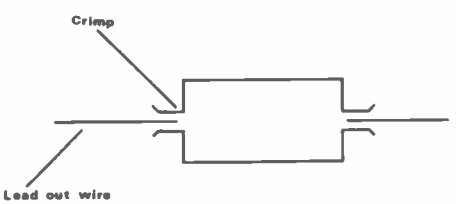


Fig 1 *Capacitor crimps*

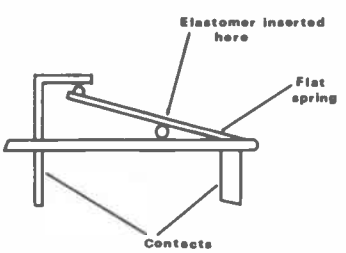


Fig 2 *Microswitch repair*

Intermittency in high power circuits, such as television line output stages, power supplies etc, can sometimes be found by running up the equipment in the dark and jarring it. Small flashes can sometimes be observed where the poor contact is taking place, but I must emphasise the extreme care necessary when using this method. Exposed high voltages and a darkened workplace are not conducive to a long life, so take great care.

Portable Russian SW radios

These sets are sold under various names, such as Vega, Selena and Astrid, at very attractive prices, often around £30 new, £5 or less secondhand. A lot of amateurs first came into the hobby by buying one of these and becoming 'hooked' on short wave listening. Although there is no BFO for amateur SSB use, it's quite surprising how much interesting broadcast stuff that these sets will pull in.

The main bugbear on these sets is the turret used in the tuner. This is a six inch long, three inch diameter thing, containing all the coils for the different wavebands. The band change switch on the side of the set rotates the turret and changes contact between the coils. This is achieved by a row of fingers, which are fixed, and small 'studs' on the rotating bit.

These studs are silver plated and tend to blacken up over the years as the silver oxidises, leading to great intermittency. Rule one, never, ever try bending the fixed fingers. I've not come across one set yet that has had trouble here, it's always the studs. Rule two, don't use sandpaper or emery cloth on the studs to clean them up, it's too vicious. The ideal thing to use is the non-metallic stuff used in the kitchen to scrub pots and pans, often referred to as 'Scotchbright'. It's sometimes sold adhering to the back of sponges used for washing up. Used dry, a couple of gentle rubs will soon clear away the black oxide, thus restoring the set to its former glory.

In the 'egg on my face' department I must confess to having repaired dozens of these sets which had push on knobs (volume, tuning etc). Sometimes these were a little difficult to get off, and required a screwdriver to persuade them free. Who bought a duff one for 25p at a rally and bust a pot levering off a screwed on knob?

On the subject of pots on these sets, the variant with the tone control underneath the wavechange switch (on the side) requires great care in its removal. Even the gentlest tug on the knob to get it off will pull the middle out of the pot, breaking it for good. I always hold the shaft inside the set with a pair of pliers, whilst pulling the knob off outside.

Microswitches

A friend came round in a panic. He was off to some sailing race or another and his marine hand-held transceiver, an Icom ICH6, had died on him. Apparently, he had put it on charge the day before it was required, and had grabbed it on his way to the river, after which it didn't work. He did provide one important clue – he said the transmit receive switch, the normal bar on the side, didn't feel right.

He was correct, the microswitch was not well, a flat spring had lost its springiness. The problem was he had a car and boat outside, and required the rig working, there and then, and I had no spare switch. Suddenly, inspiration struck, use elastomer sleeving. I lightly glued in a thin sliver as per *Figure 2* and all was well. I warned him it was only a bodge, but he told me this was the last race of the season and boat, trailer and transceiver were being sold as a lot. Thus a proper repair was SEP (someone else's problem!).

Although I've never had trouble with them in other rigs, the mini-microswitch referred to above is used in a number of modern amateur hand-portables, so the above might be a good 'get you home' bodge while waiting for the new spare to arrive. I wouldn't recommend the bodge on high current mains microswitches, such as in washing machines. Such a decent contact is required that I wouldn't consider anything but a proper new replacement in these cases.

Daiwa SR1000

This is a VHF 1000 channel synthesized receiver. Not that widely sold in this country as an amateur receiver, they seem to have sold well in their marine band variants, so watch it. There is absolutely *no* indication of where they are set up to tune, amateur or marine. The 'sales' idea at the manufacturers was basically sound, make a 1000 channel receiver with a synthesizer that steps in 10kHz channels over a 10MHz range (that's 1000 channels). Now add a mixing crystal and make it receive over a 10MHz chunk where required. In practice the rather nice, quiet front end covers roughly 120 to 180MHz.

