MARCH 1988 £1.45

Amateur RADIO

For all two-way radio enthusiasts

CONSTRUCTION:
Build a Morse practice oscillator or your own linear amplifier

HF antennas for small gardens

RSGB 1987 AGM report

On test: Kenwood TS140S lower priced HF transceiver

MORSE REPORT

Amateur RADIO

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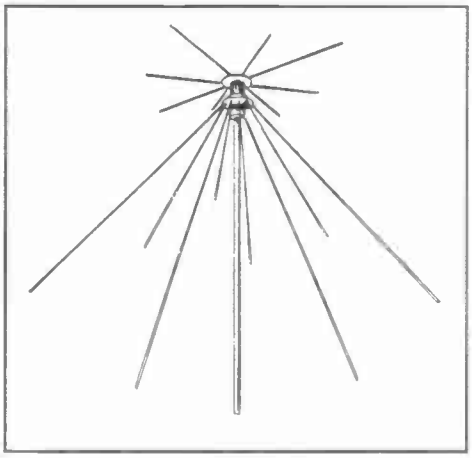

SERVICES

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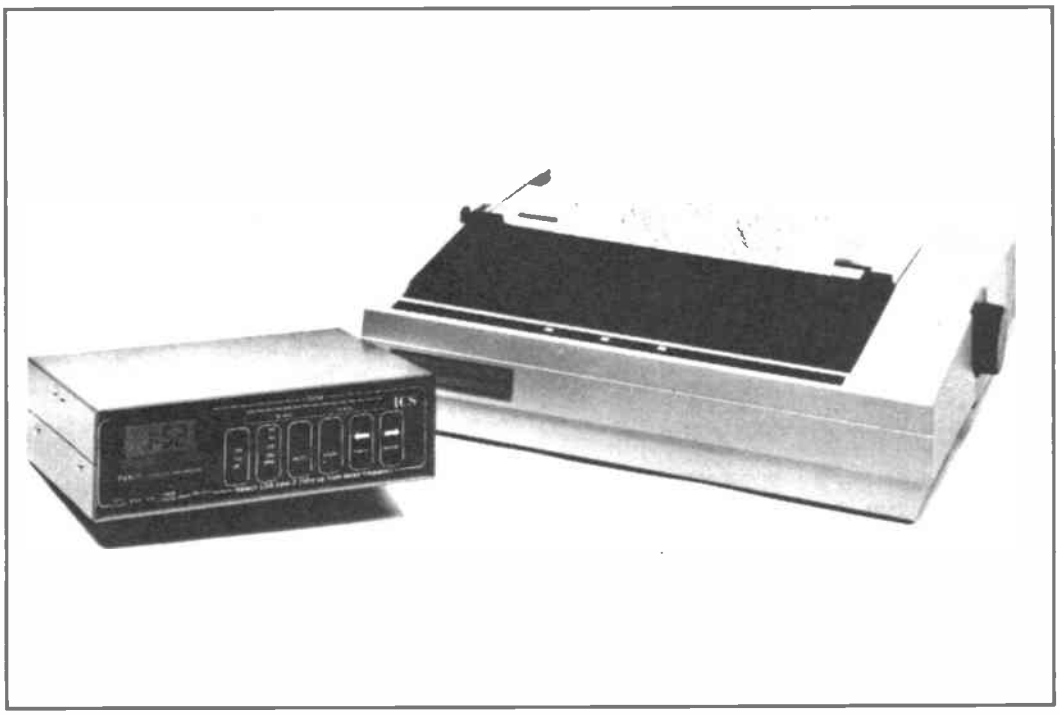


RTTY PACKAGE

ICS Electronics Ltd have recently announced the availability of a low cost package for weather facsimile, Navtex and radio teletype reception.

For £399.95 including VAT, ICS will provide their enhanced FAX-1 decoder, a mains power supply, an Epson compatible printer, all connecting leads, paper and a ribbon. The user simply plugs the supplied cable into the extension loudspeaker socket of any HF SSB communications receiver to obtain superbly detailed weather maps, satellite cloud pictures, navigational warnings and news bulletins from around the globe.

The FAX-1 incorporates a built in tuning indicator and timer, and is fully automatic in operation.

The prices offered by ICS are dramatically lower than those for any other comparable equipment – even from South East Asia. The FAX-1 is British designed and built.

The system components are available separately if required, and ICS can also offer a complete dc powered marine system with inbuilt Navtex receiver. This permits concurrent Navtex and facsimile reception.

Many hundreds of FAX-1s are already in use around the world by amateur and professional weather forecasters, yachtsmen, aviators and enthusiasts.

For further details, contact: *ICS Electronics Ltd, PO Box 2, Arundel, West Sussex BN18 0NX. Tel: (024) 365590.*

DUAL TRACE SCOPE

With dc to 30MHz bandwidth and 11.7 rise time, the type 3337 dual-trace oscilloscope can display the rising edges of rapidly changing waveforms.

Available from ECW, the type 3337 is considered to be very suitable for maintenance and servicing as well as laboratory and educational establishments.

Its display is enhanced by the inclusion of a built-in signal delay line that operates on both channels, providing sufficient delay to capture fast leading signal edges. Input sensitivity is 5mV/div, and the two inputs can be algebraically added or subtracted. X/Y operation is possible and the timebase range is from 40ns to 1s/div, with triggering to 50MHz. The trigger circuit gives a reliable display with ac/dc coupling, composite trigger and single-shot modes.

The type 3337 is fitted with a bright, 10kV 5-inch CRT that gives a clear image for performing measurements and signal analysis.

Offered with a two-year guarantee, the type 3337 costs £425.00,.excluding VAT.

For further information contact: *Electronic & Computer Workshop Ltd, Unit 1, Cromwell Centre, Stepfield, Witham, Essex CM8 3TH. Tel: (0376) 517413.*

PCB DESIGNER

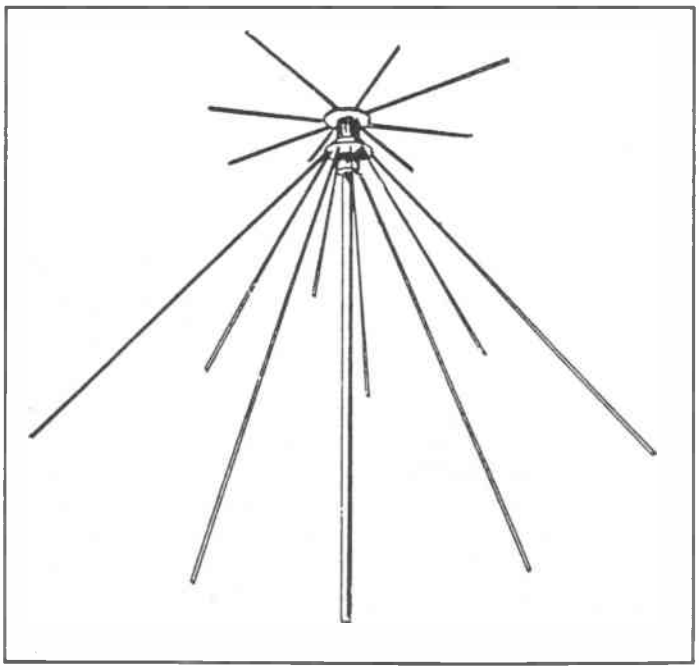
Pineapple's highly acclaimed PCB designer program has now had many enhanced features added in its latest version. The main program resides in a single 16K EPROM which provides all the facilities for the manual production of PCBs. A second optional 16K EPROM

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

adds useful auto-track routing capabilities. All the facilities of the program are fully implemented for all models of the BBC micro and the full features, including autorouting, are available even on a standard unexpanded Model 'B' computer (with disc drive).

Once the PCB design has been completed, printouts may be obtained of the component placement stage, a solder resist mask and both sides of double sided boards. The prints may be either 1:1 or 2:1 positives or negatives and are to a size accuracy of better than .5%. Although they are made very dense by using a triple pass technique in quadruple density graphics mode, a 7in × 5in board can be printed in less than 5 minutes. An optional plotter driver is also available which allows the files produced by PCB to be plotted on a large number of different plotters.

For further information, contact: *Pineapple Software, 39 Brownlea Gardens, Seven Kings, Ilford, Essex IG3 9NL. Tel: 01-599 1476.*



DISCONE ANTENNA

At last, a British company has proved itself able to compete with the quality, performance and price of products from Japan.

The new wideband discone antenna from South Midlands Communications Ltd, the DSC770, has a frequency coverage from 0 to 700MHz, which is wider than the well-known GDX series. The gain is slightly better at 3.5dB compared with a ¼ wave dipole. It is designed for use either for reception or transmitting up to 500 watts PEP.

The top centre disc, cone and elements are all manufactured from high grade alluminium alloy. The elements screw directly into the cone and disc, as opposed to using wing nuts – a less expensive and less reliable manufacturing technique – to prevent elements vibrating loose in high winds. The antenna is supplied with a stub mast of 1½in diameter and mast clamp to fit a 1¼in to 2in mast. The stub mast protects the input connector from the ingress of moisture.

Prices start at £55.75 VAT. The antenna is available from specialist shops.

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

SERVICE CONTRACT

A new service has been introduced, allowing amateur radio enthusiasts to protect themselves against heavy costs incurred through expensive faults developing with their equipment.

The Amateur Radio Maintenance Service – ARMS, specially devised by an operator of many years' experience, offers complete cover against the cost of repairs.

For an annual fee based on a small percentage of the current new retail price of the equipment, ARMS will refund the repair costs including parts, labour and carriage from approved service agents throughout the country. For example, a two year old transceiver costing £1,000 new could be covered against breakdown for £30 per year.

Send details of your equipment including make, model number, year of manufacture and whether it is intended for home use only or mobile/portable use, and a quotation will be sent by return.

For further information, contact: *Amateur Radio Maintenance Service, Freepost, Ormskirk, Lancs L39 3AB.*

RF PROTECTION

STC Instrument Services has recently introduced the BNOS PR series of 19in rack-mounted power supplies which offer full RF protection.

Based on the popular BNOS P range and providing power up to 600W continuous, the PR series offers output voltages in three ranges: 2–7V, 10–15V and 20 – 30V, with output currents up to 40A.

The series offers protection against short circuit, overvoltage and over current with an automatic shutdown facility. Each features stability of better than 0.01% for 10% line change; 50Hz input frequency; 240V input voltage (ac); and 500μV at maximum continuous output. The series also incorporates 'Power On' LED indication.

For further details, contact: *STC Instrument Services, Dewar House, Central Road, Harlow, Essex CM20 2TA.*

WIDEBAND OP-AMPS

Rapid evaluation of Comlinear's CLC400/401 op amps can be performed with the E400 PCB evaluation board available from Anglia Microwaves Ltd. The board acts as an efficient method of developing PCB layouts for product design engineers.

The board is supplied set up for non-inverting gain circuits but can also be configured for inverting, summing and differential applications.

The Comlinear CLC400/401 op amps are fast settling wideband monolithic components that utilise current feedback rather than conventional voltage feedback. This results in settling time being independent of gain, and frees designers from the gain-bandwidth product restriction.

With the evaluation board, it becomes simple to experiment with the unique performance features of the op-amps. These include a low power consumption (150mW), overload and short-circuit protection, a choice of 200 or 150MHz bandwidth and gain of 1 to 8 or 7 to 50, for the CLC400 and 401 respectively.

For further information contact: *Radford Business Centre, Radford Way, Billericay, Essex CM12 0BZ.*

STRAIGHT & LEVEL

COAXIAL SWITCH

Wavecom's Series 120 coaxial switch is a 12 pole RF type, which features a guaranteed one-million cycle lifetime per position.

Available now from Anglia Microwaves Ltd, the Series 120 has a frequency range from dc to 12.4GHz. Its versatility makes it an ideal component for switch matrix assembly.

The range of control and drive options includes BCD TTL decoders and MOSFET driver circuits.

Custom drivers are another option, along with 50 ohm internal terminations, indicator circuitry, self de-energising circuitry and suppression diodes.

MIL-S-3928 and MIL-E-5400 standards are met by the switch. VSWR is 1.5:1 and insertion loss is 0.5dB (both are maximum figures). Isolation is 60dB. SMA connectors are fitted as standard.

For further information, contact: *Anglia Microwaves Ltd, Radford Business Centre, Radford Way, Billericay, Essex CM12 0BZ. Tel: (0277) 630000.*

SWITCH ATTENUATOR

The Sivers-IMA PM7558, a coaxial switch attenuator that meets MIL-E-5400 and MIL-E-16400 requirements, has been introduced by Anglia Microwaves Ltd.

The unit has two inputs with a changeover action that switches between a direct and attenuated connection. Frequency range is from 2 to 18GHz, with a VSWR of 1.5:1. Two female SMA connectors provide the RF inputs, while six solder pins give access to the actuator control and position indicator circuits.

Insertion loss is 0.5dB (maximum) in the low loss state, and 30dB in the high loss condition. Transmission power rating is 2W CW and 10W peak. The duty cycle is 50ms from −55 to +40°C, linearly increasing to 200ms at 85°C. The guaranteed lifetime is in excess of 10^6 cycles. Switching time is 20ms (maximum).

For further information, contact: *Anglia Microwaves Limited, Radford Business Centre, Radford Way, Billericay, Essex CM12 0BZ. Tel: (0277) 630000.*

BOOKS · CATALOGUES · BOOKS · CATALOGUES

RADIOWAVE PROPAGATION

by L Boithias

Many books deal with the various ways in which radio waves are propagated, but this one goes into minute technical detail. The publishers call it 'a state-of-the-art' review and it certainly is; to say it is comprehensive would be an understatement.

Equations and diagrams abound in this highly-structured text, but a beginner would have to be well-grounded in general electronics amd mathematics to begin to use the abundance of information.

The book starts with a review of line of sight propagation and the characteristics of the way in which major physical phenomena affect propagation, including details of the anomalies known to exist. The second part deals with the mechanisms involved in non-line of sight propagation and types of interference, including electromagnetic disturbance.

Aimed at practising electrical and electronic engineers, there is enough detail in this text to satisfy the most enquiring mind.

North Oxford Academic Publishers Ltd, £35. ISBN 0 946536 06 6

WEEKEND ELECTRONICS PROJECTS

by A Guzman

'Fun and Easy Electronics Projects' is the full title of this little book, which should provide quite a few weekends' worth of entertainment for soldering iron fans.

Many of the projects look very simple, and several are universally useful, like the car alarm and headlight alarm. Many others will appeal to radio enthusiasts, such as the RFI sniffer, the VHF receiver, LED meter and so on to a total of thirty-three different things to build, of varying complexity.

As this is an American publication, some of the appendices refer to US-based details – the copper wire table gives AWG, and the list of parts suppliers gives only American companies as references.

Nevertheless, most enthusiasts should be able to figure it all out and find reputable UK suppliers for components. A most useful book.

John Wiley and Sons Ltd, £6.95. ISBN 0 8306 2 861 4

OSCILLOSCOPES

by I Hickman

This is a revised edition of a popular and inexpensive book which caters for any scope user.

The text has been updated to include recently introduced scopes, resulting in a considerably enlarged volume.

The book starts with a description of the instrument's purpose and performance and moves on in easy stages with ample explanation of the processes involved.

The controls and functions of a basic scope are described, and the various terms used are simply described – which should be a relief to beginners.

The oscilloscope is such an essential tool that this no-nonsense text is bound to be welcomed in its revised form. 'The right scope for the right application' is the author's watchword, and scope applications are examined at some length.

This should provide useful reference material for any would-be scope purchaser. Covering most major types of scope, this handy book should once again prove a welcome guide.

William Heinemann Ltd, £5.95. ISBN 0 434 90738 3

DIAL SEARCH

by G Wilcox

A most interesting little reference book, this checklist and guide to European broadcasting is published every two years. Now in its fifth edition, this is a practical and very useful guide which will help any listener eager to add new stations to his log.

The A5 sized booklet contains two maps, one showing the locations of stations as far away as Tbilisi and Tripoli, and the other showing places within the British Isles, including those immortal oceanic locations – Dogger, Viking and Forties. A small part of France is included, which may be wishful thinking!

The written information is equally to-the-point, ranging from details of frequency bands, an index of programme networks covering all MW and LW stations, hints on how to make the most of your portable, programme notes, station signature tunes (written on a stave, so you can play them yourself!) and many more useful hints and tips. Details of amateur bands and short waves are included.

Priced at a most reasonable £3.95, this little book could prove to be an invaluable addition to the enthusiasts' list of essentials. To purchase a copy, write to the author, who is also the publisher, at the address below:

9 Thurrock Close,
Eastbourne,
East Sussex BN20 9NF.

ANTENNAS VOLUME TWO

by S Drabavitch and C Ancona

This is the second of a two volume work, the first part of which was reviewed in the October 1987 edition of this magazine.

The first volume summarised the basic principles on which antenna theory is based, the second looks into the applications of these theories.

Translated from the original French, this is an impressive text, designed to provide students of electronic engineering and practising engineers with a thorough introduction to antenna applications and theory.

Beginning with large antennas (those whose dimensions are considerably greater than the wavelength), the book examines focusing systems, going on to consider the antenna as a signal processing component.

The second section examines small and plasma-embedded antennas, and looks at dipoles, slots and frequency independent antennas.

The final section looks at antennas in linear plasmas, which is of particular importance in the study of antennas in spacecraft.

A serious in-depth study of an intricate subject, the two-volume set provides a comprehensive overview of this field.

North Oxford Academic Publishers Ltd, £35. ISBN 0 946536 17 1

THE HISTORY OF ROBERTS RADIO

by K Geddes OBE and G Bussey

This slim volume is a cloth-bound hardback in royal blue, with cover detail in gold leaf, reflecting the firm's royal connections over the years. Their royal appointments extend through three generations – The Queen, The Queen Mother and The Prince of Wales.

Roberts is one of the few British companies left in the radio market, and the attention to detail and quality which is paid to their products is echoed in the quality of this book.

A detailed, personal tale of the genesis of this firm, this book is a chronicle of a highly individual company which has remained with the Roberts family even in this age of the corporation. Those of us who remember the faithful, reliable Roberts radios with affection are bound to find this a little gem of a book.

With plentiful black and white photographs of radios depicting the various developments and landmarks of the company, including period photographs of royalty with Roberts radio sets – and a wonderful picture of a mink(!) covered radio – this is a book to delight both the bibliophile and the radio owner.

This book was originally intended for distribution to 'the trade' only, but *Amateur Radio* sleuths have, in an exclusive interview with an executive of the company, negotiated the release of a few of these rare books for our readers. Just send a cheque for £5.95 made out to Roberts Radio Co Ltd, for the attention of Mr R Burt, to their address in Molesey Avenue, West Molesey, Surrey KT8 0RL.

Barnard and Westwood Ltd, £5.95. ISBN 0 9512590 0 8

CLUB NEWS

Marconi day

Poldhu Cove, in Cornwall, has gone down in the history books as the place from which Marconi sent the first trans-atlantic radio signals.

To celebrate this feat, the Cornish Radio Amateur Club has, in the past, organised an International Marconi event – a special event station which ran for a full week ten years ago.

A decade later the club, together with the South East Amateur Radio Club of Ireland, has decided to hold an international Marconi day which, it is hoped, will become an annual event.

The Cornish special event station, callsign GB4IMD, will operate from Poldhu Cove, near the Goonhilly satellite station. The Irish station, callsign EI2IMD, will operate close to the spot where Marconi carried out his first Irish experiments, at Crookhaven.

Several other stations will be operating internationally from places which have some connection with Marconi. In the US, K1VV and friends will be transmitting as K1VV/IMD from the Cape Cod area, where the first US-Europe contact was made.

In Newfoundland, the Society of Newfoundland Radio Amateurs will be operating from Signal Hill, St Johns, where the first transatlantic contact was made. Their callsign will be VO1IMD.

Another Canadian group taking part is the Sydney ARC of Nova Scotia, whose station will be set up at the Marconi Museum in Glace Bay, where the first east/west Atlantic contact was made. The callsign will be VE1IMD.

Lastly, the Sasso Marconi Radio Club will be operating from Bologna, Marconi's birthplace, using the official Marconi call, IY4FGM.

The event will take place on April 23rd, close to the date of Marconi's birthday. Operation will be on five bands, SSB (J3E) only. All stations will be on the air from 0001GMT to 2359GMT. The Cornish club will be operating on the following frequencies: 3.770 to 3.780; 7.070 to 7.080; 14.270 to 14.280; 21.250 to 21.260 and 28.530 to 28.540.

A special award will be offered for any station working five of the six stations mentioned above. Claims should be accompanied by three IRCs or $5 (US), plus a pre-paid envelope (UK) or overseas IRCs to cover the postage of QSLs. All claims should be sent to CRAC, PO Box 100, Truro, Cornwall TR1 1XP.

Going down

And now for something completely different... talking about the unusual, how about Roy Andreang's latest venture?

Roy, who is a long standing member of the Scouting movement in Humberside, has responded to the county's request for support. Not one to do anything by halves, Roy, who is 64, will be making a sponsored parachute jump at the Grindale Parchute Centre in Bridlington.

Unusual, we hear you say? Read on! Roy is performing a

free-fall tandem jump from 10,000 feet with one of his ex-Scouts. While descending he will send a birthday greeting to all Venture Scouts in the UK, to celebrate their twenty-first anniversary year. How will he send these greetings? By Morse, of course. The fastest dots around.

He also intends to contact as many hams as possible, especially in Yorkshire and Humberside. So if you hear a doppler-shifted Morse signal out there on April 2nd (or 9th if the weather is unsuitable) you know who it is!

Being a civilised man, Roy will also be making a cup of tea on the way down. Wonder where he'll plug the kettle in? He is hoping to be sponsored by Brooke Bond for this spectacular feat, and you too can sponsor Roy by writing to: Humberside Scouts County Office, Raywell Park Scout Centre, Riplingham Road, near Cottingham, Hull.

Game for a laugh

Edgware and District Radio Society is going to be full of the joys of spring this month, March 10th brings an informal evening and a technical team game. Trivial electronics, mayhap?

Auntie is coming to the club on March 24th, in the shape of Nick Davies from the BBC, who will be talking about some modern developments in terrestrial broadcast transmission. Wot, no word on what the Martians are up to?

The club meets on the second and fourth Thursdays of the month in the Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware. The club contact is Ian Cope G4IUZ, on (0707) 65707.

Bristol course

Bristol has turned up trumps again – the West Bristol Adult Education Authority, recognising the local need, has arranged a second Morse class to be held at the Stoke Lodge Adult Education Centre, Stoke Bishop, Bristol.

The course will be held on Monday evenings from 7pm to 9pm and will start on April 11th. Lasting for three terms, the course will culminate in the taking of the test in March 1989.

The cost will be at the County's standard rates, and normal concessions will apply.

At the time of writing, the course fee will be 57p per hour, and the full fee for the first term will be £11.40. For further information, please contact L G Woodward, the area's Adult Education Officer.

Starstruck

If you mention blue stars, a southerner will stare at you blankly or call the men in the white coats, but anyone who knows the North-East will probably burst into fond reminiscences about his local.

The reason being, of course, that Scottish and Newcastle Breweries (who produce the unparalleled 'broon') use the blue star as a trademark, and Newcastle at night looks like a small, blue galaxy from afar.

Anyway, S and N are getting together to stage on event to be called 'The Blue Star Rally', on Saturday, March 5th. Black boxes, bargains, build-it-yourself kits, beer and butties (no stottie cakes?) will all be on sale at the North East Exhibition Centre in Gosforth Park, Newcastle, from 11am to 5pm.

Many dealers will be there, from all over the country, clubs will be exhibiting and the RSGB will be conducting Morse tests. Plus there are the local goodies to be had, of course.

There will be a special event station on HF and VHF, with talk-in on S22 – and there will be plenty of free parking. For more information telephone G4MHW on (091) 232 4141 ext 430 or G4MRT on (091) 281 0994.

Sea station

A life on the ocean wave is better than going to sea, as they say, and who should know better than those who care for HMS Belfast? Now at rest by Symon's Wharf, near the Tower of London, this magnificent vessel dominates the view of the Thames at this point.

To celebrate the 50th anniversary of its launch, the Royal Naval Amateur Radio Society will be holding a special event station, callsign GB5RN, from Thursday, March 17th until Wednesday April 13th.

The amount of activity will depend upon the availability of operators, except for the period between April 2nd and 10th when the station will be operational full time.

The preferred frequencies are: CW – 1845, 3520, 7020, 10117, 14052, 18071, 21052, 21120, 24900, 28052, 28120, 144035. SSB – 1970, 3660, 3740, 7052, 7088, 14140, 14190, 14278, 14310, 14335, 21360, 28410, 28933, 144375. FM – 145350, 145400.

A special QSL will be issued to contacts, via the RSGB or Derek Costello G4UKJ, Three Ways, The Green, Stalham, Norfolk NR12 9PZ. Requests for direct QSLs must be accompanied by an SAE. The ship's address is HMS Belfast, Imperial War Museum, off Morgan's Lane, Tooley Street, London SE1 2JH.

Final frontier

Now we move to KARS – Keighley Amateur Radio Society, which has moved into new premises. The club now meets in the club room at the rear of the Victoria Hall, Victoria Park, Keighley – this is behind the leisure centre.

The meetings for March commence with an informal meeting on March 8th, and on March 29th G4ZVD will be talking about America – the first twenty-five years in space. Out of this world!

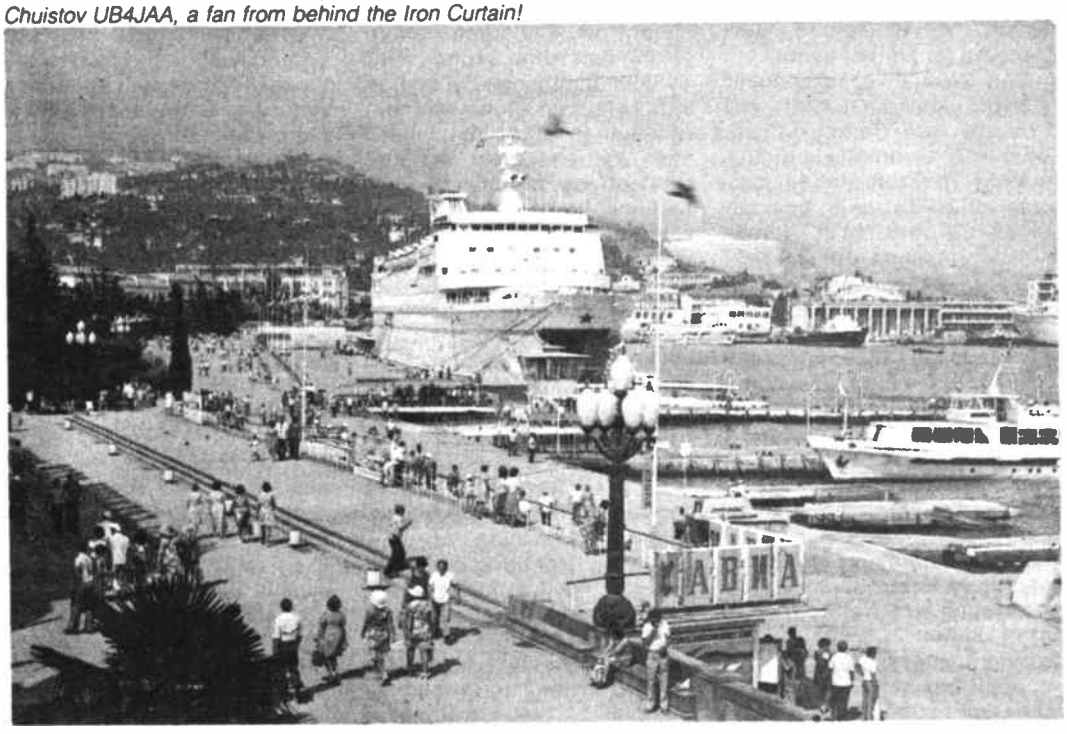
KARS meets on Tuesdays at 8pm in the new club room. Details of forthcoming events can be obtained from Kathy G1IGH on Bradford 496222.

Banbury AGM

Banbury Amateur Radio Society's AGM will take place on Wednesday, March 23rd at 7.30pm in 'The Mill Club', Spiceball Park, Banbury. All members and anybody else who has an interest in radio are invited to attend.

Further information can be obtained from the Secretary, Bryan G1IIO QTHR or on Banbury 51774.

From Russia with love! We were pleased to receive this postcard from one of our international readers, Boris Chuistov UB4JAA, a fan from behind the Iron Curtain!



Non-stop

Not to be outdone by anybody on the activity front, MARS – the Midland Amateur Radio Society – has sent details of its rather full agenda for the year.

The club meets three times a week; does this explain why the club-houses wear out so quickly?

The first Tuesday of the month is a committee meeting, the second a computer night with G4OMP, the third brings the monthly meeting and the fourth is the Birmingham Central Raynet monthly meeting. We feel exhausted already...

Wednesdays are filled with the sound of dots and dashes – the weekly Morse class is taken by Tim G0GPZ. Thursdays are nights on the air with Roy G4SEA. We think we'll go and lie down now!

Oh, and in addition, the main meeting for the month is on March 15th, and this will be a talk about earthing given by Frank Fear G8CVR.

Since MARS is moving about so much, it would be advisable to contact Tom G8GAZ or Norman G8BHE, or to telephone (021) 422 9787 for the latest update before attending. Classes normally start at 7pm, meetings at 7.30pm in whatever premises are still standing!

ATV competitions

We have received details of the ATV contests for the year, which differ slightly from previous ones due to an agreement reached with neighbouring societies in Europe. The calendar for the year is:

Spring Vision Joint European, Saturday March 12th, Sunday March 13th, 1800 Saturday to 1200GMT Sunday, FSTV, all bands.

May Day Microwave, Monday May 2nd, 0001 to 2359 local time, 24cm and above.

Summer Fun Joint European, Saturday June 11th, Sunday June 12th, 1800 Saturday to 1200GMT Sunday, FSTV all bands.

IARU ATV (International), Saturday September 10th, Sunday September 11th, 1800 Saturday to 1200GMT Sunday, FSTV all bands.

SSTV Autumn Vision Combined, Sunday November 13th, 0001 to 2359 local time, SSTV, FSTV all bands.

Winter ATV Joint European, Saturday December 10th, Sunday December 11th, 1800 Saturday to 1200GMT Sunday, FSTV, all bands.

The rules for all these contests will remain the same, apart from the IARU contest, which will be subject to IARU rules.

Further details can be obtained from the BATC, 14 Stairfoot Close, Adel, Leeds 16.

Cut glass-nost

We may have to conduct a survey into the number of clubs that go by the acronym CARS – it certainly seems to be popular! Caithness Amateur Radio Society is one, but must take the prize for the northernmost version – indeed, you can't get any further north club-wise; Caithness ARS is the most northerly club on the British mainland. And what a lovely place!

So if you're up for the salmon fishing this year, the club meets in the Loch Watten Hotel, Watten on the second Wednesday of the month from 7.30pm. To find out more please contact Denny Morrison GM1BAN on (0847) 82241 or Mrs Wylie GM1XJY on (0847) 85604.

Memorial lecture

Verulam ARC's meetings for the month start with an activity evening on March 8th, and continue with the G3PAO memorial lecture on Tuesday, March 22nd. This event is held annually to commemorate the late George Slaughter G3PAO, a founder member and past chairman and secretary of the club.

This year's lecture will be entitled 'Aspects of the Pan-European Cellular Radio Network', and will be delivered by Chris Morcom G3VEH.

The club meets at the RAF Association Headquarters, New Kent Road, St Albans on the second and fourth Tuesdays of the month, from 7.30pm. For further information contact Hilary G4JKS on St Albans 59318.

The 1988 Presidential Installation

by Fiona Mckenzie

The Radio Society of Great Britain's presidential installation ceremony was held on Saturday, January 30th this year in Ipswich, the bustling County Town of Suffolk. The Society's 54th President is Sir Richard Davies, KCVO, CBE, C Eng, FIEE, G2XM, who was at one time equerry to HRH the Duke of Edinburgh.

The venue for the installation and celebration dinner was the council chamber of the 19th century Town Hall and Corn Exchange.

Joan Heathershaw G4CHH, the 1987 President, pointed out that 75 people were sitting down to dine, which seemed appropriate in this, the RSGB's 75th anniversary year! She spoke of her term of office, and told us that Sir Richard has three hobbies – sailing, gardening and amateur radio. She forecast that for the next year he would not have much time for two of these hobbies!

Handing over the presidential chain she said she was sure that Sir Richard would add lustre to the chain and to the office of President.

Several messages of congratulations for the new President had been received from around the world and, after reading these, Mrs Heathershaw sat down to much applause.

At this point, Terry Barnes GI3USS made his customary charming gesture of a presentation to the President of a gift, this year a book about Ireland, on behalf of Irish amateurs.

After thanking Mrs Heathershaw for her speech and Mr Barnes for the gift, Sir Richard welcomed the RSGB's guests. These included K Allen, L Barclay, K Hutchinson and T Jeacock from the DTI, Bill Hancock, the local County Emergency Planning Officer, and P Cleminson from the BBC.

Sir Richard then spoke of the great honour of wearing the historic chain. He compared the weight of the chain to the burden of office, particularly in this most important anniversary year. Programmes are in hand, he said, that are vital to the future of amateur radio, and the Society must promote public awareness, particularly amongst the young. A student licence is planned, and a 'young amateur of the year' award is to be instigated. Sir Richard made the point that even new licencees tend to be older people these days.

The 75th anniversary will see a number of celebrations, particularly the extended NEC exhibition in July. In addition, there will be 'Open Days' at the RSGB Headquarters, a data symposium, an Amsat colloquium and family activity days. It is hoped that local clubs will plan activities to celebrate. Sir Richard thanked the DTI for allocating the callsign GB75, for use by special event stations in 1988.

Sir Richard concluded by saying that people get out what they put in to any hobby, and it is important that the Society should promote itself more to non-members to ensure that the greatest possible number of amateurs enjoy the advantages of an even stronger society. He then mentioned the RSGB staff, some of whom were present, and expressed his deep appreciation for all that they do.

Sir Richard's final duties were to introduce Julian Gannaway G3YGF, who at the council meeting held earlier in the day had been appointed Executive Vice President, and to present council badges to the two new members, Geoffrey Smith G4AJJ and John Allen G3DOT, and the Immediate Past President's badge to Joan.

Everyone agreed that it had been a most enjoyable evening, and for many it was a first visit to Ipswich, where there are some fascinating buildings.

I was lucky enough to be able to spend the day exploring early 16th century architecture in Constable country, while the council and one or two committees were hard at work.

Very best wishes to Sir Richard Davies G2XM in his year of office.