Marine variants

I came across a forlorn short wave listener who had bought a marine variant, thinking it was a two metre one, a reasonable assumption to him since he had (and was pleased with) their 'Search 9' two metre receiver. I worked out the frequency of the crystal he required (59.652MHz) and showed him which one to change (it's the one at the back). When I met him again he said I deserved only seven out of ten for my efforts, because although the receiver now worked well on two, the switch markings for the MHz frequency selector were wrong.

Think about it. The marine variant covered 154 to 164MHz. The continously rotatable MHz switch (ie no end stop), if set to 4 gives 154MHz, there being no 100's or 10's of MHz switch. '0' thus equalled 160MHz and '3' thus gave 163MHz.

After fitting my conversion crystal, which I'd worked out to give coverage of 140 to 150MHz, his receiver gave 140MHz as an indicated 144MHz, ie he had to dial up an indicated 8 MHz to get 144. What he didn't know was that the MHz indicator dial on the switch shaft is on a clutch. In front of his startled eyes I removed all the knobs, pulled off the front panel and moved the indicator disc back four positions, being now awarded 10 out of 10 for effort!

Price wise a secondhand SR1000 on two goes for £45, the marine variant about a tenner less. By the way, 10kHz is the lowest channel selection. Don't let this worry you with respect to our 25kHz channel spacing, in practice they don't sound too bad 5kHz off.

Heathkit HR10B

I must confess to never having noticed these receivers before. I came across an amateur with what I thought was a RA1 Heathkit reciever under his arm at a rally. The guy was looking for the bring and buy, but after the obligatory haggle I was carrying it to my car and he was tucking fivers into his wallet. It was only as I went to put it into the boot that I noticed it didn't cover Top Band, as does your RA1, and the layout looked a bit odd. The reason for all this was that I'd just bought a HR10B.

Once again Heathkit are belittling their own product – the handbook describes it as a basic receiver. Somehow, an amateur bands only receiver with a crystal filter and RF stage doesn't strike me as too basic.

Performance wise, they are very stable indeed. I am only talking of experience here with two examples (I bought another soon afterwards). The RA1 exhibits an itsy bitsy tendancy to pull a kHz or so when you twiddle things whilst on 10 metres, the HR10B doesn't. It has very good SSB reception, even on 10. OK, it doesn't cover 160 metres or the new bands, but that still leaves plenty of action to listen to. I am quite favourably impressed.

Price wise they seem to go for about the same as an RA1, forty to fifty quid. Note, apart from my two I've since seen two others change hands. Also note that neither of these Heathkit receivers (the RA1 or the HR10B) came with fitted speakers. I've seen quite a few amateurs take back RA1s to sellers saying that their recent purchases don't work, only to look surprised when the seller demonstrates it working into an external speaker! Another thing to watch is the calibrator. Both sets come with a 'Cal' button on the front. Don't be lulled into thinking that this means a calibrator is fitted. The odds are that it isn't. A calibrator was an optional extra on both receivers, it plugs into an octal socket inside. Only the button and socket are standard!

Varying standards

It's also worth remembering that most Heathkit stuff is kit built (I know I'm stating the obvious!). Construction standards will thus vary enormously, from the frankly awful to the 'you sure this wasn't factory made'? Strangely enough the layout of the HR10B is a little bit better thought out and the examples of these that I have recently seen seem very well made, though a good layout is no guarantee against dry joints and other poor workmanship.

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■ Altron 3 ele 4 band mini beam, 6m, 10m, 15m, 20m, £70 ono. Buyer collects. Tel: Peter (0538) 702208 G4YYO QTHR

■ Hallicrafter Communication Rx, super sky rider model SX28, £50. AVO model 7 test meter, £25. Tel: Staines 59331

■ Wien portable radio, MW, VHF/FM, short wave 4-12MHz aircraft, 108-135MHz public services and marine 145-175MHz, £20. Nash, 39 Fleet Street, Holbeach, Lincs PE12 7AD. Tel: Holbeach 22649

■ Yaesu FT767GX, six months old, as new, £1200, buyer collects. KW200A HF tcvr, including PSU, just been re-aligned, very good condition, circa 1968, £235, buyer collects. Tel: (051) 327 5852

■ Yaesu FRG7700 receiver with antenna tuner FRT7700 and VHF converter (D) FRV7700. Mint condition, hardly used, £295. Tel: Oxford (0865) 779118

■ Very good amateur band receiver, KW201, crystal controlled front end by 200kHz dial, 4 x 10 metres, 3 x 21MHz, 2 x 14MHz, 1 x 7MHz, 2 x 3.5MHz, 1 x 1.8MHz, £80. 34 Wenny Estate, Chatteris, Cambs PE16 6UX

■ Yaesu FRG9600 Mk2 scanner, 100kHz-950MHz, with AKD, LF/HF converter which plugs into aerial socket, also PA4C ac adaptor, £400 ono. Tel: 01-228 4835

■ Microwave Modules 432/144R transverter, 10 watts output, £90. Microwave Modules 144/100S linear, 10 watts in, 100 out, with built-in pre-amp, £100. Tel: Durham 3701429

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■ Trio TS700G multimode base station transcvr, £375. Sony colour television, rotary tuning, suitable for DX TV, £60. Sharp stack system in cabinet, cost £160, sell for £60. FDK base station, multimode, digital frequency readout, 144-148MHz, £375. Will swap or part exchange for 50MHz gear, FT726R particularly wanted. Power supply for Trio TH21E and battery packs wanted. CB aerial and SWR meter, £10. Mike G1XGM, 51B Brownhill Road, Catford, London SE6. Tel: 01-461 5398

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■ Yaesu FT290R fitted with pre-amp, including Diawa LA-2035 linear amplifier, carrying case and slide mount. £245. B McMinn, 1 Aird Mhor, Mallaig, Inverness-shire, Scotland. Tel: (0687) 2570 pm

■ Compact short wave receiver, 153kHz-30MHz FM, 76 108MHz AM, FM SSB CW, 10 memories with all manuals and accessories. Boxed, as new, £80. Contact Les Haworth, Castleford, West Yorks. Tel: 516904 after 2pm daily

■ Realistic DX302 comms Rx. Digital readout, vgc. Complete with photocopy manual and circuit diagram (no mods), only £115 or WHY? G4YRQ, 4 Glovers Cottages, Ring O'Bells Lane, Lathom, Ormskirk, Lancs L40 5TF. Tel: (0704) 894700

■ KW Viceroy transmitter with PSU, ATU and spare valves. Used daily last five years. Need space for later KW rig, £40 ono. G4IZM Duncan. Tel: Rugby 811295 QTHR

■ Atlas 215X 100W HF mobile rig, 160m to 15m, including safety mobile microphone, speaker, handbook, with seven mobile whips and gutter mount. This rig is outstanding mobile, £300, no split. 10m multimode Ham International, full coverage of 10m band CW, SSB, FM, AM, ideal also for transverting, £120 ono. Sharp MZ80K, RTTY, with ST5C type modem, plus most of software, £120, no offers. Andy G0AYZ. Tel: Gosport (0705) 589560 anytime

ADVERTISERS PLEASE NOTE

Please ensure that your telephone number (if applicable) and address are included in the appropriate section of your ad.
If you do not wish to have your address published, please include it but state 'not for publication'.
Any ads submitted without an address and/or telephone number will not be printed.
This condition has become necessary because a small number of ads have been submitted by bogus readers, causing considerable inconvenience to the holders of the telephone numbers quoted.

■ Satellite dish DIY steel bladed, parabolic profile, rotary scraper. Makes 'plug' in sand/cement/plaster, etc, on which to 'lay up' 1.8m GRP dish. F/D= 0.45, £15 including some plaster. Complete dish on heavy duty polar mount with LNB tripod, £95. Feedhorn available. Demonstration free to callers. R Exell, 'Waybac' Victoria Road, Bicester, Oxon OX6 7PJ. Tel: (0869) 242676

■ Amstrad PCW8256 computer + printer with all documentation and following software: Wordstar, Dbase II, Supercalc, Multiplan, Chitchat, plus blank disks. Offers or will swap for 2m transceiver. Tel: (021) 7437425 evenings (ask for Stuart)

■ Sommerkamp FR500DX deluxe HF Rx with manual, immaculate condition, £90. Small discount if buyer collects. Also SEM multifitter with instructions, cost £75, accept £35. Patter of tiny feet forces sale. Tel: Dennis G1UKS. Tel: Lancaster (0254) 61675 evenings

■ Eddystone 730/4 receiver vgc with instruction, £130. Also Eddystone 940 receiver, excellent, £150. Buyer collects. Tel: 01-657 0430, evenings

■ Realistic PRO31 VHF UHF scanner, NiCads charger, £110. Sony Air Seven scanner, NiCads, £170. Icom 735 general coverage receiver transmitter, 100 watt AM FM SSB CW, mic, requires 20 amp PSU, 5 amp to receive only, all vgc, £700. Swap scanners for Grundig Satellite or IC28E Icom VHF Tx, cash your way. Write enclosing phone number to Peter, 61 Crystal Palace Park Road, SE26

■ AR88 CW/ SP/ h/book, £85 ono. DR49 digi readout, £125 ono. Evets compandor, £50 ono. Rx2 ATU £25 ono. LAR omnimatch, £25 ono. Mizuho, Rx1, GDO, £25 ono. All g/cond. W Gibson, 180 Castlemilk Road, Glasgow G44 4NS. Tel: (041) 649 4345