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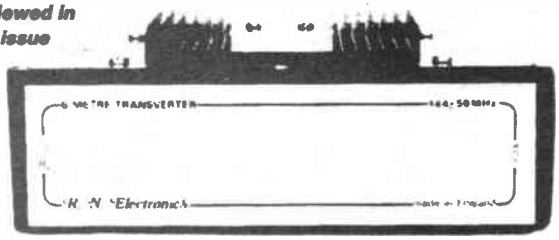

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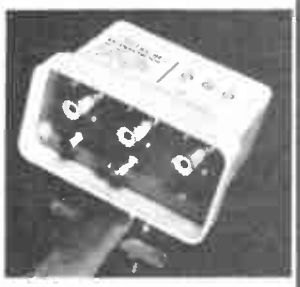

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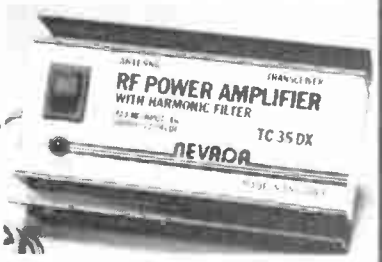

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DX DIARY

News for HF operators compiled by Don Field G3XTT

Conditions during January were fair, but nothing to write home about. There were some good spells on the lower bands, particularly to Japan, but there was very little from the Pacific. Nevertheless, there was one highlight when KX6DS and KX6DC were worked one morning in the UK on Top Band! The major expedition of note was by Salvatore IT9AZS and others. They started operations as J50AS from Guinea-Bissau, and later moved to the Bijagos Islands which, while still counting as Guinea for DXCC, will count as a new one for Islands on the Air purposes. During this period of their operation they signed J56AS, and were particularly active during the evenings on 40 metres. If you didn't work them, don't worry. K8MN is now QRV as J52US, and promises lots of activity during his two year tour of duty.

Mt Athos

Eric SM0AGD has recently written about the /SY operation last September, and *DX News Sheet* also carried further details direct from SV2RE. To operate from Mt Athos not only requires a Greek licence but also permission from the monks themselves. This is very difficult to obtain, and the Radio Amateur Union of Northern Greece were taken completely by surprise when, after some three years of trying, a monk whom they had befriended arrived with a 15-day permit for them. Much to the credit of the group, within 48 hours they were able to collect gear, antennas, etc together and set off for the Holy Mountain.

The monks made a building available to the group, although unfortunately it was half-way up the peninsula and screened between north-west and east. Nevertheless, the group managed to keep three stations running for much of the 13-day operation, including on four occasions transporting a complete station to the top of the mountain in order to work into the Far East.

In all, some 22,848 QSOs were made including about 100 on 160 metres. The group also made an effort to participate in the daily life of the community, taking part in fishing, picking grapes, repairing buildings and attending mass.

Following the operation there was criticism in the amateur radio press, both of the group's operating abilities and of the statement being put out that QSLs would only be sent on receipt of a 'green stamp'. I suspect both problems arose because no members of the group were regular DX operators, and some understanding is required on the part of those of us who worked them. Certainly all the members of the group are to be congratulated for putting a major DXpedition together at such short notice, some having to take unpaid leave of absence from work in order to take advantage of the opportunity being offered by the monks.

It seems that the group has established a good rapport with the monks, and it is to be hoped that future operations will be possible. SM0AGD also reports that one of the monks, Apollo, is studying to become an amateur himself, so we may yet see Mt Athos acquiring a resident amateur.

Keep your fingers crossed about the DXCC status of this recent operation. There is a rumour doing the rounds to the effect that the permission to operate from Mt Athos was given verbally, which wouldn't go down too well at the DXCC desk. The QSLs were due to start going out in late January.

Incidentally, there has been some confusion as to the whereabouts of SY1UA, as the SY prefix is usually associated with Mt Athos. In fact this station, which makes regular appearances on the bands, is operating from Athens to celebrate the 150th anniversary of the founding of the University of Athens. If you work the station you can apply for an attractive (and free!) certificate via RAAG, PO Box 3564, Athens, GR10210, Greece.

Egypt

There has been some controversy recently about the legality or otherwise of stations signing /SU from the Sinai. PA3AXU/SU, for example, is currently very active on all bands. N6TJ, after operating as a guest operator from SU1ER during the CQWW SSB contest, reported that 'only operations from licensed SU stations are legitimate. Foreigners operating /SU, usually from the Sinai, are clearly illegal and the PTT would dearly love to locate them and shut them down'.

In reply N5RM, who has operated on several occasions as N5RM/SU and also from club station WD5AJE/SU, points out that not all such operations are, or have been, illegal. In effect there are two governments in Egypt, the civil government in Cairo and the military government in the Sinai.

Some years ago a procedure was set up whereby the senior US Department of State official at the Sinai Field Mission, on behalf of the radio amateur concerned, would make a written request to the Egyptian Military Commander in the Sinai who would then approve the operation. W3AZD of the ARRL DXCC desk certainly takes the view that such operations are perfectly ok, and accepts them for awards credit.

Iran

It is some time since there has been much amateur radio activity from Iran. However, G3FKM, the RSGB's HF Manager, reports that there are now six officially licensed amateurs in Iran. These are EP2AK, EP2ASZ, EP2DL, EP2HRD, EP2HZ and EP2MRD. Some of these have been reported on the bands recently. Other EP callsigns have also been noted. Whether these are very recently licensed or pirates remains to be seen. However, the six listed above look like good ones.

Got a big antenna?

If you think a tribander on a 60ft tower is the ultimate in HF DXing, you haven't lived! In *The DX Bulletin* recently K5IU described the hardware which he now markets commercially that will enable whole towers to be rotated. He also gave details of some installations using his hardware. N8RA/1, for example, has a 100ft tower, the top 50ft of which is rotatable.

In addition, he has a further rotator 20ft from the top of the tower, so that the highest antennas can be rotated independently of the ones below them! W6GO's 150ft tower supports 6 elements on 20, 4 on 40 and a rotatable dipole for 80. All these are above the rotator which is at the 70ft level. N5RM has a 145ft rotatable tower supporting four stacked TH7DX antennas. And so it goes on. Somehow I don't imagine we will see many such arrays in the UK, but it's always nice to dream, isn't it?

CQ DX

What can you expect to find on the bands during the coming month? Close to home, Phil G4OBK has written to me to say that he and Chris G0EJK will be active from the Island of Colonsay in the Inner Hebrides from March 23rd to 29th, from WAB square NR39. They hope to have a GB callsign, possibly GB5CO, and will operate in

the CQ WPX contest. Outside the contest they also hope to do some /P and /M operation to dish out some additional WAB squares (NR38 and NR49) plus a further island (Oronsay). Although limited to wire antennas, they will be taking a TL922 linear to make sure they are heard!

The big one to look out for in March is an operation from Canton Island (KH1 and T31) by Jim VK9NS and others. No callsigns are known at the moment. The format looks like being very similar to Jim's operation from Heard Island, with a mixed group of amateurs and scientists. Propagation is likely to be best on 20 and 40 at that time of the year, with some possibility of 15 metre openings.

They leave on March 21st and expect to arrive on the island a couple of days later, and will probably have to go QRT around April 6th. As if planning this operation wasn't enough, Jim has recently received permission to operate from Sao Tome (S9) and hopes to take advantage of this in May or June before visiting the UK.

As I write this, I have just received a press release from the Northern California DX Foundation giving further details of the forthcoming operation from Palmyra Island and Kingman Reef. The NCDXF has committed $4,000 to assist this operation by DJ8NK, F6EXV, W0RLX and others (as well as committing $2,000 to Jim Smith's DXpedition described above).

The group plans to leave Christmas Island on April 20th and will commence operations from Palmyra a couple of days later. They then expect to sail to Kingman Reef for an operation during the first week of May.

According to a recent survey, Kingman ranks as the fifth most wanted country by European amateurs, and Palmyra ranks number twelve. Again, 20 looks like being the best band on which to catch this operation.

With these two very rare ones coming up, I can see that a bout of that rare virus 'DX Disease' is about to start affecting the workforce, with people going inexplicably absent from work. The curious thing about this disease is that the length of the affliction tends to be of inverse proportion to the height of the sufferer's antenna and the size of his linear! Seriously, though, if you want to work these then some planning is called for. Unless you have lots of power and a big monoband antenna, it's probably not worth chasing them for the first day or two of their operations.

During that time, however, plug into the grapevine (phone the DX News Sheet Hambank number, listen to the DX information frequencies on two, etc) and find out when and where the DXpedition is being worked. Then arrange to be at home at the best times. Remember that major DXpeditions like these will almost inevitably be using split-frequency operation to speed things up, so listen carefully for clues as to where they are listening.

Taking KH1 first, at the end of March there is no darkness path during our evening, but our dawn almost exactly coincides with sunrise there, so there should be a possibility of 40 metre propagation round 0535GMT. However, the path is almost exactly over the pole, so there could be high absorption unless solar activity is low. There could well be both a morning and an afternoon path on twenty, and it's just possible that the MUF could climb high enough for fifteen metres by late morning if the sunspots help us out.

The story is much the same for KH5, except that being a month later there is no darkness path at all, so the possibility of LF propagation is very slight indeed. The path is not quite so northerly (338 degrees from my QTH), so problems of polar absorption should be less severe. Remember, for both operations, to check both long and short paths.

Prefixes

From January, Omani amateurs should have been using a new A41 prefix if they are Omani nationals, while non-Omanis should now be using A45.

A Cuban group will sign T47DX (SSB) and T47CW (CW) from March 26-28th on 80-10 metres from Ramano Island. This looks like being a major operation, with several stations running simultaneously. Check 3740, 3790, 7075, 14120, 14180, 21160, 21280 and 28480 on SSB, and 5kHz above the band edges on CW.

The European Council station TP2CE in Strasbourg will be operational on March 11-13th and June 24-26th. Unlike 4U1ITU and 4U1UN this doesn't count for DXCC, but it is worth looking out for.

The RSGB HQ station has been signing GB75RS, and will continue to do so during the Jubilee year. However, although all contacts will be confirmed with QSL cards via the bureau, this won't be until much later in the year.

There will be some special prefixes from Korea later in the year to coincide with the Olympic Games. HL8N will be active as 6K88SOG (Seoul Olympic Games), HL8V as 6K88KOG (Korean Olympic Games) and HL8A as 6K88A. Other Korean amateurs may also be allowed to use the 6K prefix instead of HL.

IK2CKR and IK2GNW will operate from Wallis Island (FW) from March 8th to 22nd, and Dick G3PFS will be back in Madeira as CT3EU from March 21st until April 4th. Gary VE3XN will be in Italy in March, and hopes for a one day operation from the Vatican as HV1CN on the 12th.

VP8BNC is now operational from the South Orkney islands, and will be there until June. This is the first British operation from there for several years, although there have been a number of operations by groups from Argentina, Russia and elsewhere. By the time you read this an Ecuadorian amateur should be operational from Antarctica signing HD0AE (Antarctic/Equator).

Finally on the DX news front, there are still rumours of a forthcoming operation from the Spratly Islands around mid-March. A number of well-known DXers are reported to be involved, although at the end of the day it is possible that only Philippino amateurs will be allowed to take part.

Contests

The big one during March is the CQWW WPX SSB event on the last full weekend of the month (26/27th). This is your big chance to catch lots of rare prefixes. Score one point for European QSOs and 3 points for DX. Contacts on 40, 80 and 160 score double. Contacts with your own country score nothing, but count for multiplier credit. The final score is calculated by multiplying QSO points and the total number of prefixes worked, regardless of band. There are single-band, multi-band, QRP and multi-operator categories.

Single operators may not operate for more than 30 hours of the 48 hour contest period, and off periods must be a minimum of 60 minutes. Entries go to *CQ Magazine*, WPX Contest, 76 N Broadway, Hicksville, NY 11801, USA. These same rules apply to the CW leg of the contest on May 28/29th. I can provide a photocopy of the full rules, plus blank logs and cover sheets on request. A whole range of trophies and certificates is on offer to the winners of the various categories.

The other major contest to look out for in March is the Bermuda contest, which takes place on the weekend before the CQ WPX. This, of course, is the one which offers a trip to Bermuda for the UK winner, so it's worth a major effort! G4LJF won it last year, and is not allowed to win it again for another 4 years. Without going into too much detail on the rules, the idea is to make QSO points by working W, VE and VP9 stations.

Each station may be worked twice per band, once on SSB and once on CW, but there must be a gap of at least 30 minutes between the two QSOs. The multiplier is the number of different VP9 stations worked per band added together. Total operating time must not exceed 36 hours in the 48 hour period.

This is a brief summary of the rules; full details ought to be obtainable from the Radio Society of Bermuda, PO Box HM275, Hamilton 5, Bermuda, and I imagine previous UK winners may also be able to help with details and advice.

QSL Info

Brian Russell G1WBI has recently sent me details of the W6GO/K6HHD List, a computerised listing of QSL managers which is published monthly with over 5,000 entries in each issue. Single copies are available from Brian for £2, or a year's subscription can be obtained for £20. Brian's address is 163 Halton Rd, Runcorn, Cheshire WA7 5RJ. This list is very useful indeed, although you still need access to an International Callbook for the actual addresses if you want to send cards direct.

That's it for another month. If you are planning some portable operation over the summer from rare WAB squares, islands, countries or whatever, then please let me know in good time so that I can mention your operation in these pages. 73 de Don.

MORSE PRACTICE OSCILLATOR

By Steven and John Goodier, G4KUB and G4KUC

For anybody wishing to learn Morse code, a Morse oscillator is a useful project to build. The oscillator described here is very simple to construct and would make a very useful first time project for anybody just entering the world of radio and electronics. It also gives the constructor a chance to have a go at making a simple printed circuit board; a very useful skill to learn if you are planning more construction in the future.

Because the article is intended as a first time project, extra help and information will be given about components and construction.

The circuit

Figure 1 shows the circuit diagram of the Morse oscillator and is based around two very common transistors. The circuit is a multivibrator, where there are two transistors joined so that the output of one is connected to the input of the other. When Tr1 is conducting, then Tr2 is cut off and vice versa, so both transistors are never switched on at the same time. If the capacitors connecting the transistors together are equal, then the output will be a square wave and if the value of each capacitor is low enough, then the output will be an audible whistle.

In the circuit shown, the values of C1 and C2 determine the frequency at which the circuit will oscillate; changing the value of these will change the tone of the output. It is a little inconvenient to have to change these capacitors each time we want to change the output tone, so VR1 has been added in series with R2 to do this job for us. VR1 is a variable resistor and is mounted on the PCB, and when this is adjusted the pitch of the oscillator will change so that the output can be set to suit the user.

It was found that ample volume was produced when the output was connected to a 35 or 64 ohm loudspeaker, so VR2 was added, and this works as a volume control.

The supply voltage for the circuit can be anything from about 9-15 volts and the prototype was powered from a 9 volt battery.

There is no need for an ON/OFF switch, as the supply voltage is taken through the Morse code key and this acts the ON/OFF switch.

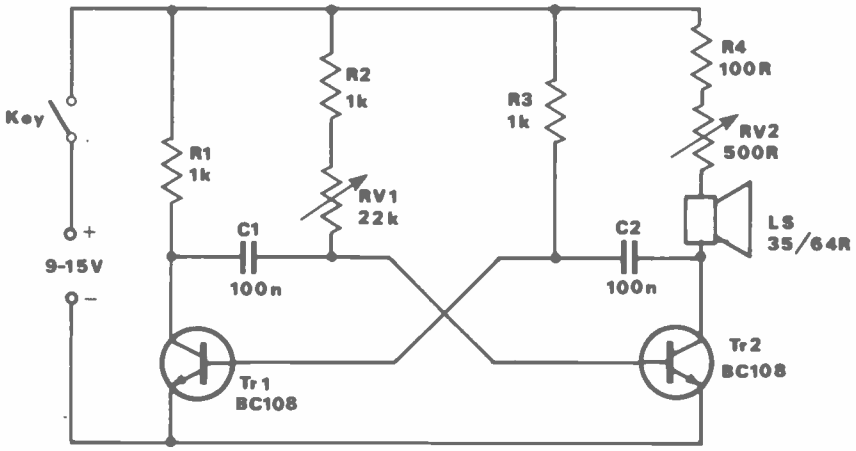


Fig 1 *The circuit diagram of the Morse oscillator. Note that the Morse key acts as the on/off switch*

(a)

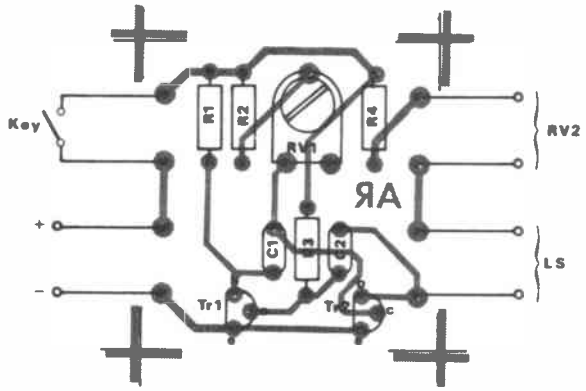


Fig 2a *The component overlay for the PCB. The emitters of Tr1 and Tr2 are shown and fit towards the bottom of the board.*

(b)

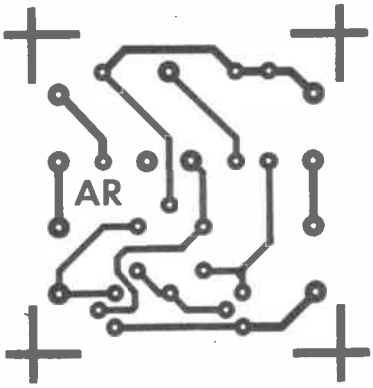


Fig 2b *The PCB foil pattern*

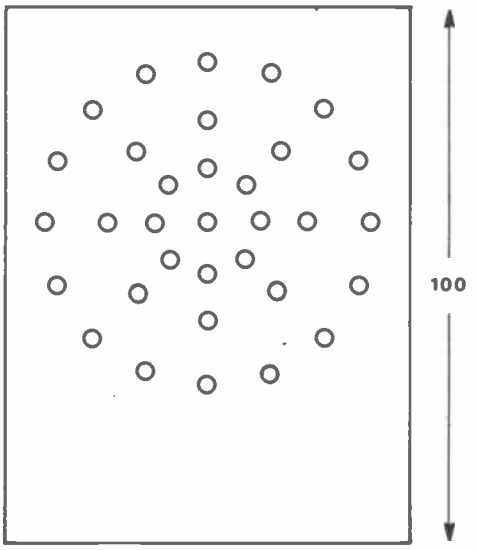


Fig 3 *The drilling details of the plastic box*

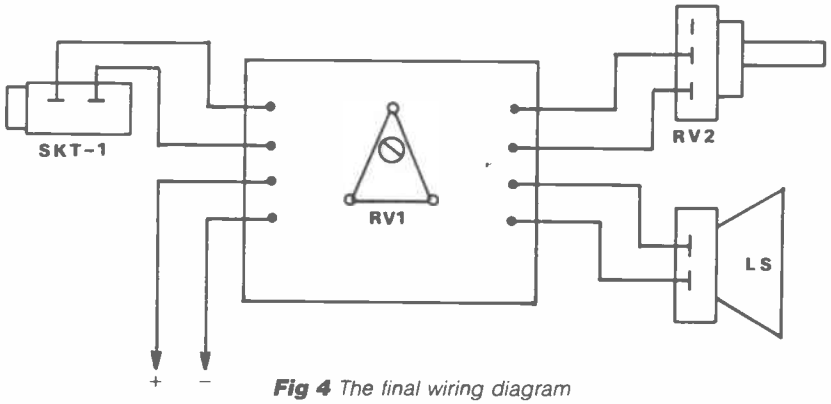


Fig 4 *The final wiring diagram*

Construction

The oscillator is constructed on a small printed circuit board. If you don't want to go to the trouble of making a PCB then the unit can be built on a piece of Veroboard.

The PCB is very easy to make, and if you have never had a go at making a printed circuit board before, then this is a good one to try.

The first thing you will need is a good PCB pen. I have tried various pens, such as the Altai PC Marker, but have found this type of pen to be very poor. The main trouble is that the ink is runny and so can't be used to draw thin lines. I have found the best pen to use is the Staedtler Lumocolor 318 Permanent. You should be able to purchase one, as I did, from a good stationery shop.

Start by cutting the PCB to size. You will need a piece of board approximately 40 × 40mm. Clean the copper side with some wire wool, then make a tracing of the PCB pattern. This is shown in *Figure 2b*. Where a hole is to be drilled on each pad, mark with a pencil dot. Fix the tracing onto the board using sticky tape at the top, so that you are able to lift the tracing up like a flap. The next job is to mark onto the board the position of each hole to be drilled; this is done using a scribe. 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 to make an indent on the copper. This clearly marks each drilling position.

You should now have all the positions of each pad and the holes to be drilled. Using the PCB pen, begin to draw the pattern as shown on the tracing. Use a ruler to draw the straight lines between the pads, and every so often place the tracing onto the PCB to check that all is going well. When satisfied with your work, etch the PCB in acid following the instructions supplied. Just one final point, make sure that you go over the board at least twice with the pen to ensure that a thick layer of ink has been laid down.

In hot water

When the board has been etched, clean off the ink with wire wool and drill all the holes. Once drilled, wash the board in hot soapy water. We are now ready to mount the components. We will start by mounting all the resistors. R1, R2 and R3 are all the same value, 1k, and are coloured brown, black, red. R1 and R2 sit side by side and R3 is placed just underneath VR1. This can be clearly seen from the PCB overlay in *Figure 2a*.

The next component to be mounted is R4. Its value is 100R and its colour is brown, black, brown. This is fitted next to VR1 on its right-hand side. Remember that resistors can be mounted either way round and can withstand a fair amount of heat from the soldering iron, but it is always best to solder as quickly as possible.

Make sure all your solder joints are a nice bright silver colour. Most home-made projects fail to work simply because of bad solder joints. The iron should be rated at about 15 to 25 watts, and the solder about 18 or 22swg.

Next, mount VR1. You may have to enlarge the holes on the PCB for this component, and as can be seen from the overlay it is mounted between R2 and R4. C1 and C2 are the next components to be soldered into place. Capacitors come in many shapes and sizes and the ones used in this project are disc-shaped with wire legs either side.

Mount the capacitors as shown, and these again can be fitted either way round. At this stage, stop and give your board a quick check; if all seems well carry on to the next stage.

It is now time to fit the two transistors Tr1 and Tr2, which are BC108 or BC109. Transistors have three legs, base, collector and emitter, and *must* be mounted the correct way round for the project to work. The BC108/109 series of transistors have a little lug on the side of the case and the wire nearest to this is the emitter. The emitter lug must face the bottom edge of the board. The wire in the middle is the base and the remaining wire is the collector. If you study *Figure 2a*, this can be clearly seen and the transistor is shown from the underside.

Solder the transistors as quickly as you can; they do not like a lot of heat for long periods. However, it must be said that I have never damaged a transistor due to overheating it. Once Tr1 and Tr2 have been mounted, the construction of the board is complete and it is now ready for the final wiring.

The box

After completion of the PCB, the next job is to drill all the holes in the box. The prototype was mounted in a small plastic box about 100 × 76 × 41mm in size, which enabled a 66mm speaker to be fitted. The drilling details are shown in *Figure 3*. The speaker is mounted in the bottom of the box and is held in place by impact adhesive.

A ¼in jack socket is used to take the Morse key, and the volume control can be mounted alongside this. The PCB can either be mounted on top of the loudspeaker or on the lid of the box using double-sided sticky pads. There is also room for a PP3 9V battery.

Final wiring and testing

Give the board a final check and, when satisfied, you can wire it into the box, as shown in *Figure 4*. First, connect all the

MORSE PRACTICE OSCILLATOR

wires to the board; you will need two for the Morse key, two for the volume control (VR2) and two for the loudspeaker.

Also, solder into place the PP3 battery connector. Start by wiring the volume control and then connect the wires to the loudspeaker. Next, connect the two wires to the ¼in jack socket for the Morse key. Give your work a final check and that completes the wiring of the Morse oscillator.

Connect the battery and push the Morse key into the socket. Remember, there is no ON/OFF switch. Closing the contacts of the Morse key should produce a tone from the speaker, and you should be able to alter the volume level using VR2. If you adjust VR1, then the pitch of the oscillator should change. This can be set to suit individual taste.

COMPONENTS LIST

Resistors
R1, R2, R3 – 1k (brown, black, red)
R4 – 100R (brown, black, brown)
VR1 – 22k horz min preset
VR2 – 500R lin potentiometer

Capacitors
C1, C2 – 0.1μF disc ceramic

Semiconductors
Tr1, Tr2 – BC108 or BC109

Miscellaneous

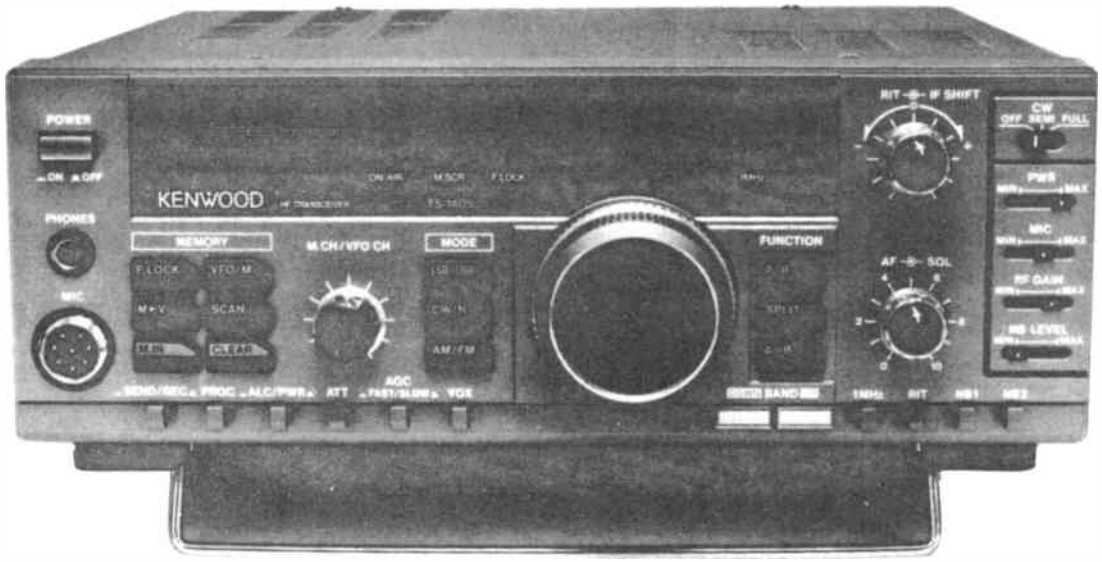
Loudspeaker 35 or 64 ohms	Maplin WF57M
¼ inch mono jack socket	
Plastic box 100 × 76 × 41mm type MB2	Maplin LH21X
PP3 battery clip	
PP3 battery	
Knob for volume control	
Printed circuit board, PCB pen	
Ferric chloride crystals	Maplin XX12N

Conclusion

A number of these Morse oscillators have been built over the last few months and all have worked first time. I hope I have given enough information for the absolute beginner to build this project without too many problems. This simple project should give a good introduction to component identification, soldering and PCB making – all the skills needed for home construction. The current consumption at 9 volts is only 23mA so the battery should last many hours, and there is also ample volume from the loudspeaker.

Don't miss Amateur Radio every month for the best in home construction! Next issue on sale 31st March.

ANGUS McKENZIE TESTS



KENWOOD TS140S

100W HF mobile transceiver

There are those who are always grumbling about rig prices, and no doubt some will be surprised that I regard this new £860 model as inexpensive and so I feel some explanation is justified. The TS140S is very nearly £300 cheaper than its senior counterpart, the TS440S. If we were to look at the price of HF transceivers nearly 25 years ago, we would see that the cheapest, the KW2000A, was around £200 or so. If this price were inflated to today's it would cost approximately one and a half times the price of this new model and be more expensive than the 440S!

One can draw a similar comparison with rigs such as the Yaesu FT200, and you would again see that, very broadly, rig prices are not so bad today if you consider facilities and performance as well. However, there is some justification in the feeling that the yen is too strong, and prices in Europe seem to be inflated when compared with US prices, but we have all gone through this sequence before!

The TS140S

This very interesting new 100W rig covers all amateur bands from 1.8 to 28MHz, but also offers Rx coverage all the way from 50kHz to 35MHz, quite an unusual facility in a transceiver. Upper and lower SSB, FM, AM and CW modes are all fitted, and the correct sideband is chosen automatically for the frequency in use, but you can change sidebands easily and without altering the carrier injection frequency. 31 memories are included, which are very easy to use, and ten of them can store separate Tx and Rx frequencies for 10m repeater operating, for example.

The rig requires 13.8V dc from an external power supply, and the Kenwood PS430 should suffice (at £173 including VAT). The rig is intended to take over the market that previously existed for the TS130S.

Frequency access and tuning

When you switch the rig on, you will find that the tuned frequency is that last used when it was switched off. The mode in use is also memorised. You can either change bands up and down or, if you select the receive only mode with the 1MHz button, the rig then moves in 1MHz bands (or 500kHz if programmed). There is one rather useful ergonomic touch that I particularly liked – the up and down buttons give 500kHz jumps on the 28MHz amateur band when in the transceive condition.

Tuning is at the rate of 10kHz per revolution for SSB and CW, but 50kHz per revolution on AM and FM. The SSB/CW steps are 10Hz, and these are linear. When the tuning knob is rotated fast, the tuning rate accelerates considerably, thus allowing one to QSY very quickly. However, another extremely convenient way of making a large frequency change is to use the memory channel switch when in the VFO mode, as the click steps allow stepping to the nearest 10kHz points up and down each band.

Although Kenwood have fitted two basic VFOs (A and B) and buttons are provided for selecting either of these, split operation and A=B, there are in reality 11 more VFOs, of a kind, if you select memories 20 to 30 inclusive. Each of these can be used to store a complete band with user-defined lower and upper limits, with a chosen mode.

I checked the facility by putting 3.6 and 3.8MHz into memory 21, and found to my delight that when this memory was selected I was able to tune the VFO knob only between these frequencies and, when at the top end I then tuned further, the frequency jumped down to 3.6MHz again. It is a pity that the Kenwood omits a pip at the band changeover point, since the rig pips on almost any other happening! It even puts out the letters in Morse code, appropriate to the modes, and there are also many alarm warnings in Morse, such as 'Check Memory'. If you didn't know that the machine did this, you might well imagine that the rig had been invaded by an ET!

Use by the blind

Returning to memory, you can of course transfer from any memory to VFO. If you are in one of the memories storing band limits, you will find that the MHz/band up and down buttons put you either to the top or bottom of the band limits selected by the memory. Thus, a blind amateur who selects 80m and then presses the 'up band' button will find

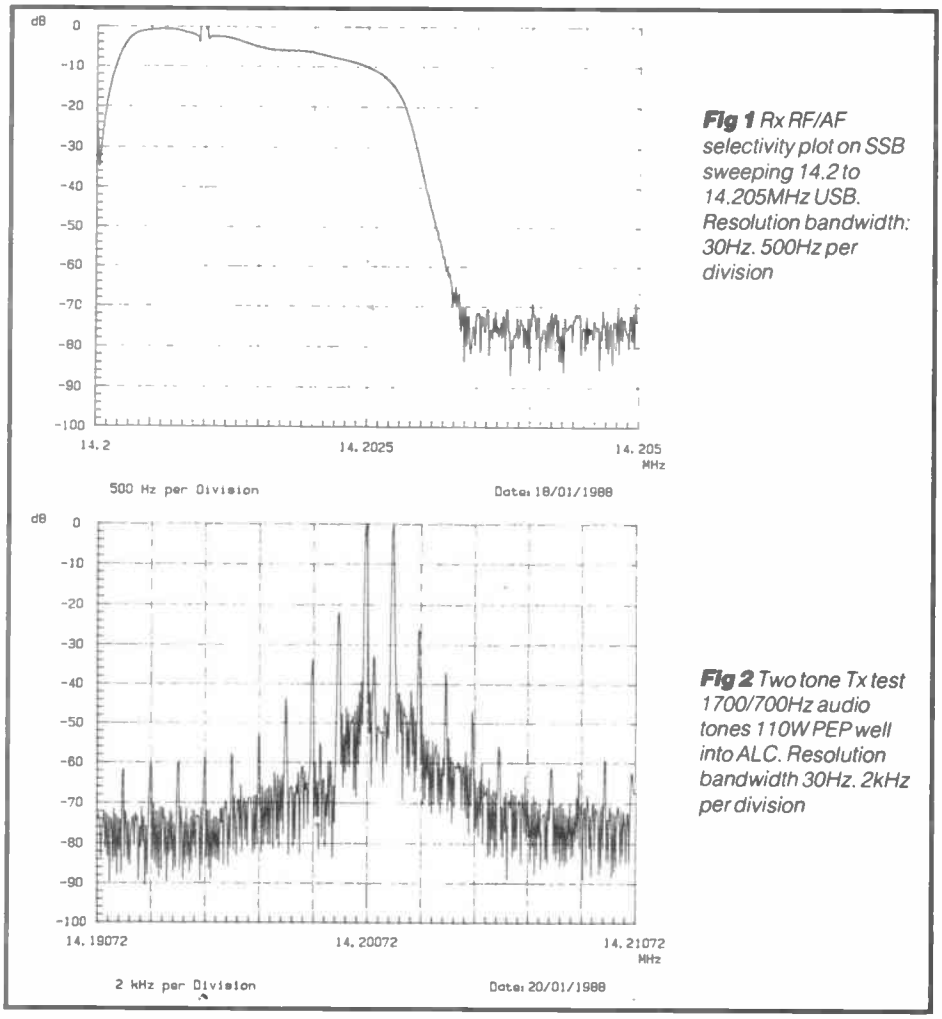


Fig 1 *Rx RF/AF selectivity plot on SSB sweeping 14.2 to 14.205MHz USB. Resolution bandwidth: 30Hz. 500Hz per division*

Fig 2 *Two tone Tx test 1700/700Hz audio tones 110W PEP well into ALC. Resolution bandwidth 30Hz. 2kHz per division*

himself on 3.8MHz. If the memory to VFO button is pressed and the clip step rotary is turned anticlockwise by five clicks, 3.750MHz will be the receiving frequency. A slow 'left hand down a bit' rotation of just under 90° will then find the Radio Amateur Invalid and Blind Club net on 3.748MHz!

Fiona and I put all the bands into these memories, and then put into memory 28 BBC European Service relays on medium wave as the lower limit and Capital Radio as the top limit. At any time, I could find memory 28 by rotating the memory control and waiting until I heard the inevitable 'thump thump pops' from Capital. I could then click anticlockwise for the required band so, although the rig does not have speech frequency readout, it is easy for blind people to use.

Further facilities

Bandpass tuning is provided, and the switchable RIT can be selected to operate in 10 or 20Hz steps, these giving maximum QSYs of ±1.25 or 2.5kHz respectively. Push buttons select either of two noise blankers (a slider adjusts the blanking threshold), and the following additional facilities: Tx/Rx, processor on/off, meter ALC/power output on Tx, Rx 20dB RF input attenuator (it actually gave 21dB!), AGC fast/slow and vox control on/off. Microprocessor control buttons provide frequency lock, memory/VFO selection, memory to VFO, scan and memory write and clear, in addition to others previously described.

Mini sliders, all acting sideways, adjust Tx power out (around 5W to 100W on CW/SSB, 50W max on FM and up to just under 100W on AM), mic gain (fixed on FM, though), Rx RF gain and noise blanker level. A three-position slide switch selects CW off, semi or full break in, a useful feature on the front panel. The audio gain control has a squelch control concentrically mounted behind it, which operates on FM only. On CW, an optional narrow filter is available, and this can be selected by pressing the CW mode button twice instead of once. These mode buttons cycle between two positions – FM/AM, CW wide/narrow and SSB normal or reverse.

Front panel display

The front panel digital display is absolutely superb for a budget rig, and you can pre-program it to give either 10 or 100Hz resolution on CW/SSB. Very comprehensive status indications are given, including chosen memory channel, etc. The display is in red, white and yellow on a black background, and is clear and easy to read.

There is also a headphone jack socket on the front panel, together with a standard eight pin mic socket, wired to Kenwood conventions.

The rear panel

An SO239 socket is supplied for antenna connection, and there is a special 13.8V dc connector fitted. A very long dc lead is supplied, which is fitted with fuses in positive and negative sides. Both polarities are doubled up, thus making four wires in all to reduce the voltage drop in the leads. A 3.5mm jack socket can supply audio to an external loudspeaker, and cuts out the internal one when in use.

Another jack socket is used for a straight Morse key connection, and, incidentally, has +5.5V on it with key up on CW. There are four multi-way sockets on the back, and the first of these is called 'remote'. This socket provides the following: pin 1, loudspeaker connection; pins 2, 4 and 5, short circuit on Tx or Rx for external linear control, etc; 3 is external PTT; pin 6 is ALC input and pin 7 is 12V dc on Tx (maximum 10mA). There is also an earth connector. This socket thus allows for a wide variety of linear amplifier interfacing.

The accessory 1 socket is for use with the optional computer interface, whilst accessory 2 provides all the normal interfacing for data and packet interconnections, as well as providing audio signals for tape recording, etc. There is also a pin which turns the internal microphone amplifier off when earthed, and this is useful when using either external data or mic in succession.

The accessory 3 socket is provided for directly interfacing with the Kenwood AT250 external automatic antenna tuning system, the socket giving the appropriate band switching data signals, etc.

Delay, vox and anti vox presets are also mounted on the back panel. There are ventilation holes in the back panel and on the top, and an internal cooling fan is fitted to provide a fairly modest air flow. A pull forward bail stand is mounted underneath the front, to lift up the front of the rig for base station operation.

The internal speaker is mounted in the top of the rig, which could possibly be inconvenient for mobile use but of course is ideal for a base station. Finally, the tuning tension can be altered by selecting the required tuning stiffness, by holding onto the front of the tuning knob assembly whilst turning the back.

Subjective tests

I very much liked using this rig and I found the ergonomics to be superb, far and away better than the lowest priced competition from Japan, although I have not yet tested the Yaesu FT747 and the new Icom rig which has just been announced for release later this year. I very much liked the positive feel of the memory click step rotary which also gives 10kHz steps when you are in the VFO mode.

The front panel is much less cluttered than some of its competition, and this is a very important point for mobile use. Unfortunately, the review sample did not have the narrow CW filter in, and in the

wide CW position the receiver uses the SSB filter, so results were hopeless here. However, I see no reason why they should be other than very satisfactory with an appropriate filter, as the rig is fairly similar to the R5000 in operation. The receiver's dynamic range seemed excellent, and sensitivity was always good enough up to 29.7MHz, and I heard nothing of interest between this frequency and 35MHz.

The reciprocal mixing performance close in did not seem to be as good as it should have been, and this is a disadvantage for serious DX working. However, in the context of a mobile rig replacing the TS130S, I do not think that this is as serious a drawback as it is in more expensive rigs which have the same problem.

I found the little sliders for mic and RF gain, etc, quite adequate, but they are so small that I wonder how long they would actually last in practice before becoming noisy. There are many functions provided with either of two variants, and you can change between them by holding your finger on the appropriate button when turning the set on.

The RIT can either cover the range of up to 2.5kHz offset with 20Hz steps or a range of 1.25kHz with 10Hz steps, which I very much prefer, but which is insufficient to cope with some stations that I know on 80m who have rigs that both drift and apparently have different Tx and Rx frequencies! Other pre-programmable choices include 500kHz or 1MHz band changes, 10 or 100Hz main frequency display resolution, 9 or 10kHz click steps across medium wave, programme scan hold on or off and various alarm functions with ordinary pips or Morse code warnings of one type or another.

The noise blankers worked satisfactorily, but I did not hear the 'woodpecker', which seems to have conveniently hibernated this winter – hopefully it is dead!

The transmitted quality seemed to be quite good, but the incorrect carrier offset was noted by one or two stations; however, I understand from Lowe Electronics that this is easily corrected. The received quality was very good on all modes, and the fast and slow AGC speeds seemed to be a good compromise.

Lowe Electronics did put in one important modification which they found necessary – a considerable speed up in the ALC attack time to prevent excessive PA output on speech transients, which were otherwise rather excessive. Some transmitters take a massive burst of current on the odd peak after some silence, and this can actually be sufficient to trip some power supplies, as well as causing instantaneous splatter. This modification is to be recommended on all TS140S transceivers.

I did receive some excellent reports of modulation quality on FM, and the provision of an F filter at 455kHz definitely contributed to improved selectivity.

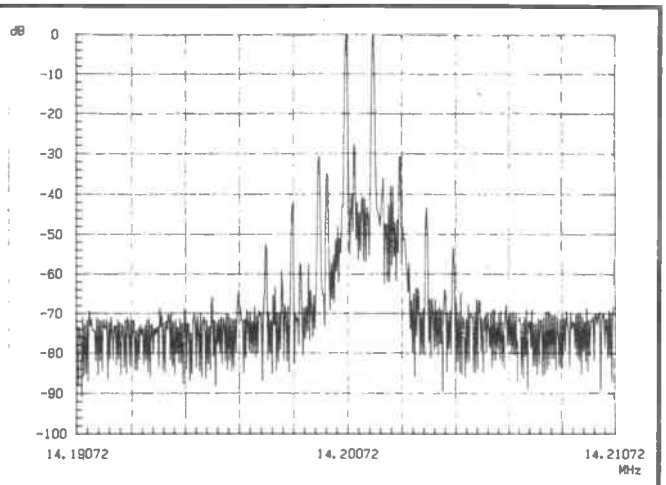


Fig 3 *Two tone Tx test 1700/700Hz audio tones SW PEP low level test. Resolution bandwidth: 30Hz. 2kHz per division*

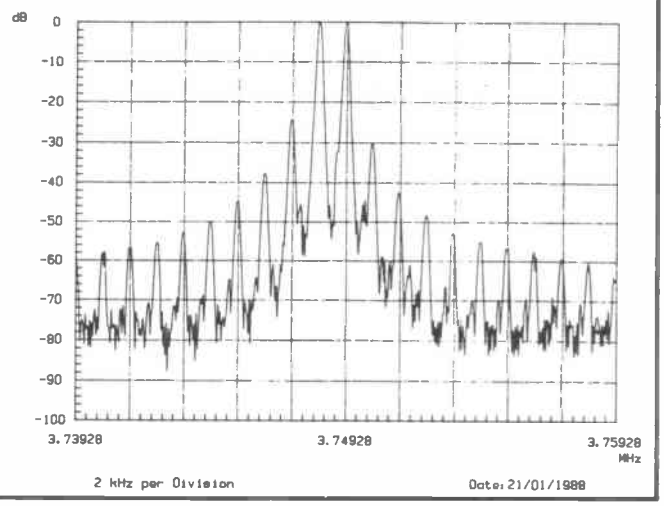


Fig 4 *Two tone Tx test 1700/700Hz audio tones 110W PEP LSB well into ALC. Resolution bandwidth: 100Hz. 2kHz per division*

The absence of what I regard as redundant bells and whistles is praiseworthy, and I hope that nobody will be fooled by some who might try to criticise this rig for not having one useless function or another. However, there is just one facility that I think Kenwood were definitely wrong to omit, and I cannot understand their marketing policy here. There is no transverter feed socket and this would have been very cheap to put in, as there is still plenty of room on the back panel.

Lowe Electronics inform me that it may be possible to install the same mod that they already provide on the TS440S, and this would be a boon. Perhaps Japanese manufacturers are trying to make us buy extra multimode rigs for 144 and 432MHz, etc, and they want to discourage us from using good European made transverters or, more importantly, making them ourselves. We must all resist this pressure and insist on having this particular facility, which allows us to get on to VHF bands so much more cheaply.

Kenwood seem to be making a strange marketing decisions at the moment, for they have released another version of this rig known as the TS680 which includes the 6m band as well, with an output of 10W, at only £150 more. For some curious reason, Kenwood are not supplying Lowe Electronics with the TS680 until the late spring, I am told, but grey importers have had it from the beginning of the year. Our hobby of amateur radio could not be more international than it is, and news travels fast.

Japanese manufacturers would be well advised not to put backs up by giving one part of the world priority over another, and thus provide an encouragement for rigs to enter the UK by the back door. I have not as yet tried the 680, but if it really is identical to the TS140, then it would be a much better buy in terms of value for money if you want 6m, and I cannot really imagine anyone not wanting the band, especially as the sunspot cycle is now on the way up.

The limitation of 50W on FM is very sensible, but I was very curious to see that just over 90W was available on AM from a PA, which cannot possibly pass more than around 30W of fully modulated AM. Icom should at the very least have limited the AM carrier level to 50W, although it is easy enough for the user to back off the carrier level manually as appropriate (25W AM carrier becomes 100W PEP AM when fully modulated).

Instruction manual

Kenwood now seem to be showing promise in the presentation of their instruction manual, and we were pleased to see that there is a 'description of circuit' section, although this is far too

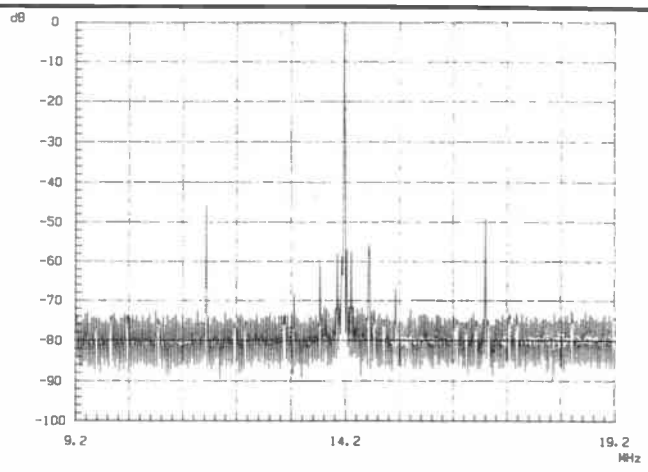


Fig 5 *Tx image and spurious responses, nb IF and 2 × IF ± products and spurii. Resolution bandwidth: 3kHz. 1MHz per division*

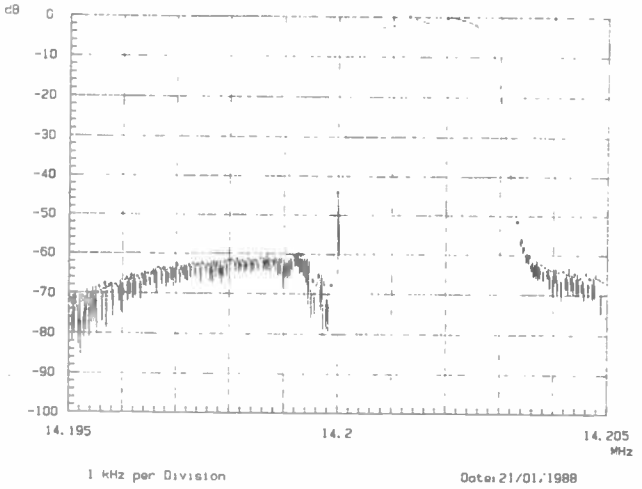


Fig 6 *AF/RF Tx plot at 10W max, nb IF filter rather far from carrier frequency on USB. Resolution bandwidth: 30Hz. 1kHz per division*

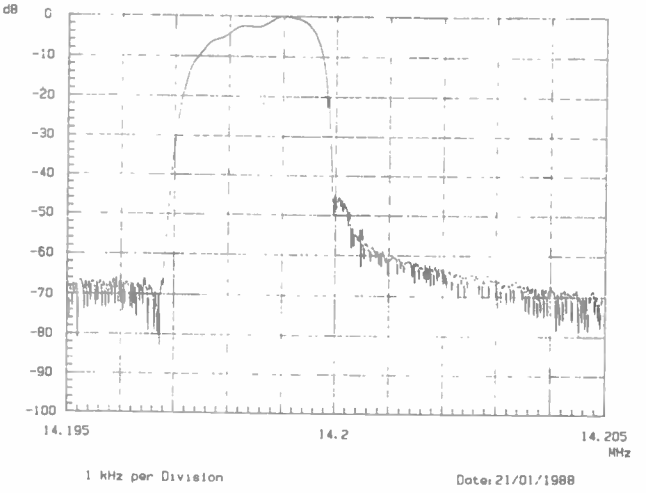


Fig 7 *AF/RF Tx plot at 10W max, nb IF filter too close to carrier frequency on LSB. Resolution bandwidth: 30Hz. 1kHz per division*

crude and tends to resemble advertising blurb! There are some errors in the description, but at least one soon finds out that there are two IFs, 40.055MHz and 455kHz. There are virtually no details about filters in this section, and there is a total lack of information about the synthesizer and logic circuitry. Instructions are clear and helpful, but there are still the idiot drawings included.

Receiver tests

The RF input sensitivity was very good on all amateur bands on SSB but we also looked at AM sensitivity throughout with short wave listening in mind. Sensitivity was excellent down to 1.6MHz, but Kenwood adopted their usual practice of fitting a fixed attenuator which drops in automatically between 500kHz and 1.6MHz, which I regard as something of a nuisance. On long wave, sensitivity was adequate, and I had no difficulty in receiving Rugby on 60kHz, although the sensitivity at the extreme LF end was somewhat poorer. Sensitivity above 30MHz fell fairly rapidly, and was nearly 20dB worse at 35MHz, but this is not of any consequence to the average user.

The RF input intercept point in general measured very well, but it was not quite so good at LF, where you actually need a better intercept point than at HF. However, the 20dB attenuator will be found extremely useful for increasing the intercept point to one that should be good enough for all usual purposes.

The first IF filter was a little bit on the wide side and so intermodulation was noticed within the passband of the filter. Very strong pairs of off channel stations close in frequency can cause a blocking problem to a wanted station, although the performance was better than that of much of the competition.

The reciprocal mixing performance was not good, about on a par with some recent Yaesu rigs close in, although it improved very rapidly as we swung away from the disturbing signal. It is very significantly worse than that of Icom rigs, and my measurements show that it is also inferior to the TS440S and 940S models. Obviously, this is one of the areas which was compromised by the much lower price of this model.

Figure 1 shows that the SSB filter has quite a respectable performance, the plot being taken by using my normal technique with a tracking signal sweeping across the passband while a stronger signal, giving a 1kHz beat tone, is present all the time to hold the AGC steady. The FM selectivity was very much better than usual, and allows the rig to be used comfortably on 10m in this mode. AM selectivity was also good, allowing quite weak stations to be knifed out quite close to very strong ones.

The S meter gave 23dB range between S1 and 9. The marked points over 9 were all a few dB out, but useful on SSB. The S meter showed willing on FM, but the range between S1 and 9 was only around 14dB.

Distortion of the demodulation stages measured at low levels on SSB and CW, whilst AM was quite acceptable, although at very high modulation levels it was fairly high. I was puzzled by the fact that the rig was about 1.8kHz out on FM, both in the tuning position for minimum distortion (very good when offset, but poor exactly on channel) and for optimum sinad and quieting. I can only assume that the discriminator was rather out of adjustment.

The received FM response is excellent, showing an appropriately steep LF cut and quite a fast roll-off above 3kHz. AM is also quite well compromised, but on SSB I would have preferred a little more HF between 2 and 2.5kHz before the IF filter comes in. Signal to noise ratios on FM and AM were excellent on strong signals, AM actually giving a reading of 61dB s/n ratio, which is outstanding.

I was a little surprised to see somewhat less power available into 8 ohms than usual, although there was a useful increase into a 4 ohm load. The internal speaker is fairly sensitive, however, and so there should be enough volume available unless you want to drive a fairly insensitive external speaker.

Tuning accuracy on SSB was superb, an error of only 70Hz being noted at worst, and over many hours this actually got better. We hardly noticed more than 10Hz drift in at least half an hour after a long warm up and this made the various selectivity tests much easier to perform, with narrower filters than usual employed in the spectrum analysis.

Since this is a budget transceiver I felt it important to have a look at image responses, and these were checked for both first and second IF images. The first IF one is within Band II over quite a large tuning range and, whilst the rejection was quite good, you might just about have a problem if you are in an extremely strong FM Band II signal reception area.

I am a little more concerned about the image response at 910kHz below the indicated frequency, for this was only 73dB down, so a very strong out of band commercial signal could cause a problem on some of the bands, although the measurement did actually vary from band to band. The quoted measurement was with the receiver tuned at 28.55, and the image response was slap in the CB area! This could cause a problem, especially if you have a nearby CB operator using illegal boots!

Transmitter tests

Maximum outputs from 113W PEP at LF to 100W PEP at HF were measured, with actual carrier levels on CW being about the same. When the rig was switched to FM on 29.6MHz, the output was reduced automatically to 50W to avoid overheating. Two tone tests were taken at various power levels on several bands, see *Figures 2* to *4*. It seems once again that higher order products are quite a lot higher than I feel they should be. This is a slight disappointment, and probably one of the compromises produced by the cost of the rig.

It may very well be that Kenwood are allowing the final mixer to be over-driven in order to get sufficient output to the PA. The performance could have been very much better if there had been room for another amplifier stage at final frequency. Some of the output spurii, eg at just below 12MHz, might well be due to final mixer overload as well.

Fiona and I spent well over an hour checking for harmonics and spurii on all the bands, and whilst the harmonics were no higher than −55dB at worst (the third harmonic of 7MHz) and most of the harmonic levels were below −60dB, we did note some spurii that are of concern. *Figure 5* shows some wideband spurii produced on 14.2MHz. You will see products either side at plus and minus 455 and 910kHz, at levels which are not of too much concern, but note spurii at ±2.5MHz, which are of concern, the levels being −46 and −49dB respectively on non-amateur frequencies. I suggest that the 40.055MHz IF filter has an inadequate stop band performance, in addition to it being too wide at the top (commented on earlier), but it could be that the 2.5MHz spaced spurii are

TS140S LABORATORY MEASUREMENTS

Receiver measurements

RS sensitivity SSB 12dB sinad

1.9MHz	−123dBm
3.7	−124
7.05	−125
10.1	−123.5
14.2	−124.5
21.2	−123
28.5	−123
34.9	−105

RF sensitivity AM 10dB s/n

60kHz	−95dBm
210	−108.5
900	−98
1.59MHz	−98
1.61	−112
6.1	−116
15.1	−117.5
21.5	−115

RF sensitivity FM 12dB sinad

29.6MHz	−118dBm (improved by 3dB when Rx retuned by 2kHz)

RF input intercept point (100kHz spacings)

1.9MHz	+6dBm
3.75	+8
7.05	+5.5
14.2	+11
21.2	+10.5
28.5	+12

Reciprocal mixing performance off channel signal/noise floor ratio for 3dB noise increase

5kHz	66dB
10	79
20	93
50	105
100	112
200	118

S meter	SSB	FM
1	−99dBm	−101dBm
3	−94	−97
5	−89	−94
7	−83	−91
9	−76	−87
9 + 20	−60	−78
9 + 40	−43	−69
9 + 60	−29	−60

SSB selectivity bandwidth

3dB	2.0kHz
6	2.4
40	3.4
60 (see RF/AF plot)	4.0

FM selectivity

±12.5kHz	22dB
±25kHz	74dB average

Audio and detector distortion

SSB	1.4%
FM (2.5kHz deviation)	4.5%, 1.1% when tuned for best *(see text)*

AM 1kHz mod

90% mod	5.9%
80% mod	4.3%
50% mod	2.2%

Maximum audio output for 10% THD

8 ohms	1.9W
4 ohms	2.9W

Transmitter measurements

Typical max output power SSB/CW

1.9MHz	100W
3.75	110W
7.05	113W
10.1	110W
14.2	110W
21.2	105W
28.2	100W
28.7	100W
29.2	100W
29.6 (FM)	50W

Frequency accuracy well within ±100Hz at all times and over long periods

Carrier rejection	59dB
Alternate sideband rejection of 1kHz modulation	59dB
Absolute max FM deviation	5.4kHz at 400Hz modulation
Size (W×H×D with projections)	281 × 107 × 305mm
Weight	6.1kg

developed within the synthesizer local oscillator injection into the final mixer before the PA section.

Figures 6 and *7* show the AF/RF plots of the filters on Tx, and you can see the difference between the effective position of the filter for lower and upper sidebands.

Note that the lower one is much closer to the carrier position (centre of plot) than the upper and that the loss at 2.5kHz on LSB is much too high at −10dB ref peak output, whereas it is much less attenuated on USB at −4dB.

Both the carrier and alternate sideband 1kHz rejections measured at very low levels, typical values of −59dB being noted when the rig was driven to full output. It was quite clear that the stop band attenuation of the 455kHz SSB filter was rather better than that of the 40MHz one.

After a very long warm up, we decided to check the frequency accuracy of the rig by carefully tuning an audio oscillator to 1kHz to an accuracy of better than 1Hz. We selected frequency measuring equipment which gives 1Hz resolution and accuracy when locked to Rugby/60kHz. We were astonished to see that the rig was only 3Hz in error at 14.2MHz!

On FM, the typical frequency error was 25Hz and maximum deviation at 1kHz was set to the normal 25kHz channelling specification, rather than the much lower maximum deviation generally used for 10m FM, especially in the UK. The highest deviation of 5.4kHz was noted from a modulation frequency of 400Hz.

I feel most strongly that Kenwood should reduce the factory preset deviation to 3kHz at 1kHz modulation, especially in view of the fact that they are now installing much more appropriate IF filter bandwidths for FM (type F at 12kHz overall bandwidth).

The FM transmitted response showed a 3dB bandwidth from 150Hz to 2.7kHz, with a fairly slow roll-off at LF, but a welcome, very rapid, fall-off above 3kHz. This means that 5kHz was actually 17dB down ref 1kHz when 750μs de-emphasis was inserted into the modulation test equipment. The superbly controlled response obviously contributed to the reports of superb transmitted FM quality, FM distortion being below 1% at 3kHz deviation, which is astonishing. The transmitted signal to noise ratio was significantly better than 40dB, just slight digital noise being noted in the background.

The maximum current drawn from my BNOS power supply was 15 to 17 amps, depending on the band and the current state of my whistle! The rig took just over 1 amp on receive, so don't leave it switched on in a car for a weekend!

Conclusions

The only two areas of criticism that I have for this rig are those of reciprocal mixing performance, which is not particularly good close in, and of the presence of slight spurii on Tx with a fairly poor 910kHz image response on Rx. I would be far more critical if the rig was sold for double the price, but I have to be realistic. This rig is only £850 including VAT, and is by far the least expensive recommendable 100W HF transceiver that I know of on the market. It far outclasses the earlier TS130S, and I very much prefer it to the Yaesu FT757.

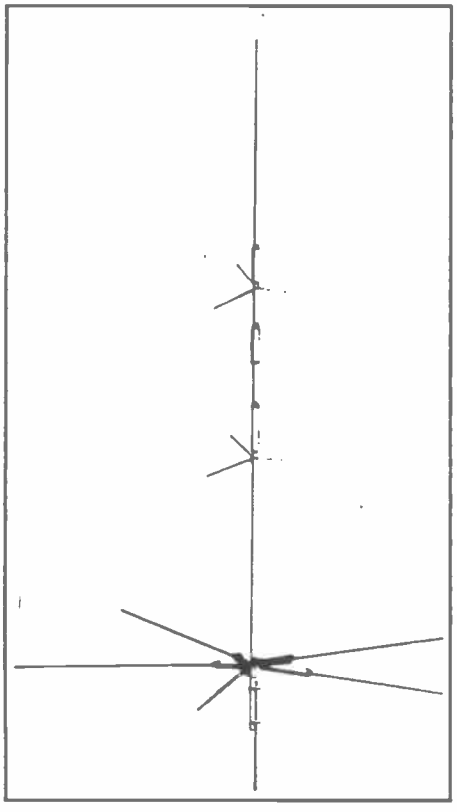
Some excellent facilities have been provided and the ergonomics have obviously been very carefully thought out by the manufacturers. The only important facility that is missing, in my opinion, is that of having a transverter drive socket, but no doubt each reader will feel that something else is missing here and there!

Summing up, I recommend this rig highly in terms of value for money, but you should consider the TS680 which is coming shortly, as well as the new Yaesu and Icom budget rigs, which are also on the way.

Very many thanks to Lowe Electronics for the loan of the review sample and to Fiona for helping with days of measurement work in the lab, let alone the writing of the review.

HOKUSHIN HS-VK5

Vertical 5 band HF antenna



The dreadful storm in the middle of October last year caused me to have an enforced rest from VHF and UHF, and I have spent much of the time since October on the 1.8 to 28MHz bands. Lowe Electronics sent down the Hokushin antenna for me to try for two reasons, one specifically for a review in this magazine and the other for the possibility of being chosen by the RAIBC as one of the recommended antennas for use by blind and disabled amateurs living in accommodation with virtually no garden area.

This trapped vertical is completely different to any other that I have tried over the years, as it has inductively loaded tunable radials, as opposed to other antennas such as the Hy-Gain 18 AVT, which requires you to add your own radials. The HS-VK5 has a total height of 5.1 metres, and includes traps for 10, 15, 20 and 40m, the top section being a whip element. Around the circumference of the base of the antenna is a series of holes into which five radials can be screwed, each band having its own radial. These can be mounted either through an angle of 144°, every 36°, or through the complete 360°, and thus every 72°. The 144° mounting is recommended if you have to put the antenna at the top of the side wall of your house or flat, whereas the all round radial mounting, which is better, can of course be used when the antenna is positioned on the roof or above the ground in your garden. The actual length of the radials is different for optimum tuning between the 144° and 360° mountings, because of interaction.

I am indebted to Phil G3BSN, Terry G0GTO and Tom G0CAJ, who all helped with the assembly of the antenna and its testing. It was mounted at the top of an 8ft pole fixed to the garden fence and was actually assembled the day after the storm, by Phil and Terry, in order to give me something to play with in terms of amateur radio!

The bottom section of the antenna up to the first trap is effectively a quarter wave on 28.5MHz, the trap passing all other bands. This means that as you go up the antenna each trap stops the bands in successive wavelengths, so that the whole antenna becomes resonant on 3.7MHz. The inductive component of each trap causes the equivalent antenna length to be greatly increased, for a proper 80m quarter wave should of course be 20m high. Similarly, the radials, which are only 2m long on average, are each equivalent to a much greater length, except for 10m, which is only slightly shorter with its relatively small extra inductance. In addition to the traps and radials, this antenna has two capacity hats, each a series of three spokes sticking out from its position in the stem. The capacity hat also affects

resonance and the bandwidth around the resonance, and plays a part in improving the match.

Preliminary findings

When I originally tried this antenna, my 30ft mast at the bottom of the garden, which normally supports my trapped dipole, had collapsed across the garden and so there was no vertical metal closer than about 80ft to affect the antenna performance. The instructions tell you to tune the radials for minimum SWR on the part of the band that you wish to operate, and this worked fine on all bands, with the assistance of slight adjustments to the capacity hat, except for 80m, where we just could not budge it from an adjustment range of 3.5 to 3.55MHz.

We spent hours going through the instructions again and again, and went through all the tips which tell you to try insulating the bottom of the antenna from the mast, or to try various other procedures, to absolutely no avail. It was so far off on 80m that we decided to leave it for another day. The following morning, Tom came round and we decided to take out the top section and find another chunk of rod from one of the broken antennas, make it appreciably shorter, and then pop it into the top of the Hokushin, thus hopefully making the whole antenna resonant on a higher frequency.

We had calculated an approximate length and immediately obtained a resonance on 3.73MHz, which then gave an excellent SWR after we had also tuned the radial. The fact that it should have been immediately obvious to us the previous day is fine in hindsight, but when you see absolutely nothing in the instructions about altering the length of the top section for 80m by cutting it shorter, you do begin to doubt your sanity. The instructions do tell you to adjust frequency by tuning the radials and one is somewhat hesitant to carve up a product kindly loaned for review!

A vertical as short as this one is just not going to compare with a ¼ wave vertical for LF band DX, or even a dipole inverted V with the centre very high up. However, most operators on 80m seem to want an antenna that will let them work friends around the UK at an appropriate time of day, usually no later than mid afternoon in the winter. Propagation is usually sufficiently good on 80m to allow a station to get out surprisingly well with a good dipole with only 10W, so the aim of the exercise was to see if the Hokushin would give reasonable signals on 80m in the mornings for distances up to 250 miles or so running 100W.

I used it on many nets, including the RAIBC one on 80m, and whilst I was usually somewhat weaker than most of the stations using dipoles, I nevertheless obtained good reports. I was surprised to find that when I turned on my linear the reports were actually comparable to those that I am accustomed to receiving on a dipole without the linear. I did not notice any problems working nearby stations, and almost certainly I was obtaining much more high angle radiation than is usual for a vertical.

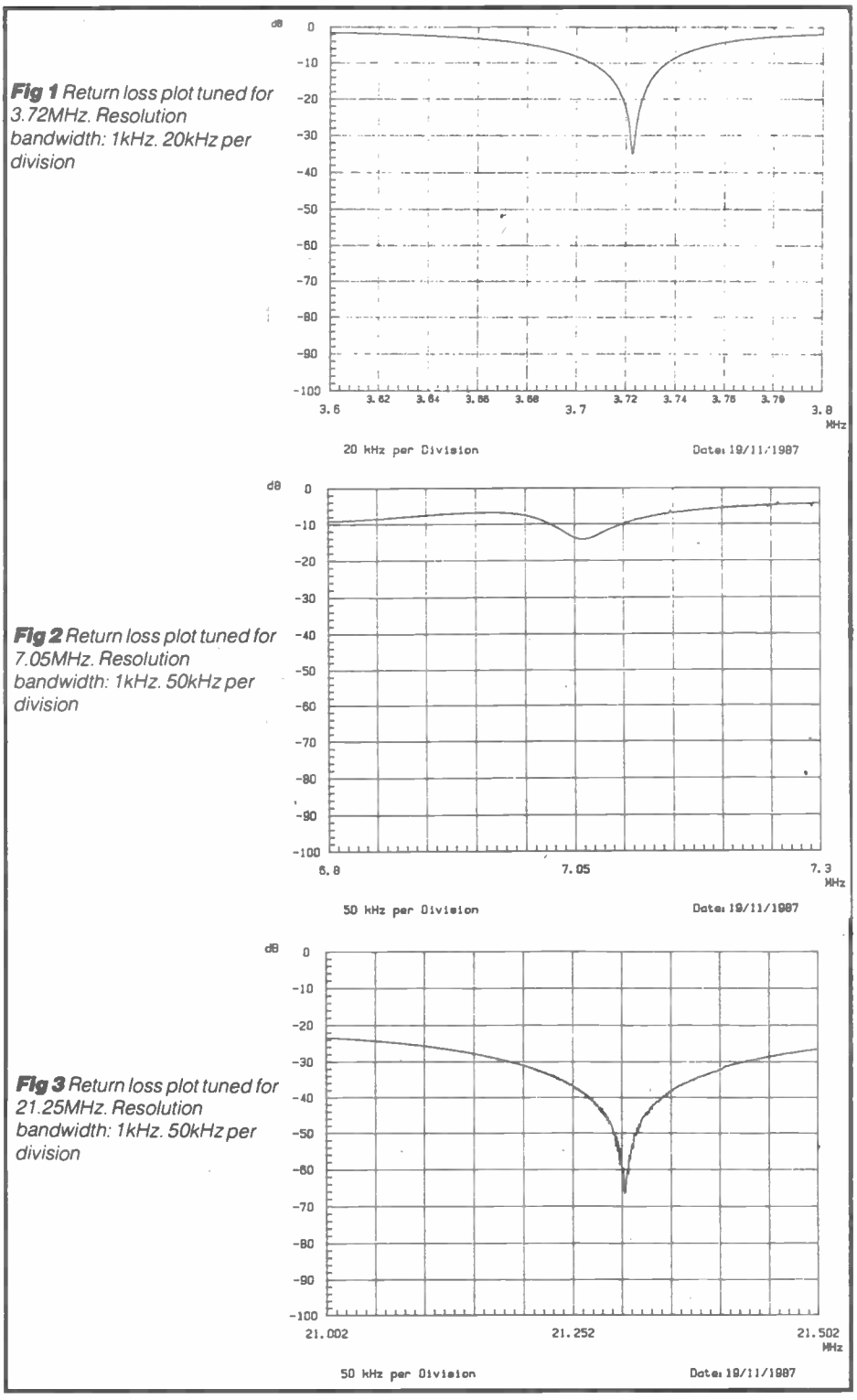


Fig 1 *Return loss plot tuned for 3.72MHz. Resolution bandwidth: 1kHz. 20kHz per division*

Fig 2 *Return loss plot tuned for 7.05MHz. Resolution bandwidth: 1kHz. 50kHz per division*

Fig 3 *Return loss plot tuned for 21.25MHz. Resolution bandwidth: 1kHz. 50kHz per division*

A vertical dipole

I have to admit to being anything but an expert on antennas, but after a lot of thought I realised that the equivalent circuit of this one is that of a vertical dipole. On 80m the top ¼ wave element is shortened to about a quarter of its normal length by inductance loading, but the single radial for 80m is cut short by much more inductive loading to form the bottom ¼ wave of the dipole.

The principle is similar to that of the Wattpole, a CB antenna which had a loaded top vertical section of the legal length, but a bottom section which was actually a ¼ wave on 27MHz and was connected to the braid! The manufacturers managed to persuade the DTI that the bottom half of the antenna was a ground plane element rather than half a dipole!

The actual idea of a counterpoise in the form of a short tuned radial was mentioned in Les Moxon's book *HF Antennas for all Locations*. It could well be said that the tuned counterpoise is

actually a matching trick, in which case it certainly works very well indeed, a point worth noting by DIY addicts. I have heard so many people complain that they don't have room for ¼ wave radials on 80m, but there is no reason why they couldn't use inductively loaded shorter ones.

The HF bands

I have a sked every Sunday afternoon with W0QM in Boulder, Colorado, and I have been keeping it up for over 20 years, normally using my TH6 6-element beam. Since this was beaming down into the ground, looking terribly sick, it was logical to attempt my sked on the Hokushin, and both Dick and I were amazed that we managed to keep the sked QSO going on SSB on 21.420MHz for about an hour without any problems, although admittedly the conditions were quite good.

I had many QSOs on 40, 20 and 10m as well, and I was quite surprised at how well I got out, although I was not really aware of low angle radiation being particularly well favoured. I have tried all manner of verticals at my QTH over the last 28 years, and I have come to accept the fact that on LF the answer really is in the soil; mine is of such high resistance that DX is a non starter, since in any case an earth mat is not on! I made my mind up many years ago that DX for me was to be worked at HF, and LF was for the UK and Europe, and I have only rarely even bothered to work stations outside Europe on LF.

The Hokushin put out excellent signals on 10m FM and covered the London area and Home Counties comparatively well.

Brief test results

Have a look at *Figure 1*, which is a plot of the return loss curve of the antenna on the 3.5MHz band. Phil and Terry had connected a long UR74 coaxial cable (thick and very low loss at LF) with a fairly short tail to the antenna itself, with the other end again going through a short tail to the shack. We used a Wiltron bridge onto the Marconi 2382 spectrum analyser, and used the analyser's own tracking generator.