■ Homebrew gear: 160m/80m Rx, £10. 160m AM Tx, £5. HF CW Tx, £5. All believed working or good for spares. Also some odds and ends. Buyer collects. John. Tel: 01-940 2151 (days) 01-994 5765 (eves)

■ Tandy Realistic PRO32 portable scanner, AM, FM, receiver, 200 channels, 22,000 frequencies, as new, cost £260, sell £165. Fidelity citizen band 3000 FM home base, as new, cost £130, sell £75, or exchange either for video recorder or WHY? B Stapleton, 36 Hallingbury Road, Bishops Stortford, Herts CM23 5LA. Tel: (0279) 57735

■ SX200N scanner Rx, UHF, VHF, 26-314, £165. A Davies, 42 Everest Way, Hemel Hempstead, Herts HP2 4HX. Tel: Hemel Hempstead 216776

■ Heatherlite 2m explorer amplifier, £375. M/M 70cms transverter, 144IF, £90. M/E 70cms transverter, 28IF, £60. M/M RTTY MM4000 +2 keyboards, £180. ICS Amtor AMT-2 + BBC ROM, £180. M/M1296 Rx converter, £20. M/M1296 Varactor tripler, £25. J Wilson, 5 Braeside, Annbank, Ayr KA6 5EW. Tel: Annbank (0292) 520580

■ SEM 2m auto pre-amp, £15 ono. Vic20 8K RAM plus three cartridges, £30 ono. 48K Spectrum, plus books and software (approx £100). £75 ono. Buyers collect or pay carriage at cost. Ron G6BMY, 12 Chedlin Drive, Newall Green, Manchester M23 8RJ. Tel: (061) 437 0916

■ Trio R2000 communication, HF 150kHz to 30MHz, with SSB LSB FM AM CW, programmable memory, scan store, not 6 months old, with box and manual, offers around £366. NATO 2000 suitable for conversion to 10MHz, £125 ovno. Concord Marr 2 Ham International, AM FM USB LSB, £90. Tel: (0283) 221870

■ Realistic PRO31, complete with 9 volt power unit, scanner and power unit, only two months old, freq coverage 66-88, 138-174, 380-512MHz, cost £209, selling for £100. Dev. Tel: (0245) 257186

■ Yaesu FT newsletters, two volumes 1984/85, packed with mods, hints, fault finding tips etc, for all Yaesu rigs, £5. G Knox, 20 Pullan Avenue, Bradford BD2 3RT. Tel: (0274) 630266

■ Yaesu FT757GX, with FX757AT, antenna tuner and FP757HD. Heavy duty PSU. All boxed and in mint condition, only 12 months old, £950, may split. Wanted: FT one or FT902 or similar rig. (G4NXW). Tel: (0706) 224617

■ Superstar 360FM mint condition, £90 ono. WK5 1001, AM, SSB, with freq readout, £80 ono. Zetagi TM100 SWR, £30. Various valves; XG1-2500, £35. M8163, £3 each. GZ33, ECC 32-33, ECC 81, UU5, all £1.50 each. Tel: (0298) 71834 after 5.30

WANTED

■ Sony CRF330K, also Pan-International Crusader 'X', 12 bands, FM/AM/SSB/CW Rx, or Panasonic RF9000. Must be excellent condition, with manual if possible, and moderately priced. Cash buyer. Tel: (061) 743 1570

■ Hallicrafers CR50 receiver. Also wanted, the small volume knob (inner) for 'Ham' Multimode 2. John Higgins, 30 Underwood Road, Portishead, nr Bristol BS20 8PJ. Tel: (0272) 845351

■ Any Sony head reel to reel tape recorder, using 717 heads TC64S TC377 etc, any condition. R N Baker, 17 Chapel Lane, Upwey, Weymouth, Dorset

■ Wanted in exchange for my UHER 4000 professional report monitor reel to reel portable recorder, in vgc, value approx £450, a MuTek 50MHz transverter, or any 50MHz multimode transceiver, no MM thank you. GM1FOS, 163 Milnafua, Alness, Ross-shire IV17 0YT

■ Exchange Yaesu FT230, ten memories, dual VFO 25W etc in excellent condition for a Yaesu FT209 RH portable. Contact Graham. Tel: (0942) 609696

■ Nineteen twenties or thirties wireless parts (radio components) and short wave or amateur receivers. Also interested in Collins equipment. Tel: (0904) 794680

■ FT690R/FT290R to swap for FT790R, 9 months old. Also consider swap for older HF rig, or sell £225. Write K J Argyle, No3 Gregory Close, Barlestone, Nuneaton, Warks CV13 0EP. All letters