We calibrated and normalised the analyser with the bridge open circuit, and then connected the antenna lead. The plots are very slightly optimistic, as the slight loss in the coaxial cable would cause the return loss curve seen in the shack to be slightly better than it would be if we had carted the whole apparatus down to the bottom of the garden near the aerial! Even so, you will see the remarkable null at just above 3.72MHz, representing an SWR as near to 1:1 as one could ever wish.

However, note that the antenna only has a bandwidth of around 28kHz for an SWR better than 2:1, and this is the typical snag that you will get with any inductively tuned vertical short antenna on an LF band. Note also that at both 3.6 and 3.8MHz well above half the power is reflected back again, actual field strengths also showing that the antenna was hopeless at the band extremities, even when matched at the shack end.

On the 7MHz band (*Figure 2*) the antenna was not as good, and the return loss of – 14dB just above the centre of the band would correspond to an SWR of 1.5:1 – completely acceptable, although band extremities were around 2:1.

The matching on the 21MHz band was so remarkably good across the whole band (*Figure 3*), that I began to suspect my test method! It was only when we looked much further out that we could confirm that the plot was absolutely correct, and the effective match was the best that I have ever seen on any antenna. Results were also very good on the 14 and 28MHz bands, although the Q on 14MHz was sufficiently high that it made the high end of the band around 2:1.

Specifications

The antenna is nominally rated at 50 ohms at resonance, with an SWR of 1.5:1 or better. It clearly met this specification throughout at resonance. It is rated to take up to 300W of CW and a maximum rating on SSB of 600W PEP, and so it will easily withstand the UK maximum licensed power output. The specified wind-velocity is claimed to be 40 metres per second, ie, about 90 miles per hour – just about sufficient to cope with the hurricane last October!

The antenna can clamp on to a mast of between 30 and 50mm diameter, and is thus suitable to clamp on to a scaffold pole, but will probably need insulating from it. The cable connector is an SO239 at the base. The antenna has a total weight of 6.3kg, and does come completely to pieces. It is thus very suitable as a portable antenna.

Conclusions

If you have room for a beam for HF and for dipoles, including trapped types for LF, then these would be preferable to the Hokushin. However, if you are in a jam, and you either have serious difficulties with neighbours or you do not have any garden space at all, then the Hokushin HS-VK5 will not only get you out of difficulty, but should actually perform surprisingly well. It is far superior to the Hy-Gain 18AVT, but the latter has always had a fairly poor reputation.

The HS-VK5 is too tall for an average attic, but you should be able to find a place for it without having to seek planning permission, unless you have extremely awkward neighbours. Don't forget that you can put a post into the ground which sticks out between 2 and 4 metres, dependent upon the regulations of your local authority, and you could then bolt on the HS-VK5 just at the times you need to use it, taking it off again when you have finished with it. This should then allow it to count as a temporary structure. It would be essential for you to take it down whenever it was not in use to be reasonably sure of avoiding infringements, and this especially includes times when you are away.

The antenna is very well made, but is fairly expensive at £218 including VAT. It is available from Lowe Electronics, the importers.

Thanks to all those mentioned in the review, and to Fiona for helping in a fascinating project. Next month I will be tackling the Butternut HF-6V, and I suggest you wait for that review before making your final choice.

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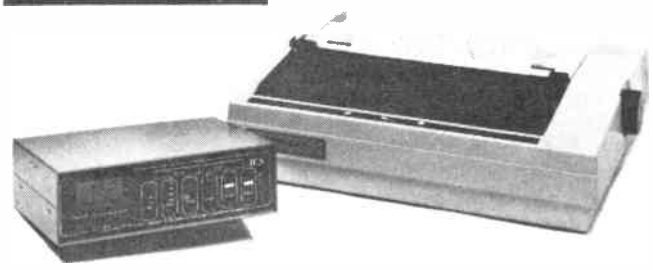

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SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

It's a rare thing for a listener to be involved in anything to do with rescue, but when it does happen it usually causes some excitement, for both the listener and others involved. In late December, the Christmas festivities over, Bob Watters decided to get a bit of listening in from his station in St Stephen, Cornwall. He wasn't to know that this was going to be his day.

Distress call

The amateur bands were a bit noisy, so Bob decided that the marine frequencies would be a change. He'd only been listening a few minutes, when he heard a distress call from the 2,500 tonne 'Island Queen' which was listing in heavy seas. A quick call to the Falmouth Coastguard with all the information, and 14 seamen were picked up by an East German trawler, 'Ludwig Renn'. It just shows that, however long you listen, you can never be sure of what you will hear. Well done, Bob.

Even after that excitement, the mailbag was far from boring this month, with plenty of DX being heard by our regular reporters. Herbert Yeldham in Burnham-on-Crouch logged enough prefixes for his Bronze Prefix award, and included CU2, YC6, YT4, 7X25, OD5, 5B4, XQ3, TI2, YC2, PT7 and VU2 in his list.

Herbert uses the FRG8800 with two 83m end-fed antennas, plus a 14AVQ and a Delta loop fed through the FRT7700.

Another one in the thick of it was David Tanswell G6LAU, of Iver, who has really gone into RTTY with a vengeance. Using the FT101ZD with a Tono 9000E, he made some excellent loggings to get the first *single* band RTTY Bronze award as well as a multiband award!

Amongst the loggings were 4N2, 5Z4, 8R1, 9Y25, FP5, HC2, KL7, KP2, OA4, P43, S79, TR8, VP2, WP4 and ZP5 . . . all nice on any mode, but RTTY especially. David is now looking for more to get another single bander in.

Terry Lincoln of Weymouth was not to be left out either. After a couple of cracks at it, he got the Bronze award with plenty to spare towards his silver. Amongst the regulars were YT3, VK9, 5N4 and ZC4, all showing promise of things to come. Terry uses the FRG8800 and an R600 with aerials trimmed down with the KX3 ATU.

Ken Burnell of Milton Keynes has been using the FRG7700 to get in the awards lists again, and this month claimed the ILA Continental awards for logging 100 stations in Europe and North America. These are new awards introduced this year by the International Listeners Association to encourage serious listening. They are part of a series of awards issued by the association.

Martyn Whyte of Edinburgh also sent in some of his loggings which included CP0, CJ1, EC1, VX1, XK1, YB5, JA7, YZ7, J20 and HK1 amongst the crowd. Martyn mentioned the excellent openings lately on eighty metres which he had noted on his Sony 2001D, including a DX net on 3797 where he logged 7X5, HK4, YV8, ZLs, 6W4, 6W2, T77, A71 and lots of other nice ones . . . in answer to his query regarding the prefix awards, these are available for single mode or single band (see David's claim above).

Direct QSL

Colin Blunn G0IFM of Stoney Stanton still only has the 10m conversion for Tx, but has been using the R600 to pull in the first 100 countries from his present QTH. Recent catches included 9Q5FF in Zaire. PZ2AC in Surinam, HI8IH in Dominica and OY7XA in the Faroes. Colin mentioned that a QSO with WB4ULO on the key resulted in a direct QSL. Something I have noticed with Americans recently too, and I've had quite a few in over the past year . . . a new trend, perhaps?

While all the others have been frantically logging far off stations, F G Garraway of Keynsham has been hard at the DIY, constructing a new earth system that intrigued me. It consists of two five foot copper tubes with radials, and the receiver is mounted on a 16swg aluminium base which houses the ATU, speaker, changeover switches and audio filter. He's now into making a 1.5m square MW loop with Q multiplier turned by a homebrew (what else?) rotator using no less than 24 reed switches! There ain't nothing wrong with being keen!

Jim Lawrence of Halstead has come up against a problem while using the Spectrum +2. He wants to use it for receiving and decoding RTTY, and has the G4IDE FAX unit which he has used, with some good signals being received. However, when it comes to getting an audio signal through the Speccy, he can only get sound on the monitor TV and not through the G4IDE unit. Does anyone have any ideas out there?

Info wanted

An appealing letter has arrived from Israel, where the first Listeners Club has been set up by some keen youngsters out there. Eyran Millis is 14 years old, and would like to exchange information with a youngster of a similar age over here. If you would like to contact Eyran, he can be reached through P O Box 183, Nathanya, Israel.

So, over to Lisburn, where Colin Tait has been booking them in like fury, and offers HB0/DL8OH, VP9ADD and ZB2X on eighty, K4YT/DU8, P40V, KP2A and T77T on forty, 9N1MC, TU4BR/5U7, 5T5BC, UJ9JWA, VK9YH, D44BC and J37AH on twenty, PJ2KI, VP5SL, V2AA, TJ1CH, FY5YE, HL90B, HH2MC, XX9T and W8ILC/J6L on fifteen plus 5H3TM, PZ1BQ, LU4BAZ, KP4BZ, 5Y7AN and KP2AH on ten metres . . . who says the bands are dead?

Peter Bowles in Peacehaven has also been in the thick of it, with HV3SJ, TK5FF, VK5BEG, ZS6IN, 5N8HES, ZC4IT, S79WHW and IK3GHW, which was the first expedition to Madonna Del Monte Island... the lady say *yeees*!

ILA station

The anniversary station of the International Listeners Association was on the air from 0800 on January 9th, and many listeners sent cards in, for which I thank them. The station was on until the 16th, and over 300 stations were worked, mainly on eighty metres, although the station only operated for a couple of hours each day.

Amongst the many contacts made were G0ILA, Nigel in Southampton; GB75RS, the RSGB station; OH7NJI/MM in the English Channel and a young lad who phoned to say he could hear me, and could I send him a card . . . I did.

It was a very interesting week, particularly on the 15th, when I was calling frantically on 15 and 20 with the key, to no avail. I thought the aerials had come adrift in the previous night's storm . . . but *three* of them?

Tall tribander

Contacts later in the day with EI5GA and G3JRS put my mind at rest, however, they had also been trying in vain to make contacts with the only few European stations to be had . . . and EI5GA has a tribander at 90 feet to play with! My thanks to all who made the station worthwhile.

As I said last month, there are many interesting stations to be heard on short wave and most of them have some sort of program that is directed towards the serious listener, or DXer. It would be impossible to include all of them here, but this is a list of some of them. The frequencies do vary according to time of day and time of year, so I'll leave you to find them . . . it will be good practice anyway!

So that's it for this month. Thank you very much for your letters and those cards. Have a good month with plenty of rare DX. 73 de Trevor.

Broadcast Station DX Programmes

Some of these programmes are on alternate weeks, such as the second and fourth weeks in the month. These are marked with an asterisk.

Monday

0011 Manila FEBC
0030 Brussels BRT
0050 Madrid REE, also at 0150, 0550
0200 Bucharest
0200 Kiev
0300 Sofia
0305 Montreal RCI
0430 Austria ORF
0930 Budapest, also at 1600, 2000
0930 Quito HCJB, also at 2130
1040 India AIR, 2/4, also at 1435, 1830, 2130 *
2250 Moscow

Tuesday

0040 India AIR, 2/4 *
0050 Moscow also at 0250, 0350, 0550
0100 Budapest also at 0200, 0930, 1030, 1415, 1430, 1600, 2/4 *
0200 Bucharest
0230 Quito HCJB, also at 0630
1115 BBC London
1345 Washington VOA, also at 1745
1340 Manila FEBC
1600 Stockholm RSI, also at 1700, 1830, 2100, 2300
1815 Cologne DLF

Wednesday

0445 BBC London
0700 Quito HCJB, also at 2130
0930 Stockholm RSI, also at 1130, 1230
2000 Budapest, 2/4 *

Thursday

0100 Budapest, also at 0200, 0930, 1050, 1430, 1600, 2/4 *
0130 BBC London
0230 Quito HCJB, also at 0630
0300 Sofia, also at 2300
0448 Nederland, also at 0748, 0848, 1048, 1148, 1448, 1648, 1848, 2048
0800 Brussels BRT, also at 1300
1302 Johannesburg RSA

Friday

0148 Nederland, also at 0248, 0548
0935 Japan
1415 Budapest
1600 Portugal, also at 1700, 2030
2030 Sofia

Saturday

0030 Portugal, also at 0300
0300 Budapest
0310 Australia
0400 New Orleans WRNO
0630 Sofia, also at 2130
0630 Berne SRI also at 0840, 1000, 1100, 1330, 1700, 2100, 2130
0825 Guam TWR, also at 1325
0830 Prague
0900 Cologne RDW, also at 1610 3rd week
0910 Australia
0910 Brussels BRT
0930 Quito HCJB, also at 2130
1520 Moscow, also at 1620, 2220
2000 Turkey VOT, also at 2200
2035 Montreal RCI, also at 2135
2135 Johannesburg RSA
2305 Manila FENC

Sunday

0100 Budapest, also at 0200, 0930, 1600, 2000
0130 New Orleans WRND, also at 1300
0200 Berne SRI, also at 0400
0230 Quito HCJB, also at 0630
0235 Japan, also at 0435, 0915, 1115, 1225, 1810, 2315
0235 Johannesburg RSA, also at 0300, 0702
0300 Turkey VOT
0750 BBC London
0815 Portugal AWR
0900 Austria ORS, also at 1230, 1400, 1805
1200 Moscow, also at 1920
1230 Australia, also at 2040
1800 Kiev, also at 2330
1820 Madrid REE, also at 2250
1900 Israel, also at 2130, 2300
2305 Montreal RCI

ICOM

THE NEW F

IC-761, HF TRANSCEIVER with General coverage receiver.

The new ICOM IC-761 H.F. Transceiver has many features making it probably the best top of the line Amateur transceiver available today. This all mode transceiver features an internal tuning unit and A.C. power supply. The A.T.U. boasts a 3 second band selection and tune up with a VSWR matching of less than 1.3:1. For the serious operator the 100kHz-30MHz general coverage receiver and 105dB dynamic range make it ideal for DX chasing. Frequency selection is by the main VFO or via the front panel direct access keypad. And for when reception is difficult, pass band tuning, I.F. shift, notch filter, noise blanker, pre-amp and attenuator should enable you to copy even those weak DX stations whether amateur or broadcast. The C.W. operator will appreciate the electronic keyer, 500Hz filter and full break in (40wpm) other filter options are available. The IC-CR64 high stability crystal is standard as is the CI-V communications interface for computer control. Twin VFO's and split mode for cross band contacts,the IC-761 features program scanning, memory scan and mode select scan and the 32 memories can store frequency and mode. The transceivers operating system is held permanently in ROM and is not dependant upon the lithium battery. The cell is used for memory back up only. A new style meter gives P.O., A.L.C., IC, VC, COMP and SWR readings.

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- 100 watts.
- 12v Operation.
- 105dB Dynamic Range.
- 32 Memories.
- Electronic Keyer.
- Full Break In (40wpm).
- 500 Hz CW Filter.
- HM36 Microphone.

IC-735.

- Small Compact Size.
- 100kHz-30MHz General Coverage Receiver.
- 100 watts.
- 105dB Dynamic Range.
- FM Standard.
- 12v Operation
- Large LCD Readout.
- 12 Memories.
- CI-V Communications Interface
- HM12 Microphone.

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LINEAR AMPLIFIER

Build one and stay friends with your bank manager. By Brian Kendal G3GDU

PART 1 – DESIGN

There comes a time in every amateur's life when he decides that the 100 watts or so available from the average amateur transceiver is not sufficient to penetrate the QRM, and that the addition of a high power linear amplifier is an absolute necessity.

He then picks up the latest copies of his favourite radio magazines and starts scanning the adverts. Very quickly he realises that he will have to spend as much or more on the linear amplifier as he did on his much prized transceiver, with the result that he:

a)kicks the dog
b)goes to the pub.

Leaning on the bar, thoughtfully perusing a glass of Paul Hogan's favourite beverage or similar nectar, inspiration strikes like a bolt of lightning – *Home Brew!*

Pausing only to arrange a private pipeline from the Midnight Oil Co, our hero quickly returns home, raids his archives and rapidly covers the living room floor with every amateur radio magazine published since 1945.

As the early morning sun strikes through the gaps in the curtains, he rises triumphant – he has found just what he needs – *The Ultimate Linear.*

Months of toil follow as he visits rally after rally, emporium after emporium and every club junk sale within 100 miles. Finally, he must admit defeat – he just cannot find the parts specified for his dream linear.

The real world

Unfortunately, this tale has been repeated many, many times in recent years, yet quite needlessly. If approached in the right manner, the component parts can be acquired at quite reasonable prices relatively quickly, and then construction can commence.

The whole secret is to know the *type* of components required for high power linear amplifier construction and purchase them where and when available. When sufficient have been obtained, you can then design the amplifier around the components you have.

Fortunately, United Kingdom licence conditions dictate only the maximum output power from the transmitter. So even if the output device selected is not

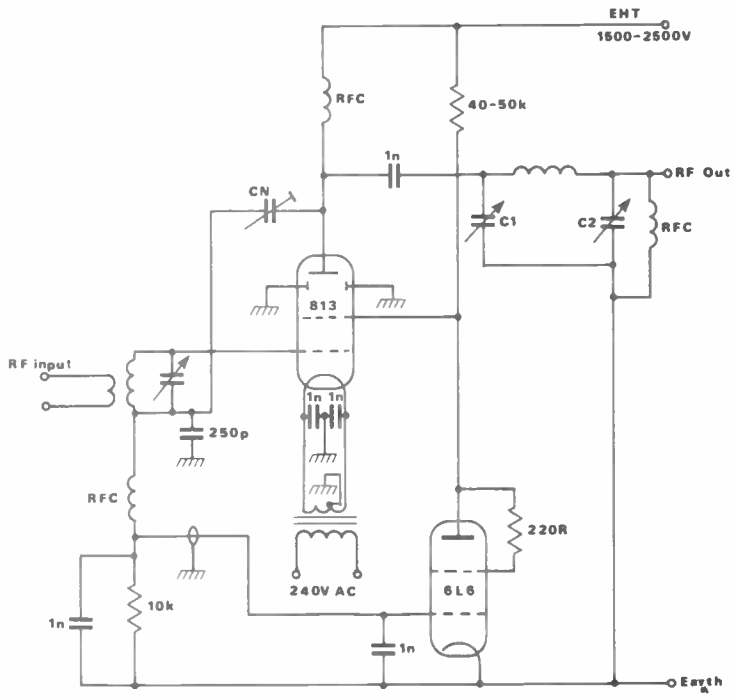


Fig 1 *The classic ZL linear circuit. CN is a neutralising capacitor*

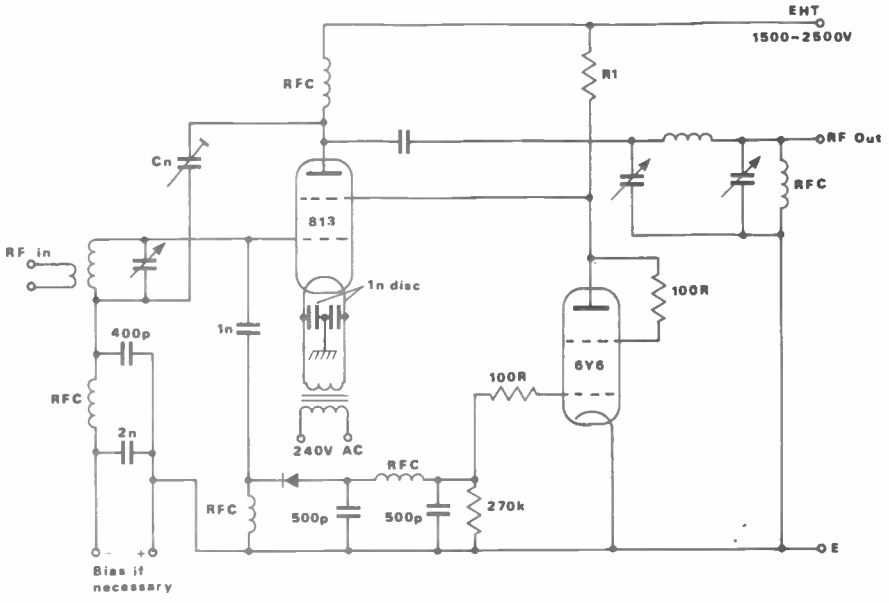


Fig 2 *The G2MA linear circuit. The diode performs the task which the grid-heater diode action performs in the ZL linear circuit. R1 should be chosen so that 30-40mA passes in 813 circuits but only 15mA for 807s. No bias is necessary if there is less than 2000V on the 813 diode*

the most efficient, it need not affect the power delivered to the aerial.

The author was recently in this position and after examination of his admittedly deep junk box, very few components actually had to be purchased.

First thoughts on design

In order to be worth the effort of construction, the amplifier has to be designed for an output approaching the full legal limit of 400 watts peak envelope power output. This will give a theoretical gain of one S point over the standard 100 watt transceiver, but, in practice, it will have more apparent effect.

This power can be obtained from either thermionic or solid-state devices. However, when intending to construct a high power amplifier at minimum expense, it is probable that thermionic techniques using the older type power valves will prove most economical.

Obviously, when searching, components are purchased as available, but within these articles it is more convenient to discuss the various sections of the amplifier in turn.

These may be considered as:
1) the power supply section
2) the active devices and circuit
3) the output circuit
4) the switching circuitry

The power supply unit

Acquiring suitable power transformers is probably one of the most daunting tasks, but with a little ingenuity it need not be as bad as you might imagine. Two or three transformers may be required depending on the design adopted. These supply:
1) the EHT for the anode circuit
2) heaters
3) bias and/or screen grid voltages if necessary.

The EHT transformer and its associated circuitry are required to provide a voltage of between 1000 and 2500 volts at a peak power in the order of 800 watts. The points to note are that this is a *peak* power rating, and that allowance has to be made for the fact that most linear amplifiers only run at an efficiency of about 50 to 60%.

However, for a peak input power of 800 watts or so, unless the RF is heavily compressed, the *mean* power will be less than 200 watts. Thus, the requirement drops to a transformer of this rating, as the current peaks will be supplied from the smoothing capacitors.

Even so, the requirement still looks formidable, so let us look a little further. In the days when most of the 'surplus' transformers were being manufactured, valve rectifiers were still in common use in a bi-phase rectification circuit which necessitated a centre tapped HT winding.

Today, suitable semiconductor rectifiers cost only coppers, which permits a bridge circuit across the whole winding, providing double the voltage. These rectifiers are also extremely efficient, with a very low forward resistance compared with that of valve rectifiers, which was sufficient to cause a voltage drop of anything up to 100 volts. Furthermore, whereas in earlier days high voltage electrolytic capacitors rarely exceeded 32μF in value, today units of several hundred microfarads are readily available.

The combination of these allows us to take full advantage of the power available from the mains transformer and, for example, with a 500–0–500 volt RMS winding, a bridge rectifier and the high value smoothing capacitors, the output voltage will rise to the peak value of over 1400 volts. This is quite sufficient to supply many of the older types of high power output valves. Of course, care has to be taken that the transformer is sufficiently 'beefy' to handle the power.

Over recent years the author has purchased several such transformers at club junk sales for only a few pence each. In general they are rated at about 500–0–500 volts at 3 to 500mA. Furthermore, many manufacturers of that period were very conservative in their ratings, which allows a little leeway. The physical size of these transformers is in the region of six inches cube and any of this size or larger should be quite capable of handling the necessary power.

Perhaps at this stage it is appropriate to issue a word of warning: high voltage power supplies are extremely dangerous if not carefully handled. Power supply units capable of running a high power linear amplifier are quite capable of killing a human being and, in fact, there are several well documented cases where this has happened. Utmost care must be taken both in handling and design.

Never work on the unit unless power has been switched off and the smoothing capacitors have been discharged to earth. Do not rely on the bleeder chain because one of the component resistors may have become open circuit since last checked.

From time to time it is necessary to perform certain checks with power on, such as measuring EHT voltages. When performing these, ensure that the probe is well insulated and there is no chance that any other part of your body can possibly be in contact with the chassis. The old technique of working with one hand in your pocket is a very wise precaution.

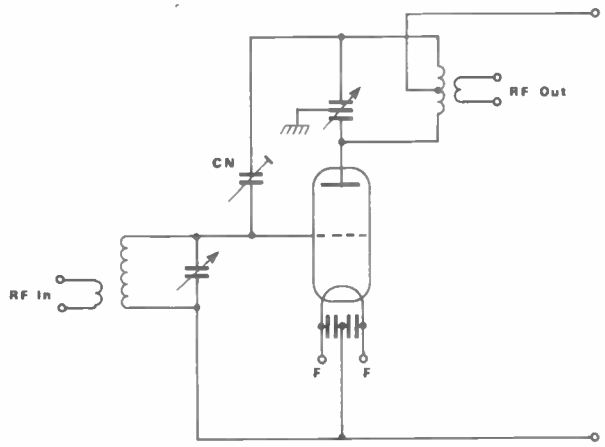


Fig 3 *The simplicity of the zero bias triode linear circuit for valves such as 811, 805, etc. Two valves may be paralleled for greater output*

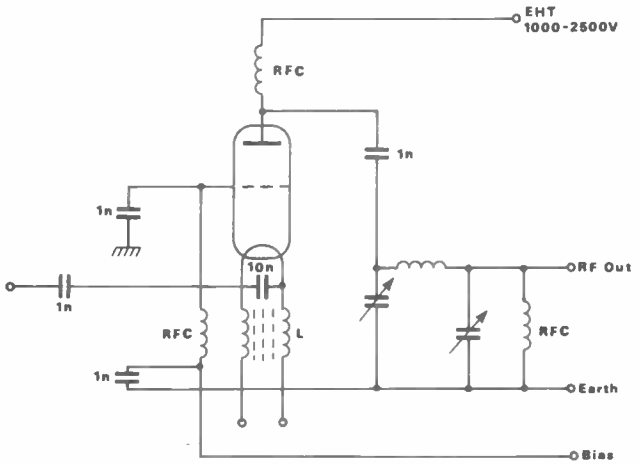


Fig 4 *The grounded grid linear circuit. Some valves require no bias, in which case the grid may be grounded directly. Choke L is bifolar wound on a ferrite core*

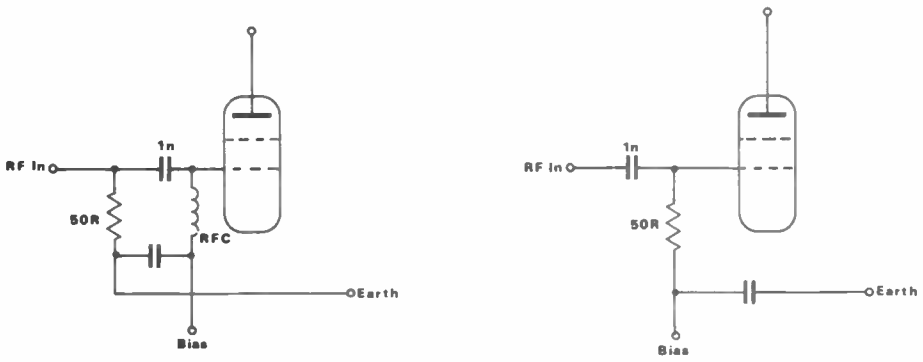


Fig 5 *Passive grid input circuits. These will eliminate the necessity for neutralising tetrode linear circuits. The 50Ω resistor must be non-inductive and of quite high power rating*

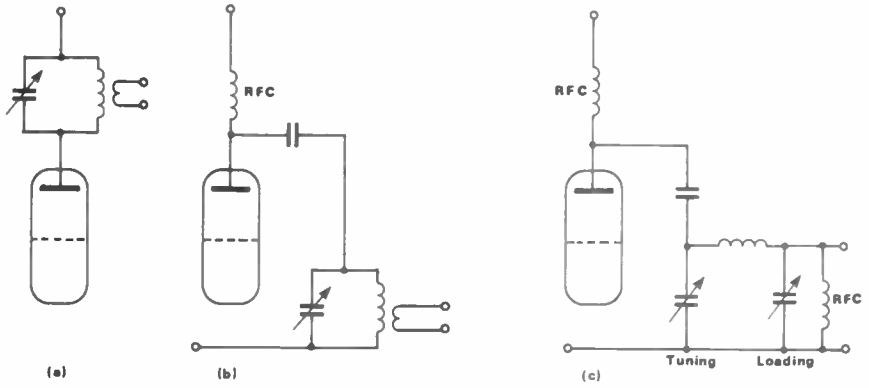


Fig 6 *Output circuits: (a) series; (b) parallel; (c) PI. The RF choke across the output of the PI circuit is essential for safety*

The second transformer supplies the heaters of the valves. RF output valves may require any of a number of different voltages at quite high current. For example, the 813 tetrode required 10 volts at five amps, whilst the popular 811A triode manages with 6.3 volts at four amps. Availability of a suitable heater transformer may well dictate the type of valve used in the amplifier. This transformer may also supply the power for relay switching, clamp valves, indicator lamps etc.

If a tetrode valve is being used in a conventional circuit, an additional transformer may be needed to supply the screen grid voltage and bias supply. For this, as the power requirement is low, a small 250–0–250 volt, 60mA transformer would be sufficient.

Using tetrode valves, however, it is well worth considering the use of the G2MA or ZL linear amplifier circuits, neither of which require either separate screen or bias voltages.

In the case of the linear amplifier used to illustrate this article, the author was fortunate in purchasing an old Marconi VHF base station for a couple of pounds at a club junk sale. On examination, this was found to contain two very substantial transformers, one of which was 425–0–425 at 380mA and the other, 6.3 volts at considerable current and 5 volts.

The transmitter was mounted in a very presentable case with the two transformers mounted along one side of the steel chassis. After removing all components except the power supply, there was more than enough room for the linear amplifier. The holes in the chassis from the original transmitter were all in the wrong places, however, so the upper surface of that section of the chassis was cut away using a jigsaw, leaving only half an inch all round, to which could be attached a flat plate to form the new chassis.

At a later time it was found possible to mount the PI output circuit capacitors, switches etc, in such a position that it was only necessary to drill one new hole in the front panel.

In constructing the power unit, a bridge rectifier circuit was wired across the whole of the HT winding. This was then smoothed with three 120mF, 500 volt working capacitors in series, with voltage balancing resistors in parallel. A bleeder chain was also fitted to form a constant load of about 25mA.

On completion, this was found to give a little under 1200 volts, which was later increased to just over 1400 volts by changing the mains input tap.

It is a wise precaution to include a fuse in series with the EHT line. This will protect the rectifiers against inadvertent short circuits to earth, and should be rated at about one amp. Unfortunately, most fuse holders are only rated at mains voltage and it is therefore necessary to mount the holder on insulated stand-offs, in a position where it cannot be touched in normal operation.

Care must also be taken where high voltage lines pass through the chassis. One convenient method for this is to use small ceramic stand-offs as feed through insulators, but the simplest solution is to ensure that all high voltage circuits are on the same side of the chassis.

In the author's case, although both types of valve were available, the presence of the high current 6.3 volt winding had a considerable influence on selecting 811As in preference to 813s for the output valves, for they require 6.0 volts as compared with 10 volts for the latter.

The more modern ceramic valves, such as 4CX250s, would have been more efficient but these were not considered on the grounds of cost, not only for the valves themselves, but for that of the holders, chimneys and cooling fans.

The 811A in grounded grid linear service requires a bias of 4.5 volts, this being derived from the 5 volt winding, which was also placed in series with the secondary of a small 6 volt 1 amp transformer, to provide power to operate the aerial changeover relays.

The amplifier circuit

As suggested earlier in this article, in building a minimum cost linear amplifier the selection of the valves to be used will, in all probability, be controlled by their availability or that of the power supplies.

Mention has already been made of the two old 'warhorses', the 811A and the 813. Both these types are readily available at reasonable prices, but I do not suggest that these are the only types suitable. Many other power valves may be used equally, or even more effectively but, for the purpose of description, these types make excellent examples of the use of power triodes and tetrodes respectively.

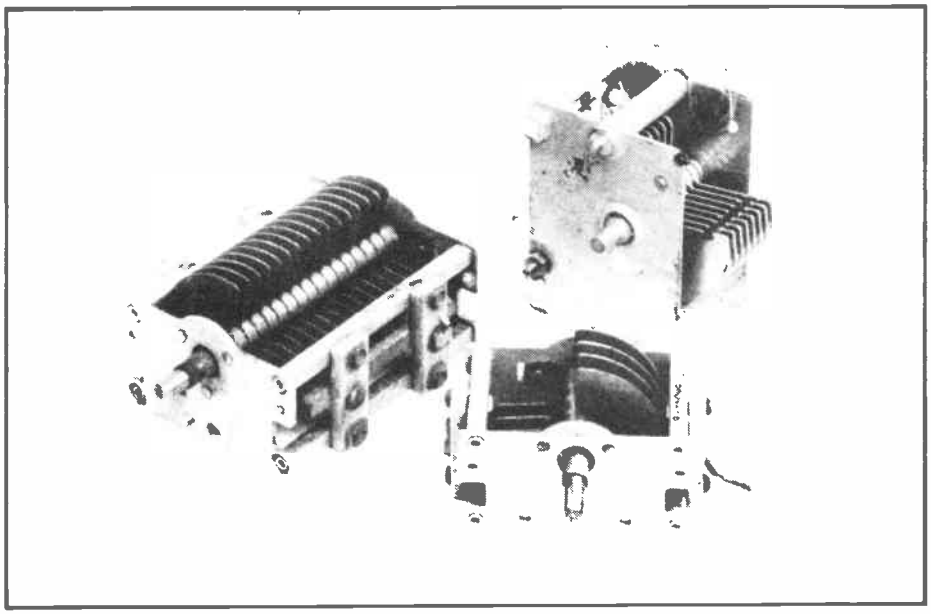
In general, on the lower frequency HF bands (80, 40, 30, 20 metres), a power valve in linear service will give a peak envelope power output of between three and four times its anode dissipation. Thus an 813 with a maximum dissipation of 125 watts will give up to about 500 watts, whilst the 811A, which is rated at 60 watts, will give approaching a quarter of a kilowatt.

In the latter case, two valves in parallel will be necessary in order to obtain the legal maximum output power.

Having decided on the type of valve, the circuit configuration in which it is to be used must be decided. For triode valves the alternatives are: the classic neutralised amplifier; grounded grid; or passive grid configurations.

Of these, the former was rejected due to the requirement for a neutralisation capacitor which is not readily available and, although tried, the passive circuit without neutralisation was found to be less stable than desirable on 20 and 15 metres. In consequence, the grounded grid configuration was finally adopted.

If a tetrode is selected, the alternatives are either the traditional amplifier circuit or the ZL or G2MA linear configurations, both of which operate in a similar manner.



In these, the screen grid in parallel with a clamp valve is fed from a bleeder chain from the EHT. The clamp valve grid bias is derived from the RF drive to the amplifier, thus on no drive conditions there is no bias on the clamp valve, which therefore conducts heavily.

Due to the resistance of the bleeder chain, the anode voltage is reduced to a very low value. As the clamp valve anode and the PA screen grid are in parallel, the PA current also drops to a very low value. When RF drive is applied, bias is applied to the clamp tube whose current reduces allowing its anode voltage and consequently the PA screen grid voltage to rise, thus permitting the PA valve to draw current.

In deciding between the alternatives, it must be considered that the traditional circuit requires both separate screen and fixed bias supplies. The ZL or G2MA requires neither, but they additionally require a small power valve and a high power bleeder chain network. The latter should comprise a number of wirewound resistors in series, of value totalling about 50,000 ohms and at least 50 watts rating.