FREE CLASSIFIED ADS

answered promptly

■ Complete mechanical slow motion drive system, good working condition from Hallicrafter S27/C receiver. Sykes, 30B Bridge Street, Louth, Lincs LN11 0DP

■ Pensioner urgently requires for cash a complete set of changeable wave band coils for an ancient HRO receiver as part of a mobile listening unit for children to operate at fetes and other events. Documents on the use of the HRO would also be of great help. Mr R S Brewer, 71 Mortimer Street, Trowbridge, Wiltshire BA14 8BT

■ A SWR/power meter for 26-30MHz, also a Pulsar 27 mini beam. Also a pre-amp 26-30MHz. D Mitchell, Westfield, Rillington Fields, Scagglethorp, Malton, N Yorks YO17 8EB. Tel: Rillington 671

■ Round bakelite Ekco wanted. Good price paid. Also other vintage wireless sets, wood or bakelite by private collector. Boxed valves, parts etc. Have for disposal 2 Roberts valve portables, old McMichael valve portable and Ever-Ready. Marconi Mercury comm receiver with PSU to go. Few other sets. Tel: Clacton on Sea 429779

■ Help! Wanted urgently, a circuit diagram for a Hallicrafters 36A VHF Rx. Please write to Mark G1VGK, PO Box 78, Hastings, Sussex TN34 3QQ

■ Sony CRF330K. Pan-Crusader X 12 band VHF Rx. Also interested in Panasonic RF9000. Must be excellent condition, no mods, with manual if possible. Please phone with moderate asking price. Private cash buyer. Tel: (061) 7431570

■ Original workshop manual/instruction book for a Plustron TVRC5D TV, radio and cassette. Also wanted. *Scanners VHF, UHF, Listeners Guide.* Please phone Goole 2235 for either or both books and state price. Ask for Andy

■ T1154 mounting bars, type 209 10A/13787, last items required to complete station, your price paid. Tel: Phil (0483) 572653 eve, w/ends

■ Heathkit HW101 HF trans, or Trio Kenwood TS120V HF trans. Both must be in vgc. Wanted: for my own collection, Corgi, Dinky, Spot-on, Matchbox, Yesteryear models. Tel: Weymouth (0305) 813202

■ Jan 1985 issue *Amateur Radio* mag, or photocopy of article re T1154/R1155, or any help or info re same. John Addies, 14 Lamer Street, Dunbar, East Lothian, Scotland EH42 1HG

■ Urgently needed: any manuals for the ex-gov A40 wireless set. I wish to copy them and return, will pay postage for both ways. Also, any other information for the above radio and the whereabouts of good cond spare battery packs, or how to convert to PSU/NiCad etc. Please write first, before sending anything. All letters answered. C D Hoy, 185 Streatham Rd, Mitcham, Surrey CR4 2AG

■ Icom R700 scanning receiver, must be in excellent condition, etc. Tel: Colchester 394336 after 7pm

■ Ex RAF communication receiver, type R1155B or R1155F. Must be complete and original, although not necessarily in working order. Tel: (0380) 830654 Wilts

■ PSU for HRO receiver. Also HRO speaker, 5 coil set wooden container, or any spares for HRO 5 Rx. Also wanted: R206 Rx, or any large ex govt Rx with outside PSU. Prefer turret tuner. I have a box of AR88 spares if anyone wants same for price of postage. J Edwards, Beeches Coach House, Burton Hill, Malmesbury, Wilts SN16 0EE

■ Nat Pan RF9000 radio, cash offered or similar considered, like Sony CRF330, or CRF320 radios, or Grundig 650 professional. Although prefer RF9000. Tel: (0462) 33690

■ ac power unit for Codar AT50, old Heathkit RA1 Rxs. Details, condition, and price to Richard Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA

■ GEC BRT400 Rx. Buy or would exchange for Daiwa Search 9 2m Rx, cash adjustment. Wilkes, 3 Bescot Rd, Walsall. Tel: Walsall 642509

■ Information on communications receiver, type MR1410, could be made by Murphy Radio, circuit diagram, handbook, all postage refunded. Will purchase or photocopy any manuals. Terry. Tel: (0462) 35248 after 6pm

■ Exchange my HW8 QRP rig in vgc, plus power pack and manual. Wanted: HF receiver or will exchange plus cash for FT290R 2 metre rig. Tel: Geoff (0484) 645923

■ Any home brew short wave receiver, £5 to £20 paid. Tel: (0664) 61699 and ask for Ron, evening only

■ Eddystone receivers wanted by collector. Pre war to present day. Ring Richard Baker. Tel: (021) 556 3324 (not weekends)

■ Information on the Weltz HF/DP-GP5 antenna, ie bandwidth, shortcomings if any, all information welcome. Postage and photocopying paid. Mr P Webster, 4 Cheadle Close, Bilborough, Nottingham NG8 4AT. Tel: (0602) 296429