A passive grid input circuit may be used with either configuration to enhance stability.

The output circuit

The purpose of the output circuit is to match the power generated in the output devices to the output terminal. In solid-state circuits a broadband configuration is normally used, but with valves it is more practical to use tuned circuits.

These may take one of two forms: a single tuned circuit with an output link coupling or, alternatively, a PI coupler.

Either is capable of good results and which one to use is largely a matter of personal preference and the components available. The former has the advantage of simplicity for single band operation, but when more than one band is required, very high RF voltages have to be switched. In comparison, although the PI coupler requires an additional tuning capacitor, multiband switching is at relatively low voltage and the circuit will match to a wide range of output impedance.

In either case, the circuit constants have to be chosen to match the output impedance of the valves in use.

The tuning capacitor of the single tuned circuit or the input capacitor to the PI tank must be capable of handling very high RF voltages, and the component selected should have at least 1/16in and preferably 1/8in spacing between plates, together with ceramic insulation. The maximum capacity should be at least 200pF.

The output capacitor of the PI circuit is not critical, for there is only a relatively low voltage present at that point. The capacity required is 1000 to 1500pF and this may be met by a receiving type two or three gang 500pF variable capacitor.

The inductance must be wound airspaced or on a ceramic former of at least two inches in diameter with 16 gauge, preferably silver-plated, copper wire. Two other critical components remain: the anode RF choke and the capacitor coupling the anode to the output circuit.

The RF choke may be purchased or home wound. This component must be capable of carrying a current of at least half an ampere and show no resonances in any amateur band. If purchased, a choke specially designed for the purpose must be selected, even if this proves expensive. Home construction is, however, possible and a design will be included in the second part of this article.

Some constructors have found, however, that a wirewound resistor of 100 ohms or so will function quite well, for the resistance of the wire tends to dampen any resonances in the winding.

The coupling capacitor is also a very critical component, for it must not only be rated to stand a combination of the EHT and RF voltages, it must also carry considerable RF current. In general, a good quality component of about 1000pF rated at a minimum of 2500 volts working should be selected.

All other components required for the RF section of a low cost linear amplifier may be quite easily obtained and will usually be found in the station junk box.

Switching

Two types of switching are required in a linear amplifier – RF and mains. The former is, in general, so that the transceiver is directly connected to the aerial either during reception periods or when the additional power of the linear is not required.

This is most easily achieved by relays on the input and output of the amplifier. The input relay should be rated to adequately handle the power output from the transceiver, and for this the author has found the RF relays fitted to many of the older Pye VHF transmitter receivers quite satisfactory.

The output relay must be capable of handling at least 500 watts of RF, and the type finally used must depend on what can be found at rallies, etc. There is no necessity for coaxial relays in either position.

The RF relays are powered from the linear amplifier and are hard-wired to the transceiver.

The mains switching circuits are relatively simple; just ensure that the heater and bias supplies are switched on a minute or so before the EHT. This may be achieved by a simple interlocked circuit and sequential manual switching or, if desired, by a mechanical or electronic timing device.

Whether triodes or tetrodes in whatever configuration are used, it will be found that the efficiency of the amplifier drops very considerably on 15 and 10 metres. This is due mainly to the characteristics of the older types of valves, losses in the output circuits and losses in components, particularly RF chokes and switches.

For this reason, the author limited the frequency coverage of his own amplifier to the 80, 40, 20 and 15 metre bands. At a later date it is intended to build a separate amplifier to cover 15 and 10 metre bands based on the use of VHF techniques for optimum efficiency.

In the next article, I shall be discussing the physical construction of a low cost linear amplifier.

COMPONENTS TO LOOK OUT FOR

Large mains transformers (see text)
Electrolytic capacitors, 500 volt, 100 or more microfarads
Ceramic valve holders to suit valves to be used
Capacitor, high grade, 2500V wkg min 1000pF
Variable capacitors, 200pF wide spaced
Variable capacitors, 2 or 3 gang, 500pF per section, receiving
Transmitting type RF chokes
Relays, 12 volt coil, suitable for RF switching
Ceramic coil formers, 2 to 3 inches in diameter
16 or heavier swg wire for coils and chokes

HF ANTENNAS FOR SMALL GARDENS

Don Field G3XTT continues with the fourth instalment of his series.

In the first three parts of this series I have quite deliberately steered your thinking away from the easy answer of a trapped dipole or G5RV to more ambitious solutions for the small garden. However, at the end of the day, you may reluctantly conclude that in your particular situation such solutions simply cannot be adopted.

This month I want to return to some of the more traditional approaches to getting a multiband antenna system to fit into a small garden. Bear in mind, though, what I said at the beginning of the series. Any multiband approach of the sort which I am about to describe requires something of a compromise and should only be the result of a conscious decision that this is the way you want to go. If you are only going to end up working one or two bands, or are only looking to have contacts to specific parts of the world, then it would be far better to optimise your antenna system for those particular activities.

The G5RV

When faced with a requirement for a reasonable multiband antenna system, UK amateurs often choose the G5RV antenna, named after the callsign of its inventor. Dimensions for the classic G5RV are shown in *Figure 1*. The dimensions are such that they produce a feedpoint impedance which is reasonably close to 50 ohms on the 80 to 10 metre bands. Remember, though, that the G5RV was introduced in the days of valve transmitters, which were fairly tolerant of VSWR and which generally had a tunable pi-tank output circuit which would match a range of impedances.

If you run a modern solid-state rig, then you will almost certainly want to use an antenna tuner with a G5RV to get maximum power transfer into the antenna. The G5RV also works on Top Band by shorting the twin feeder at the bottom end and feeding the whole system as a top-loaded vertical. Some amateurs also use a half-size G5RV which will work on 40-10, plus 80 metres with the feeders strapped.

There have also been some minor modifications published from time to time which will allow the G5RV to work on the WARC bands. The exact radiation pattern of the G5RV antenna will depend on its particular configuration at your QTH, including the effect of any surrounding buildings, etc. On 80 metres it is a shortened dipole, and will, of course, produce predominantly high angle radiation unless it is a half wavelength high, which it is hardly likely to be in a small garden. On 40 metres it is longer than a half wave, so will have very slight gain compared with a dipole in certain directions, but again the radiation will be predominantly high angle. Assuming, though, that you have the antenna at least 35ft high, you will have a reasonably low angle of radiation on the higher bands. So what you end up with is a multiband system which is useful for European contacts on the lower bands, but which will enable you to pull in some of the longer distance DX on 20, 15 and 10. If this matches your operating requirements, then the G5RV may well be the antenna for you.

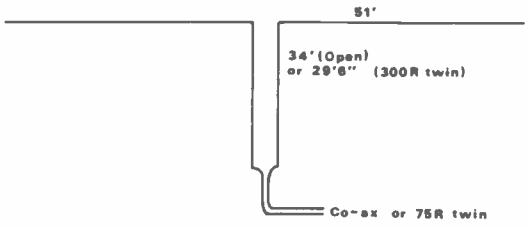


Fig 1 *Dimensions for the classic G5RV*

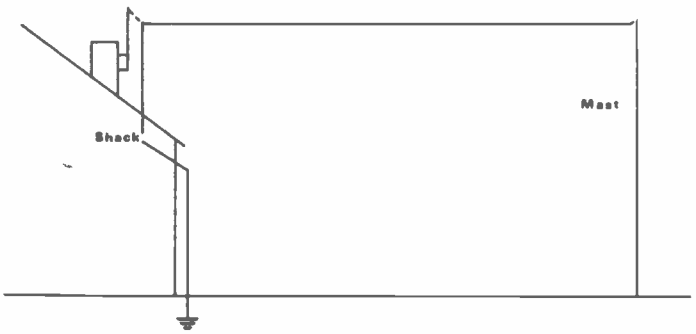


Fig 2 *Long-wire antenna*

The long-wire

I can't resist a plug at this point for the traditional 'long-wire' antenna *(Figure 2)*. A long-wire is exactly that, an antenna that is long in terms of a wavelength. In practice, many amateurs are able to put up a wire of, say, 150ft long. On Top Band this is barely more than a quarter wave. If the antenna is mainly horizontal, radiation will be mainly high angle and the antenna will work reasonably well around the UK and Europe. A similar argument applies on 80, where the antenna would be just over a half wavelength long.

On 20, 15 and 10, the antenna is getting progressively longer in terms of wavelength, and will start to produce lobes of radiation with useful amounts of gain. On 15, for example, the antenna will be over three wavelengths long, will have its main lobes about 25 degrees to either side of the antenna wire, and in these favoured directions will have a gain of almost 3dB compared with a dipole. On 10 metres the gain will be

about 4dB over a dipole. Not bad for an antenna which can be almost invisible.

Pacific pleasures

An amateur I used to know, who used such an antenna which pointed roughly towards the north, found that he could work as effectively into the Pacific on 15 metres as those using triband beams.

While 150ft is, of course, a greater length than many can manage, the same arguments still apply for shorter lengths. Of course, with a long-wire you will certainly have to use an ATU at the feedpoint. A good earth system will also be required to prevent high RF voltages being developed in the shack. If the shack is in an upstairs room, this earth connection should consist of several parallel wires of differing lengths.

A single earth wire may prove to be resonant on certain operating frequencies, and will then cease to be effective. The need for a good earth system is, of course, important with all antennas, but becomes particularly crucial with non-resonant systems such as the long-wire where high RF voltages can be present in the shack. *Table 1* shows the properties of long-wire antennas in terms of wavelength and gain.

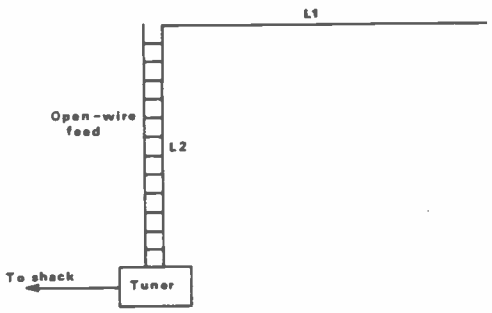


Fig 3 *Multiband antenna system*

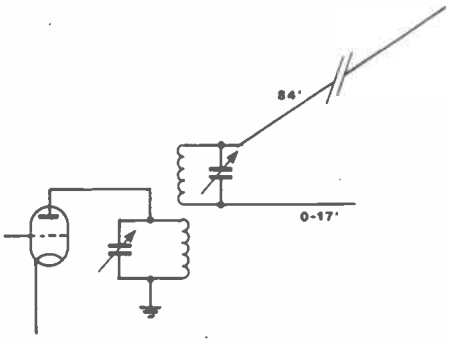


Fig 4 *The W3EDP*

The Zepp

A Zepp antenna is basically a resonant antenna fed at one end by an open wire transmission line. It was originally developed to be trailed from Zeppelin airships, hence its name. Although a centre-fed dipole cannot be used on its harmonic frequencies because the feed impedance will increase dramatically, an end-fed dipole will have a high impedance on its basic resonant frequency and on its harmonic frequencies. An open wire feeder provides a suitable means for feeding this and, hey presto, you have a multiband antenna system *(Figure 3)*. At the base of the open wire line you will need an ATU, and you can then run co-ax back to the shack. Open wire feeders are less popular than they used to be, but are less lossy than co-ax when the SWR departs from 1:1 and are not so heavy as co-ax either.

The W3EDP

Now a brief mention of an antenna which was popular in the days of valve transmitters, but seems to be out of fashion these days, though I know of some QRP enthusiasts who like its simplicity. The W3EDP *(Figure 4)* avoids the need for a direct earth connection, using a counterpoise wire up to 17ft in length, depending on the frequency band in use. Ideally, the counterpoise wire should run at right angles to the antenna proper, and can be dropped out of the shack window or even accommodated indoors provided it is well insulated.

As shown in the diagram, the W3EDP was originally designed to be coupled directly into the tank circuit of the transmitter, but it is quite possible to build a suitable ATU for feeding it from a solid-state rig. The W3EDP lends itself particularly well to flat dwellers or those whose shack is in an upper room. Some experimentation will be necessary to find the best dimensions for minimum SWR.

Incidentally, with all multiband antennas, remember that they will (by design) radiate harmonic frequencies as well as the actual frequency in use. Take particular care, therefore, to minimise the generation of harmonics by the transmitter, and preferably use an ATU between transmitter and antenna to attenuate any harmonics even further.

Length (wavelengths)	Angle of main lobe to wire	Gain of main lobe relative to half-wave dipole
1	54°	0.4dB
1½	42°	1.0dB
2	36°	1.5dB
2½	33°	1.8dB
3	30°	2.3dB
4	26°	3.3dB
5	22°	4.2dB
6	20°	5.0dB
8	18°	6.4dB
10	16°	7.4dB

Table 1

Supports

That brings us to the end of what I am going to say about antennas themselves. Many, many articles have appeared in the literature over the years describing ingenicus ways of getting over the problem of lack of space. I hope that what

I have said has given you some ideas and some criteria by which to judge any other designs you might come across.

Remember, particularly, what I said in the first of these articles. It is vitally important, before selecting an antenna design, to consider exactly what you are aiming to do. Is it DX or local contacts you are after? Is it regular skeds or the ability to put out a big signal for brief periods, such as contests? Are you interested in one band or several? Another point you will want to consider is what means you have for supporting any antennas you put up.

Natural supports may well be to hand. Trees can often be pressed into use, both to support and to conceal antennas. I have even seen a triband beam 'growing' out of the top of an oak tree. Trees are often difficult to climb, but once you have got a pulley and halyard into a tree it is then very easy to erect or dismantle wire antennas.

The house is also an obvious antenna support for many amateurs. A mast on the chimney or gable end (perhaps the existing TV antenna mast) can be used to support wires of various sorts. One at either end of the house and you may well have the makings of that fixed 2-element wire beam you wanted.

Quad antennas are light in weight and can often be supported on aluminium TV masting. A lightweight TV rotator would be adequate to turn a 15 or 10 metre quad, or you might even be able to design the mast supports so that you can use the 'Armstrong' method of rotation, in other words, be able to turn the whole assembly by hand either from ground level or by reaching out of the shack window.

Aluminium yagi beams can be more of a problem. Although I have previously used a triband beam on 30ft of 2in steel tubing, getting it up into the air, or down for maintenance purposes, was far from easy. However, crank-up tilt-over towers are readily available nowadays, and some are very inconspicuous when retracted. In fact, one of the best ways of concealing a quad or yagi when not in use is to wind the tower down so that the antenna is hidden below the roof line. For the contest operator, there is even scope for dismantling the antennas and tower completely when not in use. The popular aluminium lattice towers can be assembled rapidly by one person and will support a triband beam at 30ft without the need of guys, or at greater heights if guying is used.

Getting your antenna working

The various full-size antennas I have described in this series of articles can, in most cases, be fed directly by 50 or 70 ohm co-ax. Where the antenna is a balanced system (eg, dipole or quad), a 1:1 balun will help to reduce radiation from the feeder and will ensure a symmetrical radiation pattern. Matching reduced-size antennas is more difficult. Ideally, you would want to be able to measure the actual impedance at the feedpoint of the antenna.

An antenna noise bridge will enable you to do this. The noise bridge is connected either directly at the antenna feedpoint or coupled to the antenna via a feeder which is electrically an exact number of half-wavelengths long. Using a receiver tuned to the frequency at which you want to make the measurement (see *Figure 5*), the bridge is adjusted for a null in the noise level heard at the receiver.

The impedance can then be read off the scale of the noise bridge. The better bridges allow both the resistive and reactive components of the impedance to be determined, and you can then use some mathematics or a Smith chart to work out what is required in the way of matching.

Incidentally, the noise bridge has a range of other uses in antenna work, such as allowing you to find the resonant frequency of an antenna. A dip meter is also a handy device for checking the resonant frequency of an antenna. While simply knowing the resonant frequency isn't as useful as measuring the actual impedance, it can certainly help in starting to think about the best way of matching the antenna.

What I have just said is all very well, but may sound rather complicated. In practice, you may prefer to arrive at a suitable match by way of cut and try techniques. Let's suppose that the impedance of your antenna is well away from 50 ohms resistive. With a short vertical antenna it could be well below this figure; with a voltage fed antenna such as the Zepp it could be much higher. In either case, the mismatch will lead to a high VSWR on a coaxial line if you try to feed the antenna directly. This will lead to power losses, although at HF these will be rather less than would be the case on the VHF bands.

However, the situation is not ideal and you should aim to match the antenna to the feedline at the feedpoint. This can be done in a variety of ways. The literature describes Gamma and Omega matches, the use of co-ax line as an impedance transformer and much more. Essentially, you are trying to do two things. One is to get rid of any reactance to bring the antenna to resonance. Secondly, you will then need to transform that resistance to something close to 50 ohms (assuming you are using 50 ohm co-ax). For example, with a short vertical you may use a loading coil to bring the antenna to resonance and then tap off at the 50 ohm point *(Figure 6)*. In the case of a beam, which you will in any case have tuned to resonance, something like a 4:1 balun may do the trick at the feedpoint.

The easy approach to feeding the

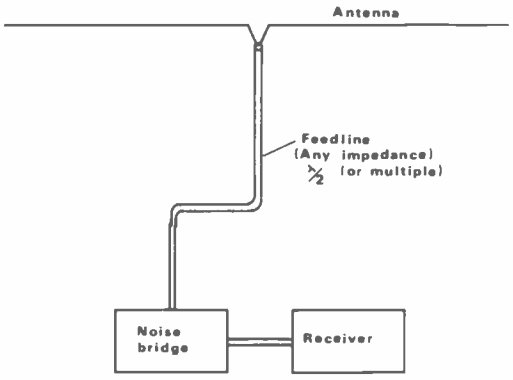


Fig 5 *Adjusting the bridge*

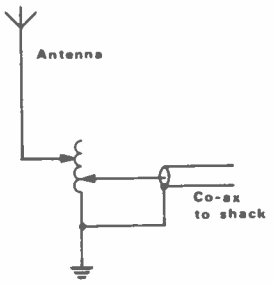


Fig 6 *The loading coil*

antenna would, of course, be to ignore the VSWR on the transmission line and match the transmitter into the system at the shack end. As I said earlier, on HF this may be adequate as the losses in the line will not be too high. It also has the advantage that, if it is a multiband antenna you are feeding, the impedance will vary from band to band; otherwise you would have to have remote switching of the matching unit at the antenna for when you changed bands.

However, a few points need to be borne in mind. One is that many commercial ATUs will not match outside a fairly limited range of impedances, and you could end up finding that your ATU simply won't cope with the impedance at the shack end of the feeder.

If this is the case, it is worth experimenting with altering the feeder length, as this will affect the impedance seen by the tuner. However, whether you will end up with a length which is a suitable compromise for all bands is another matter altogether. You are also more likely in this situation to have radiation from the feedline. The further you are operating from the resonant frequency of the antenna, the greater this will be and, in particular, you run an increased risk of TVI, as well as affecting the antenna's radiation pattern.

Finale

This concludes my short series, *HF Antennas for Small Gardens*. I hope it has given food for thought. My apologies if I have failed to mention your particular favourite antenna. However, if I have persuaded at least some readers to think twice about what antenna to use, rather than simply reaching for the cheque book to order a commercial antenna which may well be far from ideal for their particular requirements, then I will consider my job well done. Any feedback would be most welcome.

RSGB AGM 1987

The Editor reports

Following last year's AGM, there was a certain amount of unrest within the ranks concerning the reproduction of the minutes in the March 1987 issue of *Radio Communication*. A number of complaints were received by RSGB Headquarters following publication, but I feel it should be noted here that any discrepancies found in the printed account of the minutes were corrected at a later date.

Before this year's 61st Annual General Meeting, the members present voted on a show of hands that as an official recording of the proceedings would be available to anyone who wished to listen to the meeting per se, other recordings made by attending members should not be permitted. The official tape is now available from RSGB Headquarters, and this report has been made through the use of one of these copies and liaison with some of the members present.

To ensure that much of the confusion recorded on last year's tape was not repeated, and that the printed minutes in *RadCom* should remain accurate, each speaker was requested to withhold speaking until the microphone had reached them and they had announced their name and callsign. This arrangement proved very successful, and I am sure that it will ensure that the staff writers who are faced with the task of reporting this year's AGM for *RadCom* will not have the same difficulty as last year. However, it still has to be remembered, as the President pointed out in the meeting, that only half the number of the words spoken at the AGM can be included in *RadCom* due to space restrictions, and that there are bound to be some omissions in order to present a general summary of events.

This year's meeting was held as usual at the Institute of Electrical Engineers, Savoy Place, London W2, on Saturday 12th December, and was attended by 193 members. After the discussion of the minutes for last year's meeting, the company accounts were presented to the members. A deficit of £27,304 for the year ending 30th June 1987 was shown, an amount which it was explained was due to several items of unforeseen expenditure for the year.

These items included steps made to make RSGB Headquarters more streamlined by reorganising the administrative side of the company, and moving the editorial offices of *RadCom* to Potters Bar. In addition to this, a fair amount of legal costs were accrued in connection with an EMC case, book sales dropped by 20% in numbers, banking costs rose dramatically (although they are looking at improving on this situation by using a direct debit system rather than standing orders, with members' co-operation), and income only increased by 4%.

However, despite the above, the auditors, Messrs Moores and Rowland, considered that the accounts were now on an upward trend, and that this deficit should have reduced considerably by the end of the current financial year.

Points raised by members from the floor included the increase of subscription rates, although these have in fact been raised in line with inflation, and the possibility of lowering book prices in order to encourage more members to purchase them, and hopefully increase on net profits. This idea, we were told by the Secretary, Mr David Evans G30UF, was actually being looked at at this time, and it was hoped that some remedy could be formulated to change the situation quickly.

The old 'rotten apple' of how much council members claim in out of pocket expenses, in particular in connection with the AGM, was raised yet again. The President, I felt, made a very good job of explaining how much time, effort and, in some cases, loss of business council members put into their positions, and that as directors of the company they are fully entitled to put in claims for travelling to attend meetings, etc.

However, the gentleman on the floor felt that the members of council were only attending the AGM as members of the society like everybody else and that consequently everybody should be entitled to a reimbursement of expenses for this purpose; perhaps in the form of a reduction of the following year's subs!

This was considered laughable by the majority of the floor, and we can only suggest that if the gentleman is so worried about his travelling expenses accrued in attending the AGM, that he work hard enough to get himself elected onto council when he will no longer need to worry – about travelling expenses in any case!

Before concluding the AGM, announcements of the new council members were made following the recent elections. Mr John Allarway G3FKM was voted an ordinary member of council, Mr GR Smith G4AJJ was voted the representative for Zone A, and Mr John Allen G3DOT was voted representative for Zone B. No nominations were received for the Zone G (Scotland) election, and this we were told was to be discussed at the first council meeting following the AGM.

After the formal business, as stipulated in the Companies Act, had been covered, the President closed the meeting for tea – very civilised – which was followed by the Extraordinary General Meeting.

EGM

Following the break, the Extraordinary General Meeting was opened, in which two resolutions were put to the members by the RSGB Council. The first of these was a proposed motion to change the situation over proxy voting at future AGMs. As the articles of the Companies Act stood, a member was permitted to entrust his vote into the hands of another member, should he not be able to attend the meeting personally. This member would then be able to use his vote as he saw fit at the time for any resolution for which it was required. This means that someone, such as the President, could well find him- or herself in a position where their accumulated proxy votes could actually outweigh the number of voting members attending the meeting, and make a decision differing from that seeming to be considered reasonable by the floor at the time.

This situation is not only unsatisfactory from the point of view of those outvoted by the holder of a large number of proxy votes, but also by the person that holds them – would you have the courage to outvote everybody in the meeting with a bunch of proxy votes entrusted to your care? A new resolution was put forward as a solution to this situation; any member should now be able to entrust his vote to another attending member and also be able to stipulate which way he should wish his vote to be used (ie, for or against). This motion was passed by a majority vote and the articles will now be amended accordingly.

The second resolution put to the members by council was one that would alter another aspect of the articles of the Companies Act. This resolution stipulated that in any council elections, members over the age of 70 years should have their age stated on the ballot form. This resolution was felt necessary, as in the past there have been problems with council members being unable to attend meetings on a frequent basis due to poor health. A member of council that is never there is really no better than no member at all, and as poor health is generally linked with old age, it was felt that the membership should be aware of the possibility of an elected member's term of office being interrupted.

This is not to say, of course, that everyone over the age of 70 is going to be ill all the time, but it has to be admitted that the risk of absense for this reason is far more likely. Whatever, the members must have thought it a good idea, as they passed the resolution with a majority vote. The meeting was then closed and the Open Meeting convened.

Open meeting

The Open meeting commenced with the presentation of a number of awards to mark achievements of specific members during the year. Included in these were a number of awards given by the Technical Publications Committee to members who had contributed pieces of outstanding quality to *RadCom*, and the Raynet trophy, awarded by the Raynet Committee to Mr Douglas Willis G3HRK, the Norfolk County Controller, for outstanding service. Mr Willis was involved in the rescue operations in connection with the East Coast floods of 1953, the year preceding the launch of Raynet in 1954.

Since that time he has encouraged hundreds of other members to become involved in the service, and his enthusiasm has resulted in his county providing one of the most comprehensive Raynet services in the country. It therefore seemed fitting that a tribute should be shown to the gentleman in this, his year of retirement from Raynet. In fact, the President awarded the trophy after stating that if she herself should have to rely on a Raynet operation in a disaster, she would rather it be in Norfolk! I hope the rest of the county took that in good spirits.

Following these special awards, certificates were issued to the two members voted vice presidents for the year. The first certificate went to Mr Douglas Willis G3HRK, who was again thanked for his outstanding contributions to the Raynet operations and his tireless efforts supporting the society over the years.

The second certificate of office went to Mr Dane Evans G3RPE, who has been a member since 1960 and has made outstanding contributions to the promotion of the microwave bands. He was made a member of council in 1976, President in 1978 and has held a variety of other committee positions.

Following the award ceremony, the President made her address, which she must surely be congratulated for. In her speech she highlighted the critical point that amateur radio as a hobby had reached. She pointed out that what happened now would decide the future of the hobby into the 21st century. Her first concern was the reduction in the number of new members joining the society in the last few years. In the year ending June 1987 an increase of only 60 members was recorded on the membership total, and she asked the floor how they felt new frequency allocations, or indeed even the existing ones, could be held when their numbers were dwindling.

She emphasised that if members were not prepared to put in time to promote amateur radio then they should be prepared to lose bands. The biggest problem it seems is that of encouraging young members into the hobby. Industry for a long time has used members who start with an interest in amateur radio, and go on to study to build a career in an associated technological field. New, young members should therefore be encouraged into the RSGB, and their interest held through a restructuring of the society's facilities. These changes should include publications for the younger mind, help from experienced amateurs and the availability of some sort of novice licence to bring them into the hobby before they are frightened off by the task of studying for the RAE. The President emphasized the need for simple new constructional projects and kits, so that these new members could participate in the hobby without needing to extend on daddy's mortgage, and pointed out how this required the involvement of industry in their cause.

Although the President's speech continued to outline the changes recently made within the RSGB administration to offer a better service, the point of promoting the hobby to youngsters was discussed after her address. It is obvious that most of the members do see this as a very important task which needs everybody's help. Although a few seemed only to be interested in the provision of some sort of 'Student Licence' or a quick non-exam way into the hobby, most points raised were of particular relevance to young people. The whole message seemed to be that if they wanted to keep their hobby it was absolutely essential that everybody input in whatever direction they could, to ensure that amateur radio received as much coverage for young people as could possibly be managed.

In the past, a number of grumbles have been directed at the choice of venue for the RSGB AGM and other meetings. This message has finally filtered through the ranks, and Mrs Heathershaw concluded her speech with the suggestion that the venue could be changed to a more central location. Consequently, if any of you know of a venue that is easily accessible from most of the country and has the facilities to cope with such an event, you are invited to put your suggestions forward to RSGB headquarters as an alternative for next year's meeting.

As the Open meeting is held principally so that members can put questions to council on any matters that concern them, a considerable amount of time was given to answering queries on subjects ranging from the lack of response to letters to RSGB headquarters, to the progress being made with repeater interlinking. A number of questions were raised concerning the slow Morse transmissions in south London and the South East, and although it was a valid point, I don't think it really justified the hour or so of the meeting's time that it consumed. In fact, when the 7th or 8th (or was it 70th or 80th?) question was asked from the question box, groans of dissent were heard from the floor. What seemed to be the problem was that, at the last IARU meeting, the slow Morse allocated frequency had been allocated to Packet radio, and the slow Morse enthusiasts, whom it must be said are only trying to provide an aid to class B licensees in their Morse studies, were angry that no alternative had been allocated to them. Admittedly they had a point, but when it was explained to them the difficulty of the procedures required to find them another allocation, they would not be appeased.

Another point of controversy was raised by Mr Arthur Milne G2MI. Mr Milne has taken responsibility for the reading of the GB2RS news every Sunday morning since the year dot. In fact, Mr Milne informed the meeting that the next day he would be reading the news for the 1447th time. He was particularly upset about a letter which

Joan Heathershaw listens to DTI head John Butcher's speech at last year's RSGB HF Convention held at the NEC, Birmingham

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had been sent out to all newsreaders concerning the necessity to adhere to the opening and closing speeches before and after reading the news, as suggested by the RSGB, after a complaint made to the DTI.

As it happens, under the licensing conditions of GB2RS held by the RSGB, it is only compulsory to open the broadcast with the identification 'GB2RS from the station of . . . ' and for the newsreader to re-identify the station half way through the broadcast and finally again at the end, ensuring that the listener is aware that the station is not able to communicate on that frequency under the GB2RS callsign.

What had occurred was that one of the 200 newsreaders had felt it necessary to write to the DTI informing them that Mr Milne had not adhered to the RSGB's preamble and closing speech, although as I understand it he had identified the transmission correctly. Mr Dave Smith G4DAX rose to answer the question and explain the series of events, and outlined the above mentioned requirements for each GB2RS newsreader to identify himself under the terms of the licence. He also pointed out that for the HF transmissions, the news had to be relevant to the whole country, and that consequently there was often rather a lot of it. Because of this problem, some experienced newsreaders shortened the opening preamble and closing paragraph in order to include all the broadcast within the allotted time. He was confident, however, that they were experienced enough to identify themselves correctly.

Writing to the DTI about this piffling omission was generally considered to be the act of a pathetic backstabbing member, especially as it was another newsreader. Thankfully, the DTI viewed it in the same light and wrote back to the gentleman (!) concerned and said: 'The contents of your letter have been noted with interest. However, since the RSGB are the licencee for GB2RS they are responsible for any questions regarding newsreaders and their practises.'

The other GB2RS newsreaders, on hearing about this incident, had felt so outraged by the gentleman in question's actions that some of them had even insinuated that, if this is all the thanks they get for sacrificing their Sunday mornings each week, then it obviously wasn't worth the bother – and who can blame them? As no one at the meeting had had the nous to ask Mr Dave Smith who the instigator of this action was, and as there had been so many rumours flying about, I took it upon myself to contact him and ask him myself. The gentleman concerned, and I use that term loosely, has actually been elected onto council as the representative for Zone A – Mr Geoff Smith G4AJJ.

He is the GB2RS newsreader for Scarborough. Apparently, up until just before the council elections, he also had a deputy newsreader, Mr Ross Neilson, who read the news with him on a week-on week-off basis. However, Mr Geoff Smith had taken it upon himself to dispense with Mr Neilson's services and read the news each week himself. This was against Mr Neilson's wishes and as far as I know Mr Smith has no authority to take such an action. Perhaps he felt that he needed the extra publicity so near to the council elections?

After this incident had been explained, the time left for other questions was limited, and seemed far less important in its shadow. The two main messages for the whole of the day's events seem to be that we've all got to pull together to encourage younger members into the hobby and guarantee its future, and that going round sniping at other members, who have made a valid contribution to the society is not on. Without an awareness of this it doesn't matter how much effort is put in by the staff at Lambda House.

Stop nodding your heads, you lot. Get out there and do something! There are countless schools, clubs and organisations that could be approached with an offer of an amateur radio demonstration. If you don't make the effort now, when you reach the age when you no longer have to work and you can donate more of your time to the hobby, there will be no one left to talk to you.

Finally, I'd just like to include a mention of the enthusiastic efforts of Mrs Joan Heathershaw. Not only is she a pleasant and polite lady (in fact until recently the only member of the Lambda House set, apart from Dave Evans, who had seen fit to speak to me), she is organised, straightforward and a credit to the society. The fact that she is a fellow woman working in a male saturated area has nothing to do with these comments, I genuinely feel she has done a good job. Well done, Joan.

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

Last March I mentioned Steve Muster G4UOL and his CW successes of 1986. In 1987, as you might guess, he did even better, as the following figures show. Total QSOs in year = 6,400; DXCC countries worked = 121 (including 110 on 40 metres); QSL cards received = 2000; participation in contests = 40 (20 seriously); CW awards received = 27.

In the middle of all that, Steve found time to go to the RSGB HF Convention to demonstrate, and give others the opportunity of trying *Dr DX*, the fascinating computer program which simulates world-wide CW contest situations. For 1988, he plans a one-man expedition to GD for the CQ WW CW Contest in November, and possibly to GW in May for the WPX CW Contest. He also hopes to build a QRP transceiver for low power field days which, presumably, he will make in his spare time between QSOs!

Tip for learners

In his book, *The Secret of Learning Morse Code*, Mark Francis G0GBY recommends 'echoing', ie, imitating the output of a Datong Morse Tutor to assist in learning to send properly spaced code. Paul Smith G8IAR (son of G4FAI!), busily learning Morse with the active encouragement of his Dad, has discovered in trying this technique a useful extra facility on the Datong Tutor, dispensing with the need for an external practice oscillator.

If the jack plug from a Morse key is inserted half-way into the key socket of the tutor (so as not to activate the code generator cut-out switch), and a delay of about one second is selected between characters, it is possible to key the internal oscillator to imitate the characters generated by the tutor. It is often recommended that a learner should acquire a good receiving speed before ever touching a key – to be sure of knowing exactly what good sent Morse should sound like – but this technique enables sending practice to begin much earlier than usual.

Not only does it provide an accurate standard against which to check your sending style but, according to Paul, 'it is a great help in the overall process of memorising the code and improving one's speed, both in sending and receiving'. Datong recommend that when learning to receive, the tutor should be set with a character sending speed of 8-12wpm and a long delay between the characters, which is gradually reduced as skill is acquired. It would seem sensible to do exactly the same when practising keying with the tutor in the manner suggested.

Getting an OK licence

Marion Hlavac, ex-OK3CAW, recently described the process of getting an amateur radio licence in Czechoslovakia in *The Canadian Amateur Radio Magazine*. Firstly, a potential amateur must join ZVAZARM (Union for co-operation with the Army), which directs the operation of the radio clubs. Then an RO (radio operator) exam is taken in Morse, radio engineering, operating proficiency, radio regulations and politics.

Successful candidates wait a few weeks, or months, for their RO certificate and can then operate a club station under the supervision of an SO (independent operator). The RO operator has to make a prescribed number of QSOs then, after a few more months, can take the SO (also called OK) exam with the same five subjects, only more difficult. The usual waiting time for a certificate after this examination is about a year. OK3CAW waited three years, and knows another YL operator who waited five years!

There are four operator classes. Class D is VHF only. Class C is for beginners, with CW only on 1750-1950, 3520-3600 and 28100-28200, requiring a Morse test speed of 50 characters a minute. Class B is all bands with 150W input, and class A the same with 500W input. In the examination for class A, candidates are required to know, among other things, every DXCC prefix and to pass a Morse test of 120 characters a minute.

Alice on the Line

In 1870, when all communications to Australia were carried by ship, work was begun to erect a single wire across that country, north to south, Darwin to Adelaide – the Great Overland Telegraph Line. Linking with a new submarine cable from Java to Darwin, the Morse telegraph, in 1872, enabled direct telegraphic communication between England and Australia for the first time.

The story of the Overland Telegraph is one of great achievement in a hostile environment. The stories from those days have become legends in the history of Australia.

One of those repeater stations, at Alice Springs in the Northern Territory, has been preserved and is a popular tourist attraction. Now, a special project financed from bi-centennial funds plans to have the old station virtually operational again as an educational facility.

Youngsters will stay overnight and relive the life of the station as it was at the turn of the century. Part of the original line will be reconstructed, and two-hourly weather reports will be sent down the line – just as they were in the old days. Incidentally, the name of Alice Springs originated when a pool of water along the route was named Alice Spring after the wife of Charles Todd, planner and organiser of the overland line. The nearby township of Stuart eventually took on the name, commemorating the work of those early telegraph pioneers.

Due for completion in October 1988, the project is inspired by the book *Alice on the Line* by Doris Blackwell, daughter of the Telegraph Supervisor there from 1897-1908. For Morse enthusiasts visiting Australia, from now on a visit to the Alice is a very definite must! The dramatic and fascinating story of the Australian telegraphs will be found in future issues of *Morsum Magnificat*.

Never too old!

Bob Freeman G1TMX, from Sunderland, has been licensed for three years and is now working towards his Morse test. Nothing unusual in that, you might say, but Bob is 80 years old. He reports, 'I am at present up to 10wpm and can read at 12-15, but with some mistakes'.

I hope it won't be long before we can welcome his new call at the bottom end of 80 and elsewhere. Are there any other octogenarians who are studying for, or have taken, the Morse test?

Really?

Heard on 20 metres CW:

1. G0 to 1M – 'OK on QTH OM = QSL via Box 88 Moscow.'
2. K4 to G0 – 'My name is Mario = QTH Virginia . . . ' G0 to K4 – 'OK DR OM Virginia . . '

From *Hear and There* by Tom Mansfield G3ESH, in *Groundwave*, the newsletter of Wimbledon and District ARS.

DATA SHEET

by Ian Poole G3YWX

One of the major advances to analogue circuit design, brought about by integrated circuit technology, must be the widespread use of operational amplifiers. They are ideal for a vast number of jobs because they come so close to the ideal amplifier. This means that it is possible to use them when more conventional circuits have no hope of success.

Their advantages are quite wide ranging. They possess a very large open loop gain, often in excess of 10,000. For the most part, this can be taken to be infinity. They also have a very high input impedance and a low output impedance. Again, these are usually such that they do not affect any networks placed around them.

Many types of operational amplifiers, or op amps, have appeared. Some give high bandwidths or high slew rates whilst others offer very high impedance FET inputs. In spite of all these variants, the most commonly used is the proverbial 741. Basically, this IC offers no frills, but it is a good general purpose beast which can be bought from every component stockist for a matter of a few pence.

Specification

The specification may not seem particularly wonderful when compared with some of the more modern devices which are now on the market. Even so, it is usually more than adequate for most jobs.

It comes in a variety of packages. There is a choice of TO5 can, 8 pin dual in-line (DIL) package or 14 pin DIL package. Of these, the 8 pin is by far the most common.

As far as the insides go, it has quite a reasonable amount of gain. The minimum is 20,000, but it is typically around 200,000. In fact, this value is only correct up to a few hertz, because after this it falls off at 6dB per octave. The reason for this is that the IC is internally compensated to stop it oscillating.

This compensation obviously works, because I have never been able to get one to oscillate – at least not when I want it to! Although the gain drop off may seem rather drastic, it is not nearly as bad as it seems. The feedback networks which are used with these amplifiers counteract the effect. This enables the op amps to give perfectly flat responses up to 20kHz and beyond. The only proviso is that the gain of the op amp has to be sufficiently high for the negative feedback to operate. This is usually no problem provided that the gain is not too high.

Some of the other important parameters are the input impedances. The two inputs (inverting and non-inverting) both have minimum values of 250kohms, and they are typically around 2Mohms. Usually this is high enough!

The IC is quite robust as well. It will withstand voltages of ±15 volts on each input and a total difference between them. It can also withstand an indefinite short circuit on its output, though it will get hot.

The supplies are not critical. Although it requires a positive and a negative supply it is not too fussy, tolerating up to ±18 volts, although some versions can take up to ±22 volts.

Useful circuits

The most common jobs for op amps are usually as straightforward amplifiers. However, they can be used in a very wide variety of other applications as well: high pass filters, low pass filters, multivibrators, sine wave oscillators, comparators, astables, peak detectors, peak to peak detectors . . . the list goes on almost for ever.

In terms of the amplifiers there are two basic configurations. The first is the non inverting type shown in *Figure 2*. This configuration

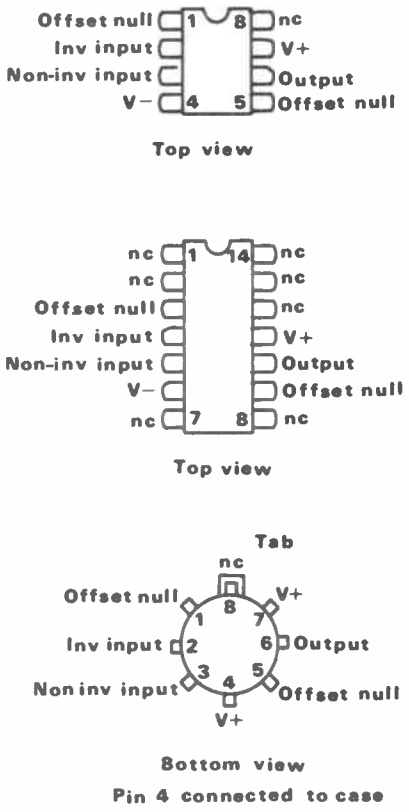


Fig 1 *Pin connections for various 741 packages*

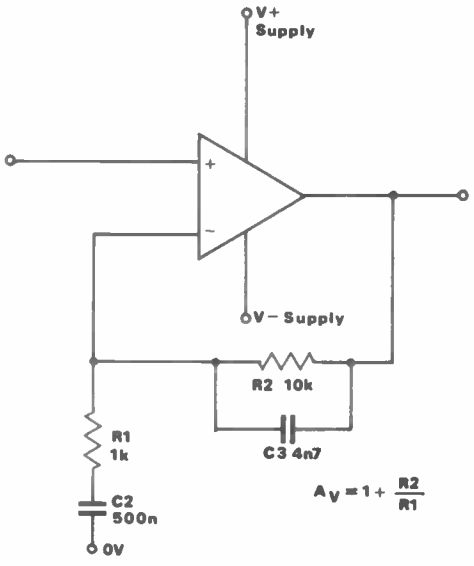


Fig 2 *Non-inverting amplifier*

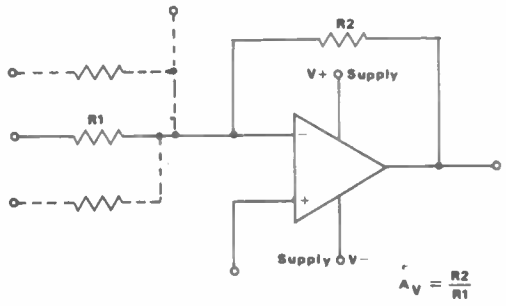


Fig 3 *Inverting amplifier*

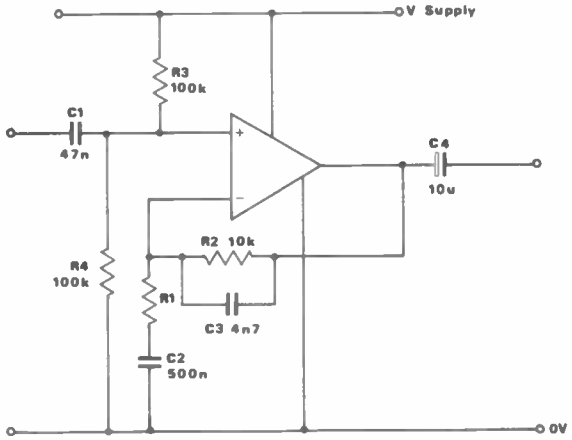


Fig 4 *Non inverting amplifier run from a single supply*

has the advantage of a high overall input impedance and it also retains the low output impedance of the amplifier. The inclusion of the capacitor C_2 ensures that the circuit has 100% negative feedback at dc. It can be used to tailor the LF response of the amplifier.

Values have been calculated for a typical circuit which may be needed. The gain is about 10 (11, to be exact, because the circuit uses standard value resistors) and it has its low frequency breakpoint at 300Hz. This is the point where the response has fallen to 3dB below the midband value. The capacitor C_3 is included to make the response fall off at the high end of the band. Again, this has been calculated to give a top end breakpoint at 3kHz.

The other form of amplifier is the inverting one. Unfortunately, this does not retain the high impedance of the amplifier itself – the actual impedance is equal to R_1. However, it does have the advantage that it can be, and is often used as an audio mixer or combiner. This type of circuit is called a virtual earth mixer. Its great advantage is that no input affects any other one. This is not true of other types of circuit. Values have been chosen for a gain of 10, and it is exactly 10 this time. It is possible to have different gains for inputs choosing different input values.

One of the disadvantages of op amps is that they require a dual supply. Fortunately, it is possible to run them off a single supply by simulating a dual supply, as shown in *Figure 4*. If this is done with a non-inverting amplifier (*Figure 2*) it is absolutely essential that C_2 is not an electrolytic, for the leakage through the capacitor will cause the output from the IC to rise and hit one of the voltage rails. Tantalum, polyester or ceramic types of capacitor are satisfactory.

Another point to watch when using 741s is the output or load impedance. Even though 741s have a low output impedance they are not man enough to drive a low value load without severe distortion. Generally, if a load greater than 1kohm is used, everything should be fine.

50MHz

by Ken Ellis G5KW

During January, we experienced some newly active solar eruptive regions, with corresponding periods of good conditions, and some prolonged periods of aurora. These are detailed by our correspondents later in 'From the mailbag'.

New European 50MHz activity

It has now been confirmed that from April 1st Dutch amateurs will be able to operate on CW from 50.000-50.450MHz with 30 watts. From Eric F9LT we learn that the French authorities are considering limited access to 50MHz on a regional basis.

There are two restricted areas where Band 1 transmitters are still operating, one in the north and the other in the south. No operation will be allowed within 150km of the stations, and between 150-200km power will be restricted to 3 watts; beyond 200km power will be restricted to ten watts. Eric has kindly agreed to provide maps of these two areas, which we hope to publish shortly. I do not like printing unconfirmed rumours, but I hope it is correct to say that the Belgian authorities are considering joining the French with some concessions for 50MHz. I will keep you informed if I hear of anything positive.

The recent exciting 50MHz QSOs with Botswana by G2ADR and five other operators, who luckily were in the right place at the right time, go into the record books to join the historic QSOs made by G5BY and others with South Africa during 1947.

The all time first QSO between G5BY and ZS1T on November 6th 1947 was an expected, conventional high MUF F layer QSO, which took place at the sunspot cycle peak just after the reception of Alexandra Palace TV in South Africa and crossband 23/50 QSOs. There were also other indications that the MUF would reach the six metre frequencies, and direct QSOs 'in band'.

Equipment at that time was home built, as no black boxes were available and SSB had not come into use in amateur circles. The unexpected and historic QSOs by Eric Parvin G2ADR and the other five successful operators with A22KZ of Botswana were by TEP, enhanced by isolated sporadic-E at the sunspot minimum. There had been no previous indication of a probable opening except the previous TEP conditions during the spring and autumn equinox periods. Success was due to dedicated monitoring over long periods, and an alert to others in the true ham spirit.

Steve G4JCC has sent me a long list of spring openings to South Africa during the peak years 1979-1982 of cycle 21. It covers five A4 pages, so is too long to publish in my column, but I will include a few details of cross-band 28/50MHz contacts. Early QSOs: 16.3.80 1645Z ZS6LN, 1635Z S3E; 1.3.81 1213Z ZS6LN; 4.3.81 1708Z ZS6LN; 7.3.81 1525Z ZS6LN; 9.3.81 1441Z ZS6XJ, 1710Z ZS6LN; 20.2.82 1152Z ZS6ZM; 19.3.82 1341Z ZS6BMS; 25.3.82 ZS6BUF; 31.3.82 2058Z ZS3E; 12.4.82 1100Z ZS3E; 12.4.82 1156Z ZS3E, 1245Z ZS5TR, 1320Z ZS6BT, 1335Z ZS5TR S9+20dB.

All observations and contacts were made using an indoor dipole, a converter and a general coverage receiver.

Extensive aurora during January

During January we experienced some very active solar eruptions, with corresponding periods of good propagation conditions due to the passage of a coronal hole and some new groups of sunspots, giving the highest solar activity for five months. With the A index above 20 for 10 days and the storm level producing some long periods of aurora, the peak arrived around the 17-19th. By the time this appears in print, we will know whether or not the 27 day cycle produced a repeat. In any case, it is probable that the March active period around the middle of the month will enhance the conditions for the spring equinox TEP activity.

On 2nd January, heard by GM3DGT, GB3RMK went A just before 1500Z. However, no answer to CQ calls was received. At 1509Z GM0FWV 42A telephoned GW3LDH and G4UPS. This resulted in the following: 1545Z GW3LDH 53A; 1656Z GI3RXV 59A; 1656-1911Z 18A QSOs. GM3WYL worked LA60J about 1530Z. The A index was 29 for 16.12.87; GM3MXN worked LA3TQ at 2230Z auroral E. There were several short As on the following days, but the next main ones didn't occur until 14/15th January.

GM4DGT arrived at his shack at about 1800Z and worked a few Gs up to 1930Z, when the A subsided until 2145. During the first phase, the farthest contacts south were G4XDZ (Kent) and G6XM.

At 2221Z, the OX3VHF beacon was 529. I worked G3JVL, and he said the beacon was 55A with him! The OX beacon went auroral from 2337-0027Z. On the 15th, in reply to a CQ call, I then worked LA3EG at 2222Z. From midnight onwards, GB3NHQ was 54A until 0200Z. Beaming west, I heard EI6AS, GW3LDH, G2ADR and G4GLT calling CQ DX until I went to bed at 0200Z.

From Ted Collins G4UPS, IO80JV; 14th January; with a solar flux of 117 and the A index at 05, an aurora was expected – or at least hoped for! First indications were heard on 15 metres, when all signals became 'fluttery' at 1645Z. Ten metres had been open from 1535 to KP2 and KP4, but no signals from W/VE. The GB3NHQ beacon became auroral at 1745Z. The first call heard on six metres was GM3WOJ; very strong, very auroral at 1800Z on 50.110. I heard him work G4JCC, then he went to SSB but was too distorted to copy.

GM4DGT heard very weak A at 1835Z. From 1850-2050Z he heard GM3MXN, GM3WLY, GI8YDZ, EI6AS, G8DYK and several others too weak to copy. Under these conditions CW is much easier to copy.

G3CCH worked GM3WOJ, EI6AS, GM4FGT, G3BGT, G4IJE and LA6OJ on SSB. The aurora must have been a very big one and it will be interesting to know how extensive it was in other parts of the world.

From John Baker GW3MHW: on 14th January, he noted the ten metre beacon 5B4CY in at 1415Z. At approximately 1730Z he heard CW by A on 50.212, then lost the signal and there was no further sign of it. Clearly, the A did not last long and was very patchy. John feels that a special frequency away from 50.100, 50.110 and 50.200 should be employed when calling CQ A. He suggests 50.150 be

50MHz Beacons January 1988

Freq	Call	Location	Watts	Antenna	Beam	Mode	Notes
50.015	SZ2DH	Athens					
50.020	GB3SIX	I073TJ	100E	3 el yagi	W	F1A	
50.030	CT0WW	IN61GE	40	Dipole	NE/SW	F1A	
50.035	ZB2VHF	IM76HE					Not operational
50.050	OX3VHF	GP60QQ					at present
50.050	GB3NHQ	IO91VQ	25E	Turnstile	Omni	F1A	
50.060	GB3RMK	IO77UO	20E	Folded dipole	N/S	F1A	
50.850	9H1SIX	JM75FV	25	5 el yagi	Various	F1A	
50.500	5B4CY	KM64PR	15	Ground plane	Omni	F1A	

E =effective radiated power

used on CW, and 5kHz away if the frequency is in use. What do readers think?

South African beacons: ZS2SIX-50.005; ZS1STB-50.010; ZS6LW-50.0225; ZS6DN-50.050; ZS2DH-50.015. The beacon for Ascension Island has now been completed (ZD8MB) so, hopefully, by the time this appears in print the beacon will be in operation.

The RSGB Contests Committee is organising a 50MHz fixed station contest from 1800-1800GMT on 2nd April 1988. See the January issue of *Radio Communication*, page 63, for details and rules.

From the mailbag

Ted Collins G4UPS, ex-ZD8TC and TR8DX, who had a 7 day permit until 31st December 1987, has been granted a 50MHz licence for 1988.

M A Barry ZD8MB/G4MAB (c/o BBC ARS, Ascension Island, South Atlantic Ocean) in a letter to G4UPS dated 1st January says: 'The two Tonna aerials have arrived and have been installed, together with the two element and a vertical 6m at the beacon site. I have started building a version of the G3FRE keyer now that all the components have arrived. IQD have promised to provide crystals for the project. Regarding the station at Gabon, I have been up to the beacon site to try for a contact on 50MHz, but no luck so far.'

His permit does allow him to operate during 1988, so let's hope we get a contact. His details are as follows: Philip Delcroix TR8DX, PO Box 231, Libreville, Gabon, Africa. His equipment has 40 watts output to a 4-element rotatable Yagi CW/SSB. He operates only in the evenings and at weekends, due to his job as a day worker at the international airport. He can be found on 28.885 and 50.110MHz. Other stations interested in 6m are Alan TR8JLD and Jon Louiz TR8JLD, of the National Radio Society AGRA, PO Box 1826, Libreville, Gabon.

Boulder WWV Indices for 1987/8

D/N	Date	Month	S	A	Act/Rg
335	Tue	1st Dec	90	3	2
336	Wed	2nd Dec	89	5	2
337	Thu	3rd Dec	88	16	3
338	Fri	4th Dec	88	5	2
339	Sat	5th Dec	89	13	2
340	Sun	6th Dec	88	9	2
341	Mon	7th Dec	88	3	2
342	Tue	8th Dec	91	2	2
343	Wed	9th Dec	94	2	2
344	Thu	10th Dec	93	14	3
345	Fri	11th Dec	94	12	3
346	Sat	12th Dec	98	10	2
347	Sun	13th Dec	94	3	3
348	Mon	14th Dec	94	2	3
349	Tue	15th Dec	97	7	3
350	Wed	16th Dec	99	29	3
351	Thu	17th Dec	95	13	3
352	Fri	18th Dec	93	8	3
353	Sat	19th Dec	92	3	2
354	Sun	20th Dec	90	6	2
355	Mon	21st Dec	94	6	1
356	Tue	22nd Dec	91	14	2
357	Wed	23rd Dec	91	11	2
358	Thu	24th Dec	93	7	3
359	Fri	25th Dec	102	7	4
360	Sat	26th Dec	102	4	3
361	Sun	27th Dec	102	1	1
362	Mon	28th Dec	106	5	1
363	Tue	29th Dec	105	5	2
364	Wed	30th Dec	103	2	2
365	Thu	31st Dec	103	3	2
1	Fri	1st Jan	104	4	2
2	Sat	2nd Jan	105	4	3
3	Sun	3rd Jan	105	12	3
4	Mon	4th Jan	102	15	2
5	Tue	5th Jan	103	16	2
6	Wed	6th Jan	105	24	3
7	Thu	7th Jan	106	13	3
8	Fri	8th Jan	109	18	3
9	Sat	9th Jan	111	5	3
10	Sun	10th Jan	104	3	6
11	Mon	11th Jan	108	11	6
12	Tue	12th Jan	114	18	4
13	Wed	13th Jan	117	5	6
14	Thu	14th Jan	118	18	6
15	Fri	15th Jan	122	45	7
16	Sat	16th Jan	127	8	6
17	Sun	17th Jan	120	5	4

50MHz DX standings

Geoff Roberts G3ENY of Bridgnorth drew our attention to the DX Standings List which appeared in *QST* in November 1987. The full 50MHz DX Standings List is too large to be published in this column, but some extracts are included. If you are a top 50MHz DXer you should send your claim to Bill Tynan W3XO by September 1988. Reports must state each country worked, one station worked in that country, an indication as to whether the contact was two-way on 6 metres or cross-band, the date of the contact and whether it has been confirmed by receipt of a QSL. Top of the list is Bob VE1YN: 82 worked, 81 confirmed, truly a remarkable achievement! He is followed by JA4MBM, with 81 worked and 79 confirmed.

Coming down the list to the British Isles and Ireland, the following claims appear (the first figure is the one claimed; the second has been confirmed): GW3MHW 18/15; GW3LDH 14/10; EI2W 13/-; G4BPY 11/11; G3COJ 11/7; GJ3YHU 11/3; G5KW ★ 9/4; GI3ZSC 8/-; G4JCC 6/4; G4GLT 6/-; G3PWK 6/-; GU2HML 5/-; G4HUP 5/-; G4JLH 5/-; G2AOK 4/-; G4BAO 4/-; GM4FZH 3/- (★ means some contacts made from locations more than 150 miles apart).

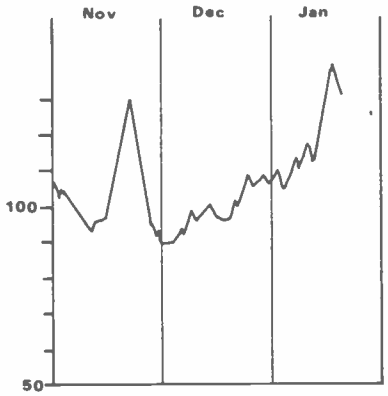
G5KW, incorrectly reported as WAC 6/6, should be WAC cross-band. Gordon G4BPY also made WAC cross-band. Brian G3COJ also had a QSO with VK6OX, but as he did not consider his South American contact a 100 per cent QSO, does not at present claim WAC cross-band. Better luck this cycle, Brian.

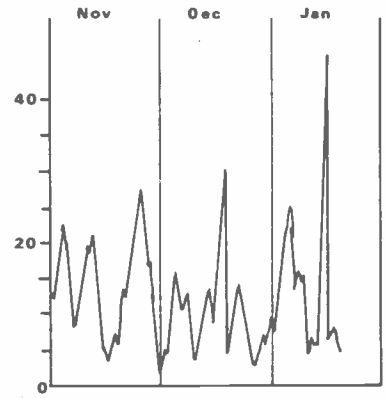
As mentioned in an earlier column, due to controversy about the legality of some countries, I have refrained from publishing a six metre ladder earlier. Bill Tynan states: 'Credit has not been granted for contacts with stations known not to have authorised 6 metre operation at the time of the contact. Totals are those worked by stations operating from a single location or multiple locations within a radius of 150 miles. Countries are those listed in the latest ARRL countries list, but countries deleted and worked prior to deletion are included.' Some of the numbers listed are less than the numbers claimed. I have written to Bill Tynan for clarification, and will publish his reply when I receive it.

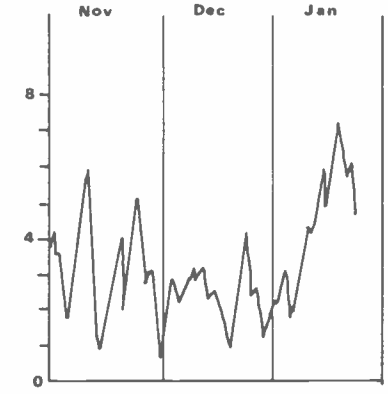
For stations with claims in the 80s, WAC 6/6 is a distinct probability, and all credit is due to Jim Trebig W6JKV and others who have mounted DXpeditions to countries where no six metre operation has previously taken place. Which of the top runners will have the historic distinction of being the first to make WAC 6/6? Is it too much to expect it during cycle 22?

We are indebted to Geoffrey Roberts G3ENY for the graphs of useful solar data from WWV and Radio Australia illustrated this month, showing the trend since the minimum between cycles 21 and 22, with the sharp upward turn towards the peak of cycle 22. Using the 27 day monthly cycle, a rough forecast of future active periods may be approximated. We hope to update these from time to time.

That is all for this month. Please send your reports and any items of interest to Ken Ellis G5KW, 18 Joyes Road, Folkestone, Kent CT18 6NX.







News and comment from Glen Ross G8MWR

We now have evidence that there is life after death. Last month in a note about repeaters I asked what had happened to the Sheffield SSB unit; this came on air several years ago on a trial basis and then got lost somewhere in the depths of Sheffield University. Hardly had I sent the copy in when news arrived that this repeater had returned to active life. As always happens, the news arrived just too late to get it into last month's edition. You may remember that my comment was that this was a repeater which no one, except the originators, actually wanted.

Sour grapes

As I am not known as a great lover and user of repeaters – although I readily admit that there are advantages to be gained when they are used for the intended purpose – you may feel that this is just a case of sour grapes; not so. Let us take a look at the thinking behind the original experiment. Firstly, it has to be said that the original idea was not, and is still not, to provide a super DX repeater. The original thinking had to do with spectrum use, not increased range.

Back to basics

The British repeater system is based on using 25kHz spacing between units and uses eight output frequencies between 145.6 and 145.775MHz, the input frequencies being 600kHz lower than the output. The continental system allows for another repeater with output at 145.8MHz, but this system has not been implemented in the UK. This results in an attempt to spread out a repeater system using only eight frequencies, so that it covers the whole of the country without causing mutual interference. You may feel that this is a long shot – and you would be right.

The real world

What actually happens is that well-sited stations, usually running far more power than they need to use, are able to get into more than one repeater even under flat band conditions. When there is a lift, things get even worse. One problem is that people working on the more distant repeater cannot even ask the offender to move, for the simple reason that the output of the repeater that he is using actually covers the output from the more distant one. Because of this unfortunate fact, he can't hear the frenzied calls, usually accompanied by a certain amount of speculation about his parentage, that are being hurled at him.

An answer

One way of getting round the problem is to close the repeaters up to 12.5kHz spacing.

Now people will tell you that you can't work at this spacing with the rigs currently available, because of the type of filter which is fitted. This is only true if you have a very large signal on the adjacent frequency. If the physical spacing of the repeaters is properly planned, this should not happen.

Try finding an S9 signal on the band and then tune 12.5kHz away, then you will see what I mean. Repeat the experiment with signals of varying strengths and you will soon see just how strong a signal you can work close to.

Added benefits

This system can be refined even more by running two grades of repeaters. We could keep the present high power units on the frequencies they now inhabit, but put a second lower powered system in the spaces between the major units. This would enable us to have a secondary system, each repeater being designed specifically to cover a particular town and its immediate area.

This is a system which works well in the States; as an example of just how many units you can accommodate in a small area, I found I could get into seven different repeaters from a hotel room in Washington DC, running a two watt handheld and a rubber duck – try that over here!

Another way

A good alternative would be to actually reduce the bandwidth used by the repeater so that you could cram even more into a given space. This is a ploy used commercially where spacings of as little as 5kHz are now used. In our 200kHz designated repeater band this would allow for 40 discrete frequencies. The other answer would be to go to an SSB repeater system; then the benefits would really begin to show because we are now talking about bandwidths of around 2.5kHz on some 80 repeaters, each on a discrete frequency.

In practice, a certain amount of breathing space would probably be allowed, but it would be reasonable to expect around 60 frequencies to be used. We would probably still get repeaters using the same frequency but, if you remember the large geographical spacings that would be possible when using such a large number of frequencies, I think you will agree that the chances of mutual interference are for all practical purposes non-existent.

Go SSB!

It does seem to be the answer to all our prayers, but do any snags accompany the advantages that we have seen? Let us review the way in which the normal FM repeater works. We will assume that the repeater is not in use at the moment. Your signal is picked up on the aerial, goes through the filters to the Rx and opens the squelch. The logic sees an incoming signal, checks for a toneburst and, if everything fits, switches on the Tx and connects the output of the Rx to the input of the Tx, and so your signal is repeated.

No carrier

At certain intervals the logic inserts the repeater's callsign and looks after the housekeeping, provided that your carrier is still there. The limiters also smooth out the tremendous variations in incoming signal strength, so that the receiving station is not aware of all the QSB. All this sounds as though it could be done on SSB – except that all these functions depend on having a carrier. On SSB we do not have one.

Big problem

The real nut to crack has yet to come. To recover information from SSB, the carrier insertion oscillator has to be set with an accuracy better than plus or minus 50 hertz. If an audio pilot tone is to be filtered out, then an accuracy of plus or minus 20 hertz is nearer the mark. This is easily achieved using manual tuning, but the repeater has to do it automatically. Due to the fact that the frequency readout on your rig is not 100% accurate, the repeater needs to be able to tune over a range of about plus or minus 200 hertz to be on the safe side.

Worst case

This assumes that the spread in calibration accuracy between all the rigs that are going to use the system will not be worse than about one part in a million, and that is a tight specification to hold.

To solve this the CIO can be controlled by some form of automatic frequency control system, which is often implemented by using a phase locked loop so that it adjusts itself to your requirements. The unfortunate thing is that this also needs a carrier to operate it, and we still have not got one. 'Easy,' you say, 'insert one'.

Two ways

Relying on you to provide the carrier is the easy option for the repeater builders to take, but it does present difficulties of its own. Because the carrier is placed at the edge of the passband it will be vulnerable to adjacent channel interference, and that is one thing we are trying to avoid. There is also the possibility that, if there are any non linearities in the chain – and there are sure to be some – a phantom sideband will be produced.

Just switch on

A second solution which overcomes these difficulties is to inject an audio tone at your transmitter. This is known as the pilot tone system. It satisfies all our requirements and has the additional advantage that you do not have to dig around inside your rig to provide it. A simple switch on the rig, so that you can throw in a signal from the usual repeater toneburst when using SSB, will do the trick. If you do not want to do that, a simple audio oscillator in an add-on box in your microphone lead works wonders and can also be used on any rig, provided that you have suitable socketry connected up. The Sheffield system will not let you use anything so simple.

Horror!

Get inside the rig? Not me! But this is what you are going to have to do if you want to use the Sheffield design. The carrier they want is around 10dB down on your power output, and for a 10 watt rig this means allowing one watt of carrier to escape, or 44 watts PEP if you are running the full legal limit.

Now the makers have spent a lot of time in setting it all up so that virtually no carrier gets out. Nevertheless, you now have to dig in and throw the system out to get a carrier back.

Unfortunately, you will also have to get back in after you use the repeater to tune it out again, otherwise everyone you contact is going to be complaining about the horrible whistle they can hear on your transmission.

Makers' options

Eventually the SSB repeater system will be here to stay. The advantages to be gained from the extra channels, and the ability of most repeaters to have a dedicated channel, far outweigh any extra complication.

It has been claimed that the carrier system will become the standard and that the makers will provide this facility. This may be true, but I doubt it. Most design teams would rather simply wire in the already existing toneburst than engineer the 'leak' system (if they do fit a carrier insertion switch I will explain how to nail jelly to the ceiling!).

Conclusions

Remember that the unit is not a DX machine. Are you going to get out your spectrum analyser and adjust the carrier every time you use it? Then get out the test gear and 'fix the leak' when you want to operate simplex? I started by saying that it was a repeater which no one wanted; well, do you want it?

Readers' news and comments are welcomed, and should be sent to the editorial address on page 3

SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

I've just had an example of what I call the bus syndrome. I've not seen a short circuit valve audio output stage capacitor for ages, in fact I'd almost forgotten the symptoms, when in came two sets featuring low audio output. The first repair was a Heathkit GR64, which was a valve general coverage receiver that I'd bought at a rally for a fiver, sold as non-working.

It did things, like light up and tune stations in, but there was no difference between volume a twentieth of the way up and flat out. Like a true wally, I took the covers off and put the audio output value into the valve tester, which showed good. I disconnected the speaker and worried it with a pair of AVO leads, AVO set on low ohms: click click.

'Headphone socket,' thought your scribe, again barking up the wrong tree. I reconnected the speaker and tried again with the AVO leads: again AVO click click, though not quite so loud.

'Low HT then,' I thought, really warming to the task of getting it all wrong. I turned the set on and checked the HT, which struck me as a bit low, being a gnat's under 200 volts.

Then I noticed the smell, one of hot paint. I whipped out the mains plug, and stuck in my finger to see what was cooking, burning it on a hot audio output transformer.

It really is amazing how you can forget things. Even then, I disconnected the transformer and checked it to earth, firmly expecting a short in it to deck, which there wasn't. The anode of the valve was a short to deck, though, and it was then that I noticed an innocent-looking .01μF 250V dc working capacitor going from anode to earth.

Like a true artist, I snipped the bugger out. In with the mains plug, and I drowned out the lab with a goodly loud dose of Radio Free China blasting away in the 'exclusive' amateur band of 7MHz. Turning the volume down, joy of joys, it was all spitchy. In with the 'scope, and there were dollops of 40kHz lurking around the audio stage, about 250ms worth of it which we shall call a quarter of a second, after each speech peak. Slowly, the brain functioned and I soldered in a replacement .01μF capacitor, but 450 volts working. The set now works.

If you still aren't with it, refer to *Figure 1*. The capacitor from the anode to deck has more or less the full HT on it in the quiescent state, ie, no audio output. When there is audio there is a considerable ac voltage swing on the anode, and consequently across the capacitor. Due to ringing, back EMF and what have you there can be twice the HT voltage across it at some stage of the game, thus a highish dc volts working is required. Why is it there? Well for starters, it sure removes any tendency towards instability, as you can see from my tale of woe above.

Trio JR59DS

I'd literally only just screwed the covers back on the Heathkit, when in came a 'friend' carrying a dead JR59DS. The symptom of the fault was low audio output. Without turning it on I opened it up, checked the audio output stage capacitor, which was a short, replaced it and gave it back. It's a nice feeling to be called a genius occasionally. Little did he know that if I had done his set twenty minutes earlier...

Heathkit GR78

Some people call this all solid-state portable receiver a Mohican replacement. Personally, I would say it's streets ahead. The image response is considerably better for a start, it's got a much more sophisticated circuit and it uses more modern devices. We are talking of a thirteen transistor superhet that is single conversion 190kHz to 18MHz, with an IF of 455kHz and a double conversion superhet with 4.034MHz and 455kHz IFs from 18 to 30MHz.

It is the higher IF on the higher ranges, incidentally, that gives the set a better image response. Imagine a set tuned to 30MHz with a 500kHz IF. I've used 500kHz because the maths are easier than for the more standard 455. With a local oscillator running high, we have to have it running at 30.5MHz. The image, or additive mix, is thus 31MHz. An average single tuned circuit, ie one coil, one capacitor, isn't going to give you much rejection 'twixt 30 and 31MHz. In fact, you will be lucky to see a few dB by the time misalignment and poor tracking have crept in.