■ N type connectors for Cellflex HCF ½in 50 ohm co-ax (the correct ones, not Andrews 44ASW). Also wanted, Andrews FSJ4-50B co-ax ½in 50 ohm superflexible, any lengths considered. Contact Ian. Tel: (0676) 40744 after 6pm

■ Trio TR9500 70cms multimode, must be in mint condition. Any other 70cms multimode considered. Reasonable price offered. Tel: (0720) 22035 evenings only please

■ Eddystone battery rcvr, EB35 mark I, preferably gd condx, but anything considered. Contact GM4WPU QTHR. Tel: (0382) 552295

■ Exchange AOR2002 scanner, two months old, for Yaesu FRG9600. Tel: (0325) 487175 after 6pm

■ Avanti Moonraker 6ft whip mobile antenna, 27MHz use, must be in vgc, fair price for fair antenna. Please state price in any letters sent. For sale: Stalker XX(20) home base 27MHz, usual side bands + FM, digital clock, 13.8V or 230-240V power supply, ideal for conversion, lovely box, excellent reception & transmit, £80. WDC 654, PO Box 50, Carlisle, Cumbria. Tel: (0228) 23408

■ R1481 and R1132A service data required, manual or photocopy. G8BSK, 290 Priory Road, St Denys, Southampton SO2 1LS

■ WW2 German ex-service radio/radar equipment, parts literature. Will collect, any condition OK. Cash or swap. Available WS38, 58, 19, 22, R1155. Wanted for Norwegian museum: WS11, WS1, T1190, WS65 + 66, AD67, 52ERT, R637, 4Q transmitter, remote control units type C, D, F, H, H2/s or SCR720 parts. OZ8RO, R Otterstad, Vejdammen 5, DK-2840 Holte, Denmark. Tel: (010) 452-80 1875

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Amateur RADIO SMALL ADS

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3.5" unbranded DS disks	£1.26
5.25" unbranded disks DS 96tpi	£0.44
Resistors 25W 5% E12 values	£0.01
25 way D plug, socket or shell cent. printer cable PC1512/IBM	£7.95
BBC printer cable	£4.95
DIN plugs & SKT's 5,6,7 pin	£0.20
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Amateur RADIO

ADVERTISING RATES & INFORMATION

DISPLAY AD RATES

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
61 x 90	1/8 page	£66.00	£62.00	£59.00	£53.00
128 x 90 or 61 x 186	1/4 page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	1/2 page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.10
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

COLOUR AD RATES

colour rates exclude cost of separations

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
128 x 186 or 263 x 90	1/2 page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£550.00	£530.00	£470.00
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Covers	Outside back cover 20% extra, inside covers 10% extra
Bleed:	10% extra [Bleed area – 307 x 220]
Facing Matter	15% extra

DEADLINES

*Dates affected by public holidays

issue	colour & mono proof ad	mono no proof & small ad	mono artwork	on sale thurs
Sep 87	30 Jul 87	5 Aug 87	7 Aug 87	27 Aug 87
Oct 87	27 Aug 87	2 Sep 87	4 Sep 87	24 Sep 87
Nov 87	1 Oct 87	7 Oct 87	9 Oct 87	29 Oct 87
Dec 87	29 Oct 87	4 Nov 87	6 Nov 87	26 Nov 87

CONDITIONS & INFORMATION

SERIES RATES
Series rates also apply when larger or additional space to that initially booked is taken

An ad of at least the minimum space must appear in consecutive issues to qualify for series rates

Previous copy will automatically be repeated if no further copy is received

A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received

Display Ad and Small Ad series rate contracts are not interchangeable

If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken

COPY
Except for County Guides copy may be changed monthly

No additional charges for typesetting or illustrations (except for colour separations)

For illustrations just send photograph or artwork

Colour Ad rates do not include the cost of separations. Printed – webb-offset

PAYMENT
Above rates exclude VAT

All single insertion ads are accepted on a pre-payment basis only, unless an account is held

Accounts will be opened for series rate advertisers subject to satisfactory credit references

Accounts are strictly net and must be settled by the publication date

Overseas payments by International Money Order or credit card

FOR FURTHER INFORMATION CONTACT
Amateur Radio, Sovereign House, Brentwood, Essex CM14 4SE
(0277) 219876

Commission to approved advertising agencies is 10%

CONDITIONS
10% discount if advertising in both Amateur Radio and Radio & Electronics World.
A voucher copy will be sent to Display and Colour advertisers only.
Ads accepted subject to our standard conditions, available on request

ADVERTISERS INDEX

£1 BAKERS DOZEN PACKS

Price per pack is £1.00.* Order 12 you may choose another free. Items marked (sh) are not new but guaranteed ok.