Now consider a receiver with a 5MHz IF, again taking 5MHz to make the maths easy. The local oscillator must now

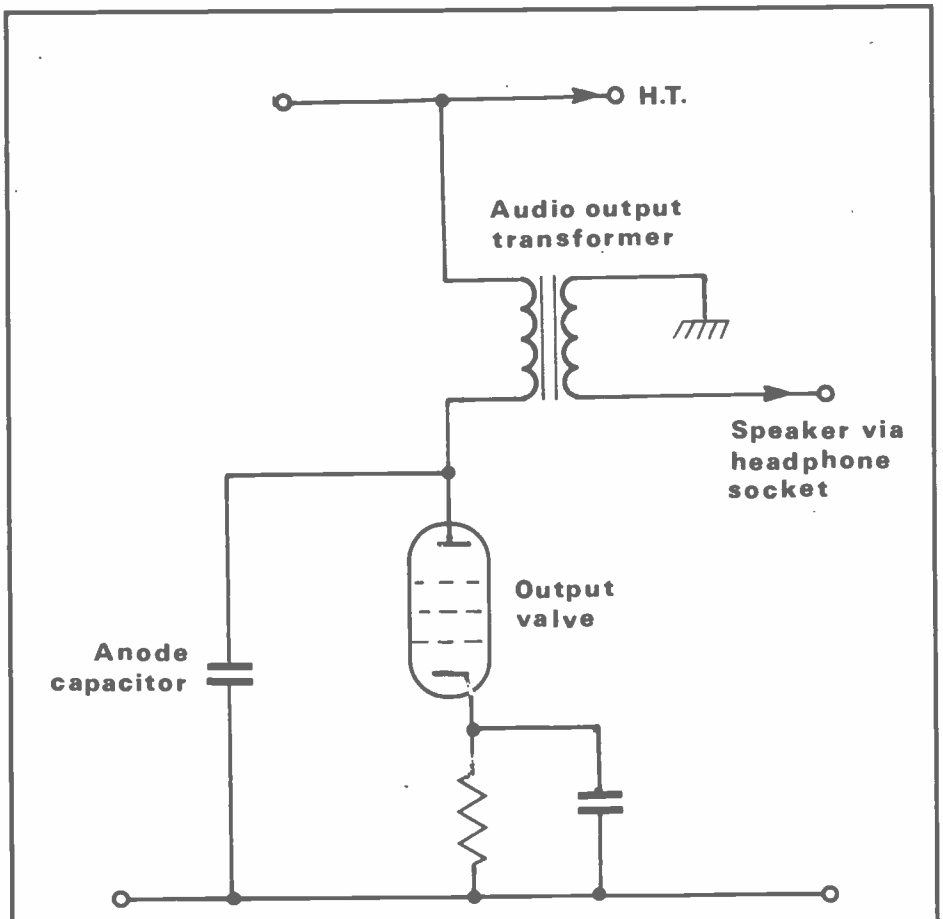


Fig 1 *Typical valve audio stage*

poggle away at 35MHz to receive 30MHz, but consider the image. This will be at 40MHz, ie, 35 + 5, and a coil resonant at 30MHz is much more able to reject 40MHz than the previous 31.

To return to the GR78, there are the delightful 40673 dual gate MOSFETs in the RF, mixer and first IF/second mixer stages, and a single gate FET is the local oscillator. Chuck in a handful of ceramic resonators down the IF and you have a fairly sophisticated animal, well under a microvolt on SSB/CW. Image response is, in the light of the above lecture on higher IFs, worst as we come up to 18MHz as a single conversion superhet, and is typically about 25dB down, back out to 35dB at 30MHz (because the IF has gone up!).

One weird characteristic of the GR78 is in the NiCad pack. Although you can charge it from the mains via the internal power supply, it will also charge from an external 12V dc supply. When you do this, the dial lights can come on, even with the set switched off! This is due to the bulb being used as a constant current source on 12V charge. A word to the wise – replace the bulbs with ones of the correct wattage.

Price-wise we are looking at EC10 money, about £45 to £55 depending on condition, and a tenner tops for a dead 'un. They don't seem to sell too quickly, probably due to not being well known, but performance-wise I'd back a GR78 against an EC10 any day. Mind you, the EC10 would probably come out best if both were thrown down a flight of stairs!

Redifon linear GA406

This is a big boy's machine. Two off QY4-400s should tell you that we are talking about the best part of a kilowatt. It is to amateur legal power levels what a Formula One racing car is to the 30mph speed limit.

Before I discuss the merits of this over-engineered HF linear, I must issue a word of caution. The innards are lethal. Not *maybe* lethal, *are* lethal. The big red warning on the first page of the manual makes sobering reading. Please read it. I'm normally a big fan of buying up non-working tat and getting it going, but this machine in the wrong hands is a killer. If you don't know what you are doing, don't buy one of these. We are discussing nigh on 3kV at over half an amp capability. You don't get second chances with surge like that.

Right, that's the end of the serious bit. Does it work? That's like asking if the Pope is a Catholic. For genuine power levels, it's hardly trying. What use is it to a legal amateur? Well, your average HF wonderbox is about flat out on normal legal SSB/CW power levels. These two modes do not have high duty cycles, ie, the PA devices are only working their nuts off about 30 to 50% of the time.

Get interested in modes such as SSTV and FM, for example, when you can have a 100% duty cycle, and overall rig reliability will suffer. Wheel in a big linear, capable of the 'California Kilowatt', and you will only need 30 watts or so out of your wonderbox to drive the linear up to the legal limit, where the linear sits and hardly ticks over. Thus, the rig is unstressed so there are no expensive repair bills, and the linear, especially a well built one like this big Redifon, will last for ages.

The GA406 is big, real big. It weighs in at an awe-inspiring 100lb (45kg, if you must); it nearly crippled the wife carrying it in. Most variants seen on the amateur surplus market seem to be 19in rack mounters, so they are 19in wide (obviously), the same deep and nearly that high. Consider it a 19in cube and you are not far out.

The GA406 was more or less designed for SSB HF use, mainly marine. It covers 2-18MHz – more on this later – and was originally designed to have four operating channels, three preset and the fourth continuously tunable from the front panel.

Now preset channels may not seem to be of a lot of use on amateur bands, and lots of people have taken out all the preset gubbins leaving only the front panel tune. In two ways this is a good move.

One, it's got a uniselector in it. Uniselectors and me don't mix. All mechanical gubbins, pages in the handbook dedicated to setting the damn things up with feeler gauges, etc – yuck. In my book, uniselectors are beaten only by re-stringing dial cords as my least favourite job.

The second reason for hauling the preset facility out is that all the gubbins in there is adding capacity to the PA tank circuitry. Extra capacity equals lower frequency response; if you haul it out the frequency response will go up. It goes from only about 'evens' on 22MHz-ish, to 30MHz-ish.

What I am trying to say is that with the pre-select left in, the linear will give 100 watts out at about 22MHz for 100 watts in. Nip it out, and the thing is moderately useful on 21MHz. You will need 75 watts drive for full legal, but it will now do it.

My one regret about having no pre-select on mine is that it would be rather nice just to flick a switch and be ready to go on 14.230MHz, the SSTV (Slow Scan Television) channel. You win some, you lose some.

Talking of frequency coverage, that 2MHz lower limit is nominal. They *will* work on Top Band, so I'm told, but naughty, naughty.

The valves are QY4-400s, also known as 7527s or CV5959s. I often wonder if the person issuing CV numbers was an amateur with a sense of humour! These valves are breathtakingly expensive new, and only occasionally available at resonable surplus prices, say £15 to £25 each. Even at that sort of money you are having a lucky day, believe it or not.

Considering the cost of the valves, a working example of the GA406 goes surprisingly cheaply. I've seen them sell for between £60 and £120 in the last year. These days a big new amateur bands linear will come nowhere near the quality of these will cost you serious money, nigh on telephone numbers. So, if you have the room, and acute financial cramp, it's well worth considering. You ain't going to use it on 28MHz, or CB(!), but, man, does it motor on all bands 80 to 20.

Incidentally, when I work on a GA406 there is *always* someone with me. Someone who knows to turn the power off and then kick me clear. I never work on one alone, even when it's turned off.

There are two faults, apart from that sodding uniselector. The first common problem is the change-over relay. Lazy amateurs, myself included, don't bother to run a switching line into the linear from the rig, they rely on the built-in RF switching. The relay thus chatters away, but one day it will stick, ie 'on' transmit, and refuse to drop out. The proper cure is to replace the relay. Bodge? Stick an inch of Sellotape on the moving bit of the relay, see *Figure 2*.

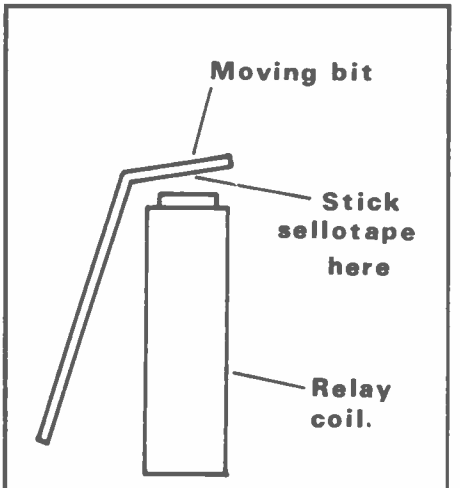


Fig 2 *Bodging, to stick the relay*

The second common fault (well, I've done two like this in three years) is that the heater transformer burns out. Not as easy as it sounds, this one. It's five volts for starters, but it's also low capacitance to core because the circuit is grounded grid, ie, the cathode's driven. In one repair, I actually used the correct replacement – oh, the shame and indignity of it.

In the second, we used a transformer designed to light up a pair of 813s similarly driven, gently modified. Don't wop in a standard 6.3 volter, because you are going to have drive problems and a short valve life.

Incidentally, RF-wise, the circuit is grounded grid. For dc volts, the screen grid is at ground potential, to form an electrostatic screen 'twixt input and output.

To this end, it works well. No signs of any instability in any way, shape or form on every one I've worked on. It does mean, however, that the grid 1 and cathode are 600 volts *down* on chassis, so there are nasty, dangerous dc voltages lurking where you least expect them. The anode sits up 2kV.

To sum up, the oft seen for sale GA406 is a well made, very cheap, high power linear, capable of producing much power from 2 to 18MHz but very, very dangerous to work on. Treat with care. Even *I* use the handbook when working on these!

PROJECT BOOK

by Martyn Williams

This month we continue on the subject of colour coding of components. Having looked at the codes used on resistors and fuses, we now move on to the bewildering methods of marking capacitor values.

The good news

This is that at least the same basic colours are used, so there is nothing new to learn here. There are many ways of actually applying the codings and the more common methods are shown in the diagram. We also have to grapple with the fact that there are at least two ways of showing the value, and the one used depends on the type of component. If the capacitor is a polyester or ceramic type, then the value shown will be read using the same method as employed for decoding resistors, and the final result will show the value in picofarads. If the capacitor is a tantalum type, then the final result will be the value in microfarads.

More to come

There are, however, some new tricks to learn and the first of these is the band that shows the voltage rating of the component. This is positioned as shown in the various drawings, and indicates the voltage rating as shown in *Table 1*.

One to go

Just when you thought that you were out of the wood, along comes another colour band, this time the one to indicate the temperature co-efficient of the component. This is the amount by which the actual value of the capacitor will change from the stated value per degree centigrade change in temperature. The change may be a result of the component heating due to the current passing through it, or to a change in ambient temperature. It is usually, of course, due to a combination of the two causes. The effect is shown as parts per million per degree centigrade and is always indicated using the colour coding shown in *Table 2*.

Stability

As can be easily seen, all except one of the tolerances shows a reduction of capacity with a change in temperature. This is what causes your home made VFO to drift. The trick is to use a suitable combination of negative and positive drift types so that one cancels the drift of the other and so stability is maintained.

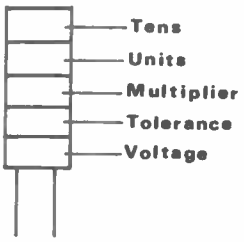
Black	10V
Brown	100V
Red	250V
Yellow	*
Green	16V
Blue	20V
Grey	25V
White	3V
Pink	35V

Table 1 *Volt ratings*

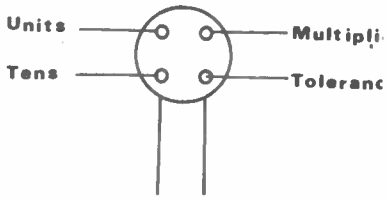
Black	0
Brown	−30
Red	−80
Orange	−150
Yellow	−220
Green	−330
Blue	−470
Violet	−750
Grey	+30
White	*

Table 2 *Colour codings*

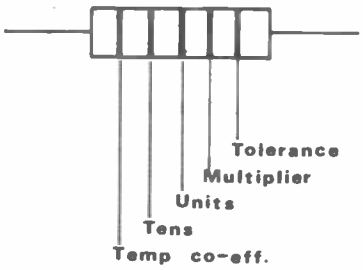
Capacitor outlines and code systems



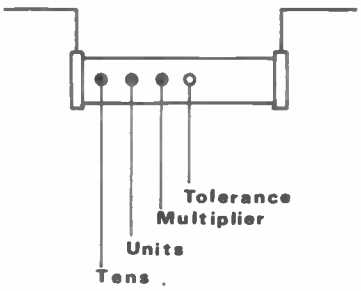
Polyester



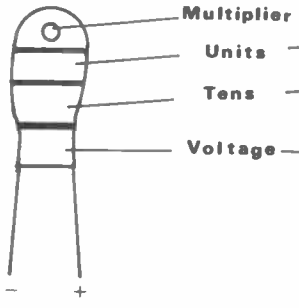
Disc ceramic



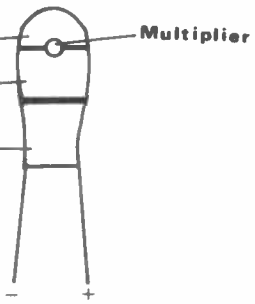
Ceramic (A)



Ceramic (B)



Tantalum (A)



Tantalum (B)

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■ MTV435 435MHz ATV transmitter, £100. JVC GX44E colour video camera with zoom lens, instruction book, £135. MMC435/600 ATV converter, £15. Tel: (03977) 416

■ 934MHz Reftec Mk1 mobile transceiver, works well, £85. Tel: (0702) 512814 Southend

■ Pye HF transceiver 1.6MHz to 10MHz valve rig, QRP, fone, cw ex-WD built in ATV, 12 volts dc to rotary transformer, also built in. Portable or base station VFO or xtal-controlled headset, mic, working order, weight 30lbs, buyer collects or pays postage, £75, handbook available also. No 10 set with details, £35, needs power supply and slight attention. Mr Bent, 97 Nottingham Road, Selston, Notts NG16 6BU. Tel: (0773) 810010

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■ 2 Binatone 27MHz FMC36, 1 Mustang 27MHx FM CB, £20 each, can be converted to 29MHz. FR400 Rx, all options, £120, carriage extra. Duncan McFarlane, 23 Gateside Ave, Bonnybridge FK4 1AX, Tel: (23481) 4269

■ 13.8V dc 25A linear PSU, £25.00; 13.8V dc 15A PSU, £15.00; army transceiver No 38 (Marconi) complete but untested, ideal for spares or rebuild, £12.00. Navy d-beam monitor mini-scope with PSU, complete but untested, £15.00. Bradley Electronic multimeter (solid state) dc-1500MHz with RF probes & manual, £18.00. S G Brown professional headphones, £5.00; 2m mobile whip & pod, £3.00; mobile h/held PTT mic, £3.00. Mobile 12V PSU for scanner, Rx's Bearcat, SX200N etc, £5.00. 4 off h/duty ribbed ae insulators, £3.00. 13A, 6 skt mains distribution block, £5.00, boxed Tx parts, caps, chokes, meters, PSU modules, £5.00 the lot. Over 100 mostly new or boxed valves octal, big, B9A etc, £20.00 the lot. 50ft of 300Ω ribbon cable £3.00. Approx 100' of unused ½" RG214 tx, coax £5.00. G4FZG QTHR Tel: (0242) 580329

■ Deceased sale, BRS 90083 Racal receiver RA1218, £150. Racal receiver RA117E, £100. Wayne Kerr universal bridge CT492, £30. Electronic multimeter CT471, £40. Thermal noise generator CT82 15kHZ/160MHz, £25; standard telephone attenuator 1-90dB type 74615A, £35. Marconi signal generator TF144G 55kHz/25MHz, £40. Avo valve tester mk IV, £35. Advance FM/AM signal generator, type 63A 7.5MHz/230MHz, £60. WD oscillator test set, CT212 85kHz/32MHz, £30. Commodore mini computor SR1800, £15. Send for list. Mrs Stanley, 21 Kewhurst Ave, Cooden, East Sussex TN39 3BJ. Tel: Cooden 2829

■ Ham International Jumbo base station, FM/AM/LSB/USB/26.965 to 28.305MHz. First class order throughout, recently overhauled by professional radio engineer, and valued at £275. Will exchange the above for Nato 2000 mobile, or Cobra 148 GTL DX *plus cash adjustment* of approx £100, to include post, packing and insurance. Please write in first instance enclosing an SAE. Only the above mobiles will be considered in p/exchange. Advertiser, 134 South Seton Park, Port Seton, East Lothian EH32 0BN, Scotland

■ Trio R1000 communications receiver, 200kHz to 30MHz, SSB CW and AM, £185. Tel: Chester (0244) 351154

■ Icom R70 rcvr + FM + DC kit, mint, £450. Hallicrafters Sky Champion, £40. BC348 rcvr, £45. Marconi RC0SC TF1370A, £25. XTAL CALIB no 7, £8. Thermal noise generator 15K – 160m, £10. Philips 3WB 1937 mod 727A GW0, £45. Pye 4WB 1950 mod P76 GW0, £30. Regentone 2 spkr 1949 MODU353 GW0, £40. Dawe white noise gen mod 419C, £30. Armstrong stereo tuner/amp mod 226, £35. QST mags 1935-1975 offer complete or single years. K. Hindle. Tel: 061-9627 7577

■ 934MHz Nevada P7M-E, mobile mag mount collinear, £35 ono. Adonis MM2025 mobile mic, fitted with 8 pin socket for amateur radio, £20. Altai lightweight rotator, £15. Postage paid on the collinear and mobile mic or buyer can collect. Or swop for HF amateur band receiver in working order. Swop 208 track tapes assorted titles for 10 to 15 Country & Western twin track cassette tapes. Or Traditional Jazz or WHY. Mike. Tel: (0704) 892088

■ Ham international jumbo, suitable for conversion to amateur band, AM, FM, LSB, USB etc. Open to offers or WHY amateur radio wise. Tel: Mervyn (0474) 874480

■ 50MHz Meon transceiver kit 144MHz IF, CW case to feet to solder etc. Will swop for Acorn computer with or without extra memory or WHY radio wise. Craig G1EHX QTHR. Tel: (0989) 62551

■ Superstar 360, suitable for conversion to 10MHz, £120. Amtec 300 ATU, offers over £12. Tel: (0283) 221870

■ Heathkit SSB HW100 Tx/Rx vgc with manual, offers. Eddystone Rx S640, good working cond, 1.8-30MHz, offers. Mr Fegen. Tel: (05754) 325

■ SX200N VHF UHF scanner covering 26-88; 108-180; 380-514MHz AM and FM 16 memory channels, memory and band scanning, various modes with squelch and fire hire. Excellent radio in immaculate condition. Complete with PSU, £180 ono. GD Make. Tel: Carlisle (0228) 35177 after 6pm

■ Icom IC240 2m FM Tx/Rx, £85 ono. FDK multi 750A FM/SSB 2m Tx/Rx £280 ono. Pye PF1 Nightcall for PF1 Tx/Rx, £15. MM E counter 50MHz, £45 ono. Also wanted fdk Palm 4 70cm Tx/Rx and 2m FM handheld. Tim G8HEB. Tel: (021) 358 0524

■ HF Communications receiver Rx Century 21. Century 21 same as 5RX 30 or Drake SSR1, 500kHz to 30MHz in 30 bands. Product detector for SSB. Switched sidebands AM USB LSB. Outstanding performance all round, as new with manual. ac mains or 12 to 15 volts dc, £185.00. Tel: 01-785 9325

■ IC02E, cased since new, spkr/mic, mobile headset, two NiCad cases plus NiCad and chargers, £200. FT709R(4) PA3, mobile headset, CSC-10, mint, 6 months old, little used, £200. IC71E Rx mint, CW, FM units fitted plus remote controller. Boxes, manuals, etc, for all above, £650 ovno. Tx/Rx with gen coverage Rx considered in p/x for any of above. John. Tel: (0375) 674301 after 6pm

■ FT208 hand-held speaker mic, spare NiCad pack, hard case, £175. Tel: Calne Wilts (0249) 812329

■ Sommerkamp TS-788Dx, NATO 2000, Eddystone S640, Philips D2999, other FM/AM SSB CB rigs etc for disposal or exchange. Bill Hall, 1 Crookhill Ter, Ryton, Tyne And Wear NE40 3ER. Tel: (091) 4132707

■ Vintage radios: 1927 AJS Symphony Three, 1923 BurnDept Ethophone 'V', 1927 BurnDept Screened Four, 1926 Brunswick Panotrope very first valve record reproducer, rare, massive!. Gambrell C1929 mains console Philips Collection. Seven radios 1930 to 1935 includes models 2634, 930A, 940A, 830A, 834A, 634A, 580A, all first class, as one lot only. Ekco's SH25 console, M23, 313, sell or swop, want early American mains radios, Drake R4C, good HF tranceiver. Jim Taylor G4ERU, 5 Luther Road, Winton, Bournemouth. Tel: (0202) 510400

■ ICOM 720A all band transceiver with general coverage all solid state 200W input twin VFO PBT IC-PS20 power supply IC-SM5 desk microphone, original cost £1159, all mint, as new, £625. Buyer tests and collects. G4LW. Tel: Trowbridge 3166 anytime

■ Moving house clearout, FT726R with 2m, 70cm, HF and satellite modules plus microphone, £870, no offers. ICOM R70 comms rcvr with FM, £500, no offers. AOR receiver for two metres, £60. (Hand-held) Spectrum plus. 50 games, joystick, datacorder, £85. Trio R-600 comms rcvr, £220. Colour TV dodgy sound but ok if you switch it off and on occasionally, £25 with stand. J Barton, 51B Brownhill Road, Catford, London SE61 2HB. Tel: 01-248 4252 or Mike G1XGM tel: 01 461 5398

■ Concord III Ham International, offers over £150. SX200 Jif in good condition, £170, no offers. Tel: (0283) 221870

■ Commodore 64 monitor, green screen, never used, as new, £40. Buyer collects or will swop for Mamod model steam engine, must be in vgc. Brian. Tel: Farnborough 512028

■ Super De-luxe Roller Coaster by E F Johnson, USA, all ceramic, new 1kW plus, £35. RCA headphones for AR88, brand new, boxed, £9. AVO 8, real leather carrying case, unused, £25. Sentinel HF pre-amp, new, boxed, £14. WW2 German army field telephone, very good condition, £28. All plus postage. G3GUU QTHR. Tel: (0995) 40387

■ Icom 1C251E mint, she says I have to sell, offers, about £360. Yaesu FT290R, fitted very smart toneburst, only works when repeater closed, offers around £250. MM linear 30 watt, offers about £50. Julian G6LOH 29 High St, Whittlebury, Towcester NN12 8XH. Tel: (0327) 857766

■ FT290R, original, exc condition, mobile mount, new Nicads, charger, plus 30W linear amplifier with built-in pre amp, £290 ovno. Also available: storm damaged 8 ELE Quad, 12V/5A mains PSU (going QRT). Andy. Tel: (0737) 833 428 (M25-Junc.8)

■ Yaesu FT200 transceiver 3.5MHz to 28MHz, mike, Morse key and power supply, the lot, £170 ono. 16 Seapark Drive, Clontarf, Dublin 3. Write or call.

■ SX200 Scanner 26-514MHz, regularly serviced by Garex, ac supply, dc power lead, brackets, manual, boxed, good cond, £120. Brand new, unused, Icom ICB 1050 FM transceiver, purchased for conversion to 10m FM, includes mike, manual, brackets, leads, £35. Buyer to collect. Tel: (0249) 653740 (not Sunday please)

■ Telephone patch (BT approved) CES 510SA, microprocessor controlled, fits any simplex radio, £200. CES 520D Duplex patch, £200. CES DTMF microphone, £50. Tel: Dublin (0001) 689249 evenings

■ Tono 550, £180. ZX Spectrum, £70. Scarab terminal, £40. CW audio filter, £5. CW Tx/Rx software, Tx spectrum interface, £14. Datong FL1, audio filter, £35. George G4RNU QTHR (0344) 54848

■ FRG7 receiver, mint condition, £125. Datong active antenna with interface/power supply, as new, £25. FL200B 10-80m 120 watt SSB/CW transmitter, GW0, £75. 1950s vintage, Vidor 'My Lady Anne' battery/mains case radio, vgc £20. Rob, G2BKZ. Tel: Stevenage 721418

■ Exchange my JVC midi hi-fi model E22, cost over £400, for a hand-held scanner Regency HX850, Realistic Pro 32, Uniden 100XL. Buyer must collect.

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Mr R Jones, 41 Gwernllwyn Terr, Tylorstown, Rhondda, M Glam CF433DP. Tel: (0443) 755876

■ Complete HF bands station Ten-Tec Argosy transceiver, five band, SSB/CW, mains PSU KW eezee match ATU, mic, superb condition and performance, £495. Also Commodore 64 and disc drive, lots of software, £195. Peter. Tel: Newhaven (0273) 517933

■ Kent double paddle, £30. Kent brass key, £25. Both complete and working, prefer buyer collect, cash only, or swop, cash adjustment if necessary. Write Angie G0HGA QTHR.

■ Icom RY1E receiver FM fitted, £400. Sony 7600D receiver good condition, £70. Eddystone 730/4 receiver fair condition, £75. J/R 310 HAM receiver fair condition, £60. All cash only. Ron Simpson. Tel: (021) 708 1473 anytime

■ FT290R 2m Multimode transceiver, rubber duck and shoulder strap, good condition, £220. Amstrad PC 1512 sd/mm with mouse and software, £350. Amstrad DMP2000 dot matrix printer, £110. Patrick. Tel: 01-874 7049 after 7pm

■ Two high grade heavy duty welding transformers, varnish impregnated with turret tag terminations. Type LTP 50814 primary +10 -0 -200 -220 -240 volts. Secondary 2040 -0 -2040 volts. 450mA S/C max 7¼ ×6 ×7 inches, boxed, new condition, weight 17kg, £10.00 each or £15 pair. For collection or carriage at cost. John G3JHL QTHR, Southampton area. Tel: (0794) 512283 evenings or weekends

■ Silent key sale: Trio TS780 (2m/70) all-mode; Datong PC1 gen cov conv; Datong active dipole AD370 + PSU. Datong RFA b/band preamp; Tokyo HRA2 masthead preamp; MMG 144V 2m preamp. Drae 2m wavemeter, Matsui MR4099 World Band receiver. MMC 144/28 conv; Maldol HS770 144/435 duplexer. Daiwa CS401 switch, Joymatch ATU. Reasonable offers please. Tel: Siva, 01-423 3884

■ US Signal Corps frequency meter BC221-AC complete with calibration charts, phones, power unit, exc cond, £70. Rare 1930s WD 44 to 61MHz wireless set No 17 MkII transceiver with original carton, handbook and accessories, all mint, £150. Collector's item: rare old induction coil in mahogany case, £40. Old NV4 and NT39 transmitting valves, £20 each. Nombrex audio/sig gen, types 30 and 24, £8 each. Multi-range m/voltmeter, £5. Tel: Bookham (0372) 52569 evenings

■ Yaesu FTV901 transverter with 2m module, £160, boxed. FDK700 ex 25 watt Tx, £150. Standard 828 carrying case with 12V NiCad battery pack, charger and helical whip, £25. G3VYP. Tel: (056) 885 296 (near Ludlow)

■ Cobra 148GTL DX MkI, super low fitted, just overhauled, £95. Bremi 200 watts amp, new valve fitted, £55. Tel: (061) 927 7325

■ Realistic DX300 comms Rx – AM, USB, LSB, CW, 10kHz to 30MHz, no gaps, runs off mains, 12V batteries built in, Morse practice oscillator, telescopic ant etc, excellent condition, complete with box and manual, £140 ono or part/ex for FT77 or FT707. Tel: (0709) 862871 after 5.30pm

■ FT757GX MkII, as new, £750. FP757HD PSU, mint, £130. FC757AT ATU, vgc, £210. Matching homebrew transverter, 50MHz and 144MHz, 20W output, professional appearance, £100. Complete station for £1,095. Realistic PRO-31 hand-held FM scanner, as new, £120. ERA microreader, small RTTY, CW decoder, £75. 9MHz 250Hz CW xtal filter, £12. G4ILO, QTHR. Tel: Colchester (0206) 210878

■ Marconi Atlanta comms Rx with homebrew power supply unit, 240-110V, good condition and grand working order, covers 15kHz to 28MHz AM, SSB/CW. Will do a straight swap for good home base scanner, eg Uniden Bearcat 175XL or Realistic base scanner, or make me an offer between £70 and £100. Buyer must collect, very big and heavy, just requires a good ATU. Andy Nevill, 1 Humber Street, Old Goole, North Humberside DN14 5UJ. Tel: Goole 2235

■ Radio mast, 3½in diameter sectional alloy with guy ropes and clamp, £20. Tel: Nottingham (0602) 874235

■ President Madison base unit, AM/FM/USB/LSB, digital clock, alarm, boxed in excellent condition, can easily be converted to 10m; also Tristar 727, AM/FM, covering 10/11m, in good condition. Has anyone any info on a radio I have been given, it's made by Raytheon Co, Model No RAY1056, has 1-5 channels plus PA? I believe it to be for marine band but any help would be gratefully accepted. I would like to swap any of the above for the following: a good ATU, ie FC902, FT102, FT707, AT230 or an FT107R transverter with 2 metre module, or FT290R 2m multimode, or a ham International Jumbo, or WHY? Please ring for a chat. Tel: Stalham (0692) 82075 daytime only please, ask for Ian

■ Era micro-reader, reads CW/RTTY, liquid crystal display, just checked/updated by Era, £80. LAR antenna noise bridge, £15. Tel: (0926) 498388

■ FT480R c/w manual and original packing, £225. TS520 10MHz fitted; CW filter fitted, £250. Tel: (0623) 642348

■ Trio SSB/CW 2m rig, ex cond, model TR7010, 10W output, £85 ono. Marconi Company aerial tuning coil MkII (roller coaster) made in 1943 by Canadian Marconi Co, offers? Alan. Tel: Basildon (0268) 45573 after 6pm

■ HF station, Yaesu FT77 with FM board and N/filter plus FC700 ATU and FP757HD power supply. All boxed and mint condition, sell £600 or exchange all for TS430S FT757 Icom or WHY? Tel: (0475) 706451

■ Bird thru-line elements, 400-850MHz 2.5W, 300-500MHz 5W, 2-30MHz 100W, 2-30MHz 1kW, £15 each. Shure hand mic 401B, unused, £15. AKG gooseneck mic, new, £10. SX200 scanner receiver, £50. Qty 8 EPROMS 27128 (blank, unused), £10. Or the job lot for £120, no offers please. Des G6LPH. Tel: Basingstoke (0256) 56985 after 6pm

■ Sony ICF Pro 80 receiver/scanner, 150kHz-108MHz, 115.15MHz-223MHz with converter, LW/MW/SW (SSB), FM, air, boxed with manual, 6 months old, £220. S Hancox, 11 Burbury Close, Marston Vale Estate, Bedworth, Warks CV12 8DU. Tel: (0203) 310211

■ Closing down sale, all must go, HF/VHF/UHF Rxs, ants, the lot, no offer will be refused. Call any time for what's left, eg TS FT FV etc, 73 de Martyn G4SUI. Martyn Bolt G4SUI, 112 Leeds Road, Mirfield, West Yorkshire WF14 0JE. Tel: (0924) 495916

■ Radio scanning receiver SX200, excellent working order, £100. S Turff, 22 Windsor Gardens, Thundersley, Essex SS7 3YF. Tel: Southend 555395

■ FT726R 2+6m fitted, 4 weeks old, pristine, exchange for FT757GX and accessories, or sell for £800. QTH W Midlands. Tel: (0384) 65614

■ Jaybeam HF 3 el yagi 20/15/10 metres, very good DX antenna, 18 months in use, £175. Yaesu FL2100Z linear, vgc, little used, £595. Max Bacon G3WMB QTHR. Tel: Ware (0920) 3564 Herts

■ Superstar 360 FM, good condition, £90 ono. Zetagi BU130 200W mains linear, new valves fitted, £80 ono. Also Sanyo Betamax video recorder, with infra-red remote control, hardly used, £100 ono. Contact Kevin. Tel: (0224) 684004

■ Superstar 360 FM, absolute mint condition (Cobra 148GTL DX board) complete with original bracket, microphone etc, includes AM/FM/CW/USB/LSB-kHz shift, mic/RF gain, SWR meter. Also Roger bleep switch, ideal for 10 metre conversions, offers over £135 ono. Also various CB/amateur accessories. Can post. Tel: (021) 453 2862 after 6pm

■ Trio TS515 HF transceiver + PS515 matching power supply + Shure base mic, homebrew speech processor. Can be seen working, new PA valves recently aligned, vgc, £225 ono. Glenn G0GBI QTHR. Tel: Bedford 66443 evenings

■ Two AR88D RCA original handbooks; two RCA mains transformers, part no GO1432. Radio technical books, pre-war and post-war, details available. WWII equipment handbooks: R209, R109, WS53, WS19, WS31, T1131A and others, details available. Quantity of RAF 104 connectors, RF and aluminium MK4 types; RF connector, Pye type, angled for WS19 and other WWII RF cables. Various mains transformers, capacitors, resistors, valves, meters. List of all items available. J H King GVJK, 36 Haroldslea Drive, Horley RH6 9DU. Tel: (0293) 783556

■ ARA 500 active antenna, gwo, £85. ARA 30 active antenna, vgc, £85. Zenith audio speech processor, £15. Plessey type 72 switches, 7 to sell, offers? All letters answered. All post paid. S P Martin, 24 Collingwood Close, Worle, Weston-Super-Mare, Avon BS22 9PQ

■ FDK multi 800D 2m 1/25W variable, g/mount, cable, aerial, £125. Tandy colour comp 64K, all packing plus w/shop book and basic course, £45. Would prefer cash or swap both for Yaesu FT730 or Sommerkamp FT730 or 70cm h/held. Tandy micro radio cassette with NiCads and charger, £35 or swap for Datong Morse tutor. May be able to deliver. Dave, Kings Lynn. Tel: (0553) 761943

■ 934 Cybernet Delta 1, plus mobile collinear, £220 ono. Tel: (029) 93 5702

■ Lowe SRX30 with 2m converter and PSU, plus 2m gamma twin and dipole antennas and homebrew ATU and antenna switch, plus other useful items, £75. B Wright, 33 Bradshaw Avenue, Glen Parva, Leicester. Tel: (0533) 777636

■ Icom ICR7000 scanning receiver, the best! Covers: CB, TV, emergency services and amateur bands above 30MHz. Unopened, unwanted wedding present, give me a call and haggle over £775 ono, ask for Tom. Tel: (0483) 62586

■ Yaesu FT7B HF mobile tcvr, c/w w/shop manual, in excellent condition, £295. Kenwood MC80 desk mic with scan facility, £35. Yaesu FC707 ATU, as new, £80. H/brew CM Howes ATU in alloy case, excellent budget-priced ATU, £25. Realistic DX100 communications receiver, in good working order, £35. Contact Christina. Tel: (0482) 825719 any time

■ Trio TR7010 2m SSB/CW rig, ex cond, with mic and mobile mount, £85 ono. Hammarlund SP600 Rx 0.54 to 54MHz, good cond, with line transformer for spkr out, £85 ono. FT209R, soft case, charger, box and manual, only 3 months old, £160. Alan. Tel: Basildon (0268) 45573 after 6pm

WANTED

■ 28-50MHz transverter, Meon/Cirkit etc. Alan. Tel: (0268) 45573 after 6pm

■ WWII German ex-service equipment, parts, literature, any condition – for museum purposes only. Also wanted: WS11, WS65 or 66, T1190 transmitter, YQAD67, 52ERT, RG375G, H2S modules, suitcase radio, will collect. OZ8RO, Rag Otterstad, Vejdammens DK-2840 Holte, Denmark. Tel: 010-452 801875

■ Urgently needed: photocopy of circuit for WKS model 1001 AM SSB multimode CB transceiver, all expenses paid. Barry G1VZW. Tel: (0254) 581949 after 5pm

■ Has anybody got spare copies of the June 1983 and October 1983 issues of *Amateur Radio*, full price paid plus postage. Please contact Adrian McGonigle, 30 Gilsland Road, Durranhill, Carlisle, Cumbria CA1 2XD. Tel: (0228) 41309

■ Drake R7A general coverage receiver, must be in mint condition, will collect if necessary. Rogers, Tadley, Hants. Tel: (07356) 2476

■ FT221R in vgc, small HF linear, eg Dentron, Ameritron. Defunct Yaesu 301 series for spares. G4ILO QTHR. Tel: Colchester (0206) 210878

■ Manuals for receivers B40C, SP600 JX, Eddystone 940, or good photocopies of same. Write to K Barker, 29 St Andrew's Court, Benton, Newcastle-upon-Tyne NE7 7UT

■ CW transmitter for amateur bands 80 through to 10, 150 watts complete with power supply, Collins Labgear LG300 or similar. Good price paid for quality unit. Tel: Heath (0226) 764425 9am-5pm, (0484) 606542 evenings

■ Yaesu FT7B plus FP7B PSU or Trio TS510 plus PS510 PSU, must be in good working order. Jim, 2 Stanley Court, Belfast BT12 4FY, N Ireland. Tel: 247049

■ Pye personal miniature portable battery receiver, model M78F. Amplion drive unit for Amplion Radiolux model RS2M loudspeaker (1925), or any similar drive unit. Crystal set for forthcoming exhibition, brand name preferred. Stan Casperd G3XON, 14 Dagden Road, Shalford, Guildford, Surrey GU4 8DD. Tel: (0483) 36953

■ Eddystone receiver model 1590, contact GM1XHZ QTHR. Tel: (0674) 76503

■ Grundig Satellit 2100 world zone Rx, plus SSB adapter and 476 Dryfit battery, showroom condition. Direct exchange for Sony CRF330K or GEC RC410R synthesized Rx. Write to 60 Highfield Road, M6 5LA. Tel: (061) 743 1570

■ *Short Wave* magazine, September 1948. issue number 62 vol 6, or any info on TU5B as frequency checked VFO. Also wanted: good condition HRO, prefer bandspread 14MHz coils or WHY? G3DOP. Tel: (0326) 290711

■ Eddystone 888A or 830, or EA12, or Murphy B40, Heathkit RA1 or similar, with instruction manual. Exchange for 32 *Amateur Radio* magazines from

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1986 to 1988, plus 53 CB magazines from 1982 to 1985 – not all full 12 months – also three RAE books, all full of hints and tips. All offers considered, all letters answered. Sorry will not split. Michael Tansley, 10 Telscombe Drive, Holmewood, Bradford 4 9AF

■ Russian ham wants to correspond with any British radio amateurs. I find *Amateur Radio* magazine fantastic, there is not same one in this country. I live in the South of Russia and have home-made equipment. I don't know much about British amateur radio and would be glad to correspond with Britons. All letters will be answered. Boris Chuistov, PO Box 20, Yalta, Crimea, USSR

■ Icom 551E 6 metre base transceiver, complete with FM, in good condition, price etc. R J C Burt, 339 Budshead Road, Whitleigh, Plymouth. Tel: (0752) 709956

■ Yaesu FL101 with or without matching FR101, preferably pristine (for display station). Also 2m/6m/FM boards for FR101S. Also fully equipped FR101S/D/DD etc, also pristine FT101 any mark. Also wanted: Yaesu CW filters for 101S. All to good home. Tel: (0789) 841285

■ Desk mic, Shure Brothers No 55 or 556 or similar mic insert, not import even if dud, type illustrated in *ARRL* 1947, page 82, also in *HRTA* April 1987, RSGB NARC, will refund costs, postage etc. Tel: Welwyn Garden City 322862

■ Your old Amateur Radio magazines wanted, please send what you have and what you want for them, address all letters to Michael Hudson, 71 Knight Avenue, Canterbury, Kent CT2 8PY

■ Hammalund Rxs 180, 145, 100, 170, etc. Also matching l/spkr, transformer etc; HRO Rx, coils, p/pack, speakers etc, any good gen cov Rxs. Can probably collect or arrange pick up. Tel: Milton Keynes 313507

■ Paper calibration chart for front of 7MHz to 14 MHz HRO coil pack, original or good copy. A Cooper, 1 Cottage Crescent, Camelon, Falkirk, Scotland FK1 4AX

■ Software for Packet Radio, Amtor cw Rx-Tx RTTY or information where available, all expenses paid for Sinclair QL. GM4JKL or Tel: (0236) 23153

■ Exchange FT767DX (FT707) with manuals for 2m/70cm multimode base Tx/Rx or sell for £380.00. Exchange Shimizy SS105S HF 5 band SSB/CW/FM Tx/Rx plus TL120 200 watt PEP linear for 50MHz multimode Tx/Rx or sell for £325.00. G4XPP QTHR

■ Receiver Collins R388/URR triple conversion with manual. Must be unmodified and in mint condition. Tel: Sutton on Sea, Lincs 41681

■ Stop!! Are there any scanner owners who want to swop frequencies ie radio information in the Swansea, Port Talbot, Barry, Weston-Super-Mare, Minehead or Ilfracombe areas? Contact Phil Lee, Nevadd Gilbertson, Mill Lane, Blackpill, Swansea SA3 5BA

■ Exchange TS130V Tx/Rx SP120 speaker, Daiwa CNA1001 Cross Needle ATU, creed 444 tele printer ST5ML terminal unit for FT707 or sell separately. TS130V, £250. SP120, £15. CNA1001, £80. Creed 444 with reader and perf and lots of paper, £30. ST5ML, £50 with 45/50 baud or total package, £375. Will deliver 50 miles. Also with above, mobile mount for TS130V, £15. All boxed. Terry G4XMQ. Tel: Lincoln 595051 eve & w/ends

■ Power pack 13.5 volts. 3 amp and 7 amp mic shore in good condition. Tel: (0283) 221870

■ Vertical HF antenna 10, 15, 20, 40 metres. Durham area if possible. Ian G1MQH. Tel: (0388) 662630

■ Collins 51J handbook, circuit diagram, valves, etc. Any service information please. For sale or exchange. Bill Hall, 1 Crookhill Ter, Ryton, Tyne & Wear. Tel: (091) 4132707

■ 70 cms SWR meter, 50MHz wave meter, 50 MHz module for FT726R, pay £165 or swop for HF module. Spectrum Plus 2 or 3 computers, pay £120 for the Plus 3 with accessories, and £80 for the Plus 2 with accessories, must be in good condition. VHS JVC Nicam stereo video. Infra-red headphones. NAD tuner/amp. Cheap compact discs. Spectrum games or amateur programs. FT23R 120 meter hand-held R-7H 1COM comms rcvr. Please write to Mike G1XGM, 51B Brownhill Rd, Catford, London SE6 2HB. Tel: 01-461 5398 anytime, or J Barton 01-248 4252 9am-5pm.

■ Drake 'C' Line late model. G4LW. Tel: Trowbridge 3166 anytime

■ 6V 12AH batteries lead acid, new condition, dry charged, 4½" high, 2¼" wide, £5.75 cash (shop price £14). Buyer collects. One AVO40 £49, cash. Good condition. Buyer collects. Tel: Worthing 501896

■ Clear out your loft! Philips 580A mains radio wanted in any condition, even cabinet only. Pure nostalgia for old timer (not a collector), but will pay your price. Please contact Roy G0EWC QTHR. Tel: Bristol 776891

■ Cobra 148GTl or Superstar 360, must be in perfect condition. Urgent. Yaesu 7700 also wanted. Tel: (0283) 221870

■ 2m 2 × 42 × 250 linear, no PSU, cash waiting. Julian G6LOH, 29 High St, Whittlebury, Towcester NN12 8X4. Tel: (0327) 857766

■ Corsair II Ten Tec with PSU. Tel: (061) 928 6828 anytime

■ Labgear LG300 Tx in original cond. For collector. Tel: (0329) 667498 (Hants)

■ Sony ICF 7600D receiver, with ac power supply, must be in excellent condition. Tel: (0902) 20636

■ Grundig SSB unit for satellit 2100, also any knowledge on how to hook up Grundig satellit 2100 to BBC B. Also any software for the above, RTTY CW etc. P A Sutton. Tel: (0493)850733

■ BBC, Amstrad or Commodore computer with monitor and preferably disc drive, in good working condition but reasonable. Also scanning receiver and frame store, suitable for weather satellite picture reception. Manuals essential. Write with full details. W A W Lankshear G0HFB, 57 Saint Georges Road, East Looe, Cornwall PL13 1ED. Tel: 2823

■ KDK 2025. Two meter FM transceiver in good condition. John G3JHL QTHR, Southampton area. Tel: (0794) 512283 evenings or weekends

■ Cheap HF rig, must be QRO but CW only most acceptable. Full Q5K essential. Also want light action, fast, straight key and good paddle for QRQ, eg Bencher or Vibroplex. Prefer to inspect, try, 30 miles radius Herts, will pay cash. All letters replied to. Please write Angie G0HGA QTHR.

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Tel: (0460) 73718.

Selectronic

The UK's leading suppliers of 934MHz personal radio equipment

203 High Street
Canvey Island, Essex,
Tel: 0268 691481
(Open Mon-Sat 9-5.30)

Amateur radio equipment also in stock

HEATHERLITE MOBILE MICROPHONES

telephone 0482 871762

With control box, mic gain control, PTT, LED on TX.
with plug, with scan buttons £26.00
with plug, without scan buttons £24.00
FOR SINGLE EARPHONE ON ANY OF ABOVE...add £3.00

TYPE SW for portables, mic, earphone, sw box, jacks £15.50
'please state rig'
p&p add £1.50 per order

EXPLORER VALVE AMPLIFIERS

2M EXPLORER VHF linear amp with single 4CX250B.....£535
70cm EXPLORER UHF linear amp with single 4CX250B.....£585
HF EXPLORER linear amp 2 x 3-500Z valves £1050
carriage on amps £15

Heatherlite Products,
1 Beverley Business Centre,
St. Nicholas Road, Beverley,
North Humberside. HU17 0QN

IAN FISHER COMMUNICATIONS OF STANHOPE

CB Works, The Market Shop, Market Place, Stanhope (0388) 528464

Main Distributors of 27MHz CB radios and the NEW CEPT models including ATRON and DNT.

Large stocks of coaxial cable, plugs, sockets and adaptors.
All available via mail order. Retail/ Wholesale

OPEN: MON-SAT 10.30am-6.00pm
SUN 2.30 - 4.30
RING FOR DETAILS
(0388) 528464

KANGA PRODUCTS

Kits for the contructor

Top Band transceiver kit	£49.50
Single band receiver	£19.95
Dual band receiver, 20 & 80	£35.95
Digital dial/counter	£19.95
Marker kit, 10kc-10Meg	£9.95
Our very popular VFO kit	£9.95
Miniature VFO 1in square PCB	£8.50
RF sidetone generator kit	£5.95
FT707, FT77 160M conversion kit	£27.50

(Some kits are supplied semi-complete). Please add 85p P&P. Plus many, more interesting kits Send large SAE for free catalogue!

KANGA PRODUCTS
3 Limes Road, Folkestone CT19 4AU

JAPANESE Ic's (PART OF OUR RANGE)

AN7178 £2.95, BA5406 £2.20, HA1377 £2.20, HA1392 £2.50, HA1394 £2.95, HA1397 £2.75,HA1398 £2.75, HA13001 £2.95, LA4460 £1.80, LA4461 £1.80, LA4507 £4.25, LC7137 £4.50, M51517 £2.80, MB3705 £1.80, MB3712 £1.50, MB3722 £3.50, MB3730 £2.50, MB3731 £3.50, STK461 £7.50, STK463 £8.40, TA7205AP £1.00, TA7222AP £1.30, TA7240 £2.95, TA7241 £2.95, TA7270 £2.75, TA7271 £2.75, TA7274 £2.95, TA7280 £3.50, TA7281 £2.95, TA7282 £2.95, TA7283 £2.95, TA7288 £2.95, TA7611 £3.20, UPC575 £1.00, UPC1156 £2.95, UPC1181 £1.10, UPC1182 £1.10, UPC1185 £2.50, UPC1188 £2.75, UPC1230 £2.50, UPC1263 £2.50, UP1277 £2.75, UPC1278 £2.75, UPC1365 £3.60, UPC1394 £1.95,
ADD 60p POST AND PACKING AND THEN ADD 15% VAT TO TOTAL

T POWELL 16 PADDINGTON GREEN LONDON W2 1LG
OPEN MON-FRI 10AM-5PM, SAT 9AM-12 NOON.
TELEPHONE: 01 723 9246
ACCESS/VISA. TELEPHONE ORDERS ACCEPTED OVER £5.00

NEIGHBOURHOOD WATCH BURGLAR ALARM D.I.Y KIT

will offer a profesional system at a DIY price

Ham mini beam 10,15,20 meters. Parts integrated circuits, transistors, diodes, valves, resistors, etc.

Service Manuail and parts for spectrum and Amstrad

Send a 8" x 5" SAE for list

M.J. SEAWARD (Mail Order)
St. Olafs Road, Stratton, Nr. Bude. Cornwall
Telephone: 0288 4892

Amateur RADIO SMALL ADS

This method of advertising is available in multiples of a single column centimetres — (minimum 2cms). Copy can be changed every month.

RATES
per single column centimetre:
1 insertion £7.00, 3 — £6.60, 6 — £6.30, 12 — £5.60.

AMATEUR RADIO SMALL AD ORDER FORM

TO: **Amateur Radio · Sovereign House**
Brentwood · Essex CM14 4SE · England · (0277) 219876

PLEASE RESERVE.....centimetres by.....columns

FOR A PERIOD OF 1 issue.....☐ 3 issues.....☐ 6 issues.....☐ 12 issues.....☐

COPY enclosed.....☐ to follow.....☐

PAYMENT ENCLOSED: (Add 15%VAT).... £ — Cheques should be made payable to Amateur Radio. Overseas payments by International Money Order and Credit Card

CHARGE TO MY ACCOUNT.....☐ CREDIT CARD EXPIRY DATE ☐☐ / ☐☐

COMPANY .....

ADDRESS .....

SIGNATURE ..... TELEPHONE.....

.....

C P I

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	⅛ page	£86.00	£82.00	£59.00	£53.00
128 x 90 or 61 x 186	¼ page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	½ page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.00
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	½ page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£550.00	£530.00	£470.00
263 x 394	double page	£1,130.00	£1,070.00	£1,010.00	£900.00

SPECIAL POSITIONS

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
Apr 88	3 Mar 88	9 Mar 88	11 Mar 88	31 Mar 88
May 88	31 Mar 88	6 Apr 88	8 Apr 88	28 Apr 88
Jun 88	28 Apr 88	4 May 88	6 May 88	26 May 88
July 88	2 Jun 88	8 Jun 88	10 Jun 88	30 Jun 88

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 – web 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.

AMATEUR RADIO
BACK ISSUES SERVICE

TO: Back Issues Department • Amateur Radio • Sovereign House • Brentwood • Essex • CM14 4SE

NAME .....

ADDRESS .....

.....

.....

.....

POSTCODE .....

PLEASE SUPPLY: (state month and year of issue/s required) NOTE: Only issues from August 1986 are available

.....

.....at £1.45 each

PAYMENT ENCLOSED: £ –

Cheques should be made payable to *Amateur Radio* Overseas payment by International Money Order or credit card

CREDIT CARD PAYMENT: ☐ ☐ EXPIRY DATE

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ ☐☐/☐☐

SIGNATURE .....

C P I

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 – 513 amp ring main junction boxes
2 – 513 amp ring main spur boxes
5 – 3 flush electrical switches
7 – 4in flex line switches with neons
8 – 2 80 watt brass cased elements
9 – 2 mains transformers with 6V 1A secondaries
10 – 2 mains transformers with 12V ½A secondaries
11 – 1 extension speaker cabinet for 6½" speaker
12 – 5 octal bases for relays or valves
13 – 12 glass reed switches
14 – 4 OCP 70 photo transistors
16 – 4 tape heads, 2 record, 2 erase
17 – 1 ultrasonic transmitter and 1 ditto receiver
18 – 2 15000 mfd computer grade electrolytics
19 – 2 light dependent resistors
20 – 5 different micro switches
21 – 2 mains interference suppressors
22 – 2 25 watt crossover units 2 way
23 – 1 40 watt 3 way crossover unit
28 – 1 6 digit counter mains voltage
30 – 2 Nicad battery chargers
31 – 1 key switch with key
32 – 2 humidity switches
34 – 96 x 1 metre lengths colour-coded connecting wires
36 – 2 air spaced 2 gang tuning condensors
37 – 2 solid diaelectric 2 gang tuning condensors
38 – 10 compression trimmers
41 – 6 Rocker Switches 10 amp mains SPST
43 – 5 Rocker Switches 10 amp SPDT Centre Off
44 – 4 Rocker Switches 10 amp DPST
45 – 1 24 hour time switch mains operated (sh)
46 – 1 6 hour clock timeswitch
48 – 2 6V operated reed switch relays
49 – 10 neon valves – make good night lights
50 – 2 x 12V DC or 24V AC, 4 CO relays
51 – 1 x 12V 2C O very sensitive relay
52 – 1 12V 4C relay
55 – 1 locking mechanism with 2 days
56 – Miniature Uniselector with circuit for electric jigsaw
57 – 5 Dolls' Houses switches
60 – 5 ferrite rods 4" x 5/16" diameter aerials
61 – 4 ferrite slab aerials with L & M wave coils
62 – 4 200 ohm earpieces
63 – 1 Mullard thyristor trigger module
64 – 10 assorted knobs ¼ spindles
65 – 5 different themostats, mainly bi metal
66 – Magnetic brake – stops rotation instantly
67 – Low pressure 3 level switch
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
73 – 4 3 watt wire wound pots 50 ohm
77 – 1 time reminder adjustable 1-60 mins
78 – 5 5 amp stud rectifiers 400V
85 – 1 mains shaded pole motor ¾" stack – ¼ shaft
86 – 2 5" ali fan blades fit ¼" shaft
87 – 2 3" plastic fan blades fit ¼" shaft
88 – Mains motor suitable for above blades
89 – 1 mains motor with gearbox 1 rev per 24 hours
91 – 2 mains motors with gearbox 16 rpm
93 – 4 11 pin moulded bases for relays
94 – 5 B7G valve bases
95 – 4 skirted B9A valve bases
96 – 1 thermostat for fridge
98 – 1 motorised stud switch (sh)
101 – 1 2½ hours delay switch
103 – 1 6v mains power supply unit
104 – 1 4½ V mains power supply unit
105 – 1 5 pin flex plug and panel socket
107 – 15" speaker size radio cabinet with handle
109 – 10¼" spindle type volume controls
110 – 10 slider type volume controls
112 – 1 heating pad 2000 watts mains
114 – 1 1W amplifier Mullard 1172
115 – 1 Wall mounting thermostat 24V
118 – 1 Teak effect extension 5" speaker cabinet
120 – 2 pcb with 2 amp full wave and 17 other recs
122 – 10 mtrs twin screened flex white pvc outer
132 – 2 plastic boxes with windows, idealfor interrupted beam switch etc
155 – 3 varicap push button tuners with knobs
188 – 1 plastic box, sloping metal front, 16x95mm, average depth 45mm
241 – 1 car door speaker (v flat) 6½" 15 ohm made for Radiomobile
243 – 2 speakers 6" x 4" 15 ohms 5 watt made for Radiomobile
266 – 2 mains transformers 9V ½A secondary split primary so OK also for 115V
267 – 1 mains transformers 15V 1A secondary pcb mounting
330 – 2,6V 0.6Vmains transformer .3a pcb mounting
350 – 40 double pole leaf switches
365 – 1 7uf 660V 50hz metal cased consenser
453 – 453 – 2 2¼ in 60 ohm loudspeakers
454 – 2 2¼ in 8 ohm loudspeakers
453 – 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 led displays
470 – 4 pc boards for stripping, lots of valuable parts
480 – 1 3A double pole magnetic trip, saves repairing fuses
498 – 4 1000uf 25V axial electrolytic capacitors
504 – 1 Audax PM 8" speaker 15 ohms 5 watt rating
515 – 100 4BA 1½" cheesehead plated screws and 100 4BA nuts
541 – 1 pair stereo tape head as in cassette recorder/players
546 – 1 bridge rectifier 600V international rectifier ref 3SB100
548 – 2 battery operated relays (3-6v) each with 5A c/o contacts 2 pairs
553 – 2 lithium 3V batteries (everlasting shelf life)

OVER 400 GIFTS YOU CAN CHOOSE FROM

There is a total of over 400 packs in our Baker's dozen range and you can become entitled to a free gift with each dozen packs.
A classified list of these packs and our latest 'News Letter' will be enclosed with your goods and you will automatically receive our next news letter.

THIS MONTHS SNIP

3½ floppy Disk Drive, made by the Chinon Company of Japan. Beautifully made and probably the most compact device of its kind as it weighs only 600g and measures only 104mm wide, 162mm deep and has a height of only 32mm, other features are high precision head positioning – a single push loading and eject – direct drive brushless motor – 500K per disc – Shugart compatible interface – standard connections – interchangeable with most other 3½ and 5¼ drives. Brand new with copy of makers manual. Offered this month at **£28.50** post and VAT included.

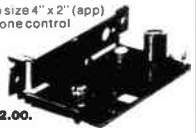
CASE – adaptable for 3" or 3½" FDD, has room for power supply components price only **£4** includes circuit of PSU. Our Ref 4P8.

POWER SUPPLY FOR FDD – 5V and 12V voltage regulated outputs, complete kit of parts will fit into case 4P8 price **£8** or with case **£11**

MULLARD UNILEX AMPLIFIERS
We are probably the only firm in the country with these now in stock. Although only four watts per channel, these give superb reproduction. We now offer the 4 Mullard modules – ie Mains power unit (EP9002) Pre amp module (EP9001) and two amplifier modules (EP9000) all for **£6.00** plus £2 postage. For prices of modules bought separately see TWO POUNDERS.

CAR STARTER/CHARGER KIT
Flat Battery! Don't worry you will start your car in a few minutes this unit – 250 watt transformer 20 amp rectifiers, case and all parts with data case **£17.50** post £2.

MINO MONO AMP on pcb size 4" x 2" (app)
Fitted volume control and a hole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms.
More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of **£1.15 each, or £13 for £12.00.**



LIGHT BOX
This when completed measures approximately 15" x 14". The light source is the Philips fluorescent 'W' tube. Above the light a sheet of fibreglass and through this should be sufficient light to enable you to follow the circuit on fibreglass PCBs. Price for the complete kit, that is the box, choke, starter, tube and switch and fibreglass is **£5** plus £2 post, order ref 5P69.

TANGENTIAL HEATERS
We again have very good stocks of these quiet running instant heat units. They require only a simple case, or could easily be fitted into the bottom of a kitchen unit or book case etc. At present we have stocks of 1,2kw, 2kw, 2.5kw and 3kw. Prices are **£5** each for the first 3, and **£6.95** for the 3k. Add post £1.50 per heater if not collecting.

CONTROL SWITCH enabling full heat, half heat or cold blow with connection diagram, 50p for 2kw, 75p for 3kw.

FANS & BLOWERS
5" **£5** + £1.25 post. 6" **£6** + £1.50 post
4" x 4" Muffin equipment cooling fan 115V **£2.00**
4" x 4" Muffin equipment cooling fan 230/240V **£5.00**
9" Extractor or blower 115V supplied with 230 to 115V adaptor **£9.50** + £2 post.
All above are ex computers but guaranteed 12 months.
10" x 3" Tangential Blower. New, Very quiet – supplied with 230 to 115V adaptor on use two in series to give long blow **£2.00** + £1.50 post or **£4.00** + £2.00 post for two.

9" MONITOR
Ideal to work with computer or video camera uses Philips black and white tube ref M24/306W. Which tube is implosion and X-Ray radiation protected. VDU is brand new and has a time base and EHT circuitry. Requires only a 16V dc supply to set it going. It's made up in a lacquered metal framework but has open sides so should be cased. The VDU comes complete with circuit diagram and has been line tested and has our six months guarantee. Offered at a lot less than some firms are asking for the tube alone, only **£16** plus £5 post.

LOW COST OSCILLOSCOPE – kit to convert our 9" monitor into an oscilloscope with switched time bases to allow very high and very low frequency waveforms to be observed and measured. Signal amplitudes from as low as 10mV and as high as 1kV can easily be observed and measured. Ideal for servicing, also for investigating TV, radio and audio circuits.
Kit containing all the parts for the conversion and the power supply to operate from mains **£25** our ref 25P3.

TELEPHONE LEAD
3 mtrs long terminating one end with new BT, flat plug and the other end with 4 correctly coloured coded wires to fit to phone or appliance. Replaces the lead on old phone making it suitable for new BT socket. Price **£1** ref BD552 or 3 for **£2** ref 2P164

COMPACT FLOPPY DISC DRIVE EME-101
The EME-101 drives a 3" disc of the new standard which despite its small size provides a capacity of 500k per disc, which is equivalent to the 3½" and 5½" discs. We supply Operators Manual and other information showing how to use this with popular computers. BBC, Spectrum, Amstrad etc. All at a special snip price of **£27.50** including post and VAT. Data available separately **£2**, refundable if you purchase the drive

POWERFUL IONISER
Generates approx 10 times more IONS than the ETI and similar circuits. Will refresh your home, office, shop, workroom etc. Makes you feel better and work harder – a complete mains operated kit, case included **£11.50** + £3 P&P

J & N BULL ELECTRICAL
Dept AR, 250 PORTLAND ROAD, HOVE BRIGHTON, SUSSEX BN3 5QT

MAIL ORDER TERMS: Cash, PO, or cheque with order. Orders under £20 add £1 service charge. Monthly account orders accepted from schools and public companies. Access & B/card orders accepted. Brighton (0273) 203500.

NEW ITEMS

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

SUPER WATER PUMP – Approx ½ hp mains operated originally intended to operate a £300 shower unit at controlled pressure – but of course suitable for many other water or liquid moving operations – where a good flow at a constant pressure is required – Price £25 each VAT and Post Paid. Our Ref: 25P2
VERY USEFUL MULTI TESTERS – These have all usual ranges AC & DC volts – DC MA and OHMS etc but an unusual and very useful feature is a "low OHMS" range. Very useful for checking dry joints etc. They are ex GPO and may have faults but we test and guarantee the movement to be OK. Price £3 each. Ref: 3P30
AGAIN AVAILABLE – 12" mini flourescent tubes – Price £1 each. Ref: BD314
POWER PACK OF AMPLIFIER CASE – Size approx 10" x 8¼" x 4¾" plated steel – with ample perforations for cooling. Front panel has on/off switch and EEC mains inlet plug with built-in RF filter – undoubtedly a very fine case which would cost at least £50 from regular sources, our price is £5 each and £3 post. Ref: 5P111
MINIATURE BCD THUMP WHEEL SWITCH – Matt black edge switch engraved white on black – gold plated, make before break contats – size approx 25mm high, 8mm wide, 20mm deep – made by the famous Cherry Company and designed for easy stacking – Price £1 each. Ref: BD601
EDGE METER – miniature, whole size approx 37mm x 13mm 100 ua fsd – centre zero scaled 0 to – 10 and 10 to + 10. Price £1 each. Ref: BD602
LARGE 2 SPEED MOTOR – 1hp at 2500rpm and ¼hp at 200rpm – continental make, intended originally to power an industrial machine – regular price over £60, our Price £15 plus 15 carriage. Ref: 15P5
RUBBER FEET – Stick on – ideal for small instruments and cabinets – pack of 56 for £1. Ref: BD603
CLEANING FLUID – Extra good quality – intended for video and tape heads – regular price £1.50 per spray can – our Price – 2 cans for £1. Ref: BD604
DON'T FREEZE UP! – We have had the strongest winds for over 200 years and who knows we may be in for the coldest winter, so if you have not already protected your water pipes you should do so now – our heating wire wound arond the pipes will do this and will only about 50p per week to run – 15 metres (minimum length to connect to 230/240v mains! Price £5. Our Ref: 5P 109
PIEZO ELECTRIC FAN an unusual fan, more like the one used by Madame Butterfly, than the conventional type, it does not rotate. The air movement is caused by the two vibrating arms. It is American made, mains operated, very economical and causes no interference. So it is deal for computer and instrument cooling. Price is only £1 each. Ref: BD605
SPRING LOADED TEST PRODS – heavy duty, made by the famous Bulgin company. Very good quality. Price four for £1. Ref: BD599
CURLY LEAD four core, standard replacement for telephone handset, extends to nearly two metres. Price £1 each. Ref: BD599
TELEPHONE BELLS – these will work off our standard mains through a transformer, but to sound exactly like a telephone, they then must be fed with 25hz 50v. So with these bells we give a circuit for a suitable power supply. Price 2 bells for £1. Ref: BD600
ULTRA SENSITIVE POCKET MULTIMETER – 4k ohms per volt – 11 ranges – carry one of these and os be always ready to test ac/dc volts to 1000. DC milliams and have an ohms range for circuit testing – will earn its cost in no time. Price only £7. Ref: 7P2
BLOW YOUR ROOF OFF 140 watt speaker systems – new type you must not hide! They have golden cones and golden surrounds and look really "Bootiful" 12 Woofer, Midrange and Tweeter and comes with a crossover at a special introductory price of £49, carriage paid. Two sets for £95 carriage paid! 140w Woofer only £35 carriage paid
SWITCH MODE PSU Mains input 2 output plus 5v at 3.5 amps plus 12v at 1.5 amps. Very compact (6½" × 4" × 2"), ideal for driving 1 or more floppy discs. Regular price around £30. Our price only £10 brand new. Ref: 10P34
APPLIANCE THERMOSTATS – spindle adjust type suitable for convector heaters or similar price 2 for £1. Ref: BD582

COMPUTERS

Big consignment of computers expected in mid Jan, various makes and numbers, write or phone for details

NOVEL NIGHT LIGHT – plugs into a 13A socket. Gives out a surprising aamount of light, certainly enough to navigate along passages at night or to keep a nervous child happy. Very low consumption, probably not enough to move the meter. Price £1. Ref: BD563
CASE WITH 13A PRONGS – to go into 13A socket, nice size and suitable for plenty of projects such as car battery trickle charger, speed controler, time switch, night light, noise suppressor, dimmers etc. Price – 2 for £1. Ref: BD565
SPEAKER EXTENSION CABLE – twin 0.7mm conductors so you can have long runs with minimum sound loss and for telephone extensions or burglar alarms, bells, intercoms, etc. 250m coil only £3 plus £1 post. Ref: 3P28
ALPHA-NUMERIC KEYBOARD – this keyboard has 73 keys with contactless capacitance switches giving long trouble free life and no contact bounce. The keys are arranged in two grouns, the main area field is QWERTY array and on the right is a 15 key number pad, board size is approx 13" x 4" – brand new but offered at only a fraction of its cost namely £3, plus £1 post. Ref: 3P27
TELEPHONE EXTENSIONS – it is no legal for you to undertake the wiring of telephone extensions. For this we can supply 4 core telephone cable, 100m coil £8.50. Extension BT sockets £2.95. Packet of 500 plastic headed staples £2. Dual adaptor for taking two appliances from one socket £3.95. Leads with BT plug for changing old phones. 3 for £2
MODULAR SWITCH – Panel mounting highest quality and ideal where extra special front panel appearance is required, can be illuminated if required dpdt and latching. Price – 2 for £1. Ref: BD607
WIRE BARGAIN – 500 metres 0.7mm solid copper tinned and pvc covered. Only £3 + £1 post. Ref; 3P31 – that's well under 1p per metre and this wire is ideal for push on connections
INTERRUPTED BEAM KIT – this kit enables you to make a switch that will trigger when a steady beam of infr-ref or orindary light is broken. Main components – relay, photo transistor, resistors and caps etc. Circuit diagram but no case. Price £2. Ref: 2P15
3-30V VARIABLE VOLTAGE POWER SUPPLY UNIT – with 1 amp DC output. Intended for use on the bench for experiments, students, inventors, service engineers etc. This is probably the most important piece of equipment you can own. (After a multi-range test meter). It gives a variable output from 3-30 volts and has an automatic short circuit and overload protection which operates at 1.1 amp approx. Other features are very low ripple output, a typical ripple is 3mV pk pk 1mV rms. Mounted in a metal fronted plastic case, this has a voltmeter on the front panel in addition to the output control knob and the output terminals. Price for complete kit with full instructions is £15. Ref: 15P7
TRANSMITTER SURVEILLANCE (BUG) tiny, easily hidden, but which will enable conversation to be picked up with FM radio. Can be housed in a matchbox, all electronic parts and circuit. Price £2. Ref 2P52

ALINCO DUAL BANDER

- ★ 2m/70cm
- ★ 25 Watts output
- ★ Full duplex operation
- ★ 21 Memories
- ★ 2 Call channels
- ★ Priority channel
- ★ Dual VFO's
- ★ 12.5 & 25kHz steps
- ★ Memory Scan
- ★ Programme Scan
- ★ Memory Skip

£449 inc vat

ALD-24E

This transceiver could transform your operating habits! It contains completely separate 2m and 70cms transceivers, permitting full duplex operation. To the un-initiated, this means you can transmit on 2m whilst receiving on 70cms, or vice versa. The built-in duplexer means a single antenna socket with a full 25 watts output on both bands. Measuring only 5.5"x2"x6.5" it is the ideal mobile rig. Its comprehensive memory and scanning facilities provide rapid access to both simplex and repeater channels on 2m & 70cms. Using the dual VFO's you can instantly switch between 2m & 70cm and the single knob tuning provides simple and quick frequency selection. The large LCD readout incorporates an S-meter and is back lighted. If you are looking for a completely self contained 2m & 70cm station, then look no further. At this price it has to be a bargain. For further details of this amazing transceiver, send today for the full colour brochure.

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