1 5 – 13 amp ring main junction boxes
2 5 – 13 amp ring main spur boxes
4 5 – surface mounting
5 3 – electrical switches, white flush mounting
7 4 – in flex line switches with neons
9 2 – mains transformers with 6V 1A secondaries
10 2 – mains transformers with 12V ½A secondaries
11 1 – extension speaker cabinet for 6½" speaker
13 12 – glass reed switches
17 2 – ultrasonic transmitters receivers with circuit
19 2 – light dependent resistors
25 4 – wafer switches – 6p 2 way, 4p 3 way, 2p 6 way, 2p 5 way, 1p 12 way small one hold fixing and good length ¼ spindle your choice
28 1 – 6 digit counter mains voltage
30 2 – Nicad battery chargers
31 1 – key switch with key
33 2 – aerosol cans of ICI Dry Lubricant
34 96 – 1 metre lengths colour-coded connecting wire
39 1 – long and medium wave tuner kit
41 8 – rocker switch 10 amp mains SPST
45 1 – 24 hour time switch mains operated (s.h.)
49 10 – neon valves – make good night lights
50 2 – 12V OC or 24V AC, 3 CO relays
51 1 – 12V 2 CO miniature relay very sensitive
52 1 – 12V 4 CO miniature relay
54 10 – rows of 32 gold plated IC sockets (total 320 sockets)
55 1 – locking mechanism with 2 keys
56 1 – miniature uniselector with circuit for electric jigsaw puzzle
60 5 – ferrite rods 4" × 5/16" diameter aerials
61 4 – ferrite slab aerials with L & M wave coils
63 1 – Mullard thyristor trigger module
66 1 – magnetic brake – stops rotation instantly
67 1 – low pressure 3 level switch can be mouth operated
69 2 – 25 watt pots 8 ohm
70 2 – 25 watt pots 1000 ohm
71 4 – wire wound pots – 18, 33, 50 and 100 ohm your choice
77 1 – time reminder adjustable 1-60 mins clockwork
85 1 – mains shaded pole motor ¾" stack – ¼ shaft
89 1 – mains motor with gear box 1 rev per 24 hours
91 2 – mains motors with gear box 16 rpm
96 1 – thermostat for fridge
98 1 – motorised stud switch (s.h.)
101 1 – 2½ hours delay switch
103 1 – mains power supply unit – 6V OC
104 1 – mains power supply unit – 4½V OC
107 1 – 5" speaker size radio cabinet with handle
112 1 – heating pad 200 watts mains
114 1 – 1W amplifier Mullard 1172
115 1 – wall mounting thermostat 24V
118 1 – teak effect extension 5" speaker cabinet
120 2 – p.c. boards with 2 amp full wave and 17 other recs
121 4 – push push switches for table lamps etc.
122 10 – mtrs twin screened flex white p.v.c. outer
124 25 – clear plastic lenses 1⅜ diameter
127 4 – pilot bulb lamp metal clip on type
128 10 – very fine drills for pcbs etc.
129 4 – extra thin screw drivers for instruments
132 2 – plastic boxes with windows, ideal for interrupted beam switch
134 10 – model aircraft motor – require no on/off switch, just spin to start
137 1 – 6½" 4 ohm 10 watt speaker
142 10 – 4 BA spanners 1 end open, other end closed
145 2 – 4 reed relay kits 3V coil normally open or c/o if magnets added
146 20 – pilot bulbs 6.5V.3A Philips
154 1 – 12V drip proof relay – ideal for car jobs
155 3 – varicap push button tuners with knobs
169 4 – short wave air spaced trimmers 2-30f
172 10 – 12V 6W bulbs Philips m.e.s
178 3 – oblong amber indicators with lilliputs 12V
180 6 – round amber indicators with neons 240V
181 100 – p.v.c. grommets ⅜ hole size
182 1 – short wave tuning condenser 50 pf with ¼" spindle
184 1 – three gang tuning condenser each section 500 pf with trimmers and good length ¼" spindle
188 1 – plastic box sloping metal front, 16 × 95mm average depth 45mm
193 6 – 5 amp 3 pin flush sockets brown
195 5 – B.C. lampholders brown bakelite threaded entry
196 1 – in flex simmerstat for electric blanket soldering iron etc.
197 2 – thermostats, spindle setting – adjustable range for ovens etc.
199 1 – mains operated solenoid with plunger ½" travel
200 1 – 10 digit switch pad for telephones etc.
201 8 – computer keyboard switches with knobs, pcb or vero mounting
206 20 – mtres 80 ohm, standard type co-ax off white
211 1 – electric clock mains driven, always right time – not cased
216 1 – stereo pre-amp Mullard EP9001
232 2 – 12V solenoids, small with plunger
236 1 – mains transformer 9V 1 amp secondary C core construction
241 1 – car door speaker (very flat) 6½" 15 ohm made for Radiomobile
241 2 – speakers 6" × 4" 4 ohm 5 watt made for Radiomobile
243 2 – speakers 6" × 4" 16 ohm 5 watt made for Radiomobile
244 1 – mains motor with gear-box very small, toothed output 1 rpm
245 4 – standard size pots, ½ meg with dp switch
249 1 – 13A switched socket on double plate with fused spur
266 2 – mains transformers 9V ½A secondary
267 1 – mains transformers 15V 1A secondary p.c.b. mounting
291 1 ten turns 3 watt pot ¼ spindle 100 ohm
296 3 car cigar lighter socket plugs
298 2 15 amp round pin plugs brown bakelite
300 1 mains solenoid with plunger compact type
301 10 ceramic magnets Mullard 1" × 3/8 × 5/16
303 1 12 pole 3 way ceramic wave charge switch
305 1 tubular dynamic microphone with desk rest
308 1 T.V. turret tuner (black & white T.V.)
310 2 oven thermostats
313 5 sub miniature micro switches
316 1 round pin kettle plug with moulded on lead
453 2 – 2½in. 80ohm loudspeakers
454 2 – 2½in. 8ohm loudspeakers
463 1 – mains operated relay with 2 sets c/o contacts
464 2 – packets resin filler/sealer with cures
465 3 – 5A round 3 pin plugs will fit item 193
466 4 – 7 segment l.e.d. displays
470 4 – pc boards for stripping, lots of valuable parts
473 1 – 5" 4ohm speaker with built in tweeter Radio mobil
480 1 – 3A double pole magnetic trip, saves repairing fuses
498 4 – 1000uf 25V axial electrolytic capacitors

3" DISCS For our £27.50 F.D.D.—Amstrad 664, Einstein, etc, pack of 10 £25, ref 25P3 or sample £3, ref. 3P24.

COMPACT FLOPPY DISC DRIVE For Only £27.50

As used in the Amstrad 664/6128, the Einstein and other popular computers. Drives the new standard disc, only 3" but with a capacity of 500k per disc, this is equivalent to the 5¼" disc. Other features are:

1. **It has the shugart compatible interface (34 way edge connector).**
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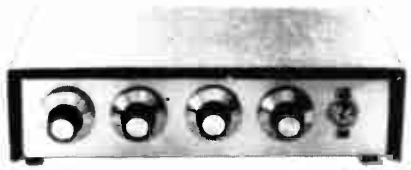
We include the operator's manual and other information showing how to use this with popular computers BBC, Spectrum, Amstrad etc. Brand new and at only £27.50 including post and VAT.
Data available separately £2, refundable if you purchase the drive.

Ex-Electricity Board. Guaranteed 12 months.

VENNER TIME SWITCH

Mains operated with 20 amp switch, one on and one off per 24 hrs. repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only **£2.95** without case, metal case – **£2.95**, adaptor kit to convert this into a normal 24hr time switch but with the added advantage of up to 12 on/offs per 24hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is **£2.30**.

SOUND TO LIGHT UNIT



Complete kit of parts of a three channel sound to light unit controlling over 2000 watts of lighting. Use this at home if you wish but it is plenty rugged enough for disco work. The unit is housed in an attractive two tone metal case and has controls for each channel, and a master on/off. The audio input and output are by ¼" sockets and three panel mounting fuse holders provide thyristor protection. A four pin plug and socket facilitate ease of connecting lamps. Special price is **£14.95** in kit form.

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Some of the many described in our current list which you will receive with your parcel.

RE-WIRING?

Here's a bargain for you – M.E.M. 3 circuit splitter 45A switch with 3x15A rewirable fuses normal cost over £10, but yours for only £5. Our ref 5P100

AUTO TRANSFORMER BARGAIN

200W 230/115V encapsulated into a very neat unit, size 4x4x1½ appr. Only £3, plus £2 post, our ref 3P22

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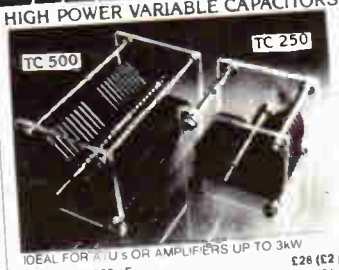

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76 Watts FM (150W P E P)
INPUT:- 0 5 10 Watts
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REMOTE CONTROL FACILITY

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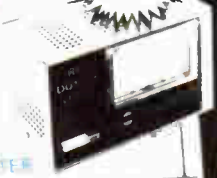

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